ATTACHMENT B

CITY OF SEATTLE
2011 NPDES PHASE I MUNICIPAL STORMWATER PERMIT
Program Evaluation and Other Activities Narrative

Prepared by
Seattle Public Utilities

March, 2012

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B.1 Changes in Authorization (G19.C)(S9.E.9)

There have been no changes to the duly authorized representative pursuant to G19.C at the City during 2011. In January of 2010 Michael McGinn became the 52nd Mayor of Seattle. Mayor McGinn reauthorized the Deputy Director (or Acting Deputy Directory) of the Utility Systems Management Branch (USM), Seattle Public Utilities (SPU), to sign on his behalf any documents required by the permit and any other official correspondence related to the NPDES program that would otherwise bear the Mayor's signature, to the full extent allowed by permit or law.

B.2 Actions Taken Pursuant to S4F (S9.E.3)

The City, through Seattle Public Utilities (SPU), provided notifications to the Department of Ecology under S4.F of potential water quality problems that may be related to discharges from the City of Seattle's (City) municipal separate storm sewer system (MS4). The City continues to apply and implement its programs for stormwater management and to seek improvement to those programs through increased understanding of stormwater impacts and mitigation tools. A summary of the 2011 notifications and the Washington Department of Ecology (Ecology) required actions under S4.F.2 is below. In addition, this section contains S4.F.2 notifications from prior years (2007-2010) where a report on additional actions is required by Ecology.

B.2.1 Notification for Lower Duwamish River.

This S4.F notification was submitted in 2007 to notify Ecology of potential water quality problems that may be related to discharges from the City's MS4 for the Lower Duwamish River. Ecology determined that a report under S4.F.2.a was not necessary, with that determination conditioned on certain City actions. Ecology required the City, beginning with its Phase I Permit Annual Report for 2008, to include a summary of its stormwater management efforts in basins that discharge to the Lower Duwamish River. The City must notify Ecology if Seattle's involvement in Federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and associated Source Control Strategy processes change or new information becomes available regarding phthalate recontamination in the Lower Duwamish Waterway.

The Lower Duwamish River extends from approximately the north end of Harbor Island in the City of Seattle to the upper turning basin in the City of Tukwila. This area is subject to and is undergoing, contaminated sediment studies and cleanup actions governed by CERCLA and State Model Toxics Control Act (MTCA) cleanup laws. This area includes the East and West Waterway operable units of the Harbor Island Superfund site and the Lower Duwamish Waterway (LDW) Superfund site. The City of Seattle and others are conducting source tracing and source control activities on adjacent upland public and private properties. As explained in the 2007 S4.F notification letter, Source Control activities are organized and prioritized across drainage areas to minimize the possibility for recontamination of the waterway.

Regarding City stormwater management efforts in basins that discharge to the Lower Duwamish River, the City implements several source tracing programs with specific emphasis to the Lower Duwamish Waterway. These programs include:

- Business Inspections: In support of the clean-up effort, multi-media inspections are conducted, which cover stormwater pollution prevention, hazardous waste management and industrial waste management. In 2011, 347 initial inspections were conducted with the Lower Duwamish Waterway (LDW) and East Waterway Basins (EWW). Each business is inspected for compliance with the City's Stormwater Code and required to be brought into compliance with all relevant best management practices (BMP) for source control. The inspections resulted in 135 Corrective Action Letters and1of these sites were referred to Ecology for potential NPDES Industrial Stormwater permit coverage. Six facilities were issued NOV's for non-compliance with the City's Stormwater Code and one facility entered into a Voluntary Compliance Agreement.

- Stormwater Facility Inspections: While inspecting a business for source control BMPs, the flow control and/or treatment facility is also inspected. Within the LDW and EWW basins, 147 sites were inspected for Code compliance with regard to flow control and treatment system code requirements during 2011.

- Illicit Discharge Detection and Elimination (IDDE): SPU conducts sediment sampling of onsite catch basins, right of way catch basins and drainage system mainlines to identify sources of contamination and potential illicit discharges and illicit connections. Sampling is conducted in tandem with business inspections to identify and terminate sources of pollution. In 2011, SPU took 92 samples to assist in identifying and source tracing sources of pollution. Samples are analyzed for the LDW contaminants of concern, including TOC, SVOC's, TPH-Dx, select Metals, PCB's, Grain Size and occasionally site specific parameters, such as pH, additional metals, VOC's.

- Water Quality Complaints: Inspectors respond to complaints as they are received through the water quality hotline, web form or from agency referrals. In 2011, 61 water quality complaints were reported in the LDW and EWW basins. When a complaint is reported at a business, a full business inspection is completed. Spill Response: Spills are dispatched through the SPU Operations Response Center to on-call Spill Coordinators as they are received. In 2011, SPU responded to 24 spills within the LDW and EWW basins.

- Education and Outreach: SPU funds the Resource Venture, a conservation service for Seattle businesses. Resource Venture implements the City's Spill Kit Incentive Program, which provides free spill kits, assistance in developing spill plan and site specific technical assistance to Seattle businesses. Approximately 53 businesses in the LDW and EWW basins received spill kits, either stemming from a business inspection or through targeted outreach. Surveys conducted of spill kit recipients

statistically show that businesses who participate in this program show an improved understanding of stormwater pollution prevention.

B.2.2 Duwamish East Waterway Electroplating Wastewater Tank Spill

A 55,000 gallon wooden tank holding electroplating wastewater at a private business failed in March 2008. Following a call by SPU, Ecology personnel arrived on site. SPU issued a Notice of Violation for the spill and conducted a business inspection that resulted in a corrective action letter. Because the private business drained to the City's MS4, the City submitted an S4.F notification to Ecology in April 2008.

Ecology determined that Seattle's response to the incident occurred as required in Special Condition S5.C.8.b.viii and that a report under S4.F.2.a was not necessary because the incident was a spill, which is typically a one-time event, and Seattle has taken steps regarding the second wooden tank of the property to ensure that another such spill was unlikely to occur. Ecology stated that the City should prioritize this facility, and others like it, for annual source control inspections under S5.C.7.

The City has developed its initial list of businesses to be inspected under S5.C.7, prioritized facilities that have high pollution generating activities and conducted business inspections in 2011.

B.2.3 Coho Pre-Spawn Mortality

The City provided S4.F notification in regard to the coho salmon (*Oncorhynchus kisutch*) pre-spawn mortality phenomenon in creeks to which the City's MS4 drains, including the possible influence of the MS4 upon water quality problems in receiving waters. Notification was provided in May of 2008, following general notification in December 2007. The City has worked with NOAA Fisheries, by providing direct financial support and City staff resources, to collaboratively investigate the causes of coho pre-spawn mortality (PSM) for the period 2000-2009. Information about the possible causes of PSM is evolving. Experts cannot definitively say what is causing PSM in coho in urban streams in Seattle.

Ecology determined that a report under condition S4.F.2.a.was not necessary because the correlation between coho PSM and stormwater discharges is based upon urbanization and/or arterial roads, and a link to any single or combination of parameters that would be potentially present in stormwater has not yet been found. Ecology's determination that a S4.F.2.a report was not necessary is conditioned, based in part, on the following: the City will continue to be involved in investigating causes and/or collecting data associated with the coho PSM phenomenon; when the City becomes aware of the exact cause(s) of PSM, Ecology must be notified immediately; and should parameter-specific information about the cause(s) or contribution(s) to pre-spawn mortality become available, Ecology reserves the ability to require a response under S4.F.2.a. Beginning with the Phase I Permit Annual Report for 2008, Seattle must include a summary of the reporting year's studies or findings associated with the coho PSM phenomenon.

As to such summary, the NOAA NWFSC Ecotoxicology Group, partnering with USFWS, SPU, WSU, UW and others, has led an investigation to search for the causes of coho pre-spawn mortality (PSM) since 2002. The daily surveys, which had been conducted in Longfellow Creek in Seattle from 2002 to 2009, were discontinued in 2010. Instead, efforts were focused on preparing publications summarizing the findings to date. Although a correlation exists between coho PSM and stormwater discharges and the level of urbanization, the researchers involved in these studies are still unaware of the exact cause(s) of PSM, and have not found a link to any single, or combination, of parameter(s) that would be potentially present in stormwater. In 2011, NOAA hosted a public workshop to present findings to date as summarized in an article titled "Recurrent Die-Offs of Adult Coho Salmon Returning to Spawn in Puget Sound Lowland Urban streams" published in PLoS ONE in December 2011, and to discuss the next phase of the research.

B.2.4 NPDES Phase I Monitoring Results

SPU is monitoring stormwater for compliance with S8.D of the permit in the MS4 outfall to Venema Creek, a sub-basin of Piper's Creek. During WY 2008 SPU sampling detected that fecal coliform analytical results were greater than the extraordinary primary contact recreation criteria Water Quality Standard.

To address these results, SPU is conducting the following stormwater management activities in the Pipers' Creek Watershed: business inspections, IDDE screening of the MS4 to determine if there are illicit connections, education and outreach to citizens in the Piper's creek watershed to inform them on proper pet waste practices, and in the future, construction of a Natural Drainage System project to provide flow control and water quality treatment for a significant portion of the Venema Creek drainage basin.

Ecology determined that an adaptive management response under condition S4.F.3 was not necessary because the potential water quality impacts will be eliminated through implementation of existing permit requirements. However, Ecology requested that the City include a description of the public education and outreach, illicit discharge detection and elimination screening, business source control inspections and a structural control retrofit project in our MS4 Annual Report for 2010, and beyond.

Description of Activities
The City continued to implement the Doo Diligence pet waste program in the Piper's Creek Watershed. The program has 12 pet waste bag dispensers located in Piper's Creek. Overall bag use in the City held steady from last year at 87,000 in 2011The Piper's Creek watershed was the first MS4 basin screened during 2010 as part of the IDDE dry weather screening program (see section B.3.5 of this document for a description). The screening did not detect any illicit connections to the MS4. SPU is in the design phase for the Venema Natural Drainage System where stormwater from multiple blocks will be infiltrated by use of green stormwater management in an effort to reduce the effects of over 100 years of urbanization on the ecological health of Piper's Creek while providing citizens with local drainage, pedestrian, and other street right-of-way improvements using a naturalistic design.

B.2.5 Source Control Sediment Sampling Data Results, Seattle Iron & Metals

SPU has been engaged with Ecology in inspection and enforcement of City code and a state issued NPDES permit, respectively, regarding a private business, Seattle Iron & Metals Corp, 601 S. Myrtle St. Evidence indicates that the source control BMPs implemented by the business have failed to contain and eliminate the discharge of pollutants from the work site of the business into the City's MS4. The City's MS4 discharges into the Duwamish Waterway, which is part of the Lower Duwamish Waterway (LDW) Superfund site. SPU has been engaged in storm drain solid sampling from private and public catch basins in the City's MS4 as part of the LDW source control program. Results from storm drain samples collected by SPU in 2008-2009 indicated elevated PCBs in the MS4 on S. Myrtle St. that could be associated with operations at Seattle Iron & Metals. SPU conducted a business inspection at Seattle Iron & Metals on January 30, 2009 and after sampling both the MS4 in the vicinity of the property and onsite catch basins, sent a corrective action letter on July 10, 2009, requiring the following improvements:

- Eliminate trackout of sediment and dirt onto adjacent City streets.
- Cover all outside materials that have a potential to leach or spill to the Duwamish River, including scrap piles adjacent to the dock where gaps in the dock permit material and stormwater to discharge directly to the river.
- Remove scrap metal storage bins from the City right-of-way.
- Prepare a written spill response plan for the site and post at an appropriate location onsite.
- Improve onsite housekeeping by regularly 1) sweeping the lot, 2) checking catch basins for sediment accumulation and maintaining as needed, and 3) cleaning up leaks/spills when they occur and employing the spill plan when necessary.

Following the business inspection and source tracing sampling of the MS4, SPU jetted and cleaned all the MS4 and associated MS4 structures (inlets, catch basins and maintenance holes) to remove sediment from the City's MS4 that discharges to the LDW at S. Myrtle St.

Following the jetting and cleaning of the MS4, SPU conducted a joint inspection of Seattle Iron & Metals with EPA. During the inspection, SPU and EPA collected sediment samples from the roofs of the main office and maintenance buildings, as well as the catch basins in the Seattle Iron & Metals employee parking lot and from a City-owned catch basin in the right-of-way adjacent to Seattle Iron & Metals' property. The data collected by SPU indicated that contaminants in the City's MS4, that had accumulated after jetting and cleaning, continued to exceed source control screening levels and these contaminants might be associated with stormwater discharges from Seattle Iron & Metals. Because of this, SPU issued a Notice of Violation (NOV) to Seattle Iron & Metals on July 8th, 2010. Upon receipt of the NOV, Seattle Iron & Metals requested, and SPU agreed to a, Voluntary Compliance Agreement (VCA) on September 29th, 2010. The VCA requires Seattle Iron & Metals to implement the following source control measures:

A. Roof Drains:

   SIM agreed to survey roofs and drains for solid buildup and provide a report on this survey to SPU for review

SIM agreed to clean roof and drains per the roof survey results. Wash water associated with this cleaning will be routed to the onsite treatment system.

SIM agreed to design a roof drain treatment system and provide the design to SPU by November 15, 2010. SPU will review and provide comments or approve the design within two weeks of receiving the design.

After approval, SIM will install the roof drain treatment system consistent with the design plans by December 31, 2010, provided that permitting, engineering design and equipment manufacturing make installation of the stormwater filters feasible. If infeasible, SIM and SPU will negotiate a revised installation date.

B. Track Out:
SIM will continue to implement a sweeping regiment that includes: sweeping at least once per day at the end of shift, moving employee vehicles to the employee parking lot onsite, rather than in the street, and more frequent sweeping as needed.

C. Storm Drain Cleaning
SIM agreed to clean the catch basins located on the south side of S. Myrtle Street from the end of Myrtle St. to 7th Ave. South by November 15, 2010.

Failure by SIM to comply with the Voluntary Compliance Agreement may result in further administrative, legal action or both by SPU.

Ecology responded to the S4.F Notification on September 20th, 2010 that improved source control efforts by Seattle Iron & Metals will address their contribution to pollutant discharges, but Ecology expressed concern that Seattle Iron & Metals efforts by themselves may not eliminate the problem because there may be contribution to MS4 from an unpaved right-of-way on S. Myrtle St. Because of the potential for contribution to the MS4 from the unpaved right-of-way, Ecology determined that an Adaptive Management Response under condition S4.F.3 was necessary.

SPU submitted the Adaptive Management Response report to Ecology on November 22, 2010. The Adaptive Management Response report addressed the requirements detailed in S4.F.3.a and the required elements requested by Ecology in their September 20, 2010, response to the S4.F notification. Ecology acknowledged receipt of the Adaptive Management Response report on November 29, 2010, but as of December 31, 2010, Ecology had not approved the additional BMPs and implementation schedule or required SPU to modify the report as needed to meet AKART on a site specific basis.

Per the requirements of Special Condition S4.F.d, SPU provides that following summary of the status of the Adaptive Management Response report.

Status of implementation in 2011:

Adaptive Management Response report: On February 4, 2011 Ecology provided the City a response to the Adaptive Management Response report (AMRR) that approved the business inspection program, IDDE program and Street Use permitting portions of the AMRR and instructed the City to revise and resubmit the AMRR to include the following:

- Identify potential additional structural and/or operational BMPs for the unpaved portions of the S. Myrtle St. right-of-way.
- Describe the City's potential follow up actions as a result of planned storm drain solid sampling from the City's MS4.
- A feasibility study and cost/benefit analysis to evaluate and compare different stabilization and filtration scenarios for the unpaved portions of the S. Myrtle St. right-of-way.

The City submitted a revised AMRR on April 4 2011to Ecology that included the additional information requested by Ecology on February 4. This information included:

- A field investigation to verify the location of MS4 assets on S. Myrtle St. and updates to the City's GIS data.
- Updated information on MS4 operation and maintenance and street sweeping on S. Myrtle St.
- Results of MS4 storm drain solids samplings.
- A feasibility study, that includes five alternatives for the unpaved right-of-way on S. Myrtle St. to be submitted on June 4, 2011, with a preferred alternative selected and submitted to Ecology on August 15, 2011.

Ecology approved the revised AMRR on April 20, 2011.

SPU submitted the Second Quarter submittal to Ecology on June 30, 2011 which contained; a report summarizing the results of MS4 solids sampling, the feasibility of installing a catch basin insert and a status update on the EPA air monitoring data.

The City submitted the five alternatives for the unpaved right-of-way to Ecology on May 31, 2011, and the preferred alternative to Ecology on August 15 2011. The preferred alternative was Option 1, which was based upon MS4 sampling that indicated that the unpaved portion of the S. Myrtle St. right-of-way was not contributing PCBs to the MS4. Option 1 implements quarterly operation and maintenance of the MS4, weekly street sweeping and follow-up sampling of the MS4 to verify that the unpaved right-of-way is not a source of PCBs.

Ecology responded on October 11, 2011. "in combination the submittals (May 31, 2011, June 30, 2011 and August 15, 2011) document the results of recent MS4 storm solid sampling and propose the City's near-term stormwater management actions to adaptively manage the quality of discharges from the S Myrtle St. MS4." Seattle continues to implement the elements of the AMRR and is in continuing communication with Ecology.

Monitoring Results

SPU monitored storm drain solid accumulation in the catch basins in the vicinity of S. Myrtle St. in April 2011 as part of the Adaptive Management Response. The results of the sampling are summarized in the table below. Note that catch basin RCB 225 is adjacent to Seattle Iron and Metals Driveway and RCB 226 is the catch basin in the unpaved right-of-way.

Total PCBs in SPU source samples collected in April 2011.

	Source Tracing Benchmarks		RCB225	RCB226	CB211	CB212
	SQS/LAET[a]	CSL/2LAET[b]				
total PCBs	130	1,000	8,230J	860	1,020	360

J= Analyte was positively identified. The reported result is an estimate.

Units: ug/kg dw

a. Sediment quality standard/lowest apparent effects threshold. SQS used for metals, LAET used for most organic compounds because relatively high levels of TOC in organic compounds make comparison with TOC normalized SQS values impossible.

b. Cleanup screening level/2nd lowest apparent effects threshold. CSL used for metals, 2LAET used for most organic compounds because relatively high levels of TOC in organic compounds make comparison with TOC normalized CSL values impossible. This is the threshold used by SPU for triggering source tracing activities.

Chemical concentrations in the sample collected from the catch basin in the unpaved right-of-way of S. Myrtle St (RCB226) do not exceed the CSL/2LAET. As shown in Figure 2, PCBs found in sample RCB226 (860 ug/kg dw) are on the high end, but generally within the range typically found in street catch basins samples throughout the Lower Duwamish study area (< 130 to 1,000 ug/kg).

Assessment of Evaluation Efforts

The City will continue to use storm drain solid sampling from the MS4 on S. Myrtle St. to evaluate the effectiveness of the AMRR.

Seattle Iron and Metals (SIM) Voluntary Compliance Agreement (VCA).

SPU has entered into a VCA with SIM to resolve stormwater discharges and source control implementation issues. The following elements and deadlines have been implemented.

- Roof Drains: SIM completed the following VCA elements during 2010.
  - A survey of the roofs and gutters of all structures on the SIM site and assessment of their condition with regard to solids build up was completed by September 30, 2010.
  - SIM provided the roof drain and gutter assessment data, including photos and narrative to the City by October 15, 2010.
  - SIM cleaned the roof and gutters by November 11, 2010.
  - SIM prepared and submitted to SPU an engineering plan regarding design and placement of stormwater filters to prevent the discharge of contaminants from

the roof drains to the storm drainage system by November 15, 2010 as required by the VCA.
    - SPU reviewed the roof drain engineering plan and provided comments back to SIM on December 1, 2010.
    - The VCA require SIM to install the roof stormwater filters consistent with the plan by December 31, 2010. However, SIM, Ecology and SPU negotiated an alternative plan for the roof drains.
    - On June 10th, 2011 SPU referred the violation of the City's Stormwater Code by SIM to Ecology for Ecology enforcement under the NPDES Industrial Wastewater Permit Program.
- Track Out – SIM continued to implement a pavement sweeping regiment as agreed to in the VCA.
- Storm Drain Cleaning – SIM cleaned the catch basins located on the south side of S. Myrtle Street by November 15, 2010.

On February 15, 2012, SPU and SIM agreed to a revised VCA, which included the requirement that SIM install a Filtera Biofiltration system in RCB 225.

B.2.6 Illicit Connection Screening Results- Pritchard Beach MS4 Drainage Basin

In July of 2010 and in the subsequent investigations, the City discovered 48 illicit connections in the Pritchard Beach MS4 drainage basin as a result of the permit requirement to conduct illicit connection dry weather screening. A screening sample collected from the MS4 near the MS4 outfall during dry weather indicated the likelihood of an illicit connection. SPU initiated an investigation, following the SPU illicit discharge detection and elimination (IDDE) procedure, and discovered three stand alone illicit connections and 45 illicit connections in a subdivision developed between 2000 and 2007. SPU issued Notices of Violation or Voluntary Compliance Agreements with the owners of the properties or other responsible parties to eliminate the illicit connections in a timely manner.

Ecology responded on October 12, 2010 that additional information was required in order to determine an appropriate response under S4.F.2. Ecology requested the following information: map of existing drainage infrastructure, description and timeline of NewHolly development focused on utility installations, a description of the City's development review process, statistics on IDDE program, and information on the City's wet weather IDDE screening methods.

