

FACT SHEET
for the
**PHASE I, WESTERN WASHINGTON PHASE II, AND
EASTERN WASHINGTON PHASE II
MUNICIPAL STORMWATER PERMITS**

National Pollutant Discharge Elimination System and
State Waste Discharge General Permit
For discharges from
Small, Medium, and Large Municipal Separate Storm Sewer Systems
In Washington State

August 15, 2018

State of Washington
Department Of Ecology
Olympia, Washington 98504-7600

3.0 Background

3.1 The Stormwater Problem

Stormwater runoff is a leading pollution threat to lakes, rivers, streams and marine water bodies in urbanized areas of Washington State. The stormwater problem was well defined decades ago, and we continue to learn about both the impacts of stormwater on receiving waters and biota across the State, as well as the effectiveness of stormwater management approaches to prevent, reduce, and correct these impacts.

Impacts from stormwater vary geographically due to differences in local land use conditions, hydrologic conditions, the type and condition of the stormwater infrastructure, and the type of receiving water. In typical undeveloped conditions, less than about ten percent of precipitation runs off the land as surface flow. In urban areas, the large amount of impervious surfaces interrupts infiltration and groundwater recharge, concentrates surface flows, and increases the frequency and quantity of runoff sent to receiving waters. As a result, more than 40% of precipitation exits urban areas rapidly through stormwater sewer systems¹. This causes hydrologic impacts such as scoured streambed channels, excessive sediment transport, loss of habitat, and increased flooding.

Many pollution sources from common land use activities contaminate urban stormwater. Streams and storm outfalls monitoring studies have shown elevated concentrations of metals, nutrients, pesticides and organic compounds in relation to urban development. Contaminants in building materials, in illicit discharges and spills, from vehicular traffic, and atmospheric deposition are picked up by stormwater runoff and make their way to receiving waters if left untreated. Most of

these pollution sources are not under the direct control of the Permittees that own or operate municipal storm sewer systems.

The following is a list of typical and potential impacts caused by stormwater discharges:

- **Human Health:** Untreated stormwater contains bacteria, trash, excessive nutrients, toxic metals, and harmful organic compounds. Untreated stormwater is not safe for people to drink and is not recommended for swimming or contact recreation.
- **Drinking Water:** In some areas of Washington, notably Spokane County and parts of Pierce and Clark Counties, gravelly soils allow rapid infiltration of stormwater. Untreated stormwater discharging to the ground could contaminate aquifers that are used for drinking water.
- **Shellfish:** Washington State’s multimillion dollar shellfish industry is increasingly threatened by closures due to stormwater contamination.
- **Degraded Water Bodies:** In urban and urbanizing areas across Washington State, residential, commercial, and industrial land development continues to change land cover and drastically alter stream channels. Unmanaged stormwater from urban areas has severely degraded beneficial uses of Washington’s waters.
 - A recent study described the “urban stream syndrome”² where development predictably and consistently results in degraded conditions of instream water quality and biota.
 - Other recent studies suggest that road density and traffic volumes are main stressors to benthos community health in urban streams indicating traffic associated pollutants in stormwater degraded receiving water bodies³.
 - Studies in the 1990s found degraded stream benthos communities in watersheds with as little as 10% impervious surface⁴. Studies since then have found a continuum, with impacts detectable at lower levels of impervious surfaces.
 - Unmanaged stormwater has likely permanently destroyed stream habitat in some urban areas of Puget Sound. There are no known instances of recovering “poor” to “fair” or even “fair” to “poor” condition of stream benthos.
 - Recent modeling exercises have demonstrated that current site-by-site approaches to stormwater management approaches are insufficient to prevent continued degradation of receiving water quality (see section 3.2.1 below on “Phase I Counties’ Watershed Modeling and Planning”).
 - Elevated concentrations of pollutants in small Puget lowland streams in 2015 were significantly correlated with indicators of urbanization including impervious surfaces and watershed canopy⁵. This same study found significant differences between conditions of water quality and biota in streams inside and outside Urban Growth Areas (UGAs).
 - Bacteria is the most common cause of stormwater-related water quality impairment listings. Puget Sound nearshore monitoring programs that focus on

monitoring storm events or source identification tend to have higher bacteria levels than ambient programs⁶.

- There are significantly more contaminants Puget Sound nearshore sediments in the incorporated UGAs than the unincorporated UGAs, and sites identified as depositional areas contained more chemicals than the high-energy drift cells (left, right, or divergent)⁷.
- Contaminant levels in mussels along Puget Sound UGA shorelines were correlated with impervious surfaces in the small watersheds adjacent to the shoreline⁸.
- The common urban use pesticide bifenthrin was found in sediment samples from about ten percent of Puget lowland stream sites monitored in 2015⁹.
- Numerous 303(d) listed water bodies across the State have been assigned stormwater waste load allocations.
- **Salmon Habitat:** Urban stormwater degrades salmon habitat in streams through effects on hydrologic flows and toxicity. Paved surfaces cause greater and more frequent winter stormwater flows that erode stream channels and damage spawning beds. Toxic chemicals in stormwater harm benthic insects, salmon embryos, immature fish, and adults returning to spawn. Several studies have identified concerns. Two important examples:
 - Surveys of spawning adult Coho salmon in Seattle in the early 2000s found that very high percentages of adult females (60-100 percent) were dying before they could spawn¹⁰. Scientists soon found that stormwater pollution is likely involved¹¹ and the problem is widespread throughout urban streams in Puget Sound. Untreated highway runoff is lethal, leading to 100% toxic response or death of adult salmon within 24 hours¹². Active scientific investigation continues, and has made progress toward identifying the precise causes of these acute die-offs. Scientists are most recently honing in on chemicals associated with some tires¹³.
 - Ecology and Pierce County conducted *in situ* trout toxicity testing studies in four urban streams in 2008. Pierce County found no significant toxicity¹⁴. However, Ecology identified the following chemical stressors that were capable of causing adverse effects that were detected on the native trout embryos and pre-swim-up fry: copper, lead, nickel, zinc, polycyclic aromatic hydrocarbons, and the agricultural fungicide Captan¹⁵.
- **Pollution:** Urban stormwater is known to contain a fairly consistent suite of pollutants from common land use activities.

