# Preparing Stormwater Planning Documents

## A Guide for Clean Water State Revolving Fund Loan Applicants



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## Alternative formats

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# Executive Summary

This guide is a resource for municipal staff, officials and loan applicants of the Oregon Department of Environmental Quality's Clean Water State Revolving Fund. The CWSRF provides below-market rate financing to support stormwater planning and other water quality projects, as well as offers technical assistance.

Communities need stormwater planning for various reasons, including failing infrastructure; local flooding problems due to inadequate or undersized infrastructure; damage to infrastructure or permit compliance, such as the National Pollutant Discharge Elimination System, known as NPDES; and the Total Maximum Daily Load, known as TMDL.

This guide provides information for the following types of planning:

- A stormwater management plan for a post-construction stormwater control program for new development and redevelopment, as well as to address NPDES Municipal Separate Storm Sewer System Permit and TMDL
- Updates to a stormwater master plan addressing Statewide Planning Goal 11 for Public Facilities and Services and addressing the mapping requirements in a NPDES Municipal Stormwater Permit
- Pre-design report for a stormwater construction project identified in a stormwater master plan or in response to a failing or damaged stormwater system
- Illicit discharge and detection plan addressing NPDES Municipal Stormwater Permit and TMDL requirements

This guide presents a variety of references and examples to consider when developing a stormwater management plan and the post-construction stormwater control program to implement this plan. It also includes suggestions for leveraging limited funds by integrated planning or focusing on a priority drainage basin during master planning. The appendices include checklists for different types of stormwater planning to help in drafting loan application project descriptions.

Finally, this guide addresses some key findings from a needs assessment conducted by Oregon State University on barriers and opportunities to implementing low-impact development in communities characterized by:

- Municipalities unfamiliar with the low-impact development approach
- Small municipalities lacking the staff and funding to develop, revise and enforce codes, as well as educate developers on a low-impact development approach

Clean Water
State Revolving Fund

# 1. Introduction

## 1.1 Financing water quality projects

The Oregon Department of Environmental Quality's Clean Water State Revolving Fund offers below-market rate loans to public agencies for projects that enhance, protect or restore water quality. Eligible borrowers are cities, counties, tribal governments, sewer and sanitary districts, various special districts, irrigation districts, soil and water conservation districts and intergovernmental entities.

The loan program offers interest rates as low as 1 percent and projects that are environmentally innovative or conserve energy or water may qualify for principal forgiveness. Please submit this project inquiry form and a program representative will contact you about your community's stormwater issues.

Stormwater management activities may fall into one or more of the program's loan categories. For example, an eligible borrower could take a planning loan to design a stormwater management plan and take a construction loan to build treatment systems.

The program offers flexible loans in the following project categories:

- **Point Source -** Financing for design and construction of publicly owned wastewater facilities; building or rehabilitation of sewer collection systems; urban wet weather flow control activities, including stormwater; or sanitary and combined sewer control measures.

- **Nonpoint Source** - Financing for projects that include animal waste management; agricultural water conservation; protection or restoration of riparian (streamside) habitats; establishing conservation easements; acquiring riparian lands or wetlands; estuary management projects and other nonpoint source pollution control activities outlined in DEQ's Nonpoint Source Management Program Plan. The Sponsorship Option allows a public agency to fund a traditional point source water quality project and a nonpoint source or estuary management activity as a combined loan with a lower overall interest rate.

- **Planning -** Financing of data collection and measurement, evaluation, analysis, security evaluation, report preparation, environmental review and any other activity leading to a written planning document.

- **Local Community Loan -** Financing to help public agencies establish their own loan program addressing a local water quality issue. Rural counties, soil and water conservation districts or irrigation districts often do this.

This guide introduces a widely used stormwater management approach and the development of a municipal stormwater master plan. It also contains information on preparing a pre-design report for specific stormwater infrastructure projects. A pre-design report is an engineered planning document that municipalities can use to develop designs and specifications for a stormwater infrastructure project.

In addition to below-market interest rates on planning and other loans, CWSRF offers technical assistance to help determine the best approach to meet your water quality needs. Refer to the appendices for further guidance about eligible projects and requirements for financing through this program.

### 1.1.1 An overview of this guide

The stormwater management approach presented in this guide may reduce the cost associated with using a conventional approach while improving the quality of stormwater discharged. This is done through a three-step approach to stormwater management:

1. Establish a site performance standard to ensure a development's stormwater management system helps mimic pre-development hydrology, which refers to how rainfall moves naturally on vegetated land
2. Establish nonstructural stormwater controls to reduce the volume of stormwater generated from a development and amount of pollutants transported in stormwater
3. Establish structural stormwater controls giving priority to green infrastructure, to provide the highest stormwater treatment and volume reduction possible

This guide does not provide an overview of considerations and requirements for stormwater runoff for construction sites. However, municipal stormwater manuals from National Pollutant Discharge Elimination System permittees should include design and specifications for erosion and sediment controls for construction activities, as well as address other permit requirements as needed. Visit EPA's National Stormwater Best Management Practices Menu for Construction for resources to help develop a municipal construction site runoff program.

This guide reflects several fundamental shifts in how runoff is managed at development sites, including:

- Emphasizing on-site runoff reduction, using site design practices referred to as "better site and environmental site design", also called "low-impact development"
- Promoting and requiring greater infiltration and groundwater recharge at the site
- Providing a unified approach to size structural stormwater controls that employs four to five defined sizing criteria for concerns, such as water quality, groundwater recharge, channel protection, overbank flood control and extreme storms
- Requiring increased runoff retention volume requirements for treatment and pollutant removal
- Requiring new storage and release requirements to prevent bed and bank erosion in urban streams
- Providing explicit numeric guidance to size stormwater controls

The examples featured in this document represent the current state of stormwater management nationally.

## 1.2. Current practices in Oregon

Oregon communities prioritize stormwater management on not only the west (wet) side, but east of the Cascades as well. There are many stormwater manuals and references specific to Oregon communities and regions that are available online. Portland's Stormwater Management Manual is an example of a thorough document with policy and design requirements developed for a municipality west of the Cascades.[1] Other Oregon municipalities have adapted the Portland manual for their documented local or regional rainfall frequency and intensity.

Cities, counties and organizations in Central Oregon came together in 2005 to form a regional stormwater management committee. This committee worked with a consulting firm to develop the Central Oregon Stormwater Manual, presenting requirements and practices appropriate to the regional climate and geological conditions. The Central Oregon Manual was developed so that it can be adopted by communities in the region as their stormwater manual. For municipalities in Oregon east of the Cascades, this manual is an example of stormwater regulations and requirements for a drier region of the state.

Stormwater management is undergoing continual improvement in Oregon. For example the Oregon Environmental Council has developed, in collaboration with DEQ and other entities, the Low Impact Development Guidance Manual for Western Oregon. This manual helps small municipalities develop post-construction stormwater requirements to address a Total Maximum Daily Load.

## 1.3 Federal and state stormwater requirements

### 1.3.1 Overview

A number of regulatory requirements influence stormwater management actions and practices in Oregon. A Clean Water State Revolving Fund planning loan does not trigger federal environmental requirements, such as Endangered Species Act consultation, but a construction loan. Review Appendix C for more information or contact Clean Water State Revolving Fund technical assistance at 503-229-LOAN.

Various federal certifications and permits may be required for water quality. DEQ provides information about these requirements online or contact Clean Water State Revolving Fund technical assistance at 503-229-LOAN.

# 2. Stormwater management

## 2.1 General approach

There are seven key program elements from new development and redevelopment, based on a review of municipal stormwater requirements nationwide. The first key element is a clear trigger or threshold for when post-construction stormwater controls are required in new development or redevelopment. Once this trigger is established, a numeric site performance standard is needed for volume reduction and flow control. This standard is a retention requirement and requires a portion of stormwater generated on a site be retained to mimic predevelopment hydrology. This is intended to promote a site design that decreases impervious surface area directly connected to the stormwater conveyance system in a development. This reduction will reduce the number and size of structural stormwater controls.

To help meet the numeric retention standard mentioned above, a developer and designer first use nonstructural stormwater controls to minimize the volume of stormwater discharged from a developed or redeveloped site. If site constraints limit the required retention of stormwater utilizing nonstructural controls, the designer gives priority to structural controls using green infrastructure. At the site scale, “green infrastructure” refers to stormwater management systems designed to help maintain and restore the natural hydrology by harvesting, infiltrating and allowing the evapotranspiration of stormwater.
As part of the site performance standard, a numeric treatment standard is also established to ensure that a portion of the stormwater generated from new impervious surfaces receives an appropriate level of treatment before it is discharged to a channel or conveyance system connected to state waters. This treatment standard applies when the target volume of stormwater in the retention requirement cannot be retained onsite. Finally, to ensure that the treatment standard is achieved, the municipality develops sizing criteria and design specifications for these structural controls.

This general approach for a Clean Water State Revolving Fund-financed municipal stormwater management plan, including post-construction stormwater control requirements (see Appendix B.1) for new development and redevelopment, is summarized as follows:

1. Establishing a trigger for post-construction stormwater management requirements
2. Establishing a retention requirement for stormwater volume reduction
3. Employing nonstructural stormwater controls to help meet this requirement
4. Following nonstructural controls with structural stormwater controls, giving priority to green infrastructure
5. Establishing a treatment requirement for structural controls
6. Identifying sizing criteria for these structural controls to meet this treatment requirement
7. Identifying designs and specifications for these structural controls

**Table 1: Examples of stormwater controls**

| Control Type | Structural | Nonstructural |
|---|---|---|
| **Runoff** | Increase infiltration/retention: bio-retention (vegetated swales, green-roofs), rainwater harvesting, permeable pavement, underground injection controls, retention ponds, constructed wetlands<br>Maintain discharge rates: detention/retention ponds, increase infiltration and retention as above | Reduce/disconnect impervious surface: cluster development, narrow streets, downspout disconnection, wetland and riparian buffer zones, preserve vegetation<br>Maintain natural drainage/storage: protect riparian vegetation, minimize soil compaction, protect natural drainage ways, preserve trees, reduce impervious surfaces |
| **Source** | Cover pollutant sources: waste and material storage, fuel dispensing, auto repair<br>Redirect/remove pollutants: hydraulically isolate waste storage and material handling areas, oil/water separators | Proper handling/disposal: proper disposal of household, yard wastes and auto fluids; proper application of landscaping chemicals, illicit discharge and detection program; good housekeeping in municipal operations<br>Redirect/remove pollutants: street/parking lot sweeping, clean and maintain stormwater collection and treatment facilities, spill containment/response programs |
| **Treatment** | Reduce stormwater runoff volume: bio-retention (vegetated swales, green-roofs), rainwater harvesting, retention ponds<br>Remove stormwater pollutants: bioswales, vegetated filter strips, wet ponds/wetlands, media filtration | Maintain natural treatment: protect riparian vegetation and wetlands, minimize soil compaction, protect natural drainage ways |

# 2.2 Nonstructural stormwater controls

## 2.2.1 Nonstructural controls explained

The purpose of nonstructural stormwater controls is to reduce the volume of stormwater generated by development and by minimizing the impervious surface area. Nonstructural stormwater controls include the following:

- Lot size averaging
- Cluster development
- Transfer of development rights
- On-site density transfers
- Minimize soil compaction
- Amend soils with loam, sand, and/or mulch
- Fingerprint clearing to minimize soil compaction/vegetation disturbance
- Riparian buffers
- Construction sequencing
- Vegetation standards
- Tree protection
- Reduce street widths
- Avoid curb and gutter using bioswales
- Allow pervious pavement
- Reduce home setbacks to shorten driveways
- Reduce frontages to reduce street lengths
- Minimize cul-de-sac diameters
- Reduce the width of sidewalks
- Use sidewalks on one side only
- Allow shared parking
- Minimize excess parking space
- Utilize pervious pavers in low-use parking areas
- Disconnect downspouts
- Protect faster draining soils
- Minimal excavation for foundations
- Avoid impacts to wetlands/riparian buffers
- Substitute pervious trails in common areas
- Use diffuse flow or runoff over the landscape
- Avoid concentrated flow
- Disconnect runoff by routing across vegetated soils
- Reduce stormwater conveyance grades
- Increase stormwater conveyance lengths using circuitous flow routes if possible and add vegetation to swales with check dams in swales

A municipality implements these through zoning ordinances and development standards. To use a site design, or low-impact development approach to stormwater management, municipalities may need to create more flexible land-use development.

### 2.2.1.1 Development standards and zoning for stormwater management

DEQ and the Oregon Department of Land Conservation and Development developed the Water Quality Model Code and Guidebook, which provides a variety of land-use planning techniques to meet the retention requirements. The guidebook includes a number of examples of how site-design standards can be used to incorporate nonstructural controls into standards for parking lots, front and side yard setbacks, minimum lot sizes and more. For example, providing flexibility in lot sizes allows a developer to protect and use more permeable soils, as well as protect wetlands, riparian areas and floodplains that can be included in stormwater management.

