



Port of Seattle - Maritime Division
Operation and Maintenance Manual

**OPERATION AND MAINTENANCE
GUIDANCE MANUAL**



December 2021

Port of Seattle – Maritime Division

Operation and Maintenance Manual

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SECTION I

INTRODUCTION

The Port of Seattle (Port) Operation and Maintenance (O&M) Manual was prepared to meet permit requirements set by the Washington State Department of Ecology (Ecology) in the *Western Washington Phase I Municipal Stormwater Permit* (Permit), and to describe the standards for maintaining the Port's municipal separate storm sewer system (MS4) and areas draining to the combined sewer. The intent of this O&M Manual is to establish maintenance requirements to allow the Port to comply with both Permit requirements and City of Seattle (City) Code, and includes all applicable best management practices (BMPs) that the Port must follow. Where City requirements are more stringent than Permit requirements, the City standards will apply. Records of maintenance activities will comprise a portion of the Annual Report submitted to Ecology to verify compliance with the conditions of the Port's Permit in accordance with 2019 Permit requirements.

According to the Permit, the O&M Manual must meet the following minimum criteria (Special Condition S6.E.6):

The SWMP shall include an operation and maintenance program for all stormwater treatment and flow control BMPs/facilities, and catch basins to ensure that BMPs continue to function properly.

Minimum Performance Measures:

- a. *Each Permittee shall implement an Operation and Maintenance (O&M) manual for all stormwater treatment and flow control BMPs/facilities and catch basins that are under the functional control of the Permittee and which discharge stormwater to its MS4, or to an interconnected MS4.*
 - (i) *Retain a copy of the O&M manual in the appropriate Permittee department and routinely update following discovery or construction of new stormwater facilities.*
 - (ii) *The operation and maintenance manual shall establish facility-specific maintenance standards that are as protective, or more protective, than those specified in the Stormwater Management Manual for Western Washington. For existing stormwater facilities which do not have maintenance standards, the Permittee shall develop a maintenance standard. Each Permittee shall update maintenance standards, as necessary, to meet the requirements of this section.*
 - (iii) *The purpose of the maintenance standard is to determine if maintenance is required. The maintenance standard is not a measure of the facility's required condition at all times between inspections. Exceeding the maintenance standards between inspections and/or maintenance is not a permit violation. Maintenance actions shall be performed within the time frames specified in S6.E.6.b.ii.*

- b. *The Permittee will manage maintenance activities to inspect all stormwater facilities listed in the O&M manual annually and take appropriate maintenance action in accordance with the O&M manual.*
 - (i) *The Permittee may change the inspection frequency to less than annually, provided the maintenance standards are still met. Reducing the annual inspection frequency shall be based on*

maintenance records of double the length of time of the proposed inspection frequency. In the absence of maintenance records, the Permittee may substitute written statements to document a specific less frequent inspection schedule. Written statements shall be based on actual inspection and maintenance experience and shall be certified in accordance with G19 Certification and Signature.

(ii) Unless there are circumstances beyond the Permittees control, when an inspection identifies an exceedance of the maintenance standard, maintenance shall be performed:

- (1) Within 1 year for wet pool facilities and retention/ detention ponds.*
- (2) Within 1 year for typical maintenance of facilities, except catch basins.*
- (3) Within 6 months for catch basins.*
- (4) Within 2 years for maintenance that requires capital construction of less than \$25,000.*

Circumstances beyond the Permittee's control include denial or delay of access by property owners, denial or delay of necessary permit approvals, and unexpected reallocations of maintenance staff to perform emergency work. For each exceedance of the required timeframe, the Permittee shall document the circumstances and how they were beyond their control.

- c. The Permittee shall provide appropriate training for Permittee maintenance staff.*
- d. The Permittee will maintain records of inspections and maintenance activities.*

This O&M Manual applies to property under the Port's functional control where the Port is responsible for planning, staffing, and conducting operation and maintenance activities. At the Port of Seattle this includes several parks, portions of several terminals and piers, Shilshole Bay Marina, Fisherman's Terminal, Maritime Industrial Center, and Salmon Bay Marina. Property maps are maintained in the Stormwater Maintenance Zone Map Book in SharePoint.

This O&M Manual is reviewed and updated after published revisions of the Ecology Stormwater Management Manual of Western Washington or the City of Seattle Stormwater Code and Manual are in effect. The process includes reviewing the updated manual, understanding the impact to the O&M Manual and maintenance practices, updating necessary documentation, and conducting necessary review by all affected personnel, including Marine Maintenance and Maritime Stormwater Program Management. This process may require up to 12 months after the published manual update.

SECTION II

OPERATION & MAINTENANCE PROGRAM ELEMENTS

Conformance with Mandatory BMPs

The Port complies with all BMPs required by Ecology and the City of Seattle. Mandatory BMPs applicable to the Port are provided in Appendices B, C, D, and E.

Facility Inspections

Inspections help determine if BMPs are working properly and whether maintenance is needed. Inspections are performed across maintenance zones using zone inspection forms, which reference the maintenance standards provided in Appendix A. Inspection frequencies are summarized in Table 2-1. Related safety information is provided in the *Marine Maintenance Job Hazard Analysis* located in the Marine Maintenance SharePoint site.

Table 2-1 Summary of Maintenance Inspection Frequencies				
Permit Reference	System Component	Frequency of Inspection (Phase I Permit)	Recommended Frequency of Inspection* (City of Seattle)	Frequency of Inspection** (Port Practices)
S6.E.6(b)	Stormwater conveyance facilities (catch basins and maintenance holes)	Annually	Annually; more frequent as needed	Inspections annually with cleaning as needed
S6.E.6(b)	Catch basin filter socks	Annually	Monthly	Biannually
S6.E.6(b)	Stormwater treatment facilities (swales, ditches)	Annually	Annually; more frequent as needed	Biannually
S6.E.6(b)	Stormwater treatment facilities (oil water separator)	Annually	Annually; more frequent as needed	Annually, after spills
S6.E.6(b)	Stormwater conveyance facilities (roof, gutter, and trench drains)	Annually	Annually; more frequent as needed	Annually
S6.E.6(b)	Flow control facility (detention vault)	Annually	Annually; more frequent as needed	Quarterly
S6.E.6(b)	Contech StormFilter	Annually	Annually; more frequent as needed	Quarterly
S6.E.6(b)	Other treatment/ flow control BMPs in this Manual	Annually	Varies	Varies

* The City of Seattle defines summer as June to August and winter as December to February.

** Refer to the *Marine Maintenance Job Hazard Analysis* for safety information.

Maintenance Documentation

Table 2-2 identifies BMP categories that have required maintenance standards and documentation requirements. As required by the Phase I Permit, the Port maintains records of inspections and maintenance activities for stormwater treatment and flow control BMPs/facilities and catch basins under the functional control of the Port and which discharge stormwater to a MS4 (see Table 2-2 Storm System Facilities). Maintenance standards and associated inspection checklists are provided in Appendix A for the Storm System Facilities. Additional documentation requirements for other BMPs are also identified in Table 2-2. All documentation (forms, job plans, inspection results, photos, maps, etc.) is recorded for maintenance field work. Field notes and other information can be gathered using either hardcopy field forms or electronically through tablets or similar devices. Completed documentation is stored in SharePoint and Maximo as appropriate.

Table 2-2 BMP Categories, Associated Maintenance Standards, and Documentation Requirements		
BMP Category	Maintenance Standard	Documentation Requirement
Catch Basin, Manhole, and Inlets	X	Inspections for stormwater treatment and flow control facilities and catch basins are documented using zone inspection forms. Records of inspections are maintained in SharePoint
Catch Basin Filter Sock	X	
Vaults, Tanks, and Pipes	X	
Biofilters (Swales, Wet Swales, and Filter Strips)	X	
Oil Water Separator	X	
Media Filters	X	
City BMP 18: Inspection records for loading/unloading equipment	NA	Pre-trip inspections are completed for loading/unloading equipment and are maintained in a binder at the location where the inspections are being conducted
City BMPs 9 (Fueling at Dedicated Stations) and City BMP 10 (Mobile Refueling): Inspection records for fueling vehicles	NA	Fueling vehicles are inspected at an established interval. Records of inspections are maintained in Maximo
City BMP 16: Inspection records for tank/containment areas	NA	Inspections of aboveground storage tanks are completed monthly as part of the SPCC Plan requirements. Records of inspections are maintained in SharePoint

When performing an inspection, the maintenance standards, located in Appendix A, should be used to determine when a maintenance standard has been exceeded. Once the appropriate maintenance has been determined, a work order will be generated including the schedule for completion. Proposed additions or modifications to the maintenance standards should be brought to the attention of the Maintenance Manager, and revisions should be made as needed.

Recordkeeping

Documentation of maintenance activities related to the O&M Manual will be maintained for at least five years as required under the Permit and City Code. Documentation typically includes inspection forms, field notes, or work orders, and can be recorded using either hardcopy field forms or electronically through tablets or similar devices. Documentation will be stored in SharePoint and Maximo as appropriate.

SECTION III

MAINTENANCE ACTIVITY BMPS

Maintenance activity BMPs have been divided into the following categories:

- Required Citywide BMPs
- Storm System Facilities
- Fleet and Facility Maintenance
- Landscaping
- Maintenance Work

Tables 3-1 through 3-6 identify BMPs that must be implemented on Port property. Table 3-1 includes required BMPs that must be implemented on all Port properties, while Tables 3-1 through 3-6 identify BMPs that must be implemented at certain properties dependent on the type of activities or operations being conducted.

The BMPs listed in this Manual have been included in the appendices, with applicable BMPs categorized based on their source:

- Appendix B: City of Seattle Directors’ Rules, Volume IV, Source Control (selected pages)
- Appendix C: City of Seattle Directors’ Rules, Volume II, Construction Stormwater Control (selected pages)
- Appendix D: City of Seattle Directors’ Rules, Appendix G, Stormwater Control Operations and Maintenance Requirements (selected pages)
- Appendix E: Stormwater Manual for Western Washington, Volume II – Construction Management Stormwater Pollution Prevention (selected pages) and Volume IV – Source Control BMPs (selected pages)

Required Citywide BMPs

Table 3-1 lists the required Citywide BMPs, along with the appendix in which they are located. The required Citywide BMPs must be implemented for all Port properties.

Table 3-1 Required Citywide BMPs and Required BMPs for Specific Activities		
BMP No.	Title	Appendix
1	Eliminate Illicit Connections	B
2	Perform Routine Maintenance	B
3	Dispose of Fluids and Wastes Properly	B
4	Proper Storage of Solid Wastes	B
5	Spill Prevention and Cleanup	B
6	Provide Oversight and Training for Staff	B
7	Property Maintenance	B

9	Fueling at Dedicated Stations	B
10	Mobile Fueling of Vehicles and Heavy Equipment	B
11	In-Water and Over-Water Fueling	B
12	Maintenance and Repair of Vehicles and Equipment	B
13	Concrete and Asphalt Mixing and Production	B
14	Concrete Pouring, Concrete Asphalt Cutting, and Asphalt Application	B
16	Storage of Liquids in Above Ground Tanks	B

Storm System Facilities BMPs

Table 3-2 lists the applicable storm system facility BMPs, along with the appendix in which they are located.

Table 3-2 Storm System Facility BMPs	
Title	Appendix (*)
Vaults, Tanks, and Pipes	D
Flow Control Structure and Control Device	D
Catch Basins, and Maintenance Holes	D
Wet and Continuous Inflow Biofiltration Swales	D
Proprietary Technology Filter Cartridge Systems	D
API Oil/Water Separators	D
Coalescing Plate Oil/Water Separators	D
Catch Basin Filter Socks	D

(*) The maintenance standards provided in this manual supersede those referenced in Appendix D.

Fleet and Facility Maintenance BMPs

Table 3-3 lists the applicable fleet and facility maintenance BMPs, along with the appendix in which they are located. Most of these activities should be conducted at a Marine Maintenance facility within an area covered under the Industrial Stormwater General Permit, an area connected to sewer, or in a contained area where water is collected and properly disposed.

Table 3-3 Fleet and Facility Maintenance BMPs		
BMP No.	Title	Appendix
17	Cleaning or Washing	B
18	Loading and Unloading of Liquid or Solid Material	B
19	Manufacturing and Post-Processing of Metal Products	B
20	Processing and Storage of Treated Wood	B
22	Landscaping and Vegetation Management	B

23	Painting, Finishing, and Coating Activities	B
26	Storage or Transfer of Leachable or Erodible Materials	B
27	Temporary Storage or Processing of Fruits, Vegetables, or Grains	B
28	Portable Container Storage	B
29	Dust Control in Disturbed Land Areas and on Unpaved Roads and Parking Lots	B
31	Soil Erosion Control at Industrial Facilities	B
34	Boat Building, Maintenance, and Repair	B
37	Maintenance and Management of Roof and Building Drains at Industrial and Commercial Buildings	B
46	Labeling Storm Drains on Your Property	B
48	Goose Waste	B
51	Irrigation	B
52	Dock Washing	B
53	Roof Vents	B
54	Streets and Highways	B
S442	Labeling Storm Drain Inlets on Your Property	E
S452	Goose Waste	E
S450	Irrigation	E
S434	Dock Washing	E
S447	Roof Vents	E
S406	Streets and Highways	E

Landscaping BMPs

Table 3-4 lists applicable landscaping BMPs that address vegetation management and composting activities, along with the appendix in which they are located. In general, only City source control BMPs apply to landscaping activities. The Storm System Facilities section covers landscaping maintenance related to grass swales and ditches. This category also includes vacant lands which often have an existing storm sewer and include open, uncovered areas subject to erosion from wind and rain.

Table 3-4 Landscaping Maintenance BMPs		
BMP No.	Title	Appendix
C120	Temporary and Permanent Seeding	E
C121	Mulching	E
C122	Nets and Blankets	E
C123	Plastic Covering	E
C130	Surface Roughening	E
C140	Dust Control	E
C220	Inlet Protection	E
26	Storage or Transfer of Leachable or Erodible Materials	B

Maintenance Work BMPs

Table 3-5 lists the applicable maintenance work BMPs, along with the appendix in which they are located. Maintenance work projects are defined as projects that the Port maintenance personnel would accomplish in lieu of hiring a contractor. The projects might include installation of a manhole, catch basin adjustment, or pavement repair.

All maintenance activities should use appropriate erosion control measures to prevent discharge of sediment or other contaminants into the storm drainage system during the activity. The extent of erosion control will depend on the type of maintenance activity and its location. The BMPs selection matrix below will help determine the type of erosion control required.

The erosion control BMPs for maintenance work include the minimum applicable requirements based on local and state regulations. Additional site-specific measures may be necessary. The Engineering Department of the Port is available to provide direction on recommended additional erosion control measures.

Table 3-5 Maintenance Work Erosion Control BMPs		
BMP No.	Title	Appendix
C1.15	Material Delivery, Storage and Containment	C
C1.20	Use of Chemicals During Construction	C
C1.35	Sawcutting and Paving Pollution Prevention	C
C1.40	Temporary Dewatering	C
C1.45	Solid Waste Handling and Disposal	C
C1.56	Concrete Handling	C
E2.45	Dust Control	C
E3.10	Filter Fence	C
E3.25	Inlet Protection	C
13	Concrete and Asphalt Mixing and Production	B
14	Concrete Pouring, Concrete/Asphalt Cutting, and Asphalt Application	B
15	Manufacturing and Post-Processing of Metal Products	B
26	Storage or Transfer of Leachable or Erodible Materials	B

Pavement Management

Table 3-6 lists the applicable pavement management maintenance BMPs, along with the appendix in which they are located. Pavement management encompasses maintenance associated with parking lots, small area paving, and snow and ice control.

Table 3-6 Pavement Management Maintenance BMPs		
BMP No.	Title	Appendix
13	Concrete and Asphalt Mixing and Production	B
14	Concrete Pouring, Concrete/Asphalt Cutting, and Asphalt Application	B
26	Storage or Transfer of Leachable or Erodible Materials	B
27	Lot Maintenance and Storage	B
29	Dust Control in Disturbed Land Areas and on Unpaved Roadways and Parking Lots	B
54	Streets and Highways	B

SECTION IV

REFERENCES

Director's Rule 10-2021, DWW-200, City of Seattle Stormwater Manual Vol. 4 of 5: Source Control, Seattle Public Utilities, Department of Construction and Inspections, July 2021.

Director's Rule 10-2021, DWW-200, City of Seattle Stormwater Manual Vol. 2 of 5: Construction Stormwater Control, City of Seattle, Seattle Public Utilities, Department of Planning and Development, July 2021.

Director's Rule 10-2021, DWW-200, City of Seattle Stormwater Manual Appendix G: Stormwater Control Operations and Maintenance Requirements, Seattle Public Utilities, Department of Construction and Inspections, July 2021.

Regional Road Maintenance - Endangered Species Act Program Guidelines, Regional Road Maintenance Technical Working Group, Washington State Department of Transportation, 2002.

Stormwater Management Manual for Western Washington, Volume II – Construction Stormwater Pollution Prevention and Volume IV – Source Control BMPs, Washington State Department of Ecology, Water Quality Program, Publication No. 19-10-021, July 2019.

SECTION V

DOCUMENT CHANGE LOG

Table 5-1 provides a record of changes made to this O&M Manual.

