



Prepared for  
Salmon-Safe Inc.

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# SALMON-SAFE URBAN STANDARDS

Version 3.0



Prepared for Salmon-Safe Inc.

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# Table of Contents

<b>Executive Summary</b> .....	iii
Using This Document .....	iv
Campus or Portfolio Approach .....	v
Existing Developments .....	v
<b>Introduction</b> .....	1
Salmon-Safe .....	1
The Urban Context .....	1
Organization of Standards .....	2
Integrating Certification in the Urban Development Process .....	4
<b>Evaluation Process for Certification</b> .....	7
Scope of the Evaluation Process .....	7
Eligibility for Salmon-Safe Certification .....	7
The Science Team .....	7
Description of Review Phases .....	7
Fast-Track Certification .....	9
Decision Rule for Certification .....	9
Maintaining Certification .....	9
<b>Pre-Conditions for Certification</b> .....	10
<b>Core Urban Certification Standards</b> .....	11
U.1 Stormwater Management .....	12
U.2 Water Use Management .....	21
U.3 Erosion Prevention and Sediment Control .....	27
U.4 Water Quality Protection in Landscaping .....	30
U.5 Enhancement of Urban Ecological Function .....	35
U.6 Site Climate Resiliency Planning .....	38
<b>Context Dependent Urban Certification Standards</b> .....	41
U.7 Instream Habitat Protection and Restoration .....	42
U.8 Riparian/Wetland/Vegetation Protection and Restoration .....	48
<b>References</b> .....	55
<b>Glossary</b> .....	56



<b>APPENDIX A</b>	
Campus and Portfolio Approach for Certification of Multiple Sites . . . . .	60
<b>APPENDIX B</b>	
Urban Site Development Certification Process . . . . .	62
<b>APPENDIX C</b>	
Certification for Existing Urban Development . . . . .	65
<b>APPENDIX D</b>	
IPM, Nutrient and Chemical Management Plan Guidance . . . . .	69
<b>APPENDIX E</b>	
Salmon-Safe High-Hazard Pesticide List . . . . .	73
<b>APPENDIX F</b>	
Model Stormwater Management Guidelines for Campus New Development and Redevelopment . . . . .	76
<b>APPENDIX G</b>	
Model Stormwater Management Guidelines for Residential New Development and Redevelopment . . . . .	83
<b>APPENDIX H</b>	
Model Stormwater Management Guidelines for Ultra-Urban Redevelopment . . . . .	90
<b>APPENDIX I</b>	
Worksheet for Model Stormwater Management Guidelines . . . . .	96
<b>APPENDIX J</b>	
Model Construction-Phase Stormwater Management Program . . . . .	100
<b>APPENDIX K</b>	
Water Conservation Plan Guidance . . . . .	102
<b>APPENDIX L</b>	
Annual Certification Report and Verification Form . . . . .	103
<b>APPENDIX M</b>	
Fast-Track Certification for New Development . . . . .	106



## Executive Summary

The *Salmon-Safe Urban Standards* is a guide for site developers, designers, contractors and land managers interested in demonstrating environmental leadership by reducing watershed impacts from site development and operation<sup>1</sup>. These Standards are the most recent effort by Salmon-Safe to promote urban land management at a variety of scales that emphasize protection of downstream water quality and enhancement of site ecology during this time of increasing climate impacts.

Based on two decades of work with more than 900 urban and agricultural landowners across the Pacific Northwest, Salmon-Safe brings a project-specific, collaborative, peer-reviewed approach to urban certification that is unique among certification programs. While the Urban Standards are designed as a standalone program, they can also complement other leading certification standards (e.g., LEED, Sustainable Sites, and Living Building Challenge) by focusing on project activities with watershed impact.

An interdisciplinary Science Team of qualified experts is assigned to the project certification candidate to work with the development team during each stage of the design development process. The evaluation and certification process is a collaborative effort between Salmon-Safe and the development team. All certification standards and performance requirements are performance-based, not prescriptive, to give the development team (and their assigned Science Team) the freedom to generate designs that work best for the developer, the development site and overall project goals.

Even after a project is certified, Salmon-Safe promotes the long-term environmental performance of certified sites through an annual verification process. This process reviews landscape management practices, habitat restoration progress, facility performance and other program elements to make sure the project is functioning as designed. The independent science team is available for the full 5-year certification cycle to work with the client to provide guidance in meeting performance requirements.

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<sup>1</sup> Included herein is an update of the *Salmon-Safe Standards for Corporate and University Campuses (Campus Standards)* and *Standards for Residential Development*. Since their publication, experience gained in conducting certification assessments demonstrated that these two different settings have enough common elements that the standards could be combined. In addition, numerous potential certification opportunities arose that fit into neither category but involved conversion of highly urban sites to new land use. Termed "Ultra-Urban Redevelopment", this category was also subsumed within these Urban Standards. Application of the standards differs between the ultra-urban and less dense urban settings mainly in planning and designing stormwater management functions, which is covered for the two situations in separate appendices. Combined, these standards are the most recent effort by Salmon-Safe to promote development at a variety of scales that emphasizes landscape-level conservation and protection of biological diversity.





The Certification Standards describe the performance requirements or desired outcomes for the following eight Salmon-Safe management categories:

#	Management Category	Context
U.1	Stormwater Management	 <p>CORE STANDARDS</p>
U.2	Water Use Management	
U.3	Erosion Prevention and Sediment Control	
U.4	Pesticide Reduction and Water Quality Protection in Landscaping	
U.5	Enhancement of Urban Ecological Function	
U.6	Site Climate Resiliency Planning	
U.7	Instream Habitation Protection and Restoration	 <p>CONTEXT- DEPENDENT STANDARDS</p>
U.8	Riparian, Wetland and Locally Significant Vegetation Protection and Restoration	

**Table 1.** Salmon-Safe's Eight Management Categories

## Using This Document

Many of the urban development projects currently being reviewed by Salmon-Safe are high-density urban infill projects, where streams, wetlands and other habitat features that have traditionally been a major focus of the certification standards are not present. Therefore, the main body of these standards targets performance requirements and metrics that likely apply for traditional urban infill type development (Categories 1-6), which are called the 'Core Urban Standards'. Although infill projects are not directly adjacent to streams and wetlands, stormwater runoff from development sites still impacts receiving waters and salmon, but the focus of the *Core Urban Standards* is typically on indirect impacts. If a project site has a wetland or stream within the site boundary, the applicable 'Context-Dependent Standards' (Categories 7 and 8) must also be met. This provides an urban-focused approach to meeting standards while also

allowing for additional requirements for sites with more intact ecological systems present. All Core and applicable Context-Dependent Standards should be reviewed during all phases from analysis through construction, as appropriate based on whether the project is new or existing. Project teams can find a list of Required Submittals within Appendix B.

## Campus or Portfolio Approach

The Urban Standards focus on individual sites within an urban context. A 'Campus' or 'Portfolio' approach is provided to accommodate larger campuses and multi-building developments within a local area. Site boundaries for such campuses or portfolios will be reviewed by the Science Team and additional submittal information may be required. Additional information on the process for evaluating multiple buildings for compliance with Salmon-Safe standards, including defining the site boundary, is found in Appendix A. Existing campus and portfolio projects seeking certification should also refer to the 'Existing Developments' paragraph below for additional guidance.

## Existing Developments

The document provides pathways for certification of both new and existing sites within an urban context. Existing projects are defined as those that are already constructed and aren't currently undergoing significant expansion, renovation, or other improvement. Standards for existing projects are marked with an **E**. Submittal requirements for existing projects will be reviewed by the Science Team to provide guidance to owners based on specific project characteristics. Additional information on the process for certification of existing projects is found in Appendix C. See below for specific guidance for pursuing certification based on a project's scope (development or portfolio/campus) and status (new or existing).



# Introduction

## Salmon-Safe

Salmon-Safe's urban development certification program is intended to promote ecologically sustainable land management that protects water quality and aquatic biodiversity. Beginning with the 2004 certification of the 10,000-acre City of Portland system of parks and natural areas, Salmon-Safe has successfully completed urban certification projects including many high-rise developments, urban campuses, and light industrial and large-scale transportation projects in Oregon, Washington and British Columbia.

This document presents Certification Standards for urban development (Urban Standards), as well as an overview description of the evaluation process that will be used to assess and certify candidate urban development projects. Salmon-Safe's urban development standards constitute a set of best management practices (or BMPs) that can be applied across a variety of urban development landscapes, ranging from high-density urban infill to corporate and university campuses.

The Salmon-Safe certification program focuses on salmonid species (i.e., salmon and trout) and their habitat requirements. Salmonid species are key indicator species in the Pacific Northwest and their conservation is entwined with the health of ecosystems that include a variety of aquatic and upland wildlife species. Therefore, this evaluation focuses on the following biological components of the ecosystem that most affect salmonids and the ways these components can be protected: (1) water quality, (2) water quantity, (3) instream habitat, (4) riparian habitat and (5) fish passage. Climate change is affecting all of these components, and climate change considerations are integrated throughout these standards.

## The Urban Context

The challenge of an urban setting is the physical disconnect between urban development and biological systems. Many types of development occur in the urban context, but often on previously developed sites that lack intact natural systems like riparian corridors, wetlands and streams. Whether utilizing a previously developed polluted site (brownfield), or a site that had previously been undeveloped (greenfield), urban development can have many negative impacts on salmonid species— both directly (by introduction of polluted runoff to off-site, downstream locations) or indirectly (through unsustainable resource extraction, inefficient water use and contribution to global climate change).

Urban development can contribute positively to ecosystem health and urban sites can provide habitat for many wildlife species. Using development techniques like green infrastructure can help improve water quality, facilitate the reuse of water that would otherwise be wasted and consequently provide healthier water resources for aquatic species. Urban landscapes and rooftops can be planted with species that provide habitat for urban wildlife, creating corridors and refuges for birds, small mammals, pollinators and other species vital to our global health.





These areas can also improve the treatment of stormwater through the filtering and biological uptake of pollutants. Even when specific ecological habitats are not present on site, urban ecosystems can help protect resources, clean up pollution, restore soil health, reduce the urban heat island effect, and carbon footprint.

While the contents of this document focus on individual urban development projects, the Certification Standards also include a pathway for certifying multiple developments, referred to as the Campus and Portfolio approach. This is provided to accommodate larger campuses and multi-building developments throughout a district local area. Details on how to work with these standards are provided in Appendix A.

All of Salmon-Safe's certification standards receive formal peer review by scientists, technical experts, representatives of environmental organizations and other interested parties. Salmon-Safe may periodically review and revise these standards to reflect changes in the best available science and emerging development practices.

## Organization of Standards

Following this Introduction section, the Urban Standards are presented in two main sections, with supporting documentation provided in the Appendices. The first main section includes the *Core Certification Standards*, presenting the specific standards and related performance requirements that must be met for the project to be considered for Salmon-Safe certification. The Certification Standards are organized by category.

The *Core Certification Standards* and their associated performance requirements are organized under one of the following six habitat-related management categories:

### U.1 Stormwater Management

This management category focuses on the management of stormwater runoff within a development, including standards designed to minimize the amount of stormwater generated on site and improve the quality of stormwater runoff.

### U.2 Water Use Management

Water withdrawals have the potential to adversely affect salmonid habitat, primarily by reducing instream flows. The focus of this management category is the use of water in landscaping.

### U.3 Erosion Prevention and Sediment Control

Sediment delivery from stream bank and upland surface soil erosion into fish-bearing streams is a major cause of habitat degradation, particularly for salmonid spawning areas. The goal of the standards in this management category is to control erosion from upland sources.



#### U.4 Pesticide Reduction and Water Quality Protection in Landscaping

The focus of this management category is on avoiding contamination of salmon-bearing waters by minimizing overall inputs of landscape contaminants<sup>2</sup>, restricting the type of inputs, and developing an acceptable method of application through a comprehensive management program.

#### U.5 Enhancement of Urban Ecological Function

Overall improvement to a broad range of ecological systems is an overarching goal of Salmon-Safe in highly urbanized environments. This management category includes standards designed to promote broader, non-aquatic ecological functions important for urban wildlife such as birds, bats and pollinators.

#### U.6 Site Climate Resiliency Planning

This management category focuses on how elements of climate change such as increased temperature and changes in precipitation will impact urban watersheds and the health of the salmonid species, and how these impacts can be reduced or eliminated through Site Climate Resiliency Planning.

The additional *Context-Dependent Certification Standards* and their associated performance requirements are organized under one of the following two additional habitat-related management categories. Since not all urban development projects have streams, wetlands, and associated riparian areas within site boundaries, this section is only applicable to certain projects.

Documentation of specific certification standards in preliminary review stages will determine if these specific site characteristics are present on a site. These additional standards will also provide necessary requirements for Salmon-Safe certification—some are applicable to both.

#### U.7 Instream Habitat Protection and Restoration

This management category applies to certain stream types and other water bodies that occur within the boundary of the development, including lacustrine (lake), estuarine and near-shore marine environments. The focus of this management category is on assessing the condition of the actual channel or waterbody, including the streambed and bank, water quality, and identifying opportunities for restoring or improving habitat. Physical as well as biological conditions contributing to habitat quality are considered for these standards.

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<sup>2</sup>Contaminants may include chemical inputs, fertilizers (nutrients), pesticides (herbicides and insecticides, fungicides and other biocides), and organic waste.

## U.8 Riparian, Wetland and Locally Significant Vegetation Protection and Restoration

The focus of this management category is on measures taken to protect areas closest to surface water bodies—riparian vegetation zones and wetlands. It also applies to areas with locally significant vegetation, as identified during the site inventory. The performance requirements may vary according to wetland type.

### Integrating Certification in the Urban Development Process

The Certification Standards are meant to be broad to cover a range of project types and to be applied strategically in such a way that does not add additional documentation burden to the design and construction team. The type of documentation that may be required varies according to the stage of development, as follows:

#### I. Inventory and Assessment

Collection of site-specific and other data to assess the condition of the site, its context within the watershed, existing natural resources and habitat and opportunities and constraints for addressing habitat and resource-based concerns. Information gleaned during this development stage will be useful to both the project design team and the Salmon-Safe Science Team in determining existing site assets.

#### II. Site Planning

Development of conceptual building and site plans, master plans, renderings or other products that provide an orientation of overall site features. Applicable permit documents would also be developed during this stage.

#### III. Site Design

Design development of “hard” site elements including site utilities, infrastructure, buildings, roadways or other necessary site improvements. Design development of habitat elements, landscaped areas, open space and other “soft” natural resource features. These include native vegetative communities, landscaped areas (native or otherwise), water features and habitat buffers. Construction documents, specifications, cost estimates and easements would be developed during the design stage.

#### IV. Site Construction


Site mobilization, protection of natural resources and physical installation of approved plan elements onto a project site. This stage typically coincides with installation of roads, utilities and homes.

#### V. Site Maintenance and Monitoring

Long-term care, performance recording and adaptive management elements to be completed after the site is completely installed.

Each of the Standards categories (U.1-U.8) includes a graphic to show the relationship of each specific criteria to the typical urban development design phases. Below is a reference table showing all of the Standards and when they should be applied during the design process. This is a guideline for when to engage in planning, conceptual design, construction and maintenance to maximize the potential opportunities within a project to meet and exceed Salmon-Safe Urban Standards. Each project will differ in scope and phasing and project teams should be familiar with all elements in order to be proactive in addressing each requirement (i.e., thinking about construction and maintenance issues during planning and design phases).



		Project Phase				
		Site Inventory + Assessment	Site Construction	Site Design	Site Planning	Site Maintenance + Monitoring
	Core Standards					
U.1	Stormwater Management	1.1 1.2	1.3 1.4	1.5 1.6 1.7 1.8	1.9	1.10
U.2	Water Use Management	2.1	2.2 2.3 2.4	2.5 2.6	2.7 2.8	2.9
U.3	Erosion Prevention and Sediment Control	3.1	3.2	3.3	3.4	3.5
U.4	Pesticide Reduction and Water Quality Protection in Landscaping	4.1	4.2 4.3	4.4 4.5	4.6 4.7 4.8	4.9
U.5	Enhancement of Urban Ecological Function	5.1 5.2	5.3	5.4 5.5	5.6	5.7
U.6	Site Climate Resiliency Planning	6.1		6.2		
	Context-Dependent Standards					
U.7	Instream Habitation Protection and Restoration	7.1 7.2	7.3 7.4 7.5 7.6	7.7 7.8 7.9	7.10	7.11
U.8	Riparian, Wetland and Locally Significant Vegetation Protection and Restoration	8.1 8.2 8.3	8.4 8.5	8.6 8.7	8.8	8.9

**Table 2.** Salmon-Safe Core and Context-Dependent Standards (including Project Phases)

# Evaluation Process For Certification

## Scope of the Evaluation Process

The evaluation process begins with an initial consultation with Salmon-Safe to determine whether the project may be eligible for Salmon-Safe certification. If Salmon-Safe confirms that the project is eligible and the project proponent is interested in moving forward, Salmon-Safe would then select an appropriate Science Team.

### *Eligibility for Salmon-Safe Certification*

To be certified by Salmon-Safe, a proposed urban development must demonstrate thoughtful design stewardship and a commitment to long-term progress in addressing the impacts of the proposed development on sensitive aquatic and natural resources.

To begin this process, the project owner or developer should contact Salmon-Safe as early as possible to determine whether a proposed development will be eligible for Salmon-Safe Certification. Salmon-Safe will request information about the project site and general information on the proposed development. The objective of this preliminary screening is to determine if a proposed project is compatible with the mission and goals of Salmon-Safe and the Certification Standards themselves.

### *The Science Team*

The Certification Evaluation is conducted by a team of three or more qualified and independent experts hired by Salmon-Safe. The Science Team is well versed in aquatic ecological science, development planning and design, as well as landscape management. Salmon-Safe will determine the composition of the team for each project.

To conduct the Certification Evaluation for Salmon-Safe, the Science Team conducts a detailed assessment of the development's overall design and planning documentation related to habitat and water quality protection. The team also conducts a field review of the development design and habitat conditions to evaluate whether such management is consistent with Salmon-Safe's site-specific Certification Standards.

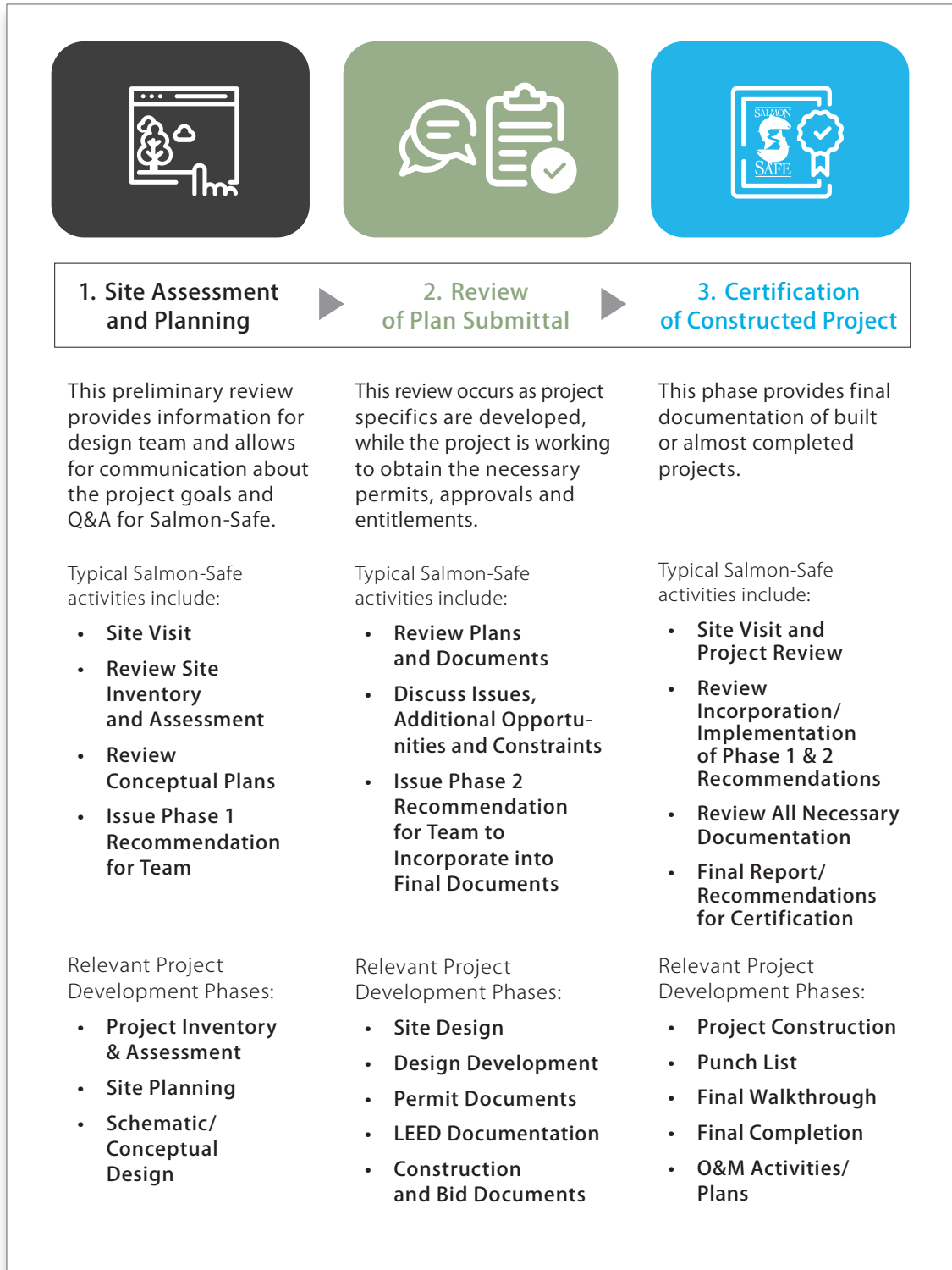
## Description of Review Phases

The Science Team assesses project plans, designs and maintenance practices against a defined set of standards that represent best site planning and design practices. The team also evaluates the extent to which the proposed development design and infrastructure elements protect and restore both aquatic and terrestrial components of local ecosystems, within the context of urban development criteria for human use and enjoyment. The Science Team uses the standards and performance requirements in this document to evaluate whether the development as a whole will be awarded certification.