Reviewing and revising development standards for streets provides another opportunity to reduce impervious surfaces, as described in, Neighborhood Street Design Standards – an Oregon Guide to Reducing Street Widths. It identifies opportunities for adjusting street widths while providing research on safety and stakeholder concerns. Stormwater to Street Trees – Engineering Urban Forests for Stormwater Management is a reference developed by EPA that explores using street trees for management and disposal of stormwater in urban environments.

### 2.2.2 When to use nonstructural controls

A municipality's effort to develop nonstructural stormwater control requirements should be an early step in establishing a stormwater management approach for new development and redevelopment. Applying nonstructural stormwater controls during site design will reduce runoff and may eliminate or reduce the number and/or size of structural stormwater controls and the costs associated with them. Nonstructural stormwater controls are critical to implementing a Low Impact Development approach to stormwater management. The Low Impact Development Center describes it as:

> "… a comprehensive land planning and engineering design approach with a goal of maintaining and enhancing the pre-development hydrologic regime of urban and developing watersheds."

Given its role in reducing stormwater runoff and increasing infiltration, low-impact development is emphasized in this guide and other design manuals. The approach uses nonstructural controls, such as land-use development standards, as well as structural controls, like engineering associated with green infrastructure. The unit processes typically associated with green infrastructure, with its focus on bioretention, involve sedimentation, adsorption, filtration and plant uptake. These reduce a variety of pollutant loads in stormwater[2] and the volume of runoff generated from development. Stormwater volume reduction is the most reliable and cost-effective approach to reduce pollutant load.

### 2.2.3 Source controls

Source controls minimize the amount of pollutants picked up by stormwater and should be used before considering structural controls. Structural *source* controls are different in that they prevent pollutants from reaching stormwater. Examples include proper outdoor storage of solid wastes, including food waste and household garbage, or requirements that automobiles only be serviced in covered garages.

Helpful resources include:

- Chapter 4 of the Portland Stormwater Management Manual[1]
- Thurston County, WA's Residential Stormwater Pollution Prevention Source Control Manual
- The City of Salem's codified source control requirements for all properties and for certain pollutant generating activities in the administrative rules for the Salem Department of Public Works[49]
- Volume IV Source Control Best Management Practices of the Washington Department of Ecology's "Stormwater Management Manual for Western Washington" focuses on source control best management practices with an extensive list for commercial activities.[16]
- The California Stormwater Quality Association's series of Best Management Practices Handbooks, focusing on industrial, commercial, municipal and new/redevelopment projects with each of the handbooks containing recommended source controls.

#### 2.2.3.1 Illicit discharge detection and elimination

Illicit discharges are a major source of stormwater pollution. An "illicit" discharge is any discharge to the municipal separate storm sewer system that is not composed entirely of stormwater, except for discharges allowed. For example, authorized illicit discharges may fall under a National Pollution Discharge

Elimination System Permit or include runoff resulting from emergency firefighting operations. Oregon's NPDES Municipal Separate Storm Sewer System Permits require the development of an Illicit Discharge, Detection and Elimination Program to find and eliminate inappropriate discharges to the storm sewer, such as a sewer lateral connection to a municipal stormwater conveyance pipe. An illicit discharge detection and elimination program is also a recommended management strategy in water quality management plans for Total Maximum Daily Loads. An illicit discharge detection and elimination program can also be integrated into the development of a stormwater master plan as discussed in Section 5 and Appendix B.2.

The goal of such a program is to either prevent these discharges entirely by using inspections and code enforcement during construction and reconstruction projects or to identify existing illicit connections, require their disconnection and rerouting of the sewer lateral to the appropriate sanitary collection system. Although many small Oregon municipalities are not explicitly required to implement these programs, establishing the authority in ordinance to identify and address illicit discharges can play an important role in improving water quality in their communities, particularly if the community's stormwater system is addressed in a Bacteria Total Maximum Daily Load. A municipality is ultimately responsible for the discharge from its stormwater conveyance system under state law to protect water quality.

In Oregon, a Total Maximum Daily Load for bacteria typically requires communities greater than 10,000 in population to implement the six minimum stormwater control measures in Oregon's NPDES Municipal Separate Storm Sewer System Phase II Permit, which, as noted above, requires the implementation of an illicit discharge detection and elimination program. Communities with populations less than 10,000 are required to consider these six control measures and implement those appropriate for their community's impact on a water body listed as impaired for water quality. Illicit discharge elimination requirements in the municipal Phase II permit, as well as Phase I permits generally include the following requirements:

- Development of an illicit discharge program to find and eliminate illicit discharges to the storm sewer system, including a process to document and respond to complaints
- Prohibit through ordinance or other regulatory mechanism non-stormwater discharge to the storm sewer system
- Public education on the hazards of illegal discharges and improper disposal of wastes carried by stormwater conveyance systems to water bodies

Guidance for establishing procedures for an illicit discharge, detection and elimination program is provided in the Center for Watershed Protection's Illicit Discharge Detection and Elimination – A Guidance Manual for Program Development and Technical Assessments.[3] Appendix B.4 of this guide provides steps to create an illicit discharge, detection and elimination plan and to give a municipality the authority to implement this program. Combine these planning efforts with other municipal plans in order to save money.

Site performance standards highlighted in this section are critical for a municipality's effort to manage stormwater volume and minimize pollutant discharge. These define requirements, such as the size of the design storm, the volume of stormwater to be retained on-site, the level of treatment for stormwater discharged off-site and the allowable discharge rate of runoff from a development. Site characteristics will greatly influence the most effective means to meet site performance standards.

# 2.3 Site performance standards

## 2.3.1 Retention requirement

Site performance standards typically include a retention requirement for retaining a portion of the stormwater on the development, as well as a treatment requirement for removing pollutants in stormwater discharged from the development. A numeric retention and treatment requirement to mimic predevelopment hydrology may be developed, using one of the following methods:

- Volume-based method (for example, first one inch of storm event)
- Storm event percentile-based method (for example, 95th percentile storm event)
- Annual average runoff-based method (for example, 80 percent of annual average runoff)

If site constraints limit retention, the developer can use mitigation to meet this requirement offsite using one of the approaches discussed in Section 6.2. This stormwater retention standard not only strives to conserve the predevelopment hydrology, but also provides a reliable pollutant reduction measure by reducing stormwater volume.[4] Appendix H in the Western Oregon Low Impact Development Guidance Manual provides information on selecting a design storm size and provides information on how to select a 95$^{th}$ percentile storm for an area.

Table 2 provides some example site performance standards, but cannot completely convey the complexity of the site performance standard or other relevant requirements. For example, if adapting the Portland manual to your municipality, you will likely choose a more frequent storm event with a lower retention volume requirement when attempting to mimic predevelopment hydrology for your area.

**Table 2: Example site performance standards in stormwater manuals and as required when Endangered Species Act-listed salmonids are present**

| Source | Design storm | Retention requirement | Discharge rates |
|---|---|---|---|
| *Portland Stormwater Management Manual | Water quantity – 10-year, 24-hour storm (3.4 inches)* | Stormwater must be infiltrated onsite to the maximum extent feasible, before any flows are discharged offsite | The base standard must be sufficient to maintain peak flow rates at their predevelopment levels for the two-year, five-year and 10-year, 24-hour runoff events |
| **Central Oregon Stormwater Manual | Water quality – six-month National Resource Conservation Service Type I 24-hour storm; size varies with community 0.7 – 1.2 inches | Infiltration encouraged, no site performance standard for retention | The post development discharge rate must be kept equal to or less than the predevelopment discharge rate for the two-year and 25-year precipitation events |

| | | |
|---|---|---|
| Eugene Stormwater Management Manual[5] | • 1.4 inch, 24-hour storm, selected based on 80 percent capture of average annual runoff<br><br>• Flow through treatment control (target 80 percent capture):<br><br>o Off-line flow-through type facilities: treat the peak flow rate resulting from a design storm with a rainfall intensity of 0.13 in/hour<br><br>o On-line flow-through type facilities: treat the peak flow rate resulting from a design storm with a rainfall intensity of 0.22 in/hour | Design storm for flood control requirements vary by size of drainage area. City requires that stormwater runoff does NOT:<br><br>• Exceed the capacity of the receiving conveyance facility<br><br>• Increase the potential for stream bank and channel erosion<br><br>• Create or increase any flooding problems |
| National Marine Fisheries Service Standard Local Operating Procedures for Endangered Species V | Flows between the 50 percent of the two-year event and the 10-year flow event (annual series) | Retention or detention facilities must limit discharge to match predevelopment discharge rates (For example, discharge rate of the site based on its natural groundcover and grade before development occurred.) |

* *The Portland Stormwater Manual uses the 10-year, 24-hour storms as the model design storm for managing runoff volume recognizing that few sites will be able to retain this volume of stormwater without discharge. The water quality treatment standard is a volume treatment goal of 90 percent of the average annual runoff*.

** *The version of Central Oregon Stormwater Manual cited in this guide uses Type I storm for its design storm requirements. However, the Natural Resource Conservation Service has published updated (January 2016) synthetic rainfall distributions indicating synthetic rainfall distributions of Types IA and II represent climate in Oregon*.[6]

#### 2.3.1.1 Site evaluation tools for developers

There are various tools to evaluate approaches that best achieve the site performance, treatment standards and developer's goals in the most cost-effective manner. Some, like the Upper Neuse Site Evaluation Tool noted below, may also be of use to city staff or contractors reviewing stormwater site plans. These tools include the following:

- **EPA Green Infrastructure Modeling Toolkit**
  EPA's Office of Research and Development studies green infrastructure practices and develops models and tools to help communities manage their stormwater runoff and address the impairment of water bodies. They developed the Green Infrastructure Modeling Toolkit, which includes the National Stormwater Calculator, Green Infrastructure Wizard, Watershed Optimization Support Tool, Stormwater Management Models and Visualizing Ecosystem Land Management Assessments. Communication materials are also included.

- **Upper Neuse Site Evaluation Tool**
  The Upper Neuse Site Evaluation Tool is a simple model created to assess the effects of development, including sediment and nutrient loading, on a site scale.[7] Microsoft Excel allows for the definition of pre- and post-development land use, as well as for multiple drainage areas and various combinations of practices. Structural and nonstructural practices can be represented giving the user a suite of options for evaluation. The tool predicts pre- and post-development annual stormwater volume and associated pollutant loads for sediment, nitrogen and phosphorus.

- **Delaware Urban Runoff Management Model**
  The Delaware Department of Natural Resources created the Delaware Urban Runoff Management Model to provide a more rigorous hydrological design tool for what the department refers to as green technology best management practices.[8] They are designed to:

  > … intercept runoff from rooftops, parking lots and roads as close as possible to its source, and direct it into vegetative recharge/filtration facilities incorporated into the overall site design and runoff conveyance system.

  These best management practices include the following: conservation site design, impervious area disconnection, conveyance of runoff through swales and biofiltration swales, filtration through filter strips, terraces and bioretention facilities and recharge through infiltration facilities.

#### 2.3.1.2 Off-site stormwater mitigation

Off-site stormwater mitigation is needed when the numeric retention and treatment requirement cannot be fully met at a site. Municipalities' review criteria typically establishes site constraints that would warrant off-site mitigation, such as shallow bedrock, high groundwater, groundwater contamination and soil instability. This would be documented by a geotechnical analysis or land use that is inconsistent with capture or infiltration of stormwater. Once approved, municipalities allow the developer's designer to meet the unmet portion of the numeric retention standard at another location in the same sub-watershed by contributing to a stormwater payment-in-lieu program or by purchasing credits at a stormwater mitigation bank. This may also include groundwater replenishment projects and a treatment equivalent that attains the water quality benefits of on-site retention.

An in-lieu program involves establishing a rate based on a currency, such as a dollar amount per volume of runoff mitigated. If a municipality develops a payment-in-lieu program, a municipality typically develops trading ratios and the scale of trading. The trading ratios establish the runoff reduction volume that a stormwater control must be designed to infiltrate or evapotranspire. The scale of trading defines the geographic boundary linking the development site to eligible alternative locations for compliance. This option provides more flexibility to minimize compliance costs while leveraging limited resources to strategically locate stormwater controls.

The development of a stormwater mitigation bank requires an analysis of the supply and demand for off-site mitigation credits to determine if there is viable market to support this program. It also involves the establishment of a trade currency based on the unmet stormwater retention at the development site. Given this, municipalities with a greater administrative capacity and pool of potential mitigation sites are more likely to pursue this option. Institutional standards and management systems are needed to value, estimate and track the disposition of the required retention volume for compliance assurance.