An evaluation of stormwater monitoring data from the National Stormwater Quality Database (NSQD)¹⁶ compared the results for a range of pollutants in urban runoff from areas of different land uses. The NSQD contains a large data set from a representative number of Municipal Stormwater Permit holders. Much of the data may be used to characterize stormwater produced from specific land uses, such as industrial, commercial, low density residential, high density residential, and undeveloped open space. Preliminary statistical analysis of the NSQD found significant differences among land use categories for all pollutants, as shown in Table 2.

In the 2007 Permit, Phase I cities and counties and the ports of Tacoma and Seattle were required to conduct stormwater discharge characterization monitoring to improve our understanding of the amounts of a wider range of pollutants found in stormwater from various land uses. That monitoring and the findings are presented in section 3.2.8 below on “Phase I Permittees’ Stormwater Discharge Characterization Monitoring.”

Table 2: Event Mean Concentrations of Pollutants Discharged via Stormwater Compiled from the National Stormwater Quality Database, Version 1.0

Pollutant	Units	Land Use					Overall
		Resident-ial	Commer- cial	Industrial	Freeways	Open Space	
Ammonia	mg/L	0.31	0.5	0.5	1.07	0.3	0.44
Biochemical Oxygen Demand	mg/L	9	11.9	9	8	4.2	8.6
Cadmium, Total	ug/L	0.5	0.9	2	1	0.5	1
Cadmium, Filtered	ug/L	ND	0.3	0.6	0.68	ND	0.5
Chemical Oxygen Demand	mg/L	55	63	60	100	21	53
Copper, Total	ug/L	12	17	22	35	5.3	16
Copper, Filtered	ug/L	7	7.6	8	10.9	ND	8
Fecal Coliform	MPN/100 mL	7,750	4,500	2,500	1,700	3,100	5,081
Lead, Total	ug/L	12	18	25	25	5	16
Lead, Filtered	ug/L	3	5	5	1.8	ND	3
Nickel, Total	ug/L	5.4	7	16	9	ND	8
Nickel, Filtered	ug/L	2	3	5	4	ND	4
Nitrogen, NO ₂ +NO ₃	mg/L	0.6	0.6	0.7	0.3	0.6	0.6
Nitrogen , Total Kjeldahl	mg/L	1.4	1.6	1.4	2	0.6	1.4

Pollutant	Units	Land Use					Overall
		Resident-ial	Commer-cial	Industrial	Freeways	Open Space	
Phosphorus, Total	mg/L	0.3	0.22	0.26	0.25	0.25	0.27
Phosphorus, Filtered	mg/L	0.17	0.11	0.11	0.2	0.08	0.12
Suspended Solids, Total	mg/L	48	43	77	99	51	58
Zinc, Total	ug/L	73	150	210	200	39	116
Zinc, Filtered	ug/L	33	59	112	51	ND	52

ND = Not detected, or insufficient data to determine a value
 mg/L = Milligrams per liter
 ug/L = Micrograms per liter
 MPN = Most probable number

3.2 Previous and Ongoing Regional Efforts

Ecology and Permittees are investing in efforts to inform and improve our collective understanding of stormwater impacts and Permittees’ implementation of the stormwater management programs and practices required in the Permits. The goals are to better understand the sources and pathways of pollutants, to measure our progress over time, and to continue to identify and target effective management approaches. In recent years, several regional efforts have significantly contributed to an understanding of stormwater impacts and management practices on the beneficial uses of Washington waters.

3.2.1 Phase I Counties’ Watershed Modeling and Planning

The 2013 Permit required detailed modeling and planning by the four Phase I counties in western Washington. The purpose of the Permit requirement was to determine what stormwater management and other actions are necessary to meet water quality standards in developing areas. The counties invested considerable staff time and resources into this effort and learned some lessons that can be broadly applied.^{17,18,19,20}

Each of the counties selected a medium sized (10-50 square miles) watershed located in an Urban Growth Area (UGA) designated pursuant to the State’s Growth Management Act (GMA) and therefore known to be under pressure for development in the near future. The watersheds have unique characteristics, but all are already partially urbanized.

The counties created models to test a suite of supplemental strategies in various scenarios to see if water quality standards were, or could be, met. The modeling showed that current and future

conditions in these watersheds are impacted in various ways, and that actions beyond site-by-site stormwater management will be needed to prevent degradation of the receiving waters and meet water quality standards. The models in all of the watersheds projected that riparian restoration and large amounts of additional stormwater detention are needed to improve conditions.

The anticipated costs to recover from these impairments is hundreds of thousands of dollars per acre of watershed. The costs per acre for these basins are somewhat lower for less developed basins, but they are still well beyond what might be affordable with current funding programs and approaches.

An important strategy that one of the four counties highlighted in their scenarios was changing the land use designation or zoning established as part of the growth management process. King County demonstrated that such changes will help protect water quality while substantially lowering the high capital project costs identified by the models. Ecology encourages stormwater managers to seriously consider pursuing this type of strategy in future planning to accommodate projected population increases.

