# TMDL Implementation Guidance:

## Guidance for Including Post-Construction Elements in TMDL Implementation Plans



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DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.

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# Introduction

This document provides guidance to urban and rural residential Designated Management Agencies (DMAs) and DEQ staff for including post-construction stormwater management strategies in TMDL implementation plans (IP). Although DEQ encourages all urban and rural residential DMAs to use this guidance, it is particularly recommended for urban and rural residential DMAs within the Coastal Nonpoint Management Area (Figure 1).

DMAs are required under the existing provisions in OAR 340-042-0080 to develop TMDL IPs in accordance with the applicable Water Quality Management Plan (WQMP). This guidance assists DMAs and DEQ staff with ensuring TMDL IPs address this requirement, and serves as a supplement to previous DEQ guidance (i.e., May 2007 TMDL Implementation Plan Guidance) for State and Local Government Designated Management Agencies.[1]

While this version of the guidance has been specifically developed for addressing the post-construction program element and related program components in a TMDL IP, this document also provides the framework for incorporating additional program element guidance, such as guidance for incorporating a construction site runoff program in a TMDL IP, in the future.

# What's in the Guidance

The guidance recommends that all urban and rural residential DMAs expand their TMDL IPs to include specific post-construction stormwater management strategies similar to those applicable to cities and counties in more populated regions of the state (i.e., operators of regulated small municipal separate storm sewer system (MS4) sources). The Water Quality Management Plan (WQMP) associated with the TMDL identifies whether or not a stormwater management program is required. In the future, DEQ anticipates that similar guidance will be developed to assist urban and rural residential DMAs for incorporating riparian protection, particularly to address temperature TMDLs, and other management strategies to reduce WQ impacts of urban development (see Figure 2).

This guidance is structured to follow a process flow, and includes the sections outlined below. The initial four sections provide information for determining how the TMDL applies, and the general process for developing and implementing a TMDL IP. The next three sections provide background and general guidance for developing an effective post-construction stormwater management program with appropriate program components. The final section provides information regarding TMDL IP development and implementation assistance.

A. TMDL Implementation Plans (IP)
    1. Background
    2. TMDL IP Development Process
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    4. Implementing the TMDL IP

B. Post-Construction Stormwater Management
    1. Post-Construction Stormwater Management Strategy Development
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C. Technical, Outreach Assistance, and Funding

[1] http://www.deq.state.or.us/WQ/TMDLs/docs/impl/07wq004tmdlimplplan.pdf


**Figure 1. Coastal Nonpoint Management Area Boundary.**

# A. TMDL Implementation Plans

## 1. Background

The TMDL assigns to DMAs the load allocations or their surrogates for the 303(d) listings that the TMDL was issued. Each DMA is required to prepare an individualized implementation plan that provides a description of the management strategies necessary to prevent, control, and/or treat specific sources of the TMDL pollutant.[2] The TMDL WQMP may provide information that the DMA *must* include in the TMDL implementation plan (IP).

Each TMDL IP must include the management strategies the DMA will use to reduce pollutant loading and achieve the load allocations. The TMDL IP must describe the selected management strategies and measurable milestones in sufficient detail, such as providing program components, siting criteria and operating methods/procedures, to inform DEQ's independent and objective review and effectiveness evaluation. The TMDL IP must also include implementation timelines and performance monitoring, including specific timelines for each practice to ensure that the TMDL load allocation is met within a reasonable timeframe.

The DMA must also include in the IP reasonable assurances that the strategies described in the plan will work. There are two elements to these assurances. First, the management strategies selected should be justified with estimates of their contribution to load reduction targets. Second, a description of funding sources and other mechanisms that will be used to assure implementation of strategies is essential for a complete plan. The cost of administration, operation and maintenance, and monitoring should be considered for the long term implementation of the IP.

## 2. TMDL Implementation Plan Development

A TMDL IP describes the actions that are needed to improve water quality once a TMDL has been established. Generally, a TMDL IP includes a list of pollutants of concern and the sources (if known), proposed treatment strategies, a timeline for implementation activities, and proposed methods for monitoring the effectiveness of implementation activities. These TMDL IPs are necessary because a TMDL typically describes only what needs to happen and does not set out a schedule for implementing the specific improvements (see applicable TMDL/WQMP for specific requirements).

The required components of a TMDL IP are described in OAR 340-042-0080(4) excerpted below. See DEQ's May 2007 TMDL Implementation Plan Guidance for additional information.

**OAR 340-042-0080(4):**
*Persons, including DMAs other than the Oregon Department of Forestry or the Oregon Department of Agriculture, identified in a WQMP as responsible for developing and revising sector-specific or source-specific implementation plans must:*

*(a) Prepare an implementation plan and submit the plan to the Department for review and approval according to the schedule specified in the WQMP. The implementation plan must:*

*(A) Identify the management strategies the DMA or other responsible person will use to achieve load allocations and reduce pollutant loading;*
*(B) Provide a timeline for implementing management strategies and a schedule for completing measurable milestones;*
*(C) Provide for performance monitoring with a plan for periodic review and revision of the implementation plan;*

[2] OAR 340-042-0080 (4)

*(D) To the extent required by ORS 197.180 and OAR chapter 340, division 18, provide evidence of compliance with applicable statewide land use requirements; and*
*(E) Provide any other analyses or information specified in the WQMP.*
*(b) Implement and revise the plan as needed.*

DMAs should consider the following flow chart when developing TMDL IPs (Figure 2). This flow chart outlines the general approach a DMA should use to determine the process they should follow in developing a TMDL IP and to identify the management strategies (e.g., stormwater minimum control measures, riparian protection) that will be needed to meet the load allocations and other WQMP requirements. Although not specifically highlighted in the flow chart, the DMA must incorporate opportunities for the public to be involved at all appropriate TMDL IP development steps. Additional flowcharts for urban water quality management program elements will be developed as needed.

The DMA should review the WQMP for a list of BMPs that are recommended to control sources of pollution. The WQMP may list recommended BMPs or strategies by pollutant and source and the estimated pollutant load reduction.

Many DMAs already have plans or strategies in place that can help prevent or control water pollution, such as stormwater management plans or road maintenance plans, but these plans may not address all of the TMDL pollutants or cover relevant sources of pollution. TMDL IPs should *build* upon existing management efforts, not duplicate or repeat them. Examples of plans and programs with useful information for DMAs are included in Appendix A.