The cost savings for a developer from stormwater mitigation banking typically occurs when the retention standard for a constrained property is met at another more cost-effective location. This generates savings using market forces to identify low-cost mitigation opportunities within a sub-watershed, especially when both properties have the same owner. Groundwater replenishment projects create another opportunity to address a retention standard off-site and may be part of a stormwater mitigation bank. Commercial systems designed to efficiently store and infiltrate large volumes of stormwater within a small footprint lend themselves to groundwater replenishment. The opportunity to generate these credits by maximizing the stormwater retained on a site creates an incentive for the site owner to pursue these projects and will also help support a municipality's efforts to implement a "one water approach" to water management. This tactic integrates the management of stormwater, drinking water and wastewater for cost efficiencies and better resource management.[9]

Key references for off-site stormwater mitigation include the following:

- Guidance for Developing an Off-Site Stormwater Compliance Program in West Virginia
- Creating Clean Water Cash Flows – Developing Private Markets for Green Stormwater Infrastructure in Philadelphia
- Managed Aquifer Recharge: A Water Supply Management Tool

### 2.3.2 Treatment requirement

A treatment requirement ensures that a significant percentage of the annual volume of stormwater generated from impervious surfaces is captured by structural stormwater controls before discharging to surface waters. This provides criteria to evaluate the performance of a structural control. The treatment standard used in the TMDL guidance is to reduce total suspended solids by 80 percent and is required for revolving fund-financed stormwater management plans when a municipality does not have a comparable or more protective requirement.

After optimizing the retention of stormwater at a development site, NPDES Municipal Phase I Permit holders are required to treat the remaining portion of the 80 percent of the average annual stormwater volume that cannot be retained onsite. As an example, the Eugene Stormwater Management Manual describes the precipitation analysis as follows:

> "Detention Type Water Quality Facilities Long-term hourly precipitation data at the Eugene airport were analyzed to select the water quality design storm parameters for designing detention type stormwater quality facilities. The Surface Synoptic Observations (SYNOP) analysis was conducted using an inter-event time of 6 hours and a minimum storm depth of 0.01 inches. Based on the results presented in Figure 1, a design storm rainfall depth of 1.4 inches is required to capture approximately 80% of the average annual runoff from a site. A design storm rainfall depth of 0.95 inches is required to capture approximately 70% of the average annual runoff from a site. A

design storm rainfall depth of 2.4 inches is required to capture 90% of the average annual runoff from a site."

For an illustration of the diminishing returns of treating more than 80 percent of the average annual runoff, see Figure 1 below. Example treatment performance standards are provided in Table 3. For site constraints that do not allow onsite retention of 80 percent of the average annual stormwater volume, the Oregon Municipal Phase I Permits require stormwater mitigation measures.

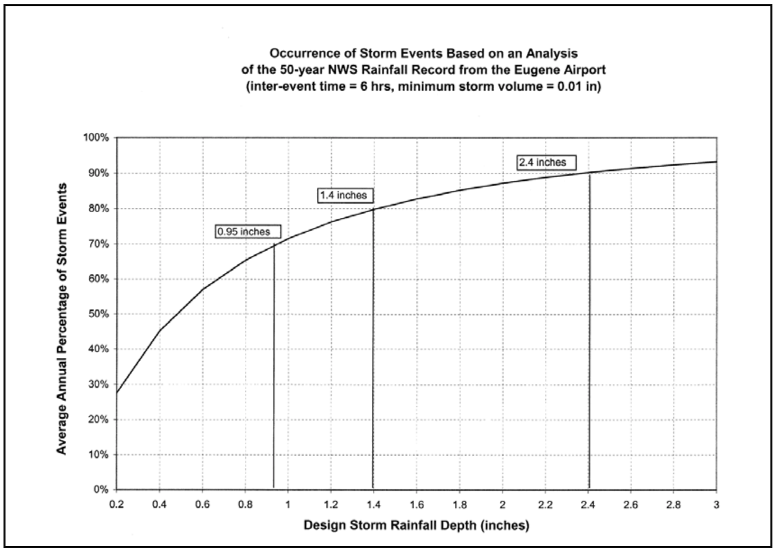


**Figure 1: Precipitation Analysis from Appendix L of the Eugene Stormwater Management Manual**

**Table 3: Example treatment standards in Oregon stormwater manuals**

| Stormwater manual | Percent capture for water quality | Treatment performance | Other pollutants |
|---|---|---|---|
| Portland Stormwater Management Manual | Stormwater must be infiltrated onsite to the maximum extent feasible, before any flows are discharged offsite | 70 percent removal of Total Suspended Solids from 90 percent of the average annual runoff | In watersheds that have established Total Maximum Daily Loads or that are on DEQ's 303(d) list of impaired waters, stormwater management facilities must be capable of reducing the pollutant(s) of concern as approved by Bureau of Environmental Services |
| Central Oregon Stormwater Manual | The goal is to treat the runoff to the maximum extent practicable. Treating to MEP is accomplished<br>by treating approximately 80 percent of total runoff volume generated at a project site on an annual basis by designing facilities to treat the full 6 month NRCS Type I 24-hour storm event | 80 percent removal of suspended solids for typical influent concentrations ranging from 30 mg/l to 100 mg/l | Oil control facilities are intended to achieve the goal of non-visible sheen, and to have a 24-hour average Total Petroleum Hydrocarbons concentration below 15 mg/l.<br>Structural controls for metals are intended to achieve a goal of 50 percent removal of total metals on an annual basis. |
| Eugene Stormwater Management Manual | 80 percent capture of average annual runoff; design storm of 1.4 inch, 24-hour storm; selected to meet this target | Treatment performance standard not specified, structural controls must meet manual design specifications | |

# 2.4 Structural stormwater controls

After the development of retention requirements in the site performance standard and source controls, the selection of structural stormwater controls to remove pollutants is the next step. Some structural controls such as those referred to as green infrastructure not only remove pollutants but also reduce the volume of stormwater discharged from a site, while others manage the flow of stormwater. Since structural controls are typically more costly to implement, the developer and the designer should first investigate nonstructural and source controls. Green infrastructure is given priority over conventional stormwater controls if site constraints allow. Nonstructural controls, by themselves, may not achieve the retention requirement; however, they will reduce the number and size of the structural controls needed and the costs. Some structural stormwater controls can act as both treatment and volume controls. These include retention ponds, infiltration basins and constructed wetlands. Their effectiveness depends on the specific design.

## 2.4.1 Example design criteria for structural controls

Some structural stormwater controls can act as both treatment and volume controls such as retention ponds, infiltration basins, and constructed wetlands. Their effectiveness as a structural stormwater control depends on the specific design. The references below provide information on the sizing and design of structural stormwater controls as well as references to consider.

### 2.4.1.1 Sizing structural controls

Sizing criteria can include sizing for the water quality treatment volume, on-site retention such as infiltration and re-use, channel protection and flood control. Each municipality must develop sizing criteria based on documented local or regional rainfall frequency and intensity. The Low Impact Development Guidance Manual Western Oregon provides a Microsoft Excel spreadsheet model for simplified Type IA storm distribution sizing criteria that can be adapted to the other storm type distribution in Eastern Oregon.

Examples for sizing structural controls include the following:

- Minnesota developed an issue paper that provides a review of various approaches to size stormwater structural controls for groundwater recharge, water quality, channel protection, overbank flood control and extreme flood control, and this sizing approach is summarized on a Unified Sizing Criteria webpage[10]
- The Denver Metropolitan Area Urban Drainage and Flood Control District has a series of manuals with criteria for urban storm drainage. Chapter 3 of Volume 3 describes a water quality capture volume appropriate for the Denver area as well as information on quantifying the volume reduction achieved with low-impact development approaches[11]
- Chapter 2 of the Maryland Stormwater Design Manual titled Unified Stormwater Sizing Criteria provides an example of specific sizing criteria for water quality treatment volume, recharge volume, channel protection and overbank flood protection[12]
- The City of Eugene Stormwater Management Manual includes a worksheet titled Simplified Approach for Stormwater Management for sizing stormwater facilities based on the effective impervious area in the facility's drainage[13]

### 2.4.1.2 Design considerations and criteria

Oregon stormwater manuals provide design criteria for several types of structural stormwater controls. There are many other stormwater manuals, fact sheets and references with design criteria for structural controls available online. The following are a few examples to consider:

- The California Stormwater Quality Association's Best Management Practices Handbooks contains fact sheets on structural best management practices with design considerations and guidelines as well as recommendations for inspection and maintenance of the best management practices
- Clean Water Services Design and Construction Standards includes administrative and technical requirements for the design and construction of residential or commercially developed surface water management systems as well as sanitary systems, erosion control methods, and vegetated corridors[14]
- EPA's Post-Construction Stormwater Management in New Development & Redevelopment Website has links to best management practices facts sheets with design considerations as well as links to several resources on post-construction stormwater management.[15]
- The Urban Drainage and Flood Control District cited above serves the Denver, Colorado metropolitan area has a website with technical papers on the stormwater quality best management practices.
- The Washington Department of Ecology has a Stormwater and Design Manuals Website dedicated to stormwater management and design manuals.[16]
- The structural stormwater controls in other manuals referenced in the Oregon DEQ's Stormwater Management Plan Submission Guidelines.

### 2.4.2 Percent removal versus concentration in treatment

Percent removal is commonly used as a measure of structural control performance and is an easy way to conceptualize pollutant removal effectiveness. However, there are some shortcomings with this method for quantifying the performance of best management practice, known as BMP, some of which are noted below:[17]

> 1. Percent removal is primarily a function of influent quality. In almost all cases, higher influent pollutant concentrations into functioning BMPs result in reporting of higher pollutant removals than those with cleaner influent (see Figure 1). In other words, use of percent removal may be more reflective of how "dirty" the influent water is than how well the BMP is actually performing. Therefore (and ironically), to maximize percent removal, the catchment upstream should be dirty (which does not encourage use of good source controls or a treatment train design approach).
>
> 2. Significant variations in percent removal may occur for BMPs providing consistently good effluent quality. Stated differently, the variability in percent removal is almost always much broader than the uncertainty of effluent pollutant concentrations. These variations in percent removal have little relationship to the effluent quality achieved.
>
> 3. BMPs with high percent removal (e.g., greater than 80% removal of total suspended solids, or TSS) may have unacceptably high concentrations of pollutants in effluent (e.g., greater than 100 milligrams per liter of TSS), which can lead to a false determination that BMPs are performing well or are "acceptable," when in fact they are not.

To address the concern noted in number one, an upper and lower bound to a percent removal treatment requirement can be established by indicating, for example, 80 percent removal of total suspended solids for typical influent concentration ranging from 30 mg/L to 100 mg/L. This would better reflect the practical limits of a structural stormwater control. The volume reduction must also be considered to assess the overall performance of a structural control's effectiveness at removing pollutants from stormwater discharge. A good example of volume reduction is presented in the EPA website Three Keys to BMP performance.[18] EPA explains that the overall reduction in pollutant load discharge from a structural control is a function of the reduction in pollutant concentration and the reduction in volume of stormwater discharged. The goal should be to estimate the total pollutant load that may be removed by a structural stormwater control when evaluating and demonstrating progress in complying with a wasteload or load allocation for a TMDL applied to municipal stormwater discharge.

### 2.4.3 Targeted pollutant removal

Stormwater is considered a large source of pollutant loading that includes bacteria, sediment/turbidity and nutrients that affect the beneficial uses of surface water. DEQ generally does not consider stormwater to contribute to in-stream temperature violations because runoff from rainfall typically occurs during the cooler seasons when in-stream flows are high and ambient stream and runoff temperature are low. Many municipalities have designated management agencies to specifically target TMDL pollutants, as they cause impairment to the beneficial uses of a water body. A common example of a TMDL water quality pollutant is bacteria in stormwater runoff. The data from the International Stormwater Best Management Practice Database noted below suggests that the low impact development approach is an effective approach to control bacteria loading from stormwater systems.

The specific design criteria of a structural control will affect its performance. For example, a vegetated swale that is designed with an under drain to allow more stormwater to flow through the mulch layer and soil mix provides more effective bioretention and bacteria control than a swale without this underdrain.

Similarly, the length of the flow path improves the performance of a vegetated buffer strip in controlling bacteria. Therefore, the space available for the best management practice and the unit processes incorporated are likely to influence the extent of pollutant removal.[19] Water quality benefits of stormwater treatment will occur through specific unit processes such as sedimentation, filtration, adsorption, biotransformation and plant uptake. Applying fundamental principles of flow and water quality processes in structural stormwater controls will allow for the design of quantitative pollutant load reduction and more predictable performance characterization.[20]

**Table 4: Relative Removal Efficiency for Stormwater Treatment BMPs. Data Reproduced From the City of San Diego Treatment Control Selection Matrix**

| BMP | Sediment | Nutrients | Metals | Bacteria | Oil and Grease |
|---|---|---|---|---|---|
| Infiltration Basin | H | H | H | H | H |
| Bioretention Basin | H | M | H | H | H |
| Constructed Wetland | H | M | H | H | H |
| Extended Detention Basin | M | L | M | M | M |
| Vegetated Swale | M | L | M | L | M |
| Vegetated Buffer Strip | H | L | H | L | H |
| Flow Through Planter Boxes | H | M | H | H | H |
| Vortex Separator | M | L | L | L | L |
| Media Filter | H | L | H | M | M |

H = High, M = Medium, and L = Low Removal efficiency

The International Stormwater BMP Database contains over 500 best management practice studies with performance analysis results and other tools and information.[21] The intent is to provide scientifically sound information to improve the design, selection and performance of best management practices, called BMPs. A study of the database titled Statistical Addendum: TSS, Bacteria, Nutrients, and Metals analyzed the available performance data to develop influent and effluent event mean concentration statistics for classes of structural BMPs and the pollutant categories.[22] Other publications are available in the database on design and performance.