In particular, Salmon-Safe offers three formal opportunities for collaboration throughout the project planning and construction process. For maximum benefit to the project, Salmon-Safe recommends that the Science Team participate in the process during the following review phases. The following graphic summarizes typical activities associated with each Salmon-Safe Review Phase and how they align with typical project development phasing.



## Fast-Track Certification

For large-scale development projects where Salmon-Safe is engaged early in the design process, certification can also be awarded early in construction based upon certain benchmarks being met with respect to stormwater design, construction-phase runoff prevention and planning for post-construction operations. This fast-track certification process for new development is illustrated in Appendix M.

## Decision Rule for Certification

Certification is awarded when the Science Team and Salmon-Safe are satisfied that the development meets all relevant Certification Standards and associated performance requirements. If the candidate urban development does not fully meet the Certification Standards and performance requirements, the Science Team may recommend conditional certification for a development, subject to one or more conditions for certification that must be completed to the satisfaction of the Science Team during the five-year certification period. The team may also stipulate one or more pre-conditions that must be completed prior to formalizing certification.

## Maintaining Certification

Salmon-Safe urban certification is valid for five years, subject to annual verification of satisfactory progress in meeting any conditions to the certification. Annual verification requirements require preparation of an annual site summary report. This report typically includes a characterization of site conditions and observed performance, verification of incorporation of policies and procedures identified during certification, photo documentation of site conditions at select photo points and other reporting elements that are agreed upon at the time of certification. The annual certification report format and verification form is attached as Appendix L.

After five years, certified projects may be recertified through a recertification process composed of a project site audit and assessment.



## Pre-conditions for Certification

This section outlines pre-conditions that must be met for a site to be eligible for certification.

1. Candidate project is not in violation of national, state, or local environmental laws or associated administrative rules or requirements, as determined by a regulatory agency in an enforcement action.
2. Candidate project is not currently altering or degrading salmon habitat or other ecologically sensitive aquatic resources.
3. Stormwater design approach and anticipated on-site treatment and infiltration is documented in sufficient detail to inform Salmon-Safe's evaluation of the project. Project teams may use the Worksheet provided in Appendix I or provide equivalent information in another format.
4. A statement of commitment or policy addressing new alterations or re-development is in place. This statement requires that the design for expansion or re-development of an existing project be consistent with Salmon-Safe standards, as feasible considering human-use mandates and cost considerations.
5. All pesticide use occurs within the context of an IPM process as documented in a comprehensive written strategy or as demonstrated or described during field assessment.
6. No application of any chemical on Salmon-Safe's *High-Hazard Pesticide List* (Appendix E) shall occur unless written documentation is provided in advance and approved by Salmon-Safe.



## Core Urban Certification Standards

These Certification Standards are intended for site designers involved in development projects that are part of the Salmon-Safe certification process. Each standard falls under one of six management categories that cover a set of considerations important for conserving salmonid and upland habitat and promoting the protection and enhancement of urban ecology. The standards are designated with the alphanumeric prefix “U.1” through U.6”; the “U” designation is used to denote standards and performance requirements associated with urban development. Table 3 below shows three symbols that appear throughout this document—placed next to particular performance requirements and indicating specific requirements for specific site conditions are in place.

### U.1 Stormwater Management

### U.2 Water Use Management

### U.3 Erosion Prevention and Sediment Control

### U.4 Water Quality Protection in Landscaping

### U.5 Enhancement of Urban Ecological Function

### U.6 Site Climate Resiliency Planning

Throughout the standards, the phrase “to the greatest extent operationally feasible” is used. This phrase is used to describe actual potential for incorporating standards and performance requirements into site development activities. A mixture of economic, technical, biological, cultural/aesthetic and other reasonable factors are used to determine the “operational feasibility” of implementing a standard at a given site. In any instance when an applicant for certification concludes that implementing a performance requirement is not operationally feasible, documentation demonstrating why should be assembled and presented during or preceding the certification assessment. Ultimately, the operational feasibility of implementing certain standards or performance requirements rests on the judgment of the interdisciplinary Science Team and is evaluated on a case-by-case basis.

**E** = Applicable to Existing Sites

**S** = Related to Sites with Streams (U.7)

**W** = Related to Sites with Wetlands (U.8)

**Table 3.** Legend for Symbols Used to Indicate Specific Requirement for Site-Specific Conditions



## U.1 Stormwater Management



For urban projects, stormwater management often provides an opportunity for thoughtful development to improve downstream salmon habitat. At a minimum (and to meet the pre-conditions for certification), every development must meet local, state, federal and other applicable regulations related to stormwater management. However, a Salmon-Safe development typically goes beyond regulatory requirements and utilizes creative and thoughtful approaches to benefit urban ecology and salmon habitat through stormwater management practices. Replacing a predominantly impervious site with one that includes infiltration and vegetated stormwater facilities can improve the water quality and habitat of receiving waters.

High levels of impervious surface and drainage systems from roads, parking lots, buildings and other surfaces reduce infiltration and can increase the magnitude and frequency of peak flows and flow volumes in receiving streams. Increased flooding can degrade stream habitat by eroding the channel bed and banks, scouring spawning gravels, and removing stream structures. Frequent flooding can also directly impact juvenile rearing salmonids that require stable, slower waters as over-wintering habitat. Climate change considerations make the challenges associated with unmitigated or poorly managed stormwater starker<sup>3</sup>. Stormwater from parking lots, roads and landscapes can also be contaminated with oils, heavy metals, pesticides and fertilizers (nutrients) that degrade the water quality of the receiving streams. Certain building materials can introduce metals toxic to salmon and other aquatic life. This management category addresses practices to control stormwater runoff to reduce both water quantity and water quality impacts.

<sup>3</sup>Regional climate models project increases of up to 20% in extreme daily precipitation in the Pacific Northwest. The number of days with more than one inch of precipitation is projected to increase 13%. The increased precipitation is projected to occur during the late fall to early spring. Summer precipitation is anticipated to decrease. Regional warming and changes to the historical precipitation patterns have been linked to changes in the timing and amount of water availability. Region-wide summer temperature increases and, in certain basins, increased river flooding and winter flows and decreased summer flows, will threaten many freshwater species, particularly salmon, steelhead, and trout. Warming temperature impacts on watersheds with significant snowmelt contributing to spring and summer stream flows will likely result in lower summer flows. Salmonid species life stages are inherently tied to historic climate patterns and the resulting stream flow patterns. Any changes to flooding, duration of flows and water temperature may adversely impact salmonid species.

## Standard U.1.1

### Existing site improvements related to stormwater management have been inventoried.

#### Performance Requirements

- i. Information on existing stormwater infrastructure, if any, has been collected from record drawings, site mapping, or field visits. This includes locations of stormwater conveyance channels, pipes, catch basins, outlets, and all storm-water facilities. **E**
- ii. Existing improvements contributing to stormwater runoff, including impervious and semi-pervious (e.g., gravel or pavers) surfaces, are mapped. **E**
- iii. Site topography has been mapped and a drainage area assessment conducted. This information shows major stormwater catchments and locations of receiving stormwater drains or streams, if present.<sup>4</sup> **E**
- iv. Areas suitable for low-impact development stormwater facilities based in part on soil infiltration capacity (U.1.7.iii) have been mapped. **E**

## Standard U.1.2

### An off-site drainage analysis has been conducted.

#### Performance Requirements

- i. Any known or potential off-site drainage or stormwater resources entering the site from an adjacent property have been identified based on drainage or topographic maps or site visits. Off-site areas contributing to on-site hydrology have been characterized in terms of impervious and pervious area, any water quality concerns they may pose due to land use or operations of the off-site drainage, and any proposed changes in off-site conditions that may affect stormwater flow or water quality on site. **E**

<sup>4</sup> An existing site stormwater management plan, if updated and available, is generally sufficient to meet performance requirements U.1.1 (i-iii), and can be provided to the Science Team as a substitute for these requirements.





## Standard U.1.3

Site layout responds to site conditions in a way that conserves contiguous existing vegetation, minimizes impervious or semi-pervious areas, eliminates effective (or connected) impervious area and minimizes stormwater runoff.

#### Performance Requirements

- i. Noninvasive vegetation and soils are left undisturbed to the greatest extent operationally feasible. Disturbed locations are selected over undisturbed locations during overall site planning for building, infrastructure and other improvement locations. Locally significant patches of on-site native vegetation identified during the site inventory are left undisturbed. To the greatest extent operationally feasible, these patches of existing vegetation are spatially connected to other habitat elements via appropriate, native vegetation as a functioning conservation framework.
- ii. Lots and buildings are clustered to the greatest extent operationally feasible to reduce sizes of building footprints, resulting in conservation of identified habitat areas and other open space, trees, other vegetation and soils, as well as greater overall infiltration of precipitation. Minimizing soil excavation and compaction and vegetation disturbance; minimizing impervious rooftops and building footprints; constructing streets, driveways, sidewalks and parking lot aisles to the minimum widths necessary, provided that public safety and a walkable environment for pedestrians are not compromised.<sup>5</sup>
- iii. Roadway alignment avoids vegetation and areas with good infiltration potential.

<sup>5</sup>The 2012 *LID Technical Guidance Manual for Puget Sound* describes the techniques that can be incorporated into site design, depending on the density of the proposed development, to cluster impervious surfaces and conserve open space.

## Standard U.1.4

### Parking and roadway design deliberately minimizes the footprint of impervious areas and associated stormwater runoff.

#### Performance Requirements

- i. Site designs minimize impervious surfaces where allowed by code and public safety is not compromised. Examples include reduction of parking space width, reduction of roadway widths, use of vegetated medians, shared driveways and specifying sidewalks on only one side of the street.
- ii. Designs utilize permeable paving materials to the greatest extent operationally feasible.
- iii. Roadbeds and utility lines are designed to avoid or limit impact on subsurface water flow.
- iv. Stormwater runoff is managed per Standard U.1.7.
- v. Parking areas are deliberately grouped together and are limited to the minimum number of required spaces required by code to minimize footprint. Existing parking or other impervious surface areas that are not needed for future operations or code compliance are eliminated to the extent operationally feasible. If existing pavement or parking exceeds code or operational requirements, paved surfaces are removed to the amount operationally feasible to promote infiltration and reduce the heat island effect.

## Standard U.1.5

### Building design deliberately minimizes the footprint of impervious areas and associated stormwater runoff.

#### Performance Requirements

- i. Impervious rooftop areas and building footprints are minimized to the greatest extent operationally feasible.
- ii. To the greatest extent operationally feasible, rooftop runoff is treated on site and dispersed or infiltrated rather than concentrated during treatment. Existing downspouts are disconnected and treated per Standard U.1.7 to the greatest extent operationally feasible.

U.1.5 continues ➡



- iii. Stormwater runoff is managed per Standard U.1.7.

## Standard U.1.6

### Exterior building materials do not introduce metals toxic to salmon and other aquatic life to stormwater runoff.

#### Performance Requirements

- i. The following exterior building materials are expressly avoided: (1) zinc-based building side panels; (2) galvanized metal and copper roofing, gutters and downspouts; and (3) wood shingles, shakes and other outdoor wood features treated with chromated copper arsenate or copper azole. In cases where it is not possible to completely avoid these materials, the following analysis shall be conducted:
  - Determine where any stormwater coming into contact with the building material goes.
  - Indicate if that stormwater is being or will be treated.
  - If not, determine if it is operationally feasible to treat it.
  - If not feasible, are alternate materials or treatments (e.g., painting, cladding) feasible?
  - If the potential watershed impact is significant (e.g., the surface area is very large, there is a sensitive water body nearby, etc.), mitigation (e.g., treating more stormwater elsewhere onsite) could be appropriate.
- ii. The following building materials are avoided to the extent operationally feasible or, if used, are isolated as feasible from contact by precipitation and runoff by painting or coating with an inert material: (1) galvanized metal heating, ventilating and air conditioning (HVAC) equipment in outdoor locations; (2) galvanized flashing, and (3) galvanized fencing.



## Standard U.1.7

Stormwater management planning and design emphasize a goal of maintaining and restoring pre-development hydrology<sup>6</sup> and follow a hierarchy<sup>7</sup> (see diagram, p.18) that prioritizes total on-site water quantity and water quality control.

#### Performance Requirements

- i. The planning and design assessment is conducted according to the relevant *Model Stormwater Management Guidelines* (the Guidelines) for *Campus and Residential New Development and Redevelopment*<sup>8</sup> (Appendix F and G); or *Ultra-Urban Redevelopment*<sup>9</sup> (Appendix H).
- ii. Stormwater design approach and anticipated on-site treatment and infiltration is documented in sufficient detail to inform Salmon-Safe's evaluation of the project. Project teams may use the Worksheet provided in Appendix I or provide equivalent information in another format (see Pre-condition 3).
- iii. The documentation clearly and convincingly demonstrates that the prime objective stated in the Guidelines is operationally feasible or, if it is not, why not and how an alternative objective has been or will be pursued.
- iv. The documentation provides the results of the inventory and analysis step designated in the Guidelines and specifies all green stormwater infrastructure (GSI) development and alternative practices that have been or will be implemented to achieve the prime or alternative objective.
- v. Stormwater facilities are designed with adequate bypass/overflow measures to avoid the risk of catastrophic failure during high flow events.<sup>10</sup>
- vi. Stormwater facility design(s) consider predicted changes in precipitation patterns related to climate change and are appropriate for predicted changes in rainfall intensity and duration.

<sup>6</sup>Pre-development conditions can be defined as a naturally vegetated state, free from human disturbance. Pre-development plant communities can be interpreted from historic records and other documentation.

<sup>7</sup>See Figure 1. Salmon-Safe Urban Standard U.1.7: *Stormwater Management Planning Hierarchy*, on p.18.

<sup>8</sup>A "campus" consists of a corporate or university complex with buildings located in close proximity to each other; having centralized support, amenities and other internal functions; and interspersed with features such as landscaping, parking, roadways, walkways and recreational facilities. Residential development in this context includes single- and multi-family buildings not covering the entire parcel and places amid such features as landscaping, parking, driveways, and walkways. "Redevelopment" means building on an area already having some form of built environment, whereas new development is construction on a parcel without any extensive prior building.

<sup>9</sup>Ultra-urban redevelopment comprises conversion of an already developed site to a high-density land use, generally involving multi-story commercial or residential development, or both, covering the entire parcel.

<sup>10</sup>General guidance for effective stormwater facility design may be found in the *Stormwater Management Manual for Western Washington*, or other similar documentation (Ecology, 2019).



Stormwater management planning generally follows a hierarchy that prioritizes total on-site treatment and infiltration as follows:



**Figure 1.** Salmon-Safe Urban Standard U.1.7: *Stormwater Management Planning Hierarchy*

## Standard U.1.8

**Stormwater facilities and infiltration features are fully integrated with habitat-based site features.****Performance Requirements**

- i. Stormwater facilities are planted with native and/or adapted vegetation capable of handling the fluctuating water conditions characteristic of stormwater facilities.
- ii. Stormwater facilities pose no fish trap hazard during normal or high flow conditions. Stormwater facilities are outfitted with screens to prevent fish from entering stormwater management facilities.
- iii. Where consistent with the needs of local species, stormwater facilities incorporate habitat features such as logs, snags and varying pool depths, integrate with the surrounding habitat and vegetation, and support connectivity between nearby habitats.
- iv. Significant open space that has been designed to manage stormwater is protected from future development by a perpetual conservation easement through an existing local agency or land trust, is protected by local buffer zoning regulations, or is owned and/or protected in perpetuity by site management, as stipulated in development agreements or other binding documents. This includes existing locally significant patches of native vegetation inventoried in U.8.3 and identified in U.1.3(i).

## Standard U.1.9

**Construction practices avoid or reduce short- and long-term negative stormwater impacts resulting from construction.****Performance Requirements**

- i. Construction practices eliminate stormwater runoff and sediment transport into surface waters during construction. A construction-phase stormwater management plan is used on site. See Appendix J (Model Construction-Phase Stormwater Management Program) for plan guidance.

U.1.9 continues ➡





- ii. Vegetation disturbance, soil excavation and compaction are avoided or minimized to the greatest extent technically feasible during construction.
- iii. LID facilities are fully protected from soil compaction and receiving sediment during construction.

## Standard U.1.10

**A long-term stormwater management plan has been adopted as a concise written document to formalize an ongoing commitment to low impact development practices.**

### Performance Requirements

- i. The plan provides a post-construction maintenance plan to ensure that installed low impact development stormwater control features are working as designed. The plan lists activities to perform, provides a schedule for activities, identifies visual and other indicators of performance problems, and identifies responsible parties. Adaptive management triggers actions that respond to changes in performance.
- ii. The plan guides the design and construction of any future improvements, infill development, or new phases of development so that they comply with the Salmon-Safe Certification Standards defined in this document.
- iii. The plan identifies areas with soils with high infiltration rates appropriate for future low impact development stormwater BMPs that should be protected to the greatest extent operationally feasible during construction of future improvements.
- iv. The plan, as a whole, or its elements therein, have been adopted into the development's guiding documentation that formalizes the site management's responsibility to implement and enforce all aspects of the plan on both private property or common property managed for the public good.

## U.2 Water Use Management



Climate change is affecting the quantity and quality of water available for salmon and other aquatic life. Traditional water demands associated with urban developments include use of potable water for irrigation, sinks and showers, and toilet flushing. Irrigation water use also introduces the risk of contamination of receiving waters by landscaping chemicals. Wastewater from sinks, laundry washing machines and showers is referred to as “graywater.” If allowed by the local permitting agency and if the building is designed with appropriate safeguards, graywater and harvested rainwater can be reused for irrigation or toilet flushing. This reuse can benefit salmonids and other species that rely on clean, abundant water in streams by reducing the amount of surface and groundwater withdrawals necessary for these purposes. Reuse can also benefit water quality by reducing volumes of wastewater discharged to surface waters. Even treated wastewater can have elevated temperatures and pollutant concentrations detrimental to salmonids and other species.