3.2.2 Puget Sound Ecosystem Monitoring Program Stormwater Work Group (SWG)

The SWG developed recommendations for a comprehensive stormwater monitoring strategy focused on Puget Sound²¹. To develop the strategy, the SWG convened many of the region's stormwater experts to review previous work and evaluate the direct and indirect effects of stormwater on the Puget Sound ecosystem. The SWG also evaluated the various pathways by which those effects are transmitted and to develop the monitoring approach ultimately included in the 2013 Phase I and Western Washington Phase II Permits. In the process of reaching consensus from a broad range of expertise and technical backgrounds, the work group members formulated a conceptual model of the factors driving the stormwater-related impairment of water quality and habitat in the region. Figure 1 shows the types of stressors that should be considered, the pathways by which those stressors are transmitted, and how the outcomes of our management efforts should be assessed, using a Driver-Pressure-State Impact-Response (DPSIR) conceptual model approach²².

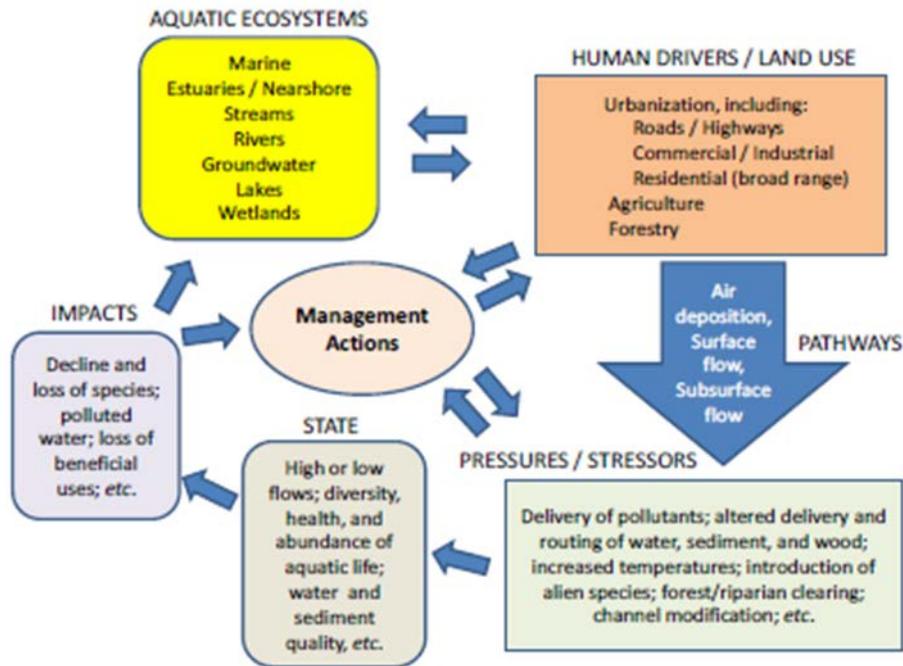


Figure 1: Stormwater Stressors and Pathways

The conceptual model identifies land use as the driver for impacts to aquatic ecosystems. Ecology is applying the DPSIR approach illustrated in this conceptual model to organize stormwater-related ecosystem recovery efforts and use monitoring information for adaptive management.

The SWG continues to discuss recent scientific finding and recommend priorities for the regional stormwater monitoring program.

3.2.3 Stormwater Action Monitoring (SAM)

SAM is the regional stormwater monitoring program which is primarily funded by Phase I and Phase II permittees in western Washington in the 2013 Permits through Special Condition S8. Monitoring and Assessment requirements. SAM was launched in 2014 and is implementing the SWG’s strategy and recommendations. By the summer of 2018, 16 effectiveness, three source identification, and five receiving water studies were in various stages of completion, and two new studies were identified for contracting to begin before the end of the Permit extension year.

3.2.4 How has SAM resulted in changes to the Phase I and Phase II Western Washington Permits?

While findings and recommendations of SAM studies initiated during the 2013 permit were just beginning to come in as Ecology began the 2019 Permit reissuance process, some SAM results are already closely connected to various Permit requirements and compliance oversight.

- Ecology permit writers evaluated the “Business inspection source control”²³ SAM effectiveness study findings and recommendations in writing the 2019 Permit S8.C.5 IDDE program requirements for Phase II Permittees.
- Ecology engineers updated language in BMP T7.30 in the *Stormwater Management Manual for Western Washington* (SWMMWW) to emphasize proper design and sizing for curb cut inlets to match expected site conditions after Ecology reviewed the findings of the “Stormwater retrofit monitoring in the Echo Lake drainage basin”²⁴ SAM effectiveness study.
- The “Illicit Discharge Detection and Elimination Data (IDDE) evaluation for Western Washington”²⁵ SAM source identification study revealed that many Permittees were not keeping adequate records. These findings helped Ecology’s permit managers provide technical assistance to improve record keeping practices. Ecology permit writers also clarified Permittees’ IDDE reporting requirements to improve consistency and inform regional understanding and approaches for the most common IDDE problems.
- Ecology management supports the new comprehensive stormwater planning requirements in light of our understanding that the current Permit provisions are not sufficient to protect and restore water quality. Ecology looks to the SAM regional status and trends monitoring studies to assess whether the Permittees’ SWMPs and additional strategic management actions can achieve the goals of minimizing and reversing harm caused by stormwater.
- Ecology’s engineers kept the 60/40 mix as the default bioretention soil medium due in part to the “Bioretention reduction of toxicity to Coho salmon from urban stormwater”²⁶ SAM study that confirmed prevention of acute toxicity to Coho salmon. Performance of the 60/40 mix over time and lower phosphorus-exporting alternative mixtures are important anticipated results from ongoing SAM effectiveness studies.