The article entitled, “Can Stormwater BMPs Remove Bacteria?” may be of particular interest to a designated management agency operating a stormwater system under a Bacteria TMDL. The assessment in this article found that controls infiltrating stormwater and reducing runoff volumes were a reliable method for reducing bacteria loads. The conventional stormwater controls that were also evaluated did not consistently reduce bacteria to primary contact recreation standards. The assessment also shows that grass swales and filter strips have limited value in removing bacteria, with the authors suggesting additional treatment processes such as filtration. This recommendation is consistent with the removal efficiencies in Table 4 which shows that flow through planter boxes – which have underdrains increasing filtration – have higher bacteria removal efficiency. Alternatively, as suggested above, increasing the length or width of a swale or filter strip may be needed for better pollutant removal if the selected control has limited capacity for infiltration.

### 2.4.4 Performance requirements for structural controls

Proper design and subsequent operation and maintenance procedures for structural stormwater controls are critical to achieving effective pollutant removal. Many municipalities with a post-construction stormwater control program establish requirements to ensure that they are actually installed, designed, constructed and maintained to meet the required treatment standard. For structural stormwater controls on private property, municipalities establish maintenance agreements with the private entity that owns and operate the control to ensure that it is properly maintained after construction. If a structural control will become part of the public stormwater system, securing bonds prior to the installation is important so the municipality does not acquire an incomplete, problematic or ineffective control. A performance bond is a financial tool required of a contractor to ensure that funds are available to complete a structural control capable of meeting the treatment standard, should the contractor fail to achieve these two objectives. Goals for the performance bond include the following:

- Establishing of a total dollar amount required for the bond
- Specifying the length of the bond
- Setting the requirements for notice of defect or lack of maintenance
- Clearly identifying bond enforcement measures

The following provide some examples of both maintenance agreements and performance bonds:

- Maintenance Agreement and Private Facility Program examples:
    - Clean Water Services Private Water Quality Facility Program and Frequently Asked Questions[23]
    - City of West Linn, Oregon Stormwater Maintenance Agreement[24]
    - Georgia Stormwater Management Manual Volume 1 Section 7.2.4 Maintenance Agreements[25]

- Performance bond examples:
    - Loudoun County Virginia Stormwater Management Agreement[26]
    - City of Charles Town West Virginia Guarantee of Public Improvements[27]

# 2.5 Underground injection control

In Oregon, all groundwater is considered to have the beneficial use of drinking water and a large percentage of communities in the state depend on it for drinking and irrigation. Underground injection controls dispose of fluids to the subsurface and, therefore, have the potential to contaminate groundwater if not properly operated. In Oregon, the majority of underground injection controls dispose of stormwater and all require DEQ authorization. While underground injection controls may be a desirable method for management of stormwater, particularly for sites with space constraints, it is important not to unintentionally trigger underground injection control requirements developed to address the federal Safe Drinking Water Act.

To assist you with designing stormwater controls, DEQ's Underground Injection Control website provides information on requirements and proper operation for the subsurface disposal of stormwater.[28] DEQ's fact sheet titled "Identifying an Underground Injection Control" is helpful in identifying when the design of a stormwater control triggers underground injection controls requirements.[29] Additional information on low impact development controls for porous pavement, rain gardens, stormwater planters and swales is available through Oregon State University Extension Service's low impact development fact sheets.[30] These provide guidance on how to avoid triggering state underground injection controls requirements when using green infrastructure to manage stormwater.

# 2.6 Retrofitting

Municipal stormwater programs commonly include requirements for redevelopment as well as new development. Generally, structural stormwater controls can be implemented in developed areas with some limitations. However, modifying the existing urban development to reduce impervious surface using nonstructural controls may not always be cost-effective. These areas may have been constructed before local post-construction stormwater requirements were in place. If stormwater controls were constructed such as a catch basin with a sump, these controls are inadequate for stormwater pollutants such as bacteria. Given the constraints often present in developed areas, EPA developed a fact sheet, Stormwater Retrofit Techniques for Restoring Urban Drainages in Massachusetts and New Hampshire, identifying examples of stormwater retrofit goals, such as:

- The correction of prior design or performance deficiencies
- Flood mitigation
- Disconnecting impervious areas
- Improving recharge and infiltration performance
- Addressing pollutants of concern
- Demonstrating new technologies
- Supporting stream restoration activities
- Meeting TMDL pollutant reduction targets[31]

The Center for Watershed Protection published Urban Stormwater Retrofit Practices which provides guidance on where and what type of retrofits are most commonly incorporated into a stormwater management system. Some of the challenges identified in the document include:

- Greater cost for both design and construction of retrofits
- Many retrofits are installed on public land and publically maintained
- Retrofits must be located around existing development and acceptable to neighbors
- Retrofits often connected to existing stormwater conveyance system due to space constraints

The Center for Watershed Protection has a document titled An Eight-Step Approach to Stormwater Retrofitting: How to Get Them Implemented. To encourage retrofitting in redevelopments, a municipality may want to consider providing developers with credits or off-sets. For additional information, refer to the following:

- Selection and monitoring of best management practices for an ultra-urban setting, see: Federal Highway Administration Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring
- Stormwater retrofitting in industrial areas, see the Port of Portland’s Stormwater Retrofit Strategy

## 2.7 Additional requirements for managing stormwater

Some stormwater manuals or management programs specify drainage requirements in addition to a site performance standard. For example, the Central Oregon Stormwater Manual contains prohibitions concerning drainage intended to comply with Oregon case law. These prohibitions are often referred to as the "drainage law" and provide legal guidance for the management of drainage on property in all Oregon municipalities. This case law prohibits the following actions:

- Diverting water onto adjoining land that would not otherwise have flowed there
- Changing the location where water flows onto land located at a lower elevation
- Accumulating large quantities of water then releasing it at a greatly accelerated rate of flow onto an adjacent lot at a lower elevation
- Concentrating flows on downstream properties where sheet flow previously existed

The Central Oregon manual establishes additional standards to address the volume of stormwater managed by a control. A municipality may set conveyance standards for constructed drainage that includes, for example, the following:

- Constructing channels to convey and contain, at a minimum, the depth of the 50-year peak flow plus an additional 30 percent
- Constructing new culverts to convey the 50-year design storm, or the 100-year event if safe overflow for low rates above the 50-year event cannot be provided

# 3. Local stormwater requirements

## 3.1 Trigger for stormwater controls

Triggers for when a proposed new development and re-development must have post-construction stormwater controls typically take the form of a threshold associated with the area being developed. When reached, a site performance standard, treatment standard, sizing criteria, design requirements, and possibly source controls, must be addressed in the design of a stormwater management system.

Some municipalities require post-construction stormwater controls based on the area of impervious surface created. These range from 500-square-feet of new impervious surface area in Portland developments, 5,000-square-feet for new or redevelopment in the Central Oregon Stormwater Manual, and 1,000- or 5,000-square-feet depending on the size of the municipalities in the Clackamas County NPDES Municipal Stormwater Phase I permit covering several communities. The Center for Watershed Protection recommends a minimum threshold range of one acre of land disturbance including all new development and redevelopment activities for triggering stormwater requirements, depending on a municipality's program resources and the sensitivity of streams receiving stormwater runoff.[32] To encourage redevelopment such as infill, municipalities may want to consider establishing a different threshold for redevelopment or provide developers with incentives for this type of development.[33]

EPA's "MS4 Permit Improvement Guide" provides an example of a permit provision for post-construction stormwater management:

> "…control stormwater discharges from new development and redeveloped sites that disturb at least one acre (including projects that disturb less than one acre that are part of a larger common plan of development or sale)…must apply to both private and public development sites…"[34]

This one acre area of land disturbance should be considered the maximum area to trigger post-construction stormwater management requirements. The examples above using a smaller area criterion are more protective than the MS4 Permit Improvement Guide example. Municipalities are encouraged to set a rigorous or small threshold for stormwater requirements as appropriate, considering their concerns and funding constraints as these will be more protective of water quality as well as infrastructure such as structures, bridges, roads, and road culverts downstream of urban drainage areas. In fact, compliance with a NPDES Municipal Stormwater Permit or a Total Maximum Daily Load may require a municipality to establish a lower area threshold.

# 3.2 Code development for stormwater management

## 3.2.1 Authority to develop stormwater requirements in code

The local comprehensive land-use plan should provide the policy framework and authority for municipalities to protect water quality as well as control local flooding. The plan guides a municipality's activities in areas such as land use, conservation, economic development and public facilities such as the development and management of stormwater, wastewater and transportation systems. It also provides the legal authority to regulate these systems while municipal code or ordinance provide the details on how a municipality will implement this authority.

Oregon Revised Statute 197.175 requires municipalities to adopt a local comprehensive plan, zoning and ordinance. This comprehensive plan must be consistent with the Statewide Planning Goals in the Oregon Administrative Rules. Several of these goals are applicable to water quality and public facilities such as stormwater systems. In particular, Statewide Planning Goal 11 specifically addresses the planning and development of orderly and efficient public facilities such as stormwater systems to serve as a framework for urban and rural development. Planning Goal Number 5 addresses natural resources and Planning Goal Number 6 addresses water quality.[35] [36] [37] Planning Goal Number 1 requires public involvement in the implementation of all the planning goals.[38]

The Oregon Department of Land Conservation and Development administers the Oregon's Statewide Land Use Planning Program and provides assistance to municipalities implementing its program requirements. The agency worked with DEQ to develop a Water Quality Model Code and Guidebook providing model comprehensive plan language to support the establishment of stormwater codes. The guidebook explains how codes can serve as nonstructural stormwater controls. The information below provides tools to use in evaluating codes for water quality protection.

**Center for Water Protection Code & Ordinance Worksheet**
The Center for Watershed Protection's worksheet walks users through the process of evaluating how their community's code measures up to 22 better site design principles. Although the worksheet is designed to evaluate water quality protections in municipal code, it also provides a good overall assessment of a municipality's authority to protect the environment. The worksheet is in Chapter 3 of Better Site Design: A Handbook for Changing Development Rules in Your Community. This handbook covers everything from basic engineering principles to actual and perceived barriers to implementing better site design, guidelines for better developments and provides a detailed rationale for each principle. It also examines current practices in local communities, details the economic and environmental benefits of a better site design approach and presents case studies from across the country.

**EPA Water Quality Scorecard**
EPA developed the Water Quality Scorecard to help local governments identify opportunities to remove barriers, revise and create codes, ordinances and incentives to better protect water quality.[1] The scorecard provides a guide to review key local ordinances across departments to ensure that a municipality's regulatory authorities work together. As stated in the scorecard, the two main goals of this tool are to:

- Help communities protect water quality by reducing stormwater flows in a community
- Educate stakeholders on the wide range of policies and regulations that have water quality implications

The scorecard is designed for all municipalities, including those with limited or no stormwater infrastructure. It also shows how development regulations and other ordinances can present barriers or opportunities to implementing a comprehensive water quality protection approach. Finally, the scorecard provides policy options, resources and case studies to help communities develop a comprehensive stormwater management program.

**Puget Sound Partnership Guidebook**
The Puget Sound Partnership, in collaboration with the Washington Department of Ecology, developed Integrating LID into Local Codes: a Guidebook for Local Governments to help local government integrate low impact development requirements into codes and standards.

## 3.2.2 Assessing existing code

In order to implement a post-construction stormwater management program supporting low impact development, municipalities will need to assess and revise existing codes if these contain outdated stormwater regulations. This review could lead to programs and procedures to reduce stormwater runoff volume that reduces pollutant loads from stormwater discharged from a developed site. Failure to update local stormwater regulations will require a developer to seek a variance to implement low impact development, increasing design, financing and regulatory costs, and may delay construction.[39] There are several assessment tools highlighted below to evaluate whether current code supports better site design to more cost effectively manage stormwater.

A report prepared by ECONorthwest highlights factors complicating implementation of a stormwater management approach using low-impact development. According to this report, the most frequent complaint from the development community is meeting local codes that were developed well before low-impact development was put into practice.

The report also summarizes the results of several analyses comparing a low impact development approach to a conventional approach. These analyses indicate that low impact development lowers costs, increases the sale price of the developments or both. For additional economic analyses, EPA maintains the Green Infrastructure Cost-Benefit Resource website providing a list of cost-benefit analyses of low-impact development.