On January 7 2011, SPU responded with the requested information. Ecology responded on June 6, 2011, that Ecology had determined that an Adaptive Management Response under condition S4.F.3 was not necessary because the Phase I Permit's Stormwater Management Program (Special Condition S5.C.8) are designed to address illicit connections to the MS4. However, Ecology requested information on the City's side sewer inspection protocol.

Seattle reviewed and revised the protocol for side sewer inspections and submitted a report on this revised protocol in October of 2011 and provided a copy to Ecology for their review. Ecology responded via email on October 31, 2011 that they had placed a copy of the protocol in our permit file

B.2.7 Hydraulic fuel spill from a Vehicle Accident at 1900 Westlake Ave. N

On October 3, 2011, SPU submitted an S4.F notification to Ecology on a discharge of vegetable oil –based hydraulic fluid that spilled into the MS4 and discharged out of the outfall into Lake Union. The spill occurred as a result of a garbage truck that broke the lid of a stormwater treatment facility causing the truck to fall into the vault, which resulted in a rupture of the truck's hydraulic fluid tank. The SPU spill response team, Ecology's Spill Response team and the trucking company's spill response team responded and cleaned up the spill in the MS4 and in the receiving water body.

Ecology responded that it determined that an adaptive management response under condition S4.F.3 is was not necessary because the Phase I Permit's Stormwater Management Program Requirements are designed to address spills into the MS4.

B.3 Assessment of Best Management Practice Appropriateness (S9.E.6 and S8.B.2)

This section provides an assessment of the appropriateness of the City's program design and/or specific BMPs identified for each component of the SWMP, including any changes made or anticipated to be made, and why.

B.3.1 Public Involvement and Participation (S5.C.4)

The permit requires the City to develop and implement a process to create opportunities for the public to participate in the development of the Stormwater Management Program (SWMP) Documentation. The City's BMP used for public involvement and participation is to create opportunities for the public to learn about, comment on and question the City's approach to the management of stormwater. Public participation is encouraged by providing multiple opportunities for public involvement. These include, but are not limited to, opportunities to comment on funding allocation for the NPDES related programs and projects, to give input and review codes describing the technical standards for control of stormwater discharges and enforcement of impacts to the MS4, and to review and comment on the ongoing development of stormwater management activities. Additional opportunities for the public to learn about the City's stormwater program are provided on the City's web site: (http://www.seattle.gov/util/about_spu/drainage_&_sewer_system/reports/stormwatermanagementplan/). Over 844 people viewed this web page during 2011, a decrease from 1,358 people during 2011. The SWMP had 413 visits, there were 158 visits to the Annual Report, and 125 visits to the Attachment B Evaluation of Effectiveness and 148 visits to Attachment C, Monitoring. The web site contains the email address (swmp@seattle.gov) that the public can use to email questions and comments to the City about stormwater management.

The City has found that these methods of soliciting public comments are an appropriate BMP for public participation because they reach a wide audience. Additional information on public involvement and participation can be found in the City's SWMP, submitted as Attachment A of the City's 2011 Phase I Permit Annual Report Form.

B.3.2 Controlling Runoff from New Development, Redevelopment and Construction Sites (S5.C.5)

The 2007 NPDES Phase I Municipal Stormwater Permit required the City to implement the following elements of the program for controlling runoff from new development, redevelopment and construction sites: begin a local program that adopts by ordinance or other enforceable document equivalent to Appendix 1 of the permit; establish legal authority to inspect private stormwater facilities and enforce maintenance standards for all new and redevelopment, implement a process of permits, plan review, inspections and enforcement; make available copies of Ecology's documents: "*Notice of Intent for Construction Activities"* and "*Notice of Intent for Industrial Activities"*; and train staff to properly implement the program to control stormwater runoff from new development, redevelopment and construction sites.

The City continued to implement its existing program to control runoff from new development, re-development and construction sites in 2011 under the Revised Stormwater Code (SMC 22.800-22.808) and related Directors' Rules. This program, which was documented in Section III.5 in the City's SWMP dated March 2011, is led by the Department of Planning and Development (DPD). This program has conducted 596 temporary sediment and erosion control (TESC) inspections and 35 enforcement actions during 2011.

The determination of equivalency by Ecology indicates that the revised Stormwater Code is appropriate for implementation of the minimum requirements in Appendix 1, and will protect water quality, reduce the discharge of pollutants to the maximum extent practicable (MEP), and satisfy the state requirement under chapter 90.48 RCW to apply all known, available, and reasonable methods of prevention, control and treatment (AKART).

During 2011, DPD made copies of Ecology's documents: "*Notice of Intent for Construction Activities"* and "*Notice of Intent for Industrial Activities"* available to the public. These documents were made available to the public at the DPD Applicant Services Center (ASC), which is located on the 20th floor of Seattle Municipal Tower at 700 Fifth Avenue in downtown Seattle. Providing the documents at the ASC is appropriate because the majority of the people who seek permits from the City visit the ASC and have the opportunity to view and learn about the Ecology NOI requirements.

In 2010, SPU led five different types of Stormwater Code implementation training classes designed to educate City staff whose primary job duties are implementing the requirements of the revised Stormwater Code and Directors' Rules as they relate to redevelopment and construction sites, including permitting, and plan review construction site inspections. The training was provided to 319 employees from SPU,

DPD, SDOT, Parks, FFD and SCL, with some employees attending multiple trainings. Below is a brief description of the training classes. This training was effective in providing information and education on the revised Stormwater Code and Directors' Rules in addition to providing an opportunity for staff from different departments to meet one another and discuss how their work relates to other departments' work and how they can coordinate on Stormwater Code implementation.

Modeling – This training class provided staff with a description of the minimum requirements for projects with a specific focus on each type of drainage basin; combined sewer, non-listed creek, listed creeks and wetlands. In addition, the class presented information on plan submittal requirements and design aids such as the technical information report, Hydro-stats (the modeling post-processor), the pre-sized tables and spreadsheets.

Green Stormwater Infrastructure for projects in the right-of-way – This training class provided staff with an overview of the requirements for implementation of green stormwater infrastructure (GSI) to the maximum extent feasible (MEF) as part of projects conducted in the City's right-of-way that trigger flow control or water quality treatment under the Stormwater Code. Examples of GSI to the MEF were provided along with a review of the GSI calculator and reviewer checklists.

Green Stormwater Infrastructure for parcel based projects - This training class provided staff with an overview of the requirements for implementation of green stormwater infrastructure (GSI) to the maximum extent feasible (MEF) for parcel based projects that trigger flow control or water quality treatment under the Stormwater Code. Examples of GSI to the MEF were provided along with a review of the GSI calculator and reviewer checklists.

Overview of Standard Plans – This training class provided staff with an overview of the new requirements for standard plans and what types of elements to look for when conducting plan review.

Stormwater Construction Control Training – This training class provided staff with an introduction to the new Construction Stormwater Control plans for large and small construction projects, with a focus on Stormwater Code changes. The training described what Stormwater Construction Control plans should contain, an introduction to the usual BMPs, and a discussion on what an inspector, designer, planner or reviewer needs to look for either during project development, when reviewing plans, or when conducting an on-site inspection.

All staff whose primary job duties are implementing the program to control stormwater runoff from new development, redevelopment, and construction sites, including permitting, plan review, construction site inspections, and enforcement, are trained to conduct these activities. In addition, all site inspectors have had Certified Erosion and Sediment Control Lead (CESCL) training. This level of training is appropriate because it is BMP 160 in the Stormwater Management Manual for Western Washington.

Information on how the City is implementing the minimum performance measures for controlling runoff from new development, redevelopment and construction sites can be found in the City's SWMP, submitted as Attachment A of the City's 2011 Phase I Permit Annual Report Form.

B.3.3 Structural Stormwater Controls (S5.C.6)

The 2007 NPDES Phase I Municipal Stormwater Permit required the City to implement the development of a structural stormwater control program (SSCP).

The City has implemented a SSCP, which is appropriate because it uses a comprehensive planning process to support the SSCP. The geographic scale of the program is the area served by the City's MS4 and the MS4-related receiving water bodies. The SSCP projects are prioritized using asset management principles. Asset management is the process by which projects are evaluated for their whole-life cycle cost benefit including social, economic, and environmental factors (known at SPU as the "triple bottom line"). Projects are prioritized by SPU staff based on an assessment of receiving water body conditions, anticipated benefits of the project, regulatory compliance needs, opportunity, and application of asset management principles that have been adopted by SPU under the guidance of the Asset Management Committee (AMC). Projects must pass through several AMC evaluation screens and funding allocation phases before they are formally approved by SPU management for implementation.

Information on how the City is implementing the 2011 minimum performance measures for the structural stormwater controls program can be found in the City's SWMP, submitted as Attachment A of the City's 2011 Phase I Permit Annual Report Form.

B.3.4 Source Control Program for Existing Development (S5.C.7)

The City continued to implement the following elements of the source control program for existing development as required by the 2007 NPDES Phase I Municipal Stormwater Permit for areas that discharge to Seattle's MS3s: adopt and enforce the Seattle Municipal Code and Directors' Rules; create an inventory or listing of the businesses using the categories in Appendix 8; establish a complaint-based response to identify other pollutant generating sources such as mobile or home-based businesses; implement an audit/inspection program for sites identified as pollution generating per the permit; implement a progressive enforcement policy and provide training to staff involved in the source control program.

The approval of the Seattle revised Stormwater Code and Directors' Rule Source Control BMPs by Ecology indicates that the revised Stormwater Code will protect water quality, reduce the discharge of pollutants to the maximum extent practicable (MEP), and satisfy the state requirement under chapter 90.48 RCW to apply all known, available, and reasonable methods of prevention, control and treatment (AKART).

The City has established, and updated in 2011, a list of businesses that have the potential for outdoor pollution generating sources. The list is based on a comparison of the most

current list of businesses, which was compared to Appendix 8. This list resulted in identification of 3,790 businesses that have the potential to have outdoor pollution generating sources. Each of these businesses was provided with a flyer on the stormwater requirements for businesses during 2009. The flyer was provided to each business that received an audit inspection during 2011.

In 2008, SPU conducted a review of the business list against the business inspection database and determined that a number of businesses have common urban land uses that lack pollutant generating sources or activities. Consequently, these businesses have been removed from the list, leaving approximately 3,790 businesses eligible for inspection. The groups of businesses removed from the inspection list are summarized below along with rationale for removing them from the list.

- Personal Services – Standard Industry Code Industry Group 723 and 724, Beauty Shops (7231) and Barber Shops (7241). The City has screened and inspected this sector in previous years and determined that these industry groups do not conduct outdoor pollution generating activities and that stormwater source control requirements are not relevant to this sector. The facilities generally do not have loading docks - shipments are hand carried through the front door and there is no outdoor storage of either product or waste. These facilities do not have wastes that could impact stormwater. Any sites with private drainage systems (flow control or treatment) will be inspected through the Stormwater Facility Inspection Program.
- Transportation Services – Standard Industry Code Industry Group 4121, Taxicabs. Within the City of Seattle, individual taxicab drivers must obtain a business license in order to drive for a taxicab company. Due to this licensing process, the licensed business address is actually the private residence of the individual and these locations are not pollution generating with regards to the targeted activity. Within this grouping, there are taxicab maintenance facilities, and these businesses will be kept on the list and inspected.

In 2007, SPU used a portion of the Local Government Stormwater Grant it received from Ecology to hire a consultant (R. W. Beck) to review the evaluation of business stormwater runoff pollution potential that was completed by SPU for their Source Control program. SPU used federal guidelines based on the Standard Industrial Code (SIC) to rank each business as having low, medium-low, medium, or high stormwater runoff pollution potential. Based on its ranking, each business was assigned one of four levels of action within SPU's Source Control program. The intent is to assign a higher or more thorough level of inspection for businesses that have higher stormwater runoff pollution potential.

R.W. Beck's review determined that SPU's ranking of business stormwater runoff pollution potential is appropriate for implementing the business inspection program. Following initial implementation of the program and follow-up evaluation of its effectiveness, SPU may modify these rankings based on the activities observed at sites and ability to implement appropriate BMPs.

The City continued to implement its business inspection program for compliance with S5.C.7 during 2011. In 2009 SPU began conducting stormwater pollution prevention *audits,* as part of the business inspection program, of businesses in selected neighborhoods as a way to educate businesses on the stormwater system, provide technical assistance on preventing stormwater pollution, and rank businesses according to their pollution-generating potential for future inspection cycles. During the audit, inspectors examine storm drains, facilities, and activities at the business; educate the staff member who guides the inspector on the site about the stormwater system and best management practices; supply printed information on reducing stormwater pollution; and provide a form detailing recommended changes tailored to the business based on the audit. The *audit* inspection is a new type of inspection, and because of this SPU had a desire to determine if it was an effective tool in educating businesses about the Stormwater Code and BMPs for stormwater pollution prevention.

In summer 2010, SPU worked with Cascadia Consulting Group to assess the effectiveness of the stormwater pollution prevention audits and gather feedback from businesses on how to improve the audits and increase businesses' compliance with stormwater rules. Cascadia and SPU developed and conducted a telephone survey of businesses that had received audits. The survey addressed whether the interviewees remembered the audit and implemented the changes recommended during the audit. Respondents were also asked to discuss the challenges they faced in making changes, describe what helped or would help them make changes, rate and suggest improvements for the audits, and rate potential motivators for compliance.

The 2010 survey found measurably increased awareness of stormwater issues and adoption of BMPs. The survey helped SPU determine that the audit program is an effective tool for educating low- and medium-risk businesses. In addition, audits provide SPU an opportunity to assess the stormwater risk posed by business for prioritizing future inspections. With both an audit inspection program and a stormwater inspection program, SPU can more efficiently allocate resources to address both outreach and compliance.

In summer 2011, SPU worked with Cascadia Consulting Group (Cascadia) to evaluate the effectiveness of stormwater pollution prevention inspections using a telephone survey. To assess effectiveness, survey respondents were asked about a variety of the business's stormwater practices such as outdoor washing or water use, outdoor material storage, stormwater facilities, and spill response preparedness. The survey also included questions on the respondent's knowledge of Seattle's stormwater system, rating of the stormwater inspection, attitude toward stormwater pollution prevention, and demographics.

To the extent possible, the 2011 study was designed to determine whether business compliance decreased as time increased and whether there were differences in responses related to the estimated level of risk to stormwater posed by the business. After fielding the survey, SPU and Cascadia determined that businesses with stormwater permits issued by the Department of Ecology or King County are not comparable to

businesses without a permit; as a result, responses from businesses with Ecology or King County permits were analyzed separately.

Based on the results of the 2011 study, stormwater pollution prevention compliance and knowledge appear to be fairly high among all subpopulations surveyed. Responses regarding most stormwater pollution prevention practices and attitudes among businesses without permits did not appear to show clear trends based on time elapsed since the last stormwater inspection or risk category. Time elapsed appeared to affect responses regarding stormwater facility inspections and rating of the inspector. Risk category at businesses without permits appeared to affect responses regarding stormwater facility inspections, spill kits and plans, and stormwater treatment. A complete evaluation of this program is included as Appendix A of this document.

SPU conducted 1,089business inspections in 2011, of which 176 required a corrective action letter and follow up visit to determine compliance with the Stormwater Code. Of the 176 that required corrective actions and follow up visits, 28 were issued Notices of Violation (NOV) and one entered into Voluntary Compliance Agreements (VCA) for failure to implement the BMPs detailed in the corrective action letter and during the follow up visit. The moderate number of follow up visits and low number of NOV incidents shows that the City's source control program for existing development is an appropriate BMP for meeting the permit requirements to reduce pollutants in runoff from areas that discharge to the MS4.

The City's complaint-based response program includes the water quality hotline, business inspections, and illicit discharge, detection and elimination programs. The City staffs a 24-hour water quality hotline to allow citizens and businesses to report illicit discharges into the MS4. Businesses, including mobile and home-based, and citizens who are found to be causing illicit discharges, receive education and are potentially subject to enforcement actions if they refuse to voluntarily correct the problem. During 2008, the City conducted an evaluation of the water quality hotline to determine if it is an effective program for identifying other pollutant generating sources via a complaint-based program. The evaluation determined that the majority of callers reporting incidents to the water quality hotline were calling primarily because they witnessed dumping or a spill (54%), with the rest calling to report negative environmental impacts or drainage problems.

The City's complaint-based response program received over 217 reports in 2011, all of which were investigated and 18, of which resulted in business inspections. This program is an appropriate BMP as it provides a mechanism for the public to take an active role in stormwater pollution prevention, identifies businesses that require source control information or inspection and help the City increase awareness of activities that have negative impacts on stormwater.

All staff involved in the Source Control program receive the following basic training; EPA Basic Inspector Training: Overview of all aspects of inspection preparation, conduct, and follow-up and various federal environmental laws and regulations, 40 Hour Hazardous

Waste Operations and Emergency Response, 24 Hour Hazmat Emergency Spill Response, Blood-borne Pathogens, Confined Space Entry, First Aid and Traffic Control and Flagging Certification. These trainings are appropriate because the trainings are considered the industry standards and taught by instructors that are certified by the respective sponsoring organization In addition, all IDDE staff will receive the following program-specific training: IDDE Standard Operating Procedures – field and laboratory training, Field Hazards and Illicit Drug Lab Identification.

B.3.5 Illicit Connections and Illicit Discharge Detection and Elimination (S5.C.8)

The City continued to implement the following elements of the Illicit Connection and Illicit Discharge Detection and Elimination (IDDE) program as required by the 2007 NPDES Phase I Municipal Stormwater Permit during 2011 for illicit connections and illicit discharges into Seattle's MS3s: continue implementation of an on-going IDDE program; evaluate and updated existing ordinances or other regulatory mechanisms to effectively prohibit non-stormwater, illegal discharges and/or dumping into the MS4; ensure that all staff who are responsible for IDDE are trained to conduct the required activities; provide a publicly listed water quality citizen complaint/reports telephone number; prioritize complete field screening of the conveyance system; and develop and implement procedures to investigate and respond to spills and improper disposal into the MS4.

During 2011, SPU continued to lead the City's illicit connection, detection and elimination (IDDE) program, which was first implemented to meet the requirements of the 1995 NPDES Municipal Stormwater permit. Citizens can report water quality concerns and complaints, which may lead to a discharge to the City's MS4 by either calling the publicly listed 24 hour "water quality hotline" phone number or by using the internet-based form on the City website.

In 2011 the hotline received 217 surface water quality calls. The water quality hotline and web based reporting mechanism enable the general public to take an active role in stormwater pollution prevention and enhance the City's ability to prevent illicit connections and discharges. This BMP is appropriate as it provides a mechanism for the public to take an active role in stormwater pollution prevention and help the City increase awareness of activities that have negative impacts on stormwater. An evaluation of the water quality hotline can be found in sections B.3.4 and B.3.7.2.3 of this document.

There were 6 illicit connections investigations (16 individual illicit connections) during 2011 which resulted in 6enforcement actions. The City notified Ecology of the IDDE events by way of the Environmental Response Tracking System (ERTS), which also serves as the City's process for notification under G3. The IDDE program resulted in elimination of 5 illicit connections in 2011 with other corrections pending. There were no referrals from the City of IDDE violations to Ecology after making a good faith and documented effort of progressive enforcement to terminate the violation(s) in 2011.

The SPU Spill Response Program is staffed by a Senior Spill Coordinator and a network of on-call Spill Coordinators. Spill Coordinators work in 3 or 4 day on-call shifts and are available 24 hrs/ 7 days a week. Spill Response calls are dispatched through the Operations Response Center (ORC) and are received via a publicly-available phone number (206-386-1800). The water quality hotline advises citizens who are reporting an active spill to call the ORC to report the spill. Once a spill call is received, the Dispatcher contacts the on-call Spill Coordinator and advises them of the situation. Spill Coordinators follow written procedures for investigation, clean-up and reporting to appropriate agencies.

Each of the major departments at the City has a spill prevention and response program that includes procedures on how to respond and report spills and training to keep staff involved in spill response current on how to conduct their responsibilities. Each department's procedure includes instructions on when and how to report spills to SPU that enter the MS4.

Resource Venture, a contracted consultant of SPU, provides free site visits, spill kits and education to Seattle businesses to assist them with development of a spill prevention plan and proper clean-up and disposal of spills. The spill kit program is promoted on the Resource Venture web site, and a workshop for high risk potential polluters group is offered each year. Spill Plans are reviewed by Resource Venture, and businesses receive training with the spill kit. Resource Venture is an effective method of providing businesses with BMPs so they can voluntarily comply with the City's Stormwater Code.

In 2008, the City conducted an evaluation of the spill kit program to determine if it is an appropriate BMP. The evaluation included a survey of kit recipients since 2004 to assess their understanding of stormwater pollution prevention and their use of spill plans and kits. A previous survey was conducted among Seattle businesses in 2005. The survey in 2008 of spill kit recipients included many elements of the previous survey to examine changes since 2005. The majority of those surveyed were auto repair and maintenance businesses (24%). Industry, restaurants and sales made up the next highest business types (~14% each).

Among respondents who reported experiencing spills that require spill kit materials, more respondents in 2008 than 2005 said that they utilize spill kits to clean-up routine spills. Similar percentages of respondents in 2008 and 2005 said that their business had written and posted a plan for dealing with a spill, but more respondents in 2008 said that the plan was posted near the spill kit.