3.2.8 Toxic Loading Studies for Puget Sound

In 2010, Ecology and others²⁹ estimated toxic chemical loadings from surface runoff in the Puget Sound Basin. This was Phase 3 of a series of studies that began in 2006 and included a multi-partner steering committee of federal, state, and local government agencies, consultants, and reviewers.

As part of Phase 3 of its toxics loading study, Ecology collected water quality samples of surface runoff during eight storm or baseflow events from 16 distinct sub-basins, each representative of one of four land covers (Commercial/Industrial, Residential, Agricultural, and undeveloped Forest/Field/Other). Analyses of the samples employed much lower detection limits than typically used to produce pollutant concentration and loading data. No other study in Washington has quantified pollutant loads for so many constituents at this scale. Although this data represents surface runoff in the sampled sub-basins and is not directly representative of regulated stormwater discharges, some of the findings are generally in agreement with those from the 2005 analysis of the National Stormwater Quality Database. The pollutant loading estimates were based on data collected from small streams, where pollutant concentrations had likely been reduced by attenuation, degradation, deposition, and/or dilution. Therefore, the loading estimates might have been greater if they had been based on outfalls from stormwater conveyance systems.

The study found the following:

- Surface water runoff, particularly from commercial and industrial areas, did not meet water quality standards or human health criteria for the following parameters: dissolved copper, lead, and zinc; total mercury; total polychlorinated biphenyls (PCBs); several carcinogenic polycyclic aromatic hydrocarbons (PAHs); and DDT-related compounds.
- Organic pollutants and metals were generally detected more frequently and at greater concentrations in surface runoff from commercial and industrial areas than from other land uses. Runoff from residential and agricultural land had higher frequency of detection for most parameters than runoff from undeveloped/forested land, but generally less than runoff from commercial land. Greater detection frequencies occurred during storm events than during baseflow across all land cover types.
- During storm events, surface runoff from areas of forested and commercial land covers were chemically distinct from each other and from the other land cover types. Forested lands produced runoff with smaller concentrations of nitrate+nitrite nitrogen, total phosphorus, and total arsenic, copper, mercury, and suspended solids. Commercial land areas produced runoff with relatively greater concentrations of total lead, zinc, PBDEs, and PCBs.
- At the local scale, pollutant loading rates via small streams were substantially greater during storm events compared to baseflow. The rain-induced surface runoff during storm events caused higher streamflow rates. These higher flow rates coupled with increased pollutant concentrations to produce substantially greater loading rates for storm events

than for baseflow. This result suggested that the greatest opportunity for transport of toxic chemicals occurs during storm events.

3.2.9 Phase I Permittees’ Stormwater Discharge Characterization Monitoring

In 2015, Ecology³⁰ summarized monitoring results from Phase I Municipal Stormwater Permittees, including Clark, King, Pierce, and Snohomish Counties, the Cities of Seattle and Tacoma, and the Ports of Seattle and Tacoma, and collected chemical monitoring data representing municipal stormwater discharge quality during 2007 Phase I Permit. Tacoma and Clark County continued this monitoring in the 2013 Permit.

The 2007 Permit required each city and county Permittee to conduct stormwater characterization monitoring at three (or, for each of the two Ports, one) municipal stormwater basins representing four land uses (industrial, commercial, low density residential, and high density residential). This monitoring represents flow-weighted composite samples from 11 storm events each water year, annual sediment sampling, and one-time toxicity testing of seasonal first-flush discharges.

No other stormwater monitoring effort in Washington – or in the nation – has generated comparable water quality data on municipal stormwater discharges for such a large parameter suite from these four typical land uses.

Generally, stormwater discharge concentrations were consistently lower than data in the National Stormwater Quality Dataset,³¹ much lower the National Urban Runoff Program data,³² but higher than the levels reported in the Toxics Loading Study for Puget Sound. These results were not surprising, the two national datasets likely contain data from denser cities and the toxics loading study sampled receiving waters, not stormwater discharges, during storm events. By in large, Ecology concluded that “typical” stormwater chemistry for a given land use remains an elusive definition. This compilation study also found the following:

- Approximately 600 storm events were sampled by the eight Phase I Permittees and Co-permittees. Hydrologically, the data set compared well to the precipitation record for the Puget Sound region and the samples covered 80-90% of the storm hydrograph in most cases.
- Efforts to assess toxicity of stormwater on trout embryos per Permit requirements were met with considerable logistical and bioassay complexity. Most bioassays had no adverse effects, and those with toxicity effects, samples from larger commercial areas, indicated the likely toxicants were zinc and copper.
- Fecal coliforms were a fairly ubiquitous contaminant, but were found at significantly lower concentrations from low density residential land uses. Seasonally, fecal counts were significantly higher in the dry season compared to the wet season.
- For nutrients, there does not appear to be any significant difference between land uses. Dissolved nutrients were higher from residential areas, but lower than the concentrations in the Toxics Loading Study, which suggests that piped stormwater systems in Phase I areas aren’t a major source for dissolved nutrient loads to Puget Sound.
- Commercial and industrial areas discharged stormwater with the highest concentrations of metals, hydrocarbons, phthalates, total nutrients, and a few pesticides.