Table 5-1 DOCUMENT CHANGE LOG		
Date of Change	Section/Text Description of Change	Changed by / Company and Name
2/9/09	Section II Waste Disposal – removed Sanitary Sewer as an option for disposal of vector wastes.	Aspect Consulting - gbt for POS - MaryAnn Lobdell
2/9/09	Section II Waste Disposal – removed reference to Port decant facility because there are none.	Aspect Consulting - gbt for POS - MaryAnn Lobdell
2/9/09	Maintenance Standards – formatted the excel sheets into a word table so page numbers and table of contents can be automatically generated. This section is now stored as O&M Manual_MaintenanceStandards.doc. To facilitate page numbering and TOC, it is a separate document.	Aspect Consulting - gbt
2/9/09	Inspection Checklists– removed the original sample checklists and added reference “See Seaport Maintenance Maximo System for Inspections Checklist.”	Aspect Consulting – gbt
12/28/10	Appendices A, B and C – Updated to use final version of City of Seattle BMPs. Added Mobile Fueling BMP. Minor edits to main text.	Aspect Consulting - ogr
5/20/13	Added a deicer BMP, dock cleaning BMP, and ditch cleaning BMP. Added an SOP and field guide for stormwater line cleaning and dual valve systems. Modified the sweeping frequency BMP. Incorporated updates associated with the 2012 Ecology Stormwater Management Manual for Western Washington and 2013 Phase 1 NPDES Municipal Permit. Added maintenance inspection checklists. Removed exhibits and maintenance zone figures. Miscellaneous edits to text.	Aspect Consulting - tla
1/19/15	Appendix A – added Fecal Coliform Maintenance Standards and Checklist.	EA Engineering – gal

Table 5-1 DOCUMENT CHANGE LOG		
Date of Change	Section/Text Description of Change	Changed by / Company and Name
2/19/15	Appendix A – revised Detention Vault / Stormwater Cartridge Maintenance Checklist.	POS – Scott Silcox
3/6/15	Section II – edited document text to allow maintenance field documentation to be recorded electronically.	EA Engineering – gal
8/14/15	Revised document to ensure it contained the necessary elements associated with the 2012 Ecology Stormwater Management Manual for Western Washington and 2013 Phase 1 NPDES Municipal Permit.	EA Engineering - gal
4/1/16	Revised document to ensure it contained the necessary elements associated with the updated 2016 City of Seattle Stormwater Code and Manual.	EA Engineering - hc
8/16/19	Revised document to ensure it contained the necessary elements associated with the updated 2017 City of Seattle Stormwater Code and Manual and 2019 Phase I Permit.	EA Engineering - mcp
12/16/2021	Revised document to ensure it contained the necessary elements associated with the updated 2021 City of Seattle Stormwater Code and Manual	EA Engineering

Appendices



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Appendix A
Maintenance Standards and
Inspection Checklists

CATCH BASIN AND MANHOLE MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
1. Structure	A. Sediment	Sediment exceeds 60 percent of the depth from the bottom of the catch basin to the invert of the lowest pipe into or out of the catch basin or is within 6 inches of the invert of the lowest pipe into or out of the catch basin	Sump of catch basin contains no sediment	Annually
	B. Trash & debris	Trash or debris of more than ½ cubic foot is located immediately in front of the catch basin opening or is blocking capacity of the basin by more than 10%.	No trash or debris blocking or potentially blocking entrance to catch basin	Biannually with at least one inspection occurring during the wet season, and after major storm events.
		Trash or debris in the catch basin that exceeds 1/3 the depth from the bottom of basin to invert the lowest pipe into or out of the basin.	No trash or debris in the catch basin.	
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases.	No dead animals or vegetation present within the catch basin.	
		Deposits of garbage exceeding 1 cubic foot in volume.	No condition present which would attract or support the breeding of insects or rodents.	
	C. Damage to frame and/or top slab	Corner of frame extends more than ¾ inch past curb face into the street (if applicable).	Frame is even with curb.	Annually
		Top slab has holes larger than 2 square inches or cracks wider than ¼ inch.	Top slab is free of holes and cracks.	
		Frame not sitting flush on top slab (separation of more than ¾ inch of the frame from the top slab).	Frame is sitting flush on top slab.	
	D. Cracks in walls/bottom	Cracks wider than ½ inch and longer than 1 foot, any evidence of water or soil particles entering catch basin through cracks, or maintenance person judges that structure is unsound.	Catch basin is sealed and structurally sound.	Annually
		Cracks wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	No cracks more than 1/4 inch wide at the joint of inlet/outlet pipe.	
	E. Settlement/misalignment	Basin has settled more than 1 inch or has rotated more than 2 inches out of alignment.	Basin replaced or repaired to design standards.	Annually
	F. Damaged Pipe Joints	Cracks wider than ½ inch at the joint of the inlet/outlet pipes or any evidence of soil particles entering catch basin through cracks at pipe joints.	No cracks more than ¼-inch wide at the joint of inlet/outlet pipes.	Annually
	G. Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries, or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.	Annually and after major storm events.

CATCH BASIN AND MANHOLE MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
	G. Fire hazard	Presence of chemicals such as natural gas, oil and gasoline.	No flammable chemicals present.	Annually and as needed.
	H. General	Painted catch basin label and stencil is worn off or unreadable.	Painted label is clear and readable.	Annually
2. Inlet/Outlet Pipe	A. Sediment accumulation	Sediment filling 1/3 or more of the pipe	Inlet/outlet pipes clear of sediment.	Summer, winter, and as needed.
	B. Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash and debris in pipes	Biannually with at least one inspection occurring during the wet season, and after major storm events.
	C. Damaged	Cracks wider than 1/2-inch at the joint of the inlet/outlet pipes, or any evidence of soil entering at the joints of the inlet/outlet pipes	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe	Annually
3. Catch Basin Outlet Trap	A. Missing	When the required outlet trap is not installed upon the outlet pipe	Outlet trap installed and prevents floatables from being discharged	Annually
	B. Permanently installed	When the trap is grouted to the outlet pipe and is not removable to allow for maintenance and inspection.	Outlet trap removable for maintenance and inspection.	Annually
	C. Damaged	Cracks, broken welds, seams or any other conditions that allows water to be discharged from other than the submerged portion of the trap.	Water will be discharged from the submerged portion of the trap.	Annually
4. Metal Grates (Catch Basin)	A. Unsafe Grate Opening	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.	Annually
	B. Trash and Debris	Trash and debris is blocking more than 20% of grate surface.	Grate free of trash and debris. Footnote to guidelines for disposal,	Biannually with at least one inspection occurring during the wet season, and after major storm events.
	C. Damaged or Missing	Grate missing or broken member(s) of the grate, or any open structure requires urgent maintenance	Grate is in place and meets design standards.	Annually
5. Maintenance Hole Cover/Lid	A. Cover/lid not in place	Cover/lid is missing or only partially in place; any open structure requires urgent maintenance.	Cover/lid protects opening to structure.	Annually
	B. Locking mechanism not working	Mechanism cannot be opened by on maintenance person with proper tools; or bolts cannot be seated; or self-locking cover/lid does not work.	Mechanism opens with proper tools.	Annually
5. Maintenance Hole Cover/Lid (cont.)	C. Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 lbs of lift.	Cover/lid can be removed and reinstalled by one maintenance person.	Annually

CATCH BASIN AND MANHOLE MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
6. Ladder	A. Ladder rungs unsafe	Ladder is unsafe due to missing rungs, misalignment, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.	Annually

CATCH BASIN AND MANHOLE MAINTENANCE CHECKLIST

Date:

Facility Name:

Location:

Inspector:

Inspection Item	Frequency	Conditions to Look For	Yes	No	Std	If no, describe condition and maintenance required and/or action taken
1. Catch Basins and Manholes	Biannually, at least once during wet season and after major storm events	Is the catch basin opening, bottom of the catch basin, and inlet/outlet pipes clear of trash and debris?			1-A 1-B 2-A 2-B	
	Annually	Is the frame or top slab in good condition?			1-C	
	Annually	Are the walls and bottom of the basin free of cracks?			1-D	
	Annually	Does the basin lid flush with the ground and aligned to the basin? (less than 1 inch vertical or 2 inches horizontal offset)?			1-E	
	Annually	Is the basin free of flammable chemicals (natural gas, oil, gasoline, etc.) or other pollution?			1-F 1-G	
	Annually	Is the catch basin label and stencil clear and readable?			1-H	
	Annually	Are inlet/outlet pipes in good condition?			1-F	
2. Maintenance Hole Cover/Lid	Annually	Is the maintenance hole cover/lid present, easily removed and in good condition?			5-A 5-B 5-C	
3. Ladder	Annually	Does the ladder appear complete, free of corrosion, and safe?			6-A	
4. Metal Grate	Annually	Is the metal grate present and in good condition?			4-A 4-B 4-C	
5. Inlet/outlet Pipe	Annually	Cracks wider than ½ inch at the joint of the inlet/outlet pipes, or any evidence of soil entering at the joints?			2-C	
6. Catch Basin Outlet Trap	Annually	Outlet trap installed? Any cracks, broken welds, or any other conditions that allows water to be discharged from other than the submerged portion of the trap?			3-A 3-B 3-C	

CATCH BASIN FILTER SOCK MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
1. Media Insert	A. Visible oil.	Visible oil sheen passing through media.	Media insert replaced.	Biannually
	B. Insert does not fit catch basin properly.	Flow gets into catch basin without going through media.	All flow goes through media.	
	C. Filter media plugged.	Filter media plugged.	Flow through filter media is normal	
	D. Oil absorbent media saturated.	Media oil saturated.	Oil absorbent media replaced.	
	E. Water saturated.	Catch basin insert is saturated with water, which no longer has the capacity to absorb	Insert replaced.	
	F. Service life exceeded	Regular interval replacement due to typical average life of product	Media replaced at manufacturer's recommended interval.	As recommended by manufacturer

CATCH BASIN FILTER SOCK MAINTENANCE CHECKLIST

Date:

Facility Name:

Location:

Inspector:

Inspection Item	Frequency	Conditions to Look For	Yes	No	Std	If yes, describe condition and maintenance required and/or action taken
1. Media Insert	Biannually	Is the catch basin filter sock (canister and support) broken or detached?			1-B	
	Biannually	Are the overflow holes in the canister or filter media blocked with debris or sediment?			1-C	
	Biannually	Is the filter media bag contaminated with oil or other material?			1-A 1-D	
	Biannually	Is the filter media bag torn or otherwise damaged?			1-F	
	Biannually	Has the projected service life of the filter media been reached? (Expected service life is at least one year.)			1-E 1-F	

DETENTION VAULT MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
1. Facility – General Requirements	A. Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries, or paint.	Material removed and disposed of according to applicable regulations; or source control BMPs implemented if appropriate; or no contaminants present other than a surface oil film.	Quarterly
2. Pipe or Vault Storage Area	A. Trash and debris	Any trash or debris accumulated in vault (includes floatables and non-floatables).	No trash or debris in vault.	Quarterly
	B. Sediment accumulation	Accumulated sediment depth exceeds 10% of the diameter of the storage for ½ length of storage vault or any point depth exceeds 15% of diameter.	All sediment removed from storage area.	Quarterly
3. Pipe or Vault Structure	A. Damage to wall, frame, bottom, and/or top slab	Cracks wider than ½-inch or evidence of soil particles entering the structure through the cracks, or qualified inspection personal determines that the vault is not structurally sound.	Vault sealed and structurally sound.	Quarterly
	B. Plugged air vent	Any blockage of the vent.	Vault freely vents.	
	C. Bent out of shape	Any part of vault is bent out of shape more than 10 percent of its design shape.	Vault repaired or replaced to design.	
	D. Gaps between sections, damaged joints or cracks or tears in wall.	A gap wider than ½-inch at the joint of any pipe or vault sections; any evidence of soil particles entering the pipe or vault at a joint or through a wall.	No water or soil entering pipe or vault through joints or walls.	
4. Inlet/Outlet Pipes	A. Sediment accumulation	Sediment filling 1/3 or more of the pipe.	Inlet/outlet pipes clear of sediment.	Quarterly
	B. Trash and debris	Trash and debris accumulation in inlet/outlet pipes (floatables and non-floatables).	No trash or debris in pipes.	Annually with at least one event conducted during wet season and after major storm events.

DETENTION VAULT MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
	C. Damaged pipes	Cracks wider than 1/2-inch at the joint of the inlet/outlet pipes; or any evidence of soil entering at the joints of the inlet/outlet pipes.	No crack more than 1/4-inch wide at the joint of the inlet/outlet pipe.	Quarterly
5. Access Maintenance Hole	A. Cover/lid not in place	Cover/lid is missing or only partially in place; or any open maintenance hole requires immediate maintenance.	Maintenance hole access cover/lid in place and secure.	Quarterly
	B. Locking mechanism not working	Mechanism cannot be opened by one maintenance person with proper tools; or bolts cannot be sealed; or self-locking cover/lid does not work.	Mechanism opens with proper tools.	Quarterly
	C. Cover difficult to remove	One maintenance person cannot remove cover/lid after applying 80 lbs. of lift.	Cover/lid can be removed and reinstalled by one maintenance person.	Quarterly
	D. Ladder rungs unsafe	Missing rungs, misalignment, rust or cracks.	Ladder meets design standards and allows maintenance person safe access.	Quarterly
6. Large Access Door/Plate	A. Damaged or difficult to open	Large access doors or plates cannot be opened/removed using normal equipment.	Replace or repair access door as it can be opened as designed.	Quarterly
	B. Gaps, does not cover completely	Large access doors not flat and/or access opening not completely covered.	Doors close flat and cover access opening completely.	Quarterly
	C. Lifting rings missing, rusted	Lifting rings not capable of lifting weight of door or plate.	Lifting rings sufficient to lift or remove door or plate.	Quarterly

DETENTION VAULT MAINTENANCE CHECKLIST

Date:

Facility Name:

Location:

Inspector:

Inspection Item	Recommended Frequency	Conditions to Look For	Yes	No	Std	If yes, describe condition and maintenance required and/or action taken
1. General	Quarterly	Any evidence of containments or pollution such as oil, gasoline, concrete slurries, or paint?			1-A	
2. Storage Area	Quarterly	Is debris or sediment depth exceeds 10% of the diameter of the storage for ½ length of storage vault or any point depth exceeds 15% of diameter?			2-A 2-B	
	Quarterly	Has trash, debris, or sediment accumulated in the vault chambers?			2-B	
3. Vault Structure	Quarterly	Is the vault structure (walls, bottom, top slab, and pipe joints) cracked or leaking?			3-A 3-D	
	Quarterly	Is the vent plugged?			3-B	
	Quarterly	Any part of vault is bent out of shape more than 10 percent of its design shape?			3-C	
4. Pipes (inlet, outlet, underdrain)	Quarterly	Has trash, debris, or sediment accumulated in inlet, outlet, or underdrain pipes?			4-A 4-B	
	Quarterly	Are any pipes crushed, damaged, or disconnected from structure? Any cracks wider than ½ inch at the joint, or any evidence of soil entering at the joints?			4-C	
5. Access Maintenance Hole	Quarterly	Is 80 lbs of lift from one person not enough to remove the cover? Is the cover damaged, warped or missing?			5-A 5-B 5-C	
	Quarterly	Is the ladder insecurely attached? Missing rungs, corroded, or otherwise unsafe?			5-D	
6. Large Access Door/Plate	Quarterly	Is the large access door/plate damaged, or warped?			6-A 6-B 6-C	

GRASS SWALE AND DITCH MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
1. Facility – General Requirements	A. Trash and debris	Trash and/or debris accumulation exceed 5 cubic feet (one standard garbage can) per 1000 feet of bioswale.	No trash or debris at the site.	Monthly
	B. Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries, or paint.	Material removed and disposed of according to applicable regulations; or source control BMPs implemented if appropriate; or no contaminants present other than a surface oil film.	Biannually and after major storm events.
2. Swale Section	A. Sediment Accumulation	Sediment depth exceeds 2 inches in 10% of the swale treatment area; or sediment inhabits grass growth over 10 percent of swale length; or sediment inhibits even spreading of inflow.	No sediment deposits in treatment area of the biofiltration; swale; and grass growth not inhabited by sediment; flows are spread evenly over entire swale width.	Biannually and after major storm events.
	B. Erosion/scouring	Eroded or scoured swale bottom due to channelization or high flows.	No eroded or scoured areas in biofiltration swale; cause of erosion or scour addressed.	Biannually and after major storm events.
	C. Poor Vegetation Coverage	Grass is sparse or bare or eroded patches occur in more than 10% of the swale bottom.	Swale has no bare spots; grass is thick and healthy, abundant, and covers the swale bottom.	Monthly
	D. Grass too tall	When the grass becomes excessively tall (greater than 10 inches); or grass is thin; or nuisance weeds and other vegetation starts to take over.	Grass between 3 and 4 inches tall, thick and healthy; no clippings left in swale; no nuisance vegetation present.	Monthly (March through June)
	E. Excessive Shade	Grass growth is poor because sunlight does not reach swale.	Healthy grass growth or swale is converted to a wet biofiltration swale.	Biannually
	F. Constant baseflow	Continuous flow through the swale, even when it has been dry for weeks and an eroded, muddy channel has formed in the swale bottom.	Baseflow removed from the swale by adding a low-flow pea-gravel drain or bypassed the baseflow around the swale.	Biannually
	G. Standing water	Water pools in the swale between storms and does not drain freely.	Swale drains freely and no standing water in swale between storms. Water depth of 4 inches throughout swale for most of wet season.	Biannually
	H. Channelization	Flow concentrates and erodes channel through swale.	No flow channels in swale.	Biannually
3. Flow Spreader	A. Concentrated flow	Flow from spreader not uniformly distributed across entire swale width.	Flow is spread evenly on entire swale width.	Biannually
4. Inlet/Outlet Pipe	A. Sediment accumulation	Sediment filling 1/3 or more of inlet/outlet pipes.	Inlet / outlet. Pipes clear of sediment.	Annually

GRASS SWALE AND DITCH MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
	B. Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.	Biannually with at least one inspection during wet season and after major storm events.
	C. Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes; any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.	Annually

GRASS SWALE AND DITCH MAINTENANCE CHECKLIST

Date:

Facility Name:

Location:

Inspector:

Inspection Item	Frequency	Conditions to Look For	Yes	No	Std	If yes, describe condition and maintenance required and/or action taken
1. General	Monthly	Have trash or debris accumulated in swale bottom?			1-A	
	Biannually and after major storm events.	Does the vegetation show a visible accumulation of oil, gas, paint or other contaminant?			1-B 4-A 4-B	
2. Grassy Swale	Biannually and after major storm events.	Has sediment accumulated in swale bottom?			2-A	
	Biannually	Is standing water present in the swale?			2-F 2-G	
	Biannually	Is there an eroded, muddy channel in the swale bottom (indicating constant baseflow)?			2-B 2-F	
	Monthly	Is grass sparse, bare, eroded, or growing poorly?			2-C 2-E	
	Monthly (March through June)	Is grass excessively tall or dominated by nuisance weeds?			2-D	
	Biannually and after major storm events.	Is erosion or scouring occurring in the swale (indicating high flows)?			2-H 2-B	
	Biannually	Is the flow concentrated in certain areas of the swale (rather than uniformly across the swale area)?			2-H	
3. Flow Spreader	Biannually	Is the flow from spreader uniformly distributed across entire swale width?			3-A	
4. Inlet/outlet Pipe	Biannually	Are inlet and outlet pipes damaged or broken?			4-C	

API / BAFFLE TYPE OIL WATER SEPARATOR MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
1. Facility – General Requirements	A. Trash and debris	Any trash or debris which impairs the function of the facility	Trash and debris removed from facility.	Annually and after major storm events.
	B. Contaminants and pollution	Floating oil in excess of 1 inch in first chamber, any oil in other chambers or other contaminants of any type in any chamber.	No contaminants present other than a surface oil film.	Annually and after major storm events.
2. Vault Treatment Area	A. Sediment accumulation	Sediment depth exceeds 6 inches in any chamber of the vault.	No sediment in the vault.	Annually and after major storm events.
	B. Discharge water not clear	Inspection of discharge water shows obvious signs of poor water quality-effluent discharge vault shows thick visible sheen.	Effluent discharge is clear.	Annually and after major storm events.
	C. Trash or Debris Accumulation	Any trash and debris accumulation in vault (floatables and non-floatables)	Vault is clear of trash and debris	Annually and after major storm events.
	D. Oil Accumulation	Oil accumulations that exceed 1 inch, at the surface of the water in the oil/water separator chamber	No visible oil depth on water	Annually and after major storm events.
3. Vault Structure	A. Damage to wall, frame, bottom, and or top slab.	Cracks wider than ½-inch, any evidence of soil particles entering the structure through the cracks, or maintenance/ inspection personnel determines that the vault is not structurally sound.	Vault replaced or repaired to design specifications.	Annually and when cleaned.
	B. Baffles damaged	Baffles corroding, cracking, warping and/or showing signs of failure.	Repair or replace baffles to specifications.	Annually and when cleaned.
4. Gravity Drain	A. Inoperable valve	Valve fails to open or close.	Valve open and closes properly	Annually
	B. Valve will not seal	Valve does not seal completely	Valve seals completely closes.	Annually
5. Inlet/Outlet Pipes	A. Sediment accumulation	Sediment filling 1/3 or more of the pipe.	Inlet/outlet pipes clear of sediment.	Annually
	B. Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables)	No trash or debris in pipes	Biannually and after major storm events.
	C. Damaged	Cracks, broken welds, seams or any other conditions that allows water to be discharged from other than the submerged portion of the tee	Water will be discharged from the submerged portion of the tee	Annually and when cleaned

API / BAFFLE TYPE OIL WATER SEPARATOR MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
	D. Missing	When the required inlet or outlet tee is not installed	All tees installed	Annually and when cleaned
	E. Permanently Installed	When the tee is grouted to the inlet or outlet pipe and is not removable to allow for maintenance and inspection	Tee removable for maintenance and inspection	Annually and when cleaned
6. Access Maintenance Hole	A. Cover/lid not in place	Cover/lids is missing or only partially in place, or any open maintenance hole requires immediate maintenance.	Maintenance hole access cover/lid in place and secure.	Annually and when cleaned.
	B. Locking mechanism not working	Mechanism cannot be opened by one maintenance person with proper tools, or bolts cannot be seated, or self-locking cover/lid does not work.	Mechanism opens with proper tools.	Annually and when cleaned.
	C. Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 pounds of lift.	Cover/lid can be removed and reinstalled by one maintenance person.	Annually and when cleaned.
	D. Ladder rungs unsafe.	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, or misaligned.	Ladder meets design standards and allows maintenance person safe access.	Annually and when cleaned.
7. Large Access Doors/Plate	A. Damaged or difficult to remove	Large access doors or plates cannot be opened/removed using normal equipment.	Replace or repair access door so it can be opened as designed.	Annually and when cleaned.
	B. Gaps, does not cover completely	Large access doors not flat and/or access opening not completely covered.	Doors close flat and cover access opening completely.	Annually and when cleaned.
	C. Lifting rings missing, rusted	Lifting rings not capable of lifting weight of door or cover/lid.	Lifting rings sufficient to lift or remove cover/lid.	Annually and when cleaned.

API / BAFFLE TYPE OIL WATER SEPARATOR MAINTENANCE CHECKLIST

Date:

Facility Name:

Location:

Inspector:

Inspection Item	Frequency	Conditions to Look For	Yes	No	Std	If yes, describe condition and maintenance required and/or action taken
1. Facility – General Requirements	Annually and after major storm events	Are trash or debris that impact function of the facility present?			1-A	
	Annually and after major storm events	Is oil greater than 1" thick in first chamber or any oil in other chambers? Any evidence of other contaminants in any chambers?			1-B	
2. Vault Treatment Area	Annually and after major storm events.	Is there greater than one inch of oil accumulation or does the discharge show obvious signs of poor water quality?			2-B 2-D	
	Annually and after major storm events.	Is there sediment accumulation of greater than 6 inches or does it impede flow in any way?			2-A 2-C	
3. Vault Structure	Annually	Is the top or bottom slab or frame damaged? Any cracks wider than ½ inch in the walls or bottom of the vault or any evidence of soil entering at the cracks?			3-A	
	Annually	Are baffles corroding, cracking, warping or showing signs of failure?			3-B	
4. Gravity Drain	Annually	Does valve open and close properly and seal completely?			4-A 4-B	
5. Vault / Inlet and Outlet Pipes	Annually	Any trash and/or debris filling 1/3 or more of diameter of inlet/outlet pipes?			5-A 5-B	
	Annually	Is tee installed? Are there cracks, broken welds, seams or any other conditions that allow water to be discharged from other than the			5-C 5-D	

		submerged portion of the tee present?				
6. Access Maintenance Hole	Annually	Is the cover missing, damaged, or difficult to remove? Is 80 lbs of lift from one person not enough to remove the cover?			6-A 6-B 6-C	
	Annually	Is the ladder insecurely attached? Missing rungs, corroded, or otherwise unsafe?			6-D	
7. Large Access Door/Plate	Annually	Is the large access door/plate damaged, or warped?			7-A 7-B 7-C	

COALESCING PLATE OIL WATER SEPARATOR MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
1. Facility – General Requirements	A. Trash and debris in vault or pipes	Trash and debris that impair function of facility are present.	Trash and debris removed from facility.	Annually and after major storm events
	B. Contaminants and pollution	Floating oil in excess of 1 inch in first chamber, , any oil in other chambers, or other contaminants of any type in any chamber.	No contaminants present other than a surface oil film.	Annually and after major storm events.
2. Vault Structure	A. Damage to wall, frame, bottom, top slab, and/or inlet or outlet pipes	Cracks wider than ½-inch, any evidence of soil particles entering the structure through the cracks, maintenance inspection personnel determines that the vault is not structurally sound.	Vault replaced or repaired to design specifications. No cracks more than ¼-inch wide at the joint of the inlet and outlet pipes.	Annually
	B. Baffles damaged	Baffles corroding, cracking, warping, and/or showing signs of failure.	Repair or replace baffles to specifications.	Annually
3. Vault Treatment Area	A. Sediment accumulation	Sediment accumulation of 6 inches or greater in the forebay .	No sediment in the forebay	Annually and after major storm events.
	B. Discharge water not clear	Inspection of discharge water shows obvious signs of poor water quality-effluent discharge from vault shows thick visible sheen	Correct function of plates so effluent is clear.	Annually and after major storm events.
	C. Trash or debris accumulation	Trash and debris accumulation in vault (floatables and non-floatables)	Trash and debris removed from vault	Annually and after major storm events.
	D. Oil accumulation	Oil accumulation that exceeds 1 inch at the water surface in the in the coalescing plate chamber	No visible oil depth on water and coalescing plates clear of oil	Annually and after major storm events.
4. Coalescing Plates	A. Damaged	Plate media broken, deformed, cracked and/or showing signs of failure.	Replace that portion of media pack or entire plate pack depending on severity of failure.	Annually
	B. Sediment Accumulation	Any sediment accumulation which interferes with the operation of the coalescing plates	No sediment accumulation interfering with the coalescing plates	Annually and after major storm events.
5. Ventilation pipes	A. Plugged	Any obstruction to the ventilation pipes	Ventilation pipes are clear	Annually
6. Shutoff Valve	A. Damaged or inoperable	Shutoff valve cannot be opened or closed.	Shutoff valve operates normally.	Annually
7. Inlet/Outlet Pipes	A. Sediment accumulation	Sediment filling 1/3 or more of the pipe.	Inlet/outlet pipes clear of sediment.	Annually

COALESCING PLATE OIL WATER SEPARATOR MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
	B. Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables)	No trash or debris in pipes	Biannually with at least one inspection occurring during the wet season, and after major storm events.
	C. Damaged	Cracks, broken welds, seams or any other conditions that allows water to be discharged from other than the submerged portion of the tee	Water will be discharged from the submerged portion of the tee	Annually
	D. Missing	When the required inlet or outlet tee is not installed	Tees installed	Annually
	E. Permanently installed	When the tee is grouted to the inlet or outlet pipe and is not removable to allow for maintenance and inspection	Tee removable for maintenance and inspection	Annually
8. Access Maintenance Hole	A. Cover/lid not in place	Cover/lids is missing or only partially in place, or any open maintenance hole requires immediate maintenance.	Maintenance hole access cover/lid in place and secure.	Annually and when cleaned.
	B. Locking mechanism not working	Mechanism cannot be opened by one maintenance person with proper tools, or bolts cannot be seated, or self-locking cover/lid does not work.	Mechanism opens with proper tools.	Annually
	C. Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 pounds of lift.	Cover/lid can be removed and reinstalled by one maintenance person.	Annually
	D. Ladder rungs unsafe.	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, or misaligned.	Ladder meets design standards and allows maintenance person safe access.	Annually
9. Large Access Doors/Plate	A. Damaged or difficult to open	Large access doors or plates cannot be opened/removed using normal equipment.	Replace or repair access door so it can be opened as designed.	Annually
	B. Gaps, does not cover completely	Large access doors not flat and/or access opening not completely covered.	Doors close flat and cover access opening completely.	Annually
	C. Lifting rings missing, rusted	Lifting rings not capable of lifting weight of door or plate.	Lifting rings sufficient to lift or remove cover/lid.	Annually

COALESCING PLATE OIL WATER SEPARATOR MAINTENANCE CHECKLIST

Date:

Facility Name:

Location:

Inspector:

Inspection Item	Frequency	Conditions to Look For	Yes	No	Std	If yes, describe condition and maintenance required and/or action taken
1. Facility General Requirements	Annually	Are trash and debris that impact the function of the facility present?			1-A	
	Annually and after major storm events.	Is there floating oil in excess of 1 inch in first chamber, , any oil in other chambers, or other contaminants of any type in any chamber.			1-B	
2. Vault Structure	Annually	Are there cracks wider than ½-inch, any evidence of soil particles entering the structure through the cracks, maintenance inspection personnel determines that the vault is not structurally sound.			2-A	
	Annually	Are baffles corroding, cracking, warping, and/or showing signs of failure.			2-B	
3. Vault treatment area	Annually and after major storm events.	Is there sediment accumulation of greater than 6 inches and/or visible signs of sediment on plates?			3-A	
	Annually and after major storm events.	Does discharge water show obvious signs of poor water quality?			3-B	
	Annually and after major storm events.	Have trash and debris accumulated in vault (floatables and non-floatables)			3-C	
	Annually and after major storm events.	Does oil accumulation exceed 1 inch at the water surface in the in the coalescing plate chamber?			3-D	

4. Coalescing Plates / Baffles	Annually	Are coalescing plates and/or baffles damaged, corroded or showing other signs of failure?			4-A	
	Annually and after major storm events.	Is there sediment accumulation which interferes with the operation of the coalescing plates present?			4-B	
5. Ventilation Pipes	Annually	Any obstruction to the ventilation pipes?			5-A	
6. Shutoff Valve	Annually	Does valve open or close normally? Is water leaking through the drain valve when closed?			6-A	
7. Inlet/outlet pipes	Annually	Is there sediment filling 1/3 or more of the pipe?			7-A	
	Biannually with at least one inspection occurring during the wet season, and after major storm events.	Any trash and/or debris filling 1/3 or more of diameter of inlet/outlet pipes?			7-B	
	Annually	Inlet or outlet piping damaged or broken?			7-C	
	Annually	Are all tees present and installed according to specifications?			7-D 7-E	
8. Access Maintenance Hole	Annually	Is the cover missing, damaged, or difficult to remove? Is 80 pounds of lift from one person not enough to remove the cover? Bolts cannot be seated? Is the self-locking cover/lid working?			8-A 8-B 8-C	
	Annually	Is the ladder insecurely attached? Missing rungs, corroded, or otherwise unsafe?			8-D	
9. Large Access Door/Plate	Annually	Is the large access door/plate can be opened using normal equipment? Is the door/plate flat? Is the access opening completely covered?			8-A 8-B	
	Annually	Are lifting rings capable of lifting weight of door or plate?			8-C	

CARTRIDGE TYPE FILTER SYSTEMS MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
The specific maintenance criteria provided below is based on ConTech maintenance standard. ConTech is the only cartridge filter system used at the Port.				
1. Facility – General Requirements	A. Trash and debris	Any trash or debris or organic material which impairs the function of the facility.	Trash and debris removed from facility; system functions correctly.	Annually and after major storm events
	B. Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries, or paint.	Material removed and disposed of according to applicable regulations; or source control BMPs implemented if appropriate; or no contaminants present other than a surface oil film.	
	C. Life cycle	If system has not been maintained for 3 years, maintenance is required.	Facility is re-inspected and any needed maintenance performed.	Annually
2. Vault Treatment Area	A. Sediment on vault floor	If >4" of accumulated sediment, maintenance is required.	Vault is free of sediment.	Annually and after major storm events
	B. Sediment on top of cartridges	If >1/2" of accumulated sediment, maintenance is required.	Vault is free of sediment.	
	C. Multiple scum lines above top of cartridges	Thick or multiple scum lines above top of cartridges.	Cause of plugging corrected and cartridges replaced if necessary.	
3. Vault Structure	A. Damage to wall, frame, bottom, and/or top slab	Cracks wider than 1/2-inch or any evidence of soil particles entering the structure through the cracks, or qualified inspection personal determines that the vault is not structurally sound.	Vault replaced or repaired to design specifications.	Annually
	B. Baffles damaged	Baffles corroding, cracking, warping, and/or showing signs of failure.	Repair or replace baffles to specification.	
4. Filter Media	A. Standing water in vault	If >4" of static water above cartridge bottom for more than 24 hours after end of rain event, drawdown of water through the media takes longer than 1 hour, and/or overflows occur frequently, maintenance is required. (Catch basins have standing water in the cartridge bay.)	No standing water in vault 24 hours after a rain event. Drawdown of water through media takes 1 hour or less.	Annually and after major storm events
	B. Plugged media	If pore space between media granules is absent, maintenance is required.	Media cartridges replaced.	

CARTRIDGE TYPE FILTER SYSTEMS MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
	C. Short circuiting	Flows do not properly enter filter cartridge.	Media cartridges replaced. Flows go through filter media.	
5. Underdrains and Cleanouts	A. Sediment/debris	Underdrains or clean-outs partially plugged or filled with sediment and/or debris.	Underdrains and clean-outs free of sediment and debris.	Annually
6. Inlet/Outlet Pipes	A. Sediment accumulation	Sediment filling 1/3 or more of the pipe.	Inlet/outlet pipes clear of sediment.	Annually
	B. Trash and debris	Trash and debris accumulation in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.	Biannually, at least one inspection during wet season, and after major storm events
	C. Damaged	Cracks wider than 1/2-inch at the joint of the inlet/outlet pipes; or any evidence of soil entering at the joints of the inlet/outlet pipes.	Cracks repaired, and no evidence of soil entering.	Annually
7. Access Maintenance Hole	A. Cover/lid not in place	Cover/lid is missing or only partially in place; or any open maintenance hole requires immediate maintenance.	Maintenance hole access cover/lid in place and secure.	Annually
	B. Locking mechanism not working	Mechanism cannot be opened by one maintenance person with proper tools; or bolts cannot be sealed; or self-locking cover/lid does not work.	Mechanism opens with proper tools.	
	C. Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 pounds of lift.	Cover/lid can be removed and reinstalled by one maintenance person.	
	D. Cover/lid rocking or noisy	Lid rocking when driven over.	Cover/lid not rocking.	
	E. Ladder rungs unsafe	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, or misaligned.	Ladder meets design standards and allows maintenance person safe access.	
8. Large Access Doors/Plate	A. Difficult to open	Large access doors or plates cannot be opened/removed using normal equipment.	Replace or repair access door so it can be opened as designed.	Annually

CARTRIDGE TYPE FILTER SYSTEMS MAINTENANCE STANDARDS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Completed	Inspection Frequency
	B. Damaged	Hatch doors show major dents and stress.	Replace to support surface loading and uses.	
	C. Gaps, does not cover completely	Large access doors not flat and/or access opening not completely covered.	Doors close flat and cover access opening completely.	
	D. Lifting rings missing, rusted	Lifting rings not capable of lifting weight of door or plate.	Lifting rings sufficient to lift or remove door or plate.	