Respondents in 2008 expressed similar confidence to respondents in 2005 about their ability to clean-up spills quickly, knowledge of whom to contact for help containing or cleaning up a spill, stock of spill clean-up materials on hand, and knowledge of where to obtain and dispose of clean-up material. However, respondents in 2008 expressed higher levels of agreement that having a spill plan and clean-up kit makes their

employees more aware of surface water pollution and how their business practices can help reduce impacts on water quality.

This evaluation indicates that spill kits are an appropriate BMP for spill prevention and clean-up and verified that information provided directly to the general public helps to reduce behaviors that cause or contribute to adverse stormwater impacts.

All staff involved in the IDDE program receive the following basic training which is appropriate because the trainings are considered the industry standards and taught by instructors that are certified by the respective sponsoring organization; EPA Basic Inspector Training: Overview of all aspects of inspection preparation, conduct, and follow-up and various federal environmental laws and regulations, 40 Hour Hazardous Waste Operations and Emergency Response, 24 Hour Hazmat Emergency Spill Response, Blood-borne Pathogens, Confined Space Entry, First Aid and Traffic Control and Flagging Certification. In addition, all IDDE staff will receive the following program-specific training: IDDE Standard Operating Procedures – field and laboratory training, Field Hazards and Illicit Drug Lab Identification.

In 2011 the City continued to implement a conveyance field screening program for compliance with S5.C.8.b.vi(1) that is based upon the methods identified in Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments, Center for Watershed Protection, October 2004. SPU is implementing the program to meet the permit requirement to conduct on-going screening and source tracing per Special Condition S5.C.8.b.vi of the permit. If a suspected illicit connection is detected, source tracing is initiated within 21 days. Upon confirmation of the source or illicit connection, SPU uses the progressive enforcement process detailed in Directors' Rule 18-2009, SPU 2009-006, Volume IV – Stormwater Code Enforcement Manual to eliminate the connection.

Information on how the City is implementing the 2011 minimum performance measures for the illicit connection and illicit discharge detection and elimination program can be found in the City's SWMP, submitted as Attachment A of the City's 2011 Phase I Permit Annual Report Form.

B.3.6 Operation and Maintenance Program (S5.C.9)

During 2011 the City continued to implement the following elements of the operation and maintenance program in areas served by Seattle's MS3s: establish maintenance standards for stormwater facilities, adoption and enforcement of the Seattle Municipal Code and Directors' Rules, development of an initial inspection schedule for all known, permanent stormwater treatment and flow control facilities regulated by the Permittee, establish practices to reduce stormwater impacts associated with runoff from parking lots, streets, roads, and highways owned or operated by the Permittee, and road maintenance activities conducted by the Permittee and establish and implement policies and procedures to reduce pollutants in discharges from lands owned or maintained by the Permittee.

The determination of equivalency by Ecology indicates that the revised Stormwater Code will protect water quality, reduce the discharge of pollutants to the maximum extent practicable (MEP), and satisfy the state requirement under chapter 90.48 RCW to apply all known, available, and reasonable methods of prevention, control and treatment (AKART).

The Source Control and Monitoring (SCM) group at SPU is responsible for inspecting private stormwater facilities regulated by the City. During a facility inspection, all aspects of the system are inspected: flow control devices, catch basins, etc. When any part of that system (including catch basins) is found to be out of compliance with Stormwater Code requirements for maintenance, a corrective action letter is sent to the facility owner and the owner or contractor must certify that the work has been completed. The City has established an initial inspection schedule for privately-owned stormwater treatment and flow control facilities in areas served by Seattle's MS3s and inspected 528 private facilities during 2011, which resulted in 298 corrective action letters for maintenance of the private facilities.

Maintenance of stormwater facilities owned or operated by the City that are located in areas served by Seattle's MS3s are divided between the departments. SPU inspects and maintains stormwater facilities located in the right of way. Inspection and maintenance of stormwater facilities outside the right of way on City owned property is conducted by the City Department that manages the property. All departments have continued to implement a program to annually inspect all permanent stormwater treatment and flow control facilities that they own or operate in 2011. The inspection and maintenance is conducted per the requirements in Appendix D of Volume 3 of the Directors' Rules. These standards have been determined by Ecology to be equivalent to the maintenance standards in Chapter 4 of Volume V of the 2005 *Stormwater Management Manual for Western Washington* and as such, are the most appropriate BMPs for implementation of this permit requirement.

The Seattle Department of Transportation (SDOT) is the lead City agency for establishing practices to reduce stormwater impacts associated with runoff from streets, parking lots, roads or highways owned or operated by the City. In addition to the revised draft Stormwater Code and Directors' Rules, SDOT has developed Maintenance Management Systems Performance Sheets that reference BMPs and elements of the Regional Road Maintenance Initiative to meet Endangered Species Act (ESA) and NPDES requirements. These BMPs have been adopted by 23 different agencies in Western Washington, so it is appropriate that the City use these BMPs.

Parks, FFD, SCL and SPU are governed by the Stormwater Codes and Directors' Rules to reduce pollutants in discharges from lands owned or maintained by the City. The departments are governed by the current Stormwater Code and implement appropriate BMPs when conducting construction and maintenance activities on or near streets, parking lots and roads. The individual City departments have and will continue to implement a spill program and provide training on spill and source control.

DPD and SDOT have revised the temporary erosion and sediment control (TESC) training that is provided to City staff and the public involved in ground disturbing activities to reflect the changes in the 2009 Stormwater Code. This new training, called Stormwater Construction Controls (SWCC), was provided to 131 city staff during the first quarter of 2010. The Class is available to members of the public if requested during 2011, however no training sessions were requested.

The SWCC class is an appropriate BMP for training staff and the public on the proper use of stormwater construction controls for retaining sediment on site and preventing erosion as it provides descriptive training and real life examples of the BMPs required by the City Stormwater Code.

Information on how the City is implementing the 2011 minimum performance measures for the operation and maintenance program can be found in the City's SWMP, submitted as Attachment A of the City's 2011 Phase I Permit Annual Report Form.

B.3.7 Education and Outreach Program (S5.C.10)

The 2007 NPDES Phase I Municipal Stormwater Permit directs the City of Seattle to implement a program for conducting education and outreach to specific audiences on specific topics. The City has prepared an education and outreach program of work to meet these requirements over the term of the Permit and is therefore the best management practice for managing stormwater by education and outreach. The following sections include a brief description of the education and outreach activities associated with each of the BMPs and what strategies are in place to track improvements in the target audience's understanding of the problems.

B.3.7.1 Audience: General Public

B.3.7.1.1 The Urban Watershed School Programs

This program educates the general public about the impacts of stormwater flows into surface waters and the impacts associated with impervious surfaces. The program includes teacher training, curriculum support, field trips and community service/service learning activities. Programs are implemented through a partnership between Seattle Public Utilities, Seattle Parks, and Seattle Public Schools (SPS).

SPU and SPS have identified existing curriculum areas where applied stormwater issues can support and enrich student learning. As a result local geographic references, stormwater-related content and new lessons have been added to the district science curriculum at 4th and 6th grade. In addition field trips at the elementary level tie the investigation of an applied problem- the impacts of stormwater on a real stream to district-wide grade level content (either the Land and Water science kit, or Salmon in the Classroom program). The field trips bring children to a local urban stream (Longfellow, or Piper's Creek) where they explore hydrologic concepts and the impacts of urbanization on lotic systems. Community service and service learning opportunities, such as storm drain stenciling, extend the reach of this content into the adult community and build a personal stewardship ethic.

In 2011 SPU provided materials for 50 stormwater related district-wide science kits. Materials included the Ecology GROSS grant-funded *Lost and (Puget) Sound* video and lessons and an original power point presentation titled *Discovering Seattle's Land and Water*. Thirty-four teachers received training on the kits and the use of the new materials. In addition 1,218 children attended urban watershed fieldtrips at Piper's Creek, and Longfellow Creek. Forty-two classrooms participated in Community service and service learning activities. Twenty-two different public, private and parochial schools participated in the program. Several years of teacher surveys have indicated that teachers in both programs see increases in student understanding of the impacts of stormwater and impervious surfaces.

This program is the most appropriate BMP because it reaches a large diverse geographic audience and engages them in applied learning. The program links closely with school science curriculum to reinforce target messages and illustrate concepts with real, local examples.

B.3.7.1.2 STORM/Puget Sound Starts Here

The City participated in STORM (Stormwater Outreach for Regional Municipalities) activities and the Puget Sound Starts Here (PSSH) regional campaign which focuses on stormwater BMPs for cars, pets, yard care and home cleaning. SPU supports STORM as a member of the Core Team and participates in the North King County Stormwater Outreach Group (SOGgie). In addition, SPU staff provided presentations including the Ecology GROSS grant-funded Lost and Puget Sound video and lessons (October, 2011 STORM quarterly) and shared examples of programs and materials with other municipalities (both Phase I and Phase II permitees) through STORM and mypugetsound.net . The PSSH Campaign includes a website and additional media with information to education the general public about the impacts of cleaning products on stormwater and alternative products. Mainstream media campaign efforts for PSSH include substantial outreach and education in the City through newspapers and television. In addition the City included the PSSH brand on many related outreach materials. The PSSH website is an appropriate BMP because information is available and accessible for a wide general public audience.

B.3.7.1.3 Pet Waste Program

The City conducts a city-wide outreach program that promotes and educates the general public about the impacts of pet waste on water quality. In 2011, the program employed several programmatic strategies to educate and engage the public on the topic of source control BMPs and environmental stewardship actions and opportunities around the issue of pet waste disposal. Key partnerships with businesses and community groups (including 14 animal clinics, 7 animal hospitals, 22 pet stores, and several Block Watch organizations) facilitate distribution of mutt mitts and brochures. In 2011 new partnerships with five businesses and two community Block Watch organizations were established. There are 60 pet waste dispenser locations city-wide with three new locations added in 2011.

Partners and city staff distributed 87,300 mutt-mitts and 2,680 pet waste brochures in 2011. Mutt-mitt distribution increased by 10% from 2010. The program also expanded its outreach efforts to include six apartment complexes. Approximately 900 pet waste brochures were distributed at apartment locations. Approximately 2,400 mutt mitts were distributed at the Annual Seattle 5K Dog Run.

This program is an appropriate BMP to address pet waste because it makes educational materials accessible to the target audience and provides them with a means to personally implement a BMP.

B.3.7.1.4 RainWise

The City has implemented the RainWise program in 2011 to meet the requirement to educate general public, homeowners, landscapers and property managers about low impact development techniques, including site design, pervious paving, vegetation retention, sustainable landscape practices, and other green stormwater practices. This program provides education and outreach on how to slow, spread, filter and infiltrate stormwater. The program has implemented the following educational/technical elements to raise awareness about GSI (including stormwater treatment and flow control). SPU has provided rain garden and cistern design information, plant lists and maintenance guidelines that can be downloaded from our webpage: www.seattle.gov/util/rainwise. The RainWise program also provides information and brochures in hardcopy format including a new a set of guidance for roadside rain garden installation by citizens.

RainWise Tools, www.rainwise.seattle.gov, an internet-based education, recruitment, tracking and marketplace outreach tool that helps educate property owners about GSI techniques they can use on their property, is available online. The RainWise tool connects residents with trained contractors who can construct rain garden and cistern facilities.

In 2011, RainWise staff and DPD developed a Client Assistance Memo (CAM) to guide homeowners who want to install a rain garden in the publicly-owned right-of-way in front of their house (http://www.seattle.gov/DPD/Publications/CAM/CAM701.pdf) The RainWise web site includes rain garden design details, plant lists and maintenance guidelines that can be downloaded from the internet. *RainWise Tools* (www.rainwise.seattle.gov) is an internet-based education, recruitment, tracking and marketplace outreach tool that helps educate property owners about GSI techniques they can use on their property, is available to all residents. Two RainWise contractor training workshops were offered in 2011 to build capacity in the landscape contractor community for implementing these types of projects. Ninety one contractors attended the workshops.
RainWise is an appropriate BMP to educate general public, homeowners, landscapers and property managers about low impact development techniques, including site design, pervious paving, and retention of forests and mature trees. The program uses a variety

of tools to reach the target audiences ranging from printed material to class presentations and demonstration projects.

B.3.7.1.5 Automotive Maintenance Program (AMP)

In 2011, outreach activities for the Automotive Maintenance Program focused on raising awareness about car maintenance BMPs through the distribution of posters and brochures. BMP adoption efforts included oil leak workshops, incentives and key partnerships with Seattle Public Schools and quick lube businesses.
Outreach materials were translated into Chinese, Vietnamese, Spanish and Amharic and were distributed to 13 Department of Neighborhoods (DON) Neighborhood Service Centers and Seattle Parks and Recreation Community Centers throughout the city as well as to local auto parts, repair shops, and emissions stations. Approximately 5,000 translated brochures and 3,000 English language brochures were distributed.
The SPU website was updated regularly with information about automotive maintenance BMPs, available coupons and partner businesses such as Jiffy Lube Grease Monkey, Midas, West Seattle Autoworks and Your Family Auto Service and Repair. SPU's "At Your Service "and "CurbWaste and Conserve" newsletters also featured the coupons for an oil change and/or leak inspection as well as information about curbside waste oil pick-up offered by SPU during regular garbage pick-up. Four hundred and twenty-eight incentive coupons were downloaded from SPU's web page. These newsletters reached more than 500,000 Seattle area residents. The curbside service recycled approximately 1,640 gallons of motor oil.

SPU hosted five oil leaks workshops in partnership with South Seattle Community College. The target audience was the do-it-yourself drivers ages 16 -24, and the quick lube users. These half-day workshops aimed to remove barriers for BMP adoption as well as to emphasize the connection between clean water and vehicle maintenance. Do-it-yourself oil change kits were provided to the forty workshop participants. One hundred additional kits were distributed to Seattle businesses by SPU's Water Quality Inspection team. A key partnership was formed with Seattle Public Schools to educate 150 first time student drivers on environmental impacts to Puget Sound caused by automotive leaks. The workshops were hosted by Department of Ecology and SPU.

This program is an appropriate education outreach strategy for vehicle maintenance BMPs for the general public because it targets the use, storage, and disposal of car products.

B.3.7.2 Audience: General Public & Business

B.3.7.2.1 Spill Kit Program

Resource Venture, an SPU funded conservation service, provides free site visits, spill kits and education to Seattle businesses to assist them with development of a spill prevention plan and proper clean-up and disposal of spills. This work continued in 2009. Because of the detailed evaluation conducted in 2008 and the modification of the permit, an evaluation of this program was not conducted in 2010. Please see the 2008

and 2009 City of Seattle Annual Report Attachment B for information on this evaluation. In addition, the spill kit evaluation report is available on the Ecology web site at: http://www.ecy.wa.gov/programs/wq/stormwater/municipal/MUNIdocs/SPU2008NPDESEOeval.pdf

B.3.7.2.2 Car Wash Kit Program

In 2011 Car Wash BMP outreach efforts were directed towards residential car washing by the general public and new strategies for fundraising groups.
For the general public, SPU partnered with Brown Bear and the Puget Sound Car Wash Association (PSCWA) to offer coupons for a free car wash in the Utility's *@Your Service* bill insert newsletter. This publication reaches approximately 180,000 residents. PSCWA redeemed approximately 420 coupons, representing a 35% increase from last year, and Brown Bear redeemed 2,266 coupons, representing a 38% increase from last year.

Fundraising groups were encouraged to use "green" ticket selling car wash fundraising programs offered by Brown Bear and Puget Sound Car Wash Association (PSCWA). In addition, the City identified one new *Host Site* business in the combined sewer area at which groups could hold car wash events, bringing the total number of host sites to three. Flyers were developed to raise awareness about the impacts of car washing and provide information on the recommended BMPs. The flyers were distributed to approximately 138 organizations. Eleven of the groups contacted adopted the ticket selling BMP. Eighteen car wash fundraisers were held at the host site locations in combined sewer areas.

In an effort to discourage car wash events that discharge into the MS4, SPU water quality inspectors handed out postcards to car washes and host sites located in the MS4 area that were discovered during their regular work in the field. Seven additional organizations and businesses that had been reported by City or County employees for hosting car wash events that discharged to the MS4 were contacted and given information on car wash BMPs. Those organizations received information on the environmental impacts associated with traditional car washes and alternatives for car wash fundraisers. Car wash event sites reported in the MS4 were educated and informed that they should discontinue those activities.

The City feels that these BMPs are appropriate for reducing the amount of car wash soaps entering the MS4. Evaluation of this effort will inform the 2012 program.

B.3.7.2.3 Water Quality Hotline

The City staffs a 24-hour water quality hotline to allow citizens and businesses to report illicit discharges into the MS4. Businesses and citizens who are found to be causing illicit discharges receive education, and potentially enforcement actions, if they refuse to voluntarily correct the problem. Because of the detailed evaluation conducted in 2008

and the modification of the permit, an evaluation of this program was not conducted in 2010. Please see the 2008 and 2009 City of Seattle Annual Report Attachment B for information on this evaluation. In addition, the water quality hotline evaluation report is available on the Ecology web site at: http://www.ecy.wa.gov/programs/wq/stormwater/municipal/MUNIdocs/SPU2008NPDESEOeval.pdf

B.3.7.3 Audience: Homeowners, landscapers, and Property Managers

B.3.7.3.1 Green Gardening Program

The Green Gardening Program educates landscape professionals and horticulture students on how to reduce their use of pesticides. The program promotes BMPs for environmentally-sensitive landscaping practices, with emphasis on Integrated Pest Management (IPM), as well as water conservation, landscape stormwater mitigation, and the recycling of organic materials, either on-site or via collection programs.

Two IPM Workshops were held in November of 2011 The workshops serve private sector landscape professionals who generally work throughout Seattle and the County, as well as public sector landscapers, program managers students, and educators. The first workshop, titled "Landscapes We Can Live With: IPM and Plant Health Care Strategies", was held at South Seattle Community College and attracted 224 participants. The second workshop, titled "The Role of Water in a Healthy Landscape: Practical IPM and Irrigation Scheduling", was held at Lake Washington Technical Institute on the Eastside and attracted 117 participants. Four trainings were offered for non-English speaking professional audiences; two in Spanish, and one each in Vietnamese and Cambodian. A total of 63 participants attended.

Seven IPM classes were offered at three local horticulture schools (Seattle, Edmonds and Kirkland) and at South Seattle Community College's sustainable agriculture program, reaching a total of 113 students. The courses continue to be rated very highly by students and professors alike. As the horticulture schools continue their practice of integrating the new material into their program offerings, the Green Gardening program continues to expand its development of new content, keeping this a vital program offering.

The Natural Yard Care Nurseries recognition program was transitioned into the King County EnviroStars program in 2011. This continues to motivate nurseries to commit to sustainable practices and education, while reducing program costs and increasing efficiencies.

This is an appropriate BMP for yard care techniques protective of water quality as it provides the target audience with information on how to change their behaviors to improve stormwater quality.

B.3.7.3.2 Natural Soil Building

The Natural Soil Building Program is supported by SPU Solid Waste and Water Supply funding as well as Drainage funding and the Local Hazardous Waste Management Program in King County. The NSB Program has two components: the Master Composter Soil Builder volunteer training and outreach program, and the Garden Hotline (which answers phone and email requests, and also conducts classes especially for underserved and ESL audiences). The NSB program provides outreach and education on Natural Yard Care (including pesticide and fertilizer reduction) and also on RainWise techniques (LID and GSI) for the general public, residents, property owners and landscape professionals.

In 2011 the Master Composter Soil Builder program conducted three multi-day trainings for volunteers: one in the Spring for English-speaking MCSB volunteers, one in summer for SE Asian P-Patch gardener volunteers (with 4 language translators) and one in early fall for E. African P-Patch volunteers (with three translators). The newly trained volunteers joined the existing volunteer cadre in completing 1029 hours of outreach and making 9684 customer contacts on Natural Yard Care and RainWise at community events, demonstrations, and classes around Seattle. The Garden Hotline serves all of King County through additional funding from the county-wide Saving Water Partnership and the Local Hazardous Waste Management Program in King County. The Garden Hotline responded to 12,170 public requests for information on IPM, plant selection, soil building, RainWise, and other resource conservation issues. Sixty-one percent of the Garden Hotline contacts were with residents within the City, and over 25% of event contacts were provided in underserved, immigrant, or communities of color. Hotline staff also wrote articles for community media, updated factsheets and guides, and assisted in preparing materials for translation. A survey of Hotline customers in 2011 indicated 90%+ satisfaction and usefulness of the information they received.

This program is an appropriate BMP because the workshops provide information and resources to the public that inform them on how to change their behaviors to reduce the impact of their yard on stormwater quality.

B.3.7.3.3 Green Your Rug

The City developed and implemented two programs in 2008 directed towards educating homeowners and property managers about BMPs for carpet cleaning. The Green Your Rug residential pilot program was aimed at the homeowners who rent do-it-yourself carpet cleaning machines. The second part of the Green your Rug program included developing a baseline measurement of property manager awareness, understanding of, and adoption of proper disposal of used wash water from carpet cleaning. Both programs determined that the majority of the Target Audience are adopting the proper behaviors and using practices to reduce or eliminate adverse stormwater impacts associated with carpet cleaning.