- Metals concentrations monitored during the dry season (May through September) were statistically higher than concentrations monitored during the wet season.
- Comparisons to water quality criteria were made for context in this report. Copper, zinc, and lead most frequently exceeded (did not meet) the water quality criteria for protection of aquatic life.
- PAHs, phthalates, PCBs, and the few detected pesticides did not exhibit a significant seasonal difference, suggesting these parameters were being discharged from a consistent source throughout the year. Bis(2-ethylhexyl) phthalate was frequently found in stormwater and stormwater sediment.
- Volatile organic chemistry parameters and multiple pesticides were infrequently detected or not detected at all in samples such as benzene, toluene, ethylbenzene, xylene, Malathion, prometon, chlorpyrifos, Diazinon, Triclopyr, mecoprop, and many phenolics.
- NWTPH-Dx compounds were persistent stormwater contaminants. Commercial and industrial areas discharged much higher concentrations and loads than did residential areas. When the motor oil fraction was considered separately, the highest load was from residential areas. However, NWTPH-Gx was poorly detected and, if present, was likely volatilized before monitoring.
- Stormwater sediment samples (collected from catch basins or outfall locations) were infrequently collected but some of the parameters showed a similar contaminant level pattern to the stormwater samples across land uses. Concentrations for several phthalates, PAHs, phenols, copper and lead were often detected but generally lower than sediment cleanup objectives, except bis(2-ethylhexyl) phthalate which was often above. More data is needed to better characterize in-line stormwater solids both spatially and temporally.

3.2.10 Other Studies on Toxics Loading from Stormwater

Ecology monitored building materials and atmospheric deposition in areas of Lacey and Olympia, Washington, and found that high levels of copper and zinc are released each year from materials including streetlight poles, building roofing and siding materials, chain-link fencing, and roof gutters during rainfall events. The primary sources of copper were vehicle brake wear, building roofing and siding materials, treated lumber, and vehicle exhaust. The main sources of zinc were moss control products, building siding, vehicle tire wear, chain-link fence, roofing materials, and vehicle brake wear. New asphalt shingles with algae resistance were found to be particularly significant sources of both copper and zinc.^{33,34}

3.2.11 Sediment Phthalates Work Group

The Sediment Phthalates Work Group was convened in 2006 to address the re-contamination of cleaned up sites in urban bays of Puget Sound. The Duwamish and Foss Waterways are Superfund sites in which sediment samples showed contamination by phthalates after costly sediment cleanups. Phthalates were not among the original contaminants of concern that led to the cleanup, and are pollutants of more contemporary origin than those addressed by the cleanup.

The work group was charged with identifying the sources and pathways for the phthalates and making recommendations regarding the newly contaminated sediments. This workgroup

evaluated information to better understand how phthalates are reaching Puget Sound. The work group identified data gaps, made recommendations, and developed a comprehensive problem statement that included the following findings.³⁵

- Billions of pounds of plasticized polyvinyl chloride (PVC) products are currently in use in urban environments, and these materials off-gas phthalates into the surrounding atmosphere for many years.
- Volatilized phthalates adhere to fine particulates in the air and eventually settle onto impervious surfaces and soil.
- Stormwater washes the phthalate-contaminated particulates into storm drains and subsequently into natural water bodies and sediments, where the concentrations and loadings of phthalates can build up over time.
- Although phthalates do not readily bioaccumulate, large amounts loaded into sediments are toxic to benthic organisms.

Phthalates are an example of a pollutant that exists throughout the urban environment. The work group report acknowledged that it may not be feasible to remove some pollutants such as phthalates from stormwater once they are in the environment. Source control solutions to reducing these pollutants may include finding alternatives to use in manufacturing the products that contain them. Their widespread uses make them somewhat ubiquitous in the contemporary urban setting. Phthalates and some other pollutants will require broader societal efforts to address the contaminants resulting from the manufacturing processes for many products widely used in contemporary society.

3.2.12 Climate Change

Ecology is funding a King County led study to determine the effects of climate change in the region. Working with University of Washington's Climate Impacts group, the study is looking to take larger scale global climate models and downscale them to align with the development regulations in the Phase I and Phase II Western Washington Permits. The study is ongoing and will not be complete until after the Permits are drafted. Ecology will analyze and disseminate the findings of the study within this Permit cycle and may use these findings as the basis for policies and regulations moving forward.

The continuous hydrologic modeling that is the foundation of the development regulation in Western Washington already considers climate change. Continuous modeling is based on the historic rainfall record. The rainfall record will be updated with this Permit cycle. Thus, the model adjusts to the extent that the most recent rainfall records reflect the changing climate.

Eastern Washington development regulations rely on single event modeling and climate that has not yet been analyzed. This modeling is based on widely accepted theoretical rainfall patterns not tied directly to local rainfall records. These theoretical rainfall events have not yet been adjusted to reflect the impacts of climate change.

6.5.10 Comprehensive Stormwater Planning. Western WA Only. (Phase I S.5.C.6; WWA Phase II: S5.C.1.)

This section is new to the western Washington Permits and contains requirements that apply a more holistic view to municipal stormwater management.

The 2008 Pollution Control Hearings Board (PCHB) Phase I ruling acknowledged the need for a watershed-scale approach to stormwater management based on the testimony of stormwater experts on all sides of the appeal. Scientists and policy-makers recognize that it is not possible to maintain water quality and aquatic habitat in lowland streams in Washington State without considering land use and how the landscape is developed. This must occur at a scale that is broader than individual site and subdivision projects.

The PCHB directed Ecology to require the “permittees to identify, prior to the next permit cycle or renewal, areas for potential basin or watershed planning that can incorporate development strategies as a water quality management tool to protect aquatic resources.”^{42,43} This proposal continues the effort to meet the PCHB’s direction.

6.5.11 Background and need

Urbanization of stream basins in western Washington has almost without exception been accompanied by a significant degradation or loss of the stream-related beneficial uses; in particular, the anadromous fish resources. There are multiple causes for the loss and those include: degradation of chemical and physical water quality; high flow-related stream channel alterations; loss of base flows; significant alteration of hydrologic patterns; and loss of critical riparian area functions.