Information on the DMAs existing legal authority (comprehensive plan and code provisions), an inventory of infrastructure assets (e.g., roads, storm and sewer systems) and a description of watershed characteristics, may be necessary in developing an adequate TMDL IP. This information will further assist the DMA in aligning its efforts to protect and improve the environment.

If a DMA is also a MS4 permittee, DEQ recommends the DMA coordinate the development and implementation of its TMDL IP with the development and implementation of its MS4 program, including the Stormwater Management Plan (i.e., SWMP). DEQ envisions that in such instances, the DMA could develop a comprehensive program document that addresses stormwater-related pollutants in jurisdictional areas covered under its MS4 permit, stormwater-related pollutants in areas outside of the MS4 jurisdictional area, and non-stormwater pollutants (e.g., temperature).

In some instances, the DMA may find it necessary to prioritize management strategies if resources are limited. This may mean addressing some sources of pollution before others or focusing implementation efforts in a particular geographic area. To the extent possible, the DMAs should establish priorities based on the greatest opportunities for achieving pollutant reductions.

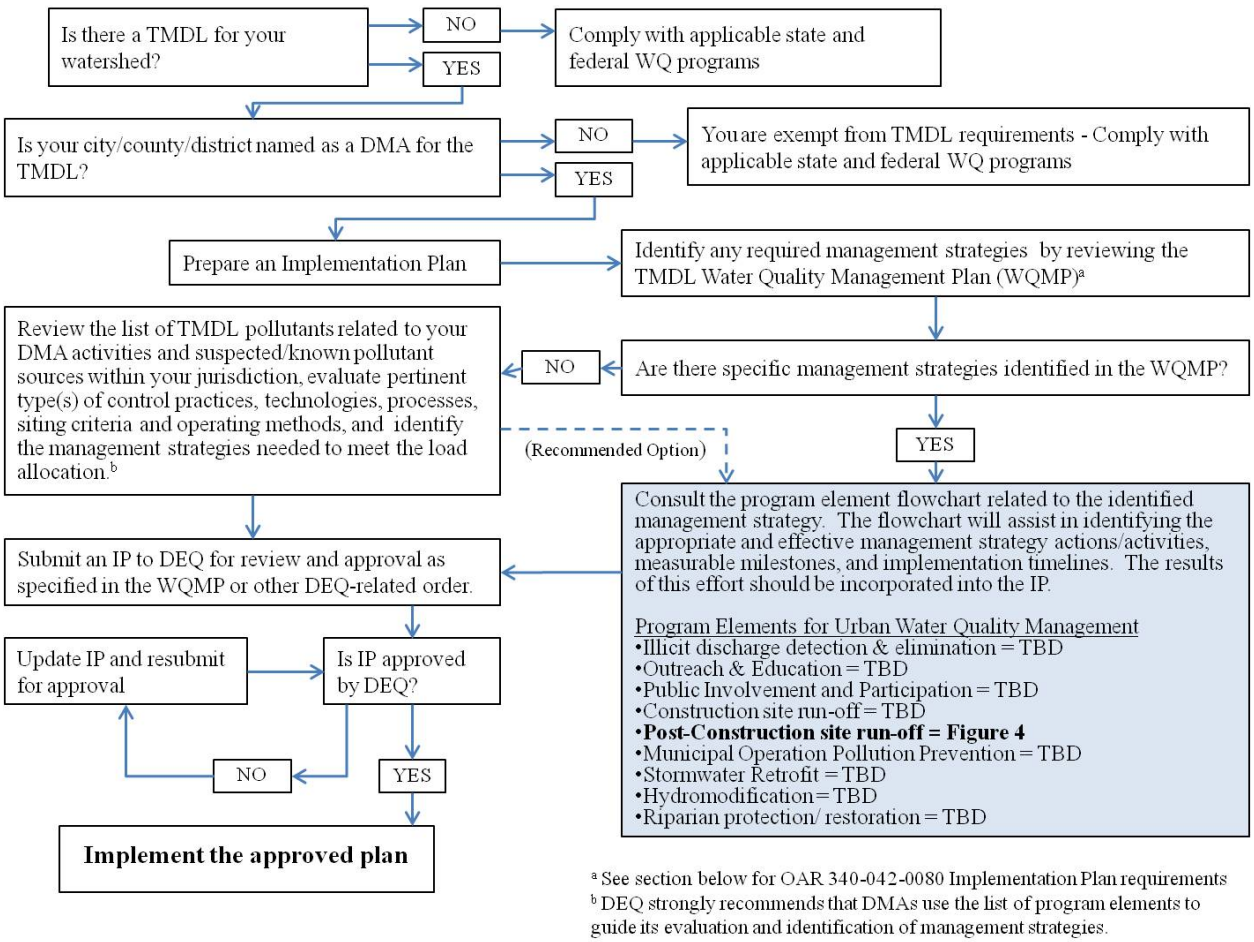


**Figure 2 - Process for TMDL Implementation Plan development and approval**

# 3. TMDL Implementation Plan Submittal and Approval

TMDL IPs are developed by the DMAs and submitted to DEQ for review and approval. DEQ may extend the WQMP deadline for TMDL IP submittal if there is sufficient justification.

Notification and other requirements for TMDL IP development and submittal are in the WQMP or OAR 340-042-0080.

- The due date for submitting a completed TMDL IP is in the WQMP and is typically between 12 and 18 months after TMDL/WQMP is issued ;
- After DEQ receives the plan, DEQ will acknowledge receipt of the plan by letter and will strive to review it within 60 to 90 days;

DEQ will review a TMDL IP to ensure that it includes the TMDL and WQMP required components. This review is based on the following:

- All the known or suspected sources of pollution for TMDL load allocations or surrogates within the DMA's jurisdiction (or referenced in other plans and/or permits) are addressed.
- There is reasonable assurance that the DMA-selected BMPs will be effective in meeting the load allocations.

If the TMDL IP is found to be unsatisfactory, DEQ will identify which portions of the plan are considered inadequate and require revision, return the plan, and identify a timeframe for resubmitting the plan. (NOTE: To the extent possible, DEQ will provide resource materials and technical assistance to those needing help to complete the plan).

After receiving a satisfactory plan, DEQ will send the DMA a letter of approval. The approval letter may also include recommendations for additional actions the DMA should consider or undertake or DEQ's expectations of issues to be addressed in a future update of the TMDL IP.