## 3.2.3 Code development, model codes and other examples

This section provides models of both land use and stormwater management ordinances supportive of low impact development. Model codes associated with land-use planning techniques to help developers minimize impervious surfaces and protect natural areas are presented first in Table 5. These techniques give needed flexibility to meet the retention requirement in the site performance standard while minimizing the reliance on more costly structural stormwater controls.

Model codes for the local regulation of post-construction stormwater are presented in Table 6 below. These model codes provide examples of establishing regulatory thresholds, stormwater retention requirements, treatment requirements and the design and specification requirements for structural stormwater controls. They will help CWSRF loan recipients develop a municipal stormwater management plan and program. Oregon municipalities will need to address applicable state land use planning requirements in adapting model code from other states. The University of Georgia's Stormwater Utility Handbook provides a step-by-step guide to establishing a stormwater management program and a utility fee to fund its administration.[40] Several examples of Oregon stormwater codes are also provided in this guide.

**Table 5: Model codes for nonstructural stormwater controls**

| Land-use planning techniques covered | Reference |
| --- | --- |
| • Transfer of development rights | Oregon Department of Land Conservation and Development's Transfer of Development Rights Pilot Program[41] |
| • On-site density transfers for critical areas<br>• Flexible buffer widths<br>• Transfer of development rights<br>• Incentive programs for low-impact development<br>• Incentive programs for critical areas | Municipal Research and Service Center's Flexibility in Environmental Regulation Website[42] |
| • Density transfers<br>• Lot size averaging<br>• Feature-based density<br>• Conservation subdivision<br>• Infill development<br>• Riparian buffer and wetland protection<br>• Protection of groundwater and surface water resources | New Hampshire "Innovative Land-Use Planning Techniques: A Handbook for Sustainable Development"[43] |

**Table 6: Model codes for post-construction stormwater management**

| Model Code | Source |
| --- | --- |
| New Development and Redevelopment Model Code | Appendix B of Oregon DEQ's TMDL Implementation Guidance for Including Post-Construction Elements in TMDL Implementation Plans |
| Post-Construction Stormwater Runoff Control Ordinance Webpage | EPA |
| Stormwater Operation and Maintenance Ordinance webpage* | EPA |
| Stormwater Control Ordinance | New Jersey Stormwater BMP Practices Manual Appendix D |
| Stormwater Management Ordinance | Maryland Department of the Environment |
| Implementing Model Stormwater Ordinance | Minnesota Department of Natural Resources |
| Stormwater Utility[44] | University of Tennessee |

*This is not a stand-alone ordinance and should be integrated into an ordinance to regulate post-construction stormwater

### 3.2.4 Example codes in Oregon

Oregon's larger municipalities have been implementing ordinances requiring stormwater management to improve water quality since the 1990s. Initially, this was driven – in part – by NPDES Municipal Stormwater Permits. Many municipalities not covered under a NPDES Municipal Stormwater Permit are also using a low impact development approach to protect water resources, improve livability and to prevent local flooding. Examples of Oregon municipal stormwater ordinances are provided in Table 7 below.

**Table 7: Oregon municipal stormwater ordinance examples**

| |
|---|
| Portland city code[45] |
| Chapter 17.37 Downspout Disconnection<br>Chapter 17.38 Drainage and Water Quality<br>Chapter 17.39 Storm System Discharges |
| Salem city code[46] |
| Chapter 71 Stormwater |
| Bend city code[47] |
| Title 16.15 Stormwater Management Design Standards and Post-Construction Maintenance Controls |
| Corvallis city code[48] |
| Chapter 2.09 Storm Water System |
| Oregon City code[49] |
| Chapter 13.12 Stormwater Management<br>Chapter 13.16 Storm Drainage Service Charges |
| Newberg city code[50] |
| Chapter 13.20 Stormwater System<br>Chapter 13.25 Stormwater Management |
| The Dalles city code[51] |
| Chapter 3-9 Storm Drainage Regulations<br>Chapter 3-11 Storm Water System Development Charges<br>Chapter 3-12 Cross Connection Control |
| Stayton city code[52] |
| Chapter 13.32 Storm Drainage Utility |

# 4. Plan review

Providing clear criteria and necessary submittal requirements help the developer avoid delays, comply with post-construction stormwater control requirements, and ensures that plan reviewers know what to look for in a stormwater plan. Three different approaches to reviewing stormwater management plans are presented below.

## 4.1 City of Portland, Oregon manual

The Portland Stormwater Manual contains several submittal requirements for landscaping, site design and operation and maintenance. The manual also provides alternative approaches for sizing stormwater controls referred to as the simplified, presumptive or performance approaches. The city's procedural steps in the design and permit process for stormwater systems are outlined below:

1. Evaluate the site
2. Confirm current requirements
3. Characterize site drainage area and runoff
4. Determine source control requirements
5. Develop conceptual design
6. Develop landscape plan
7. Complete stormwater management plan
8. Prepare operation and maintenance plan
9. Submit final plans and obtain permits
10. Construct and inspect

This manual provides a good overview of the considerations for managing stormwater runoff from development. Regardless of the approach, the requirements need to be robust enough to address the site performance and treatment standards while making the submittal and review process manageable for both the developer and municipal staff or contract support.

## 4.2 Central Oregon manual

The Central Oregon Stormwater Manual design and submittal requirements are somewhat less complex than in Portland and do not include the multiple control options. Chapter 2, Basic Requirements, contains information on the required stormwater management elements for all development proposals. These elements are outlined as follows:

1. Drainage submittal
2. Geotechnical site characterization
3. Water quality treatment
4. Flow control
5. Natural and constructed conveyance systems
6. Erosion and sediment control
7. Source control
8. Operation and maintenance

Both manuals may be more complex than desired for a smaller municipality.

## 4.3 City of Florence, Oregon manual

The city of Florence relies primarily on stormwater controls that promote infiltration at the site using, for example, rain gardens, vegetated swales, stormwater planters, porous pavement and filter strips in an effort to mimic predevelopment hydrology.[53] The city has adapted the Portland Manual with modifications as necessary to adapt to Florence's unique political, geographical, hydrological and environmental aspects. Specific modifications to the Portland manual standards are noted in Florence's Stormwater Design Manual.

# 5. Master planning

## 5.1 Public facilities planning in Oregon

Stormwater master planning is public facilities planning under Oregon Administrative Rules 660-011-0010. By definition, a public facilities plan is a support document to a local comprehensive land use plan, required in Oregon. Certain elements of this plan must be adopted as part of the comprehensive plan (see Oregon Administrative Rule 660-011-0045). Oregon Revised Statutes 197.712(2) (e) requires cities and counties develop and adopt a public facility plan for areas within an urban growth boundary with a population greater than 2,500. A stormwater master plan/public facilities plan must contain the following:

> (a) An inventory and general assessment of the condition of all the significant public facility systems which support the land uses designated in the acknowledged comprehensive plan;
>
> (b) A list of the significant public facility projects which are to support the land uses designated in the acknowledged comprehensive plan. Public facility project descriptions or specifications of these projects as necessary;
>
> (c) Rough cost estimates of each public facility project;
>
> (d) A map or written description of each public facility project's general location or service area;
>
> (e) Policy statement(s) or urban growth management agreement identifying the provider of each public facility system. If there is more than one provider with the authority to provide the system within the area covered by the public facility plan, then the provider of each project shall be designated;
>
> (f) An estimate of when each facility project will be needed; and,
>
> (g) A discussion of the provider's existing funding mechanisms and the ability of these and possible new mechanisms to fund the development of each public facility project or system.[54]

According to Oregon Administrative Rule 660-011-0020, the public facility inventory noted in subsection (a) above of the public facilities planning requirements must adhere to the following:

> (1) The public facility plan shall include an inventory of significant public facility systems. Where the acknowledged comprehensive plan, background document or one or more of the plans or programs listed in OAR 660-011-0010(3) contains such an inventory, that inventory may be incorporated by reference. The inventory shall include:
>
> (a) Mapped location of the facility or service area;
>
> (b) Facility capacity or size; and

(c) General assessment of condition of the facility (e.g., very good, good, fair, poor, very poor).[55]

## 5.2 Requirements for State Revolving Fund financing

DEQ requires Clean Water State Revolving Fund applicants to include the elements noted above when pursuing financing for stormwater master planning. Additionally, master plans must include existing and proposed structural and nonstructural stormwater controls to improve water quality in the inventory required for a public facilities plan, in addition to the inventory information noted in Section 5.1.

## 5.3 Integrated planning

To reduce costs, DEQ recommends that municipalities consider using the stormwater master planning process to develop and implement an Illicit Discharge and Detection Plan for their stormwater systems. Municipalities can use the inventory required in master planning to search for chronic illicit discharges from inadvertent or intentional sanitary connections to the stormwater conveyance system, or sanitary inflows into a deteriorating stormwater system from a failing wastewater collection system.

In the 1983 Results of the National Urban Runoff Program, the EPA found links between high bacteria counts in receiving waters and illicit discharges of sanitary wastes.[56] In its assessment titled Pathogens in Urban Stormwater, the American Society of Civil Engineers noted that many cities have found that correcting inadvertent or intentional sanitary pipe connections to a stormwater pipe reduced a substantial portion of the sanitary flows into receiving waters.[57] They also cited leaking sanitary sewers and shifted or cracked sewer taps in older areas causing sanitary inflows by gravity into stormwater pipes as an often underestimated source of bacteria. Replacing failing wastewater and stormwater conveyance systems and removing sanitary-stormwater system connections can significantly reduce chronic bacteria, nutrients and organic waste loads.

Evaluating stormwater conveyance systems for chronic illicit discharges provides municipalities with an opportunity for integrated planning for municipal stormwater and wastewater. An integrated evaluation may also offer cost savings when replacing failing, collocated wastewater and stormwater conveyance systems. Evaluating wastewater inflows from a failing conveyance system is consistent with EPA's guidance on identifying cost savings and efficiencies in implementing Clean Water Act requirements. Municipalities can use this information to prioritize their capital investments for greater cost savings and pollutant load reductions when complying with TMDL and Municipal Stormwater requirements.[58]

## 5.4 Minimizing planning costs

Smaller municipalities may consider combining their stormwater master planning with the development of a pre-design report described in Section 6, if seeking financing to address both water quality and quantity. A municipality is better positioned to pursue funding by developing a priority stormwater facility project identified in the stormwater master plan. Additionally, a smaller municipality may want to limit the scope of stormwater master planning to a priority stormwater drainage basin to make the financing of a planning loan more affordable or to take advantage of a small grant. This allows the municipality to update its master plan basin-by-basin as additional funding becomes available.

Finally, to save money, smaller municipalities may consider combining stormwater master planning with stormwater management planning described in Sections 2 through 4. The municipality can use the update of a stormwater master plan to refine their implementation of statewide planning goals 5 and 6 to minimize the impact of their stormwater discharge. This recommendation is consistent with Statewide Planning Goal 11 guidelines for public facilities that state:

> *Plans providing for public facilities and services should consider as a major determinant the carry capacity of the air, land and water resources of the planning area. The land conservation and development action provided for by such plans should not exceed the carrying capacity of such resources.*

Taking the approach discussed above will also proactively address other requirements, such as those stemming from an NPDES Municipal Stormwater Permit and a TMDL. These other requirements can also be addressed during a master plan update.

# 6. Pre-design report

The pre-design report is an engineering planning document that describes the recommended project using preliminary design drawings and other supporting information. This may include the basis of the design, criteria, site plan, process and instrumentation diagrams, hydraulic profile, major equipment list and preliminary cost estimates. A pre-design report is required to complete an application for a stormwater construction project as noted in OAR 340-054-0022(6)(a). DEQ strongly recommends that a pre-design report consider the environmental factors that may influence or constrain the project to avoid triggering additional environmental requirements. Considering environmental factors will help a loan applicant cost-effectively address the State Environmental Review Process required in the federal funding of infrastructure projects. These requirements may surface as a result of federal permitting requirements, such as a U.S. Army Corps of Engineer's Section 404 permit, even if federal funding is not involved.

Most CWSRF loan applications will be improvements to existing stormwater facilities to replace failing infrastructure or increase conveyance capacity to prevent local flooding, while improving the quality of the stormwater discharged. The pre-design report for improving existing facilities need only address the proposed project components, if the project can be considered stand alone and can be built without other larger stormwater system changes. State land use planning requirements presented in Goal 11 will be addressed if the proposed project in your pre-design report is in a current stormwater master plan or update. Appendix A.3 provides a checklist for developing a pre-design report for a CWSRF planning or construction loan.

CWSRF staff offer technical assistance for public involvement related to a post-construction stormwater control program. This may include stakeholder training on stormwater management using low impact development.

# 7. Stakeholder involvement

Statewide Planning Goal 1 requires public input when developing a stormwater management plan and creating a post-construction stormwater control program. This is valuable in developing a program that addresses stakeholder concerns.