Various forms of basin planning took place in the past. Those planning efforts traditionally suggested managing urban stormwater from planned new development and redevelopment by using the latest practices recommended by Ecology. Most of those practices are of limited effectiveness because they are applied at the end-of-pipe and/or only partially address the water quality and hydrologic changes of new development. They cannot address the full range of impacts caused by land development. Because the controls recommended by Ecology did not fully address the water quality, nor hydrologic impacts caused by urbanization, those plans have fallen short of protecting the aquatic resources.

Further, addressing stormwater impacts from new development and redevelopment at the site and subdivision scale will not adequately address legacy impacts from previous development patterns and practices, nor will it serve to protect areas providing ecological services for stormwater management. It is clear that we cannot protect the state's waters without also addressing degradation caused by stormwater discharges from existing developed sites. For that reason stormwater programs must include planning and developing policies that address receiving water needs, including development of policy and regulations, and retrofit provisions.

A broader view of planning and implementation is needed in order to support and further habitat restoration needs. Policies that promote compact development, with a smaller footprint, reduced impervious surfaces, natural areas within the urban core, and improved water detention can help local communities meet the Growth Management Act's goals of accommodating growth while protecting the environment⁴⁴. Moreover, research indicates that most stream restoration projects that actively stabilize eroding channels should not be implemented until after hydrologic retrofits have been completed that restore the hydrologic regime, not concurrently with the implementation of the retrofits⁴⁵.

Finally, as mentioned above, the PCHB directed Ecology to use Permit requirements to include watershed-scale planning as a water quality management tool to meet MEP and AKART.⁴⁶

6.5.12 The 2013 Permit requirements

The “Watershed-scale stormwater planning” requirement in the 2013 western Washington Permits (Phase I: S5.C.5.c; W. WA Phase II: S5.C.4.g) is Permit language that must be modified for the 2019 Permit cycle as it was an effort that was not intended to be replicated each Permit cycle, it was expected that this requirement would evolve overtime based on the information gleaned and the lessons learned.

We learned from the “Watershed-scale Stormwater Plans” that the calibrated model for each of the selected basins showed that current and future conditions in these watersheds do not meet water quality standards, and that actions beyond site and subdivision scale of stormwater management will be needed to prevent degradation of the receiving waters.

The models in all of the watersheds projected that riparian restoration (for temperature) and large amounts of additional stormwater detention and infiltration (for flow control, for Benthic Index of Biotic Integrity (B-IBI) scores, and for bacteria) are needed to improve receiving water conditions.

The anticipated costs to restore these watersheds is tens of thousands of dollars per acre of watershed in Snohomish and Clark Counties. The costs per acre for these typical Puget lowland and lower Columbia developing watersheds are significantly lower than for more developed basins (the Juanita Creek Study estimated costs were approximately \$300,000 per acre).⁴⁷ While this demonstrates that current Permit requirements are having a significant impact, the modeled additional effort to recover the beneficial uses are still well beyond current funding programs and approaches.

One important strategy that only one of the four counties highlighted in their scenarios was changing the land use designation or zoning established as part of the growth management process. King County demonstrated that such changes will help protect water quality while substantially lowering the high capital project costs identified by the models.

Comprehensive planning, and stormwater management are regulated under different laws and overseen by different state and local departments with separate administrative and public processes. However, coordination and long-range planning is needed. The consideration of stormwater impacts from development is critical during the planning phases of development. This not only includes planning on the site-level, but also with respect to discharges from the MS4 on a watershed level. To the extent possible, stormwater management must be an integral part of long-range planning documents that determine where and how development that will result in stormwater discharges to the MS4 should occur since these decisions affect water quality. Using land efficiently can result in better stormwater management by putting development where it is most appropriate.

It is possible and reasonable to significantly improve water quality in many urban receiving waters. This requires more than just a new development and redeveloped sites program, however, which at best can only hold the line. To actually improve the quality of receiving waters, it is necessary to develop and implement land use and development strategies that keep in mind the needs of receiving water health, and mitigate discharges from existing developed sites. This can be done in a variety of ways, through public projects, or creative public-private partnerships, or voluntary/incentive programs that encourage property owners to retain discharge onsite. Municipal projects, such as traffic calming sites could also include stormwater retrofit components, such as curb bump outs that include bioretention features or other treatment approaches.

6.5.13 What is proposed?

Local jurisdictions take different approaches to long-range municipal stormwater management planning. Some Permittees have advanced watershed plans, that take into account receiving water health and the need to improve or develop additional stormwater management controls, where some others have only a few policies and have only implemented what has been required by the Municipal Stormwater Permits. Some municipal stormwater programs work well with their long-range planning staff and are successful in influencing policies designed and intended to improve receiving water health and municipal stormwater management; others do not.

This proposed new Phase I and W.WA Phase II Permit section includes three planning elements that address long-term and short-term stormwater management needs.

The first element, coordination with long-range plan updates, works toward a better understanding of local long-range planning processes and how policies, strategies, codes and other measures do, or do not, address probable impacts of increased future stormwater discharges on receiving water health and include additional stormwater management activities needed to meet the goals of protecting and restoring beneficial and designated uses.

The second element, low impact development code-related requirements, brings forward the requirement in the 2013 Permits’ “Controlling Runoff” section (Phase I S5.C.5.b; W.WA Phase II S5.C.4.f), which requires local development-related codes or enforceable standards to require LID in order to make it the preferred and commonly used approach. This element also includes a provision for New Permittees to follow.

The third element, stormwater management action planning (SMAP), applies differently for Phase I and W.WA Phase II Permittees. For the Phase II Permit, the SMAP element begins with a receiving water assessment – to ensure that Permittees compile and review existing data and information on their receiving waters and contributing area conditions, so that they can identify and develop a plan to fill any significant gaps in knowledge. The Permit enables Permittees to complete this element individually or as part of a regional/interlocal effort. Permittees must then develop a receiving water prioritization method and process to rank high priority areas where stormwater retrofits and other management actions would provide a water quality benefit to receiving waters. Permittees must use the prioritized ranking as the basis for creating a plan for one priority area that takes into account tailored stormwater management strategies, including identification of the potential need for stormwater treatment or flow control BMPs to address existing or planned development.

