

# Stormwater Management Program

# Effectiveness Literature Review

## Source Control

Prepared for:  
Assoc. of Washington Cities &  
Washington State Dept. of Ecology

Prepared by:  
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# Construction Source Control

**Question #1-1: Are the temporary erosion and sediment control (TESC) best management practices (BMPs) required during development or redevelopment adequate to control erosion and sediment from construction sites?**

- Only a few construction TESC BMPs discussed in literature available.
- The most effective BMP discussed is polyacrylamide (PAM) application to soil and to other BMPs.
- Sediment ponds showed poor performance.

**Question #1-2: Are the required TESC BMPs used at construction sites effective at reducing turbidity/TSS for compliance with water quality standards?**

- High reduction of TSS/turbidity in literature, but usually not to discharge levels for compliance with WQ standards.
- Currently, in western Washington compliance with water quality standards presumed via AKART.

**Question #1-3: What frequency of construction erosion and sediment control inspections is most effective for achieving compliance with codes/ordinance requirements at new developments and redevelopments?**

- Inspection frequency not addressed in literature available.
- Current requirements are to designate a CESCL.

## **Recommended Effectiveness Studies for Construction Source Control:**

- ✓ Study PAM performance on soils in western Washington.
- ✓ Improve sediment pond design by including step for estimating input of sediment, not just runoff.
- ✓ Study TESC BMPs under field conditions.

# Illicit Discharge Detection and Elimination

## **Question #4-1: Which combination of methods work best for detection of illicit connections: smoke testing, dye testing, closed circuit TV (CCTV), flow monitoring, or outfall screening (wet and dry season)?**

- Not addressed in literature available. Information gleaned from outside literature and author experience.
- Top 3 IDDE methods reported in a recent survey:
  1. IDDE hotline;
  2. Inspection of manholes/catch basins;
  3. Inspection of outfalls.
- Forthcoming IDDE Field Screening and Source Tracing Guidance Manual.

## **Question #4-2: How effective is wet weather screening as a tool to detect illicit connections?**

- Wet weather screening can be an effective part of a comprehensive IDDE program.
- Literature recommends developing a regional database of chemical indicators to identify pollutant sources.

## **Question #4-3: Which parameters should be measured during dry weather screening to improve the ability to detect illicit connections?**

- Foreknowledge helps - desktop assessment of storm drainage infrastructure and potential illicit sources.
- Several western Washington jurisdictions have developed their own dry weather screening manuals.
- Top parameters to inspect include presence of discolored or odorous discharge and deposition patterns.

## **Recommended Effectiveness Studies for Illicit Discharge Detection and Elimination:**

- ✓ Study how IDDE methods work across a range of conditions in western Washington.
- ✓ Develop regional chemical indicators database for western Washington.
- ✓ Group IDDE methods by cost and level of detail obtainable.

# Private Stormwater Facilities

## **Question #2-1: Do more frequent site visits and contact with private facility owners improve compliance with operation and maintenance (O&M) requirements?**

- Not addressed in literature available. Information gleaned from outside literature and author experience.
- Inspector presence often motivation for personnel to immediately correct issue.

## **Question #2-2: What is the optimum frequency of inspections to maintain the functionality of private stormwater facilities?**

- Frequency of inspections not addressed in literature available.
- Optimum frequency should account for type of BMP and local conditions.

## **Recommended Effectiveness Studies for Private Stormwater Facilities:**

- ✓ See below under recommendations for source control via business inspections.

# Business Inspections for Source Control

## **Question #8-1: Are businesses that receive an in-person visit/inspection more likely to implement source control BMPs?**

- Not addressed in literature available. Information gleaned from outside literature and author experience.
- Impact of in-person visits usually short-lived – needs regular reinforcement.
- Wide range of source control BMPs across many businesses and industries – knowledgeable inspection staff required.

## **Question #8-2: What frequency of business inspections is most effective for implementing and maintaining source control requirements/BMPs at businesses?**

- Frequency of inspections not addressed in literature available.
- Depends on activities occurring, local stormwater codes and regulations, and the tone of the local government-business relationships.
- For structural BMPs, frequency of inspection depends on BMP type.
- For non-structural BMPs, regular contact is key.

## **Recommended Effectiveness Studies for Business Inspections:**

- ✓ Study connection between in-person visits and the usage and maintenance of BMPs.
- ✓ Study how the frequency of inspections of BMPs relates to the O&M of BMPs – be it at businesses or other private stormwater facilities.

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## Operations & Maintenance

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# Operations and Maintenance of Catch Basins

## **Question #5-1: Do catch basins on arterial streets require more frequent cleaning vs. non-arterial streets?**

- Literature did not specifically look at arterial versus non-arterial streets, but did indicate more heavily traveled roads have higher accumulation rates.

## **Question #5-2: Can land use or road size/type be used to set an optimal frequency for inspection and cleaning catch basins?**

- Land use and road size/type are two of several factors affecting sediment accumulation rates. Optimal cleaning and inspection frequency should not be determined solely by land use or road type.

## **Question #5-3: Does the land use surrounding a catch basin influence the rate of sediment accumulation in catch basins?**

- Yes, land use does influence rate of sediment accumulation. In general Industrial > Commercial > Residential.

## **Question #5-4: Can catch basin maintenance frequency be determined by land use surrounding the catch basin?**

- Land use should not be the sole factor in determining maintenance frequency.

## **Recommended Effectiveness Studies for Catch Basin O&M:**

- ✓ Assess feasibility and cost of retrofitting catch basins that require frequent cleaning to include larger sump.
- ✓ Assess feasibility and cost effectiveness of a maintenance schedule that allows catch basins to be cleaned before reaching 40-50% of their capacity.

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## Traditional BMPs

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# Traditional BMPs: Retrofitted BMPs

## **Question #10-1: Which combination of retrofit BMPs in a basin are most effective at reducing pollutants to receiving waters?**

- Studies within database looked at individual retrofit BMPs, however, no studies looked at which combination of retrofit BMPs are most effective.

## **Question #10-2: To what extent does retrofitting using water quality treatment devices reduce urban stormwater pollution to receiving water bodies?**

- Limited studies within database show significant removals of TSS, total metals, and nutrients, and dissolved metals at higher influent concentrations.

## **Question #10-3: Once installed, do model predicted quantities of stormwater controls in a basin reduce stormwater impacts enough to support the receiving water's designated beneficial uses?**

- One study within database verified a model as a reliable tool to predict sediment removal using grass swales and filter strips.

### **Recommended Effectiveness Studies for Retrofitted BMPs:**

- ✓ Perform field studies on existing urban retrofitted BMPs within western Washington.
- ✓ Assess feasibility, cost effectiveness, and incentives for adding BMPs to existing developed areas.
- ✓ Improve BMP models by incorporating urban stormwater runoff data.

# Traditional BMPs: Vegetative Filter Strips

## **Question #12-1: Are existing sizing criteria for vegetative filter strips (based on bioswales) overly conservative?**

- Available studies indicate filter strips should be a minimum of 16.4 feet wide. Minimum width recommended by WSDOT is 8 feet.

## **Question #12-2: Which combination of length, width, slope, soil types and vegetation types result in the greatest removal of sediment by vegetative filter strips?**

- Literature was unable to answer the question. Studies looked at individual components, but not the optimal combination.

## **Recommended Effectiveness Studies for Vegetative Filter Strips:**

- ✓ Perform field studies on filter strips in western Washington where light to moderate rainfall and flow intensities are common.
- ✓ Study filter strip performance with various combination of width, slope, and vegetation type to determine if there is an optimal design combination.

# Questions?

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