## 4. Implementing the TMDL Implementation Plan

TMDL implementation requires effort by DMAs to achieve the goals of the TMDL. TMDL implementation is accomplished through DMAs enacting or continuing various land and water management strategies, implementing pollution prevention programs and completing restoration projects. These efforts will lead to non-point source pollutant load reductions that, in turn, achieve load allocations.

DEQ expects that DMAs will implement their TMDL IPs with a concerted effort, but acknowledges that adjustments or revisions will be necessary from time to time. The DMA should keep DEQ informed of any substantive changes to the TMDL IP. In most instances, it will be adequate to wait for the next 5-year review of the plan to revise a TMDL IP to reflect any changes.

One mechanism to submit substantive changes is through the submittal of a progress report. Typically, the TMDL WQMP specifies the frequency of reporting, but if not listed in the WQMP, DEQ recommends that DMAs submit annual progress reports. The annual progress report tracks implementation of the TMDL IP and the management strategies. Check with your Basin Coordinator for reporting requirements.[3]

DEQ has prepared the TMDL Implementation Tracking Matrix,[4] which is a template for DMAs to describe and report management activities in their annual reports to DEQ. DEQ encourages the use of this matrix for organizing the TMDL IP and tracking progress of the management measures. Additional details on each strategy can be included in a narrative portion of the TMDL IP.

Every fifth year, DMAs should submit a 5-Year TMDL Implementation Plan Review Report. This report should describe the effectiveness of the DMA's TMDL Implementation for the preceding four years. Check with your DEQ Basin Coordinator for reporting requirements.

# B. Post-Construction Stormwater Management

Section B provides general post-construction stormwater management guidance for DMAs that are subject to a WQMP with post-construction-stormwater management identified as a load reduction strategy, and for those DMAs that determine through their own methods that development of a post-construction stormwater management program is necessary to meet TMDL load allocation. This guidance focuses on the creation of a local program to address site-specific runoff from urban development.

3 http://www.deq.state.or.us/wq/tmdls/docs/basincoordinators.pdf
4 http://www.deq.state.or.us/wq/tmdls/docs/impl/impltrackingmatrix.doc

Post-construction stormwater management can be one piece of a larger effort to reduce the impact of urban development on a watershed. This is particularly true in Oregon where urban growth boundaries and other land use strategies, such as local zoning code, are employed to make efficient use of urban areas so that farm, forest, and natural areas can be preserved. It is important to note, however, that such land use strategies by themselves are often not sufficient to mitigate the impact of urban development on water quality.

DEQ encourages DMAs to utilize existing land use measures, and adopt new measures as needed, to support TMDL pollutant load reduction targets and overall watershed health. DEQ anticipates DMAs will include, as appropriate, such land use measures in the TMDL IP. Although Section B does not provide specific guidance regarding how a DMA can link its land use strategies/measures with the post-construction stormwater management program components described in this section, Table 1 does provide a list of a few watershed-scale land use strategies that a DMA should consider as it develops a local post-construction stormwater management program.

# 1. Post-Construction Stormwater Management Strategy Development

Increased levels of impervious surfaces (e.g., roads, rooftops and parking lots) associated with urbanization changes the hydrology of the landscape, often causing additional pollutants to discharge to surface waterbodies. Pollutants are mobilized by faster moving stormwater that is created when precipitation lands on impervious surfaces. Storm sewer systems connect this water pollution source directly to the nearest stream, lake or wetland. Post-construction stormwater management, or management of runoff from a site after construction has been completed, is an important component to protecting water quality in urban or urbanizing areas.

| Land Use Management Strategy | Contribution to watershed protection |
|---|---|
| Compact urban development patterns | Reduces the volume of stormwater per capita. |
| Riparian protection | Preserves or enables riparian vegetation, which provides shade and bank stability. Can support riparian restoration efforts. |
| Wetland protection | Preserves the natural hydrology and water quality of the watershed. |
| Development restrictions on steep slopes, highly erodible areas, and landslide prone areas | Reduces risk of chronic erosion and episodic events, like landslides, from contributing sediment to streams, lakes and estuaries. |
| Development restrictions in floodplains and channel migration zones | Preserves the natural hydrology of the watershed allows the natural processes that create diversity in stream channels |

**Table 1 – Examples of Watershed Protection Provided by Land Use Management Strategies**

Many approved TMDLs include load allocations for urban runoff-related (i.e., stormwater) pollutants, such as sediment, bacteria, or nutrients. Total suspended solids (TSS) can be used as a general surrogate for these urban pollutants since the pollutants attach to soil or street dirt rather than staying freely dissolved in stormwater. Sources of these TMDL pollutants in urban areas and rural communities include, but are not limited to, the following:

- Runoff from existing residential, commercial, and industrial, land uses.
- Runoff from new land development.
- Runoff from transportation systems, such as roads, airports or highways.
- Runoff from landscaping and parking lots.

Runoff from municipal operations, such as maintenance facilities, schools, or parks.

Post-construction management strategies improve the stormwater quality running off of impervious surfaces and managed landscapes. This can be an important element of a broader strategy to adequately address urban runoff-related TMDL load allocation, particularly when considering potential water quality impacts from new development within an urban growth boundary or future expansions of the urban area. Post-construction stormwater management controls implemented can also help DMAs avoid high costs in the future to retrofit developed areas that lack management practices or controls. Consequently, ***DEQ recommends urban and rural DMAs develop and implement a post-construction stormwater management strategy even if an applicable WQMP does not have post-construction management strategies specifically identified.***

A well-designed program for post-construction stormwater management includes seven main components (Figure 3). These components provide the framework for designing and implementing the control practices, technologies, processes, siting criteria, and operating methods needed for the post-construction program to be effective.