B.3.7.3.4 Green Your Rug Residential

Education and outreach on this subject was provided on an as needed basis by Resource Venture during 2011.

B.3.7.3.5 Green Your Rug for Property Managers

Education and outreach on this subject was provided on an as needed basis by Resource Venture during 2011.

B.3.7.3.6 Business Inspections

In 2010 SPU developed and implemented an evaluation of businesses that had received an audit inspection during 2009 to assess the effectiveness of the audit inspection for increasing awareness and compliance with the City's Stormwater Code and to obtain input from the businesses on how to improve audit inspections and improve compliance. The evaluation addressed whether the businesses remembered the audit inspection and implemented the changes recommended during the audit by the SPU Source Control Inspector. Respondents were also asked to discuss the challenges they faced in making changes, describe what helped or would help them make changes, rate and suggest improvements for the audit inspector, and rate potential motivators for compliance. The survey found measurably increased awareness of stormwater issues and adoption of BMPs. The survey helped SPU determine that the audit inspection program is an effective tool for educating low- and medium-risk businesses about source control BMPs. In addition, audit inspections provide SPU an opportunity to assess the stormwater risk posed by business for prioritizing future inspections. With both an audit inspection program and a stormwater inspection program, SPU can more efficiently allocate resources to address both outreach and compliance.

In summer 2011, SPU worked with Cascadia Consulting Group (Cascadia) to evaluate the effectiveness of stormwater pollution prevention inspections using a telephone survey. To assess effectiveness, survey respondents were asked about a variety of the business's stormwater practices such as outdoor washing or water use, outdoor material storage, stormwater facilities, and spill response preparedness. The survey also included questions on the respondent's knowledge of Seattle's stormwater system, rating of the stormwater inspection, attitude toward stormwater pollution prevention, and demographics.

To the extent possible, the 2011 study was designed to determine whether business compliance decreased as time increased and whether there were differences in responses related to the estimated level of risk to stormwater posed by the business. After fielding the survey, SPU and Cascadia determined that businesses with stormwater permits issued by the Department of Ecology or King County are not comparable to businesses without a permit; as a result, responses from businesses with Ecology or King County permits were analyzed separately.

Based on the results of the 2011 study, stormwater pollution prevention compliance and knowledge appear to be fairly high among all subpopulations surveyed. Responses regarding most stormwater pollution prevention practices and attitudes among businesses without permits did not appear to show clear trends based on time elapsed since the last stormwater inspection or risk category. Time elapsed appeared to affect responses regarding stormwater facility inspections and rating of the inspector. Risk category at businesses without permits appeared to affect responses regarding stormwater facility inspections, spill kits and plans, and stormwater treatment.

The City has selected this program for the evaluation required in S5.C.10.b.ii. A complete evaluation of this program is included as Appendix A of this document.

SPU inspects businesses, including mobile businesses and works with them to prevent pollutants from entering private and public storm drains. Inspections include responses to complaints and concerns on the Water Quality Hotline. Inspections are focused on High-Risk Pollution Generating Activities and provide education and outreach on City Code requirements and use of BMPs. This BMP is appropriate because it provides information and resources directly to businesses at their location that educate them on how to change their behaviors to comply with City Code and reduce the impact of their activities on stormwater quality.

In 2011, the business inspection program will continue. However, the auto maintenance program described in B.3.7.1.5 will instead be used to meet S5.C.10.b.(3) requirement to educate homeowners and property managers about BMPs for auto repair and maintenance.

B.3.7.3.7 RainWise

Please see the description inB.3.7.1.4.

B.3.7.3.8 Natural Landscaping Professional Development

This program is a series of well attended professional workshops (and supporting guides and web content) which target the specified behaviors and practices in the permit (low impact development (LID) techniques: including sustainable site design, soil BMPs and retention of native vegetation, plant selection and maintenance options that reduce pesticide and fertilizer use, and Natural Drainage/LID strategies for on-site stormwater management, and stormwater treatment and flow control). These workshops target permit audiences including engineers, design professionals, landscape contractors (including non-English-speakers), developers, builders, permitting and inspection staff, and land use planners. The program is built on survey and focus group work with these professionals and customers. Professionals who attend the workshops incorporate LID techniques into their designs and pass on information to the homeowners, landscapers and property managers that they work with. Participants fill out in-class evaluations and they identify (pledge) the actions they intend to take as a result of the training.

In 2011 the program conducted 34 training events, in collaboration with professional organizations and local governments, that were attended by a total of 2,070 professionals: landscape and building contractors, developers, landscape architects and designers, engineers, architects, inspection and permitting staff, and outreach trainers. While the funding comes from several sources, most training events focused on LID and Green Stormwater Infrastructure design, construction, and maintenance, IPM and other chemical-reduction maintenance practices, soil best practices, and construction site erosion and sediment control. Ninety-three percent of respondents to post-workshop surveys rated the workshops as good or excellent, and 79% said they would use the guidelines and techniques presented in the workshops in current or future projects.

B.3.7.3.9 Private Facility Inspections

Because of the detailed evaluation conducted in 2008 and the modification of the permit, an evaluation of this program was not conducted in 2011. However, education and outreach on this subject continues.

SPU conducts inspections of private stormwater and flow control facilities to determine that they are installed and maintained to City Code. In additions to conducting the inspection, SPU provides education and outreach on how to change their behaviors to comply with City Code and maintain their facility to function properly and reduce the impacts to water quality. Outreach materials include handouts on BMPs and codes. Inspections are tracked and reviewed. This program will continue into 2011.

The SCM group tracks private facility inspection and enforcement records through a Microsoft Access database and file management system. The database tracks information for both source control inspections and drainage system maintenance inspections. Records are managed in accordance with the State record keeping codes. Enforcement actions are tracked both in the database and electronically in a separate folder on the City network. Any enforcement paperwork is kept with the file.

The City evaluated the appropriateness of using the private facility inspection program as a method to meet the education and outreach requirement for educating homeowners, landscapers and property managers about stormwater treatment and flow control BMPs and determined that this education and outreach requirement is better served by the RainWise program described in B.3.7.1.4

B.3.7.4 Audience: Engineers, Contractors, Developers, Review staff and Land Use Planners.

B.3.7.4.1 Temporary Erosion and Sediment Control

The Department of Planning and Development (DPD) provides short courses to engineers, contractors, developers on appropriate BMPs for temporary erosion and sediment control from new development and re-development sites. This training exposes professionals to City Code requirements and is an appropriate BMP for the control of sediment and erosion.

DPD and SDOT have revised the temporary erosion and sediment control (TESC) training that is provided to City staff and the public involved in ground disturbing activities to reflect the changes in the 2009 Stormwater Code. This new training, called Stormwater Construction Controls (SWCC), was provided to 131 city staff during the first quarter of 2010. The Class is available to members of the public if requested; however, during 2011 no training sessions were requested.

The SWCC class is an appropriate BMP for training staff and the public on the proper use of stormwater construction controls for retaining sediment on site and preventing erosion as it provides descriptive training and real life examples of the BMPs required by the City Stormwater Code.

B.3.7.4.2 Natural Landscaping Professional Development

Please see the description in section B.3.7.3.8.

B.4 Information on Structural Stormwater Controls Program (S5.C.6)

The Structural Stormwater Controls Program is described in Section III.6 of the City's SWMP documentation, submitted as Attachment A of the City's 2010 Phase I Permit Annual Report Form.

B.5 Summary of Actions Taken to Comply with Applicable TMDL Requirements (S9.E.4)

There are no applicable Total Maximum Daily Loads (TMDL) listed in Appendix 2 of the 2007 NPDES Phase I Municipal Permit for receiving waters to which the City's MS4 drains. Therefore, compliance with this permit such as implementation of the actions comprising the components outlined in the City's SWMP, submitted as Attachment A of the City's 2010 Phase I Permit Annual Report Form, constitutes compliance with any applicable TMDLs not listed in Appendix 2 of the permit (S7.B).

B.6 Stormwater Monitoring Summary (S9.E.6)

In accordance with S8.B.1, this section provides a brief description of the stormwater monitoring or related monitoring studies conducted during 2011 by or for the City outside of the permit required monitoring:

B.6.1 Water Quality

Pollutant Source Control Sampling - This monitoring was conducted by SPU in support of and associated with the Water Quality Hotline, IDDE, and business inspections for source control from existing development.

Lower Duwamish source sediment samples - In 2011, SPU continued to collect source sediment samples (i.e., catch basins, inline sediment traps, and inline grab samples) to support the source control program for the Lower Duwamish Waterway superfund site. In 2011, SPU took 92 samples, which were analyzed for the LDW contaminants of concern,

including TOC, SVOC's, TPH-Dx, select Metals, PCB's, Grain Size and occasionally site specific parameters, such as pH, additional metals, VOC's.

B.7 Operation and Maintenance Schedules

B.7.1 Justification of Reduced Inspection Frequency

There are no data presented here to justify reducing the inspection frequency pursuant to Permit conditions S5.C.9.b.iii(1) and S5.C.9.b.iv(2).

The permit requires that the City develop an ongoing inspection schedule in 2012 to annually inspect all stormwater treatment and flow control facilities (other than catch basins) regulated by the City (S5.C.9.b.ii(3)). To comply with this requirement, SPU conducted a study during 2010 of private stormwater facility compliance to evaluate whether there would be sufficient justification to reduce the frequency of inspections of private storm water facilities from the level specified in the permit (annually starting in 2012). The study was completed, submitted to Ecology who agreed that the results support a change in the inspection frequency of private stormwater facilities for compliance with S5.C.9.b.ii(3).

Starting on January 1, 2012, SPU will change in the inspection frequency for all private stormwater facilities that discharge to the City of Seattle's MS3s to once every two years. However, if SPU receives a complaint about a private stormwater facility via its Water Quality Hotline or SPU determines during a Source Control Inspection that a site's stormwater facility is out of compliance, SPU will use progressive enforcement to bring the private stormwater facility into compliance with the City ordinances and rules.

B.7.2 Stormwater Facility Maintenance or Repairs greater than $25,000 (S5.C.9.b.v)

The City did not conduct any stormwater facility maintenance or repairs greater than $25,000 during 2011. Information on the operation and maintenance program can be found in the City's SWMP, submitted as Attachment A of the City's 2010 Phase I Permit Annual Report Form.

B.8 Notification of any Annexations, Incorporations, or Jurisdictional Boundaries (S.9.E.8)

There were no annexations, incorporations or changes in jurisdictional boundaries in the geographic area served by the City's MS4 during the 2011 reporting period.

B.9 Summary of barriers to implementation of LID and actions taken to remove the barriers

The City has been on the forefront of developing solutions to real or perceived barriers to the implementation of Low Impact Development (LID) for stormwater management. The City uses the term Green Stormwater Infrastructure (GSI) when focusing on the stormwater management aspects of LID. The stormwater management aspects of LID are the focus of this discussion on the barriers and actions.

One of the first barriers encountered by the City was the lack of authority in the Stormwater Code (SMC 22.800-22.808) to require GSI in addition to a lack of guidance and standards for design and implementation of GSI. The Stormwater Code revision project eliminated this barrier and implemented a variety of tools to educate and inform the public on GSI, including its design and application in the urban environment. The DR 17-2009, SPU 2009-005, *Vol. III - Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual* (Stormwater Manual) provides the public with a suite of tools to guide the implementation of GSI that meets the Stormwater Code requirements. In fact, this document is considered by most practitioners to be the best resource in the Puget Sound region for GSI design, modeling and maintenance information. In addition to the revised Stormwater Code, the City has revised its Right of Way Improvement Manual and the Standard Plans and Specifications to inform and educate the development community on the requirements for a consistent application of GSI within the City. These tools are useful to those implementing GSI and are used by engineers and planning staff at the City for consistent review and inspection of projects.

The majority of parcels in the City are single family residential and a potential barrier is that owners of single family parcels may not be aware of the requirements for GSI in the Stormwater Code and what their responsibilities are if and when they install GSI during development. The City developed Client Assistance Memos (CAMs) for each of the GSI technologies that summarize the information in the Stormwater Manual, including site applicability, design, and construction inspection requirements, and facilitate an informative approach to understanding the Stormwater Code requirements for GSI on parcel projects. Additional tools, such as the GSI Requirement Calculator and the Pre-sized Flow Control Calculator, facilitate the sizing of GSI facilities and understanding when Stormwater Code compliance has been achieved for smaller, less complex projects. Appendix D of The DR 17-2009, SPU 2009-005, *Vol. III - Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual* provides detailed information on the facilities maintenance requirements and the inspection components that City inspectors will be using during compliance inspections.

For more complex projects that require modeling to demonstrate and document stormwater code compliance, SPU contracted with the developers of the Western Washington Hydrology Model (WWHM) to develop GSI modules and provide WWHMv3 with these modules for free. This provides designers a consistent and easy approach to designing GSI. SPU also collaborated with Ecology, PSP and WSU for scoping future modeling needs and is taking an initial step to develop and calibrate modeling of bioretention with underdrain and greenroofs.

The City has developed incentive programs to remove real or perceived barriers around the cost of implementing GSI vs. traditional stormwater facilities. As an incentive to the applicant's design team to integrate significant stormwater management with GSI facilities, all projects less than 10,000 ft^2 of new plus replaced impervious surface have the option of not constructing traditional stormwater infrastructure if the project mitigates 70 percent of the new plus replaced impervious surface with GSI.

Programs such as the Stormwater Facility Credit Program and Green Factor help to remove the barriers around the cost of implementing GSI. The Stormwater Facility Credit Program rewards utility customers with up to a 10 percent break on their drainage bill if their GSI facility is installed and maintained in accordance with the Stormwater Code. A barrier that the Green Factor addressed is that the Land Use Code was inconsistent with GSI techniques. The Seattle Green Factor requires new development in neighborhood business districts, certain commercial, and multifamily residential zones to meet a landscaping target using a menu of landscaping strategies. Green Factor scoring has been revised to include green roofs, permeable paving, bioretention, vegetated walls, preservation of existing soils and rainwater harvesting, which helps to align the Land Use Code requirements with the Stormwater Code. Green Factors helps maintain and improve livability in growing neighborhoods. In addition to being attractive, green elements in the landscape may help to improve air quality, create habitat for birds and beneficial insects, and mitigate urban heat island effects. Green Factor elements may also reduce stormwater runoff, protecting receiving waters and decreasing public infrastructure costs. As part of the multifamily residential updates to require Green Factor, Seattle is also eliminating minimum parking requirements in certain areas of the City.

One of the barriers to wide spread use of permeable pavement is a lack of technical knowledge among professionals in the paving industry on the proper material supply and installation of these materials. To remove this barrier, SPU is involved in industry discussions on ASTM strength (and consequently material life) testing. Industry standards will give contractors and inspectors clear expectations on materials acceptance (i.e. what's "good enough"). SPU is also encouraging the use of experienced installers.

Another barrier to implementation of GSI is that there are certain areas in the City where it is unacceptable to infiltrate stormwater due to site conditions such as steep slopes, landslide prone areas, setbacks and areas with low infiltration rates. To address these potential barriers, the City designed its GSI performance standard to provide credit, although smaller, for non-infiltrating GSI facilities to the extent that they can be used in these areas. Additionally, where infiltration is marginal, the City allows the project to design an infiltration BMP with backup underdrain, which includes a cap. The credits assume the marginal infiltration rate, but if construction demonstrates the infiltration rate is not meeting other City standards (primarily duration of ponded water exceeding 24-hours past end of storm event), the cap can be removed or have an orifice drilled into it to allow stormwater to discharge via the underdrain.

Another barrier to implementation of GSI is the requirement of a water right to capture rain water for storage of rainwater. Ecology issued an Interpretive Statement clarifying its interpretation of the Water Code that under certain circumstances, a water right is not required for on-site rain water storage and use of rooftop or guzzler collected rainwater.

Stormwater facility design is a relatively new discipline when compared to wastewater and flooding facility design. The technologies and practices implemented for GSI are rapidly evolving, and new information is the key to advancing the tools available to municipalities and the public. A lack of innovation and information on design and facility performance

can be a barrier to the implementation of GSI. To help reduce this barrier, the City participated in Ecology's LID stakeholder advisory process during 2010 and 2011, to inform the permit requirements surrounding LID implementation for the MS4 permit reissuance and staff participate in national ASCE/EWRI technical committees for information sharing to facilitate the exchange of new research findings The City is also supporting (technically and financially) the City of Puyallup and WSU's Stormwater Retrofit project on the WSU Puyallup campus. This functional research project is designed to implement current GSI techniques in a real world setting where researchers can evaluate the effectiveness of these techniques to inform regional manuals and ordinances.

B.10 Summary of the extent to which basin or watershed planning is being conducted in the Permittee's jurisdiction, either voluntarily or pursuant to the Growth Management Act (Chapter 36.70A RCW) or any other requirement

The City is a key participant in watershed planning and salmon recovery planning efforts in both the Water Resource Inventory Area 8, Cedar/Sammamish and Water Resource Inventory Area 9, Green/Duwamish. This participation includes working with scientists to figure out what actions are most needed. The groups are also investigating planning tools to improve water quality, conserve water and restore shorelines.

SPU is in the process of developing a master plan for utility infrastructure focused on desired infrastructure that accounts for expected growth, as well as addressing existing capacity needs and service level gaps. This planning will be both short and long-term, and will be coordinated with broader City planning efforts (Neighborhood Plans, Comprehensive Plan update). Efforts will be strategically targeted to address problem areas, areas of rapid growth, and areas with significant construction activity (e.g., Sound Transit, City of Seattle transportation projects). Utility master planning will create a more systematic understanding of current and future infrastructure needs. This analysis will better inform planning and zoning decisions, identify needed capital projects, and provide a sounder basis for responding to opportunities and challenges presented by external projects and private development.

SPU conducted and documented an evaluation of urban watershed in 2007. This document, *State of the Waters 2007,* documented the status and current conditions of hydrology and aquatic ecology resources in the major creek watersheds in Seattle. This document serves as the current baseline for watershed and basin planning efforts.

B.11 Identification of Areas for Potential Basin or Watershed Planning that can Incorporate Development Strategies as a Water Quality Management Tool to Protect Aquatic Resources (S9.12)

The Pollution Control Hearing Board (PCHB) wrote in its August 7, 2008, Findings of Fact, Conclusions of Law, and Order (Phase I MS4, PCHB No. 07-021, -026 through -030, & -037), at page 59: "… Ecology has identified the particular importance of basin planning in areas which are relatively undeveloped where new development is occurring. The Board concludes that city or county permittees should identify such areas where potential basin planning would assist in reducing the harmful impacts of stormwater discharges upon aquatic resources. …" The PCHB ordered Ecology to modify the permit to require 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." (p. 72)

The City of Seattle is a fully built-out city where almost all development in the City is parcel-by-parcel urban infill (redevelopment), so there are no areas in the City that are "relatively undeveloped where new development is occurring." However, protection of aquatic resources in and around the City remains an important goal. In the past the City has developed watershed action plans for certain creek basins. These plans were considered during the Stormwater Code revision process to inform the Seattle-specific threshold and standards required when parcels are redeveloped. These requirements include installing Green Stormwater Infrastructure (GSI) to the Maximum Extent Feasible (MEF) on projects. The City has included the requirement for GSI to the MEF in the Stormwater code to provide increased environmental protection and better protect the functions and values of aquatic resources. The City's intent is that GSI, where feasible, is the development tool of choice when water quality or treatment thresholds are triggered. In addition, the City's Comprehensive Plan, Environmental Critical Areas Ordinance and Shoreline Master Program, as well as strategies such as the Green Factor, encourage redevelopment that incorporates tools to protect aquatic resources.

B.12 Appendix A – Evaluation of SPU Stormwater Pollution Prevention Inspections

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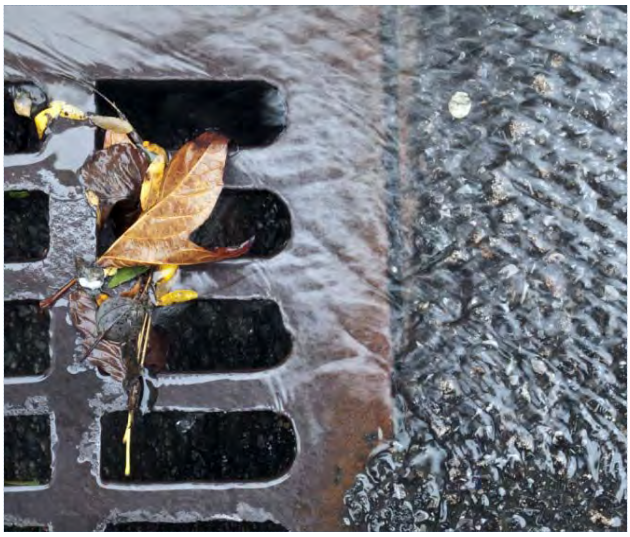

Evaluation of SPU Stormwater Pollution Prevention Inspections

FINAL Report

Prepared for
Seattle Public Utilities
Stormwater Management Program

City of Seattle

December 2011

CASCADIA CONSULTING GROUP
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Acknowledgments

Cascadia Consulting Group conducted the program evaluation and prepared this report in summer 2011. Jessica Branom-Zwick served as Cascadia's project manager. Natalee Henry, Jessica Coe, Anisha Shankar, and Christy Shelton also contributed to the evaluation. Cascadia gratefully acknowledges the many contributions of the City of Seattle's project team, without which this effort and its results would not have been possible:

- Kevin Buckley, project manager
- Louise Kulzer
- Brian Robinson
- Ellen Stewart

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Executive Summary

Background and Methodology

Seattle Public Utilities (SPU) Source Control Program works with local businesses to reduce the amount of pollutants entering private and public storm drains because these systems eventually discharge untreated water to nearby streams, lakes, and Puget Sound. To comply with the requirements of its National Pollution Discharge Elimination System (NPDES) permit, SPU performs site visits to inspect businesses that connect to the City's Municipal Separate Stormwater System (MS4) and engage in activities that could be pollution-generating. During these site visits, SPU inspectors examine stormwater facilities and activities at the business; educate the business representative who guides the inspector on the site about the stormwater system, compliance requirements, and best management practices; supply printed information on compliance and how to prevent stormwater pollution; and, if applicable, provide a form detailing corrective action the business must take to achieve compliance with Seattle's Stormwater Code. Inspected businesses that are required to make corrective actions to reduce the risk of stormwater pollution receive a follow-up inspection to determine whether they have made the required changes. Businesses that have not completed the required changes are started through a progressive enforcement process until compliance is achieved.