### Standard U.2.1

**An existing site water infrastructure inventory as it relates to water use and disposal has been completed.**

#### Performance Requirements

- i. Availability of public water sources has been investigated to aid in avoiding the use of surface water rights, to the greatest extent operationally feasible. Information on existing sanitary/wastewater infrastructure, if any, has been collected from record drawings, site mapping, or field visits. **E**
- ii. Local jurisdictional code as it relates to reuse of graywater and treated wastewater (black water) has been reviewed and documented for reference during later stages of planning and design. **E**

## Standard U.2.2

**Conduct a groundwater inventory to better understand the relationship between surface flows, infiltration, and groundwater elements.**

### Performance Requirements

- i. Record/map any existing wells present on the site and in the vicinity (0.5-mile radius).
- ii. Determine depth to groundwater and subsurface flow directions across the site. This activity should address seasonal variation of the water table.
- iii. Estimate if adjacent surface water entities are “gaining” or “losing” elements. Gaining elements are sourced from the groundwater. Losing elements feed groundwater.
- iv. Groundwater resources have been researched to better understand the relationship between surface flows, infiltration, and groundwater elements. Well logs, USGS data, site-specific geotechnical borings and other available data to better understand local groundwater resources and the relationship with surface waters. **E**

## Standard U.2.3

**Surface water withdrawals are avoided and alternative water resources are used, to the greatest extent operationally feasible.**

### Performance Requirements

- i. Document how surface water withdrawals have been avoided or minimized.

## Standard U.2.4

To the extent operationally feasible, and as permissible by building codes and other regulations, reduction, reuse, treatment and recycling, and treatment and reclamation are investigated and employed to the greatest extent operationally feasible according to the following hierarchy:

**1. REDUCTION**

Avoid water consumption and increase water conservation in site and building uses.

**2. REUSE**

Capture, store and reuse 'clean' roof runoff without treatment for toilet flushing, irrigation and wash down.

**3. TREATMENT AND RECYCLING**

Capture, store and reuse runoff and graywater for irrigation and toilet flushing after treatment.

**4. TREATMENT AND RECLAMATION**

Capture, store and reuse graywater and rainwater for potable uses after extensive treatment.

**5. POTABLE USE**

Use potable sources (only after evaluation on feasibility of options 1-4 above).

**Performance Requirements**

- i. Document evaluation of each of the options in the water use management hierarchy.

## Standard U.2.5

**Landscape vegetation has been selected and located appropriate to site conditions to limit water demand. Include a field in the planting schedule to indicate which listed species are drought tolerant.**

### Performance Requirements

- i. Drought-tolerant plants that require minimal (if any) irrigation are used in landscaping. Plants with high water demands have been avoided.
- ii. Where suitable, drought-tolerant native vegetation is selected over non-native plants, especially near habitat buffers. No invasive species, as defined by local and state agency weed lists, are used.
- iii. Open lawn is minimized to the greatest extent operationally feasible, or is composed of drought-tolerant alternative seed mixes.
- iv. Construction details specify the use of suitable compost and mulch during installation to reduce irrigation requirements.
- v. For existing developments, an analysis is performed to identify and assess opportunities to enhance or replace existing landscape vegetation per the above performance requirements.

## Standard U.2.6

**Water conservation practices are used during site maintenance. E**

### Performance Requirements

- i. Modern drip irrigation, automated soil moisture sensors and other water- conserving techniques are part of the irrigation plan. Irrigation delivers water based on specific vegetation requirements, rate of infiltration, evapotranspiration and other factors. Temporary irrigation systems are used for landscape vegetation that typically require water only during establishment periods.

U.2.6 continues ➡



- ii. Stormwater reuse and gray water reuse systems, if compatible with code and regulatory requirements and investigated in Standard U.2.4, are used. Water may be reused within building water systems, irrigation or any water use that reduces consumption.
- iii. For existing developments, an analysis is performed to identify and assess opportunities to retrofit existing water systems per the above performance requirements in U.2.6 (i-ii). A report is submitted to Salmon-Safe presenting a plan and schedule for implementing technically feasible water conservation projects.

### Standard U.2.7

Equipment washing during construction and ongoing site operations occurs offsite or sufficiently away from riparian and wetland resources or their buffers to avoid accidental wash-water runoff, contamination or other impacts on water and natural resources. **E**

### Standard U.2.8

No surface water withdrawals are made in association with site construction activities.



## Standard U.2.9

A water conservation plan has been adopted as a short written document and formalizes the existing conservation practices, as detailed in Appendix K (*Water Conservation Plan Guidance*). **E**

**Performance Requirements**

- i. The plan lists activities to perform, provides a schedule for activities and identifies responsible parties. Adaptive management triggers actions that respond to changes in performance. The plan includes a provision to track external water use to provide trend data supporting adaptive management. The water conservation plan shall also include a drought management plan that details how further significant reductions will be achieved during a drought.
- ii. This plan as a whole, or its elements therein, have been adopted into the development's guiding documentation that formalizes the site management's responsibility to implement and enforce all aspects of the plan on both private property or common property managed for the public good.

## U.3 Erosion Prevention and Sediment Control



Construction practices that fail to adequately stabilize and protect soils can adversely impact salmonids and other species by exposing soils, subjecting them to erosion and allowing sediment to enter streams and other water bodies during storm events. Effective erosion prevention and sediment control relies on an understanding of sensitive areas within a site, e.g., unstable or highly erodible soils. Site planning and development should respond to existing terrain and soils and construction practices should integrate and maintain effective measures to prevent erosion and capture sediment before it leaves the site.<sup>11</sup>

### Standard U.3.1

#### Soil characteristics have been mapped. **E**

##### Performance Requirements

- i. Soil characteristics to be mapped include but are not limited to soil types, presence of hydric soils, infiltration rates and erosion factors for both wind and water.<sup>12</sup>
- ii. Unstable or highly erodible areas, as well as existing erosion and sedimentation problem areas, have been identified and mapped. These include existing slumps or failures, steep slopes and unstable soils.
- iii. Any on-site soil tests or geotechnical bores have been made and are available to the project team early in the process.

<sup>11</sup> In addition to the Standards provided within this category, contractors may refer to the technical detail provided in Appendix J: Model Construction-Phase Stormwater Management Program as well as Salmon-Safe's *Accreditation Program Guidelines for Large-Scale Construction Management*, available for download at: <https://salmonsafe.org/certification/construction-management/>

<sup>12</sup> This information is available in county soil inventories prepared by the Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service [SCS]).

## Standard U.3.2

**Site development responds to site conditions in a way that minimizes ground disturbance, erosion, and sediment transport.**

### Performance Requirements

- i. Site development responds to existing terrain to minimize excavation, grading and soil disturbance. Disturbed site locations are selected for development over undisturbed locations.
- ii. Development on slopes, if any, is on soils and grades that are stable and will not pose long-term erosion or stability issues. Erosion prevention is emphasized over sediment control.
- iii. Utilities, including telephone lines, cable, water and sewage are grouped to the greatest extent operationally feasible to minimize ground disturbance.
- iv. Trail systems are sited sufficiently distant from riparian areas, wetlands and steep slopes such that they are not an obvious source of sediment, chemical pollution or bank instability.

## Standard U.3.3

**Soil is protected from erosion and generation of sediment that could enter surface water bodies.**

### Performance Requirements

- i. Bare or exposed soils are temporary features only, to be vegetated with plant types consistent with Standard U.2.6. Erosion control blankets, mulch and/or tackifiers are used to prevent erosion. Erosion control seed mixes are composed of native species or other suitable species that contribute to soil stability and soil quality.
- ii. Site improvements, including buildings, roads, bridges or other features are protected by BMPs as necessary to prevent erosion. Earthen trails, especially those in designated buffers, are protected by mulch, water bars, closures or other BMPs.

U.3.3 continues ➡



- iii. Permanent erosion control features, in the form of site grading, flow control and landscaping, are strategically placed to prevent turbid stormwater from leaving the site.

## Standard U.3.4

Construction practices limit soil erosion due to rain and wind (if applicable), and eliminate potential sediment inputs into surface waters to the greatest extent operationally feasible. Visible or measurable sediment or pollutants do not exit the site or enter the public right of way. Measures to prevent erosion and control sedimentation are installed according to plans, monitored and maintained regularly, and left in place until the site is stabilized. Please refer to Standard U.1.9 for additional guidance on meeting this standard. All new plans meet or exceed current state requirements for site pollution control during construction.

## Standard U.3.5

Long-term erosion and sediment control provisions should be addressed in the plans required in Section U.8 (Riparian/Wetland/Vegetation Protection and Restoration) and in Section U.1 (Stormwater Management) by providing standards that protect soil from erosion and prevent transport of sediment into streams or off-site stormwater. **E**

## U.4 Water Quality Protection in Landscaping



Certain pesticides are a serious threat to salmonids and other aquatic life, killing fish or causing sublethal impacts that stress juveniles, alter swimming ability and cause other behavioral changes that make salmonids more vulnerable to predation and otherwise reduce survival rate. Similar affects can result from other chemicals used for building construction or maintenance. Fecal coliform and bacteria associated with on-site sanitary systems or animals can introduce other water quality impacts that adversely affect salmonids and other species.

### Standard U.4.1

High risk areas, where chemical use and storage should be avoided, have been identified and mapped (e.g., areas with surface water connection to stream, wetland or other sensitive water body; areas on steep slopes or unstable soils). Potential locations for temporary storage of chemicals during construction have been identified. **E**

### Standard U.4.2

Areas identified for chemical storage during construction staging are mapped and located outside of the high risk areas identified in U.4.1. as necessary to prevent erosion.

### Standard U.4.3

Landscape plans require minimal pesticide and fertilizer inputs, if any. Areas that may require pesticide use are planted outside of wetland and riparian buffer zones and are placed in such a way to minimize risk of chemicals leaving the site.

### Standard U.4.4

Designated dog run or livestock areas are outside of required wetland and riparian buffers. Animal areas are located sufficiently away from aquatic zones. The site layout locates these areas to minimize the risk of animal waste leaving the site as contaminated stormwater. Public education programs, signage, and pickup stations promote proper waste disposal.

### Standard U.4.5

Where on-site treatment is necessary, sanitary systems result in no impact to aquatic resources and buffers defined in U.8.4 and U.8.5 and avoid contaminant risk to surface water and groundwater resources. Sanitary systems are in full compliance with all standards applied to such systems by state and local jurisdictions. **E**



## Standard U.4.6

Landscape vegetation includes either native plants or hardy non-native plants requiring minimal chemical application, if any, and should also take into consideration the water use requirements noted in Standard U.2.6.

### Performance Requirements

- i. Plants with known susceptibility to disease, or those that require high nutrient or chemical inputs to survive in existing soils, are avoided. No plants shall be used that require application of any chemical on Salmon-Safe's *High-Hazard Pesticide List* (Appendix E). Plants identified on local or regional invasive plant lists are not used.
- ii. For existing developments, an analysis is performed to identify and assess opportunities to enhance or replace existing landscape vegetation per the above performance requirements in U.4.6 (i). A report is submitted to Salmon-Safe presenting a plan and schedule for implementing technically feasible enhancement or replacement projects.

## Standard U.4.7

The staging area for the project is located outside of any designated riparian, wetland, or other buffer for storage and maintenance of equipment, vehicles, chemicals, or other materials that could reasonably pose a risk to sensitive aquatic habitats.

## Standard U.4.8

An equipment and vehicle cleaning, fueling and maintenance plan is used during construction to limit the import and export of invasive plant seeds, petroleum, or other toxic substances, to and from the site. **E**



## Standard U.4.9

Use of pesticides or other chemicals is expressly avoided to the greatest extent operationally feasible, especially within riparian and wetland buffer areas. **E**

## Performance Requirements

- i. Mechanical removal of invasive plants is chosen over chemical treatment to the greatest extent operationally feasible.
- ii. No pesticides listed in the *Salmon-Safe High-Hazard Pesticide List* (Appendix E) are used unless written documentation is provided in advance to Salmon-Safe that demonstrates a clear need for use of the pesticide, that no safer alternatives exist, and that the method of application (such as timing, location and amount used) does not represent a risk to water quality and fish habitat (see Pre-condition 6).

## Standard U.4.10

Site management for the development shall either declare that the site will be managed as pesticide-free or prepare and implement an integrated pest management (IPM) plan and nutrient management plan consistent with Salmon-Safe standards as detailed in Appendix D (*IPM, Nutrient and Chemical Management Plan Guidance*). **E**

## Performance Requirements

- i. The plans are prepared with the assistance of professionals with extensive expertise in preparing IPM plans and in managing landscapes using IPM practices.
- ii. The plans as a whole, or their elements therein, have been adopted into the development's guiding documentation that formalizes the site management's responsibility to implement and enforce all aspects of the plans on both private property and common property managed for the public good.

U.4.10 continues ➡





- iii. Contractor landscaping on publicly managed property, as well as any landscaping practices on privately managed property, shall be consistent with the IPM and nutrient management plans. Contractors must provide records and documentation to the homeowners association or site management that their activities are consistent with the plans. The IPM record keeping system shall include notes on pest monitoring, all IPM methods used and evaluation of effectiveness. Site management shall ensure that any use of pesticides or fertilizers is consistent with Salmon-Safe standards as defined in the plans.

## Standard U.4.11

Management allows water quality monitoring by a third party authorized by Salmon-Safe and fully cooperates with such monitoring insofar as possible given staffing and funding constraints.<sup>13</sup>

<sup>13</sup> Under rare circumstances, the Science Team may request that owners conduct limited monitoring where such monitoring is critically needed to assess the efficacy of existing management practices in meeting Salmon-Safe standards. The Science Team will carefully weigh the need for the monitoring against campus management's guidance regarding the scientific and economic feasibility of the proposed monitoring.



## U.5 Enhancement of Urban Ecological Function



Urban settings can host a surprising array of wildlife, including birds, bats and pollinators that can have ecological benefits far beyond the immediate site. Improving urban ecological systems helps protect water quality by restoring soils, vegetation and ecological function in areas contributing to receiving waters within the watershed. Even small patches of urban habitat can aid in species movement and provide temporary refuges for urban wildlife, while also benefiting district residents through access to nature and additional amenity zones. Research suggests that light pollution can also impact urban ecological function of many species, including salmon.

### Standard U.5.1

Provide landscape scale mapping and analysis of habitat patches and corridors within the local region (sites, buildings, roofs, open space and site) as a tool for maximizing the connectivity between habitats at multiple sites and to larger core habitat zones beyond the immediate project area. **E**

### Standard U.5.2

Conduct a survey of existing species of birds, mammals, insects and invertebrate composition within the region and onsite to aid in setting goals for successful establishment (e.g., types, numbers, distribution) of key indicator species. Provisions are made for the protection of rare, threatened and endangered salmonids and their habitat, if any, existing found on the site. **E**



## Standard U.5.3

Work with local jurisdictions and other property owners in the region to create synergies with adjacent properties to provide larger parcels (two or more buildings with similar habitat functions adjacent) or corridors (more expansive and connected terrestrial and canopy coverage in right-of-way and through sites). **E**

## Standard U.5.4

Using the analysis conducted in the previous standards, develop site strategies for creation and retention of habitat and landscape patches that provide for food, forage and refuge for a diversity of species, including key indicators of ecosystem health. Include a field in the planting schedule to indicate habitat value of specified species. Evaluate and address potential adverse ecological impacts related to light placement, sources, or operations. Such strategies could include:

- i. creation of pollinator pathways of native, non-invasive vegetation along roadways and through sites to attract bees, butterflies and other species of interest.
- ii. usage of street tree, shrub and groundcover species that provide biological diversity and consistent food, forage and refuge for a range of urban species.
- iii. extension of street planters and larger bulb-outs at corners to maximize street landscape coverage and diversity and incorporation of stormwater facilities to provide intermittent water, mud and nesting materials.
- iv. reduction of turf areas and strategic integration of large patches of green roof with specific habitat elements into designs, such as woody debris, gravel/cobble and other elements typically not found in urban settings.
- v. addressing artificial lighting impacts.<sup>14</sup> Site lighting fixture placement and alignment may contribute to disrupting natural migration patterns of insects. Provide a lighting plan that limits impacts to insect migration within vegetation corridors and along surface water/wetlands. Options include, but are not limited to, timers or motion detectors to reduce the period of time lights are in operation, shielded (directional) lighting, and light sources near the ground pointing down.

<sup>14</sup> Lighting attracts insects, so it can pull insects into a confined spatial pattern. Lighting near open water may alter the ability for salmonids to hide from predators and limit food sources.

## Standard U.5.5

Ensure that building materials, lighting and facades do not endanger or pose a threat to wildlife or insects that are food sources for salmonids. Use netting or screening to reflect glare on windows and prevent bird kills.<sup>15</sup> Consider various types of living walls and infrastructure that increase the habitat value of the site. Hazardous or toxic building and landscape materials that pose a threat to wildlife should be avoided.

## Standard U.5.6

Improve the existing environmental condition of sites prior to and during construction through restoration and retrofitting. Look at opportunities for temporary improvements to vacant or underutilized sites with low-cost plantings that have the potential to provide habitat value.

## Standard U.5.7

Utilize maintenance strategies that maximize the conservation of beneficial species, reduce intrusion of invasive species, and provide beneficial habitat elements of food, forage and refuge. **E**

#### Performance Requirements

- i. Include such activities as leaving some vegetation over winter rather than cutting back, reducing pruning, and allowing plantings to provide dense refuge.
- ii. Use appropriate composts to amend soils, maintain healthy vegetation, and support beneficial soil microorganisms.

<sup>15</sup> Refer to the American Bird Conservancy's Bird-Friendly Design guidelines for additional guidance:  
[https://abcbirds.org/wp-content/uploads/2019/04/Bird-Friendly-Building-Design\\_Updated-April-2019.pdf](https://abcbirds.org/wp-content/uploads/2019/04/Bird-Friendly-Building-Design_Updated-April-2019.pdf).



## U.6 Site Climate Resiliency Planning



Regional warming and changes to the historical precipitation patterns have been linked to changes in the timing and amount of water availability. The impacts of a warming planet have far reaching implication including:

- increased seasonal temperature;
- changes to precipitation;
- sea level rise;
- health impacts on humans including increased respiratory and cardiovascular disease; and
- forest health (to name a few).

Region-wide summer temperature increases and, in certain basins, increased river flooding and winter flows and decreased summer flows, will threaten many freshwater species, particularly salmon, steelhead and trout.<sup>16</sup> Warming temperature impacts on watersheds with significant snowmelt contributing to spring and summer stream flows will likely result in lower summer flows.

Salmonid species life stages are inherently tied to historic climate patterns and the resulting stream flow patterns. Any changes to flooding, duration of flows and water temperature may adversely impact salmonid species.

<sup>16</sup> Depending on climate change modeling assumptions made in multiple efforts, by 2070 it is projected the average annual temperature could increase from approximately 3°F to 10°F, when compared to the temperatures from the late 20th century. The modeling efforts suggest the greatest temperature increases will occur during the warmer months. Regarding rainfall, regional climate models project increases of up to 20% in extreme daily precipitation, depending on location. The number of days with more than one inch of precipitation is projected to increase 13%. The increased precipitation is projected to occur during the late fall to early spring. Summer precipitation is anticipated to decrease.

## Standard U.6.1

Assess regional climate change impacts on site design and elements related to the each of the Core Standards based on 50-year projections. Provide a short description of potential climate change future conditions related to temperature and precipitation. This information will be useful in framing responses to the other Core Standards and may be referenced as “addressed in Standard U.6.1”.

### Performance Requirements

- i. Prepare a general overview of the potential impacts climate change will/may have for the following Certification Standards, as relevant:
  - **Stormwater**—changes to peaks, seasonality, volume
  - **Water Use**—water availability,
  - **Erosion Prevention/Sediment Control**—changes in sediment transport capacity of stream/surface water
  - **Site Elevation**<sup>17</sup>
  - **Water Quality Protection in Landscaping**
  - **Enhancement of Urban Ecological Function**
  - **Instream Habitat Protection and Restoration**
  - **Riparian, Wetland and Locally Significant Vegetation Protection and Restoration**

<sup>17</sup>The 100-year flood standard may be inadequate at certain project sites as climate impacts increase.