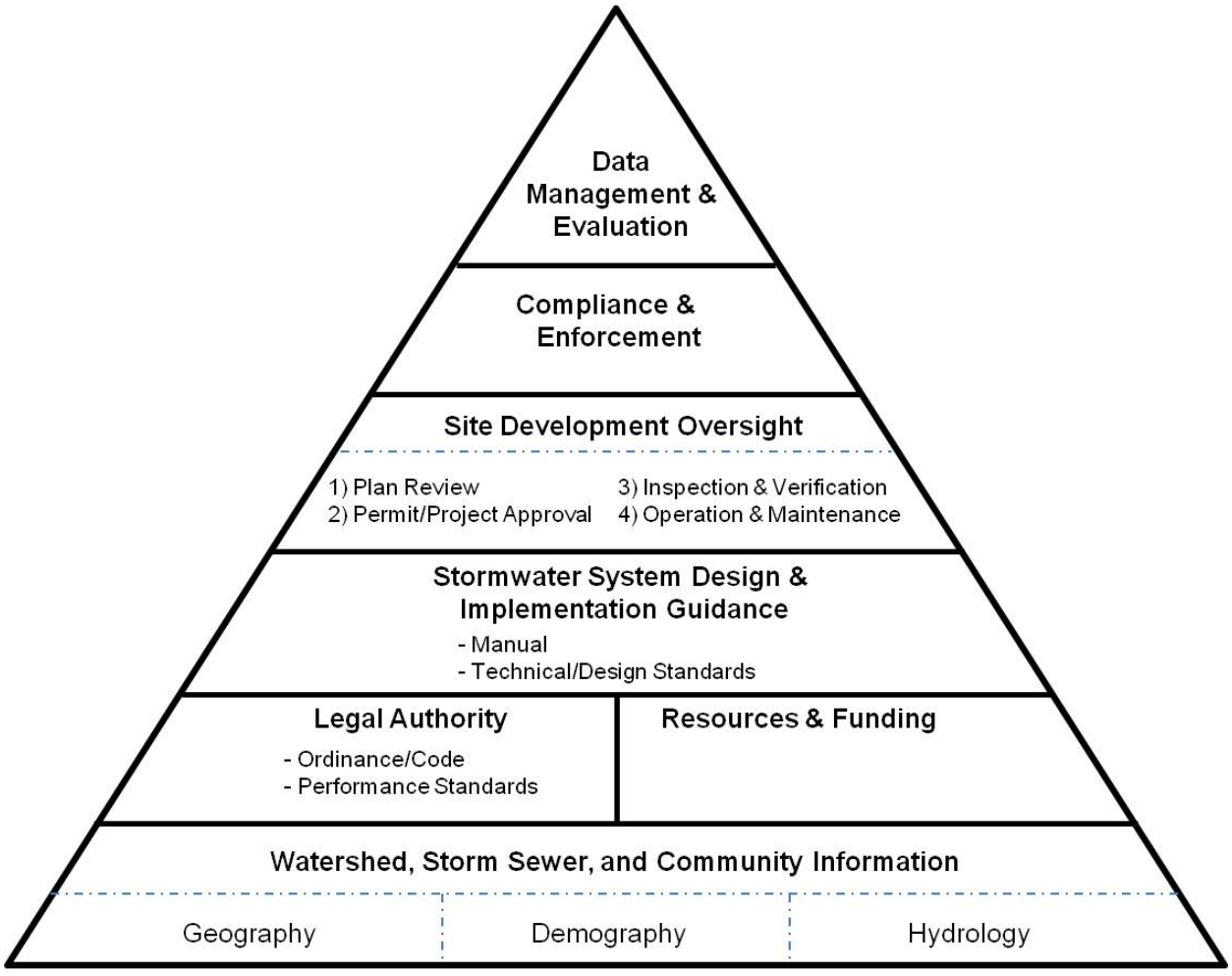


**Figure 3 - Post-Construction Stormwater Management Program Components**

In developing its post-construction stormwater management program, the DMA can follow the process flow diagram in Figure 4, which guides the DMA through several early steps of the program development process, including developing the legal authority with an appropriate performance standards and supporting the program with design & implementation guidance. DEQ also encourages the DMAs to review a publication prepared by the Center for Watershed Protection for USEPA prior to developing a post-construction stormwater management

program.[5] This guide was developed for MS4 Phase II communities and other communities not regulated under the federal permit program to assist the communities in building post-construction stormwater management program capabilities and to strengthen the link between land use planning and stormwater management.