CARTRIDGE TYPE FILTER SYSTEM MAINTENANCE CHECKLIST

Date:

Facility Name:

Location:

Inspector:

Inspection Item	Recommended Frequency	Conditions to Look For	Yes	No	Std	If yes, describe condition and maintenance required and/or action taken
1. General	Annually and after major storm events Annually and after major storm events	Annual facility re-inspected and maintenance.			1-C	
		Any trash, debris or organic materials which impair the function of the facility Are contaminants (oil, gasoline, etc.) present any channels or treatment cell?			1-A 1-B	
2. Vault Treatment Area	Annually and after major storm events	>4" debris or sediment accumulated on vault floor exceeds manufacturer's requirements?			2-A	
		Has trash, debris, or sediment accumulated >1/2" on top of cartridges?			2-B	
		Thick or multiple scum lines above top of cartridges?			2-C	
3. Vault Structure	Annually	Is the vault structure (walls, bottom, top slab, weir plates, baffles, and pipe joints) cracked or leaking? Any cracks wider than 1/2-inch, or any evidence of soil particles entering the structure through the cracks?			3-A 3-B	
	Annually	Baffles corroding, cracking, warping, and/or showing signs of failure?			3-C	
4. Filter Media	Annually and after major storm events	Does drawdown through the media filters seem slow and/or are overflows occurring frequently? Is sediment accumulating on the top of the filters? Over 4" of static water above cartridge bottom for more than 24 hours after end of rain event?			4-A 4-B 4-C	
5. Pipes (inlet, outlet, underdrain)	Biannually and after major storm events	Has trash, debris, or sediment accumulated in inlet, outlet, or underdrain pipes? Sediment filling 1/3 or more of the inlet/outlet pipes?			5-A 6-A 6-B	
	Annually	Are any pipes crushed, damaged, or disconnected from structure? Cracks wider than 1/2-inch at the joints? Any evidence of soil entering the structure through the joints?			6-C	
6. Access cover	Annually	Is 80 pounds of lift from one person not enough to remove the cover? Is the cover damaged, warped or missing? Is lid rocking when driven over?			7-A 7-B 7-C 7-D	

	Annually	Is the ladder insecurely attached? Missing rungs, corroded, or otherwise unsafe?			7-E	
7. Large Access Door/Plate	Annually	Is the large access door/plate damaged, or warped? Are the lifting rings capable of lifting weight of door or plate?			8-A 8-B 8-C 8-D	

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Appendix B
Directors' Rule 10-2021, DWW-200
City of Seattle Stormwater Manual Volume IV,
Source Control
(Selected Pages)

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Volume 4: Source Control

City of Seattle
Stormwater Manual
July 2021

Note:

Some pages in this document have been purposely skipped or blank pages inserted so that this document will copy correctly when duplexed.

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CHAPTER 2 – BEST MANAGEMENT PRACTICES FOR ALL REAL PROPERTY

2.1. Required Best Management Practices

All real property must implement and maintain the following source control best management practices (BMPs) to prevent or minimize pollutants from leaving a site or property (Seattle Municipal Code [SMC], Section 22.803.030):

- BMP 1: Eliminate Illicit Connections and Illicit Discharges
- BMP 2: Perform Routine Maintenance
- BMP 3: Dispose of Fluids and Wastes Properly
- BMP 4: Proper Storage of Solid Wastes
- BMP 5: Spill Prevention and Cleanup
- BMP 6: Provide Oversight and Training for Staff
- BMP 7: Property Maintenance
- BMP 8: Rooftop Dog Runs

Stormwater Code Language	References
SMC, Section 22.803.030 – <i>For all discharges, responsible parties shall implement and maintain source controls to prevent or minimize pollutants from leaving a site or property.</i>	<ul style="list-style-type: none"> ● None provided
SMC. Section 22.801.090 – <i>“Responsible party” means all of the following persons:</i> <ol style="list-style-type: none"> 1. Owners, operators, and occupants of property; and 2. Any person causing or contributing to a violation of the provisions of this subtitle. 	<ul style="list-style-type: none"> ● None provided

2.1.1. *BMP 1: Eliminate Illicit Connections and Illicit Discharges*

Illicit connections and discharges include sanitary or process wastewater connections and unpermitted discharges of pollutants that are improperly discharging to a drainage system or receiving water. These improper connections and discharges allow a variety of pollutants to flow directly to receiving waters instead of the sanitary sewer or septic system. Frequently, such connections and discharges are not intentional but can be very harmful to the environment and must be eliminated. Refer to *Volume 1, Section 3.11* for the minimum requirements to comply with the Seattle Side Sewer Code (SMC, Chapter 21.16).

Required elements of this BMP include:

- For all real properties, responsible parties must examine their plumbing systems to identify any potential illicit connections. A good place to start is with an examination of the site plans. Remodeling and tenant improvement projects are particularly susceptible to inadvertent illicit connections. If an illicit connection is suspected, trace the source using closed-circuit television inspection (CCTV), dye test with a nontoxic dye, smoke testing, flow test, or visual reconnaissance. These tests are typically best performed by qualified personnel such as a plumbing contractor. Notify the Washington State Department of Ecology (Ecology) Northwest Regional Office at (425) 649-7000 and Seattle Public Utilities (SPU) at (206) 386-1800 prior to performing a dye test that may result in a discharge to a receiving water.
- If illicit connections are found, permanently plug or disconnect the connections.
- Obtain all necessary permits for altering or repairing side sewers and plumbing fixtures. Restrictions on certain types of discharges, particularly industrial process waters, may require pretreatment of discharges before they enter the sanitary sewer. It is the responsibility of the property owner or business operator to obtain the necessary permits and to replace the connection.
- The Stormwater Code allows the Director to require that a responsible party provide or create site drainage and sewer system maps with verified discharge points to aid in identifying illicit connections and/or to verify that illicit connections are eliminated.
- Eliminate illicit discharges to drainage systems and receiving waters.

2.1.2. *BMP 2: Perform Routine Maintenance*

Sediment and pollutants can accumulate over time in various components of drainage collection, conveyance, and treatment systems, such as catch basins, ditches, storm drains, and oil/water separators. When a storm event occurs, the excessive sediment and pollutants can become mobilized and carried into receiving waters, the public drainage system, or a public combined sewer. Performing routine maintenance is required and helps prevent sediment and pollutants from discharging downstream.

Required elements of this BMP include:

- Inspect all conveyance, detention and treatment systems at least annually and clean or repair structures whenever the condition thresholds described in *Appendix G* are triggered. Systems in industrial areas or areas that receive excessive sediment, foliage or debris may require more frequent inspection and maintenance. If leaves or woody debris accumulate on catch basins and inlets, clean as needed to prevent flooding.
- Clean catch basins when they are greater than 60 percent full of sediment, within 6 inches of the bottom of the lowest pipe, or there are obvious signs of pollution visible. At 60 percent capacity, there is not enough settling space to remove sediment from stormwater and they cease to function as designed.
- All catch basins are required to have outlet traps (downturned elbow). Outlet traps help to keep oil and other floatables from discharging to the public drainage system, public combined sewer, or receiving waters. Replace or repair outlet traps when missing or damaged. When catch basins lack sufficient depth or room to install an outlet trap, evaluate the drainage system to determine if there is an appropriate downstream location and install an outlet trap at that location.
- Properly dispose of all solids, polluted material, and stagnant water collected through system cleaning. Do not decant untreated, treated, or filtered water back into drainage system. Do not jet material downstream into the system. In all systems, known or suspected contaminated material may need to be tested for additional disposal requirements.

Consider posting “Dump No Waste” or other warning signs adjacent to inlets/catch basins where possible.

Several contractors offer cleaning services for drainage systems. A list of contractors can be found on the SPU website, online, or in the Yellow Pages under entries such as “Sewer Contractors.”

2.1.3. *BMP 3: Dispose of Fluids and Wastes Properly*

For all real properties, responsible parties must properly dispose of solid and liquid wastes and contaminated stormwater and street waste solids. There are generally five options for disposal, depending on the type of waste:

1. Recycling facilities
2. Permitted centralized waste treatment facilities
3. Municipal solid waste disposal facilities
4. Hazardous waste treatment, storage, and disposal facilities
5. Sanitary sewer or combined sewer

Some liquid wastes and contaminated stormwater (depending on the pollutants and associated concentrations) may be discharged to the sanitary sewer system, but are subject to approval by the City and King County. Restrictions on certain types of discharges may require pretreatment of discharges before they enter the sanitary sewer.

If wastes cannot be legally discharged to a sanitary sewer, one of the other three disposal options must be used. Sumps or holding tanks may be useful for storing liquid wastes temporarily. The contents must be disposed of properly.

Contaminated street waste solids must be handled by following either the guidance in Management of Street Waste Solids and Liquids in Appendix IV-B of the *Stormwater Management Manual for Western Washington* (SWMMWW) (Ecology 2019) or the Dangerous Waste Regulations (Washington Administrative Code [WAC], Chapter 173-303), if applicable.

For assistance with finding recycling facilities, refer to the King County Green Tools web page (<https://kingcounty.gov/depts/dnrp/solid-waste/programs/green-building.aspx>).

For assistance in determining where to take motor oil, pesticides, smoke alarms, fluorescent bulbs, and other hazardous materials, refer to the Local Hazardous Waste Management Program website (www.hazwastehelp.com).

Required elements of this BMP include:

- Dispose of wastes in accordance with applicable solid waste, dangerous waste, industrial waste, and other regulations.

2.1.4. *BMP 4: Proper Storage of Solid Wastes*

This BMP applies to properties that store solid wastes, including garbage, recyclables, compostable materials, and cooking grease containers outdoors. If improperly stored, these wastes can contribute a variety of pollutants to stormwater.

Required elements of this BMP include:

- Store all solid wastes in suitable containers (Figure 1). Check storage containers and trash compactors for damage and replace them if they are leaking, corroded, or otherwise deteriorating.



Figure 1. Covered Outdoor Storage of Solid Wastes.

- Ensure that storage containers have leakproof lids or are covered by some other means, and that lids are closed at all times.
- Sweep the waste storage area or clean frequently to collect all loose solids for proper disposal in a storage container.
- Connect trash compactors equipped with a drain hose to the sanitary sewer.
- Connect areas containing dumpsters and trash compactors to the sanitary sewer, unless equipped with a drain hose.
- Contain and properly dispose of washwater pursuant to BMP 17 (Cleaning or Washing) when washing dumpsters and used cooking oil containers.
- Clean up leaks and spills as they occur. Keep the area around used cooking oil storage containers clean and free of spilled grease, oils, food waste, and debris.

- Storage Container Requirements for Used Cooking Oil:
 - Store used cooking oil containers indoors or on private property. When authorized by the Seattle Department of Transportation (SDOT) and SPU Solid Waste, containers can be stored in the right-of-way.
 - Owners of used cooking oil containers must implement the following:
 - Label each used cooking oil container with the following:
 - The name and phone number of container owner
 - Contains used cooking oil
 - Report spills by calling SPU at (206) 386-1800
 - Record all authorized users specific to each container.
 - Place and maintain lids on used cooking oil storage containers to prevent rainwater intrusion.
 - Do not fill storage containers beyond 90 percent of their capacity. If accumulated used cooking oil exceeds 90 percent of the capacity of the storage container, obtain and use another suitable storage container.
 - Ensure that screens are kept clean and clear of debris.
 - Used cooking oil containers must be located to prevent tipping, spillage, vandalism, and vehicle impact. Spills resulting from damage, tipping, vandalism, and leaks are the responsibility of the owner of the container. Recommended approaches include:
 - Store used cooking oil in containers inherently resistant to tipping. Barrels are not tip resistant.
 - Locate used cooking oil containers on a level surface or secure them to prevent tipping.
 - Store used cooking oil in containers with a tight-fitting leak-resistant lid.
 - Store used cooking oil containers within a building or in a locked and secure area to prevent unauthorized use or vandalism.
 - Protect used cooking oil containers from vehicle impact by fenced enclosures, bollards, or other physical barriers.
 - Do not attempt to transfer used cooking oil from the kitchen to the used cooking oil container using overfilled small containers.

2.1.5. BMP 5: Spill Prevention and Cleanup

Leaks and spills can damage public infrastructure, interfere with sewage treatment and cause a threat to human health or the environment. Spills are often preventable if appropriate chemical and waste handling techniques are practiced effectively and the spill response plan is immediately implemented. Additional spill control requirements may be required based on the specific activity occurring on site.

A spill can be a one-time event, a continuous leak, or frequent small spills. All types must be addressed. Spills resulting from vandalism or inadequate waste management are the responsibility of the waste owner.

Businesses and real properties that load, unload, store, and manage liquids or other erodible materials must implement this BMP.

2.1.5.1. Spill Prevention

Implement the following practices and provide spill cleanup kits (*Section 2.1.5.3*) at activity locations where spills may occur:

- Clearly mark or label all containers that contain potential pollutants.
- Store and transport liquid materials in appropriate containers with tight-fitting lids.
- Place drip pans underneath all containers, fittings, valves, and where materials are likely to spill or leak. Check drip pans periodically to prevent overflow during rain events.
- Use tarpaulins, ground cloths, or drip pans in areas where materials are mixed, carried, and applied to capture any spilled materials.
- Train employees on the safe techniques for handling materials used on the site and to check for leaks and spills.

2.1.5.2. Spill Plan

- Develop and implement a spill plan and update it annually or whenever there is a change in activities or staff responsible for spill cleanup. Post a written summary of the plan at areas with a high potential for spills, such as loading docks, product storage areas, waste storage areas, and near a phone (Figure 2). The spill plan may need to be posted at multiple locations. Describe the facility, including the owner's name, address, and telephone number; the nature of the facility activity; and the general types of chemicals used at the facility.
- Designate spill response employees to be on the site during business activities. Provide a current list of the names, and telephone numbers (office and home) of designated spill response employee(s) who are responsible for implementing the spill plan.
- Provide a site plan showing the locations of storage areas for chemicals, inlets/catch basins, spill kits and other relevant infrastructure or materials information.
- Describe the emergency cleanup and disposal procedures. Note the location of the spill kit in the spill plan.
- List the names and telephone numbers of public agencies to contact in the event of a spill. Refer to *Section 2.1.5.4* for more information.



Figure 2. Waste Storage Area with Spill Kit and Posted Spill Plan.

2.1.5.3. *Spill Cleanup Kit*

Store spill cleanup kits near areas with a high potential for spills so that they are easily accessible in the event of a spill. The contents of the spill kit must be appropriate to the types and quantities of materials stored or otherwise used at the facility, and refilled when the materials are used. A spill kit may include the following items:

- Absorbent pads
- Sorbent booms or socks
- Absorbent granular material (such as kitty litter)
- Protective clothing (such as latex gloves and safety goggles)
- Thick plastic garbage bags
- Drain cover

2.1.5.4. Spill Cleanup and Proper Disposal of Material

In the event of a spill, implement the following procedures:

- Implement the spill plan immediately.
- Contact the designated spill response employee(s).
- Block off and seal nearby inlets/catch basins to prevent materials from entering the drainage system or combined sewer.
- At the earliest possible time, but in any case within 24 hours, report all spills, discharges, or releases that have impacted or could impact a drainage system, a combined sewer, a sanitary sewer, or a receiving water to the SPU Operations Response Center at (206) 386-1800. This reporting requirement is in addition to, and not instead of, any other reporting requirements under federal, state, or local laws. Other agencies may include Seattle Fire Department (206) 386-1400, Ecology (425) 649-7000 and the National Response Center (800) 424-8802. Spill reporting should take priority over the collection of supporting information. In case of emergency, dial 911.
- Use an appropriate material to clean up spills. Do not use emulsifiers or dispersants such as liquid detergents or degreasers unless they are cleaned up afterwards.
- Do not wash absorbent materials into interior floor drains or inlets/catch basins. Pick up all absorbent materials for proper disposal after application. Spill cleanup is incomplete until all absorbent materials have been recovered.
- Dispose of used spill control materials in accordance with the Seattle Solid Waste Collection Code (SMC, Chapter 21.36), Dangerous Waste Regulations (WAC, Chapter 173-303), and applicable laws.

The SPU Green Business Program is a free conservation program funded by SPU. The program offers free technical assistance, free spill kits, and assistance in developing a spill plan. They can be reached by calling (206) 343-8505 or on the City's website (www.seattle.gov/util/ForBusinesses/GreenYourBusiness).

2.1.6. BMP 6: Provide Oversight and Training for Staff

The key to sustaining BMPs is to ensure that staff are properly trained in their purpose and maintenance requirements. Assign source control maintenance as a job responsibility for staff.

For all businesses and public entities, required elements of this BMP include:

- Train all team members annually in the operation, maintenance, and inspection of BMPs. Keep training records on file.
- Train all team members annually in spill cleanup.
- Assign an employee to oversee implementation and management of stormwater source control BMPs.

The SPU Green Business Program is a free conservation program funded by SPU. The program offers free technical assistance and can assist with employee training. They can be reached by calling (206) 343-8505 or on the City's website (www.seattle.gov/util/ForBusinesses/GreenYourBusiness).

2.1.7. *BMP 7: Property Maintenance*

Good property maintenance reduces the potential for stormwater to come into contact with pollutants and can reduce maintenance intervals for the drainage system and combined sewer.

Public and commercial parking lots such as those for retail stores, fleet vehicles (including rent-a-car lots and car dealerships), and equipment sale and rental businesses; equipment storage yards; parking lot driveways; and restaurant drive-throughs can be sources of toxic hydrocarbons and other organic compounds, including oils and greases, metals, and suspended solids. Even sidewalks may need occasional cleaning and could generate pollutants.