## Standard U.6.2

## Site design related to potential climate change impacts is considered.

## Performance Requirements

- i. **Stormwater.** Proposed stormwater facilities are sized to effectively address projected future precipitation changes related to rainfall intensity and duration. Are project stormwater facilities expandable? Is there adequate conveyance for emergency overflow?
- ii. **Irrigation and landscaping.** Plant selection and maintenance activities are updated to reflect longer dry periods in the summer months and increased evapotranspiration resulting from increased temperatures. For vegetation selection refer to Standard U.2.5.
- iii. **Heat Islands.** Urban developments have been found to absorb and retain solar heat creating localized heat islands. Conceptual site plans need to consider the impact of building materials and locations to reduce this impact, as well as consider impacts of shadows from buildings on existing/proposed vegetation. Shadows can also be used to shade impervious surfaces related to roads and parking in conjunction with Standard U.1.5.
- iv. **Instream and Riparian Habitats.** Stream and wetland conservation and restoration measures are adapted to provide a level of ecological function adapted to more extreme climate conditions, such as potentially higher and more frequent flooding in winter and increased stream temperatures and reduced stream flows in summer.
- v. **Site Climate Resiliency.** Prepare a brief narrative outlining potential adaptive management strategies for future site climate resiliency. The strategies should include monitoring and metrics related to climate change that can be used to guide when site characteristics related to stormwater, irrigation, and vegetation should be adjusted.

## Context-Dependent Urban Certification Standards

The following sections include additional sections that are atypical for dense urban conditions, but could be present in some cases. Additional documentation should be included if on-site streams, wetlands, riparian habitat or other ecological systems are present. Standards that apply to sites where wetlands and streams are present are designated with **W** and **S** respectively.

### **U.7** Instream Habitat Protection and Restoration

### **U.8** Riparian, Wetland and Locally Significant Vegetation Protection and Restoration





## U.7 Instream Habitat Protection and Restoration



### Standard U.7.1

**S** A physical instream inventory has been completed that adequately characterizes factors contributing to habitat quality conditions for salmonids and other sensitive species. **E**

#### Performance Requirements

- i. To understand the project's potential impacts and benefits to salmonids, the position of the site within the watershed is documented. Physical and biotic watershed conditions have been investigated using available data, existing information sources and/or expert interviews.
- ii. Existing watershed-specific restoration or recovery plans and local salmonid recovery programs have been investigated via an expert interview or review of planning documents. Opportunities to incorporate objectives of these plans and programs into development planning decisions have been identified.
- iii. On-site stream channel deficiencies have been identified. Bank stability and channel incision have been characterized across the site. On-site 100-year flood-plain and channel migration zones have been referenced where available.
- iv. On-site stream crossings have been inventoried and evaluated to determine priorities for fish and wildlife passage and flood conveyance.

### Standard U.7.2

**S** A biological instream inventory has been completed that characterizes riparian and aquatic habitat conditions on site and investigates the likelihood that fish may be able to access the site and characterizes aquatic habitat conditions. **E**

U.7.2 continues ➡



### Performance Requirements

- i. Data on current or potential fish presence within the watershed system have been reviewed (if available). Based on available data, stream types in the system have been classified as either: (1) fish-bearing, (2) potentially fish-bearing, (3) non-fish-bearing with a defined channel connected to a fish-bearing or potential fish-bearing stream, or (4) none of the above. If no fish are currently present, historic fish presence/absence in the system has been estimated using available data and information sources.
- ii. Presence or absence of fish on site has been assessed based on available data or regulatory habitat designation or based on expert interviews.
- iii. For on-site streams and rivers classified in U.7.2 as either (1) fish-bearing, (2) potentially fish-bearing, or (3) non-fishbearing with a defined channel connected to a fish-bearing or potentially fish-bearing stream, significant aquatic habitat features (riffles, pools, runs, large wood, etc.) are identified and mapped within the parcel.

## Standard U.7.3

**S** The site plan details locations for instream enhancement, barrier removal or other rehabilitation based on the results of the site inventory (per Standard U.7.1). Any existing design and infrastructure elements that directly degrade salmon habitat are addressed. Restoration efforts may include those required by the Science Team to address deficiencies, as well as efforts already being undertaken. This progress may include prioritized project lists for the site, including specific projects and other planning documents, as determined by the review team. **E**

## Standard U.7.4

**S** The site plan avoids impacts to instream areas identified in the inventory to the greatest extent operationally feasible during development.

U.7.4 continues ➡



**Performance Requirements**

- i. Buildings and other site improvements, included areas of compacted fill, are placed outside the floodplain and channel migration zone.
- ii. Utility lines on stream crossings are placed on bridge crossings in serviceable locations, rather than buried.

**Standard U.7.5**

**S** When avoidance is not possible, the site plan minimizes impacts on instream habitat.

**Performance Requirements**

- i. At a minimum, the site plan protects existing channels from new impacts such as filling and excavation, straightening, unnecessary additional stream crossings, unnecessary removal of wood or disconnection of off-channel wetlands and ponds.
- ii. The number of stream crossings has been reduced (where existing crossings are present) or minimized (when new crossings are needed). Placement of crossings is accompanied by rehabilitation of riparian habitat and reduction of water quality impacts where applicable.

**Standard U.7.6**

**S** Where impacts on streams are unavoidable, impacts are mitigated by site improvements that offset physical and biological impacts on streams to the greatest extent operationally feasible.

## Standard U.7.7

**S** Overall, stream bank conditions are acceptable on site. Key deficiencies identified in Performance Requirement U.7.1 have been addressed and resolved. **E**

#### Performance Requirements

- i. Incised or eroded stream banks have been stabilized using bioengineering methods to the greatest extent operationally feasible.
- ii. Where geomorphologically appropriate, stream banks are stabilized by native vegetation where suitable and beneficial.
- iii. Channel manipulation for reasons other than habitat restoration is avoided to the greatest extent operationally feasible. If channel manipulation is absolutely required and all other feasible alternatives have been exhausted, bioengineered solutions for bank stabilization/habitat enhancement are chosen over “harder” solutions such as retaining walls, riprap or gabion revetments. Acceptable forms of manipulation are those explicitly undertaken to meet specific habitat restoration objectives, e.g., floodplain storage enhancement, historic floodplain restoration, channel complexity, and realignment activities to restore overall stream health.

## Standard U.7.8

**S** Overall, stream bank conditions are acceptable on site. Key deficiencies identified in Performance Requirement U.7.1 have been addressed and resolved. **E**

#### Performance Requirements

- i. The stream has an intact channel and floodplain, existing off-channel habitats remain connected and no large wood has been unnecessarily removed.
- ii. When geomorphically appropriate, habitat improvement projects specify the use of large woody debris that has been salvaged from the site or has been harvested sustainably from an off-site location.

U.7.8 continues ➡



- iii. Habitat improvement projects incorporate large wood and rock features in a geomorphically appropriate manner in accordance with natural and historical conditions.

## Standard U.7.9

**S** Key issues with regard to barriers and man-made features identified in Standard U.7.1 have been addressed and resolved. **E**

### Performance Requirements

- i. Unnatural barriers to fish and wildlife, water, sediment and large woody debris movement have been removed or plans are in place for removal.
- ii. Non-regulated existing levees have been removed/moved, floodplains restored to the greatest extent operationally feasible, and no new levees are proposed.
- iii. Artificial ponds located in stream channels are either removed or are reconstructed as needed to provide adequate fish passage and habitat and to maintain stream temperatures and oxygen levels within applicable state water quality standards.
- iv. Stream crossings avoid obstructions and encumbrances to fish, wildlife, large wood and sediment passage to the greatest extent operationally feasible.<sup>18</sup>

<sup>18</sup> WDFW (2003).

## Standard U.7.10

**S** Fish and wildlife exclusion/protection measures are in place during construction near water bodies.

**Performance Requirements**

- i. For work below the ordinary high-water line where fish may be harmed or entrapped during construction, work area isolation barriers such as cofferdams, silt curtains, or other devices are used at all times and Applicant has coordinated with agencies to perform in-water work only when permitted.
- ii. During in-water construction, a fisheries biologist or other qualified specialist is available onsite in the event of accidental fish entrapment.

## Standard U.7.11

**S** If instream habitat features have been installed, site management has adopted a post-construction inspection and maintenance plan (O&M) to ensure that instream habitat features are working as designed.

**Performance Requirements**

- i. The plan lists activities to perform, provides a schedule for completion and identifies responsible parties. Adaptive management triggers actions that respond to changes in performance.
- ii. This plan, as a whole, or its elements therein, have been adopted into the development's guiding documentation that formalizes the site management's responsibility to implement and enforce all aspects of the plan on both private property or common property managed for the public good.

## U.8 Riparian/Wetland/Vegetation Protection and Restoration



### Standard U.8.1

**S** Existing watershed-specific restoration or recovery plans have been investigated to understand riparian habitat conditions on site, including the following: **E**

1. Local and watershed riparian habitat extent, quality and conditions characterized by species composition and estimated percent cover in the tree canopy, shrub layer and herbaceous layer, especially in areas adjacent to, immediately upstream or immediately downstream of the site.
2. Width of existing buffer and stream length of riparian vegetation free from intrusions from roads, utilities and other clearings (i.e., riparian continuity) for on-site riparian areas.
3. Degraded riparian areas in need of restoration, such as damaged, exposed or at-risk areas, as well as locations with invasive species.
4. Typical local terrestrial riparian species (vegetation, birds, mammals, reptiles and amphibians) and signs of their use on the site.
5. Locations onsite likely provide significant habitat value and/or harbor sensitive species, particularly during the breeding/nesting season.

### Standard U.8.2

**W** Existing on-site wetlands and their conditions are identified, classified and mapped. Classification of existing wetlands includes types of impacts and whether the wetland historically or currently provides fish habitat. **E**

U.8.2 continues ➡

### Performance Requirements

- i. Local wetland habitats have been characterized by type, quality and condition, especially in those areas adjacent, immediately upstream or immediately down stream of the site.
- ii. All on-site wetland areas are identified, mapped and described by wetland type and condition. Conditions within 100 feet of the wetland are characterized by vegetative composition, land use characteristics and topography.
- iii. Wetland hydroperiods have been estimated and hydrologic pathways have been determined to the greatest extent operationally feasible. Existing wetland functions and deficits have been characterized. Damaged, exposed or at-risk areas have been identified and mapped to identify degraded wetland areas in need of restoration.
- iv. Typical local wetland species (vegetation, birds, mammals, reptiles and amphibians) have been characterized via interviews with local experts, review of relevant documents or other methods.
- v. A site inventory and/or survey has been conducted at least once during the breeding or growing season to characterize the presence/absence of common wetland species (vegetation, birds, mammals, reptiles and amphibians), game trails, or other signs of use by wildlife. Locations identified in the survey that provide significant habitat value and/or may harbor sensitive species that may be impacted by nearby construction disturbance, particularly during the breeding/nesting season, have been mapped.

## Standard U.8.3

**S W** Patches of locally significant vegetation and sensitive habitats that are not associated with riparian and wetland areas have been inventoried and mapped by a qualified biologist or in consultation with a local or state fish and wildlife agency. Tree species, diameter at breast height distribution, canopy cover, understory conditions and limits of contiguous canopy cover are noted.<sup>19</sup> **E**

<sup>19</sup> Work with a qualified biologist or a local or state fish and wildlife agency to identify locally significant vegetation or habitat types.



## Standard U.8.4

**S W** Riparian habitat across the site is maintained, restored and unimpeded by structures or improvements and is contiguously connected to riparian habitat in adjoining parcels. **E**

#### Performance Requirements

- i. Development near riparian areas is avoided to the greatest extent operationally feasible. Specifically, for streams identified in Standard U.7.2 as either (1) fish-bearing, (2) potentially fish-bearing or (3) non-fish-bearing with a defined channel connected to a fish-bearing or potential fish-bearing stream, impacts on riparian functions affecting water quality, water quantity, floodplain condition, stream shading and contiguous riparian canopy connectivity shall be minimized within 200 feet of a stream or river channel migration zone or within the riparian protection areas cited in adopted local, regional or state plans, whichever distance is larger. If 100 percent avoidance of impacts to these riparian functions is not possible, the effect on riparian buffers is minimized and mitigated to offset the functional impacts.
- ii. Degraded riparian areas identified in U.8.1 in need of restoration are restored by re-vegetation, removal of existing structures or impervious surfaces or other methods.
- iii. Connectivity between riparian, wetland and upland habitats is maximized to the greatest extent operationally feasible. Life histories of identified local species are maintained by connecting riparian, wetland and upland habitats in a manner that supports habitat needs. Impediments to habitat connectivity, including fencing, buildings, or other barriers, are avoided.<sup>20</sup>
- iv. 100-year floodplain areas are avoided and not filled to the greatest extent operationally feasible. If impacts are unavoidable, floodplain volume mitigation requirements are met onsite. Consideration is made for providing additional floodplain storage should there be room available onsite.

## Standard U.8.5

**W** Impacts to wetland and their buffers are avoided to the greatest extent operationally feasible. If wetland impacts cannot be avoided, they are, in order of preference, protected, restored or recreated. The site plan strives to provide off-channel salmonid habitat, improved water quality, additional floodplain storage and/or other habitat benefits associated with proper wetland function. **E**

U.8.5 continues ➡

<sup>20</sup> Work with a qualified biologist or a local or state fish and wildlife agency to identify significant local species and their habitat requirements.

### Performance Requirements

- i. Degraded wetlands identified during Standard U.8.2 are restored, or new wetlands created to improve floodplain habitat, off-channel habitat and/or other wetland functions (e.g., habitat quality or water storage and infiltration), to the greatest extent operationally feasible.
- ii. Existing wetlands are avoided and protected from development or site improvements, to the greatest extent operationally feasible. If 100 percent avoidance is impossible, wetland loss is mitigated on site to the greatest extent operationally feasible in a way that contributes to overall site ecological and hydrological functions.
- iii. Development near wetlands is avoided to the greatest extent operationally feasible. Specifically, impacts on wetland functions affecting water quality, water quantity, floodplain condition and contiguous habitat connectivity shall be minimized within 100 feet of a wetland, or within the buffer protection areas cited in adopted local, regional or state plans, whichever distance is larger. If 100 percent avoidance of impacts to these wetland functions is not possible, the effect on wetlands and wetland buffers is minimized and mitigated to offset functional impacts.
- iv. Where existing wetland buffers are degraded, buffers are restored by revegetation or removal of existing detrimental structures or impervious surfaces. Buffers are managed to respond to needs of known local wetland fauna that require accessible adjacent or nearby upland habitat during their life histories.<sup>21</sup>
- v. Wetland habitats and their buffers are spatially connected by locally appropriate, contiguous native vegetation, to the greatest extent operationally feasible. These areas are also connected to other natural areas as part of a landscape-scale, conservation framework.<sup>22</sup>

## Standard U.8.6

**S** Riparian zones and their buffers specified in Performance Requirement U.8.4(i) are operating in a properly functioning condition.

### Performance Requirements

- i. Riparian zones are dominated by native vegetation that provide riparian functions of bank stability and shade. Invasive vegetation within the riparian area has been removed and replaced with native plantings.
- ii. Riparian buffers adequately infiltrate and/or filter site sheet flow runoff in consideration

U.8.5 continues ➡

<sup>21</sup> Work with a qualified biologist or a local or state fish and wildlife agency to identify needs of known local wetland species.

<sup>22</sup> Work with a qualified biologist or a local or state fish and wildlife agency to identify local wildlife corridors.



of steepness, substrate and degree of vegetation. Riparian plantings can assist in meeting this requirement.

- iii. Riparian buffers are protected in perpetuity by conservation easements through an existing local agency or land trust, are protected by local buffer zoning regulations or are owned and/or protected in perpetuity by the site management, as stipulated in the developments binding documents.

## Standard U.8.7

**W** Wetlands and their buffers specified in Performance Requirement U.8.5 (iii) are operating in a properly functioning condition. **E**

### Performance Requirements

- i. Wetlands are geomorphically and hydrologically similar to natural, well-functioning reference wetlands of similar types in the vicinity. Site and reference wetlands are similar in topography, pool and channel patterns, vegetation zones, depths of various zones, edge length to area ratio and other physical factors. Hydrologically, site and reference wetlands are similar in wetland hydroperiod (depth, frequency and duration of inundation).
- ii. Wetland habitats are dominated by native vegetation that provides wetland functions of bank stability, infiltration, nutrient absorption and habitat value for wildlife. Wetland types, whether emergent, scrub-shrub or forested, are characteristic of existing local wetland types identified and consistent with habitat needs for known local wetland species identified in Standard U.8.2. Invasive vegetation within the wetland area has been removed and replaced with native plantings.
- iii. Wetland buffers are designed to adequately infiltrate and/or filter site sheet flow based on steepness, substrate and degree of vegetation coverage. Buffer types and vegetation are consistent with the habitat needs of known local wetland species identified in Standard U.8.2.
- iv. Wetlands, their buffers and connecting habitats are protected in perpetuity by conservation easements through an existing local agency or land trust are protected by local buffer zoning regulations or are owned and/or protected in perpetuity by the site management, as stipulated in the developments binding documents.

## Standard U.8.8

**S W Sensitive natural resources are protected during construction.****Performance Requirements**

- i. Intensive construction activities with the potential to disturb sensitive wildlife occur outside the height of the terrestrial breeding season (typically May through July) to the greatest extent operationally feasible. This applies in particular to construction in or near locally significant habitats, known nesting locations and designated surface water buffer zones.
- ii. A tree protection plan has been developed with the aid of a certified arborist for use during construction. In addition to site-specific tree protection provisions, this plan should adhere to the following requirements:
  - Project work limits are clearly defined by a temporary construction fence, to protect tree drip lines and vegetation not-to-be disturbed.
  - Riparian areas, wetland areas, identified locally significant vegetation, and their corresponding buffers are marked and protected from construction encroachment through the use of construction fence and signage.
  - Pre-construction meetings are held onsite so that contractors understand project work limits and other construction restrictions.
  - Where necessary, disturbed native plants, woody substrate and soils are salvaged and reused on site to the greatest extent operationally feasible.

## Standard U.8.9

**S W** A post-construction inspection and maintenance plan has been adopted to ensure that riparian and wetland features are in a properly functioning condition and invasive species are controlled. **E**

**Performance Requirements**

- i. The plan lists activities to perform, provides an activity schedule and identifies responsible parties. Adaptive management triggers actions that respond to changes in performance.
- ii. The plan as a whole, or its elements therein, have been adopted into the development's agreements or other guiding documentation that formalizes the site management's responsibility to implement and enforce all aspects of the plan on both private property or common property managed for the public good.

## References

Ecology. 2019. *Stormwater Management Manual for Western Washington*. Washington State Department of Ecology. Available for download from the agency website: <https://apps.ecology.wa.gov/publications/SummaryPages/1910021.html>

Natural Resources Defense Council. 2021. *Petition Requesting That The Federal Emergency Management Agency Amend Its Regulations Implementing the National Flood Insurance Program*. Available for download at: <https://www.nrdc.org/resources/nrdc-asfpm-petition>

PSAT and WSU. 2005. *Low Impact Development: Technical Guidance Manual for Puget Sound*. Puget Sound Action Team and Washington State University Pierce County Extension. Available for download at: [https://www.psp.wa.gov/downloads/LID/LID\\_manual2005.pdf](https://www.psp.wa.gov/downloads/LID/LID_manual2005.pdf)

Salmon-Safe. 2005. *Salmon-Safe Certification Standards for Corporate and University Campuses, Draft 3.1*. Prepared by Peter Bahls, Northwest Watershed Institute, and Dan Kent, Salmon-Safe Inc.

U.S. Global Change Research Program. *National Climate Assessment*, 2014. Available for download from the organization website: <https://nca2014.globalchange.gov/report>

WDFW. 2003. *Design of Road Culverts for Fish Passage*. Washington Department of Fish and Wildlife. Available for download from the agency website: <https://wdfw.wa.gov/publications/00049>

## Glossary

**303(d) List.** Under the Clean Water Act (CWA), the 303(d) list is the list of waters (streams and lakes) identified as impaired for one or more pollutants and that do not meet one or more water quality standards. The CWA is administered by the U.S. Environmental Protection Agency, with authority often designated to a state agency for local implementation. In Oregon, the 303(d) list is maintained by the Oregon Department of Environmental Quality (Oregon DEQ). In Washington, the 303(d) list is maintained by the Washington Department of Ecology (Ecology).

**Bankfull width.** The average width of the stream when the flow is at the ordinary high water mark, generally considered the two year flow event and measured in the field as the stream channel below the line of perennial vegetation.

**Best management practices, or BMPs.** Schedules of activities, prohibitions of practices, maintenance procedures and structural or management measures that prevent or reduce the release of pollutants and other adverse impacts on the environment.