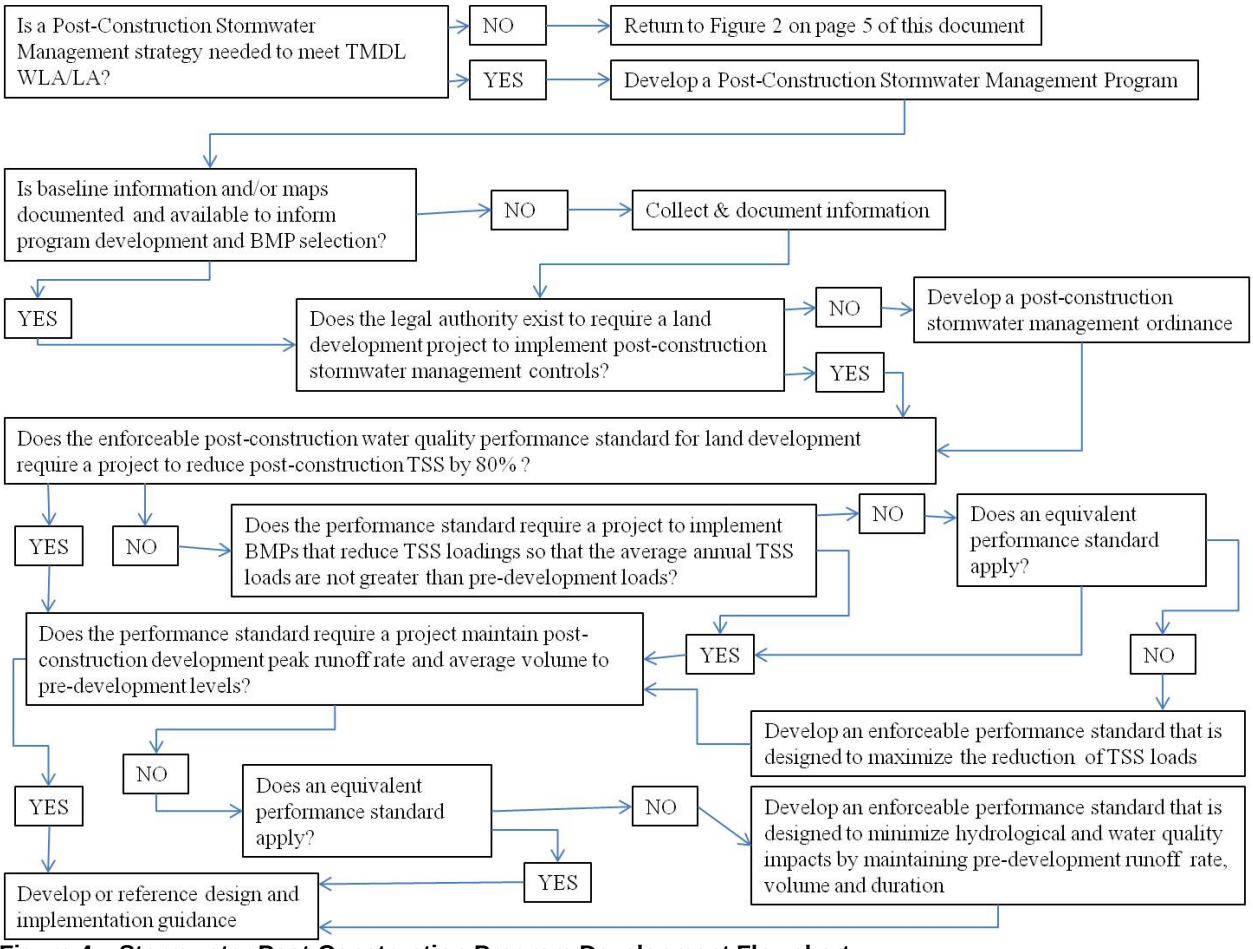


**Figure 4 – Stormwater Post-Construction Program Development Flowchart**

# 2. Post-Construction Stormwater Management Program Element - Legal Authority

To establish the legal authority for a post-construction stormwater management program, DEQ recommends that urban and rural DMAs (particularly those located within the Coastal Nonpoint Management Area) develop or reference an enforceable code that applies the following two-part post-construction performance standard to new development projects:

**1a.** Reduce post-construction development TSS loadings by 80%.

**OR**

**1b.** Include practices that reduce TSS loadings so that the average annual TSS loads are no greater than pre-development loadings.

**AND**

**2.** Maintain post-construction development peak runoff rate and average volume to pre-development levels.

[5]Center for Watershed Protection. July 2008. Managing Stormwater in Your Community: A Guide for Building an Effective Post-Construction Program. USEPA Publication No. 833-R-08-001.

As previously discussed, TSS can serve as the rational basis for a treatment (pollutant reduction) performance standard because it represents a good surrogate for many urban stormwater-related pollutants.

Similarly, since it has been demonstrated that efforts to reduce stormwater flow will also achieve reductions in pollutant load,[6] managing peak runoff rate and average runoff volume represents an effective approach for addressing the hydrologic component of stormwater management. For additional information regarding this TSS reduction and hydrologic performance standard, see USEPA's website discussing the New Development Management Measure for Urban Runoff under the Coastal Zone Act Reauthorization Amendments.[7]

There may also be other performance standards that are equally or more effective at addressing stormwater pollutant discharges and hydrologic impacts. Local performance standards should take into account regional and local hydraulic, hydrologic, and meteorological factors to ensure the most effective performance standard is applicable to new development.

A comprehensive post-construction stormwater management program that includes explicit and enforceable performance standards will reduce the potential that discharges from new development will cause or contribute to future water quality impairment. A stormwater management model code has been included in Appendix B as an example to assist the DMA in developing a code to meet this goal.

# 3. Post-Construction Stormwater Management Program Element – Design and Implementation Guidance

A guidance manual can assist land developers in designing and implementing post-construction stormwater management control practices to meet a local performance standard. The 'treatment train' concept outlined in Figure 5 provides a framework that a DMA can integrate into a guidance manual to ensure developers reduce, control, and treat stormwater runoff. The 'treatment train' concept is a holistic approach to stormwater management that can serve to meet other watershed goals, such as preventing stream channel erosion and reducing property damage caused by flooding. The 'treatment train' concept accommodates a range of practices, including preserving riparian vegetation and the natural drainage features or constructing vegetated swales for retention and treatment.

A guidance manual can also provide the mechanism to clearly describe the relationship between post-construction stormwater management and site development factors, such as area of disturbance, slope, drainage patterns, and soil type. If a DMA provides this type of guidance to developers early in the design process, the developer has a greater opportunity to select the most cost-effective and appropriate control practices.

[6] National Research Council. 2008. Urban Stormwater Management in the United States. Washington, DC: National Academies Press.