For all businesses and public entities, required elements of this BMP include:

- Locate pollution generating activities away from stormwater pathways, such as inlets/catch basins, conveyance pipes, and ditches.
- Sweep or vacuum paved areas used for loading and unloading of materials, outdoor production and manufacturing, driveways, parking lots, sidewalks, and storage areas as needed to prevent pollutant transport off site or to the drainage system. Mechanical or hand sweeping may be necessary for areas that a vacuum sweeper cannot reach.
- Do not hose down or otherwise transport pollutants from any area to the ground, drainage system, combined sewer, or receiving water except where permissible pursuant to SMC, Section 22.802.030.
- Discharges of street and sidewalk washwater may be permitted when surfaces are swept prior to washing, detergents are not used, and water use is minimized.
- Promptly contain and clean up solid and liquid leaks and spills (refer to BMP 5 for specific information on spill prevention and cleanup).
- Inspect areas used for loading and unloading, material/waste storage, and vehicle parking as needed to prevent pollutant transport off site or to the drainage system.
- Place drip pans, absorbent pads, or other containment vessels below leaking vehicles (including inoperable vehicles and equipment) in a manner that catches leaks or spills. Drip pans or other containment measures must be managed to prevent overflowing and the contents disposed of properly. Absorbent pads must be weighted down so they do not blow away and must be inspected and changed out and disposed of properly before becoming fully saturated.
- For properties other than those that drain only to the combined sewer, an oil removal system such as an American Petroleum Institute (API) oil/water separator, coalescing plate oil/water separator, catch basin filter sock, or equivalent BMP that is approved by SPU is required for parking lots that meet the threshold for vehicle traffic intensity of a “high-use site.” Refer to SMC, Section 22.801.090 for the definition of “high-use site.”

2.2. Required Best Management Practices for Specific Activities

For business and public entities with specific pollution-generating activities, the following BMPs must be implemented to prevent or minimize pollutants from leaving a site or property:

- BMP 9: Fueling at Dedicated Stations
- BMP 10: Mobile Fueling of Vehicles and Heavy Equipment
- BMP 11: In-Water and Over-Water Fueling
- BMP 12: Maintenance and Repair of Vehicles and Equipment
- BMP 13: Concrete and Asphalt Mixing and Production
- BMP 14: Concrete Pouring, Concrete/Asphalt Cutting, and Asphalt Application
- BMP 15: Recycling, Wrecking Yard, and Scrap Yard Operations
- BMP 16: Storage of Liquids in Aboveground Tanks

Stormwater Code Language	References
<p>SMC, Section 22.803.040 – <i>For all discharges, source controls shall be implemented, to extent allowed by law, by businesses and public entities for the following specific pollution-generating activities as specified in the joint SPU/DPD Directors’ Rule titled “Seattle Stormwater Manual” at “Volume 4 – Source Control,” to the extent necessary to prevent prohibited discharges as described in subsection 22.802.020.A through subsection 22.802.020.D, and to prevent contaminants from coming in contact with drainage water or being discharged to the drainage system, public combined sewer, or directly into receiving waters:</i></p> <ol style="list-style-type: none"> 1. <i>Fueling at dedicated stations, for new or substantially altered fueling stations.</i> 2. <i>Mobile fueling of vehicles and heavy equipment.</i> 3. <i>In-water and over-water fueling.</i> 4. <i>Maintenance and repair of vehicles and equipment.</i> 5. <i>Concrete and asphalt mixing and production.</i> 6. <i>Concrete pouring, concrete/asphalt cutting, and asphalt application.</i> 7. <i>Recycling, wrecking yard, and scrap yard operations.</i> 8. <i>Storage of liquids in aboveground tanks.</i> 	<ul style="list-style-type: none"> ● None provided

2.2.1. *BMP 9: Fueling at Dedicated Stations*

This BMP applies to businesses and public agencies that operate a facility used exclusively for the transfer of fuels from a stationary pumping station to vehicles or equipment. This type of fueling station includes aboveground or underground fuel storage facilities, which may be permanent or temporary. Fueling stations include facilities such as, but not limited to, commercial gasoline stations, 24-hour convenience stores, car washes, warehouses, manufacturing establishments, maintenance yards, port facilities, marinas and boatyards, construction sites, and private fleet fueling stations.

Description of Pollutants

Typically, stormwater contamination at fueling stations is caused by leaks or spills of fuels, lubrication oils, radiator coolants, fuel additives, and vehicle washwater. These materials contain organic compounds, oils and greases, and metals that can be harmful to humans and aquatic life. These pollutants must not be discharged to the drainage system or directly into receiving water.

A spill can be a one-time event, a continuous leak, or frequent small spills. All types must be addressed.

Required BMP Elements

All BMPs related to fueling at dedicated stations must be consistent with the requirements of the Seattle Fire Code (SMC, Chapter 22.600). The water quality requirements presented in this manual are separate from, and in addition to, the requirements of the Seattle Fire Code. These water quality requirements relate to fuel storage tanks, fuel dispensing equipment, area lighting, spill control and secondary containment, signage, maintenance, and operations. For current requirements, refer to the Seattle Fire Code.

New or substantially altered stations* require the following (refer to Figure 3):

*Substantial alteration of fueling stations includes replacing the canopy or relocating, replacing, or adding one or more fuel dispensers in such a way that the Portland cement concrete (or equivalent) paving in the fueling area is modified. Addition of fuel tanks to a site also triggers implementation of source control BMPs.

- Construct fueling stations on an impervious concrete pad under a roof to keep out rainfall and to prevent stormwater run-on. Pave the fueling island and containment pad with Portland cement concrete or equivalent. Asphalt is not considered an equivalent material.
- Design the fueling island (Figure 4) to minimize stormwater contamination, to control spills, and to collect and direct contaminated stormwater and/or wastewater to a pretreatment facility that will achieve the performance goal per *Section 3.5.2.1 (Oil Control Treatment)* in *Volume 3 – Project Stormwater Control*. The fueling island must be designed in compliance with all applicable codes.

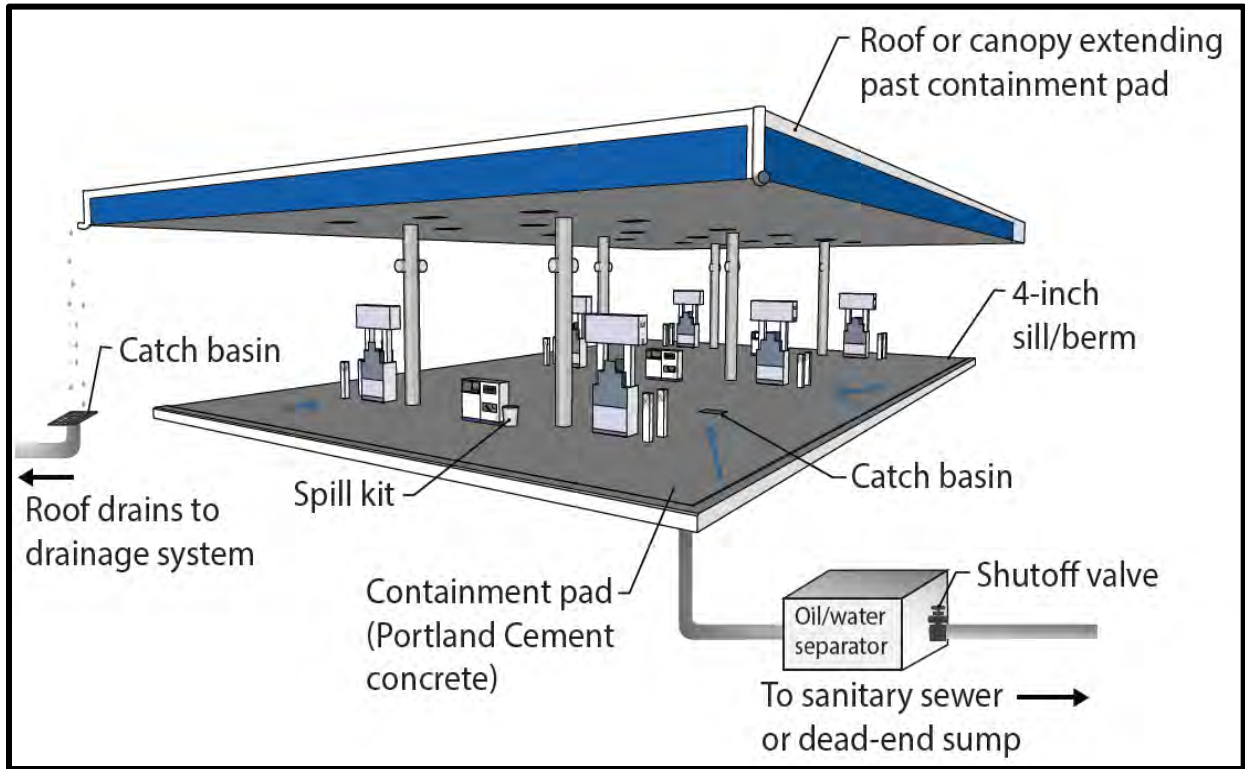


Figure 3. Fueling Island Schematic.



Figure 4. Roof at Fueling Island to Prevent Stormwater Run-On.

- The fueling island spill containment pad must be designed with the following:
 - A sill/berm (or equivalent control) raised to a minimum of 4 inches to contain spilled liquids and to prevent the run-on of stormwater from the surrounding area. Raised sills are not required at open-grate trenches that connect to an approved drainage control system.
 - A concrete containment pad around the fueling island that is sloped toward the fuel containment pad drains. The slope of the drains must not be less than 1 percent. Drains from the fueling island containment pad must discharge to the sanitary sewer, combined sewer, or a dead-end sump. Provide drainage using trench drains and/or catch basins to collect spilled liquids and any contaminated stormwater runoff from the fuel island containment pad and convey it to either (1) the sanitary sewer—if approved by SPU and King County—through an approved pretreatment system such as an oil/water separator, or (2) a dead-end sump so that it can be held for proper off-site disposal.
 - For discharges to the sanitary sewer, a catch basin must be installed upstream of the oil/water separator.
 - If a dead-end sump is used, it must be easily inspected.
 - Collected runoff from the fuel island containment pad discharged to the sanitary sewer must comply with SMC, Section 21.16.300 – Prohibited discharge of certain substances. Comply with pretreatment regulations prohibiting discharges that could cause a fire or explosion (WAC, Section 173-216-060).
 - The minimum spill retention volume of the oil/water separator or dead-end sump (i.e., volume of spilled fuel contained before the structure overflows) must be sized as follows:
 - For a covered fuel pad: 15 minutes for the flow rate of the dispensing mechanism with the highest through-put rate
 - For an uncovered area or an area that receives run-on from an uncovered area: the 15-minute peak flow rate of the 6-month, 24-hour storm event (or 91 percent of the total runoff volume for the simulation period if using continuous runoff modeling) over the surface of the containment pad, plus the volume required for a covered fuel pad.

The minimum volume of the spill containment sump must be 50 gallons with an adequate grit sedimentation volume. The spill retention/containment volume of the oil/water separator must retain the required spill volume when the oil/water separator is full of water. Dead-end sumps must not be used when the fuel containment area is uncovered or will receive run-on from other areas unless approved by the Director of SPU.

Note: To calculate the fuel containment capacity, determine the volume of fuel retention on the basis of the retained water volume in the bottom of the oil/water separator bottom and the density of fuel. Fuel containment will be above the static water level into the normal headspace of the oil/water separator (i.e., floating on top of the retained water volume) when the automatic shutoff valve is closed. Subtract the retained water volume in the oil/water separator from the overall volume of the oil/water separator to determine the spill retention volume.

- For further requirements and guidance related to the storage of fuel-contaminated stormwater, refer to BMP 16 in *Section 2.1.16*.

- For discharges to the sanitary sewer or combined sewer, an automatic shutoff valve is required at the discharge point of the oil/water separator. The valve at the discharge point must be closed in the event of a spill. When an oil-stop valve or resin plug valve is used, it must be engineered to be at least as protective as an automatic shutoff valve.
- Construct a roof or canopy over the fueling island to prevent precipitation from falling directly onto the spill containment pad (Figure 4). The roof or canopy must:
 - At a minimum, cover the spill containment pad (within the grade break or fuel dispensing area) and preferably extend several additional feet to reduce the introduction of windblown rain.
 - Roofs and canopies 10 feet or less in height must have a minimum overhang of 3 feet on each side. The overhang must be measured relative to the berm or other hydraulic grade break.
 - Roofs or canopies greater than 10 feet in height must have a minimum overhang of 5 feet on each side.
- Convey runoff collected in roof or canopy drains to a drainage system or receiving water outside the fueling containment area. This will prevent the mixing of uncontaminated runoff from the roof with contaminated runoff from the fueling island.
- A roof or canopy may not be practical at fueling stations that regularly fuel vehicles 10 feet in height or more, particularly at industrial or transportation sites. Additional BMPs or equivalent measures are required. At these types of fueling facilities, the following BMPs apply, as well as all of the other required BMPs and fire prevention requirements (Seattle Fire Code and Uniform Fire Code).
- The concrete fueling pad must be equipped with an emergency spill control device that includes a shutoff valve for drainage from the fueling area.
- The shutoff valve must be closed in the event of a spill. An automatic shutoff valve is required to minimize the time lapse between spill and containment.

Obtain all necessary permits for installing, altering, or repairing side sewers. Restrictions on certain types of discharges may require pretreatment before they enter the sanitary sewer.

The following BMPs or equivalent measures are required for all fueling stations:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Train employees on the proper use of fuel dispensers.
- Do not use dispersants to clean up spills or sheens.
- Post signs related to the operation of fuel dispensers in accordance with the Seattle Fire Code. For example, post “No Topping Off” signs near fuel dispensers (topping off gasoline tanks results in spillage and vents gasoline fumes to the air).
- Ensure that the person conducting the fuel transfer is present at the fueling dispenser/fueling pump during fuel transfer, particularly at unattended or self-service stations. Post “Stay with Vehicle during Fueling” signage near fuel dispensers.
- Ensure that the automatic shutoff on the fuel nozzle is functioning properly.

- Ensure that at least one designated trained person is available either on site or on call at all times to promptly and properly implement spill prevention and cleanup. If the fueling station is unattended, the spill plan must be visible to all customers using the station, and the spill kit must also be accessible and fully stocked at all times.
- Keep suitable cleanup materials, such as dry adsorbent materials, on site to enable employees to promptly clean up spills.
- Transfer the fuel from the delivery tank trucks to the fuel storage tank in impervious contained areas and ensure that appropriate overflow protection is used. Cover nearby inlets/catch basins during the filling process and use drip pans under all hose connections.

2.2.2. *BMP 10: Mobile Fueling of Vehicles and Heavy Equipment*

This BMP applies to businesses and public agencies that fill fuel tanks of vehicles and equipment by means of tank trucks driven to sites where the vehicles are located (also known as mobile fueling, fleet fueling, wet fueling, or wet hosing).

Description of Pollutants

Typically, stormwater contamination at mobile fueling locations is caused by leaks or spills of fuels and automotive fluids. These materials contain organic compounds, oils and greases, and metals that can be harmful to humans and to the aquatic environment. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Required BMP Elements

The following BMPs or equivalent measures are required of all businesses (organizations or individuals) and public agencies that conduct mobile fueling of vehicles and heavy equipment:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Mobile fueling operations must be permitted by the Seattle Fire Department.
- In fueling locations near sensitive aquifers, designated wetlands, wetland buffers, or other receiving water, compliance with additional local requirements may be required.
- Train the driver/operator annually in spill prevention and cleanup. Make all employees aware of the significant liability associated with fuel spills. New employees must be trained upon hiring. Document and keep all training records.
- Develop and follow a written fuel operation plan that is:
 - Properly signed and dated by the responsible manager
 - Retained at headquarters and distributed to all operators, along with the spill plan
 - Made available in the event that an authorized government agency requests a review
- Ensure that the driver/operator is present and constantly observing and monitoring the fuel transfer location during fuel transfer. Implement the following procedures at fuel transfer locations:
 - To the extent practical, locate the point of fueling at least 25 feet from the nearest inlet/catch basin or inside an impervious containment area with a volumetric holding capacity equal to or greater than 110 percent of the fueling tank volume, or cover the inlet/catch basin to ensure there is no inflow of spilled or leaked fuel. Before removing drain cover, check for sheen. Do not remove if sheen is present and properly dispose of contaminated material.
 - Place a drip pan or an absorbent pad under each fueling location prior to and during all dispensing operations. The pan must be watertight and must have a minimum capacity of 5 gallons.

- Handle and operate fuel transfer hoses and nozzles, drip pan(s), and absorbent pads to prevent fuel spills and leaks from reaching the ground, receiving water, and inlets/catch basins.
- Avoid extending the fueling hoses across a traffic lane without a cone barrier and do not allow vehicles to drive over fuel hoses.
- Do not “top off” fuel tanks.
- Use automatic shutoff nozzles for dispensing the fuel. Replace automatic shutoff nozzles as recommended by the manufacturer.
- Inspect, maintain, and replace equipment on fueling vehicles, particularly hoses and nozzles, at established intervals to prevent failures. Document and keep all inspection records on file.
- Use an adequate lighting system at the filling point.
- At a minimum, maintain the following spill cleanup materials in a readily accessible location in all fueling vehicles:
 - Non-water-absorbent materials capable of absorbing 15 gallons of diesel fuel
 - An inlet/catch basin plug or cover
 - A non-water-absorbent containment boom at least 10 feet long with a 12-gallon absorbent capacity
 - A non-spark-generating shovel
 - Adequate means to hold spent absorbents generated by a 15-gallon spill for disposal.
- Immediately remove and properly dispose of fuel-contaminated soils with visible surface contamination to prevent the spread of chemicals to groundwater or receiving water via stormwater runoff.
- Immediately notify the Seattle Fire Department (911), the Ecology Northwest Regional Office (425) 649-7000, and SPU (206) 386-1800 in the event of a spill. Establish a “call down list” to ensure the rapid and proper notification of management and government officials if any significant amount of product is discharged from the site. Keep the list in a protected but readily accessible location in the mobile fueling truck. The “call down list” should also identify spill response contractors available in the area to ensure the rapid removal of significant product spills into the environment. Include this bullet item in the fuel operation plan.
- Do not use dispersants to clean up spills or sheens unless they will be picked up for proper disposal.