Instead of the receiving water prioritization method and process that Phase II Permittees use, Phase I Permittees have a requirement in (S5.C.7) Structural stormwater controls, which requires Permittees to plan structural stormwater control projects based on a locally developed program that includes a process to prioritize and implement projects. Additionally, the third element applies to Phase I Counties which asks to explain how the watershed-scale stormwater plans (developed in the 2013-2018 permit cycle) informs the prioritization or selection of projects (or both). The requirement helps to refine the watershed-scale plans to highlight implementation actions for a catchment within, by providing a submittal that explains what actions, if any, resulting from the watershed-scale stormwater plans will move forward as short-term or long-term projects and the anticipated implementation schedule.

Overall, the proposal intends to drive a process that incorporates stormwater policies and infrastructure as a need that must be accommodated early in land use planning, capital facilities planning, and regulations.

6.5.14 Purpose of proposed Permit requirements

1. Maintain or develop an interdisciplinary team(s) that can support and coordinate the elements of the requirement.
2. To gain an understanding of how Permittees are currently addressing stormwater needs and receiving water health through various types of comprehensive planning being conducted at the local level.

3. To continue to make LID the preferred and commonly used approach.
4. For Phase I Counties, understand how the watershed-scale stormwater plans are informing and influencing planned stormwater management actions.
5. For WWA Phase II Permittees, to prioritize and plan municipal stormwater retrofits and enhanced SWMP implementation to address impacts from existing or planned development on priority receiving waters.

6.5.15 Internal Coordination

Convene an interdisciplinary team to conduct and coordinate the comprehensive planning program effort. Team make-up should include representatives from the jurisdiction’s stormwater program, long-term planning, transportation, parks and recreation, and scientific and technical experts.

For Phase II, this team could be used to coordinate the planning effort across various departments, compile existing information, refine initial prioritization results, prepare plan, and evaluate the process and implementation of the plan as an ongoing task (if applicable).

6.5.16 Coordination with long-range plan updates.

This section requires the analysis and reporting of how stormwater infrastructure and receiving water health needs are informing the planning update processes, and influencing policies and implementation strategies during existing planning update or development processes. This section does not intend to create a parallel planning process to ongoing long-range planning or Comprehensive Plan updates – rather, the reporting will describe how those processes take into account, consider, and evaluate information related to receiving water health and stormwater infrastructure needs while determining how to accommodate projected growth, or provide adequate services to the existing population served by the MS4.

Permittees will develop a submittal that describes how, or if, stormwater-related water quality and watershed protection are being addressed in revisions to your Comprehensive Plan (or equivalent process) as well as how water quality and watershed protection are being addressed in revisions to other locally-initiated, state-mandated long-range land use, transportation plans, or other plans used to prepare and accommodate population needs.

As described above, stormwater management needs must be taken into consideration early in the planning process, including while determining land capacity for accommodating growth. Ecology intends to learn how Permittees are addressing this need in existing planning updates.

6.5.17 Low impact development code-related requirements

Maintaining the intent of the 2013 Permits, this requires that as jurisdiction’s development-related regulations and standards are being developed or updated, LID must continue to be required in order to maintain and, where needed, make continued progress toward making LID the preferred and commonly used approach.

This section was moved from the “Controlling runoff from new development and redevelopment...” section as it fits in with the roles and responsibility with long-range planning

staff typically assigned to updating development codes. The requirement to look at the broader suite of development-related codes, not just stormwater code that follows Appendix 1 and which applies at the site and subdivision scale, was a point of confusion. Further, it may also be helpful to use the same interdisciplinary team that was developed to complete the first full code-review required by the 2013 Permits to continue to inform this process and the other elements of the Comprehensive stormwater program (i.e. coordinating with long-range plans and stormwater management action planning).

LID requirements for Western Washington Permittees stem from appeals of the 2007 Permit. The Pollution Controls Hearing Board (PCHB) issued a ruling on August 7, 2008 for the Phase I Municipal Stormwater Permit (Phase I permit) for local governments covered under the Phase I permit, including King, Snohomish, Pierce, and Clark counties and the cities of Seattle and Tacoma. The *Findings of Fact, Conclusions of Law, and Order* for the Phase I permit stated that Ecology must “.....require non-structural preventive actions and source reduction approaches including Low Impact Development techniques (LID), to minimize the creation of impervious surfaces, and measures to minimize the disturbance of soils and vegetation where feasible...”

On February 3, 2009 the PCHB issued a *Findings of Fact, Conclusions of Law, and Order* for the WWA Phase II Permit that recognized the wide range of capacity and expertise among Phase II jurisdictions for implementing low impact development requirements.

LID design is not limited to specific stormwater best management practices (BMPs) such as bioretention, permeable pavement, and vegetated roofs. LID also requires an approach to site assessment and project design to conserve vegetation, minimize soil disturbance, and minimize and disconnect impervious surfaces. In order to clarify that implementation of LID includes these elements, Ecology distinguishes between *LID BMPs* and *LID principles* in Permit language, as follows:

- **LID Best Management Practices:** Distributed stormwater management practices, integrated into a project design, that emphasize pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration. LID BMPs include, but are not limited to, bioretention/rain gardens, permeable pavements, roof downspout controls, dispersion, soil quality and depth, vegetated roofs, minimum excavation foundations, and water re-use.
- **LID principles:** Land use management strategies that emphasize conservation, use of on-site natural features, and site planning to minimize impervious surfaces, soil disturbance, native vegetation loss, and stormwater runoff.