[7] http://water.epa.gov/polwaste/nps/czara/ch4-2a.cfm

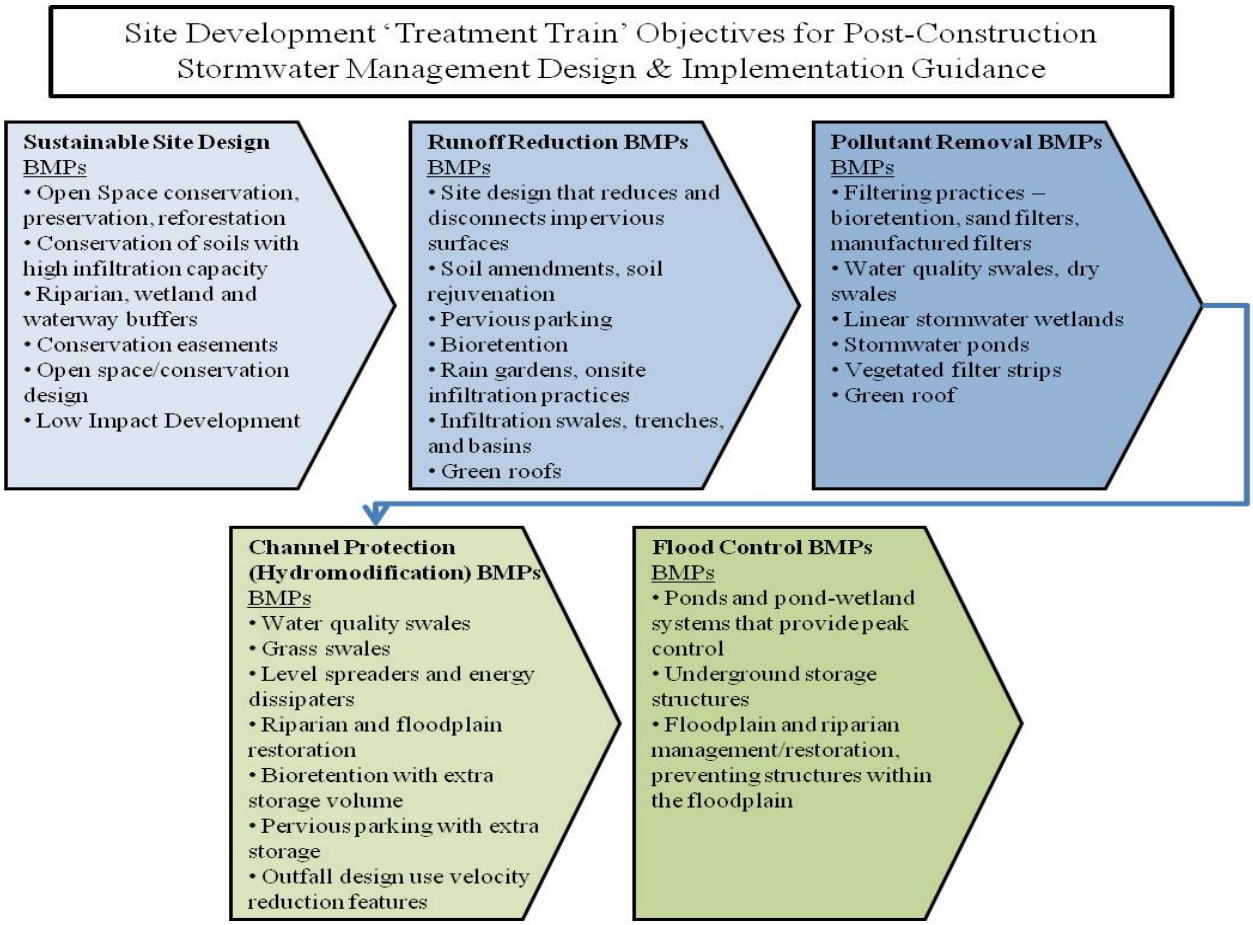


**Figure 5 – Post-Construction Stormwater Management 'Treatment Train' Concept**

# C. Technical Assistance, Outreach and Funding

DEQ is available to assist DMAs in the development and implementation of the TMDL IP, including development and implementation of a post-construction stormwater management program. The form of this assistance includes technical assistance, funding, educating the public, and engaging a diverse group of stakeholders in a broader TMDL program improvement discussion.

It is the responsibility of the DMAs to fund the development and implementation of the TMDL IP. However, as resources allow, DEQ will provide staff time and funds to DMAs in support of these efforts. There are several funding sources available for cities and counties:

- Oregon DEQ - 319 Nonpoint Source Grants
- Oregon DEQ - Clean Water State Revolving Fund
- Oregon Health Authority, Public Health Division, Office of Environmental Public Health, Drinking Water Program and the Oregon Business Development Department - Safe Drinking Water Revolving Loan Fund (SDWRLF)
- Department of Land Conservation and Development (DLCD) - Oregon Coastal Management Program (OCMP)
- Oregon Watershed Enhancement Board (OWEB) - Grants
- Oregon Department of Fish and Wildlife (ODFW) - Access and Habitat

- ODFW - The Riparian Tax Incentive Program
- U.S. Fish and Wildlife Service - Partners for Fish and Wildlife Program
- Soil & Water Conservation Districts - Small grants to fund urban rain gardens

# APPENDIX A

## Example goals, permits, or plans that may contain or generated information useful for the TMDL IP

Local
- Comprehensive Land Use Plan
- Zoning Ordinance/Code
- Water Quality-related Development Code/Ordinance
- Stormwater Management Plan
- Stormwater Master Plan
- Water Quality-related Capital Improvement Plan

State
- DEQ Onsite Septic Systems Permit
- DEQ NPDES 1200-C Construction Stormwater Permit and Plan
- DEQ 401 Water Quality Certification Program (with required Stormwater and Erosion Control Plans)
- DEQ Underground Injection Control (UIC) Program (with required Stormwater Management Plan)
- State Drinking Water Source Water Protection Program Source Water Assessments and Protection
- DEQ Air and Land Quality Programs
- Watershed Council's OWEB funded Watershed Management Plan
- State Land Use Planning Program Goals and Guidelines Compliance (DLCD)
- Department of State Lands Oregon's Removal-Fill Permit and Wetlands Planning

Federal
- EPA NPDES Stormwater Phase I and II Permit Stormwater Management Plans (SWMP)
- NMFS Endangered Species Act (ESA), Section 4(d) Rule

Example programs that have similar water quality protection goals to TMDLs:

- Oregon Plan for Salmon and Watersheds
  In 1997, the Oregon Legislature and Governor established the Oregon Plan for Salmon and Watersheds, http://www.oregon-plan.org/, to protect populations of various salmonid species with the support and participation of a wide spectrum of stakeholders and tribal nations from all sectors and regions of the state. This effort is ongoing.

- Oregon Conservation Strategies
  Oregon Conservation Strategy, http://www.dfw.state.or.us/conservationstrategy/, provides information on at-risk species and habitats, identifies key issues affecting them, and recommends actions. The Strategy could be considered when identifying priority areas for TMDL implementation.

- Integrated Water Resource Strategy
  In 2009, the State legislature directed the Oregon Water Resources Department to develop a statewide, Integrated Water Resources Strategy
  (IWRS), http://www.wrd.state.or.us/OWRD/LAW/Integrated_Water_Supply_Strategy.shtml to better understand and meet Oregon's water quantity, water quality, and ecosystem needs that was completed in 2012. DEQ is a partner in the effort and the strategy should be considered when planning TMDL implementation.

- Watershed Council Action Plans
  Watershed councils are locally organized, voluntary, non-regulatory groups established to improve the condition of watersheds in their local area. Many of the watershed councils, in Oregon have developed and are implementing action plans. http://www.oregon.gov/OWEB/watershed_council_contacts.shtml

# APPENDIX B

## New Development and Redevelopment Model Code

Local jurisdictions can adopt post construction control measures to be used as one component of a TMDL IP Below is an approach adapted from the Oregon Model Code Book (Reference with http address).

Green highlight indicates text that need to be customized by jurisdiction.

Blue highlight indicates a note to the user of the model code that identify issues needing consideration or points where choices need to be made about the appropriate strategy for meeting specific local objectives.

Storm and Surface Water Management Standards

**I.** Statement of Purpose

This ordinance includes standards for conveyance of surface water in streams, creeks and channels that exist on a site at the time of development. It also addresses pollution reduction and flow control for stormwater generated from new and redevelopment. For the purpose of this ordinance, "new" and "redevelopment" refers to any man-made change to improved or unimproved real estate including, but not limited to the placement of buildings or other structures, dredging, filling, grading, or paving.

The ordinance provides performance standards for addressing infiltration, treatment and detention of stormwater as well as design standards for facilities that serve to mitigate the water quality impacts of developments that fall below a certain size threshold.