DEQ recommends that municipalities review EPA's web-based Public Participation Guide prior to initiating a stormwater planning project.[59] In Step 3 of the process planning section, EPA's guide provides a decision-making flow chart to determine the level of public participation: inform, consult, involve, collaborate and empower.

Planning projects that are influenced by regulatory programs, such as an NPDES Municipal Stormwater Permit, may limit the level of participation to informing, consulting or involving the public depending on the specific requirements in the regulatory program. Chapter 1 of the Center for Watershed Protection's Better Site Design Handbook includes a section on convening key stakeholders to revise codes to implement low-impact development. When taking the planning steps to revise local codes to implement the stormwater management approach described in Section 2, review the research and information in the handbook concerning perceived and real barriers to implementing a low-impact development approach to stormwater management. Additionally EPA has developed the Overcoming Barriers to Green Infrastructure Website providing useful information to overcoming barriers to implementing a low impact development approach. CWSRF staff offer technical assistance for public involvement related to a post-construction stormwater control program, including stakeholder training on low impact development.

# Appendix A: Definitions

**Best Management Practices** – as used in this guide, synonymous with controls and refers to both devices to treat stormwater containing pollutants as well as procedural actions to prevent stormwater from being contaminated with pollutant and/or to reduce the amount of stormwater generated.

**Biological Assessment** – defined in 50 Code of Federal Regulations § 402.02 and refers to the information prepared by or under the direction of the federal agency concerning listed and proposed species and designated and proposed critical habitat that may be present in the action area and the evaluation of potential effects of the action (see definition below) on such species and habitat.

**Biological Opinion** – defined in 50 Code of Federal Regulations § 402.02 and refers to the document that states the opinion of the Service (National Marine Fisheries Service or U.S. Fish & Wildlife Service) as to whether or not the Federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

**Bioretention** – a stormwater control or best management practice developed in the early 1990's by the Prince George's County, Maryland Department of Environmental Resources and utilizes soils and both wood and herbaceous plants to remove pollutants from stormwater runoff.

**Clean Water State Revolving Fund** – a loan program that provides below-market rate loans to public agencies for the planning, design, and construction projects involving wastewater and stormwater treatment facilities, nonpoint source control, and estuary management projects that prevent or mitigate water pollution.

**Chronic Illicit Discharges** – continuous illicit discharges resulting from sanitary/wastewater connections to a stormwater conveyance system, sanitary/wastewater inflows into a stormwater collection system resulting from failing wastewater and stormwater conveyance systems, and unpermitted industrial wastewater discharges to the stormwater collection system.

**Effects of the Action** – defined in 50 Code of Federal Regulations § 402.02 and refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early Endangered Species Act Section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

**Equivalent Illicit Discharge Detection and Tracking Techniques** – techniques that are equal in function and documented efficacy to the techniques described in the Center for Water Protection's 2004 "Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments" and the update to this manual provided in the "2011 Illicit Discharge Detection and Tracking Guide."

**Federal Cross-Cutting Authorities** – federal laws, executive orders, and government-wide policies that apply by their own terms to projects and activities receiving federal financial assistance, regardless of whether the state authorizing the assistance makes them applicable. Federal cross-cutting authorities are often divided into environmental, social, and economic. DEQ's Applicant Guide to the State Environmental Review Process provides a step-by-step process for addressing the environmental cross-cutters.

**Fiscal Sustainability Plan** – the Water Resources Reform and Development Act amended the Clean Water Act to require treatment works projects financed by the Clean Water State Revolving Fund loan program to develop and implement these plans. These plans include (1) an inventory of critical assets that are part of the treatment works project; (2) an evaluation of the condition and performance of inventoried assets and asset groupings; (3) a certification that the loan recipient has evaluated and will be implementing a water and energy conservation efforts as part of the plan; (3) a plan for maintaining, repairing, and, as necessary, replacing the treatment works; and, (4) a plan for funding such activities.

**Green Infrastructure** – consistent with its explanation in EPA's [What is Green Infrastructure website](), green infrastructure uses vegetation, soils and natural processes to manage water and create healthier urban environments. At the scale of city or county, green infrastructure refers to the patch work of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the scale of a neighborhood or site, green infrastructure refers to stormwater management systems that mimic nature by soaking up and storing water.

**Green Project Reserve** – Oregon's Clean Water State Revolving Fund is required to direct a portion of its capitalization grant toward projects that address green infrastructure, water, and/or energy conservation and efficiency, or other environmentally innovative activities. The funds set aside for projects involving green infrastructure, for example, are placed in this reserve.

**Groundwater Replenishment Projects** – these capture available water such as stormwater as well as other sources such as high river flows during wet periods, during periods of low demand, or water that would be lost otherwise) and moves this water under controlled conditions into underground reservoirs called aquifers.

**Illicit Discharge** – any discharge to a municipal separate storm sewer system that is not composed entirely of stormwater except discharges authorized under a NPDES permit or other state or federal permit.

**Informal Consultation** – defined in 50 Code of Federal Regulations § 402.02 and refers to an optional process that includes all discussions, correspondence, etc., between the Service (National Marine Fisheries Service or U.S. Fish and Wildlife Service) and the federal agency or the designated non-federal representative prior to formal consultation, if required.

**Low Impact Development** – defined by the Low Impact Development Center as a comprehensive land planning and engineering design approach with a goal of maintaining and enhancing the pre-development hydrologic regime of urban and developing watersheds.

**Maintenance Agreements** – an agreement between the land owner and the municipality to guarantee the performance of the stormwater control after its construction.

**Municipality** –refers to local government (for example, cities and counties) with authority to regulate land use and the stormwater infrastructure supporting a new development or redevelopment.

**New Development** – refers to activities that increase the stormwater discharged to a municipal stormwater system and includes any activity that create impervious surfaces, for example, during the construction of buildings, driveways, sidewalks and roads.

**Nonstructural Stormwater Controls or BMPs** – as used most frequently in this guidance refers to controls or best management practices in the form of development standards intended to minimize and treat stormwater through soil infiltration, evaporation, and transpiration. This use is consistent with the discussion of this term in Federal Register Volume 64, Number 235 which encompasses preventative actions that involve management and source controls such as: (1) policies and ordinances that provide requirements and standards to direct growth to identified areas, protect sensitive areas such as wetlands and riparian areas, maintain and/or increase open space (including a dedicated funding source for open space acquisition), provide buffers along sensitive water bodies, minimize impervious surfaces, and minimize disturbance of soils and vegetation (2) policies or ordinances that encourage infill development in higher density urban areas, and areas with existing storm sewer infrastructure (3) education programs for developers and the public about project designs that minimize water quality impacts and (4) other measures such as minimization of the percentage of impervious area after development, use of measures to minimize directly connected impervious areas, and source control measures often thought of as good housekeeping, preventive maintenance and spill prevention.

**One Water Approach** – an integrated approach to manage stormwater, groundwater, drinking water, and wastewater to identify opportunities for cost savings and the conservation of limited water resources.

**Operational Stormwater Controls or BMPs** –actions preventing or limiting the contact with and transport of pollution in stormwater.

**Performance Bond** – a financial tool required of a contractor to ensure that funds are available to complete a structural control and ensure it is capable of meeting the treatment standard should the contractor fail to achieve these two objectives.

**Pre-design Report** – an engineered planning document as described in Oregon Administrative Rule 340-054-0022(6)(a) that provides a comprehensive evaluation of the environmental factors, engineering alternatives, and financial considerations affecting the project area. The document must adequately describe the effectiveness and suitability of the proposed project to address the identified water quality problem. If developed for a Clean Water State Revolving Fund-financed stormwater construction project, the pre-design report must be reviewed and approved by DEQ prior to signing a construction loan or initiating a construction project under the fund's sponsorship option loan.

**Pre-development Hydrology** – consistent with the term predevelopment as discussed in Federal Register Volume 64, Number 235, this refers to the runoff conditions that exist on a site immediately before the planned development activities occur. Predevelopment is not intended to be interpreted as the period before any human-induced land disturbance activity has occurred.

**Redevelopment** – consistent with tits use in Federal Register Volume 64, Number 235, this refers to alterations of a property that change the footprint of a site or building in such a way that results in a disturbance (e.g., land disturbance, increase in impervious surface area) triggering a municipality's post-construction stormwater control requirements. This term is not intended to include such activities as exterior remodeling, which would not be expected to cause adverse stormwater quality impacts and offer no new opportunity for stormwater controls. For more information on managing stormwater during redevelopment, see EPA's Guidelines for Redevelopment Webpage.

**Retention Requirement** – one of two requirements in the site performance standard that requires a portion of the rainfall on a site to be retained on this site by soil infiltration, evaporation from plant interception and transpiration.

**Runoff Controls** – either nonstructural or structural controls minimizing the generation of stormwater runoff by limiting impervious area or reducing stormwater runoff volumes through infiltration, evaporation, and transpiration.

**Site Performance Standard** – refers to the standard for stormwater retention and treatment for the post-construction discharge from stormwater controls utilized and/or installed in newly developed and redeveloped sites.

**Source Controls or BMPs** – as used in this guidance are either nonstructural or structural controls preventing or limiting the contact with and transport of pollution in stormwater.

**State Environmental Review Process** – a process to ensure that Clean Water State Revolving Fund applicants for construction loans consider environmental impacts early in the planning process by consulting with appropriate agencies and integrating any mitigation measures required by these agencies early in the design of the infrastructure project.

**Statewide Planning Goal 1** – a goal under Oregon's planning law to develop a citizen involvement program that insures the opportunity for citizens to be involved in all phases of the planning process.

**Statewide Planning Goal 5** – a goal under Oregon's planning law to conserve open space and protect natural and scenic resources.

**Statewide Planning Goal 6** – a goal under Oregon's planning law to maintain and improve the quality of air, water and land resources of the state.

**Statewide Planning Goal 11** – a goal under Oregon's planning law to develop a timely, orderly, and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.

**Stormwater Control** – refers to nonstructural and structural stormwater controls.

**Stormwater Management Plan** – a comprehensive planning approach to managing stormwater within a municipality presenting policies to address flooding concerns and to protect water quality. As used in this guide, a Stormwater Management Plan may contain many or all of the control measures required in a Stormwater Management Program Plan required in a National Pollutant Discharge Elimination System Municipal Separate Storm Sewer Permit. The focus of Stormwater Management Planning in this guide is planning that leads to policies for the development of municipal code providing design standards for stormwater infrastructure and land use development standards that influence stormwater management in new development and redevelopment. As used in this guide, a Stormwater Management Plan may also include the elements of a stormwater master plan and any pre-design reports for specific capital improvement projects identified in a master planning effort.

**Stormwater Master Plan** – a public facility plan as defined in Oregon's Statewide Planning Goal 11 and represents a support document or documents to a local comprehensive plan. A stormwater master plan describes the stormwater facilities which are to support the land uses designated in the local comprehensive plan and contains the elements described in Oregon Administrative Rule 660-011-0045.

**Stormwater Mitigation Bank Program** – a program for off-site compliance that establishes a market with an entity that tracks the life cycle of an off-site mitigation credit by certifying the credit, issuing a tradable credit to the seller, transferring the ownership of the credit from the seller to the buyer, and use or retirement of the credit to receive a benefit when buyer of the credit is unable to meet a retention requirement on their site.

**Stormwater Payment-in-Lieu Program** – a program for off-site compliance where the municipality for a public stormwater control or the developer for a private stormwater control pays a fee in lieu of full compliance on the development site. This fee is based on volume ratios (for example, volume stormwater to be retained onsite to the volume to be retained at the mitigation site) and a rate specified by the municipality. The municipality can aggregate fees and apply them to a public stormwater structural or nonstructural control at a later point in time.

**Structural Stormwater Controls or BMPs** – are physically designed, installed and maintained practices to prevent or reduce the discharge of pollutants in stormwater to minimize the impacts of stormwater on water bodies. As noted in the Federal Register Volume 64, Number 235 for the National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System Phase II rules, examples of structural stormwater controls or best management practices include: (1) storage practices such as wet ponds and extended-detention outlet structures, (2) filtration practices such as grassed swales, sand filters and filter strips and (3) infiltration practices such as infiltration basins and infiltration trenches.

**Treatment Requirement** – one of the two requirements in a site performance standard that is established to ensure a substantial portion of the stormwater generated from impervious surfaces of a new development or redevelopment will be captured and treated by a required structural stormwater control to reduce the pollutant load in this stormwater when the retention requirement for a site cannot be fully met.

**Unit Processes** – a mechanism of pollutant removal and is a term used in stormwater treatment design.

# Appendix B: Plan checklists

The checklists in this appendix should be used to develop the project description in a Clean Water State Revolving Fund planning loan application. Project officers will review your loan application to ensure it contains the key elements described below. For additional background information stormwater management planning, refer to Sections 2 through 4.

## 1. Stormwater Management Plan Checklist

For the definition of stormwater management planning as used in this guide, please refer to Appendix A.