By including both terms in the LID requirement, Ecology intends that Permittees will amend or develop stormwater and land use codes, rules, standards, and other enforceable documents as necessary to apply both LID BMPs and LID principles. For continuing Permittees, this applies to the development of new codes/documents, or whenever existing relevant codes/documents are revised. This is not proposed or intended as a repeat of the 2007-2013 Permit requirements, but rather a continuation, so as new codes are being developed or revised, they should not create barriers to LID implementation. In addition, as new codes and administrative practices are being implemented as a result of the updated local programs, any newly found barriers should be reported and corrected.

~~New Permittees are required to follow the process as was required under the 2013 Permits. See the November 4, 2011 Fact Sheet for discussion on this requirement, available here: <https://ecology.wa.gov/Asset-Collections/Doc-Assets/Water-quality/Water-Quality-Permits/MS4-permits/WWA-PhII/WWAPhaseIIFactSheetFINAL>.~~

~~The requirements entail annually reporting a summary of:~~

- ~~1. Any newly identified administrative or regulatory barriers to implementation of LID principles or LID BMPs and measures to address the barriers since local codes were updated in accordance with the 2013-2018 Permits.~~
- ~~2. Any mechanisms adopted to encourage or require implementation of LID principles or LID BMPs. This may include incentive programs, adopted code, or similar efforts.~~

~~New Permittees will submit a list of the participants (job title, brief job description, and department represented), the codes, rules, standards, and other enforceable documents reviewed, and the revisions made to those documents which incorporate and require LID principles and LID BMPs. The summary is to include existing requirements for LID principles and LID BMPs in development-related codes and organized by:~~

- ~~o Measures to minimize impervious surfaces.~~
- ~~o Measures to minimize loss of native vegetation.~~
- ~~o Other measures to minimize stormwater runoff.~~

~~New Permittees have an additional year after the requirements to adopt of Appendix 1 to complete the broader suite of code review. Ecology has developed an optional reporting template that may be used to help meet this requirement. It is found in municipal Permittee guidance on Ecology's website.~~

6.5.18 Stormwater Management Action Planning

Phase I Permittees have a requirement in Structural Stormwater Controls (S5.C.7.b.ii (a)) which requires Permittees to develop a prioritization process and criteria to select projects to address impacts caused by the MS4 from areas of existing development. (See discussion above regarding Phase I County's proposed requirement.) This type of planning requirement is new for W.WA Phase II Permit. The following describes how the requirement is structured for Phase II Permittees. See also draft guidance document, Stormwater Management Action Planning Guidance (Ecology 2018).⁴⁸

Basic receiving water inventory and assessment

Permittees will document and assess existing information related to local receiving waters and contributing area conditions to identify receiving waters that will benefit from stormwater management planning. The Permit enables Permittees to complete this element individually or as part of a regional/interlocal effort.

Permittees will prepare an inventory of local receiving waters to which the MS4 discharges and document information about the contributing watershed areas. The inventory shall include currently available basic water quality assessment information.

Where data is lacking, the Permittee should develop a plan and protocol to improve the state of knowledge.

Prioritization of basins for tailored management actions

Informed by the inventory and assessment of receiving waters, Permittees conduct a prioritization process to identify the contributing watershed areas where implementation of stormwater retrofit projects (i.e., new or upgraded stormwater facilities to reduce pollutant loading and address hydrologic impacts from existing and/or new development in the basin), and/or other tailored management strategies and actions will provide the greatest benefit to the receiving waters. This process should include a feedback loop designed to adaptively manage the process and outcomes based on lessons learned.

The Annual Report submittal will describe the well-documented approach the Permittee used to identify high priority areas for retrofits and other tailored management actions based on (1) conditions in the receiving waters, and (2) an assessment or understanding of influence of stormwater management strategies and actions to reduce impacts to the receiving waters.

The Annual Report submittal will describe how the prioritization effort identified and ranked watershed sub-basins or catchment areas where the receiving waters will receive a benefit from implementation of stormwater facility retrofits. The submittal also describes how the prioritization process was used to better inform the implementation of stormwater management actions related to Permit sections within S5.C: IDDE field screening, prioritizations of Source Control inspections, O&M inspections or enhanced maintenance, or Public Education and Outreach behavior change programs.

The Annual Report submittal will document the process and schedule to provide future assessment and feedback to improve the planning and implementation of the proposed projects and actions.

Permittees may reference existing or previous local watershed management planning process(es) as source(s) of information or as the basis or rationale for the prioritization.

Stormwater Management Action Plan

Develop a Stormwater Management Action Plan (SMAP) for at least one high priority area that identifies tailored stormwater management actions, including: stormwater facility retrofits (new facilities or upgrades to existing facilities), a proposed implementation schedule, and budget sources. The plan must identify (1) short-term actions (i.e., actions to be accomplished within six years), (2) long-term actions (i.e., actions to be accomplished within seven to 20 years), and (3) a process to adaptively manage the plan. The SMAP 6-year planning period is based upon GMA/Comprehensive Plan-related capital facilities planning (CFP) requirements, which also aligns with transportation grants which typically require a 6-year plan. The SMAP 20-year planning period is based on the Washington State Department of Commerce recommendation

that CFPs also cover a 20-year planning horizon because capital project financing often requires multi-year commitments of financial resources.

The Annual Report submittal will describe the high priority basin area, the proposed short-term and long-term actions, a funding mechanism, and a description of the adaptive management process. The actions proposed should go beyond existing site and subdivision scale stormwater management requirements. Permittees may reference existing plans, or modifications to those plans, that address these requirements.