**II.** Applicability

No permit for construction of new development or tenant improvements within the [jurisdiction] shall be issued until a stormwater management plan is approved. Separate applicability thresholds for Pollution Reduction and Flow Control Standards are listed in section IV. Development projects shall not be phased or segmented in such a manner to avoid the requirement of these rules and regulations.

**III.** Stormwater Management Plan Submittal

A. Preconstruction Submittal Requirements

1. An analysis of stormwater mitigation strategies to increase infiltration and evapotranspiration (use of water by plants) and reduce the amount of stormwater runoff generated from the site. (Note: rainwater can soak into the ground where it falls or it can accumulate on a non-pervious surface, flow to a pervious area and then infiltrate into the ground. The former scenario is stormwater mitigation, while the latter scenario requires stormwater management.)
2. Calculations of the amount of impervious surface before development and the amount of impervious surface after development. Impervious surface refers only to strictly impervious surfaces including roofs of buildings, impervious asphalt and concrete pavements, and other specifically impervious pavement materials such as mortared masonry and compacted gravel.
3. An analysis of vegetative and other treatment methods used to reduce pollutants.
4. An analysis of flow reduction methods including, infiltration, and detention and techniques.
5. Statement of consistency with [jurisdiction] stormwater management objectives stated in section [appropriate reference] and, if applicable, the watershed management plan for the basin and/or requirements of a pollutant load reductive plan for a water quality limited stream.
6. When the amount of impervious surface created is less than [1,000 square feet] responses required by 3-5 above are waved, and of the following sections of this code only Section V., Surface Water Conveyance Standards, apply.
7. When the amount of impervious surface created is less than [10,000 square feet] and use of the design

standards specified in [name document] is proposed, responses required by 3-5 above are waived.

B. Post Construction Submittal Requirements
   1. As-built plans, [stamped by a qualified professional] indicating all storm water mitigation and management strategies are installed per approved plans and approved changes.
   2. Maintenance plans for all stormwater facilities installed to comply with this ordinance. The maintenance program must be approved by the [Jurisdiction]. Proof of maintenance shall be submitted [annually]. A signed maintenance agreement with a local contractor or city/county public works department can serve to meet this requirement.
   3. When the amount of impervious surface created is less than [10,000 square feet] and use of the design standards specified in [name document] is proposed, the requirement of 1 above is waived.

**IV.** General Requirements

A. All development shall be planned, designed, constructed and maintained to:
   1. Provide a system by which storm/surface water within the development will be managed without causing damage or harm to the natural environment, or to property or persons.
   2. Protect property from flood hazards.
   3. Removal of 80% of suspended solids from stormwater.

B. Plan Review Standards

   Plans shall be submitted to the [Jurisdiction] for review. Plan approval will be based on the following criteria:
   1. Plans and calculations for development proposals resulting in more than [10,000 square feet] of impervious surface and proposals not using treatment facilities built to the design criteria specified in [name document] must be stamped and signed by a [qualified professional].
   2. Design, construction and maintenance of proposed stormwater management practices will result in post construction stormwater volumes flowing off site which are substantially the same as preconstruction volumes for all storms less than or equal to the [two-year] design storm. (Note to local jurisdiction: Although water quality and aquatic habitat benefit from preservation of the natural hydrology, small jurisdictions that anticipate the cumulative impacts of development to be small over time might consider less stringent criteria. The consideration of volume, not flow-rate, is important. Simply reducing the flow-rate to discharge increased stormwater volume over a longer period of time can still result in bank erosion and loss of habitat function. On the other hand, retention of volume may be very difficult in areas with high ground water, and tidally influenced streams have their own in-stream flow considerations. An engineer or consultant can help a jurisdiction address these considerations when drafting code language.)
   3. Where required due to presence of fish, culvert installations must allow fish passage in accordance with Department of State Lands (DSL) and the U.S. Army Corps of Engineers (COE) and any other authorized federal, state, or local agency.
   4. Installation of culverts, spans or stormwater outfalls along natural water features shall be designed to emphasize preservation of natural flow conditions, allow for natural obstructions and pursue stream enhancement opportunities.
   5. Stormwater mitigation strategies, such as retention of existing trees, and use of porous paving surfaces, as well as stormwater treatment and flow control facilities used to meet the requirements of this code must be included in the plans.
   6. Stormwater management plan shall be consistent with [State applicable basin or sub basin watershed management plan and/or pollutant load reduction plan].
   7. In areas of high pollutant load, stormwater infiltration shall incorporate, or be preceded by treatment as necessary to prevent siltation of the infiltration facility, protect ground water, and prevent toxic accumulations of pollutants in the soil. (It is preferable to eliminate pollutant contact with stormwater where possible.)
   8. All vegetation used for the installation and landscaping of stormwater facilities shall be selected from plants listed in [name of document, listing approved native plants] available from the [Jurisdiction or other source]. [Optional – Trees which are preserved or planted on site for stormwater mitigation credit, do not need to meet this criteria.] Planting schedule and maintenance of vegetation shall be approved by the [local official].

9. All storm conveyance pipes and vaults shall be built to specifications of the [Jurisdiction], as described in [reference standards document]. See Section VI for Pollution Reduction and Flow Control standards.
10. [All stormwater infiltration, treatment and detention facilities shall be built to the specifications of [Jurisdiction] as described in [reference standards document]. See Section VI for Pollution Reduction and Flow Control Standards.]

(Note to local jurisdiction: As described in the discussion prior to this model code, the code is written to provide for two approaches to local regulation. If the specifics for meeting the general standards described in Section IV(A) and IV(B)(2) are to be left to the applicant and their consultant, Section VI is not needed. If the local jurisdiction wants to set specific standards to achieve flow and pollutant reduction targets then Section IV (B) (10) provides a link to this path. In either case, the jurisdiction is encouraged to adopt a design manual for treatment facilities, such as vegetated swales, and infiltration planters, so that developers do not have to bear the cost of hiring an engineer to design each facility.)

C. The [jurisdiction] reserves the right to restrict the use of infiltration facilities in high risk areas including those with steep slopes, unstable soils, high water tables, or sites known to be contaminated by hazardous substances.
D. Infiltration facilities which fall under the jurisdiction of DEQ's Underground Injection Control (UIC) Program must be registered with the state and meet the requirements of the UIC Program.
E. Bonds: Applicants shall provide a performance bond, similar surety, or irrevocable petition for public improvement acceptable to the [Jurisdiction] to assure successful installation and initial maintenance of surface pollution reduction and flow control facilities. During construction and for a period of one year thereafter, the bond shall be in favor of the [Jurisdiction] and in an amount of the anticipated construction cost. [Reference existing local practice for administering performance bonds.]
F. Contingency for system failure: If the storm management system fails due to lack of maintenance or breakage, and causes impacts to downstream water quality or flooding as a result of the failure, the [Jurisdiction] may perform the maintenance or repair and charge the owner of the facility.