In summer 2011, SPU worked with Cascadia Consulting Group (Cascadia) to evaluate the effectiveness of stormwater pollution prevention inspections using a telephone survey. To assess effectiveness, survey respondents were asked about a variety of the business's stormwater practices such as outdoor washing or water use, outdoor material storage, stormwater facilities, and spill response preparedness. The survey also included questions on the respondent's knowledge of Seattle's stormwater system, rating of the stormwater inspection, attitude toward stormwater pollution prevention, and demographics.

To the extent possible, the study was designed to determine whether business compliance decreased as time increased and whether there were differences in responses related to the estimated level of risk to stormwater posed by the business. After fielding the survey, SPU and Cascadia determined that businesses with stormwater permits issued by the Department of Ecology or King County are not comparable to businesses without a permit; as a result, responses from businesses with Ecology or King County permits were analyzed separately.

The results of the interviews conducted with 171 respondents are included in this report. The survey population was divided into four sub-populations based on a combination of permit status and the date of their most recent inspection to determine the time elapsed between the inspection and the survey:

- No permit and inspected one to two years before the survey (July 2009 to June 2010)
- No permit and inspected two to three years before the survey (July 2008 to June 2009)
- No permit and inspected three to five years before the survey (July 2006 to June 2008)
- With Ecology or King County permit and inspected one to five years before the survey (July 2006 to June 2010)

SPU also characterized all survey respondents according to the expected risks the businesses posed to stormwater quality. Table 1, below, presents the number of completed surveys in each subpopulation and the risk category used in the final analysis.

Table 1. Completed surveys by subpopulation

Length of time since last inspection and permit status	High Risk	Moderate Risk	Low Risk	Total
1–2 years ago (no permit)	7	20	33	60
2–3 years ago (no permit)	5	12	22	39
3–5 years ago (no permit)	6	18	19	43
With stormwater permit	17	12	NA	29
Total	**35**	**62**	**74**	**171**

Key Findings

Business survey respondents were asked about common stormwater pollution prevention practices as well as about their knowledge and attitudes around the stormwater system, their SPU inspector, and their ability to protect Puget Sound.

Stormwater Pollution Prevention Practices

The majority of surveyed businesses reported following practices that prevent stormwater pollution. More than 80 percent of respondents without permits self-reported compliance regarding methods used to clean outdoor areas, disposal of wash water from regular clean-up activities (such as mopping), storage of soluble materials, and spill kits and plans. More than 60 percent of respondents without permits reported compliance regarding dumpster area cleanliness and disposal of water from washing large items.

For the most part, responses from businesses without permits regarding self-reported stormwater pollution prevention practices did not show consistent trends based on the elapsed time since the most recent inspection date. For many questions, businesses in the middle date range (2–3 years ago) reported the highest or lowest rates of compliance. Only the awareness and frequency of stormwater facility inspections appeared to decrease among respondents for whom more time had elapsed since their last inspection.

Similarly, responses among businesses without permits appeared to show no clear trend by risk category except regarding stormwater facility inspections and spill response preparedness. Respondents at low-risk businesses without permits appeared *less* likely to report inspecting facilities once a year or more and *more* likely to report not knowing about inspection frequency. Respondents at higher risk businesses were more likely to report having a spill kit and plan than respondents at lower risk businesses.

Among high- and moderate-risk businesses, permit status appeared to affect reported compliance in certain areas. Businesses with permits reported higher compliance in the areas of outdoor cleaning, dumpster area cleanliness, and stormwater facility inspection.

The following bullets present key findings in each stormwater practice area.

Cleaning Outdoor Areas

- Respondents without permits most commonly reported that they clean outdoor areas with a dry method such as using a broom or blower (54%) or picking up by hand (13%). Approximately 13 percent of respondents without permits reported using a water-based method, such as a pressure washer. High- and moderate-risk respondents with permits appear more likely to use a vacuum or vacuum sweeper and less likely to use a water-based method than similar respondents without permits.

Dumpster Areas

- Most businesses reported that they have clean dumpster or trash compactor areas, with 64 percent of respondents without permits rating their area at least six on a seven-point scale (where seven meant very clean). Among high- and moderate-risk businesses, respondents with permits were more likely to report having a clean dumpster area (86%) than similar businesses without permits (65%).

Wash Water Outdoors

- The majority of respondents without permits reported properly disposing of wash water from regular clean-up activities (such as mopping) in indoor drains (63%) or having no wash water to dispose (21%). Responses were comparable among high- and moderate-risk businesses, regardless of permit status.
- Most respondents without permits said they do not wash vehicles, equipment, or other large items outdoors (64%) or that water from washing items outdoors flows to a drain connected to the sanitary sewer (6%). About 12 percent of all respondents without permits said that wash water drains to the stormwater system. High- and moderate-risk businesses with permits were more likely to report draining wash water to an outdoor drain connected to the sanitary sewer (21%) than high- and moderate-risk businesses without permits, but both groups were similarly likely to report draining to the stormwater system (7%).

Liquids and Loose Materials

- The majority of businesses without permits reported that they either store soluble materials indoors or only transfer them outdoors (46%) or they have no soluble materials on-site at all (39%). Very few businesses reported storing soluble materials outdoors without cover.

Stormwater Facilities

- More than half of all businesses without permits reported either inspecting on-site stormwater facilities about once a year or more (38%) or having no such facilities on site (20%). More than a quarter (26%) of respondents without permits reported they did not know the inspection frequency of their facilities.

- While the share of businesses without permits that reported having stormwater facilities and inspecting them less than once a year did not show a trend by inspection date or risk level, other differences appeared across subpopulations. Respondents from unpermitted businesses inspected more recently appeared more likely to report inspecting stormwater facilities about once a year or more (47% of 1–2 years versus 30% of 3–5 years). Respondents at low-risk businesses without permits appeared *less* likely to report inspecting facilities once a year or more and *more* likely to report not knowing about inspection frequency.
- Among high- and moderate-risk businesses, those with permits appear more likely to report inspecting their stormwater facilities at least once a year (76% of permitted business versus 50% of businesses without permits). More than half (52%) of respondents at these permitted businesses said their stormwater facilities are inspected more than four times a year.

Spill Response

- The majority of all businesses without permits reported having spill clean-up materials on hand (92%) and a written plan for dealing with a spill outdoors (83%). Among unpermitted businesses, spill response preparedness appeared to show a slight trend by risk level, with higher risk respondents being more likely to report having a spill kit and plan.

Knowledge and Attitudes

Survey participants were also asked knowledge and attitude questions about the stormwater system, their SPU stormwater inspector, and stormwater pollution prevention. Nearly half of all respondents correctly identified whether stormwater from their site is treated or not. A large majority of respondents gave inspectors high marks for helpfulness and agreed that businesses like theirs can make a difference in protecting Puget Sound by preventing stormwater pollution. Because several agencies conduct stormwater and other site inspections, it is possible that respondent ratings referred to inspectors not from SPU.

Among businesses without permits, length of time since the inspection appeared to affect recall of the inspection and rating of the inspector. Risk category appeared to affect knowledge about stormwater treatment among unpermitted businesses.

Among high- and moderate-risk businesses, permit status appeared to affect knowledge about stormwater treatment and rating of the inspector. Respondents at businesses with permits were more likely to correctly report whether their stormwater was treated or untreated and give the inspector a lower rating for helpfulness.

The following bullets present key findings in each stormwater knowledge and attitude area.

Understanding of Stormwater System

- Nearly half (48%) of all respondents at businesses without permits correctly reported whether stormwater runoff from their business site is treated or untreated. About a quarter each of businesses without permits responded incorrectly (27%) or said they did not know what happened to their runoff (24%). Among businesses without permits, high-risk businesses appeared more likely to report correctly whether their stormwater was treated or untreated.

- Among high- and moderate-risk businesses, those with permits were more likely to correctly report whether their stormwater was treated or untreated (62% of permitted businesses versus 49% of businesses without permits).

Recall and Rating of Inspection

- More than half (59%) of all respondents without permits said they recalled their business receiving an SPU stormwater inspection, although they may have confused other agencies with SPU. Respondents who received an inspection more recently appeared more likely to recall the inspection.
- Most respondents at businesses without permits who recalled attending the inspection agreed with a statement that the inspector helped them learn about compliance and pollution prevention, with 79 percent of them rating their agreement at least six on a seven-point scale (where seven meant strongly agree).
- Responses and businesses without permits seemed to show a trend by inspection date, with businesses that received an inspection 3–5 years ago giving the stormwater inspector a lower average rating of seven than businesses that received inspections more recently.
- Among high- and moderate-risk businesses, respondents at businesses with permits on average gave the stormwater inspector a lower rating for helpfulness than respondents at businesses without permits.

Attitude toward Stormwater Pollution Prevention

- Most respondents agreed with a statement that businesses like theirs can make a difference in protecting local waters by preventing stormwater pollution, with 86 percent rating their agreement at least six on a seven-point scale (where seven meant “strongly agree”).

Conclusions and Lessons Learned

Based on the results of this study, stormwater pollution prevention compliance and knowledge appear to be fairly high among all subpopulations surveyed. Responses regarding most stormwater pollution prevention practices and attitudes among businesses without permits did not appear to show clear trends based on time elapsed since the last stormwater inspection or risk category. Time elapsed appeared to affect responses regarding stormwater facility inspections and rating of the inspector. Risk category at businesses without permits appeared to affect responses regarding stormwater facility inspections, spill kits and plans, and stormwater treatment.

Among high-and moderate risk businesses, permit status appeared to affect responses regarding outdoor cleaning, dumpster area cleanliness, and stormwater facility inspection, knowledge of stormwater treatment, and rating of the inspector. Surveyed businesses with permits reported higher levels of compliance, knowledge, and rating in these areas than similar respondents without permits.

During the course of this study, SPU and Cascadia learned several lessons and considerations that may be useful for future efforts:

- **Businesses interact with multiple government agencies on similar or related topics**. Several businesses surveyed were discovered to have received more recent stormwater inspections from agencies other than SPU. In future studies, researchers could:
  - Contact related government agencies **to identify what interactions these agencies have had with individuals in the survey population**.
  - **Ask respondents during the survey to identify other inspections** or interactions they have had with government agencies on the survey topic.
  - As resources allow, **test the survey instrument with a focus group** of individuals in the target population to identify way to improve the study and accuracy of responses.
- **Public education efforts may have increased compliance and knowledge among all businesses, obscuring the effects of inspections** and the differences SPU and Cascadia expected to see when businesses were segmented by time elapsed since their last inspection. Future studies could **include a separate control population**, as study resources allow.
- **The permit status of a business may affect its compliance.** As a result, **businesses with stormwater permits should be assessed separately** from otherwise similar businesses that do not have stormwater permits.
- **Businesses may over-report compliance with stormwater practices** during a survey. If resources are available, site visits to gather objective data can help minimize over-reporting.
- **Risk categorization may not have been accurate at the time of the survey** because it was based on each business's practices and site at the time of inspection. Future studies may need to **update risk categorizations through follow-up inspections** or site visits.
- **Surveyors attempted to reach the original contact** from the inspection, which seemed to increase business receptiveness to the survey; researchers should **continue this practice in future studies**.
- **Questions addressed very basic source control activities that applied to most businesses** but did not provide in-depth information on the true variety and extent of source control practices, some of which are unique to specific business types. To ask more detailed questions that yield a richer understanding of all source control practices, future studies could **survey respondents from a single business type**, such as auto repair shops.

Background and Methodology

Introduction

Seattle Public Utilities (SPU) Source Control Program works with local businesses to reduce the amount of pollutants entering private and public storm drains because these systems eventually discharge untreated water to nearby streams, lakes, and Puget Sound. To comply with the requirements of its National Pollution Discharge Elimination System (NPDES) permit, SPU inspects businesses that connect to the city stormwater system and engage activities that could be pollution-generating. During these site inspections, SPU inspectors examine stormwater facilities and activities at the business; educate the staff member who guides the inspector on the site about the stormwater system, compliance requirements, and best management practices; supply printed information on compliance and how to prevent stormwater pollution; and, if applicable, provide a form detailing corrective action the business must take to achieve compliance. Inspected businesses that are required to make corrective actions to reduce the risk of stormwater pollution receive a follow-up inspection to ensure they have made the required changes. Businesses that have not completed the required changes are started through a progressive enforcement process until compliance is achieved.

In summer 2011, SPU worked with Cascadia Consulting Group to evaluate the effectiveness of stormwater pollution prevention inspections through a telephone survey. To assess effectiveness, survey respondents were asked about a variety of their business's stormwater practices such as outdoor washing or water use, outdoor material storage, stormwater facilities, and spill response preparedness. The survey also included questions on the respondent's knowledge of Seattle's stormwater system, rating of the stormwater inspection, attitude toward stormwater pollution prevention, and demographics.

To the extent possible, the study was designed to determine whether business compliance decreased as time increased and whether there were differences in responses related to the estimated level of risk to stormwater posed by the business. To determine the risk level, each business was categorized by the inspector during the site visit or during this study as to the business's risk (high, moderate, or low) of discharging pollutants to the public storm drain system and receiving water bodies.

After fielding the survey, SPU and Cascadia determined that businesses with stormwater permits issued by the Department of Ecology are fundamentally different from other businesses; as a result, responses from permitted businesses were analyzed separately.

Methodology

To evaluate stormwater pollution prevention inspections, Cascadia and SPU developed and conducted a telephone survey of businesses that had received inspections between July 2006 and June 2010. SPU provided a list of 617 business sites that had received inspections during that period. To conduct survey calls, the list was further refined to remove businesses with no contact phone number (26 businesses total), leaving 591 sites to include in the survey population. During surveying, a further 107 businesses were found to be unreachable due to disconnected or wrong phone numbers, possibly indicating business closures.

The survey population was initially divided into three sub-populations based on the date of their most recent inspection to determine the time elapsed between the inspection and the survey:

- One to two years before the survey (July 2009 to June 2010)
- Two to three years ago (July 2008 to June 2009)
- Three to five years ago (July 2006 to June 2008)

During and after site inspections, SPU also characterized all respondents according to the expected risks the businesses pose to stormwater quality: high, moderate, or low risk to stormwater quality. This second categorization provided an additional level of detail during the analysis phase.

Businesses within each subpopulation by *inspection date* were arranged in a randomized order then divided into groups of between 30 and 70 contacts to be called in order during surveying. Within each group for each subpopulation, surveyors attempted to complete the survey or make three attempts to reach each business in that group before moving on to the next group for the subpopulation. Compared to making calls from a single randomized list in which surveyors call each business in the subpopulation once before beginning call-backs, this method reduces the chance that surveyors will complete surveys with only easy-to-reach businesses (which could bias results).

Cascadia conducted the telephone survey between June 1 and July 15, 2011, completing the survey with a total of 183 businesses, 171 of which are included in the final analysis. After the survey had been fielded, SPU requested additional information from the Washington Department of Ecology (Ecology) and King County Stormwater Management Program on whether the agencies had conducted stormwater-related inspections with survey participants more recently than SPU and on whether the survey participants were issued stormwater permits. The data request and subsequent reanalysis were conducted to investigate whether more recent inspections or stormwater permits could explain why responses were so similar between businesses inspected recently and those inspected three to five years ago. Ecology and King County records indicated that 23 businesses had been inspected more recently than shown in SPU records and that 29 businesses had stormwater permits. SPU and Cascadia decided to treat the group of businesses having stormwater permits as a separate analysis group for two main reasons. First, permitted businesses receive a different type of inspection from businesses without permits. Second, permitted businesses were expected to be generally more knowledgeable and compliant than otherwise similar businesses without permits, regardless of when their most recent inspection occurred.

As a result of SPU's investigation of permit status and inspections by other agencies, Cascadia re-divided the sample population. Several survey respondents were placed into more recent inspection date groups or removed from the analysis entirely. Five survey respondents were removed from the sample because they were inspected less than one year before survey fielding. Responses from another seven participants (permitted businesses considered to pose a low risk of stormwater pollution) were removed because of adjustments to the subpopulations presented in the analysis. Table 2, below, presents the number of completed surveys in each subpopulation and risk category used in the final analysis.

Table 2. Completed surveys by subpopulation

Length of time since last inspection and permit status	High Risk	Moderate Risk	Low Risk	Total
1–2 years ago (no permit)	7	20	33	60
2–3 years ago (no permit)	5	12	22	39
3–5 years ago (no permit)	6	18	19	43
With stormwater permit (any date)	17	12	NA	29
Total	**35**	**62**	**74**	**171**

When using the results of this survey to estimate or predict the behavior of all businesses that received or may receive an inspection, the following possible sources of error should be considered.

- **Sampling error**—Even if a sample is randomly selected, that sample may not accurately represent the population as a whole.
- **Self-reporting error**—Respondents may not accurately recall or report changes made.
- **Non-response error**—People who refused to participate or could not be reached may be very different from people who responded to the survey, biasing results.
- **Question bias**—Every effort was made to reduce bias caused by the wording and order of questions, but some bias could affect how respondents answered questions.

It is not possible to estimate the size of these possible sources of errors for the final analysis. Sampling error, which is usually calculated for surveys, is based on the size of the survey sample and the size of the underlying population. Because SPU adjusted the survey sample based on additional information and did not adjust the underlying population, the size of the underlying population is not definitively known. As a result, the sampling error cannot be calculated for the final analysis and the results could not be tested for statistical significance.

The following information was gathered during interviews to help evaluate effectiveness of stormwater audits and to identify potential changes to compliance programs for businesses:

- Reported stormwater pollution prevention practices.
- Knowledge and attitudes on the stormwater system, inspections, and pollution prevention.
- Survey respondent demographics.

The following sections present tables summarizing the responses to all survey questions and an analysis of these data. Note that percentages may not sum to 100 percent due to rounding and that respondents were allowed to provide multiple responses to some questions. **Attachment A** contains the survey instrument, and **Attachment B** presents comments from participants who provided answers that did not fit into pre-coded response categories as well as demographic question responses. **Attachment C** presents the initial, now invalid analysis before additional information on permit status and inspections by other agencies was considered.

Results

Results in this report are presented with text describing three tables (or table sets) displaying, in order, responses for surveyed businesses:

- **Without permits** segmented by **date of most recent inspection**.
- **Without permits** segmented by **risk level**.
- **High- and moderate-risk** businesses segmented by **permit status**, whether the business does or does not have a stormwater permit.

Stormwater Practices

Cleaning Outdoor Areas

Q1. How are the outside, paved areas of your business site, such as sidewalks or parking lots, usually cleaned?

Respondents without permits most commonly reported cleaning outdoor areas using a dry method, primarily with a broom or blower (54%). Approximately 13 percent of these respondents each reported using a water-based method, such as a pressure washer. As shown in Table 3 , responses did not show a consistent trend by inspection date, with respondents in the 2–3 years group reporting the lowest prevalence of water-based cleaning methods and respondents in the 3–5 years group reporting the highest prevalence. Similarly, responses for using water-based methods do not show a reliable trend by risk category, as shown in Table 4.

High- and moderate-risk respondents with permits appear more likely to use a vacuum or vacuum sweeper and less likely to use a water-based method than similar respondents without permits, as shown in Table 5.

Table 3. Cleaning methods for outdoor areas (Q1, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
NA – No outside areas	4	7%	0	0%	0	0%	4	3%
With a broom or blower	31	52%	24	62%	22	51%	77	54%
Picked up by hand	9	15%	4	10%	6	14%	19	13%
Water-based method	8	13%	4	10%	7	16%	19	13%
They are not cleaned	7	12%	3	8%	8	19%	18	13%
Vacuum or vacuum sweeper	7	12%	4	10%	5	12%	16	11%
Other	3	5%	0	0%	0	0%	3	2%
Don't know or refused	6	10%	3	8%	3	7%	12	8%
Total Respondents*	60	NA	39	NA	43	NA	142	NA

* Percentages may not sum to 100% because multiple response were allowed.

Table 4. Cleaning methods for outdoor areas (Q1, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
NA - No outside areas	2	11%	2	4%	0	0%	4	3%
With a broom or blower	8	44%	34	68%	35	47%	77	54%
Picked up by hand	3	17%	6	12%	10	14%	19	13%
Water-based method	3	17%	6	12%	10	14%	19	13%
They are not cleaned	2	11%	3	6%	13	18%	18	13%
Vacuum or vacuum sweeper	2	11%	3	6%	11	15%	16	11%
Other	0	0%	1	2%	2	3%	3	2%
Don't know or refused	0	0%	2	4%	10	14%	12	8%
Total Respondents*	18	NA	50	NA	74	NA	142	NA

* Percentages may not sum to 100% because multiple response were allowed.