2.2.3. BMP 11: In-Water and Over-Water Fueling

This BMP apply to businesses and public agencies that operate a facility used for the transfer of fuels from a stationary station to vehicles or equipment in water.

Description of Pollutants

In-water and over-water fueling can result in leaks or spills of fuels and associated petroleum products that can be harmful to humans and aquatic life.

Required BMP Elements

Required BMP elements are contained in *S439 – BMPs In-Water and Over-Water Fueling* in Volume IV of the SWMMWW (Ecology 2019).

2.2.4. *BMP 12: Maintenance and Repair of Vehicles and Equipment*

This BMP applies to businesses and public agencies on whose premises oil, fuel, engine oil, and other fluids such as battery acid, coolants, and transmission and brake fluids are removed and replaced in vehicles and equipment. It also applies to mobile vehicle maintenance operations.

Description of Pollutants

Pollutants of concern are total petroleum hydrocarbons, toxic organic compounds, oils and greases, pH, and metals. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Required BMP Elements

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in vehicle and equipment repair and maintenance activities:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Inspect all incoming vehicles and equipment for leaks and spills. Clean up all leaks and spills as they occur. Drain all fluids that have the potential to leak from wrecked vehicles and from equipment when they arrive. Store and dispose of fluids properly.

A spill can be a one-time event, a continuous leak, or frequent small spills. All types must be addressed as prescribed in BMP 5 (Spill Prevention and Cleanup).

- Maintenance and repair activities must be conducted inside a building or other covered impervious containment area that is sloped to prevent run-on of uncontaminated stormwater and runoff of contaminated water. If an emergency situation requires immediate repair outside, containment devices must be used.
- Make sure all outside materials that have the potential to leach or spill to the drainage system are covered and contained or moved to an indoor location.
- Maintenance and repair areas cannot be hosed down. Instead, they must be swept weekly or more often as needed to collect dirt.
- Wastes, such as washwater, may not be discharged to the stormwater system or receiving waters except as conditionally allowed in SMC, Section 22.802.030. Do not discharge vehicle fluids to the drainage system, sanitary sewer, or receiving waters.
- Maintenance and repair shop floor drains must discharge to the sanitary sewer. Do not allow drains inside maintenance buildings to connect to the sanitary sewer without prior approval by SPU, King County, or both.
- If extensive staining and oily sheen are present, absorbent pillows or booms must be used in or around catch basins and properly maintained to prevent oil from entering the drainage system. If operational BMPs are insufficient to prevent and manage recurrent oily discharges, then structural source control measures may be required.

2.2.5. *BMP 13: Concrete and Asphalt Mixing and Production*

This BMP applies to businesses and public agencies that mix raw materials onsite to produce concrete or asphalt.

Description of Pollutants

Pollutants of concern include petroleum hydrocarbons, toxic organic compounds, oils and greases, metals, and pH. Not only can concrete pouring activities severely alter the pH of stormwater runoff, but slurry from aggregate washing can harden in drainage infrastructure, thereby reducing capacity, which can result in flooding. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Required BMP Elements

Activities associated with concrete and asphalt mixing and production may require an NPDES permit from Ecology. Refer to Ecology's website (<https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits>) or call Ecology at (360) 407-6000 to determine if the site activities trigger permit coverage.

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in activities related to concrete and asphalt mixing and production at stationary sites:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Cover production areas to protect them from contact with stormwater.
- Recycle all process water from production, pouring, and equipment cleaning or discharge it to a dead-end sump, process water treatment system, or the sanitary sewer. Obtain all necessary permits for discharge to the sanitary sewer.
- Never discharge washout from fresh concrete or concrete mixing into streets, sidewalks, drainage systems, or receiving waters.
- Segregate production areas from stormwater inputs. Any stormwater that mixes with production areas is considered process water and cannot be discharged to the drainage system or receiving waters. Obtain all necessary permits for discharge to the sanitary sewer.
- Establish a BMP maintenance schedule and educate employees annually about the need to prevent stormwater contamination through regular BMP maintenance. Document and keep all maintenance training records on hand.
- Use absorbent materials or catch basin filter socks (Figure 5) in and around inlets/catch basins to help filter out solids. If catch basin filter socks are used, maintain the filters regularly (weekly or as needed) to prevent plugging. Stormwater contaminated with concrete or asphalt must not enter the drainage system.

Catch basin filter socks only remove solids and do not provide treatment for other pollutants associated with concrete and asphalt mixing and production.

- Sweep the production and pouring area, driveways, gutters, and all other outdoor areas daily or more often as necessary to collect fine particles and aggregate for recycling or proper disposal.



Figure 5. Commercially Available Catch Basin Filter Sock.

- Do not wash or hose down areas that flow to the drainage system.
- Make sure all outside materials that have the potential to leach or spill to the drainage system are covered, contained, or moved to an indoor location.
- Collect, treat, and properly dispose of runoff that comes in contact with release agents.
- If operational controls do not prevent stormwater contamination, treatment BMPs may be necessary.

For information about water quality treatment BMPs for activities related to concrete and asphalt mixing and production at stationary sites, refer to *Volume 3 – Project Stormwater Control*. For a current list of proprietary and emerging water quality treatment technologies, refer to Ecology's website (<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>).

Recommended BMPs

Although not required, the following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from concrete and asphalt mixing and production activities:

- Pave the mixing and production areas. A sump drain in these areas is not advisable due to potential clogging problems. Sweep these areas to remove loose aggregate and recycle or properly dispose of the aggregate.
- Use catch basin covers or similarly effective containment devices to prevent runoff from entering the drainage system.

2.2.6. *BMP 14: Concrete Pouring, Concrete/Asphalt Cutting, and Asphalt Application*

This BMP applies to businesses and public agencies that apply asphalt or pour or cut concrete or asphalt for building construction and remodeling; road construction; repair and construction of sidewalks, curbs, and gutters; sealing of driveways and roofs; and other applications.

Description of Pollutants

Pollutants of concern include petroleum hydrocarbons, toxic organic compounds, oils and greases, metals, suspended solids, and pH. Not only can concrete pouring activities severely alter the pH of stormwater runoff, but slurry from aggregate washing can harden in stormwater pipes, thereby, reducing their capacity and resulting in flooding. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Required BMP Elements

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in activities related to concrete pouring and cutting and asphalt application:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Sweep or shovel and collect loose aggregate chunks and dust for recycling or proper disposal at the end of each workday or as needed, especially at work sites such as streets, driveways, parking lots, sidewalks, curbs, and gutters where rain can readily pick up the loose material and carry it to the nearest stormwater conveyance system. Never hose down concrete or asphalt waste materials to an inlet/catch basin, ditch or receiving water.
- Place catch basin covers or similarly effective containment devices over all nearby drains at the beginning of each workday.
- Shovel and/or vacuum all slurry and remove from the site. All accumulated runoff and solids must be collected and properly disposed of at the end of each workday, or more often if necessary.
- Make sure all outside materials that have the potential to leach or spill to the drainage system are covered, contained, or moved to an indoor location.
- Use a mechanism for containment and collection of the discarded concrete slurry when performing exposed aggregate washing, where the top layer of unhardened concrete is hosed or scraped off to leave a rough finish. Dispose of the slurry properly.
- Use a catch basin filter sock to remove solid materials from inlets/catch basins. Maintain the filter regularly to prevent plugging. Stormwater contaminated with concrete or asphalt must not enter the drainage system.
- Perform cleaning of concrete application and mixing equipment or concrete delivery vehicles in a designated area where the rinse water can be controlled and properly disposed of.
- Collect, treat, and properly dispose of runoff that comes in contact with diesel or coatings used in asphalt applications, cleanup, or transportation.
- Collect, treat, and properly dispose of runoff from cutting activities.

Recommended BMPs

Although not required, the following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from concrete pouring and cutting and asphalt application at temporary sites:

- Avoid the activity when rain is falling or expected.
- If possible, portable asphalt mixing equipment should be covered by an awning, a lean-to, or other simple structure to avoid contact with rain.
- Recycle broken concrete and asphalt. Search for “Recycling Services” online to find a local recycler.

2.2.8. *BMP 16: Storage of Liquids in Aboveground Tanks*

This BMP applies to businesses and public agencies that have on their premises aboveground tanks that contain liquids (excluding uncontaminated water). These tanks may be equipped with a valved drain, vent, pump, and bottom hose connection. These include, but are not limited to, commercial aboveground heating oil tanks; gasoline and diesel tanks; food products; or process water.

Description of Pollutants

Pollutant sources include leaks and spills that can occur at connections and during liquid transfer. Oils and greases, organic compounds, acids, alkalis, and metals in tank water and condensate drainage can also result in stormwater contamination.

Required BMP Elements

The following BMPs or equivalent measures are required for activities related to the storage of liquids in aboveground tanks:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Provide secondary containment or use a double-walled tank.
- Do not discharge contaminated stormwater within the secondary containment area to the drainage system. Evidence of contamination can include the presence of visible sheen, smell, color or turbidity in the runoff, or existing or historical operational problems at the facility. Check for acceptable pH ranges for areas subject to acid or alkaline contamination. Develop appropriate screening techniques for water-miscible contaminants such as test strips or laboratory testing.
- Implement the following maintenance activities to prevent and minimize stormwater contamination:
 - Inspect tank containment areas regularly to identify problems (e.g., cracks, corrosion, leaks) with components such as fittings, pipe connections, and valves.
 - Replace or repair tanks that are leaking, corroded, or otherwise deteriorating. Document and keep all inspection records. A soundness evaluation by a Professional Engineer may be requested to confirm tank stability.
 - Sweep and clean the tank storage area regularly.
- For new and redeveloped sites, locate and design tanks to prevent and minimize stormwater contamination:
 - Locate permanent tanks on an impervious (Portland cement concrete or equivalent) spill containment pad. All exposed containment surfaces within the containment area must be impervious to all material in the tanks.
 - Surround the spill containment pad with dikes or walls or provide double-walled tanks approved by the Underwriters Laboratory (UL). Design the dike to be of sufficient height to provide a containment volume of either 10 percent of the total volume of the enclosed tanks or 110 percent of the volume of the largest tank, whichever is greater. If a single tank, the dike must be able to hold 110 percent of the volume of that tank.

- Slope covered secondary containment pads so they will drain to a dead-end sump or equivalent for the collection of small spills.
- If the tank containment area is not covered, equip the outlet from the spill-containment sump with a shutoff valve. The valve should only be opened to convey contaminated stormwater to an approved treatment system or disposal facility or to convey uncontaminated stormwater to the drainage system.
- Place adequately sized drip pans beneath all mounted taps and locations where drips and spills might occur during the filling and draining of tanks.
- Include a tank overflow protection system to minimize the risk of spillage during loading.
- In areas with multiple petroleum product storage tanks, convey stormwater through an American Petroleum Institute (API) oil/water separator, coalescing plate oil/water separator, or other approved treatment system with an automatic shutoff valve or oil stop valve prior to discharge to the sanitary sewer. Oil stop valves must be selected on the basis of the type of petroleum product stored in the tank(s).

CHAPTER 3 – BUSINESS AND PUBLIC ENTITY BEST MANAGEMENT PRACTICES FOR SPECIFIC ACTIVITIES

In addition to BMP 1 through BMP 8 for all real property (*Section 2.1*) and BMP 9 through BMP 16 for specific activities for all real property (*Section 2.2*), there are many additional source control BMPs that may be required depending on the specific activities that occur or will occur at a business or a public entity, except those that drain only to the combined sewer. Source control requirements are outlined in Seattle Municipal Code (SMC), Section 22.803.040 (Minimum Requirements for Source Controls for All Businesses and Public Entities) and SMC, Section 22.805.020.K (Install Source Control BMPs).

Before reading this chapter, fill out the worksheet in *Section 1.6* to identify which site-specific activities require BMPs.

3.1. Cleaning or Washing

The cleaning or washing of vehicles, aircraft, vessels, engines, tools, cooking equipment, manufacturing equipment, and buildings are pollution generating activities when not conducted properly. When these activities are performed, the resulting washwater usually contains soap or detergents, and can contain a variety of pollutants that contaminate stormwater. The specific BMPs that apply to cleaning and washing are presented in this section.

The discharge from some maintenance activities may be allowed, provided they meet the conditions outlined in the Stormwater Code. Those maintenance activities include street and sidewalk washing and routine external building washdown. Refer to the required provisions and conditions outlined in the Stormwater Code (SMC, Chapters 22.800 through 22.808).

Remember to also implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).

3.1.1. *BMP 17: Cleaning or Washing*

This BMP applies to cleaning, washing, and rinsing activities, including pressure washing and steam cleaning. The purpose of cleaning and washing activities is to remove pollutants from equipment, vehicles, boats and buildings; these pollutants should not be discharged to the public drainage system.

Description of Pollutants

Source pollutants include surfactants; petroleum hydrocarbons; toxic organic compounds; fats, oils, and grease; soaps; detergents; nutrients; metals; polychlorinated biphenyls (PCBs); pH; suspended solids; substances that increase biological oxygen demand (BOD); and substances that increase chemical oxygen demand (COD).

Required BMP Elements

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in cleaning or washing activities:

- Implement all BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Provide training to employees regarding proper disposal of wastewater. This training must be documented.
- Outside drains discharge to the combined sewer, directly to local waters, or to the public drainage system, depending on the location within Seattle. Directing washwater into drains that discharge to the drainage system or local waters is not allowed unless specifically identified as conditionally permitted. Identify the type of system on your property and train employees about required BMPs accordingly.
- The following are conditionally permissible washing practices: (1) Discharges of street and sidewalk washwater when the surfaces have been swept prior to washing, detergents are not used, and water use is minimized; and (2) Discharges of water from routine external building washdown when detergents are not used and water use is minimized. These conditions must be met or the washing activity is prohibited. Sweep surfaces before cleaning/washing to remove excess sediment and other pollutants.
- Discharge wastewater from cleaning or washing activities into the sanitary or combined sewer if properly approved, or into a holding tank. It is illegal to discharge washwater to the drainage system or local waters. Authorization for discharge to the sanitary or combined sewer may be required, and pretreatment may be necessary. If using a holding tank, ensure that it is properly sized and does not overflow.
- Cover and/or contain the washing activity or wash inside a building having a floor drain that discharges to the sanitary sewer.
- If roof equipment or hood vents are cleaned, ensure that no wastewater or prohibited substance (refer to SMC, Chapter 22.802) is discharged to the roof drains or drainage system.
- Label all mobile cleaning equipment as follows: "Properly dispose of all wastewater. Do not discharge to an inlet/catch basin, ditch, stream, or on the ground."

Ecology Publication WQ-R-95-056, *Vehicle and Equipment Washwater Discharges: Best Management Practices Manual* (Ecology 2012) can be used for guidance on sumps, holding tanks, and the prevention of runoff.

For wash pads discharging directly to the sanitary sewer:

- The uncovered portion of the wash pad must be no larger than 200 square feet or must have an overhanging roof (refer to Figure 6). This is to prevent excess stormwater from entering the sanitary sewer. Covering may be required in many situations.



Figure 6. Car Wash Building with Drain to the Sanitary Sewer.

- If the uncovered wash pad cannot be less than 200 square feet, a shut off valve may be installed which will direct washwater to the sanitary sewer when the wash pad is in use, and stormwater to the drainage system when the wash pad is not in use (refer to Figure 7). The valve on the outlet may be manually operated; however, a pneumatic or electrical valve system is preferable. The valve may be on a timer circuit, where it is opened upon completion of a wash cycle. The timer would then close the valve after the sump or separator is drained.
- The wash pad must be clearly signed as to the operation and location of the valve.
- Conduct annual training on operation of the valve system.

- If adjacent to a building or constructed over hazardous material storage areas, other regulations, including the Seattle Fire Code, may apply.
- Obtain all necessary permits for installing, altering or repairing onsite drainage and side sewers. Restrictions on certain types of discharges may require pretreatment before they enter the sanitary sewer.

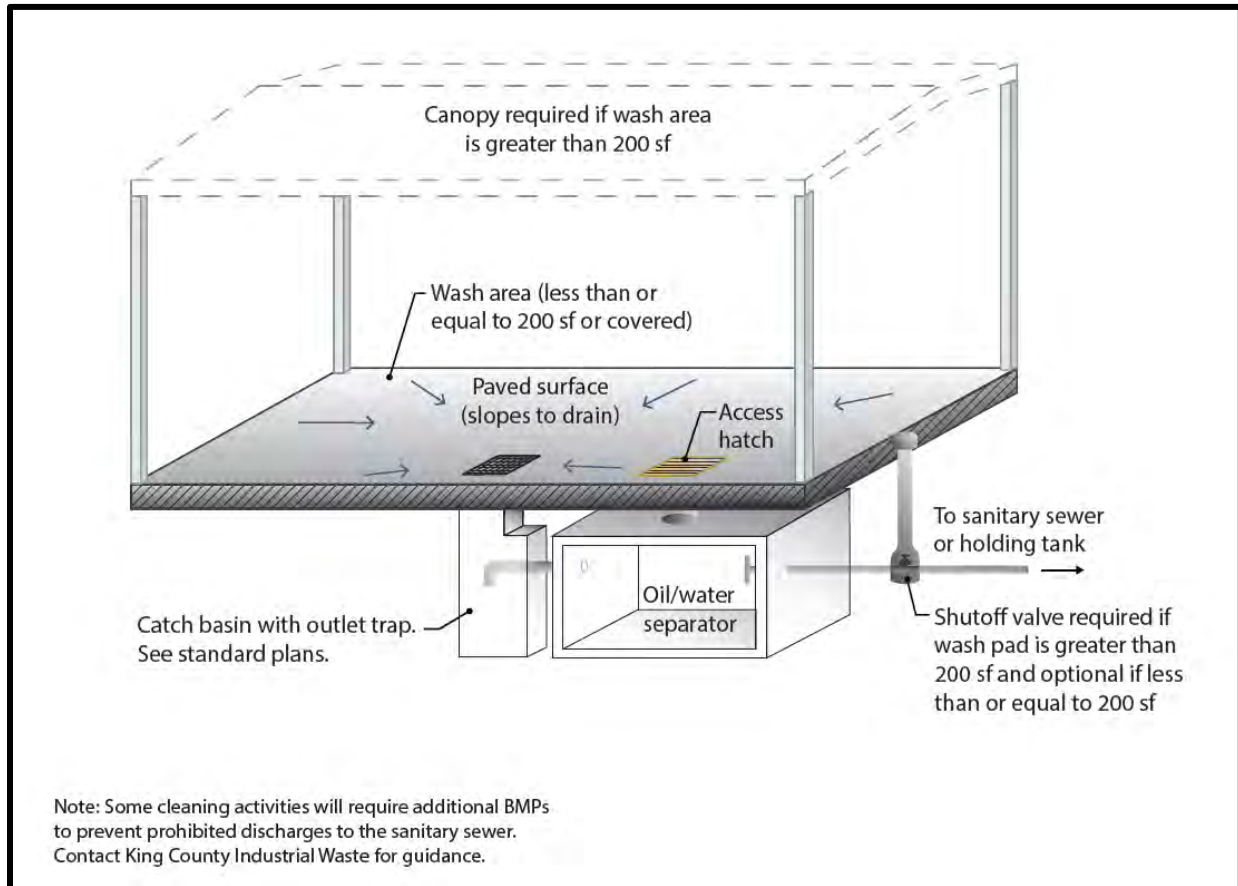


Figure 7. Schematic of Wash Pad with Sump.