**Bioretention.** Bioretention facilities are vegetated depressions that provide stormwater treatment during the capture and infiltration of water runoff through a biofiltration soil medium. Runoff treatment is provided through physical, chemical and biological treatment processes as water comes into contact with soil, vegetation and media.

**Brownfield.** An urban site that has been previously developed.

**Campus.** A corporate or university campus consists of buildings in close proximity to each other with centralized support, amenities and other internal functions.

**Certification standards.** A set of specific guidelines or BMPs developed by Salmon-Safe for site developers, site designers and land managers with an interest in the development of urban sites in a manner that protects imperiled salmonid species and other associated aquatic and terrestrial habitat elements.

**Developed campus land.** Campus land that comprises part or all of a defined campus and is managed for moderate or intensive human uses, such as parking lots, sidewalks, sport fields, turf or gardens.

**Development stage.** In the context of these Certification Standards, five stages have been defined corresponding to the typical stages of the design and construction of an urban development project: (1) Project inventory and assessment; (2) Site planning; (3) Site design; (4) Site construction; and (5) Site maintenance and monitoring.

**Existing developments.** Existing Developments are those developments that have been already been constructed prior to evaluation for certification as a Salmon-Safe Certified urban development.

**Fish-bearing stream.** A stream that is known to provide habitat for fish during at least some portion of the year. Fish-bearing includes all species of fish to ensure that potential salmonid streams are not excluded because of current degraded conditions.



**Green roof.** A low-impact development stormwater technique consisting of soil media and vegetation that reduces impervious area associated with traditional roofing materials and promotes retention, evapotranspiration and treatment of rainwater on the vegetated roof surface.

**Greenfield.** A site that has not been developed previously.

**Infrastructure.** Constructed portions of a campus, such as roads, drainage structures, road crossings of streams, and parking lots. For certification purposes, infrastructure does not include buildings.

**Landscape design.** The established or planned landscaping features of a developed site, such as plant species, areas of mowed turfgrass, buffers along watercourses, areas of trees and shrubs.

**Large woody debris (LWD).** Wood that is naturally occurring or artificially placed in streams. LWD is essential to a healthy stream because it provides habitat diversity and protects against flooding. Many streams negatively affected by human use lack a necessary amount of LWD.

**LEED.** Leadership in Energy and Environmental Design. A green building rating system established by the United States Green Building Council (USGBC).

**Low impact development.** A stormwater management approach that seeks to mitigate the impacts of increased runoff and stormwater pollution using a set of planning, design and construction approaches and stormwater management practices that promote the use of natural systems for infiltration, evapotranspiration and reuse of rainwater and can occur at a wide range of landscape scales.

**Management category.** In the context of these Certification Standards, eight primary management categories have been defined to express the desired outcome of habitat conditions in a given project area:

- (1) Stormwater management;
- (2) Water use management (irrigation activities);
- (3) Erosion prevention and sediment control;
- (4) Water quality protecting in landscaping;
- (5) Enhancement of urban ecological function
- (6) Site climate resiliency planning
- (7) Instream habitat protection and restoration; and
- (8) Riparian, wetland and locally significant vegetation protection and restoration.

**National Wetlands Inventory (NWI).** A nationwide inventory and mapping database of wetland habitat maintained by the U.S. Fish and Wildlife Service.

**Natural area campus land.** Campus land that comprises part or all of a defined campus and is managed to protect and restore native vegetation and species or is in a de facto natural area status because it has not been designated for other uses.

**New development.** In the context of these Certification Standards, new development refers to newly planned and unbuilt urban developments that are anticipated but that have not been constructed.





**Performance requirement.** Specific, measurable criteria that represent the desired outcome for habitat conditions associated with a project. Performance requirements are a subset of their broader Certification Standards.

**Permeable pavement.** Permeable pavement is a walking or driving surface constructed of open-graded asphalt, porous concrete or pavers that allow rainfall to percolate into the underlying soil or aggregate storage reservoir beneath the pavement.

**Pesticide.** A general term for any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest; any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant; any nitrogen stabilizer.

**Planter.** A planter is a vegetated reservoir with structural walls that treat stormwater through processes similar to those of bioretention. A flow-through planter is lined to prevent infiltration of stormwater due to unsuitable soils or other site constraints.

**Potential fish-bearing stream.** A stream that either historically provided habitat, or could with adequate restoration, potentially provide habitat for fish, including salmonids.

**Review phase.** Salmon-Safe offers three opportunities for collaboration throughout the project planning and construction process, as defined by the following review phases:

Review Phase 1: *Site Assessment and Planning Review;*

Review Phase 2: *Review of Approved Plan Submittal;* and

Review Phase 3: *Salmon-Safe Certification of Constructed Urban Development.*

**Riparian habitat.** Characterized by vegetated areas along bodies of surface water, including streams, wetlands and lakes. Typically, riparian habitats are distinct from upland areas, demonstrating an obvious difference in vegetation types, density and structure.

**Salmon-Safe.** Salmon-Safe is an independent, nonprofit organization devoted to restoring agricultural and urban watersheds so that salmon can spawn and thrive. Founded as a project of Pacific Rivers, Salmon-Safe became an independent organization in 2002 and is based in Portland, Oregon.

**Science Team.** Urban development assessments are conducted by a team of two or three qualified, independent experts hired by Salmon-Safe. The Science Team is well versed in aquatic ecological science, development planning and design, as well as landscape management.

**Sustainable Sites Initiative.** The sustainable sites initiative is a certification program that requires new or redevelopment to evaluate their site in terms of ecosystem services and do the maximum amount feasible to support and regenerate those services.

**TMDL (Total Maximum Daily Load).** A calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards and an allocation of that amount to the pollutant's sources.



**Waterway buffer.** A corridor of land of a specified width adjacent to the stream or wetland edge in which there are special management restrictions to protect and restore aquatic habitats.

**Wetlands.** Areas that are inundated or saturated by ground or surface water at a frequency and duration sufficient to support hydric soils and vegetation typically adapted for life in hydric soil conditions. Wetlands are regulated at the federal, state and local levels.

## Appendix A

### Campus and Portfolio Approach for Certification of Multiple Sites

Developers and owners of campuses and multiple properties can exert additional control over strategies for future developments beyond the individual site scale. Interconnected urban projects may provide one another mutual benefits in a way that individual projects cannot, and thus offer additional pathways that continue existing Salmon-Safe Certification (Campus) as well as expanding the interconnections between adjacent individual project sites (Portfolio). Rather than every project having to meet every goal, there are opportunities during the certification process to acknowledge the unique characteristics of each project, while maintaining the maximum overall district-wide benefits.

This campus and portfolio-wide commitment represents a new approach for Salmon-Safe certification in highly urbanized environments and offers, in addition to improvements to aquatic habitat, the ability to promote broader, non-aquatic ecological functions important for urban wildlife such as birds, bats and pollinators. Even small patches of urban habitat can aid in species movement and provide temporary refuges for urban wildlife, while also benefiting district residents through access to nature and additional amenity zones.



**Option 1: Campus Approach** This approach provides a certification pathways for a campus or district scale, where one entity owns and operates an aggregation of elements adjacent to each other sharing a common use, such as a college, hospital or corporate campus. In this case, the boundary surrounds the entirety of the campus and metrics are included as a cumulative total rather than as a collection of sites. The shared ownership and usage results in opportunities for district-wide solutions, such as water reclamation, local waste treatment and district energy. The shared ownership offers maintenance continuity for IPM programs, or campus-wide irrigation controls, as well as connected habitat patches to increase urban ecological continuity and connectivity. In some cases, private streets and alleys can be included within the parcel.

**Option 2: Portfolio Approach** The second approach groups together individual sites that are located on separate parcels and that do not share a common use. This may be a multiple-block development happening concurrently, or projects developed within a community over



time and added as they are completed. In these cases, the individual sites can be certified as a group, with individual buildings documented and assessed as a group. While each building may be separate, the accumulation of multiple sites developed and certified allows for many of the same district opportunities for stormwater management (through a regional facility), water reuse (through a common storage location) and other opportunities (such as green roofs with habitat plantings providing stepping stones for birds and insects).

This approach is more appropriate as different sites may offer different types of opportunities and constraints, such as an office building not generating as much graywater, which would be supplemented by an adjacent residential or mixed use building. Another opportunity is a building where rainwater reuse within that building is not permitted, such as a healthcare facility providing water for reuse in an adjacent office building.

In all cases there is flexibility by the Science Team, owners and designers in determining appropriate pathways for these different approaches. Additional factors (extent of boundary, inclusion of rights-of-way, level of compliance for individual buildings versus sum of all sites in total) will be at the discretion of the team.

There are multiple potential scenarios to explore boundary options that maximize campus and district-level opportunities that may not exist on a single site. These approaches also provide additional opportunities for Salmon-Safe Developer Certification, which could provide streamlined certification of projects based on prequalification. Contact Salmon-Safe staff for more information on these approaches.

## Appendix B

## Urban Site Development Certification Process

## Planning



## Step 1 ► Planning

This preparation phase provides information for the design and management team and allows for communication about the project with Salmon-Safe.

## Activities include:

- site manager and design team review Salmon-Safe standards;
- introductory call with Salmon-Safe to review process and address questions;
- collect project documents including, at a minimum, the most current project drawings, drainage report, geotechnical report, completed stormwater management worksheet, and/or Phase I environmental report, if available, and forward to the Science Team for review;
- project team presents project approach to stormwater management to Salmon-Safe Science Team;
- Salmon-Safe provides a memo summarizing findings from the pre-assessment, including areas where the design is consistent with the standards as well as questions and recommendations for the project team; and
- schedule Science Team assessment.

## When?

**The best time to conduct a pre-assessment is upon issuance of the 50% DD set.**

The pre-assessment can usually be completed within a couple of weeks, depending on project size and complexity.

## Appendix B

Urban Site Development Certification Process, *continued*

## Assessment



## Step 2 ► Assessment

Salmon-Safe's independent Science Team convenes as project specifics are being developed and the project is obtaining the necessary permits, approvals, and entitlements.

**Activities include:****Project overview and orientation for the Science Team**

Project team members make presentations on their respective aspects of the project, including how the design was approached and arrived at, and how the design satisfies Salmon-Safe standards related to their disciplines. Specifically:

- the developer and/or site manager describes overall sustainability goals for the project;
- the architect walks through the architecture plans at a high level, describing the site context, site size, building size and height, and general program;
- the landscape architect walks through the landscape plans, describing all vegetated areas, including existing vegetation and habitat present, plant selection, and irrigation;
- the civil engineer provides a site-level overview of stormwater management. Civil engineer also should be prepared to describe any soil contamination and planned remediation, as well as any surface water bodies, their flow path, habitat quality, and fish presence, as appropriate; and
- the general contractor describes construction-phase pollution prevention practices to be employed, including details of any anticipated dewatering activities, while also providing a rough outline of the project schedule.

**Site inspection for the Science Team**

Development, design, and construction team members mentioned above lead the Science Team on a site walk and discuss any additional questions that arise in the field. The Salmon-Safe Science Team and staff will then convene for an internal debrief to gather and collate their observations.

**When?**

**If the project is pursuing fast-track certification, the full site assessment can happen at any time.** Alternatively, the Science Team will assess the site once construction has begun and ground disturbance activities are underway. Site assessments can take a few hours or a full day, depending on project size and complexity.

## Appendix B

Urban Site Development Certification Process, *continued*

## Certification of Project



## Step 3 ► Certification of Project

**This step provides a certification decision for the development project.**

**Activities include:**

- Science Team reviews any supplemental documentation that may have been requested during the Assessment Phase.
- Science Team delivers final Report/Recommendations for Certification;
- Salmon-Safe reviews Report with site manager;
- Salmon-Safe provides a certification letter for sign-off and collects documentation to address pre-conditions;
- certification is formalized and Salmon-Safe helps develop a communication strategy with site management, including award of the certification plaque; and
- annual verification reporting to Salmon-Safe regarding progress on all conditions.

### When?

**Once the Science Team receives all requested supplemental documentation, the Report can be issued within 4-6 weeks.** Formalization of certification (or the sign-off on the certification letter) can then happen as quickly as the project team desires. Once certification is formalized, the five-year certification cycle begins.





## Appendix C

# Certification for Existing Urban Development

### Certification of Existing Developments

Salmon-Safe offers a comprehensive assessment program for existing developments that focuses on current land management practices and commitment to reducing other water quality impacts over time. Salmon-Safe recognizes that longstanding infrastructure, particularly related to stormwater management, can degrade water quality and limit fish habitat. To be certified by Salmon-Safe, an existing urban development must demonstrate a dedication to long-term progress in addressing the impacts of existing infrastructure where feasible.

The team evaluates if an existing urban development complies with the Certification Standards by the following:

- Review of overall development and maintenance practices;
- Field assessment at the development, or a representative subsample of sites within the development; and
- Field assessment of representative restoration projects, or a subsample thereof (if applicable).

To obtain an understanding of the development, the evaluation team interviews grounds managers and inspects the drawings, summary reports and inventories required for certification (based on the standards in this document). Managers of the developments provide these documents. The list of required documents is presented in the Required Documentation for Existing Developments section, below. Because some management actions will not be evident to reviewers during the field assessment (such as pesticide application methods), landscape staff will accompany the evaluation team to describe recent management history. The more complete the documentation, the easier it will be to determine how the project meets the applicable standards for Salmon-Safe Certification.

The evaluation team uses all of the standards and related performance requirements to evaluate whether the development will be awarded certification. Following this evaluation, the team will provide a summary of recommendations based on the requirements listed below. At the discretion of the evaluation team, some of the listed standards may be met by providing a written agreement to comply with specific conditions or performance requirements on an agreed timeline.





The following general requirements for Salmon-Safe certification apply to existing developments:<sup>1</sup>

1. The development is not in violation of national, state, or local environmental laws or associated administrative rules or requirements.
2. Provisions are made for the identification and protection of rare, threatened and endangered salmonids or other listed species and their habitat on the development.
3. The existing development provides documentation identified in all sections that are marked with an **E**.
4. Site Planning and Site Design standards required of the existing development demarcated by an **E**, are required for all existing developments and must be implemented prior to certification.
5. The existing development conforms to all site maintenance and management standards and all performance requirements demarcated by an **E**.
6. As a prerequisite to certification, the Science Team may also require that the site management demonstrate commitment to implementing additional improvements or practices with regard to landscape design, stormwater management and/or infrastructure features that degrade salmon habitat. The nature of these required improvements will generally be consistent with one or more of the Urban Standards included in **Section U.1 (Stormwater Management)**, **U.2 (Water Use Management)** and **U. 5 (Enhancement of Urban Ecological Function)**. Demonstration of this commitment may include development of an explicit plan that defines which improvements must be implemented and by when. Salmon-Safe would negotiate with the site management to identify and implement these additional requirements.
7. A policy addressing new design projects and future development phases is in place. Any future improvements or future development phases associated with the existing development must be executed consistent with all of the Certification Standards and related performance requirements defined by Salmon-Safe, to the greatest extent technically feasible. For example, future development plans should include green and low-impact development (LID) designs. To evaluate conformance, the evaluation team will review design policy and a sample of new design projects in existing developments or plans for future phases of development.
8. Management allows monitoring by a third party authorized by Salmon-Safe and fully cooperates with such monitoring to the greatest extent technically feasible, given staffing and funding constraints. Under rare circumstances the evaluation team may request that the owner conduct limited monitoring where such monitoring is critically needed to assess the efficacy of existing maintenance practices in meeting Salmon-Safe standards.
9. Summary reporting is adequate to document compliance with Salmon-Safe standards. See below for a partial list of written summary reports, documents and data required for Salmon-Safe certification evaluation.

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<sup>1</sup>Existing developments must conform to all of the standards in the Certification Standards listed in the main document.



## Required Documentation for Existing Developments

Possible items required for evaluation are listed below. Based on the size of the proposed development and whether it has streams, wetlands and riparian zones, all of these submittals may not be required for smaller developments. See the Certification Standards and performance requirements for existing developments for additional documentation that may be required. The Science Team will work with the applicant to determine specifically which submittals will be required for a given development.

**PLEASE NOTE:** Requirements 5-10 apply only if stream, wetland or riparian habitat is present on the development site.

1. Summary report that provides an estimate of the types and condition of land cover, including the percent composition of impervious surface (pavement) on the development area, based on visual inspection of aerial photographs and field knowledge of the site. The report includes a summary of the total percent impervious estimate for both developed and natural areas of the development site. In addition, the report lists any special stormwater mitigation projects that have been completed, such as reduction in pavement, detention ponds or biofiltration swales.
2. An integrated pest management plan and nutrient management plan (see Appendix E for additional detail)
3. A summary report that assesses and identifies stormwater retrofit opportunities (Section U.1), water use management improvements and water use conservation enhancements (Section U.2), integrated pest management as specified in performance requirements (Section U.4) and enhancement of ecological function (Section U.5). A report is submitted to Salmon-Safe within one year presenting a plan and schedule for implementing technically feasible projects with regard to these objectives.
4. Summary reports on activities and findings for any monitoring conducted on the development site, such as irrigation and water use. Reports are also provided for any water quality and habitat monitoring projects that have been conducted, including stormwater runoff testing to help determine if over-fertilization (nitrogen) is occurring in high fertilizer use areas and if soils are completely stabilized following removal of erosion prevention and sediment control measures.
5. Annual summary report from periodic soil testing conducted to determine the need for fertilizer and lime use and to demonstrate trends in fertilizer and lime use on the development site. The report should include soil analysis reports, as well as factors responsible for the reported increase or decrease in fertilizer use and relation to soil testing.
6. Inventory and mapping of fish species distribution (existing and potential distribution of native salmonid species) and stream channel types on the property. At a minimum, these stream channel types shall include: (1) fish-bearing, (2) potential fish-bearing, and (3) non-fishbearing, but greater than two feet in bankfull width and connected to a fish-bearing stream. The channel inventory shall include a summary of existing habitat impacts by general type, such as locations of channelized streams, severely eroding banks and other parameters, for each development site.



7. Inventory and mapping of stream crossings within the development site to determine the need for fish passage and flood conveyance.
8. Inventory, mapping and description of riparian zones (of all stream types listed in 1, above) to summarize existing protected buffer widths, shade condition, general vegetation types (such as mowed grass or mature native trees) within the protected buffer and outside that area in the riparian zone and riparian restoration opportunities. Local jurisdiction inventory and mapping of riparian areas overlaid with the development area are generally sufficient to meet this requirement.
9. Inventory, mapping and assessment of wetlands. Inventory and mapping using NWI or local wetland inventory data is the minimum acceptable level of mapping. Wetland assessment will address types of impacts and whether the wetland historically or currently provides fish habitat.
10. Annual restoration project monitoring reports summarizing the results of monitoring according to the restoration monitoring policy established by the appropriate management authority.



## Appendix D

# IPM, Nutrient, and Chemical Management Plan Guidance

Salmon depend on clean water free from harmful levels of fertilizers (nutrients), pesticides (herbicides and insecticides, fungicides and other biocides), stormwater runoff pollutants and organic waste. These contaminants can travel long distances in stormwater runoff from an urban development to receiving waters. The principal methods to avoid contamination of salmon-bearing waters are to minimize overall inputs of these contaminants, restrict the type of inputs and develop an acceptable method of application through a comprehensive management program, such as an integrated pest management (IPM) plan. The appropriate managing partner for the urban development shall require that guiding O&M documents for each eligible phase of the project incorporate a Salmon-Safe approved IPM, nutrient and chemical management plan to ensure maintenance of Salmon-Safe practices over time.