Table 5. Cleaning methods for outdoor areas (Q1, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
NA - No outside areas	4	6%	2	7%	6	6%
With a broom or blower	42	62%	15	52%	57	59%
Picked up by hand	9	13%	0	0%	9	9%
Water-based method	9	13%	1	3%	10	10%
They are not cleaned	5	7%	3	10%	8	8%
Vacuum or vacuum sweeper	5	7%	10	34%	15	15%
Other	1	1%	0	0%	1	1%
Don't know or refused	2	3%	1	3%	3	3%
Total Respondents*	68	NA	29	NA	97	NA

* Percentages may not sum to 100% because multiple response were allowed.

Dumpster Areas

Q2. Thinking about the amount of litter and spills around your dumpster or trash compactor, please rate the cleanliness of that area on a scale from one to seven where one means very dirty and seven means very clean.

Most respondents reported having clean dumpster or trash compactor areas, with 64 percent of all respondents without permits giving their area a rating of six or seven on a seven-point scale (where seven meant very clean). In contrast, six percent of respondents gave their dumpster area a rating of three or dirtier. As shown in Table 6, responses did not vary consistently by date of most recent inspection. As shown in Table 7, high-risk businesses appeared slightly more likely to report having a clean dumpster area than other businesses.

Among high- and moderate-risk businesses, respondents with permits were more likely to report having a clean dumpster area (86%) than similar businesses without permits (65%), as shown in Table 8.

Table 6. Dumpster area cleanliness (Q2, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
1 = very dirty	0	0%	1	3%	0	0%	1	1%
2	1	2%	1	3%	1	2%	3	2%
3	2	3%	2	5%	0	0%	4	3%
4	5	8%	0	0%	2	5%	7	5%
5	13	22%	8	21%	11	26%	32	23%
6	17	28%	17	44%	10	23%	44	31%
7 = very clean	20	33%	9	23%	18	42%	47	33%
Don't know or refused	2	3%	1	3%	1	2%	4	3%
Total Respondents	60	100%	39	100%	43	100%	142	100%

Table 7. Dumpster area cleanliness (Q2, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
1 = very dirty	1	6%	0	0%	0	0%	1	1%
2	0	0%	1	2%	2	3%	3	2%
3	0	0%	1	2%	3	4%	4	3%
4	0	0%	3	6%	4	5%	7	5%
5	4	22%	11	22%	17	23%	32	23%
6	7	39%	15	30%	22	30%	44	31%
7 = very clean	6	33%	16	32%	25	34%	47	33%
Don't know or refused	0	0%	3	6%	1	1%	4	3%
Total Respondents	18	100%	50	100%	74	100%	142	100%

Table 8. Dumpster area cleanliness (Q2, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
1 = very dirty	1	1%	0	0%	1	1%
2	1	1%	0	0%	1	1%
3	1	1%	0	0%	1	1%
4	3	4%	1	3%	4	4%
5	15	22%	2	7%	17	18%
6	22	32%	10	34%	32	33%
7 = very clean	22	32%	15	52%	37	38%
Don't know or refused	3	4%	1	3%	4	4%
Total Respondents	68	100%	29	100%	97	100%

Wash Water and Outdoor Washing

Q3. When your business has wash water from regular cleanup activities, such as mopping floors or rinsing paint brushes, where does the wash water usually go?

The majority of all respondents without permits reported properly disposing of wash water in indoor drains (63%) or having no wash water to dispose (21%). Responses among businesses without permits do not show a reliable trend by inspection date (Table 9) or risk category (Table 10). Similarly, among high- and moderate-risk businesses, responses do not show a trend by permit status (Table 11).

Table 9. Wash water disposal locations (Q3, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
NA - no wash water	9	15%	11	28%	10	23%	30	21%
Indoor drain	38	63%	25	64%	27	63%	90	63%
Outdoor drain (e.g., stormdrain)	3	5%	2	5%	1	2%	6	4%
Lawn, landscaping, or on ground	2	3%	0	0%	1	2%	3	2%
Paved area	1	2%	0	0%	0	0%	1	1%
Other	4	7%	0	0%	2	5%	6	4%
Don't know or refused	6	10%	2	5%	4	9%	12	8%
Total Respondents*	60	NA	39	NA	43	NA	142	NA

* Percentages may not sum to 100% because multiple response were allowed.

Table 10. Wash water disposal locations (Q3, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
NA - no wash water	2	11%	11	22%	17	23%	30	21%
Indoor drain	13	72%	30	60%	47	64%	90	63%
Outdoor drain (e.g., stormdrain)	1	6%	3	6%	2	3%	6	4%
Lawn, landscaping, or on ground	1	6%	2	4%	0	0%	3	2%
Paved area	0	0%	0	0%	1	1%	1	1%
Other	0	0%	3	6%	3	4%	6	4%
Don't know or refused	2	11%	3	6%	7	9%	12	8%
Total Respondents*	18	NA	50	NA	74	NA	142	NA

* Percentages may not sum to 100% because multiple response were allowed.

Table 11. Wash water disposal locations (Q3, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
NA - no wash water	13	19%	4	14%	17	18%
Indoor drain	43	63%	19	66%	62	64%
Outdoor drain (e.g., stormdrain)	4	6%	1	3%	5	5%
Lawn, landscaping, or on ground	3	4%	1	3%	4	4%
Paved area	0	0%	1	3%	1	1%
Other	3	4%	0	0%	3	3%
Don't know or refused	5	7%	5	17%	10	10%
Total Respondents*	68	NA	29	NA	97	NA

* Percentages may not sum to 100% because multiple response were allowed.

Q4. I'm going to read a list of items that may be washed at your business site. For each item, please tell me whether the item is washed indoors, washed outdoors, washed both indoors and outdoors, or not washed at your site.

If outdoors

Q5. When items are washed outdoors at your site, where does the wash water drain to?

Respondents were asked two questions about whether and where vehicles, large mobile equipment, equipment components, or other large items were washed at the business site. Overall, nearly two-thirds of respondents without permits said either that these items were washed indoors (14%) or not washed at the site (50%). About one-third of respondents (35%) said these items are washed outdoors at times.

About 6 percent of respondents without permits said that wash water from items washed outdoors drains to an outdoor drain connected to the sanitary sewer. Respondents also said that wash water from items washed outdoors drains to the stormwater system (12% of all respondents without permits); lawns, landscaping, or the ground (4%); paved areas (2%); or unidentified outdoor drains (2%).

As shown in Table 12 and Table 13, responses regarding washing locations did not show a reliable trend by date of inspection. Similarly, Table 14 and Table 15 did not show a reliable trend by risk category, although high-risk businesses may be more likely to drain water to an outdoor drain connected to the sanitary sewer.

As show in Table 16 and Table 17, among high- and moderate-risk businesses, businesses with and without permits appear equally likely to drain wash water to the stormwater system, although businesses with permits also more commonly reported using an outdoor drain connected to the sanitary sewer.

Table 12. Washing locations for large items (Q4, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
Outdoors	19	32%	7	18%	11	26%	37	26%
Both indoors and outdoors	3	5%	5	13%	4	9%	12	8%
Indoors	10	17%	5	13%	5	12%	20	14%
Not washed at site	26	43%	22	56%	23	53%	71	50%
Don't know	2	3%	0	0%	0	0%	2	1%
Total Respondents	60	100%	39	100%	43	100%	142	100%

Table 13. Drainage locations for items washed outdoors (Q5, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
Never wash outdoors	36	60%	27	69%	28	65%	91	64%
Outdoor sanitary sewer drain	4	7%	3	8%	1	2%	8	6%
Stormwater system	8	13%	5	13%	4	9%	17	12%
Outdoor drain (unidentified)	0	0%	2	5%	1	2%	3	2%
Lawn, landscaping, or ground	4	7%	0	0%	2	5%	6	4%
Paved area (parking lot, street)	1	2%	0	0%	2	5%	3	2%
Other drainage location	4	7%	2	5%	1	2%	7	5%
Don’t know drain location	1	2%	0	0%	4	9%	5	4%
Don't know washing locations	2	3%	0	0%	0	0%	2	1%
Total Respondents	60	NA	39	NA	43	NA	142	NA

* Percentages may not sum to 100% because multiple response were allowed.

Table 14. Washing locations for large items (Q4, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
Outdoors	6	33%	11	22%	20	27%	37	26%
Both indoors and outdoors	2	11%	5	10%	5	7%	12	8%
Indoors	1	6%	7	14%	12	16%	20	14%
Not washed at site	9	50%	26	52%	36	49%	71	50%
Don't know	0	0%	1	2%	1	1%	2	1%
Total Respondents	18	100%	50	100%	74	100%	142	100%

Table 15. Drainage locations for items washed outdoors (Q5, no permit, by risk category)

	High		Moderate		Low		Total	
	N	%	n	%	n	%	n	%
Never wash outdoors	10	56%	33	66%	48	65%	91	64%
Outdoor sanitary sewer drain	3	17%	3	6%	2	3%	8	6%
Stormwater system	3	17%	2	4%	12	16%	17	12%
Outdoor drain (unidentified)	0	0%	0	0%	3	4%	3	2%
Lawn, landscaping, or ground	0	0%	4	8%	2	3%	6	4%
Paved area (parking lot, street)	0	0%	2	4%	1	1%	3	2%
Other drainage location	2	11%	2	4%	3	4%	7	5%
Don't know drain location	0	0%	3	6%	2	3%	5	4%
Don't know washing locations	0	0%	1	2%	1	1%	2	1%
Total Respondents	18	NA	50	NA	74	NA	142	NA

* Percentages may not sum to 100% because multiple response were allowed.

Table 16. Washing locations for large items (Q4, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
Outdoors	17	25%	9	31%	26	27%
Both indoors and outdoors	7	10%	3	10%	10	10%
Indoors	8	12%	3	10%	11	11%
Not washed at site	35	51%	14	48%	49	51%
Don't know	1	1%	0	0%	1	1%
Total Respondents	68	100%	29	100%	97	100%

Table 17. Drainage locations for items washed outdoors (Q5, by permit status)

	No Permit		Permit		Total	
	N	%	n	%	n	%
Never wash outdoors	43	63%	17	59%	60	62%
Outdoor sanitary sewer drain	6	9%	6	21%	12	12%
Stormwater system	5	7%	2	7%	7	7%
Outdoor drain (unidentified)	0	0%	1	3%	1	1%
Lawn, landscaping, or ground	4	6%	2	7%	6	6%
Paved area (parking lot, street)	2	3%	1	3%	3	3%
Other drainage location	4	6%	2	7%	6	6%
Don't know drain location	3	4%	0	0%	3	3%
Don't know washing locations	1	1%	0	0%	1	1%
Total Respondents	68	NA	29	NA	97	NA

* Percentages may not sum to 100% because multiple response were allowed.

Outdoor Storage

Q6. What liquids, oils, or loose materials are stored in bulk or transferred at your business site?

If soluble

↳ **Q7. For the liquids, oils, and loose materials at your business site, are they stored indoors, outdoors, both indoors and outdoors, or are they only transferred?**

If outdoors

↳ **Q8. For those liquids, oils, and loose materials that are stored outdoors, what portion of them are kept under a cover: most, some, or little to none?**

Respondents were asked about the bulk storage and transfer of material at their business site and, in particular, whether soluble materials stored outdoors were kept under cover. The vast majority of unpermitted businesses overall reported either storing soluble materials indoors or only transferring them outdoors (46%) or having no soluble materials on-site at all (39%). Few businesses without permits reported storing soluble materials outdoors with some or little to none kept under cover (1%). Responses did not vary reliably by inspection date, as shown in Table 18. As shown in Table 19, responses also did not show a clear trend by risk category.

Among high- and moderate-risk businesses, those with permits were more likely to report storing materials outdoors; however, the majority of permitted respondents also reported that most outdoor materials were stored under cover, as shown in Table 20.

Table 18. Portion of liquids/loose materials kept outdoors under cover (Q8, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
No soluble materials onsite	25	42%	11	28%	19	44%	55	39%
Stored indoors or transferred	25	42%	21	54%	19	44%	65	46%
Most stored under cover	6	10%	6	15%	4	9%	16	11%
Some stored under cover	0	0%	0	0%	0	0%	0	0%
Little to none stored under cover	0	0%	1	3%	1	2%	2	1%
Don't know or refused	4	7%	0	0%	0	0%	4	3%
Total Respondents	60	100%	39	100%	43	100%	142	15%

Table 19. Portion of liquids/loose materials kept outdoors under cover (Q8, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
No soluble materials onsite	5	28%	20	40%	30	41%	55	39%
Stored indoors or transferred	10	56%	24	48%	31	42%	65	46%
Most stored under cover	3	17%	4	8%	9	12%	16	11%
Some stored under cover	0	0%	0	0%	0	0%	0	0%
Little to none stored under cover	0	0%	1	2%	1	1%	2	1%
Don't know or refused	0	0%	1	2%	3	4%	4	3%
Total Respondents	18	100%	50	100%	74	100%	142	15%

Table 20. Portion of liquids/loose materials kept outdoors under cover (Q8, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
No soluble materials onsite	25	37%	7	24%	32	33%
Stored indoors or transferred	34	50%	13	45%	47	48%
Most stored under cover	7	10%	6	21%	13	13%
Some stored under cover	0	0%	1	3%	1	1%
Little to none stored under cover	1	1%	0	0%	1	1%
Don't know or refused	1	1%	2	7%	3	3%
Total Respondents	68	100%	29	100%	97	100%

Stormwater Facilities

Q9. Are any storm drains or other stormwater facilities, such as catch basins, detention vaults, or stormfilters, located on your business site?

If yes

Q10. How often does your company have those stormwater facilities checked or inspected?

More than half of all businesses without permits reported either inspecting on-site stormwater facilities about once a year or more (38%) or having no such facilities on site (20%). More than a quarter (26%) of respondents without permits did not know the inspection frequency of their facilities.

There was no clear trend by inspection date among businesses who reported having facilities and inspecting them *less* than once a year, as shown in Table 21. In contrast, respondents from unpermitted businesses inspected recently appeared more likely to report inspecting stormwater facilities about once a year or more (47% of 1–2 years versus 30% of 3–5 years). Respondents from business inspected less recently appeared more likely to report having no on-site stormwater facilities (13% of 1–2 years versus 28% of 3–5 years), which could indicate that awareness of on-site facilities decreases over time.

Similarly, there was no clear trend by risk level among businesses who reported having facilities and inspecting them *less* than once a year, as shown in Table 22. On the other hand, respondents at low-risk

businesses without permits appeared less likely to report inspecting facilities about once a year or more (27% of low-risk versus 52% of moderate-risk and 47% of high-risk). Low-risk businesses also appeared more likely to report *not* knowing about inspection frequency (31% of low-risk versus 20% of moderate risk and 22% of high-risk).

Among high- and moderate-risk businesses, those with permits appear more likely to report inspecting their stormwater facilities at least once a year (76% of permitted business versus 50% of businesses without permits), as shown in Table 23. More than half (52%) of respondents at these permitted businesses said their stormwater facilities are inspected more than four times a year.

Table 21. Frequency of on-site stormwater facilities inspection (Q10, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
No stormwater facilities on site	8	13%	9	23%	12	28%	29	20%
More than four times a year	5	8%	4	10%	4	9%	13	9%
Two to three times a year	7	12%	3	8%	2	5%	12	8%
About once a year	16	27%	6	15%	7	16%	29	20%
About every two years	4	7%	5	13%	2	5%	11	8%
Less than every two years	0	0%	0	0%	1	2%	1	1%
Don’t know inspection frequency	17	28%	12	31%	8	19%	37	26%
Don't know if facilities on site	3	5%	0	0%	7	16%	10	7%
Total Respondents	60	100%	39	100%	43	100%	142	100%

Table 22. Frequency of on-site stormwater facilities inspection (Q10, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
No stormwater facilities on site	5	28%	7	14%	17	23%	29	20%
More than four times a year	3	17%	6	12%	4	5%	13	9%
Two to three times a year	0	0%	7	14%	5	7%	12	8%
About once a year	5	28%	13	26%	11	15%	29	20%
About every two years	1	6%	3	6%	7	9%	11	8%
Less than every two years	0	0%	0	0%	1	1%	1	1%
Don’t know inspection frequency	4	22%	10	20%	23	31%	37	26%
Don't know if facilities on site	0	0%	4	8%	6	8%	10	7%
Total Respondents	18	100%	50	100%	74	100%	142	100%

Table 23. Frequency of on-site stormwater facilities inspection (Q10, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
No stormwater facilities on site	12	18%	3	10%	15	15%
More than four times a year	9	13%	15	52%	24	25%
Two to three times a year	7	10%	3	10%	10	10%
About once a year	18	26%	4	14%	22	23%
About every two years	4	6%	0	0%	4	4%
Less than every two years	0	0%	0	0%	0	0%
Don't know inspection frequency	14	21%	4	14%	18	19%
Don't know if facilities on site	4	6%	0	0%	4	4%
Total Respondents	68	100%	29	100%	97	100%

Spill Response

Q11. Does your company have materials on hand to clean up spills that may occur outdoors?

The vast majority (92%) of all businesses without permits reported having spill clean-up materials on hand. Responses did not vary significantly by inspection date, as shown in Table 24. All respondents at businesses in the high-risk category reported having spill clean-up materials on hand, as shown in Table 25, while businesses in lower risk categories appeared slightly more likely to report not having outdoor spills.

Among high- and moderate-risk businesses, similar percentages of permitted (100%) and unpermitted (96%) businesses reported having spill clean-up materials, as shown in Table 26.

Table 24. Spill clean-up materials (Q11, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
NA – no spills outdoors	3	5%	2	5%	3	7%	8	6%
Yes	57	95%	35	90%	39	91%	131	92%
No	0	0%	1	3%	1	2%	2	1%
Don't know or refused	0	0%	1	3%	0	0%	1	1%
Total Respondents	60	100%	39	100%	43	100%	142	100%

Table 25. Spill clean-up materials (Q11, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
NA – no spills outdoors	0	0%	2	4%	6	8%	8	6%
Yes	18	100%	47	94%	66	89%	131	92%
No	0	0%	1	2%	1	1%	2	1%
Don't know or refused	0	0%	0	0%	1	1%	1	1%
Total Respondents	18	100%	50	100%	74	100%	142	100%

Table 26. Spill clean-up materials (Q11, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
NA – no spills outdoors	2	3%	0	0%	2	2%
Yes	65	96%	29	100%	94	97%
No	1	1%	0	0%	1	1%
Don't know or refused	0	0%	0	0%	0	0%
Total Respondents	68	100%	29	100%	97	100%

Q12. Does your business have a written plan for dealing with a spill outdoors?

The vast majority (83%) of all respondents without permits reported that their business has a written plan for dealing with a spill outdoors. Responses did not vary significantly by inspection date, as shown in Table 27. All respondents at businesses in the high-risk category reported having a written spill plan, as shown in Table 28, while businesses in lower risk categories appeared less likely to report having a spill plan or outdoor spills.

Among high- and moderate-risk businesses, businesses with permits all reported having a written spill plan compared to 90% of similar businesses without permits, as shown in Table 29.

Table 27. Written spill plan (Q12, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
NA – no spills outdoors	3	5%	3	8%	5	12%	11	8%
Yes	49	82%	34	87%	35	81%	118	83%
No, but employees know how.	1	2%	0	0%	0	0%	1	1%
No	4	7%	2	5%	3	7%	9	6%
Don't know	3	5%	0	0%	0	0%	3	2%
Total Respondents	60	100%	39	100%	43	100%	142	100%

Table 28. Written spill plan (Q12, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
NA – no spills outdoors	0	0%	4	8%	7	9%	11	8%
Yes	18	100%	43	86%	57	77%	118	83%
No, but employees know how.	0	0%	0	0%	1	1%	1	1%
No	0	0%	1	2%	8	11%	9	6%
Don't know	0	0%	2	4%	1	1%	3	2%
Total Respondents	18	100%	50	100%	74	100%	142	100%

Table 29. Written spill plan (Q12, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
NA – no spills outdoors	4	6%	0	0%	4	4%
Yes	61	90%	29	100%	90	93%
No, but employees know how.	0	0%	0	0%	0	0%
No	1	1%	0	0%	1	1%
Don't know	2	3%	0	0%	2	2%
Total Respondents	68	100%	29	100%	97	100%

Q13. How are employees trained or made aware of how to prevent and clean up spills outdoors?

Respondents at businesses without permits most commonly reported educating employees on how to prevent and clean up spills outdoors through trainings (51%) and written information (32%) such as signs, fliers, newsletters, or emails. As shown in Table 30, responses did not vary reliably by inspection date, although business inspected longer ago appear more likely to report not having spills outdoors. As shown in Table 31, respondents from high-risk businesses were more likely to report using trainings (83% of high-risk versus 48% of moderate-risk and 46% of low-risk) and written information (56% of high-risk versus 24% of moderate-risk and 31% of low-risk).

Among high- and moderate-risk businesses, those with permits were more likely to report using trainings (83% of permitted businesses versus 57% of businesses without permits) and less likely to report using written information (7% of permitted businesses versus 32% of businesses without permits), as shown in Table 32.