Recommended BMPs

Although not required, the following BMPs can provide additional pollution control for washing activities that drain to the sanitary sewer. To reduce the potential overall pollution load to the sanitary sewer from washing operations for tools, vehicles, engines, and manufacturing equipment:

- Minimize water and detergent use in all washing operations.
- Use phosphate-free detergents when practical.
- Consider recycling the washwater by installing a closed-loop water recycling system.
- Use the least hazardous cleaning products available.
- For intermittent washing of vehicles, use a car wash that recycles washwater and discharges to the sanitary sewer.

3.2. Transfer of Liquid or Solid Materials

The transfer of liquid or solid materials, including the loading and unloading of such material, fueling of vehicles or equipment at mobile or designated locations, and vehicle and equipment repair and maintenance are activities that have a high risk for spills or leaks of toxic material. Both required and recommended BMPs can help prevent, minimize, and manage the effects of accidental spills or leaks. The specific BMPs that apply to the transfer of particular types of liquid and solid materials are presented in this section.

Remember to also implement BMP 1 through BMP 8 for all real property from *Section 2.1*.

3.2.1. *BMP 18: Loading and Unloading of Liquid or Solid Material*

This BMP applies to businesses and public agencies engaged in the loading and unloading of liquid or solid materials or the transfer of non-containerized bulk materials. Sources of pollution include loading docks, vehicles, and equipment involved in material handling. These activities are typically conducted at shipping and receiving areas, outside storage areas, and fueling areas.

Description of Pollutants

Leaks and spills of fuels, oils, powders, organic compounds, nutrients, metals, food products, salts, acids, and alkalis during transfer are potential sources of stormwater contamination. Spills from breaks in hydraulic lines and leaking forklifts are common problems at loading docks. Many inlets/catch basins in Seattle discharge directly to local streams and waterways and therefore spilled or leaked products can adversely affect water quality and harm both people and aquatic organisms that come in contact with the contaminated water. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Required BMP Elements

The following BMPs or equivalent measures are required in all loading and unloading areas:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Sweep as often as necessary to prevent material contact with stormwater and to remove accumulated debris and other material that could otherwise be washed off by stormwater. Do not sweep this debris into drainage infrastructure.
- Place drip pans or other appropriate temporary containment devices in locations where leaks or spills may occur, such as hose connections, hose reels, and filler nozzles (Figure 8).
- Always use drip pans when making and breaking connections. Clean drip pans after each use to remove any residual material. Dispose of any residual material in accordance with the Seattle Solid Waste Collection Code (SMC, Chapter 21.36) and the state Dangerous Waste Regulations (WAC, Chapter 173-303).
- Inspect loading and unloading areas after each delivery for leaks and spills and clean up immediately.
- Check material handling equipment such as valves, hoses, pumps, flanges, and connections regularly for leaks, and repair as needed. Document and keep all inspection records. Store contaminated equipment inside or under cover to prevent residual material from coming into contact with stormwater.
- Provide impervious containment with berms, dikes, etc., and/or cover the loading/unloading area to prevent run-on and runoff of contaminated stormwater. Maintain drainage areas in and around storage areas for solid materials with a minimum slope of 1.5 percent to prevent pooling and minimize leachate formation. Areas should be sloped to drain stormwater to the perimeter for collection or to internal “alleyways” where no stockpiled material is kept.



Figure 8. Temporary Containment Device Placed Under a Hose Connection.

The following BMPs or equivalent measures are required in areas of transfer from tanker trucks and railcars to aboveground or underground storage tanks:

- To minimize the risk of accidental spillage, prepare and follow an “Operations Plan” that describes procedures for loading/unloading. Train employees on the plan.
- For rail facilities, install and maintain a drip pan system within the rails to collect spills and leaks from tank cars, hose connections, hose reels, and filler nozzles.

The following BMPs or equivalent measures are required in areas of loading and unloading from or to marine vessels:

- Facilities and procedures for the loading or unloading of petroleum products must comply with U.S. Coast Guard requirements.

- For requirements related to the transfer of small quantities from tanks and containers:
- Refer to BMP 28 for storage of portable containers of liquid or dangerous waste containers (*Section 3.4.3*) and BMP 16 for storage of liquids in aboveground tanks (*Section 2.1.16*).

Recommended BMPs

Although not required, the following BMPs can provide additional pollution protection:

- Whenever possible, conduct the activity indoors or under cover to minimize exposure to stormwater.
- For the transfer of liquids in areas that cannot contain a catastrophic spill, install an automatic shutoff system in case of an unanticipated interruption in off-loading (e.g., a coupling break, hose rupture, or overfill).
- Install and maintain overhangs (Figure 9) or door skirts that enclose the trailer end to prevent contact with stormwater.



Figure 9. Loading Docks with an Overhang to Prevent Material Contact with Stormwater.

Mobile Fueling of Vehicles and Heavy Equipment (BMP 10) (*Section 2.1.10*) is recommended in areas of transfer from tanker trucks to aboveground or underground storage tanks; it includes:

- Pave the area on which the transfer takes place. If any transferred liquid, such as gasoline, is reactive with asphalt, pave the area with Portland cement concrete or equivalent.
- Construct a slope, berm, or dike to direct runoff from the transfer area to a dead-end sump, spill containment sump, spill control oil/water separator, or other spill control device. The minimum spill retention time should be 15 minutes for the flow rate of the dispensing mechanism with the highest through-put rate, or at the peak flow rate of the 6-month, 24-hour storm event (or 91 percent of the total runoff volume for the simulation period if using continuous runoff modeling) over the surface of the containment pad, whichever is greater. The volume of the spill containment sump should be a minimum of 50 gallons with an adequate grit sedimentation volume.

3.3. Production and Application

Production and application activities are associated with a high risk for spills or leaks of toxic material. Required and recommended BMPs can help to prevent, minimize, and manage accidental spills or leaks so that there are minimal environmental impacts. The specific BMPs that apply to particular types of production and application activities are presented in this section.

Remember to also implement BMP 1 through BMP 8 for all real property from *Section 2.1*.

3.3.1. *BMP 19: Manufacturing and Post-Processing of Metal Products*

This BMP applies to businesses and public agencies such as mills, foundries, and fabricators that manufacture or process metal products. A variety of activities such as machining, grinding, soldering, cutting, welding, quenching, etching, bending, coating, cooling, and rinsing may take place.

Description of Pollutants

Pollutants of concern include toxic organic compounds, metals, oils and greases, pH, suspended solids, and substances that increase COD. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Required BMP Elements

Activities associated with metal manufacturing and processing may require an NPDES permit from Ecology. Refer to Ecology's website (<https://ecology.wa.gov/Water-Shorelines/Water-quality/Runoff-pollution/Stormwater>) or call Ecology at (360) 407-6000 to determine if the site activities trigger permit coverage.

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in activities related to manufacturing and processing of metal products:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Process wastewater (including contact cooling water, filter backwash, or cooling tower blowdown) from this activity and stormwater runoff from processing or production areas must be discharged to the sanitary sewer or a holding tank. If a holding tank is used for the storage of wastewater, the contents must be pumped out before the tank is full and disposed of appropriately to the sanitary sewer or hauled off site. Obtain all necessary permits for discharge to the sanitary sewer.
- Cover the activity area to prevent rain from contacting the process and to reduce the amount of runoff that may require treatment.
- Make sure all outside materials that have the potential to leach or spill to the drainage system are covered, contained, or moved to an indoor location.
- Sweep the activity area at the end of each workday or more often as needed to collect and properly dispose of metal fragments and product residues. Do not allow metal fragments, residues, or dust to accumulate in areas exposed to stormwater.
- Educate employees about controlling their work with metal products to minimize stormwater pollution. Document and keep all training records on hand.

Recommended BMPs

Although not required, the following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from the manufacturing and processing of metal products:

- Limit the amount of water used in quenching and rinsing. Recycle used water where possible.
- Use a catch basin filter to capture stray metal particles. Maintain the filter regularly (weekly or as needed) to prevent plugging.

For information about water quality treatment BMPs related to concrete and asphalt mixing and production activities, refer to *Volume 3 – Project Stormwater Control*. For a current list of proprietary and emerging water quality treatment technologies, refer to Ecology’s website (<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>).

3.3.2. *BMP 20: Processing of Treated Wood*

This BMP applies to businesses and public agencies that perform wood treatment including both anti-staining and preserving using pressure processes, dipping, or spraying. It also applies to businesses and public agencies that cut treated wood outside.

Description of Pollutants

Pollutant sources include drips of condensate or preservative after pressurized treatment, product washwater (in the treatment or storage areas), spills and leaks from process equipment and preservative tanks, fugitive emissions from vapors in the process, blowouts and emergency pressure releases, and kick-back from lumber (leakage of preservative as it returns to normal pressure).

Potential pollutants typically include wood treating chemicals, substances that increase biological oxygen demand (BOD), suspended solids, oils and greases, benzene, toluene, ethylbenzene, phenol, chlorophenols, nitrophenols, metals such as chromium and zinc, and polycyclic aromatic hydrocarbons (PAHs). Potential pollutants depend on the chemical additive used. Wood preservatives and antistaining chemical additives include creosote, creosote/coal tar, pentachlorophenol, copper naphthenate, arsenic trioxide, and inorganic arsenicals. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Required BMP Elements

Activities associated with processing treated wood may require an NPDES permit from Ecology. Refer to Ecology's website (<https://ecology.wa.gov/Water-Shorelines/Water-quality/Runoff-pollution/Stormwater>) or call Ecology at (360) 407-6000 to determine if the site activities trigger permit coverage.

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in activities related to wood treatment:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).

Production Areas:

- Cover and/or enclose the following and contain with impervious surfaces:
 - All wood treatment areas
 - All treated wood
 - All associated wastes
- Segregate clean stormwater from process water. Convey all process water to an approved treatment system and discharge to the sanitary sewer or haul off site. Obtain all necessary permits for discharge to the sanitary sewer.
- Dedicate equipment that is used for treatment activities to prevent the tracking of treatment chemicals to other areas on site.

- For areas around dip tanks, spray booths, and retorts:
 - Eliminate non-process traffic on the drip pad.
 - Scrub down non-dedicated lift trucks on the drip pad.
 - Construct a slope and direct the drainage in a manner that allows treatment chemicals to flow back to the wood treatment process.
 - Seal any holes or cracks in the asphalt areas subject to contamination with wood treatment chemicals.

Storage Areas:

- Cover and/or enclose storage areas for treated wood and contain with impervious surfaces. Alternatively, dry lumber stacks may be thoroughly wrapped in plastic to prevent contact with stormwater, elevated, and stored in uncovered areas.
- Immediately remove and properly dispose of soils with visible surface contamination to prevent the spread of chemicals to groundwater or another receiving water from stormwater runoff.

For Treated Wood Products:

- Elevate treated wood products to prevent contact with stormwater run-on and runoff.
- Place treated wood products over the dip tank or on an inclined ramp for a minimum of 30 minutes to allow excess chemicals to drip back to the dip tank.
- Bulk storage of treated wood is permitted outside only when the units are protected from contact with stormwater by tarpaulins or wraps.
- Ensure that the wood is drip free and dry on the surface before it is moved.
- When cutting treated wood, collect all dust and debris for proper disposal.

3.3.4. *BMP 22: Landscaping and Vegetation Management*

This BMP applies to businesses and public agencies that perform landscaping, including grading, storage of landscape materials, soil transfer, vegetation removal, pesticide and fertilizer applications, and watering. Landscaping and vegetation management can include control of objectionable weeds, insects, mold, bacteria, and other pests by means of chemical pesticides and is conducted commercially at commercial, industrial, and residential sites. Examples of landscaping and lawn and vegetation management include weed control on golf courses, access roads, and utility corridors; treatment or removal of moss from rooftops, sidewalks, or driveways; killing of nuisance rodents; application of fungicides on patio decks; and residential lawn and plant care.

Description of Pollutants

Stormwater contaminants from landscaping and vegetation management activities include toxic organic compounds, metals, oils, suspended solids, pH, coliform bacteria, fertilizers, pesticides, and detergents.

Pesticides such as pentachlorophenol, carbamates, and organometallics can be released to the environment as a result of leaching and dripping from treated plants, container leaks, product misuse, and outside storage of pesticide-contaminated materials and equipment. Inappropriate management of vegetation and improper application of pesticides or fertilizers can result in stormwater contamination. These pollutants must not be discharged to the drainage system or directly into receiving waters, except as permitted by Ecology.

The Washington State Department of Agriculture regulates pesticide use and application.

Required BMP Elements

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in landscaping and vegetation management activities:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).

Landscaping:

- Do not dispose of or store collected vegetation in drainage systems, waterways, receiving waters, or public spaces. Take care to avoid contamination or site disturbance.
- Use mulch or other erosion control measures when soils or erodible materials are exposed for more than 1 week during the dry season (May 1 to September 30) or 2 days during the rainy season (October 1 to April 30).
- Comply with *Appendix I* of this manual and *S435 – BMPs for Pesticides and an Integrated Pest Management Program* in Volume IV of the SWMMWW (Ecology 2019) (referenced in BMP 49 and BMP 50) for more information.
- Implement the landscaping principles in *Volume 1, Section 7.8*, when planning, constructing, and maintaining landscaped areas.
- Comply with all landscape management plans that apply to the site (refer to *Appendix I* of this manual).

Vegetation Management:

- Fertilizer:
 - Apply all fertilizers using properly trained personnel. Document and keep all training records.
 - For commercial and industrial facilities, do not apply fertilizers to grass swales, filter strips, or buffer areas that drain to receiving waters.
 - Refer to *S443 – BMPs for Fertilizer Application* in Volume IV of the SWMMWW (Ecology 2019) for additional information (referenced in BMP 55).

Recommended BMPs

Although not required, the following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from landscaping and lawn and vegetation management activities:

- If adjacent to a building or constructed over hazardous material storage areas, other regulations, including the Seattle Fire Code, may apply.
- Install engineered soil and landscape systems to improve the infiltration and regulation of stormwater in landscaped areas.
- Mulch and mow whenever practical.
- Dispose of grass clippings, leaves, sticks, and other collected vegetation by composting, where feasible.
- Till fertilizers into the soil where practical rather than dumping or broadcasting them onto the surface. Determine the proper fertilizer application for the types of soil and vegetation encountered.
- Till a topsoil mix or composted organic material into the soil to create a well-mixed transition layer that encourages deeper root systems and greater drought-tolerance.
- Use manual and/or mechanical methods of vegetation removal rather than applying herbicides, where practical.

An amended soil and landscape system can preserve both the plant system and the soil system more effectively. This type of approach can provide a soil and landscape system with adequate depth, permeability, and organic matter to sustain itself and continue working to effectively infiltrate stormwater and provide a sustainable nutrient cycle.

Vegetation Management:

- Material:
 - Use topsoil layer that is at least 8 inches thick and consists of at least 8 percent organic matter to provide a sufficient growing medium for the vegetation.
 - Select the appropriate turfgrass mixture for the applicable climate and soil type.

- Fertilizer:
 - Use slow-release fertilizer and organic materials for the best availability for turf grass.
 - Time the fertilizer application to periods of maximum plant uptake. Fertilizers should be applied in amounts appropriate for the target vegetation and at the time of year that minimizes loss to surface water and groundwater.
 - Do not fertilize during a drought or when the soil is dry.
 - Refer to the *S443 – BMPs for Fertilizer Application* in the SWMMWW (Ecology 2019) for additional information (referenced in BMP 55).

3.3.5. *BMP 23: Painting, Finishing, and Coating Activities*

This BMP applies to businesses and public agencies that perform outdoor surface preparation and application of paints, finishes, and coatings to vehicles, boats, buildings, and equipment.

Description of Pollutants

Potential pollutants include organic compounds, oils and greases, metals, and suspended solids. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Required BMP Elements

Activities associated with boatyard and shipyard operations may require an NPDES permit from Ecology. Refer to Ecology's website (<https://ecology.wa.gov/Water-Shorelines/Water-quality/Runoff-pollution/Stormwater>) or call Ecology at (360) 407-6000 to determine if the site activities trigger permit coverage.

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in activities related to the painting, finishing, and coating of vehicles, boats, buildings, and equipment outside.

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).

Preparation and Application:

- Train employees in the application and cleanup of paints, finishes, and coatings to reduce misuse and overspray. Document and keep all training records.
- Use ground cloths or drop cloths underneath outdoor painting, scraping, sandblasting work, and properly clean and temporarily store collected debris after each use.
- Use a catch basin cover, filter sock, or similarly effective runoff control device if dust, sediment or other pollutants may escape the work area. If catch basin filter socks are used onsite, maintain the filter regularly to prevent plugging. Stormwater contaminated with pollutants must not enter the drainage system.