### IPM Requirements within the Plan

An IPM plan or policies are developed to promote management practices that reduce the impact of, the unnecessary reliance upon, or eliminate the need for hazardous chemicals and pesticides. Hazardous chemicals and pesticide use on the development should not result in contamination of stormwater or streams with amounts of any chemical or pesticide harmful to salmon or aquatic ecosystems. These practices generally include careful monitoring and scouting of insects, weeds and disease; use of non-spray control methods (cultural practices and mechanical controls); use of reduced impact pesticide controls; and/or managing specific sites without the use of chemical or pesticides. In addition to the required elements of an IPM plan outlined in Appendix A, the IPM plan should comply with the following guidelines:

1. **Type of pesticides**—All use of pesticides within the development, including waterways, waterway buffers and uplands, is limited in an IPM program by pesticide product, active ingredient, application method, rate, frequency, location and amount. Managers and residents use only those pesticides that are on an approved list for the development (see Appendix E). These pesticides will only be used when there is no undue risk of harm to salmon and aquatic ecosystems. This limited use list is established and reviewed on an annual basis by development management to ensure that potential harm to salmon and aquatic ecosystems is minimized.
2. **Minimize aquatic impacts from high-hazard pesticides**—The use of any pesticides on the Salmon-Safe Cautionary List of High-Hazard Pesticides requires written explanation for each pesticide used that details the methods of use, including timing and location that demonstrate that the risk to aquatic systems is negligible (Appendix E: *Salmon-Safe High-Hazard Pesticide List*).
3. **Restricted use zones**—Pesticide use is specially managed within: (1) waterways; and (2) adjacent waterway buffer areas. For the purposes of pesticide application, the buffer zone is defined as a corridor of land that is 60 feet in width on each side of a stream or other body of water (no-development buffers may be wider). Measurement of this buffer zone begins at the edge of the water line at the time of application and is measured horizontally as if on a map. Anticipated seasonal or weather-related changes affecting water level will be included in the decision-making process when dealing with buffer zones.



4. **Pesticide treatment of trees**—Within riparian buffer zones, pesticides are used only on rare occasions for treating tree pests or diseases. Injection of pesticides within tree tissues or paintbrush application are the only application methods for trees allowed in riparian buffer zones.
5. **Application equipment**—Within riparian buffers, pesticide application for vegetation other than trees is done by hand and using low-volume, low-pressure, single-wand sprayers, wiping, daubing and painting equipment or injection systems. The methods used minimize fine mists and ensure that the applied materials reach targeted plants or targeted soils surfaces.
6. **Pesticide drift**—Great care is taken to ensure that pesticide drift does not reach nearby surface waters by using appropriate equipment and methods. Spray applications are not allowed in the buffer area when wind speed is above 5 mph or wind direction would carry pesticides toward open water. Also, no spraying is done during an inversion.
7. **IPM program**—Pesticide applicators, whether employees or contractors, are trained in the IPM plan and implement it fully.
8. **Pesticide applicator licensing**—All persons applying pesticides must be currently licensed as private pesticide applicators by the applicable state agency (Department of Agriculture). Licensed personnel must be specifically endorsed for any of the state-defined categories of pest management they undertake, such as aquatic endorsement for all aquatic pest management activities.
9. **Chemical and pesticide storage, rinsates and disposal**—The managing partner of the development has rigorous policies in place to ensure that no contamination of stormwater or streams occurs due to the storage, cleaning of equipment or disposal of chemicals and pesticides. These policies are adhered to by maintenance personnel, contractors and residents.
10. **Pesticide tracking system**—Detailed records are maintained for all pesticide applications on the part of the managing partner, including applications to aquatic areas and buffer zones, consistent with state requirements.
11. **Pesticide application timing**—Pesticides are not applied when it is raining (unless otherwise directed by label instructions) or when there is a potential for transport by runoff to stormwater drains or streams. Decisions regarding scheduling of pesticide applications should account for the expected impacts of anticipated storm events.

## Nutrient Management Requirements within the Plan

The potential for nutrient and lime use to contaminate stormwater and streams can be minimized through a program that uses alternative cultural and mechanical practices to maintain soil fertility, uses fertilizers with discretion based on soil fertility and plant needs, uses slow-reacting fertilizers and ensures proper application of fertilizer and lime in terms of amounts and timing. The nutrient management plan should comply with the following guidelines:

1. **Types of fertilizers**—Fertilizer types are tailored to the existing soil conditions and plant requirements. Slow release, organic fertilizers or compost are generally used. Fertilizers must be selected through a state-approved screening and approval process to ensure the fertilizer does not contain toxic contaminants. If soluble fertilizers are used, the timing and rate of application are carefully considered (see below).
2. **Fertilizer application amounts**—In general turf and shrub bed areas, soluble fertilizer rates of application are limited to no more than 0.5 lb N/1,000 square feet with restraints on timing to minimize fertilizer in stormwater runoff.
3. **Low fertilizer landscaping**—Plants with low-fertilizer requirements are used for landscaping to the greatest extent technically feasible.
4. **Focused use**—Fertilizer is used only on high- and moderate-intensity use areas, such as flower beds, ball fields, golf courses, some turf areas and planting beds, and some plantings associated with construction and restoration projects, if at all. Lime is used to adjust pH to minimize fertilizer use where suitable, in a manner that does not pose impacts to water quality.
5. **Buffer zone width**—Fertilizer and lime use is highly restricted within a waterway (riparian or wetland) buffer zone.
6. **Use within watercourse buffers**—Fertilizer use in buffer zones of waterways is restricted depending on the intensity of application and type of fertilizers. The allowable use of fertilizer also varies depending on whether it is being used for routine maintenance or for restoration and construction projects.
7. **Soil testing**—Periodic soil testing is used to determine the need for fertilizer (phosphorus and potassium), compost and lime relative to appropriate benchmarks established by the development managing partner. Testing is conducted a minimum of twice per year and prior to fertilizer application.
8. **Soil fertility**—Practices such as on-site mulching of leaf and grass clippings are used to reduce the need for fertilizer.
9. **A summary report of annual fertilizer use** is provided that shows a stable or declining trend in synthetic fertilizer use development-wide, taking into account the changes in acreage managed, specific uses, and other relevant factors.

## Other Contaminant Management within the Plan

Other contaminants, such as animal and chemical waste, should not contaminate stormwater or streams leaving the urban development. Recognizing that the managing partner may have a limited ability to control residents, the public and actions of other agencies, the project should comply with the following guidelines:

- i. **Chemical use control**—Eliminate or minimize the use of chemicals commonly used to maintain urban infrastructure that may cause undue risk of harm to salmon and aquatic species. Evaluate various solvents, deicers, sealants, etc., to choose the least toxic or harmful product to aquatic ecosystems without compromising the health, safety and welfare of the human environment.
- ii. **Animal waste control**—The development managing partner fosters management and education policies regarding dog or other domestic animal waste control that are effective in minimizing the contamination of stormwater or streams.
- iii. **Wildlife waste control program (geese, ducks)**—If necessary, and the greatest extent technically feasible, a management program is implemented to ensure that duck and goose waste does not contaminate stormwater or streams.

## Appendix E

## Salmon-Safe's List of High Hazard Pesticides

## Salmon-Safe Urban High Hazard List of Pesticides (UHHL)

High hazard pesticides are a serious threat to salmon and other aquatic life. Pesticide formulations can also contain other ingredients that are potentially more toxic than the active ingredients, such as non-ionic surfactants. In addition to killing fish, high hazard pesticides at sublethal concentrations can stress juveniles, alter swimming ability, interrupt schooling behavior, cause salmon to seek suboptimal water temperatures, inhibit seaward migration and delay spawning. All of these behavioral changes ultimately affect survival rates.

The table below lists many of the pesticides known to cause problems for salmon and other aquatic life. Use this list to identify pesticides that require special consideration.

*Note: This table lists only some of the currently available and commonly used pesticides.*

SALMON-SAFE URBAN HIGH HAZARD LIST OF PESTICIDES			
Insecticides / Miticides			
abamectin	chlorpyrifos <sup>1,2</sup> (2)	imidacloprid <sup>2</sup>	prallethrin <sup>1,2</sup>
acetamiprid	cyfluthrin <sup>1,2</sup>	indoxacarb <sup>2</sup>	spinosad <sup>2</sup>
alpha-cypermethrin <sup>1</sup>	cypermethrin <sup>1,2</sup>	lamda-cyhalothrin <sup>1,2</sup>	spiromesifen <sup>1</sup>
bifenthrin <sup>1,2</sup>	deltamethrin <sup>1,2</sup>	malathion <sup>1,2</sup> (1)	tralomethrin <sup>1</sup>
carbaryl <sup>2</sup> (2)	esfenvalerate <sup>1,2</sup>	naled <sup>1</sup> (3)	zeta-cypermethrin <sup>1</sup>
chlorantraniliprole <sup>2</sup>	etofenprox <sup>1</sup>	novaluron	
chlorfenapyr <sup>1,2</sup>	fipronil <sup>1,2</sup>	permethrin <sup>1,2</sup>	
Fungicides			
acequinocyl	cyazofamid	folpet	thiram
azoxystrobin <sup>2</sup>	cyprodinil	pentachlorophenol (PCP) wood treatment	trifloxystrobin <sup>1</sup>
captan (4)	difenoconazole	propiconazole <sup>2</sup>	
chlorothalonil <sup>1,2</sup> (4)	fluazinam <sup>1</sup>	pyraclostrobin <sup>1,2</sup>	
copper <sup>1,2</sup>	fludioxanil <sup>2</sup>	thiophanate methyl	
Herbicides			
2,4-D <sup>2</sup> (4)	dithiopyr <sup>2</sup>	linuron <sup>2</sup> (4)	prodiamine
atrazine <sup>2</sup>	diuron <sup>2</sup> (4)	oxadiazon <sup>2</sup>	triclopyr BEE <sup>2</sup> (4)
benefin	diquat dibromide <sup>2</sup>	oxyfluorfen <sup>2</sup>	trifluralin <sup>2</sup> (5)
diclofop-methyl	flumioxazin <sup>2</sup>	pendimethalin <sup>2</sup> (5)	
<p>Very Highly Acutely Toxic and/or Highly Acutely Toxic<sup>1</sup> to fish and/or aquatic invertebrates. Based on EPA's Aquatic Life Benchmarks<sup>2</sup>.</p> <p>Pesticide names followed by a number in parentheses indicates the specific NOAA /NMFS Biological Opinion where it was assessed for jeopardy and/or habitat destruction/modification to endangered salmonids in accordance with the Endangered Species Act (<a href="https://www.epa.gov/endangered-species">https://www.epa.gov/endangered-species</a>) regarding the 37 pesticides listed in the Washington Toxics Coalition (WTC) court settlement. Completed BiOps listed below<sup>3</sup>.</p> <p>* Active ingredients being Very Highly Acutely Toxic (LC50 or EC50 &lt;100 ug/L) to BOTH fish and aquatic invertebrates</p> <p>+ Active ingredients determined to generally have very high potential for risk of off target movement through surface runoff, based on the pesticide's adsorption to soil/sediment and it's field dissipation half-life (persistence) <a href="http://ccpestmanagement.ucanr.edu/files/237465.pdf">http://ccpestmanagement.ucanr.edu/files/237465.pdf</a></p>			





## Salmon-Safe Urban High Hazard List of Pesticides | List and Table References with Additional Notes

1. US EPA Toxicity Classification	Acute Aquatic LC50 or EC50 (ug/L)
Practically Nontoxic	> 100,000
Slightly Nontoxic	> 10,000; ≤ 100,000
Moderately Toxic	> 1,000; ≤ 10,000
<b>Highly Toxic</b>	<b>&gt; =100; ≤ 1,000</b>
<b>Very Highly Toxic</b>	<b>&lt; 100</b>

**These ratings are based on acute toxicity and do not account for chronic and/or possible sub-lethal effects:**

- Fish acute toxicity is generally the lowest 96-hour LC50 or EC50 in a standardized test, commonly using rainbow trout, fathead minnow or bluegill.
- Acute invertebrate toxicity values are usually the lowest 48 or 96-hour LC50 or EC50 in a standardized test commonly using midge, scud or daphnia.

2. Both EPA-established acute and chronic aquatic benchmarks are available on the EPA website:

<https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/aquatic-life-benchmarks-pesticide-registration>

In addition to inherent toxicity, the overall assessment of the risk of a specific pesticide to aquatic water quality should consider a number of other factors: Pesticide Properties (e.g., water solubility, soil adsorption, half-life), Environmental Properties (e.g., soil makeup, climate) and Management Practices (e.g., application methods, use rate, irrigation, no-till). These properties and their possible interactions are discussed in detail in the following UC publications: <https://anrcatalog.ucanr.edu/pdf/8119.pdf> and <http://ccpestmanagement.ucanr.edu/files/237465.pdf>

The 28 Threatened or Endangered species listed in the Biological Opinions (BiOps) are described as Evolutionarily Significant Units (ESU) and are species, location/habitat and temporally specific. For example, Chinook salmon are assessed as 9 separate ESU's in the BiOps: (1) Chinook salmon (Puget Sound); (2) Chinook salmon (Lower Columbia River); (3) Chinook salmon (Upper Columbia River Spring-run); (4) Chinook salmon (Snake River Fall-run); (5) Chinook salmon (Snake River Spring/Summer-run); (6) Chinook salmon (Upper Willamette River); (7) Chinook salmon (California Coastal); (8) Chinook salmon (Central Valley Spring-run); and (9) Chinook salmon (Sacramento River Winter-run).

Refer to the Biological Opinions for a detailed list and description of each ESU and their geographic range

<https://www.fisheries.noaa.gov/national/consultations/pesticide-consultations>

Refer to the NOAA/NMFS Biological Opinion Schedule on the NOAA Fisheries website

<https://www.fisheries.noaa.gov/national/endangered-species-conservation/pesticide-consultations-summary-and-schedule>

## Variances and Variance Requests

Urban sites or projects using any of the pesticides indicated as “High Hazard” may be certified only if written documentation is provided that demonstrates a clear need for use of the pesticide, that no safer alternatives exist and that the method of application (such as timing, location and amount used) represents a negligible hazard to water quality and fish habitat. All variances must be approved in advance by Salmon-Safe.

For more information about the variance process, or to request a variance form, please contact Salmon-Safe at [info@salmonsafe.org](mailto:info@salmonsafe.org).



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## Appendix F

### Model Stormwater Management Guidelines for Campus New Development and Redevelopment



## MODEL STORMWATER MANAGEMENT GUIDELINES FOR CAMPUS NEW DEVELOPMENT AND REDEVELOPMENT

MAY 2018

### Introduction

Polluted stormwater is the largest threat to the health of the Pacific Northwest's urban watersheds. Pollutants targeted by Salmon-Safe's urban initiative such as heavy metals, petroleum products, pesticide runoff and construction sediment have an adverse impact on watersheds and severely compromise downstream marine health. With the goal of inspiring design that has a positive impact in our watersheds, Salmon-Safe offers stormwater design guidance for educational and commercial campuses and residential communities.

Development of these projects usually converts formerly forested or agricultural land to buildings, roads, parking lots and other impervious surfaces, plus landscaped areas with soils often compacted and missing much of the original topsoil. The result is a hydrologic environment with surface runoff replacing much of the soil infiltration and evapotranspiration that occurred under the predevelopment conditions. Vehicles, landscaping care, other site maintenance and domestic animals deposit contaminants like heavy metals, oils and other petroleum derivatives, pesticides, fertilizers (nutrients) and bacteria. These pollutants wash off of the surfaces with the stormwater runoff and drain into the piping typically installed to convey water away rapidly.

If the development discharges to a stream, either directly or via a storm sewer leading to one, the excess surface runoff compared to predevelopment conditions increases the magnitude and frequency of stream peak flows and lengthens the durations of high flows. These flow regime alterations degrade stream habitat by eroding the channel bed and banks, scouring spawning gravels and removing stream structures. Higher flows, extending longer, also directly impact salmon through the stress associated with functioning in higher velocities, impeding migration and sweeping away organisms that serve as food sources.

Many of the pollutants conveyed by stormwater runoff are toxic to salmon and their invertebrate food sources. The toxicity of heavy metals, such as copper and zinc, to aquatic life has been well studied. However, salmon face many more potentially toxic pollutants in both their freshwater and saltwater life stages. These contaminants include other heavy metals, petroleum products, combustion by-products and industrial, commercial and household chemicals. Emerging science from NOAA Fisheries shows that these agents collectively create both lethal and non-lethal impacts, the latter negatively affecting salmon life-sustaining functions to the detriment of their migration, reproduction, feeding, growth and avoidance of predators.

If the development discharges to a combined sanitary-storm sewer system, the large stormwater runoff volumes can exceed the capacity of the wastewater



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treatment plant at the end of the line in some storms. In that case flows beyond capacity are directed to overflow points, resulting in releases of untreated, mixed sewage and stormwater to a water body.

Despite these challenges, an array of options exists to reduce, or even in the utmost application, eliminate the negative impacts of campus and residential developments stemming from the large quantities of contaminated stormwater runoff potentially generated there. New phases of development and redevelopment of existing facilities offer opportunity to apply these options. This management category addresses practices to control campus and residential stormwater runoff to reduce both water quantity and water quality impacts with the following goal.

## Goal

Any development or redevelopment project with a footprint that exceeds 5,000 square feet shall use low-impact site planning, design and operational strategies<sup>1</sup> for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the water quality, rate, volume and duration of flow.

## Objectives

### 1. Prime objective

Implement low-impact practices, especially runoff retention<sup>2</sup> practices, addressing both water quantity and water quality control to the maximum extent technically feasible in developing and redeveloping campus and residential community parcels to achieve the stated goal of restoring the predevelopment hydrology. Provide documentation of how the objective will be achieved. If full achievement of the goal is technically infeasible, assemble documentation demonstrating why it is not and proceed to consider Objective 2A and/or 2B, as appropriate to the site.

### 2. Alternative objectives

Assess if achieving Objective 1 is documented to be technically infeasible.

**2A Alternative water quantity control objective when the site discharges to a stream or combined sanitary-storm sewer**—Start with the low-impact practices identified in the assessment pursuant to Objective 1. To the extent that they cannot prevent the generation of stormwater runoff peak flow rates and volumes greater than in the predeveloped condition,<sup>3,4</sup> implement effective alternative measures to diminish and/or slow the release

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<sup>1</sup> Collectively termed “low-impact practices” in the following points.

<sup>2</sup> Retention means keeping runoff from flowing off the site on the surface by preventing its generation in the first place, capturing it for a water supply purpose, releasing it via infiltration to the soil or evapotranspiration to the atmosphere, or some combination of these mechanisms.

<sup>3</sup> A predeveloped condition is the natural state of the site as it typically would be for the area prior to any modification of vegetation or soil.

<sup>4</sup> As determined through hydrologic modeling of the previously developed and modified conditions.



of runoff to the maximum extent technically feasible, with the minimum objective of complying with the regulatory requirements for water quantity control applying to the location.<sup>5</sup> If the site is exempt from a standard flow control requirement, the minimum objective shall be reducing the quantity discharged below the amount released in the immediately preceding condition.<sup>6</sup>

- 2B Alternative water quality control objective when the site discharges to a water body or a separate storm sewer leading to a water body**—Start with the low-impact practices identified in the assessment pursuant to Objective 1. To the extent that they cannot prevent the generation of stormwater runoff containing pollutants, implement alternative effective measures to reduce contaminants in stormwater to the maximum extent technically feasible, with the minimum objective of complying with the regulatory requirements for water quality control applying to the location.<sup>7</sup>

## Plan Elements

- 1. Inventory and analysis**—Narrative, mapping, data and quantitative results that summarize: (1) site land uses and land covers in the newly developed or redeveloped condition and the immediately preceding condition; (2) results of hydrologic modeling of the undeveloped, preceding and modified conditions, as the basis for pursuing quantity control objectives; and (3) stormwater drainage sub-basins, conveyance routes and locations of receiving stormwater drains and natural water bodies in the modified state.
- 2. Low-impact practices**—Low-impact practices are systematic methods intended to reduce the quantity of stormwater runoff produced and improve the quality of the remaining runoff by controlling pollutants at their sources, collecting precipitation and putting it to a beneficial use, and utilizing or mimicking the hydrologic functioning of natural vegetation and soil in designing drainage systems.

The following low-impact practices are particularly relevant to campus and residential sites:

- source control practices
  - ✓ minimizing pollutant introduction by building materials (especially zinc- and copper-bearing) and activities conducted on the site
  - ✓ isolating pollutants from contact with rainfall or runoff by segregating, covering, containing and/or enclosing pollutant-generating materials, wastes and activities
  - ✓ conserving water to reduce non-stormwater discharges

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<sup>5</sup> Specified for discharges to Western Washington streams by the Washington Department of Ecology's Stormwater Management Manual for Western Washington, Minimum Technical Requirement #7; specified for discharges to combined sewers by the municipal jurisdiction.

<sup>6</sup> As determined through hydrologic modeling of the previously developed and modified conditions.

<sup>7</sup> In Western Washington, specified by the Washington Department of Ecology's Stormwater Management Manual for Western Washington, Minimum Technical Requirement #6, which is equivalent to the City of Seattle's SMC, Section 22.805.090.B.1.a.