Table 30. Employee spill training (Q13, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
NA – no spills outdoors	5	8%	6	15%	9	21%	20	14%
Trainings	31	52%	22	56%	20	47%	73	51%
Written information	22	37%	14	36%	9	21%	45	32%
Reminders during team meetings	5	8%	5	13%	5	12%	15	11%
Other method	1	2%	1	3%	4	9%	6	4%
No training method	4	7%	0	0%	1	2%	5	4%
Don't know	4	7%	1	3%	2	5%	7	5%
Total Respondents*	60	NA	39	NA	43	NA	142	NA

* Percentages may not sum to 100% because multiple response were allowed.

Table 31. Employee spill training (Q13, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
NA – no spills outdoors	0	0%	8	16%	12	16%	20	14%
Trainings	15	83%	24	48%	34	46%	73	51%
Written information	10	56%	12	24%	23	31%	45	32%
Reminders during team meetings	2	11%	6	12%	7	9%	15	11%
Other method	0	0%	3	6%	3	4%	6	4%
No training method	0	0%	1	2%	4	5%	5	4%
Don't know	0	0%	3	6%	4	5%	7	5%
Total Respondents	18	NA	50	NA	74	NA	142	NA

* Percentages may not sum to 100% because multiple response were allowed.

Table 32. Employee spill training (Q13, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
NA – no spills outdoors	8	12%	0	0%	8	8%
Trainings	39	57%	24	83%	63	65%
Written information	22	32%	2	7%	24	25%
Reminders during team meetings	8	12%	5	17%	13	13%
Other method	3	4%	0	0%	3	3%
No training method	1	1%	0	0%	1	1%
Don't know	3	4%	3	10%	6	6%
Total Respondents	68	NA	29	NA	97	NA

* Percentages may not sum to 100% because multiple response were allowed.

Knowledge and Attitudes

Understanding of Stormwater System

Q14. What do you think happens to stormwater that runs off your business site after it enters a stormdrain?

Respondents were asked about what happens to stormwater runoff from their business site after it enters a stormdrain. Their responses were compared to information provided by SPU categorizing whether runoff from each site is treated (combined sewer system, infiltration), untreated (direct flow to waterways, separated storm sewer system), or both treated and untreated (partially separated). Nearly half (48%) of all respondents without permits correctly reported whether their runoff is treated or untreated. About a quarter each of businesses without permits responded incorrectly (27%) or said they did not know what happened to their runoff (24%). The accuracy of responses did not vary significantly by inspection date, as shown in Table 33. As shown in Table 34, high-risk businesses appeared more likely to correctly report whether their stormwater was treated or untreated.

Among high- and moderate-risk businesses, those with permits were more likely to correctly report whether their stormwater was treated or untreated (62% of permitted businesses versus 49% of businesses without permits), as shown in Table 35.

Table 33. Perception of whether runoff from business is treated (Q14, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
Untreated (correct)*	24	40%	19	49%	21	49%	64	45%
Treated (correct)	3	5%	1	3%	0	0%	4	3%
Treated (incorrect)	11	18%	3	8%	6	14%	20	14%
Untreated (incorrect)	6	10%	7	18%	2	5%	15	11%
Both (incorrect)	1	2%	3	8%	0	0%	4	3%
Other	1	2%	0	0%	0	0%	1	1%
Don't know	14	23%	6	15%	14	33%	34	24%
Total Respondents	60	100%	39	100%	43	100%	142	100%

* Results are presented as the business's response followed by whether the response was correct.

Table 34. Perception of whether runoff from business is treated (Q14, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
Untreated (correct)*	10	56%	22	44%	32	43%	64	45%
Treated (correct)	1	6%	0	0%	3	4%	4	3%
Treated (incorrect)	2	11%	10	20%	8	11%	20	14%
Untreated (incorrect)	1	6%	4	8%	10	14%	15	11%
Both (incorrect)	0	0%	2	4%	2	3%	4	3%
Other	0	0%	0	0%	1	1%	1	1%
Don't know	4	22%	12	24%	18	24%	34	24%
Total Respondents	18	100%	50	100%	74	100%	142	100%

* Results are presented as the business's response followed by whether the response was correct.

Table 35. Perception of whether runoff from business is treated (Q14, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
Untreated (correct)*	32	47%	18	62%	50	52%
Treated (correct)	1	1%	0	0%	1	1%
Treated (incorrect)	12	18%	2	7%	14	14%
Untreated (incorrect)	5	7%	2	7%	7	7%
Both (incorrect)	2	3%	2	7%	4	4%
Other	0	0%	3	10%	3	3%
Don't know	16	24%	2	7%	18	19%
Total Respondents	68	100%	29	100%	97	100%

* Results are presented as the business's response followed by whether the response was correct.

Q15. How did you learn where stormwater from your business site goes?

About a third (34%) of respondents at businesses without permits who reported what happens to stormwater from their business site said they learned the information from an inspector or other City employee, and about 8 percent mentioned another reliable source such as an engineering drawing or permit. About a third (34%) of respondents said they did not know or remember where they learned

about their stormwater system. As shown in Table 36, responses did not show a clear trend by inspection date, except that businesses inspected more recently were more likely to recall their source of information. As shown in Table 37, low-risk businesses were more likely to report learning about their stormwater system from an inspector or other City employee.

Among high- and moderate-risk businesses, responses did not appear to vary by permit status, as shown in Table 38.

Table 36. Source of information on stormwater system (Q15, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
An inspector or someone from the City or SPU told me	17	37%	10	30%	10	34%	37	34%
From an engineering drawing, permit, or construction project	5	11%	1	3%	3	10%	9	8%
Other	12	26%	9	27%	4	14%	25	23%
Don't know / Don't remember	12	26%	13	39%	12	41%	37	34%
Total Respondents	14	30%	6	18%	14	48%	34	31%

Table 37. Source of information on stormwater system (Q15, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
An inspector or someone from the City or SPU told me	3	21%	10	26%	24	43%	37	34%
From an engineering drawing, permit, or construction project	2	14%	3	8%	4	7%	9	8%
Other	4	29%	9	24%	12	21%	25	23%
Don't know / Don't remember	5	36%	16	42%	16	29%	37	34%
Total Respondents	4	29%	12	32%	18	32%	34	31%

Table 38. Source of information on stormwater system (Q15, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
An inspector or someone from the City or SPU told me	13	25%	8	30%	21	27%
From an engineering drawing, permit, or construction project	5	10%	3	11%	8	10%
Other	13	25%	8	30%	21	27%
Don't know / Don't remember	21	40%	8	30%	29	37%
Total Respondents	52	100%	27	100%	79	100%

Recall and Rating of Inspection

Q16. Do you recall your business ever receiving a stormwater inspection from Seattle Public Utilities?

More than half (59%) of all respondents without permits recalled their business receiving an SPU stormwater inspection, although some respondents said they were not present for the inspection. In addition, some respondents may not have distinguished between inspections by SPU and inspections by other agencies. Respondents whose businesses received an inspection more recently were more likely to recall the inspection, as shown in Table 39. Recall of the inspection did not show a clear trend by risk category, as shown in Table 40.

Among high- and moderate-risk businesses, recall of the inspection also did not appear to vary by permit status, as shown in Table 41.

Table 39. Recall of stormwater inspection (Q16, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
Yes	40	67%	21	54%	19	44%	80	56%
Yes, but I was not present	2	3%	0	0%	2	5%	4	3%
Don't know	2	3%	11	28%	8	19%	21	15%
No	16	27%	7	18%	14	33%	37	26%
Refused	0	0%	0	0%	0	0%	0	0%
Total Respondents	60	100%	39	100%	43	100%	142	100%

Table 40. Recall of stormwater inspection (Q16, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
Yes	11	61%	26	52%	43	58%	80	56%
Yes, but I was not present	1	6%	1	2%	2	3%	4	3%
Don't know	4	22%	8	16%	9	12%	21	15%
No	2	11%	15	30%	20	27%	37	26%
Refused	0	0%	0	0%	0	0%	0	0%
Total Respondents	18	100%	50	100%	74	100%	142	100%

Table 41. Recall of stormwater inspection (Q16, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
Yes	37	54%	16	55%	53	55%
Yes, but I was not present	2	3%	2	7%	4	4%
Don't know	12	18%	5	17%	17	18%
No	17	25%	6	21%	23	24%
Refused	0	0%	0	0%	0	0%
Total Respondents	68	100%	29	100%	97	100%

Q17. On a scale from one to seven, where one means strongly disagree and seven means strongly agree, do you disagree or agree with the following statement:

The inspector helped me understand what my businesses needs to do to comply with the stormwater code and prevent pollutants from entering stormdrains.

When asked to respond to a statement that the stormwater inspector helped them learn to comply with stormwater code and prevent stormwater pollution, the majority (79%) of all businesses without permits rated their agreement at least six on a seven-point scale where seven meant "strongly agree." Please note that some respondents may not have distinguished between inspectors from SPU and inspectors from other agencies. Responses seemed to show a trend by inspection date, with fewer businesses that received an inspection 3–5 years ago giving the stormwater inspector a rating of seven than businesses that received inspections more recently, as shown in Table 42. As shown in Table 43, high risk businesses tended to rate the inspector more helpful.

Among high- and moderate-risk businesses, respondents at businesses without permits were more likely to rate the stormwater inspector more helpful than respondents at permitted businesses.

Table 42. Rating of stormwater inspector helpfulness (Q17, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
7 = Strongly agree	31	78%	15	71%	9	47%	55	69%
6	3	8%	3	14%	2	11%	8	10%
5	3	8%	1	5%	2	11%	6	8%
4	2	5%	1	5%	3	16%	6	8%
3	0	0%	0	0%	1	5%	1	1%
2	0	0%	1	5%	0	0%	1	1%
1 = Strongly disagree	1	3%	0	0%	2	11%	3	4%
Total Respondents	40	100%	21	100%	19	100%	80	100%

Table 43. Rating of stormwater inspector helpfulness (Q17, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
7 = Strongly agree	8	73%	19	73%	28	65%	55	69%
6	2	18%	2	8%	4	9%	8	10%
5	0	0%	4	15%	2	5%	6	8%
4	1	9%	1	4%	4	9%	6	8%
3	0	0%	0	0%	1	2%	1	1%
2	0	0%	0	0%	1	2%	1	1%
1 = Strongly disagree	0	0%	0	0%	3	7%	3	4%
Total Respondents	11	100%	26	100%	43	100%	80	100%

Table 44. Rating of stormwater inspector helpfulness (Q17, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
7 = Strongly agree	27	73%	9	56%	36	68%
6	4	11%	5	31%	9	17%
5	4	11%	1	6%	5	9%
4	2	5%	0	0%	2	4%
3	0	0%	0	0%	0	0%
2	0	0%	0	0%	0	0%
1 = Strongly disagree	0	0%	1	6%	1	2%
Total Respondents	37	100%	16	100%	53	100%

Attitude toward Stormwater Pollution Prevention

Q18. On a scale from one to seven, where one means strongly disagree and seven means strongly agree, do you disagree or agree with the following statement:

By preventing everything except rain from entering stormdrains, businesses like mine can make a difference in protecting Puget Sound and local waterways.

When asked to respond to a statement that businesses like theirs can make a difference in protecting local waters by preventing stormwater pollution, the vast majority (86%) of all businesses without permits rated their agreement at least six on a seven-point scale where seven meant "strongly agree." Responses did not follow a clear trend by inspection date, as shown in Table 45, or by risk level, as shown in Table 46.

Among high- and moderate-risk businesses, overall agreement did not vary by permit status, with 86 percent of permitted businesses and 85 percent of businesses without permits rating their agreement at least six, as shown in Table 47. However, permitted businesses (83%) were more likely to select the very highest level of agreement than businesses without permits (69%).

Table 45. Perceived ability to protect Puget Sound (Q18, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
7 = Strongly agree	42	70%	29	74%	28	65%	99	70%
6	7	12%	8	21%	8	19%	23	16%
5	6	10%	2	5%	2	5%	10	7%
4	1	2%	0	0%	2	5%	3	2%
3	1	2%	0	0%	1	2%	2	1%
2	0	0%	0	0%	0	0%	0	0%
1 = Strongly disagree	2	3%	0	0%	1	2%	3	2%
Refused	1	2%	0	0%	1	2%	2	1%
Total Respondents	60	100%	39	100%	43	100%	142	100%

Table 46. Perceived ability to protect Puget Sound (Q18, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
7 = Strongly agree	14	78%	33	66%	52	70%	99	70%
6	3	17%	8	16%	12	16%	23	16%
5	1	6%	4	8%	5	7%	10	7%
4	0	0%	2	4%	1	1%	3	2%
3	0	0%	0	0%	2	3%	2	1%
2	0	0%	0	0%	0	0%	0	0%
1 = Strongly disagree	0	0%	1	2%	2	3%	3	2%
Refused	0	0%	2	4%	0	0%	2	1%
Total Respondents	18	100%	50	100%	74	100%	142	100%

Table 47. Perceived ability to protect Puget Sound (Q18, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
7 = Strongly agree	47	69%	24	83%	71	73%
6	11	16%	1	3%	12	12%
5	5	7%	1	3%	6	6%
4	2	3%	0	0%	2	2%
3	0	0%	0	0%	0	0%
2	0	0%	0	0%	0	0%
1 = Strongly disagree	1	1%	1	3%	2	2%
Refused	2	3%	2	7%	4	4%
Total Respondents	68	100%	29	100%	97	100%

Conclusions and Lessons Learned

Based on the results of this study, stormwater pollution prevention compliance and knowledge appear to be fairly high among all subpopulations surveyed. Responses regarding most stormwater pollution prevention practices and attitudes among businesses without permits did not appear to show clear trends based on time elapsed since the last stormwater inspection or risk category. Time elapsed appeared to affect responses regarding stormwater facility inspections and rating of the stormwater inspector. Risk category at businesses without permits appeared to affect responses regarding stormwater facility inspections, spill kits and plans, and stormwater treatment.

Among high-and moderate risk businesses, permit status appeared to affect responses regarding outdoor cleaning, dumpster area cleanliness, stormwater facility inspection, knowledge of stormwater treatment, and rating of the inspector. Surveyed businesses with permits reported higher levels of compliance and knowledge in these levels than similar respondents without permits.

During the course of this study, SPU and Cascadia learned several lessons and considerations that may be useful for future efforts:

- **Businesses interact with multiple government agencies on similar or related topics**. After fielding the survey, SPU identified several businesses that had received more recent stormwater inspections from other agencies, confounding initial results assessing changes in compliance over time. Businesses may also have been inspected on other related topics, such as hazardous waste storage, which could increase their compliance and knowledge about stormwater. In future studies, researchers could:
  - Contact and coordinate with government agencies working on similar or related topics in their jurisdiction **to identify what interactions other agencies have had with individuals in the survey population**. In some cases, the efforts of non-governmental organizations should also be considered.
  - **Include a question on the survey instrument asking the respondent to identify other inspections**, site visits, permits, or other interactions the business has had on the survey topic. A question on the survey instrument could reveal potentially confounding interactions researchers were unable to identify prior to fielding the survey.
  - As resources allow, **test the survey instrument with a focus group** of individuals in the target population. The current study piloted the instrument during survey fielding, adjusting question wording as needed; however, a more in-depth examination of the survey instrument with target businesses could help identify larger, overarching changes to improve the study and accuracy of responses.
- **Public education efforts may have increased compliance and knowledge among all businesses, obscuring the effects of inspections**. Most businesses inspected by SPU and included in the present study were located in the Duwamish watershed, which had been the focus of stormwater and hazardous waste education from the EPA, Seattle Public Utilities, King County, and others for several years. These public education efforts may have increased levels of compliance and knowledge among *all* businesses, obscuring the differences SPU and Cascadia expected to see when businesses were segmented by time elapsed since their last inspection. In future studies that are not able to

compare pre- and post-inspections results for each businesses, researchers could **consider surveying a separate control population**, such as similar businesses that did not receive an inspection, as study resources allow. Survey sample sizes may also need to be increased to enable researchers to more clearly identify smaller differences between subpopulations.

- **The permit status of a business may affect its compliance.** As a result, **businesses with stormwater permits should be assessed separately** from otherwise similar businesses that do not have stormwater permits.
- **Businesses may over-report compliance with stormwater practices**. Self-reporting bias is a well-known factor in surveys: respondents may report what they know they should be doing instead of what they actually are doing. Stormwater compliance sometimes also requires the contributions of many different employees, and one survey respondent may not be able to answer accurately for the business as a whole. If researchers have sufficient resources, they can minimize over-reporting if they **conduct site visits to gather objective data** rather than relying on self-reported information. A limited number of site visits could be used in conjunction with a larger survey to compare responses and estimate the extent of over-reporting.
- **Risk categorization was based on each business's practices and site at the time of inspection and may no longer be accurate**. SPU assesses risk in relation to practices, rather than a business's inherent characteristics. Site inspection information used to assess risk for some businesses was several years old, and may not have been accurate at the time the survey was fielded if the business had changed its practices. Depending on the goals of the research, future studies may need to **update risk categorizations through follow-up inspections** or site visits.
- **Surveyors attempted to reach the original contact from the inspection.** Anecdotally this increased businesses' receptiveness to the survey and the likelihood of interviewing someone familiar with the businesses' stormwater practices and thus able to rate the inspector. Future studies should **continue to survey original inspection contacts**, as possible.
- **Questions addressed very basic source control activities that applied to most businesses** but did not provide in-depth information on the true variety and extent of source control practices, some of which are unique to specific business types. To ask more detailed questions that yield a richer understanding of all source control practices rather than only the most universal activities, future studies could **survey respondents from a single business type**, such as auto repair shops.

Attachments

- Attachment A – Survey Instrument
- Attachment B – Detailed and Demographic Responses
- Attachment C – Initial Draft Analysis

Attachment A – Survey Instrument

FINAL Survey Guide (6/1/11)

Evaluation Goals

Evaluate the effectiveness of the stormwater inspections through a survey of inspected businesses. The goal of the evaluation is to determine whether the interviewees implement key stormwater best management practices and understand the stormwater system on their site. The survey also addresses interviewees' recall and rating of their inspection, their opinion on the ability of individual businesses to protect local waterways, and basic demographic information.

Survey Population

- Businesses that received inspections in 2005-2008
- Businesses that received inspections in 2009
- Businesses that received inspections in 2010-2011

Introduction

Hello, this is _____ with Cascadia Consulting Group, a local research firm working for Seattle Public Utilities. Today we are conducting a survey with business people in your area on behalf of SPU.

May I please speak with _____ [name on list] [if contact no longer works there or not available long-term, then ask for owner or manager]?

- Yes
- Not available at this time (schedule for callback/leave message)
- No (ask about better time to reach appropriate person; thank)
- Don't know or refused (Thank you very much for your time today. Have a good day.)

- Respondent Business:_____
- Respondent Name: _____
- Respondent Title: _____
- Call-back number: _____

Stormwater Practices

Seattle Public Utilities has hired an independent firm to gather information to help SPU assess its program needs and better assist businesses. Let me assure you that this is not a regulatory call. Everything you say will remain strictly confidential and no identifying information will be provided to SPU.

I'm now going to ask you about activities that may happen at your business. If the question does not apply to your business, please tell me that.