- ☐ Develop an approach for involving local stakeholders and review the research on community's and developers' concerns or perceptions about low impact development (see Section 7).
- ☐ Consult Clean Water State Revolving Fund staff to ensure your plan addresses federal stormwater requirements.

☐ Review stormwater management plans developed by Oregon National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System permittees for plan examples or consider using or adapting the stormwater management template noted in this guide.

☐ If under a NPDES Municipal Separate Storm Sewer System Permit, consider updating a municipality's stormwater master plan (see Section 5) to use the master plan update to comply with, for example, permit requirements for mapping a stormwater system and implementing an illicit discharge and detection program (see Section 2.2.3.1).

☐ Consider developing a pre-design report, detailed in Checklist B.3, below as part of a stormwater master plan update if the municipality has high priority infrastructure project(s) to address and anticipate funding these infrastructure projects in the near future.

- Clean Water State Revolving Fund can finance a pre-design report for a project to address local flooding if the infrastructure project incorporates/includes a stormwater control to improve water quality
- A pre-design report can be used to secure funding for a retrofit project, for example, to address a TMDL allocation in a NPDES Municipal Separate Storm Sewer System Permit

☐ Assess the local code and revise as needed to remove legal barriers to implementing a low impact development approach to stormwater management (see Section 3.2.2).

- The purpose of this step in the checklist is to integrate nonstructural controls into your code

☐ Establish in local code, or in a stormwater design manual referenced in code, a trigger for when a public and private development requires the application of post-construction stormwater controls (see Section 3.1).

☐ Require in local code, or in a stormwater design manual referenced in code, that nonstructural stormwater controls infiltrating, evaporating or transpiring stormwater be used by the designer to retain water on-site before using structural stormwater controls to treat stormwater discharged off-site, to minimize compliance costs.

☐ Establish in code, or in a manual referenced in code, a site performance standard including both a retention and treatment requirement for a development's post-construction stormwater management approach using the following requirements (see Sections 2.3.1 and 2.3.2):

- Stormwater discharge mimics predevelopment hydrologic function
- A numeric retention requirement using a volume-based method, storm event percentile-based method, annual average runoff method or a flow duration curve matching method
- Off-site stormwater mitigation options and criteria for evaluating a request for developments that cannot meet the retention requirement due to site constraints
- A numeric treatment requirement for structural stormwater controls
- Designers give priority to green infrastructure over conventional structural stormwater controls when selecting controls to meet the treatment requirement

☐ Develop design criteria for structural stormwater controls and consider including:

- Specific design requirements for structural stormwater controls when discharging to surface waters under a TMDL and/or listed on DEQ's 303(d) List as impaired by one or more pollutants
- Long-term operation and maintenance procedures for these controls as discussed, including a system for tracking this maintenance and a maintenance agreement for structural stormwater controls operated by a private entity if needed
- Performance requirements such as a bond for structural controls that will be built by a private entity and turned over to the municipality

☐ Consider requiring overbank flood control criteria and extreme storm criteria referring.

☐ Establish clear criteria and submittal requirements for post-construction stormwater management plans for new developments and redevelopments (See Section 4).

# 2. Stormwater Master Planning Checklist

For a definition of a stormwater master plan as used in this guide, please refer to Appendix A. For additional information on stormwater master planning, refer to Section 5.

☐ Ensure this master plan under development or revision will be consistent with the planning period and policy in the Comprehensive Land Use Plan. If not, an amendment to the comprehensive is needed to ensure consistency.

☐ Consider doing integrated planning by combining stormwater and wastewater master planning to identify cost savings in capital improvement projects addressing failing stormwater and wastewater collection system.

☐ Consider establishing an asset management plan as you evaluate your stormwater collection system and treatment controls to better prepare financially for replacing assets when their useful life is reached or exceeded.

☐ If operating a stormwater system under a NPDES Municipal Separate Storm Sewer System permit or a TMDL for bacteria, consider including an illicit discharge detection program plan, summarized in checklist B.4. This gives the municipality the authority to investigate and require removal of chronic illicit discharges to the municipality's stormwater conveyance system. This will leverage this master planning effort to address permit and TMDL requirements. Chronic illicit discharges are defined in Appendix A.

☐ If the stormwater system is covered under an Oregon NPDES Municipal Separate Storm Sewer System Phase I or Phase II permit or the municipality is a new permittee that will be covered under the Phase II Permit, this investigation can be used to meet illicit discharge and detection permit requirements as well as tracking progress towards meeting a TMDL or wasteload allocation for bacteria and possibly other pollutants.

☐ Conduct an inventory and assessment of the condition of the public stormwater conveyance system, structural and nonstructural stormwater controls for water quality and flood controls. For this inventory, the following is also needed:

- The mapped location of the drainage area served by a conveyance system
- The mapped location of the area served by each nonstructural and structural water quantity control
- The capacity of the conveyance system, water quantity control and water quality control to manage stormwater
- General assessment of the condition of the flood controls, structural and nonstructural stormwater controls and other components of the conveyance system

☐ Include with this assessment an illicit discharge investigation noted checklist B.4 to identify sanitary connections to the stormwater conveyance system, sanitary inflows into a failing stormwater conveyance pipe from a failing wastewater conveyance pipe, and other wastewater connections to the stormwater collection system, such as industrial wastewater connections.

☐ Provide a list of needed public conveyance system projects, flood control projects, structural and nonstructural stormwater control projects that will be needed to support land uses designated in the comprehensive plan.

- A cost estimate of each significant project noted above
- A map of each project's general location and service area
- A discussion of the municipality's existing funding mechanisms and whether these or new mechanisms can fund the construction of each significant project noted above

☐ Policy statement(s) or urban growth management agreement identifying the provider(s) of each project.

# 3. Pre-Design Report Checklist

The level of detail in a pre-design report depends on the complexity of the project, including site constraints such as sensitive natural resources like wetlands or endangered species, and other factors that may limit the use of green infrastructure such as a high water table, shallow bedrock, contaminated soils and steep slopes. This checklist serves as an outline for your pre-design report. For a definition of a pre-design report as used in this guide, refer to Appendix A. For additional information on pre-design reports, refer to Section 6.

☐ Ensure the capital improvement project that is described in the pre-design report is identified in your municipality's stormwater master plan and it is consistent with the planning period and policies in the Comprehensive Land Use Plan. The master plan is a support document to the Comprehensive Land Use Plan. If not, the master plan requires an update to include this capital improvement project.

**Project Introduction**

☐ Provide a project description that includes the water quality need or impairment that the stormwater project will be designed to address.
☐ Provide scale maps and photographs of the project planning area and any existing service areas including legal and natural boundaries and a topographical map of the service area.
☐ Briefly describe the utility's approach used to engage the community in the project planning process.

- Your stormwater master planning process may be used to provide this information as this capital improvement project should be in this master plan

**Existing Stormwater Facilities in the Proposed Project Area**

☐ Describe the following: (1) for existing stormwater control(s) that will be replaced, the unit processes of the proposed water quality control(s), (2) for existing flood control(s) that will be replaced, the components of each control and/or (3) for the existing conveyance system that will be replaced, each component of the system (such as a catch basin, pipe segment, water quality manhole etc.) or, alternatively, provide the following:

- Provide a map and a schematic process layout of all existing controls/conveyance system components in the project area and identify controls/conveyance system that are no longer in use, abandoned, and/or will be replaced with this project

☐ Describe the following: (1) present condition, (2) suitability for continued use, (3) adequacy of current structural stormwater controls and flood controls and (4) limitations to their conveyance, treatment, storage, and disposal capabilities including any component failures and the cause of the failure.

☐ Indicate/estimate when major controls/conveyance system components were constructed, renovated, expanded, or removed from service.

☐ Provide a history of any applicable violations of regulatory water quality requirements.

- The project planning process should help the community develop an understanding of the need for the project, the utility operational service levels required, funding and revenue strategies to meet these requirements, along with other considerations

☐ Existing Site Conditions and Constraints Analysis such as sensitive receptors that may be affected by the project such as shallow groundwater, wetlands, and receiving waters containing species on the Endangered Species Act list.

☐ Provide maps, photographs or a narrative description of environmental resources present in the project planning area that may affect design of the project.

- Refer to the Applicant Guide to the State Environmental Review Process for a list of potential constraints that will need to evaluated and, if needed, addressed via avoidance when siting and designing the project and/or mitigated if avoidance is not possible

**Performance Requirements**

☐ Identify the federal, state and local regulations and requirements that the project must comply with.

- Review Appendix C of this guide and, in particular, the discussion on state and federal programs that regulate stormwater. If needed, seek Clean Water State Revolving Fund Technical Assistance if the requirements associated with these various program conflict

☐ Identify the performance standards/design criteria that must be used in the design of the treatment control, the water quality control and the collection system.

**Cost and Effectiveness Analysis**

The Clean Water Act requires any municipality or intermunicipal, interstate, or state agency to perform a cost and effectiveness analysis for all projects funded by the Clean Water State Revolving Fund. The analysis to identify the preferred alternative in the development of the pre-design report can be used to meet this requirement. This cost and effectiveness analysis, at minimum, must:

☐ Provide a study and evaluation of the cost and effectiveness of the processes, materials and technologies for implementing the proposed project or activity.

☐ Identify the section of a project or activity that maximizes the potential for efficient water use, reuse, recapture, and conservation and energy conservation, relative to:

- Constructing the project or activity
- Operating and maintaining the project over the life of the project or activity
- Replacing the project or activity

☐ Sign and submit the cost and effectiveness certification form to the regional DEQ Clean Water State Revolving Fund project officer.

There is no requirement that communities select the least-cost alternative. In theory, the lowest-cost alternative should be selected unless non-monetary factors suggest otherwise.

**Recommended Alternative**

**Collection System**

☐ Identify on a site plan the general location of the new, replacement, rehabilitated pipe or open channel including length and other dimensions as well as key components.

- Note any associated pump stations and provide information on their size, type, location and any special power requirements.

**Water Quantity Control**

☐ Identify the type of control selected including information on its operation and maintenance requirements, layout (such as placement, flow path and drainage area served), sizing and water storage volume, overflow structures/locations for conveying precipitation events larger than the design storm.

**Water Quality Treatment Control**

☐ Describe the unit processes in detail to be used in the structural stormwater control and include the criteria used to design the control such as the design requirements in the National Marine Fisheries Service's Standard Local Operating Procedures for Endangered Species V.

- ☐ For green infrastructure, provide the following information:

  - *Control Measures Selected*: identify types of control measures selected (such as vegetated areas, planter boxes, permeable pavement, rainwater cisterns etc.) including, as appropriate, information on the specifications for the soil mix that will be used to remove pollutants.
  - *Layout*: identify the placement of green infrastructure control measures, flow paths and drainage area for each control measure.
  - *Sizing*: identify the surface area and water storage volume for each green infrastructure control measure and, where applicable, soil infiltration rate, evapotranspiration rate and use rate (for rainwater harvesting) should also be addressed.
  - *Overflow*: describe overflow structures and locations for conveying larger precipitation events.

- ☐ For structural stormwater controls other than green infrastructure, identify the type of controls selected including information on its unit process, operation and maintenance requirements, layout (for example, placement, flow path, and drainage area served), sizing and water storage volume, overflow structures and their locations for conveying larger precipitation events.

**Total Project Cost Estimate (engineer's opinion and probable cost)**

- ☐ Provide an itemized estimate of the project cost based on the stated period of construction including construction, land and right-of-ways, legal, engineering, construction program management, funds administration, interest, equipment, construction contingency and other costs associated with the proposed project.

  - The construction subtotal should be separated out from the non-construction costs
  - The non-construction subtotal should be included and added to the construction subtotal to establish the total project cost
  - An appropriate construction contingency should be added as part of the non-construction subtotal

- ☐ Itemize, if applicable, the cost estimate to reflect cost sharing including apportionment between funding sources.

**Annual Operating Budget**

- ☐ Provide itemized annual operating budget information from the owner.

  - The owner has primary responsibility for the annual operating budget but may include other parties that provide technical assistance
  - This information will be used to evaluate the financial requirements for the system
  - The engineer will incorporate information from the owner's accountant and other known technical service providers

- ☐ Provide information about all sources of income for the system including a proposed rate schedule.

  - Provide, if applicable, project income for existing and proposed new users separately in the sources of income

- ☐ Provide an itemized list by expense category and project costs.
- ☐ Provide projected costs for operating the system as improved and, in the absence of other reliable data, based on actual costs of other existing facilities of similar size and complexity including facts in the report to substantiate operating and maintenance cost estimates.
- ☐ Include personnel costs, administrative costs, treatment costs, accounting and auditing fees, legal fees, interest, utilities, energy costs, insurance, annual repairs and maintenance, monitoring and testing, supplies, residuals disposal, office supplies, printing, professional services and miscellaneous as applicable.