- conserving natural areas including existing trees, other vegetation and soils
- minimizing soil excavation and compaction and vegetation disturbance
- minimizing structure footprints
- constructing streets, driveways, sidewalks and uncovered parking lot aisles to the minimum widths necessary, provided that public safety and a walkable environment for pedestrians are not compromised
- harvesting precipitation and putting it to a use such as irrigation, toilet flushing, vehicle or surface washing, or cooling system make-up water
- constructing low-traffic areas with permeable surfaces such as porous asphalt, open-graded Portland cement concrete, coarse granular materials, concrete or plastic unit pavers, and plastic grid systems (Areas particularly suited for permeable surfaces are low-traffic streets, driveways, walkways and sidewalks, alleys and overflow or otherwise lightly-used uncovered parking lots not subject to much leaf fall or other deposition.)
- draining runoff from roofs, pavements other impervious surfaces, and landscaped areas into one or more of the following green stormwater infrastructure (GSI) systems:
  - ✓ infiltration basin
  - ✓ bioretention area\* (also known as a rain garden)<sup>8</sup>
  - ✓ planter box\*, tree pit\* (bioretention areas on a relatively small scale)
  - ✓ vegetated swale<sup>9</sup>\*
  - ✓ vegetated filter strip\*
  - ✓ infiltration trench
  - ✓ roof downspout dispersion system
  - ✓ green roof

\* signifies compost-amended soils as needed to maximize soil storage and infiltration
- maintaining natural drainage patterns (e.g., depressions, natural swales) as much as possible, and designing drainage paths to increase the time before runoff leaves the site by—
  - ✓ emphasizing sheet instead of concentrated flow
  - ✓ increasing the number and lengths of flow paths
  - ✓ maximizing non-hardened drainage conveyances
  - ✓ maximizing vegetation in areas that generate and convey runoff

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<sup>8,9</sup> Preferably with an open bottom for the fullest infiltration, but with a liner and underdrain if the opportunity for deep infiltration is highly limited or prohibited for some specific reason, e.g., bedrock or seasonal high-water table near the surface, very restrictive soil (e.g., clay, silty clay) that cannot be adequately amended to permit effective infiltration, non-remediable contamination below ground in the percolating water pathway.



3. **Alternatives**—When on-site low-impact practices alone cannot achieve Objectives 2A and/or 2B, implement one or more of the following strategies to meet at least the minimum water quantity and quality control objectives stated above:

- **For runoff quantity and/or quality control**—
  - ✓ contribute materially to a neighborhood project using low-impact practices and serving the stormwater control needs of multiple properties in the same receiving water drainage basin, with the contribution commensurate with the shortfall in meeting objectives on the site itself.
  - ✓ implement low-impact practices on-site to manage the quantity and quality of stormwater generated in a location off the campus or residential site but in the same receiving water drainage basin, with the scope of the project commensurate with the shortfall in meeting objectives using practices applied to stormwater generated by the site itself.
- **For runoff quantity control**—install a pond, vault or tank<sup>10</sup> to store water for delayed release after storms to help avoid high flows damaging to a stream or contributing to combined sewer overflows.
- **For runoff quality control**—install a stormwater treatment system suitable for a campus or residential site:
  - ✓ treatment pond;
  - ✓ treatment wetland
  - ✓ conventional swale
  - ✓ conventional filter strip
  - ✓ basic sand filtration
  - ✓ chitosan-enhanced sand filtration<sup>11</sup>
  - ✓ advanced media filtration coupled with ion exchange and/or carbon adsorption<sup>12</sup>

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<sup>10</sup> While useful for runoff quantity control, passive vaults, tanks and ponds not specifically designed for treatment provide very little water quality benefit.

<sup>11,12</sup> The most effective candidate treatment systems now available are chitosan-enhanced sand filtration and advanced media filtration coupled with ion exchange and/or carbon adsorption. These devices are, however, more appropriate for industrial sites than campuses or residential communities.



## Considerations for Salmon-Safe Certification

Fulfilling the stormwater component of the Salmon-Safe certification process requires submission of documentation of how Objective 1 will be achieved based on the inventory and analysis conducted for the site. On the other hand, if Objective 1 has been judged to be unachievable, pursuing certification requires documentation establishing the technical infeasibility of doing so. Relevant documentation includes, but is not necessarily limited to, site data, calculations, modeling results and qualitative reasoning. If achieving Objective 1 is demonstrably technically infeasible, the certification process then requires similar documentation of how Objectives 2A and/or 2B, as appropriate to the site, will be achieved.

Prepared for Salmon-Safe Inc. by Dr. Richard Horner, et. al.





## Appendix G

### Model Stormwater Management Guidelines for Residential New Development and Redevelopment



## MODEL STORMWATER MANAGEMENT GUIDELINES FOR RESIDENTIAL NEW DEVELOPMENT AND REDEVELOPMENT

MAY 2018

### Introduction

Polluted stormwater is the largest threat to the health of the Pacific Northwest's urban watersheds. Pollutants targeted by Salmon-Safe's urban initiative such as heavy metals, petroleum products, pesticide runoff and construction sediment have an adverse impact on watersheds and severely compromise downstream marine health. With the goal of inspiring design that has a positive impact in our watersheds, Salmon-Safe offers stormwater design guidance for educational and commercial campuses and residential communities.

Development of these projects usually converts formerly forested or agricultural land to buildings, roads, parking lots and other impervious surfaces, plus landscaped areas with soils often compacted and missing much of the original topsoil. The result is a hydrologic environment with surface runoff replacing much of the soil infiltration and evapotranspiration that occurred under the predevelopment conditions. Vehicles, landscaping care, other site maintenance and domestic animals deposit contaminants like heavy metals, oils and other petroleum derivatives, pesticides, fertilizers (nutrients) and bacteria. These pollutants wash off of the surfaces with the stormwater runoff and drain into the piping typically installed to convey water away rapidly.

If the development discharges to a stream, either directly or via a storm sewer leading to one, the excess surface runoff compared to predevelopment conditions increases the magnitude and frequency of stream peak flows and lengthens the durations of high flows. These flow regime alterations degrade stream habitat by eroding the channel bed and banks, scouring spawning gravels and removing stream structures. Higher flows, extending longer, also directly impact salmon through the stress associated with functioning in higher velocities, impeding migration and sweeping away organisms that serve as food sources.

Many of the pollutants conveyed by stormwater runoff are toxic to salmon and their invertebrate food sources. The toxicity of heavy metals, such as copper and zinc, to aquatic life has been well studied. However, salmon face many more potentially toxic pollutants in both their freshwater and saltwater life stages. These contaminants include other heavy metals, petroleum products, combustion by-products and industrial, commercial and household chemicals. Emerging science from NOAA Fisheries shows that these agents collectively create both lethal and non-lethal impacts, the latter negatively affecting salmon life-sustaining functions to the detriment of their migration, reproduction, feeding, growth and avoidance of predators.

If the development discharges to a combined sanitary-storm sewer system, the large stormwater runoff volumes can exceed the capacity of the wastewater



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treatment plant at the end of the line in some storms. In that case flows beyond capacity are directed to overflow points, resulting in releases of untreated, mixed sewage and stormwater to a water body.

Despite these challenges, an array of options exists to reduce, or even in the utmost application, eliminate the negative impacts of campus and residential developments stemming from the large quantities of contaminated stormwater runoff potentially generated there. New phases of development and redevelopment of existing facilities offer opportunity to apply these options. This management category addresses practices to control campus and residential stormwater runoff to reduce both water quantity and water quality impacts with the following goal.

## Goal

Any development or redevelopment project with a footprint that exceeds 5,000 square feet shall use low-impact site planning, design and operational strategies<sup>1</sup> for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the water quality, rate, volume and duration of flow.

## Objectives

### 1. Prime objective

Implement low-impact practices, especially runoff retention<sup>2</sup> practices, addressing both water quantity and water quality control to the maximum extent technically feasible in developing and redeveloping campus and residential community parcels to achieve the stated goal of restoring the predevelopment hydrology. Provide documentation of how the objective will be achieved. If full achievement of the goal is technically infeasible, assemble documentation demonstrating why it is not and proceed to consider Objective 2A and/or 2B, as appropriate to the site.

### 2. Alternative objectives

Assess if achieving Objective 1 is documented to be technically infeasible.

**2A Alternative water quantity control objective when the site discharges to a stream or combined sanitary-storm sewer**—Start with the low-impact practices identified in the assessment pursuant to Objective 1. To the extent that they cannot prevent the generation of stormwater runoff peak flow rates and volumes greater than in the predeveloped condition,<sup>3,4</sup> implement effective alternative measures to diminish and/or slow the release

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<sup>1</sup> Collectively termed “low-impact practices” in the following points.

<sup>2</sup> Retention means keeping runoff from flowing off the site on the surface by preventing its generation in the first place, capturing it for a water supply purpose, releasing it via infiltration to the soil or evapotranspiration to the atmosphere, or some combination of these mechanisms.

<sup>3</sup> A predeveloped condition is the natural state of the site as it typically would be for the area prior to any modification of vegetation or soil.

<sup>4</sup> As determined through hydrologic modeling of the previously developed and modified conditions.



of runoff to the maximum extent technically feasible, with the minimum objective of complying with the regulatory requirements for water quantity control applying to the location.<sup>5</sup> If the site is exempt from a standard flow control requirement, the minimum objective shall be reducing the quantity discharged below the amount released in the immediately preceding condition.<sup>6</sup>

**2B Alternative water quality control objective when the site discharges to a water body or a separate storm sewer leading to a water body**—Start with the low-impact practices identified in the assessment pursuant to Objective 1. To the extent that they cannot prevent the generation of stormwater runoff containing pollutants, implement alternative effective measures to reduce contaminants in stormwater to the maximum extent technically feasible, with the minimum objective of complying with the regulatory requirements for water quality control applying to the location.<sup>7</sup>

## Plan Elements

- 1. Inventory and analysis**—Narrative, mapping, data and quantitative results that summarize: (1) site land uses and land covers in the newly developed or redeveloped condition and the immediately preceding condition; (2) results of hydrologic modeling of the undeveloped, preceding and modified conditions, as the basis for pursuing quantity control objectives; and (3) stormwater drainage sub-basins, conveyance routes and locations of receiving stormwater drains and natural water bodies in the modified state.
- 2. Low-impact practices**—Low-impact practices are systematic methods intended to reduce the quantity of stormwater runoff produced and improve the quality of the remaining runoff by controlling pollutants at their sources, collecting precipitation and putting it to a beneficial use, and utilizing or mimicking the hydrologic functioning of natural vegetation and soil in designing drainage systems.

The following low-impact practices are particularly relevant to campus and residential sites:

- source control practices
  - ✓ minimizing pollutant introduction by building materials (especially zinc- and copper-bearing) and activities conducted on the site
  - ✓ isolating pollutants from contact with rainfall or runoff by segregating, covering, containing and/or enclosing pollutant-generating materials, wastes and activities
  - ✓ conserving water to reduce non-stormwater discharges

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<sup>5</sup> Specified for discharges to Western Washington streams by the Washington Department of Ecology's Stormwater Management Manual for Western Washington, Minimum Technical Requirement #7; specified for discharges to combined sewers by the municipal jurisdiction.

<sup>6</sup> As determined through hydrologic modeling of the previously developed and modified conditions.

<sup>7</sup> In Western Washington, specified by the Washington Department of Ecology's Stormwater Management Manual for Western Washington, Minimum Technical Requirement #6, which is equivalent to the City of Seattle's SMC, Section 22.805.090.B.1.a.



- conserving natural areas including existing trees, other vegetation and soils
- minimizing soil excavation and compaction and vegetation disturbance
- minimizing structure footprints
- constructing streets, driveways, sidewalks and uncovered parking lot aisles to the minimum widths necessary, provided that public safety and a walkable environment for pedestrians are not compromised
- harvesting precipitation and putting it to a use such as irrigation, toilet flushing, vehicle or surface washing, or cooling system make-up water
- constructing low-traffic areas with permeable surfaces such as porous asphalt, open-graded Portland cement concrete, coarse granular materials, concrete or plastic unit pavers, and plastic grid systems (Areas particularly suited for permeable surfaces are low-traffic streets, driveways, walkways and sidewalks, alleys and overflow or otherwise lightly-used uncovered parking lots not subject to much leaf fall or other deposition.)
- draining runoff from roofs, pavements other impervious surfaces, and landscaped areas into one or more of the following green stormwater infrastructure (GSI) systems:
  - ✓ infiltration basin
  - ✓ bioretention area\* (also known as a rain garden)<sup>8</sup>
  - ✓ planter box\*, tree pit\* (bioretention areas on a relatively small scale)
  - ✓ vegetated swale<sup>9</sup>\*
  - ✓ vegetated filter strip\*
  - ✓ infiltration trench
  - ✓ roof downspout dispersion system
  - ✓ green roof

*\* signifies compost-amended soils as needed to maximize soil storage and infiltration*
- maintaining natural drainage patterns (e.g., depressions, natural swales) as much as possible, and designing drainage paths to increase the time before runoff leaves the site by—
  - ✓ emphasizing sheet instead of concentrated flow
  - ✓ increasing the number and lengths of flow paths
  - ✓ maximizing non-hardened drainage conveyances
  - ✓ maximizing vegetation in areas that generate and convey runoff

---

<sup>8,9</sup> Preferably with an open bottom for the fullest infiltration, but with a liner and underdrain if the opportunity for deep infiltration is highly limited or prohibited for some specific reason, e.g., bedrock or seasonal high-water table near the surface, very restrictive soil (e.g., clay, silty clay) that cannot be adequately amended to permit effective infiltration, non-remediable contamination below ground in the percolating water pathway.



3. **Alternatives**—When on-site low-impact practices alone cannot achieve Objectives 2A and/or 2B, implement one or more of the following strategies to meet at least the minimum water quantity and quality control objectives stated above:

- **For runoff quantity and/or quality control**—
  - ✓ contribute materially to a neighborhood project using low-impact practices and serving the stormwater control needs of multiple properties in the same receiving water drainage basin, with the contribution commensurate with the shortfall in meeting objectives on the site itself.
  - ✓ implement low-impact practices on-site to manage the quantity and quality of stormwater generated in a location off the campus or residential site but in the same receiving water drainage basin, with the scope of the project commensurate with the shortfall in meeting objectives using practices applied to stormwater generated by the site itself.
- **For runoff quantity control**—install a pond, vault or tank<sup>10</sup> to store water for delayed release after storms to help avoid high flows damaging to a stream or contributing to combined sewer overflows.
- **For runoff quality control**—install a stormwater treatment system suitable for a campus or residential site:
  - ✓ treatment pond;
  - ✓ treatment wetland
  - ✓ conventional swale
  - ✓ conventional filter strip
  - ✓ basic sand filtration
  - ✓ chitosan-enhanced sand filtration<sup>11</sup>
  - ✓ advanced media filtration coupled with ion exchange and/or carbon adsorption<sup>12</sup>

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<sup>10</sup> While useful for runoff quantity control, passive vaults, tanks and ponds not specifically designed for treatment provide very little water quality benefit.

<sup>11,12</sup> The most effective candidate treatment systems now available are chitosan-enhanced sand filtration and advanced media filtration coupled with ion exchange and/or carbon adsorption. These devices are, however, more appropriate for industrial sites than campuses or residential communities.



## Considerations for Salmon-Safe Certification

Fulfilling the stormwater component of the Salmon-Safe certification process requires submission of documentation of how Objective 1 will be achieved based on the inventory and analysis conducted for the site. On the other hand, if Objective 1 has been judged to be unachievable, pursuing certification requires documentation establishing the technical infeasibility of doing so. Relevant documentation includes, but is not necessarily limited to, site data, calculations, modeling results and qualitative reasoning. If achieving Objective 1 is demonstrably technically infeasible, the certification process then requires similar documentation of how Objectives 2A and/or 2B, as appropriate to the site, will be achieved.

Prepared for Salmon-Safe Inc. by Dr. Richard Horner, et. al.



## Appendix H

### Model Stormwater Management Guidelines for Ultra-Urban Redevelopment





## MODEL STORMWATER MANAGEMENT GUIDELINES FOR ULTRA-URBAN REDEVELOPMENT

MAY 2018

### Introduction

Polluted stormwater is the largest threat to the health of the Pacific Northwest's urban watersheds. Pollutants targeted by Salmon-Safe's urban initiative such as heavy metals, petroleum products, pesticide runoff and construction sediment have an adverse impact on the watershed and severely compromise downstream marine health. With the goal of inspiring design that has a positive impact in our watersheds, Salmon-Safe offers stormwater design guidance for ultra-urban areas, which we define as typically those densely developed "downtown" locations mostly covered by structures and pavement. Generally first developed long ago, many such areas are brownfields now undergoing redevelopment, mostly for commercial and residential purposes.

The very extensive impervious surfaces in ultra-urban spaces create a hydrologic environment dominated by surface runoff, with little of the soil infiltration and evapotranspiration predominating in a natural landscape. Vehicle traffic drawn to such areas and the activities occurring there deposit contaminants like heavy metals, oils and other petroleum derivatives, pesticides and fertilizers (nutrients). These pollutants wash off of the surfaces with the stormwater runoff and drain into the piping typically installed to convey water away rapidly. If the piping network is a combined sanitary-storm sewer system, the large stormwater runoff volumes draining from an ultra-urban area exceed the capacity of the wastewater treatment plant at the end of the line in some storms, resulting in releases of untreated, mixed sewage and stormwater to a water body. If the piping network is a separated storm sewer system, the runoff and the pollutants it carries enter a receiving water body without treatment, to the detriment of water quality and the aquatic life there. Although salmon-spawning and rearing streams are rarely present in an ultra-urban location, if they are, the elevated runoff quantity itself is damaging to the downstream habitat that salmon and their food sources rely on and directly to the fish themselves.

Many of the pollutants conveyed by stormwater runoff are toxic to salmon and their invertebrate food sources. The toxicity of heavy metals like copper and zinc to aquatic life has been well studied. However, salmon face many more potentially toxic pollutants in both their freshwater and saltwater life stages. These contaminants include other heavy metals; petroleum products; combustion by-products; and industrial, commercial, and household chemicals. Emerging science from NOAA Fisheries shows that these agents collectively create both lethal and non-lethal impacts, the latter negatively affecting salmon life-sustaining functions to the detriment of their migration, reproduction, feeding, growth and avoidance of predators.



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Despite these challenges, an array of options exists to reduce, or even in the utmost application, eliminate the negative impacts of ultra-urban development stemming from the large quantities of contaminated stormwater runoff potentially generated there. This management category addresses practices to control ultra-urban stormwater runoff to reduce both water quantity and water quality impacts with the following goal.

## Goal

Any development or redevelopment project with a footprint that exceeds 5,000 square feet shall use low-impact site planning, design, and operational strategies<sup>1</sup> for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the water quality, rate, volume, and duration of flow.

## Objectives

### 1. Prime objective

Implement low-impact practices, especially runoff retention<sup>2</sup> practices, addressing both water quantity and water quality control to the maximum extent technically feasible in redeveloping ultra-urban parcels to achieve the stated goal of restoring the predevelopment hydrology. Provide documentation of how the objective will be achieved. If full achievement of the goal is technically infeasible, assemble documentation demonstrating why it is not and proceed to consider Objective 2A and/or 2B, as appropriate to the site.

### 2. Alternative objectives

Assess if achieving Objective 1 is documented to be technically infeasible.

**2A Alternative water quantity control objective when the site discharges to a combined sanitary-storm sewer or a stream**—Start with the low-impact practices identified in the assessment pursuant to Objective 1. To the extent that they cannot prevent the generation of stormwater runoff peak flow rates and volumes greater than in the predeveloped condition<sup>3,4</sup>, implement effective alternative measures to diminish and/or slow the release of runoff to the maximum extent technically feasible, with the minimum objective of reducing the quantity discharged to comply with any applicable water quantity control requirement<sup>5</sup> and, in any case, below the amount released in the preceding developed condition.<sup>6</sup>

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<sup>1</sup> Collectively termed “low-impact practices” in the following points.

<sup>2</sup> Retention means keeping runoff from flowing off the site on the surface by preventing its generation in the first place, capturing it for a water supply purpose, releasing it via infiltration to the soil or evapotranspiration to the atmosphere, or some combination of these mechanisms.