Outdoor Areas

1. How are the outside, paved areas of your business site, such as sidewalks or parking lot, usually cleaned? *[DO NOT READ, MARK ALL THAT APPLY]*
    a. They are not cleaned
    b. With a vacuum or vacuum sweeper
    c. Picked up by hand
    d. With a broom (sweeping) or blower
    e. Pressure washed, rinsed with a hose, or other water-based method
    f. The business does not have outside areas.
    g. Don't know
    h. Refused
    i. Other (describe) _____

Dumpster Area

2. Thinking about the amount of litter and spills around your dumpster or trash compactor, please rate the cleanliness of that area on a scale from one to seven where one means very dirty and seven means very clean [IF THE BUSINESS DOES NOT HAVE A DUMPSTER/COMPACTOR, ASK "Using the same scale, please rate the cleanliness of the area where you business places or stores bags of garbage for collection.]
    a. 1 = very dirty
    b. 2
    c. 3
    d. 4
    e. 5
    f. 6
    g. 7 = very clean
    h. Don't know
    i. Refused

Outdoor Washing

3. When your business has wash water from regular clean-up activities, such as mopping floors or rinsing paint brushes, where does the wash water usually go? *[DO NOT READ, MARK ALL THAT APPLY]*
    a. Indoor drain (e.g., utility sink, mop sink, toilet, floor drain)
    b. Outdoor drain (e.g., stormdrain)
    c. Lawn, landscaping, or on ground
    d. Parking lot, street, or other paved area
    e. Other (specify) _____
    f. Don't know
    g. The business does not have wash water from regular clean-up activities.
    h. Refused

4. I'm going to read a list of items that may be washed <u>at your business site</u>. For each item, please tell me whether the item is washed indoors, washed outdoors, washed both indoors and outdoors, or not washed <u>at your site</u>.

    a. Vehicles and large, mobile equipment
        – Indoors
        – Outdoors
        – Both indoors and outdoors
        – Not washed at business site
        – Don't know
        – Refused

    b. Equipment components and other large items, such as vent hoods, vehicle parts, floor mats, or garbage cans
        – Indoors
        – Outdoors
        – Both indoors and outdoors
        – Not washed at business site
        – Don't know
        – Refused

5. When *[LIST ITEMS WASHED OUTDOORS OR BOTH INDOORS AND OUTDOORS]* are washed <u>outdoors</u> at your site, where does the wash water drain to? *[MARK ALL THAT APPLY. DO NOT READ OPTIONS, BUT PROBE IF NEEDED: "*For example, does the water drain to landscaping, the street, a stormdrain, or a special drain for wash water?"
    a. Outdoor drain connected to the sanitary sewer (e.g., from a wash pad)
    b. Stormdrain, street drain, drainage ditch
    c. Outdoor drain (unidentified)
    d. Lawn, landscaping, or ground
    e. Parking lot, street, or other paved area
    f. Other (specify) _____
    g. Don't know
    h. Refused

Liquids and Loose Materials

6. What liquids, oils, or loose materials are stored in bulk or transferred at your business site? [*DO NOT READ CHOICES; MARK ALL THAT APPLY]*
    a. None *[SKIP REMAINING MATERIALS QUESTIONS; GO TO STORMWATER FACILITIES QUESTIONS]*
    b. Liquids (fryer oil, cleaners, solvents, others)
    c. Loose, soluble materials (dirt, compost, others)
    d. Insoluble items (e.g., lumber, nails—things that rain can't wash away)
    e. Other (specify) _____
    f. Don't know
    g. Refused
7. For the (LIST LIQUIDS AND SOLUBLE MATERIALS MENTIONED), at your business site, are they stored indoors, outdoors, both indoors and outdoors, or are they only transferred? *[MARK ALL THAT APPLY]*
    a. Indoors *[SKIP UNDER COVER QUESTION]*
    b. Outdoors
    c. Both indoors and outdoors
    d. Transferred (also stored; note storage location)
    e. Only transferred and not stored *[SKIP UNDER COVER QUESTION]*
    f. Don't know
    g. Refused
8. For those liquids, oils, and loose materials that are stored outdoors, what portion of them are kept under a cover: most, some, or little to none? *[IF NEEDED: "*Would you say that's most, some, or little to none of materials overall?"]
    a. Most
    b. Some
    c. Little to none
    d. Don't know
    e. Refused

Stormwater Facilities

9. Are any storm drains or other stormwater facilities, such as catch basins, detention vaults, or stormfilters, located on your business site?
    a. Yes
    b. No *[SKIP QUESTION ABOUT INSPECTION]*
    c. Don't know *[SKIP QUESTION ABOUT INSPECTION]*
    d. Refused *[SKIP QUESTION ABOUT INSPECTION]*
10. How often does your company have those stormwater facilities checked or inspected? [*READ OPTIONS EXCEPT DK/REF]*
    a. More than four times a year
    b. Two to three times a year
    c. About once a year
    d. About every two years
    e. Less than every two years
    f. Don't know
    g. Refused

Spill Response

11. Does your company have materials on hand to clean up spills that may occur outdoors? *[DO NOT READ LIST; IF NEEDED, PROBE FOR OUTDOORS]*
    a. Yes
    b. No
    c. Not applicable / We don't have spills outdoors *[SKIP REMAINING SPILL QUESTIONS]*
    d. Don't know
    e. Refused
12. Does your business have a written plan for dealing with a spill outdoors? *[DO NOT READ LIST]*
    a. Yes
    b. No
    c. It's not written down, but employees know what to do.
    d. Not applicable / We don't have spills outdoors *[SKIP REMAINING SPILL QUESTIONS]*
    e. Don't know
    f. Refused
13. How are employees trained or made aware of how to prevent and clean up spills outdoors? *[DO NOT READ LIST]*
    a. Trainings
    b. Reminders during team meetings
    c. Written information (e.g., signs, fliers/newsletters, emails)
    d. They aren't trained or made aware
    e. Other _____
    f. Not applicable / We don't have spills outdoors
    g. Don't know
    h. Refused

Knowledge and Attitudes

Understanding of Stormwater System

14. What do you think happens to stormwater that runs off your business site after it enters a stormdrain? *[PROBE FOR THEIR BUSINESS SITE. DO NOT READ ANSWER CHOICES.]*
    a. Treated/goes to a sewage treatment plant
    b. Flows to local bodies of water untreated
    c. Both treated and untreated
    d. Other or answer unclear (specify) _____
    e. Don't know or refused (skip next question about learning)

15. How did you learn where stormwater from your business site goes? *[DO NOT READ ANSWER CHOICES, MARK ALL THAT APPLY]*
    a. An inspector or someone from the City or SPU told me
    b. From a dye test (by inspector or someone else)
    c. From an engineering drawing, permit, or construction project
    d. Other (specify) _____
    e. Don't know / Don't remember
    f. Refused

Recall and Rating of Inspection

16. Do you recall your business ever receiving a stormwater inspection from Seattle Public Utilities? *[Prompt only if needed: During an inspection, an inspector may have looked at your stormdrains and facility, asked about activities at your business, and talked to you about stormwater pollution and Seattle's stormwater code.]*
    a. Yes
    b. Yes, but I was not present *[SKIP "INSPECTOR HELPED" QUESTION]*
    c. No *[SKIP "INSPECTOR HELPED" QUESTION]*
    d. Don't know or refused *[SKIP "INSPECTOR HELPED" QUESTION]*
17. On a scale from one to seven, where one means strongly disagree and seven means strongly agree, do you disagree or agree with the following statement:
    The inspector helped me understand what my businesses needs to do to comply with the stormwater code and prevent pollutants from entering stormdrains. *[IF NEEDED, PROMPT FOR A NUMBER FROM 1 TO 7]*
    a. 1 = Strongly disagree
    b. 2
    c. 3
    d. 4
    e. 5
    f. 6
    g. 7 = Strongly agree
    h. Don't remember
    i. I was not present for the inspection
    j. Refused

18. *[IF SKIPPED "INSPECTOR HELPED" QUESTION]* Now I'm going to ask you the extent to which you agree or disagree with the following statement.
    [IF ASKED "INSPECTOR HELPED" QUESTION] Now I'm going to ask you the extent to which you agree or disagree with another statement.

    On a scale from one to seven, where one means strongly disagree and seven means strongly agree, do you disagree or agree with the following statement:

By preventing everything except rain from entering stormdrains, businesses like mine can make a difference in protecting Puget Sound and local waterways. *[IF NEEDED, PROMPT FOR NUMBER FROM 1 TO 7]*

a. 1 = Strongly disagree
b. 2
c. 3
d. 4
e. 5
f. 6
g. 7 = Strongly agree
h. Refused

Demographic Questions

Thank you, we're almost done. I'm now going to you two demographic questions about your business. All responses are confidential, and no identifying information about your business will be shared with the City or SPU.

19. How many people, including yourself, work for your business at this location? You can stop me when I reach your business size. [*READ LIST EXCEPT REF; PROMPT FOR CATEGORY*]
    a. Fewer than 10 employees
    b. 10 to 19 employees
    c. 20 to 49 employees
    d. 50 or more employees
    e. Refused
20. Is your business registered as a Woman- or Minority-Owned Business?
    a. Yes
    b. No
    c. Don't know
    d. Refused
21. What is your title?
    a. Owner
    b. Manager
    c. Refused
    d. Other title (specify) _____
22. What is your race? You may list one or multiple races.
    a. White
    b. Black or African American
    c. American Indian or Alaska Native
    d. Asian

   e. Pacific Islander or Native Hawaiian
   f. Don't know
   g. Refused
   h. Other (please specify) _____

23. Are you of Hispanic, Latino, or Spanish Origin?
   a. Yes
   b. No
   c. Refused
24. Those are all of the questions I have. Do you have any other comments for Seattle Public Utilities about stormwater inspections? _____

Thank you very much for your time today. Have a good day.

Attachment B – Detailed and Demographic Responses

This attachment presents detailed responses provided by businesses to open-ended questions. The interviewer strived to record responses in the survey participant's own words, but these responses should not be considered verbatim transcriptions. Identifying information, such as businesses names and addresses, have been removed from participant responses to protect confidentiality.

This section also presents tables with responses to demographic questions on number employees, status as a Woman- or Minority-Owned business, and respondent title and race.

Detailed Responses

Q1. How are the outside, paved areas of your business site, such as sidewalks or parking lot, usually cleaned?

My business sometimes uses a magnet to collect scrap metal from outside areas.
The outside areas of our site are cleaned by the City.
We have a magnetic roller to pick up metal for our parking area; we don't have sidewalks and I've never seen anyone clean the streets.
We use a scraper to get things like gum and sap off the ground.

Q3. When your business has wash water from regular clean-up activities, such as mopping floors or rinsing paint brushes, where does the wash water usually go?

All our water must go to a Trim tank where it is treated.
Because I don't have a permanent business site, where stormwater drains to depends on the site I'm working at. If I'm on a storm drain line, I direct it to somewhere else. I have a permit to discharge water from my business into the sanitary sewer system.
Employees and tenants are supposed to take wash water offsite, and not dump it into the stormdrains.
Half of the water drains to the recycled water tank. The other half is the water with wax in it that goes to another drain. There are two wells on the property but I do not know where they drain to.
Stormwater from our business drains into a recycling container.
Stormwater from this site flows into the municipal sewer.
We use an independent water recycling service to take care of wash water.

Q5. When item are washed outdoors at your site, where does the wash water drain to? "For example, does the water drain to landscaping, the street, a stormdrain, or a special drain for wash water?"

Boat owners who rent space from my business sometimes wash their boats and this wash water goes directly to the lake.
Our wash water first goes to an oil water separator and then to the public waterways.
The contractor who washes our vehicles collects the wash water and takes it off site.
The wash water flows to our percolating system.
The wash water goes to our recycling system.

We collect the wash water by berming it and then a contractor collects the wash water and discharges it elsewhere.
We have a company that collects the water for recycling.
We have a private mobile business come through that drapes off the area where the truck is being cleaned, and then sucks the wash water up.
We hire a mobile wash company that is able to trap the wash water and dispose of it off site. I am unsure where they dispose of it.
We vacuum up washwater from our site.

Q13. How are employees trained or made aware of how to prevent and clean up spills?

I am the only employee, and the stormwater inspector trained me.
The trained yard manager is responsible for cleaning up all spills.
There are only three of us here and we have been here forever so we know what to do if there is a spill.
There is an environmental number posted that employees can call if they have questions about spills.
We have one-on-one conversations about spills.
We received a staff-wide training from SPU about a year ago.

Q14. What do you think happens to stormwater that runs off your business site after it enters a stormdrain?

First stormwater from my business site flows to a catch basin that we have where we have a pump house, and then, because we're below grade, that water gets pumped up into the main City sewage drains.
I don't think the stormwater goes anywhere. We have a small site, so I believe it evaporates before it leaves the site.
I was told by the Department of Ecology that when stormwater leaves our site it ties to several other businesses, but I was not told where the end location was.
It flows to a swaled area.
We have a very sophisticated treatment process for our water that includes ph buffering, sediment flocculation, pressure vessels, UV disinfection, and several more stages of treatment before any water is discharged from the site or returned to the recycling system for reuse of the water on site.

Q15. How did you learn where stormwater from your business site goes?

A coworker informed me of where stormwater goes from our business site.
From John Beal, who passed away about 4 years ago.
I believe it's common knowledge to know where stormwater goes. Years ago the Duwamish was the most polluted waterway in the U.S.
I can see from visual observation where the stormwater flows.
I have been reading newsletters from the Department of Ecology that explain about stormwater and where it goes in this area.
I just know that our operation is divided by the street and one side of the street drains to the

Duwamish but the side we are on drains to the part of the combined sewer system that goes to a treatment facility. This is what our permit is based on as well.
I know from visual observations where stormwater goes.
I know this from general knowledge about stormdrains.
I know this from general knowledge and our safety training programs.
I know where stormwater from my business site goes based on personal knowledge.
I know where stormwater goes from common sense.
I learned from my child who did a project on stormwater in the sixth grade.
I learned where stormwater from my business site goes by working with the city and understanding the process, that all wastewater from all buildings is pumped up to street level.
I learned where stormwater from my business site goes through looking at the plans for stormwater for our facility while we were developing our stormwater management plan, with lots of help from the Environmental Coalition of South Seattle (ECOSS).
I learned where stormwater from my site goes from the business we sublet our space from.
I learned where stormwater goes from college coursework.
I learned where stormwater goes from television commercials and common sense.
I learned where stormwater goes through my coursework as that was taught in Engineering 101.
I look for myself and figured it out. I see how gravity would cause it to flow to the next lowest point.
I probably read about where my stormwater goes or someone told me.
I remember where stormwater from my business goes when I see the painted stamp on the stormdrains reminding me that it flows directly to local waterways.
I've been at this site for my business for 20 years, and I've had every environmental wacko in town come by and explain where stormwater goes to me.
My lead operations manager told me where stormwater goes.
Primarily from the Duwamish Clean Up Coalition but I am not sure if they know exactly where the water from our site flows.
Stenciling on the stormdrain says where the stormwater goes.
That is my personal view of stormwater flow.
The template or signage on the stormdrains says that stormwater goes to the rivers.
There is a sign on our building that says the stormwater drains to the Sound.
This information was included in our trainings in the past and our trainings are currently being updated.
This is just my assumption based on how water flows and general knowledge.
We are a regulated company that has always known stormwater practices and regulations.
We have a map that we got online that shows us where the stormwater in our area drains to and we also had an inspector on site a few years ago.
We have a SWPPP that tells us where the stormwater goes.
When I bought this property, I checked into where the stormwater goes.

Q21. What is your title?

Accounting
Administrative Assistant

Administrator
Assistant Store Director
CFO *[two respondents]*
Chief Operations Officer
Corporate President
Director
Director of Facilities
Director of Manufacturing
Director of Operations
Director of Safety and Purchasing
Director of Support Services/Utilities
District Environmental Coordinator
Education Program Supervisor
Employee (cashier)
Environmental Consultant for [*business name*].
Environmental Coordinator
Environmental Director
Environmental Health and Safety Director
Environmental Scientist
Environmental/Safety Officer
Executive VP of Operations
Facilities Maintenance and Grounds Supervisor
Facilities Service Coordinator
Facilities Superintendent
Field Operations Manager
Foundry Worker
General Manager of Engineering and Maintenance
Golf Course Superintendent
Inside Sales
Intermodal Supervisor
Maintenance & Environmental Control Manager
Maintenance Supervisor
Operations Manager
President *[14 respondents]*
Purchasing Agent
QA Supervisor
Safety Director *[two respondents]*
Secretary
Shipping and Customer Service Manager
Shop Operations Supervisor
Shop Supervisor
Supervisor

Vice President *[six respondents]*
Vice President of Operations

Q22. What is your race? You may list one or multiple races.

Egyptian
Hispanic *[three respondents]*

Demographic Questions

Q19. How many people, including yourself, work for your business at this location?

Table 48. Number of employees (Q19, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
Fewer than 10 employees	29	48%	16	41%	17	40%	62	44%
10 to 19 employees	6	10%	7	18%	7	16%	20	14%
20 to 49 employees	12	20%	10	26%	10	23%	32	23%
50 or more employees	8	13%	6	15%	8	19%	22	15%
Refused	5	8%	0	0%	1	2%	6	4%
Total Respondents	60	100%	39	100%	43	100%	142	100%

Table 49. Number of employees (Q19, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
Fewer than 10 employees	10	56%	21	42%	31	42%	62	44%
10 to 19 employees	2	11%	9	18%	9	12%	20	14%
20 to 49 employees	4	22%	8	16%	20	27%	32	23%
50 or more employees	1	6%	9	18%	12	16%	22	15%
Refused	1	6%	3	6%	2	3%	6	4%
Total Respondents	18	100%	50	100%	74	100%	142	100%

Table 50. Number of employees (Q19, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
Fewer than 10 employees	31	46%	6	21%	37	38%
10 to 19 employees	11	16%	4	14%	15	15%
20 to 49 employees	12	18%	7	24%	19	20%
50 or more employees	10	15%	11	38%	21	22%
Refused	4	6%	1	3%	5	5%
Total Respondents	68	100%	29	100%	97	100%

Q20. Is your business Woman- or Minority-Owned?

Table 51. Woman- or Minority-Ownership (Q20, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
Yes	13	22%	6	15%	10	24%	29	21%
No	42	70%	31	79%	29	71%	102	73%
Don't know or refused	5	8%	2	5%	2	5%	9	6%
Total Respondents	60	100%	39	100%	41	100%	140	100%

Table 52. Woman- or Minority-Ownership (Q20, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
Yes	6	33%	9	18%	14	19%	29	21%
No	11	61%	36	73%	55	75%	102	73%
Don't know or refused	1	6%	4	8%	4	5%	9	6%
Total Respondents	18	100%	49	100%	73	100%	140	100%

Table 53. Woman- or Minority-Ownership (Q20, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
Yes	15	22%	3	11%	18	19%
No	47	70%	22	79%	69	73%
Don't know or refused	5	7%	3	11%	8	8%
Total Respondents	67	100%	28	100%	95	100%

Q21. What is your title?

Table 54. Title (Q21, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
Manager	24	41%	16	41%	20	47%	60	43%
Owner	13	22%	7	18%	9	21%	29	21%
Other title (specify)	19	33%	16	41%	13	30%	48	34%
Refused	2	3%	0	0%	1	2%	3	2%
Total Respondents	58	100%	39	100%	43	100%	140	100%

Table 55. Title (Q21, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
Manager	6	35%	23	46%	31	42%	60	43%
Owner	5	29%	9	18%	15	21%	29	21%
Other title (specify)	5	29%	16	32%	27	37%	48	34%
Refused	1	6%	2	4%	0	0%	3	2%
Total Respondents	17	100%	50	100%	73	100%	140	100%

Table 56. Title (Q21, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
Manager	29	43%	14	48%	43	45%
Owner	14	21%	2	7%	16	17%
Other title (specify)	21	31%	13	45%	34	35%
Refused	3	4%	0	0%	3	3%
Total Respondents	67	100%	29	100%	96	100%

Q22. What is your race?

Table 57. Race (Q22, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
White	46	77%	28	72%	27	64%	101	72%
Asian	4	7%	1	3%	2	5%	7	5%
American Indian or Alaskan Native	2	3%	0	0%	1	2%	3	2%
Black or African American	0	0%	2	5%	1	2%	3	2%
Pacific Islander or Native Hawaiian	0	0%	0	0%	0	0%	0	0%
Other	1	2%	1	3%	1	2%	3	2%
Don't know or refused	7	12%	7	18%	10	24%	24	17%
Total Respondents	60	NA	39	NA	42	100%	141	NA

* Percentages may not sum to 100% because multiple response were allowed.

Table 58. Race (Q22, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
White	10	59%	37	74%	54	73%	101	72%
Asian	1	6%	2	4%	4	5%	7	5%
American Indian or Alaskan Native	0	0%	1	2%	2	3%	3	2%
Black or African American	0	0%	1	2%	2	3%	3	2%
Pacific Islander or Native Hawaiian	0	0%	0	0%	0	0%	0	0%
Other	2	12%	0	0%	1	1%	3	2%
Don't know or refused	4	24%	9	18%	11	15%	24	17%
Total Respondents	17	NA	50	NA	74	NA	141	NA

* Percentages may not sum to 100% because multiple response were allowed.

Table 59. Race (Q22, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
White	47	70%	20	69%	67	70%
Asian	3	4%	0	0%	3	3%
American Indian or Alaskan Native	1	1%	3	10%	4	4%
Black or African American	1	1%	0	0%	1	1%
Pacific Islander or Native Hawaiian	0	0%	0	0%	0	0%
Other	2	3%	1	3%	3	3%
Don't know or refused	13	19%	8	28%	21	22%
Total Respondents	67	NA	29	110%	96	NA

* Percentages may not sum to 100% because multiple response were allowed.

Q23. Are you of Hispanic, Latino, or Spanish Origin?

Table 60. Hispanic, Latino, or Spanish Origin (Q23, no permit, by inspection date)

	1–2 years		2–3 years		3–5 years		Total	
	n	%	n	%	n	%	n	%
Yes	1	2%	1	3%	1	2%	3	2%
No	55	92%	33	87%	32	74%	120	85%
Refused	4	7%	4	11%	10	23%	18	13%
Total Respondents	60	100%	38	100%	43	100%	141	100%

Table 61. Hispanic, Latino, or Spanish Origin (Q23, no permit, by risk category)

	High		Moderate		Low		Total	
	n	%	n	%	n	%	n	%
Yes	2	11%	0	0%	1	1%	3	2%
No	14	78%	42	84%	64	88%	120	85%
Refused	2	11%	8	16%	8	11%	18	13%
Total Respondents	18	100%	50	100%	73	100%	141	100%

Table 62. Hispanic, Latino, or Spanish Origin (Q23, by permit status)

	No Permit		Permit		Total	
	n	%	n	%	n	%
Yes	2	3%	1	3%	3	3%
No	56	82%	22	76%	78	80%
Refused	10	15%	6	21%	16	16%
Total Respondents	68	100%	29	100%	97	100%

Attachment C – Initial Draft Analysis

The initial, draft analysis is presented to enable SPU and readers to compare the effects of adjusting dates of last inspection, analyzing permitted sites separately from sites without stormwater permits, and including inspected 3–5 years ago included in analysis by risk category. **This initial, draft analysis should not be cited or used for decision-making**. It is included as an attachment only to provide a complete record of work on this study.