**Fiscal Sustainability Plan**

Under the Clean Water Act, all publically owned treatment works projects such as a stormwater structural control with its associated collection system require the CWSRF borrowers to have a Fiscal Sustainability Plan. This plan must be developed and in place by project completion and the Fiscal Sustainability Plan Certification Form signed and provided to the project officer. This plan, at a minimum, must include the following:

- ☐ An inventory of critical assets that are part of the treatment work or treatment control as well as its collection system which was part of the project
- ☐ An evaluation of the condition and performance of inventoried assets or asset groupings
- ☐ A certification that the recipient has evaluated and will be implementing water and energy conservation efforts as part of the plan
- ☐ A plan for maintaining, repairing, and – as necessary – replacing the treatment works and a plan for funding such activities

  - Consider using an asset management program to inventory the CWSRF-financed assets, document the operation and maintenance requirements for these assets, and track the performance of these requirements
  - See the previous section of this checklist on annual operating budget to help fulfill the checklist item above on preparing a plan for maintaining, repairing and replacing CWSRF-financed assets

**Conclusions and Recommendations**

- ☐ Provide any additional findings and recommendations that should be considered in development of the recommended plan of action to expedite project development and any other necessary considerations.

**Performance Bond**

- ☐ In preparation for working with contractors to build a stormwater collection system and structural stormwater control that meets site performance standards and other requirements, refer to Section 2.4.4 and the information on developing a performance bond for this construction project.

# 4. Illicit Discharge and Detection Plan Checklist

In developing an illicit discharge and detection plan, the loan applicant should use the Center for Watershed Protection's IDDE – A Guidance Manual for Program Development and Technical Assessments (2004) and the update to this manual provided in the Illicit Discharge Detection and

Tracking Guide (2011). The applicant may use another reference providing equivalent detection and tracking techniques as discussed below. The two Center for Watershed Protection documents are referred to as the Center for Watershed Protection Manual in this checklist. For the definition of illicit discharge, refer to Appendix A. For more information on illicit discharge, detection and elimination, refer to Section 2.2.3.1.

☐ Establish in code a prohibition on illicit discharges to the municipality's stormwater conveyance system that also provides the municipality with the authority to investigate possible sources of the illicit discharge and require the elimination of illicit discharges.

- Define in this code the range of illicit discharges it covers including but not limited to sewage, septic tank waste, industrial waste, trash, paints, stains, resins, household hazardous waste, pesticide waste, automotive products, construction waste and unhardened concrete

☐ Identify procedures for identifying the presence of illicit discharges, for prioritizing areas for investigation and for conducting field investigations of the stormwater conveyance system.

- Municipality should use the guidance manual for its procedures or equivalent illicit discharge detection and tracking techniques from another reference.
    - These equivalent techniques must be comparable in terms of function and efficacy to those in the guidance manual.
- Municipalities may use emerging techniques in conjunction with the guidance manual's investigation techniques but these emerging techniques should have documentation demonstrating they enhance the efficacy of the established investigative techniques in the guidance manual.

☐ Identify procedures such as capital improvement planning to eliminate chronic illicit discharges under the direct control of the municipality such as sanitary inflows due to failing public sanitary and stormwater conveyance systems.

☐ Develop procedures, if currently lacking, for eliminating illicit discharges that are not under direct control of the municipality that include the development of enforcement procedures allowing for the following:

An escalating enforcement process to ensure compliance with the illicit discharge ordinance or other regulatory mechanism to address repeat violations to achieve compliance using, for example, the tools listed below:

- Written warning with an opportunity to comply voluntarily
- Written notice of violation ordering compliance
- Administrative or civil penalties
- Compensatory action
- Criminal prosecution
- Cost of abatement of the violation and property liens
- Emergency cease and desist order
- Stop work order

- ☐ Identify timelines for compliance and, when formulating response procedures, consider factors such as the amount of pollutant discharged, the type of pollutant discharge, and whether the discharge was intentional or accidental.

- ☐ Develop a complaint and illicit discharge response tracking system that uses a municipality's existing asset management system or, if developed, the CWSRF-required fiscal sustainability plan (see definitions in Appendix A and Appendix B.3) and, for example, documents the following milestones that are applicable:

  - The date the complaint was received and, if available, the complainant's name and contact information
  - The staff responding to the complaint
  - The date(s) the investigation was initiated
  - The date the illicit discharge was identified
  - The outcome of the staff investigation and a summary of the procedures used
  - The location and stormwater asset or component affected by the illicit discharge
  - The corrective action required to eliminate the illicit discharge
  - The party responsible for the corrective action
  - The status of the enforcement procedures
  - The date the corrective action was completed and staff involved in the final inspection to evaluate compliance with the municipality's code or other regulatory mechanism

- ☐ If currently not available in an existing stormwater master plan, consider developing a storm sewer system map(s) or digital inventory that has the capacity or functionality to document the following:

  - The location of all stormwater conveyance system outfalls including the unique identifier for each, any geographic information such as streets necessary to locate these outfalls in the field, and the names of the water bodies receiving the discharge from them
  - The location of the stormwater conveyance system and structural stormwater controls including any geographic information such as streets, manholes and milepost markers necessary to locate this system in the field
  - Include a delineation of the stormwater conveyance system by storm sewer drainage basin as appropriate

# Appendix C: Requirements

This section relates to the Clean Water State Revolving Fund environmental review requirements. Listed below are the various documents that provide guidance and regulations regarding DEQ's environmental review requirements for CWSRF funded projects.

- Applicant's Guide to the State Environmental Review Process (SERP)
- Federal Environmental Cross Cutting Authorities - Oregon Contacts
- Guide for Preparing the Environmental Report for Water and Wastewater Projects - the "Green Guide"
- Categorical Exclusion Candidate Project Packet

Applicants applying to the program for funding need to work with the program's Regional Project Officers to determine which environmental review track is appropriate for their project and which documents and requirements need to be completed for the applicant's proposed project.

# 1. Environmental Review

The intent of the State Environmental Review Process, SERP, is to ensure that CWSRF loan applicants consider environmental impacts early in the planning process. This means complying with applicable environmental laws, consulting with appropriate environmental agencies and integrating any mitigation measures required by the environmental agencies consulted. DEQ will identify the appropriate track and extent of environmental analysis required. The environmental track is based on the proposed project's potential environmental impacts.

Some projects may be subject to federal laws, executive orders and policies known as cross-cutters. For example, the installation of a stormwater conveyance system may trigger a permit from the U.S. Army Corps of Engineer because of wetland impacts particularly if an outfall is part of the installation of this system. Moreover, the regulatory triggers for wetland impacts may, in turn, trigger federal Endangered Species Act and historic/cultural protection requirements, for example. For stormwater systems triggering ESA protections for salmon, the National Marine Fisheries Service's Standard Local Operating Procedures for Endangered Species referred to as SLOPES V should be considered early in the planning process.

Before beginning a project, it is best to consult with a CWSRF circuit rider or project officer and read the Applicant Guide to the State Environmental Review Process to discuss how these requirements may apply.

# 2. Section 401 Water Quality Certifications

As with the Endangered Species Act consultation requirement noted above, a Section 401 Water Quality Certification is another federal requirement that may be triggered during the planning of a CWSRF-financed stormwater construction project. The Section-401 Water Quality Certification A certification from DEQ is required for any stormwater construction project triggering, for example, a U.S. Army Corps of Engineer's Section 404 Permit. This certification ensures that a project meets water quality standards established by the state. During the certification process, DEQ evaluates a proposed project for potential impacts to the beneficial uses of a water body (such as recreation)) and, specifically, requires that projects discharging stormwater to a water body follow the DEQ's Section 401 WQ Certification Program's Stormwater Management Plan Submission Guidelines.[60] When more than one federal requirement applies to your project, DEQ encourages you to work with CWSRF Technical Assistance to help coordinate the streamlining of these requirements.

# 3. NPDES MS4 Phase I and II Permits

Several municipalities in Oregon are required to comply with an NPDES Separate Storm Sewer System Permit under the Clean Water Act. Commonly called an MS4 permit, DEQ administered this permit in two phases: Phase I for larger municipalities and Phase II for smaller municipalities. DEQ's Municipal Stormwater Webpage for Phase I and II Permittees provides a list of current permit holders. This webpage also includes a link to the list of new municipalities currently designated for permit coverage based on the 2010 U.S. Census. In its 1999 Phase II rules, EPA noted that the CWSRF would likely be a primary funding source for Phase II Permit compliance.

Each permit contains a condition requiring the permittee to develop or revise a stormwater management plan and includes establishment of a post-construction site runoff program including the ordinance to implement this program. This permit-required stormwater management plan includes other stormwater control measures that the Clean Water State Revolving Fund program can also finance such as the development of the following:

- Illicit discharge, detection and elimination program
- Construction site runoff program
- Pollution prevention and good housekeeping in municipal operations
- Public education and outreach
- Public participation

# 4. Total Maximum Daily Loads

TMDLs are also a requirement of the Federal Clean Water Act and DEQ administers them when a pollutant impairs a beneficial use of a water body. If urban stormwater is identified as one of the sources causing this water quality impairment, DEQ will condition NPDES Stormwater Permits issued in a basin to implement measures to help permittees attain a TMDL wasteload or load allocation.

For municipalities who do not have a NPDES Municipal Separate Storm Sewer System Permit, DEQ will require a municipality under the TMDL to develop an implementation plan identifying management strategies that will help the municipality meet its wasteload or load allocation. The Water Quality Management Plan of the TMDL typically recommends management strategies that are likely to reduce the pollutant causing the impairment of a beneficial use of a water body. The CWSRF encourages municipalities to seek as well as contact the DEQ Basin Coordinator assigned to their basin during the development of their proposal for a loan application. This will ensure that your proposed project will also address both the TMDL and any CWSRF project eligibility requirements while addressing management of the quantity of stormwater discharged from a site and related local flooding.

For municipalities who are not under a Municipal Separate Storm Sewer System Permit, a key reference for developing a stormwater management program is DEQ's TMDL Implementation Guidance: Guidance for Including Post-Construction Elements in TMDL Implementation Plan.[61] DEQ's Guide for Preparing Stormwater Planning Documents provides specific examples for implementing an approach that is consistent with this TMDL Implementation Guidance. If a TMDL is under development but has not yet been issued as an administrative order, collaborating with your DEQ Basin Coordinator as well as CWSRF technical assistance during the development of your project proposal will help ensure your municipality is well-positioned to address this when it is issued in the future.

# 5. DEQ Cleanup Program

When contaminants are present in the soil, stormwater can move it off the site to surface waters. DEQ's Cleanup Program manages the remediation of contaminated sites throughout the state. DEQ's Guidance for Evaluating the Stormwater Pathway at Upland Sites is applied during remediation to ensure that responsible parties manage on-going discharges of stormwater from contaminated sites. This includes adequate investigation, control or treatment to prevent mobilization of contaminants to waterways that may contribute to impairments of water, sediment quality or recontaminate remediated sediment. Stormwater discharges from these sites may or may not be regulated under NPDES permits.

## 6. NPDES Construction and Industrial Permit Program

The NPDES 1200-C and 1200-CN stormwater general permits apply during construction phases for activities including clearing, grading, excavation, materials or equipment staging and stockpiling that will disturb one or more acres of land and may discharge stormwater to waters of the state. The permits also apply to construction activities that will disturb less than one acre that are part of a common plan of development or sale if the larger common plan of development or sale will ultimately disturb one acre or more and has the potential to discharge to stormwater. In addition, DEQ may require permit registration for any other construction activity based on the potential for contribution to an excursion of a water quality standard or potential for significant contribution of pollutants to waters of the state.

Certain cities and counties have elected to administer the NPDES 1200-CN general permit for construction projects disturbing less than five acres. Owners and operators of proposed construction projects in these jurisdictions comply with all applicable code and permit requirements to receive NPDES 1200-CN permit coverage. For construction projects disturbing less than five acres, see the following for this general permit coverage: Albany; Corvallis; Eugene; Milwaukie; Springfield; West Linn; Wilsonville; Clackamas County; Clean Water Services in Washington County; Rogue Valley Sewer Services in Central Point, Phoenix, Talent, and Jackson County (unincorporated areas), Lane County (NPDES System municipal Phase II permit area); and Multnomah County (unincorporated areas). Gresham, Troutdale and Wood Village oversee construction projects disturbing less than one acre in their jurisdictions.

DEQ also assigns coverage under the NPDES 1200-Z and 1200-A stormwater general permits to facilities that may discharge stormwater associated with certain industrial activities into streams, lakes and streams from pipes, outfalls or other point sources at a site. DEQ's industrial permits contain a list of industrial sources required to obtain coverage under these permits. Examples of industrial activities that are eligible for coverage under these general permits include manufacturing, transportation, mining and steam electric power industries, as well as scrap yards, landfills, certain sewage treatment plants and hazardous waste management facilities. For a complete list of industrial facilities required to obtain a permit, refer to 40 Code of Federal Regulations 122.26(b) (14) and (15).

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