<sup>3</sup> A predeveloped condition is the natural state of the site as it typically would be for the area prior to any modification of vegetation or soil.

<sup>4</sup> As determined through hydrologic modeling of the previously developed and modified conditions.

<sup>5</sup> Specified for discharges to combined sewers by the municipal jurisdiction; specified for discharges to Western Washington streams by the Washington Department of Ecology’s Stormwater Management Manual for Western Washington, Minimum Technical Requirement #7.

<sup>6</sup> As determined through hydrologic modeling of the previously developed and modified conditions.



**2B Alternative water quality control objective when the site discharges to a water body or a separate storm sewer leading to a water body**—Start with the low-impact practices identified in the assessment pursuant to Objective 1. To the extent that they cannot prevent the generation of stormwater runoff containing pollutants, implement alternative effective measures to reduce contaminants in stormwater to the maximum extent technically feasible, with the minimum objective of complying with the regulatory requirements for water quality control applying to the location.<sup>7</sup>

## Plan Elements

- 1. Inventory and analysis**—Narrative, mapping, data, and quantitative results that summarize: (1) site land uses and land covers in the redeveloped and preceding developed conditions; (2) results of hydrologic modeling of the undeveloped, previously developed and modified conditions, as the basis for pursuing quantity control objectives; and (3) stormwater drainage sub-basins, conveyance routes, and locations of receiving stormwater drains and natural water bodies in the redeveloped state.
- 2. Low-impact practices**—Low-impact practices are systematic methods intended to reduce the quantity of stormwater runoff produced and improve the quality of the remaining runoff by controlling pollutants at their sources, collecting precipitation and putting it to a beneficial use, and utilizing or mimicking the hydrologic functioning of natural vegetation and soil in designing drainage systems.

The following low-impact practices are particularly relevant to ultra-urban sites:

- source control practices
  - ✓ minimizing pollutant introduction by building materials (especially zinc- and copper-bearing) and activities conducted on the site
  - ✓ isolating pollutants from contact with rainfall or runoff by segregating, covering, containing, and/or enclosing pollutant-generating materials, wastes and activities
  - ✓ conserving water to reduce non-stormwater discharges
- constructing vehicle travel ways, sidewalks and uncovered parking lot aisles to the minimum widths necessary, provided that public safety and a walkable environment for pedestrians are not compromised
- harvesting precipitation and putting it to a use such as irrigation, toilet flushing, vehicle or surface washing, or cooling system make-up water
- constructing low-traffic areas with permeable surfaces, such as porous asphalt, open-graded Portland cement concrete, coarse granular materials, concrete or plastic unit pavers, and plastic grid systems (Areas particularly suited for permeable surfaces)

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<sup>7</sup> In Western Washington, specified by the Washington Department of Ecology's Stormwater Management Manual for Western Washington, Minimum Technical Requirement #6, which is equivalent to the City of Seattle's SMC, Section 22.805.090.B.1.a.



are driveways, walkways and sidewalks, alleys, and overflow or otherwise lightly-used uncovered parking lots not subject to much leaf fall or other deposition.)

- draining runoff from roofs, pavements, other impervious surfaces, and landscaped areas into one or more of the following green stormwater infrastructure (GSI) systems:
  - ✓ bioretention area\* (also known as a rain garden)<sup>8</sup>
  - ✓ planter box\*, tree pit\* (bioretention areas on a relatively small scale)
  - ✓ vegetated swale<sup>9</sup>\*
  - ✓ vegetated filter strip\*
  - ✓ infiltration trench
  - ✓ green roof

*\* signifies compost-amended soils as needed to maximize soil storage and infiltration*

The following low-impact practices are of limited applicability to ultra-urban sites but may contribute to meeting objectives in some circumstances:

- conserving natural areas including existing trees, other vegetation and soils
- minimizing soil excavation and compaction and vegetation disturbance
- minimizing impervious rooftops and building footprints
- designing drainage paths to increase the time before runoff leaves the site by emphasizing sheet instead of concentrated flow, increasing the number and lengths of flow paths, maximizing non-hardened drainage conveyances and maximizing vegetation in areas that generate and convey runoff

**3. Alternatives**—When on-site low-impact practices alone cannot achieve Objectives 2A and/or 2B, implement one or more of the following strategies to meet at least the minimum water quantity and quality control objectives stated above:

- **For runoff quantity and/or quality control**—
  - ✓ contribute materially to a neighborhood project using low-impact practices and serving the stormwater control needs of multiple properties in the same receiving water drainage basin, with the contribution commensurate with the shortfall in meeting objectives on the site itself.
  - ✓ implement low-impact practices on-site to manage the quantity and quality of stormwater generated in a location off the redevelopment site but in the same receiving water drainage basin, with the scope of the project commensurate with the shortfall in meeting objectives using practices applied to stormwater generated by the site itself.

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<sup>8,9</sup> Preferably with an open bottom for the fullest infiltration, but with a liner and underdrain if the opportunity for deep infiltration is highly limited or prohibited for some specific reason, e.g., bedrock or seasonal high-water table near the surface, very restrictive soil (e.g., clay, silty clay) that cannot be adequately amended to permit effective infiltration, non-remediable contamination below ground in the percolating water pathway.



- **For runoff quantity control**—install a vault or tank<sup>10</sup> to store water for delayed release after storms to help avoid combined sewer overflows or high flows damaging to a stream.
- **For runoff quality control**—install an advanced engineered treatment system suitable for an ultra-urban site.<sup>11</sup>

## Considerations for Salmon-Safe Certification

Fulfilling the stormwater component of the Salmon-Safe certification process requires submission of documentation of how Objective 1 will be achieved based on the inventory and analysis conducted for the site. On the other hand, if Objective 1 has been judged to be unachievable, pursuing certification requires documentation establishing the technical infeasibility of doing so. Relevant documentation includes, but is not necessarily limited to, site data, calculations, modeling results, and qualitative reasoning. If achieving Objective 1 is demonstrably technically infeasible, the certification process then requires similar documentation of how Objectives 2A and/or 2B, as appropriate to the site, will be achieved.

Prepared for Salmon-Safe Inc. by Dr. Richard Horner, et. al.

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<sup>10</sup> While useful for runoff quantity control, passive vaults and tanks provide very little water quality benefit.

<sup>11</sup> The most effective candidate treatment systems now available are chitosan-enhanced sand filtration and advanced media filtration coupled with ion exchange and/or carbon adsorption. Basic sand filtration is another option suitable to an ultra-urban site but is less effective than the more advanced alternatives.



## Appendix I

### Model Stormwater Management Guidelines Worksheet



## Appendix I

## WORKSHEET

for Model Stormwater Management Guidelines

VISIT [SALMONSAFE.ORG](https://salmonsafef.org)  
TO DOWNLOAD  
A FILL-AND-SAVE  
VERSION OF THIS FORM

Site Name

1

Is it operationally feasible to achieve the Prime Objective of maintaining or restoring the predevelopment hydrology of the property with regard to the water quality, rate, volume and duration of flow?

YES

NO

1a

IF YES, summarize below the data and other evidence that demonstrate that the rate, volume, and duration of stormwater runoff discharge and the accompanying pollutant concentrations and loadings in the developed state will be no greater than in the predevelopment period. Reference any databases, calculations, modeling results, reports, etc., that present more detail and can be obtained by Salmon-Safe upon request.

Then proceed to 3 through 5.

1b

IF NO, go to the next page.

Quantitatively summarize the extent to which the rate, volume, and/or duration of stormwater runoff discharge and/or the accompanying pollutant concentrations and loadings in the developed state will be greater than in the predevelopment period. Document with data and other evidence why it is not operationally feasible to reduce any or all of those variables to the predeveloped condition. Reference any databases, calculations, modeling results, reports, etc., that present more detail and can be obtained by Salmon-Safe upon request.

Then proceed to **2**.

**1b** text here

**2**

What Alternative Objective(s) is appropriate for the site?

2A

☐

2B

☐

Both

☐

*Detail the specific regulatory or other objective(s)*

**3**

Summarize the results of the Inventory and Analysis. Reference any databases, calculations, modeling results, reports, maps, etc., that present more detail and can be obtained by Salmon-Safe upon request.



4

Summarize the GSI Practices selected.

PRACTICE	Selected?		How Used?
	Yes	No	
Source Control Practices			
Minimizing pollutant introduction			
Isolating pollutants from contact with rainfall or runoff			
Conserving water			
GSI Planning and Design Practices			
Constructing paved features to minimum widths			
Harvesting precipitation			
Permeable pavements			
Conserving natural areas			
Minimizing soil and vegetation disturbance			
Minimizing structure footprints			
Maximizing vegetation			
Emphasizing sheet flow			
Increasing flow paths			
Maximizing non-hardened conveyances			
GSI Constructed Systems			
Infiltration basin			
Bioretention area			
Planter box, tree pit			
Vegetated swale			
Vegetated filter strip			
Infiltration trench			
Roof downspout dispersion system			
Green roof			

5

Summarize the Alternative Practices selected.

PRACTICE	Selected?		How Used?
	Yes	No	
For Runoff Quantity and/or Quality Control			
Contribute to a neighborhood project			
Implement GSI practices onsite for stormwater generated offsite			
Runoff <i>Quantity</i> Control			
Pond			
Vault or tank			
Runoff <i>Quality</i> Control			
Treatment pond			
Treatment wetland			
Conventional swale			
Conventional filter strip			
Basic sand filtration			
Advanced treatment system			



## Appendix J

# Model Construction-Phase Stormwater Management Program

### Contractor Accreditation

Salmon-Safe provides an accreditation program (AP) for General Contractors that provides guidance for construction management. Accredited contractors have been pre-certified to adhere to the following guidelines and can streamline documentation and certification processes. Contact Salmon-Safe for a list of accredited contractors and to find out more about the accreditation process.

### Construction Phase Stormwater Management

#### Erosion and Sediment Transport

Manage the construction site to avoid, or minimize to the greatest extent operationally feasible, the release of sediments from the site through the use of the following measures:

1. As the top priority, emphasize construction management BMPs, such as:
  - Maintain existing vegetation cover, if it exists, to the greatest extent technically feasible.
  - Perform ground-disturbing work in the season with the smaller risk of erosion and work off disturbed ground in the higher risk season.
  - Limit ground disturbance to the amount that can be effectively controlled temporarily in the event of rain.
  - Use natural depressions and plan excavations to drain runoff internally and isolate areas of potential sediment and other pollutant generation from draining off the site, so long as safe in large storms.
  - Schedule and coordinate rough grading, finish grading and erosion control applications to be completed in the shortest possible time overall and with the shortest possible lag between these work activities.
2. Stabilize with a cover appropriate to the site conditions, season and future work plans; for example:
  - Rapidly stabilize disturbed areas that could drain off the site and will not be worked again, with permanent vegetation supplemented with highly effective temporary erosion control measures until at least 90 percent vegetative soil cover is achieved.
  - Rapidly stabilize disturbed areas that could drain off the site and will not be worked again for more than three days, with highly effective temporary erosion control measures.
  - If 0.1 inch of rain or more is predicted with a probability of 40 percent or greater, before the rain falls, stabilize or isolate disturbed areas that could drain off the site, and that are being actively worked or will be within three days, with measures that will prevent or minimize to the greatest extent technically feasible the transport of sediment off the property.



3. As backup for cases where all of the above measures are used to the greatest extent technically feasible but sediments still could be released from the site, consider the need for sediment collection systems including, but not limited to, conventional settling ponds and advanced sediment collection devices such as polymer-assisted sedimentation and advanced sand filtration.
4. Specify emergency stabilization and/or runoff collection procedures (e.g., using temporary depressions) for areas of active work when rain is forecast.
5. If runoff can enter storm drains, use a perimeter control strategy as a backup where some soil exposure will still occur, even with the best possible erosion control (the above measures) or when there is a discharge to a sensitive water body.
6. Specify flow control BMPs to prevent or minimize to the greatest extent technically feasible the following:
  - Flow of relatively clean off site water over bare soil or potentially contaminated areas;
  - Flow of relatively clean intercepted groundwater over bare soil or potentially contaminated areas;
  - High velocities of flow over relatively steep and/or long slopes, in excess of what erosion control coverings can withstand; and
  - Erosion of channels by concentrated flows either by using channel lining, velocity control, or both.
7. Minimize the number of construction entrances. Specify stabilization of construction entrance and exit areas, provision of a nearby tire and chassis wash for dirty vehicles leaving the site with a wash water sediment trap, and a sweeping plan.
8. Specify construction road stabilization.
9. Specify wind erosion control.
10. Manage the construction site to avoid the release of pollutants other than sediments by preventing contact between rainfall or runoff and potentially polluting construction materials, processes, wastes, and vehicle and equipment fluids by such measures as enclosures, covers, and containments, as well as berming to direct runoff.
  - Construction vehicles larger than pick-up trucks parked for more than two days shall be located so that any fluid leaks cannot contaminate stormwater runoff. The best way of preventing contamination is to park in a location that cannot drain into any stormwater conveyance leaving the site. If a selected location could drain away, it should be modified by slightly recessing the parking spots to prevent draining out. An alternative if such a location cannot be found, is to place leakage collection trays under the vehicles. Any vehicle observed to be leaking any significant quantity of a fluid should be repaired immediately.

## Appendix K

## Water Conservation Plan Guidance

The appropriate managing partner for the urban development shall require binding agreements for the existing project, and future phases of the project, incorporate a Salmon-Safe water conservation plan to ensure that Salmon-Safe practices are maintained over time. Water conservation measures reduce irrigation water use to the minimum necessary to support maintenance of urban development grounds.

A long-term water use plan should incorporate the following performance guidelines:

1. Conservation plan—Development management follows a plan to conserve water by focusing watering in limited areas based on varying plant needs and human use objectives.
2. Water use monitoring is conducted and annual summary reporting is available. Reporting documents a decline in water use per acre for the system over the most recent five-year period or explains how no further efficiencies are feasible.
3. A plan is implemented that shows significant progress, where technically feasible within budgetary constraints and human use mandate, toward increased water conservation, including the following:
  - Utilize water-efficient technologies within and around structures;
  - Developing landscapes with native vegetation that requires less irrigation;
  - Replacing outdated irrigation equipment with an efficient, modern irrigation system to adjust supply to vegetation requirements, infiltration, evapotranspiration and other factors;
  - Water use plan to further limit irrigation areas to high priority sites as determined by the appropriate managing authority;
  - Using rain catchment and recycled stormwater systems;
  - Using soil management practices, such as composting and mulching, and thatching and aerating turf, to reduce irrigation requirements; and
  - Minimizing total area of turf by converting turf areas to landscaping that requires less irrigation.

## Appendix L

Annual Certification Report  
and Verification FormVISIT [SALMONSAFE.ORG](http://SALMONSAFE.ORG)  
TO DOWNLOAD  
A FILL-AND-SAVE  
VERSION OF THIS FORM**All organizations**Please complete  
this form down  
to the black bar.**Organizations  
with conditions**Please complete  
the entire form.

ABOUT CERTIFIED ORGANIZATION		
Organization Name	Date	Year First Certified
Primary Contact	Title	
Phone	Email	
<b>STATEMENT OF ENVIRONMENTAL COMPLIANCE</b> —Provide a statement regarding your organization's compliance record during the last year. In the event your organization was issued a violation of non-compliance by a regulating agency, please detail the cause, the corrective action the organization conducted and the end result as applicable. Salmon-Safe may revoke the certification in the event of a compliance violation, but will determine this on a case-by-case basis.		
<b>SUMMARY OF ACTIVITY</b> —Provide a statement summarizing major infrastructure changes including new construction or restoration activity over the past year. Any operational changes impacting your Salmon-Safe certification?		
<b>SALMON-SAFE CERTIFICATION COMPLIANCE</b>		<input type="checkbox"/> Certification is conditional <input type="checkbox"/> Certification conditions have been satisfied <input type="checkbox"/> Certification issued without conditions
<b>• CONDITION 1</b> (describe condition)	Met Condition? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> In Process <input type="checkbox"/> Documentation Attached	<b>CONDITION VERIFICATION</b> Condition Cleared <input type="checkbox"/> Yes <input type="checkbox"/> No Reviewer Initials _____
Action Taken to Correct Issue		



<b>• CONDITION 2</b> <i>(describe condition)</i>	Met Condition? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> In Process <input type="checkbox"/> Documentation Attached	<b>CONDITION VERIFICATION</b> <i>Condition Cleared</i> <input type="checkbox"/> Yes <input type="checkbox"/> No Reviewer Initials _____
Action Taken to Correct Issue		
<b>• CONDITION 3</b> <i>(describe condition)</i>	Met Condition? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> In Process <input type="checkbox"/> Documentation Attached	<b>CONDITION VERIFICATION</b> <i>Condition Cleared</i> <input type="checkbox"/> Yes <input type="checkbox"/> No Reviewer Initials _____
Action Taken to Correct Issue		
<b>• CONDITION 4</b> <i>(describe condition)</i>	Met Condition? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> In Process <input type="checkbox"/> Documentation Attached	<b>CONDITION VERIFICATION</b> <i>Condition Cleared</i> <input type="checkbox"/> Yes <input type="checkbox"/> No Reviewer Initials _____
Action Taken to Correct Issue		
<b>• CONDITION 5</b> <i>(describe condition)</i>	Met Condition? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> In Process <input type="checkbox"/> Documentation Attached	<b>CONDITION VERIFICATION</b> <i>Condition Cleared</i> <input type="checkbox"/> Yes <input type="checkbox"/> No Reviewer Initials _____
Action Taken to Correct Issue		
<b>• CONDITION 6</b> <i>(describe condition)</i>	Met Condition? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> In Process <input type="checkbox"/> Documentation Attached	<b>CONDITION VERIFICATION</b> <i>Condition Cleared</i> <input type="checkbox"/> Yes <input type="checkbox"/> No Reviewer Initials _____
Action Taken to Correct Issue		

<b>• CONDITION 7</b> <i>(describe condition)</i>	Met Condition? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> In Process <input type="checkbox"/> Documentation Attached	<b>CONDITION VERIFICATION</b> <i>Condition Cleared</i> <input type="checkbox"/> Yes <input type="checkbox"/> No Reviewer Initials _____
Action Taken to Correct Issue		
<b>• CONDITION 8</b> <i>(describe condition)</i>	Met Condition? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> In Process <input type="checkbox"/> Documentation Attached	<b>CONDITION VERIFICATION</b> <i>Condition Cleared</i> <input type="checkbox"/> Yes <input type="checkbox"/> No Reviewer Initials _____
Action Taken to Correct Issue		
<b>• CONDITION 9</b> <i>(describe condition)</i>	Met Condition? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> In Process <input type="checkbox"/> Documentation Attached	<b>CONDITION VERIFICATION</b> <i>Condition Cleared</i> <input type="checkbox"/> Yes <input type="checkbox"/> No Reviewer Initials _____
Action Taken to Correct Issue		
<b>• CONDITION 10</b> <i>(describe condition)</i>	Met Condition? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> In Process <input type="checkbox"/> Documentation Attached	<b>CONDITION VERIFICATION</b> <i>Condition Cleared</i> <input type="checkbox"/> Yes <input type="checkbox"/> No Reviewer Initials _____
Action Taken to Correct Issue		
<div> <div>ADMIN USE ONLY</div> <div>Annual Certification Report</div> <div> <input type="checkbox"/> APPROVED           <input type="checkbox"/> Not Approved         </div> </div> <div> <div>Name</div> <div></div> <div>Date</div> <div></div> </div>		





## Appendix M

## Fast-Track Certification for New Development

# SALMON-SAFE CERTIFICATION

## Fast Track for New Development



Project Team



Commitment to design and construction principles

Commitment to operations principles



Consultation

Certification

Verification

## FAST-TRACK SALMON-SAFE CERTIFICATION DECISION NOW DELIVERED DURING DESIGN PHASE

Salmon-Safe Delivers:

- 1 Design consultation**  
Charrette participation and design guidance
- 2 Conditional Certification Decision**  
Expert Science Team review of drawing set and pre-construction site visit
- 3 Verification**  
Ongoing review of construction-phase pollution prevention, compliance in meeting performance benchmarks such as stormwater treated, post-construction operations, including IPM and water conservation


[www.salmonsafe.org](http://www.salmonsafe.org)



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