**V.** Surface Water Conveyance Standards

A. Culverts and/or spans of streams, creeks, gulches and other natural drainage channels shall maintain a single channel conveyance system.
B. Culverts and/or spans are to be sized for the 24-hour post-developed tributary conditions of the [100 year storm]. (Note to local jurisdiction: In drafting the code, a local jurisdiction may want to allow culverts under small local streets and driveways to be designed to a lower standard, provided thought is given to assure safe overland flow of flood water.)
C. Conveyance calculations shall use [state method desired by jurisdiction, i.e., the Rational Method or the Santa Barbara Urban Hydrograph Method (SBUH) for analysis]. Exceptions must be documented and approved by the [Jurisdiction].
D. In-stream detention is not allowed.
E. It shall be the responsibility of the owner that the new drainage system shall not negatively impact any natural waters, upstream or downstream from the site. The owner is responsible for providing a drainage system for all surface water, springs, and groundwater on site for water entering the property as well as management of springs and groundwater that surface during construction.

**VI.** Pollution Reduction and Flow Control Standards

A. Applicability
1. (Note to local jurisdiction: Applicability should be determined by the local jurisdiction. It could include all development, commercial and industrial only, or a combination of commercial, industrial and high density residential. Alternatively, a size threshold could be set for new impervious surface areas. At a minimum, it is recommended that pollution reduction and flow control standards be applied to new development $\geq$1 acre. Parking lots could be addressed under this ordinance, or addressed separately – see section 4.4.5 of this guidance. Jurisdictions that are working to encourage in-fill and redevelopment in core areas should select applicability thresholds for redevelopment such that they do not impose a disincentive for redevelopment and in-fill efforts. The minimum project threshold used to determine applicability of the pollution reduction and flow controls standards

should target a goal that ensures that 90% of all new or replaced impervious surfaces within a jurisdiction area, based on current land use and future land use needs, are required to meet the performance standard.

B. Infiltration, Treatment and Detention

1. Infiltration

a. Infiltration systems are to infiltrate a minimum of [one inch] of rainfall in 24 hours]. (Note to local jurisdiction: The rainfall is that incident on the impervious areas of the development. Where there are no other constraints, this criterion should be set to reflect the size of storm that delivers 80-90% of the annual rainfall. Most of the annual rainfall is delivered in many small storms.)

b. A facility designed to temporarily hold standing water shall drain at a rate sufficient to empty its capacity volume in [30 hours].

c. Stormwater treatment, in accordance with Subsection B.2 of this Section, shall occur prior to or concurrent with infiltration.

d. Infiltration systems shall be designed to overflow to conveyance systems in accordance with Subsection D of this Section.

e. Infiltration may be waived, or reduced, if it can be demonstrated by a registered professional engineer that infiltration will destabilize the soil, cause structural problems, or provide negative impacts to the environment, or is not feasible due to site constraints such as high groundwater or soil contamination.

2. Treatment

a. Water quality facilities shall be designed to capture and treat runoff for all flows up to [one half of a two-year, post-developed, 24-hour storm]. (Note to local jurisdictions: This standard should be set to capture about 90% of the average annual rainfall.)

b. The water quality system shall use vegetation for treatment. Accepted types of vegetated treatment facilities and sizing criteria are described in [name document]. Alternative systems may be used with approval of [local official] and shall be designed to provide equivalent treatment as is provided with a vegetated system.

c. A facility designed to temporarily hold standing water shall drain at a rate sufficient to empty its capacity volume in [30 hours].

d. Systems treating stormwater from over [10,000] square feet of impervious area and all systems that deviate from the sizing and design criteria in [name document] must be designed by a registered engineer and be approved by [local official].

3. Detention

Onsite storm quantity detention facilities shall be designed to capture and detain runoff as follows:

a. [Two-year, 24-hour post-developed runoff rate to the two year, 24-hour pre-developed discharge rate];

b. A facility designed to temporarily hold standing water shall drain at a rate sufficient to empty its capacity volume in [30 hours].

c. Sites with infiltration systems designed to handle storms in excess of that specified by Subsection (1) of this Section will be permitted to reduce on-site detention requirements by a volume equal to [100%] of the excess infiltration capacity.

(The following provisions, d and e, should be added when jurisdictions have areas of known flooding/conveyance problems. The standards contained in the brackets must be tailored to meet the specific needs and watershed conditions of your jurisdiction.)

d. In areas with limited downstream capacity, [reference map or other document specifying areas], detention shall be designed for a [25-year, 24-hour, post-developed runoff rate to a two-year, 24-hour pre-developed discharge rate, and, from the two-year, 24-hour pre-developed discharge

rate.]

e. Downstream analysis shall be provided to assure sufficient capacity for new development. Downstream analysis shall occur to the distance downstream where the project site contributes less than 15% of the upstream drainage area OR a minimum of 1,500 feet downstream of the project. (Note to local jurisdiction: Meeting this requirement can be very costly to a developer. The requirement should be imposed only when the need is justified. It is best to establish capacity estimations through a stormwater master planning exercise, initiated by the city or county).

C. Combine stormwater infiltration, treatment and detention.
(Note to local jurisdiction: Design standards should be developed by each jurisdiction to reflect rainfall patterns, soils and other factors specific to the jurisdiction. An overlay area can be established and/or a percolation test required to identify where soil and topographical conditions are conducive to infiltration. In locations where infiltration is not advisable, combined facilities can still be use to achieve treatment and detention standards. City of Portland Bureau of Environmental Services is a good source for sizing and construction standards.)

Facilities receiving stormwater from impervious areas less than [10,000 square feet] and designed in accordance with the sizing and construction standards contained in [name document] are presumed to comply with the [Jurisdiction] infiltration, treatment and detention requirements of this code.

D. Conveyance
Infiltration, treatment and detention facilities shall be constructed to convey stormwater that exceeds their design capacity. Conveyance systems shall be sized to meet the following conditions:
1. Storm sewer conveyance facilities draining [less than 640 acres], [25-year, 24-hour design storm].
2. Storm sewer conveyance facilities draining [greater than 640 acres], [50-year, 24-hour design storm].