Catch basin filter socks only remove solids and do not provide treatment for other pollutants associated with painting, finishing, and coating activities.

- Do not conduct spraying, blasting, or sanding activities over open water or where wind may blow paint into water. If windy conditions are present, use a curtain to contain the activity.
- While using a spray gun or conducting sand blasting, enclose and/or contain all work in compliance with applicable air pollution control requirements and those of the Occupational Safety and Health Administration (OSHA), the Washington Industrial Safety and Health Act, and the Puget Sound Clean Air Agency.

Cleanup:

- Wipe up spills with rags and other absorbent materials immediately. Do not hose down the area.
- On marine dock areas, sweep to collect debris. Do not hose down debris.
- Use a ground cloth, pail, drum, drip pan, tarpaulin, or other protective device for activities such as paint mixing and tool cleaning outside or where spills can contaminate stormwater. Whenever possible, conduct these activities inside or in an enclosed area.
- Clean paintbrushes and tools covered with water-based paints into drains connected to the sanitary sewer. Verify the discharge point before discharging.
- Collect solvents used to clean brushes and tools covered with non-water-based paints, finishes, or other materials. Safely and properly recycle or dispose of used solvents (e.g., paint thinner, turpentine, and xylol).

Material Storage and Disposal:

- Dispose of all waste properly and prevent all uncontrolled releases to the air, ground, or water.
- Store all paints, finishes, or solvents inside a building or in covered secondary containment.
- All containers must have tight-fitting lids able to retain the contents in the event of tipping.

Recommended BMPs

Although not required, the following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from activities related to the painting, finishing, and coating of vehicles, boats, buildings, and equipment:

- Recycle paints, paint thinner, solvents, washwater from pressure washers, and any other recyclable materials.
- Use efficient spray equipment such as electrostatic, air-atomized, high-volume/low-pressure, or gravity-feed spray equipment.
- Purchase recycled paints, paint thinner, solvents, and other products where feasible.
- Dispose of unused paint promptly.

3.4. Storage and Stockpiling

Activities related to the storage and stockpiling of liquid or solid materials are potentially associated with a high risk for spillage, leakage, erosion, or leaching of pollutants. Both required and recommended BMPs can help to prevent, minimize, and manage the effects of accidental spills and leaks. The specific BMPs that apply to various types of storage and stockpiling activities are presented below.

Remember to also implement BMP 1 through BMP 8 for all real property from *Section 2.1*.

3.4.1. *BMP 26: Storage of Leachable or Erodible Materials*

This BMP applies to businesses and public agencies on whose premises there will be storage of leachable and erodible materials, including, but not limited to: gravel, sand, salts, topsoil, compost, logs, sawdust, wood chips, lumber and other building materials, concrete, and non-coated galvanized metal or other leachable metal.

Description of Pollutants

If stormwater comes in contact with stockpiled materials, pollutants may be leached or erosion of the stored materials may occur. Though these materials are typically destined to be used outside, storage of large quantities of these materials awaiting sale or use can contribute high levels of localized pollutant loading. Potential pollutants include suspended solids, substances that increase biological oxygen demand (BOD), organic compounds, dissolved salts (e.g., sodium chloride, calcium chloride, and magnesium chloride), metals, and oils that may be attached to metal parts. These pollutants must not be discharged to the drainage system or directly into receiving waters. Even low levels of metals such as copper and zinc can have detrimental effects on aquatic life.

Required BMP Elements

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in the storage of leachable or erodible materials:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Store the material inside or cover and contain the material. The cover must fully prevent wind and weather contact with the polluting material. The cover must not contribute pollutants to the drainage system.
- Do not hose down the contained stockpile area to an inlet/catch basin, ditch, or to receiving waters.
- Sweep paved storage areas daily or more often as necessary to collect and dispose of loose solid materials.
- For stockpiles, implement the following:
 - Store in a covered, paved area, preferably surrounded by a berm, as shown in Figure 11. The cover must fully prevent wind and weather contact with the polluting material. The cover must not contribute pollutants to the drainage system.
 - Place temporary plastic sheeting (polyethylene, polypropylene, Hypalon, or equivalent material) over the material as illustrated in Figure 12. Anchor sheeting to prevent contact with rainfall.
 - For new or modified areas, pave and install a drainage system:
 - Place curbs or berms along the perimeter of the area to prevent the run-on of uncontaminated stormwater and to collect and convey runoff to a treatment system.
 - Slope the paved area in a manner that minimizes the contact between stormwater (e.g., pooling) and leachable materials.



Figure 11. Covered and Secured Storage Area for Bulk Solids.



Figure 12. Covered Storage Area for Erodible Material (gravel).

- For large stockpiles that cannot be covered:
 - Install containment devices such as a berm or a low wall around the perimeter of the site and at any catch basins as needed to prevent erosion of the stockpiled material, and to prevent discharge of leachate from the stockpiled material off site or to an inlet/catch basin.
 - Ensure that contaminated stormwater is not discharged directly to the drainage system without being conveyed through a treatment BMP. *Volume 3 – Project Stormwater Control* presents approved methods, requirements, criteria, details, and general guidance for analysis and design of on-site stormwater management, flow control, and water quality treatment pursuant to SMC, Chapter 22.800 through 22.808 (Stormwater Code).
 - Inspect and maintain catch basins on a regular basis (weekly or more often as needed). Stormwater contaminated with pollutants must not enter the drainage system.
- Maintain drainage areas in and around storage areas for solid materials with a minimum slope of 1.5 percent to prevent pooling and minimize leachate formation. Slope storage areas to drain stormwater to a collection area at the perimeter of the storage area or to internal drainage “alleyways” between storage areas, where material is not stockpiled.
- Make cleanup materials, such as brooms, dustpans, and vacuum sweepers, accessible for use near the storage area.

Recommended BMPs

The following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from activities related to the storage or transfer of leachable and erodible materials:

- If and when feasible, collect and recycle materials and leachate to the stockpile.
- Keep the minimum amount of stockpiled materials on site. Smaller piles minimize the loss of materials due to wind and rain and will make the piles more manageable to cover.

3.4.2. *BMP 27: Temporary Storage or Processing of Fruits, Vegetables, or Grains*

This BMP applies to businesses and public agencies that temporarily store fruits, vegetables, and grains outdoors before processing or sale, or that crush, cut, or shred for wines, beer, frozen juices, or other food and beverage products.

Description of Pollutants

Activities involving the storage or processing of fruits, vegetables, and grains can potentially result in the delivery of pollutants to stormwater. Potential pollutants of concern from all fruit and vegetable storage and processing activities include nutrients, suspended solids, substances that increase biological oxygen demand (BOD), and color. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Required BMP Elements Outdoor activities associated with food processing (examples include brewing activities, grape crushing at wineries, and fresh fruit packing) may require an NPDES permit from Ecology. Refer to Ecology's website (<https://ecology.wa.gov/Water-Shorelines/Water-quality/Runoff-pollution/Stormwater>) or call Ecology at (360) 407-6000 to determine if the site activities trigger permit coverage.

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in the temporary storage or processing of fruits, vegetables, and grains:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Do not allow water used to clean produce to enter the drainage system.
- Sweep paved storage areas daily or more often as needed. Inspect storage areas often and maintain good housekeeping.
- Make sure all outside materials that have the potential to leach or spill to the drainage system are covered, contained, or moved to an indoor location.
- Enclose the processing area in a building or shed, or cover the area with provisions for stormwater run-on prevention. If less than 200 square feet, alternatively, pave and slope the area to drain to the sanitary sewer, a holding tank, or a process treatment system collection drain. Prevent stormwater run-on from entering the processing area. If a holding tank is used for the storage of wastewater, pump out the contents before the tank is full and dispose of it properly.
- Keep cleanup materials, such as brooms and dustpans, near the storage area.

3.4.3. *BMP 28: Portable Container Storage*

The BMPs specified below apply to businesses and public agencies that keep containers outside on their premises that may include, but are not limited to, used automotive fluids, liquid feedstock, cleaning compounds, chemicals, dangerous wastes (liquid or solid), and contaminated stormwater. For outside storage of used cooking oil containers, refer to BMP 4.

Description of Pollutants

Leaks and spills during handling and storage of portable containers are the primary sources of pollutants. Potential pollutant constituents are oils and greases, low (acid) or high (alkaline) pH, surfactants, substances that increase biological oxygen demand (BOD), substances that increase chemical oxygen demand (COD), and toxic organic compounds.

Required BMP Elements

The following required BMPs apply to all portable containers:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Store materials in a leakproof container with a tight-fitting lid able to contain the material in the event of tipping.
- Label all containers to identify their contents. Position containers so that labels/markings are clearly visible.
- Place drip pans beneath all taps on mounted containers and at all potential drip and spill locations during the filling and draining of containers.
- Inspect container storage areas regularly for corrosion, structural failure, spills, leaks, and overfills. Check containers daily for leaks and spills. Replace containers and replace and tighten bungs in drums as needed.
- Secure containers in a manner that prevents accidental spillage, pilferage, or any unauthorized use (Figure 13 and Figure 14).



Figure 13. Covered and Secured Storage Area for Containers.



Figure 14. Containers Surrounded by a Berm in an Enclosed Area.

Recommended BMP Elements

- Wherever possible, store containers on a paved surface under a roof or other appropriate cover or in a building.

The following BMPs or equivalent measures are required for activities related to outside storage of containers of hazardous or dangerous material or wastes and liquids except potable water:

- Store containers in a designated area. Provide covered secondary containment that is capable of holding a volume of either 10 percent of the total volume of the enclosed containers or 110 percent of the volume of the largest container, whichever is greater. Provide a portable secondary containment unit or cover and pave the storage area with an impervious surface and install a berm or dike to surround the area. Slope the area to drain into a dead-end sump for the collection of leaks and small spills.
- Store containers that do not contain free liquids in a designated sloped area with the containers elevated or otherwise protected from stormwater run-on.
- Elevate metal drums to prevent corrosion and leakage.
- Ensure that the storage of reactive, ignitable, or flammable liquids complies with the Seattle Fire Code and Washington State Fire Code.

3.5. Dust, Soil Erosion, and Sediment Control

Construction, manufacturing, and industrial activities have the potential to generate significant amounts of dust, soil, and sediment, which can pollute both air and stormwater. Control measures for dust, soil, and sediment are necessary to prevent pollution, but BMPs that are not properly implemented can be harmful to stormwater and the environment.

The required and recommended BMPs for these activities are presented below. First, prevent the production of dust, soil, and sediment. Then, implement BMPs to minimize their production. Finally, manage dust, soil, and sediment so that contaminated stormwater is not conveyed to the drainage system or receiving waters.

Remember to also implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).

3.5.1. BMP 29: Dust Control in Disturbed Land Areas and on Unpaved Roadways and Parking Lots

This BMP applies to businesses and public agencies that pursue dust control measures in disturbed land areas or on unpaved roadways and parking lots. All land-disturbing activity must comply with the erosion and sediment controls described in the Stormwater Code (SMC, Chapters 22.800 through 22.808).

Description of Pollutants

Dust can result in air and water pollution, particularly at demolition sites, in disturbed land areas, and on unpaved roadways and parking lots. Chemicals applied to dust-prone areas to minimize dust production also have the potential to pollute stormwater and receiving waters if they are not properly selected or applied.

Required BMP Elements

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in activities that generate dust:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Protect inlets/catch basins during application of dust suppressants. Prevent liquid dust suppressants from flowing into the drainage system during application.
- Sprinkle or wet down soil or dust with water as long as it does not result in a discharge to inlets/catch basins or receiving waters.
- Only use local and/or state government approved dust suppressant chemicals, such as those listed in Publication No. 96-433, *Methods for Dust Control* (Ecology 2016a).
- Avoid excessive and repeated application of dust suppression chemicals. Time the application of dust suppressants to avoid or minimize their wash off by rainfall or human activity (such as irrigation).
- Street gutters, sidewalks, driveways, and other paved surfaces in the immediate area of the activity must be swept regularly to collect and properly dispose of dust, dirt, loose debris, and garbage.
- Install catch basin filter socks on site and in surrounding catch basins to collect sediment and debris. Maintain the filters regularly to prevent plugging.

BMPs required for construction dust control, such as dust suppression by water spray, are provided in *Volume 2 – Construction Stormwater Control*.

3.5.3. *BMP 31: Soil Erosion and Sediment Control at Industrial Facilities*

This BMP applies to business and public agency industrial facilities that operate in areas with exposed or disturbed soils, areas with steep grades, or as deemed necessary to prevent sediment transport. For information on construction related soil erosion and sediment control, refer to *Volume 2 – Construction Stormwater Control*.

Description of Pollutants

Industrial activities in areas with exposed or disturbed soils or areas with steep grades can be sources of sediment that can contaminate stormwater runoff. Pollutants include suspended solids, oils and greases, metals, and other industrial contaminants from onsite activities.

Required BMP Elements

The following BMPs or equivalent measures are required of all businesses and public agencies to deal with soil erosion and sediment control:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- Limit the exposure of erodible soil.
- Stabilize or cover erodible soil to prevent erosion.
- Stabilize entrances/exits to prevent track-out.
- Install one or more of the following cover practices:
 - Vegetative cover, such as grass, trees, or shrubs, in erodible soil areas
 - Covering with mats, such as clear plastic, jute, or synthetic fiber
 - Preservation of natural vegetation, including grass, trees, shrubs, and vines
- If operational BMPs are not sufficient to prevent stormwater contamination, structural controls must be implemented, including treatment or structural containment, which may include paving.

Washington State Water Quality Standards have specific limits on turbidity discharges. For specific information, reference WAC, Chapter 173-201A.

3.6. Other Activities

Several activities that do not fall into the previously described categories have a high risk for generating pollutants and contaminating stormwater and receiving waters. The required and recommended BMPs for these activities are presented as follows, according to the type of activity and the potential pollutants. Regardless of the activity, an overall approach to pollutant control should first emphasize pollution prevention, then the minimization of pollution, followed by pollution management.

Remember to also implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).

3.6.3. *BMP 34: Boat Building, Maintenance, and Repair*

This BMP applies to businesses and public agencies that perform activities related to boat and shipbuilding and their repair and maintenance at boatyards, shipyards, ports, and marinas. Activities that can generate pollutants include pressure washing, surface preparation, paint removal, sanding, painting, engine maintenance and repairs, and material handling and storage. If conducted outdoors, all of these activities are associated with a high risk for contaminating receiving water.

Description of Pollutants

Potential pollutants include spent abrasive grits, solvents, oils, ethylene glycol, washwater, paint overspray, cleaners and detergents, anticorrosion compounds, paint chips, scrap metal, welding rods, resins, glass fibers, dust, and miscellaneous trash. Pollutant constituents include suspended solids, oils and greases, organic compounds, copper, lead, tin, and zinc.

Required BMP Elements

Activities associated with boatyard and shipyard operations may require an NPDES permit from Ecology. Refer to Ecology's website (<https://ecology.wa.gov/Water-Shorelines/Water-quality/Runoff-pollution/Stormwater>) or call Ecology at (360) 407-6000 to determine if the site activities trigger permit coverage.

The following BMPs or equivalent measures are required for boat and ship building, maintenance, and repair activities:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- In addition to the BMP 5 spill control requirements, include a marine containment boom in spill kits for shipyards, boatyards, and marinas.
- Locate spill kits on all piers or docks.
- Immediately clean up any spills on dock, boat, or ship deck areas and dispose of the wastes properly.
- Immediately repair or replace leaking connections, valves, pipes, hoses, and equipment that can result in the contamination of stormwater.
- Relocate maintenance and repair activities onshore if feasible to reduce the potential for direct pollution of receiving waters.
- Perform paint and solvent mixing, fuel mixing, and similar handling of liquids onshore or in a location with proper containment so that nothing can spill directly into receiving waters.
- All liquids stored over water or on docks must have covered secondary containment.
- Store all batteries and oily parts in a covered container with a tight-fitting lid.
- Store materials such as paints, tools, and ground cloths indoors or in a covered area when not in use.
- Collect spent abrasives regularly and contain or store them under cover until they can be disposed of properly.

- Sweep and clean yard areas, docks, and boat ramps at least once each week or more often as needed. Do not hose them down. Properly dispose of the collected materials. Sweep dry docks before flooding.
- When washing, do not allow any pollutants, including soap, to enter the drainage system or receiving water.
- Use fixed platforms with appropriate plastic or tarpaulin barriers as work surfaces and for containment when work is performed on a vessel in the water to prevent material or overspray from contacting stormwater or receiving water. Use of the platform approach should be kept to a minimum. Only work that is done in compliance with NPDES requirements should be done over water.

The following BMPs or equivalent measures are required for boat and ship blasting and spray painting activities:

- Move the activity indoors or enclose, cover, and contain the activity. Prohibit outside spray painting, blasting, or sanding activities during windy conditions that render containment ineffective.
- Store materials such as paints, tools, and ground cloths indoors or in a covered area when not in use.
- Contain blasting and spray painting activities by hanging tarpaulins to block the wind and prevent dust and overspray from escaping. Do not perform uncontained spray painting, blasting, or sanding activities over open water without proper protection (e.g., overspray collection, drop clothes, booms).
- Use plywood and/or plastic sheeting to cover open areas between decks when sandblasting.
- Use ground cloths to collect drips and spills during painting and finishing operations, paint chips, and used blasting sand during sand blasting.
- Do not paint or use spray guns on or above the deck.

In the event of an accidental discharge of oil or hazardous material into receiving water or onto land if there is a potential for entry into receiving water, the responsible party must meet all notification requirements including, but not limited to, notifying the yard, port, or marina owner or manager; Ecology's Northwest Regional Office at (425) 649-7000; and the National Response Center at (800) 424-8802 (24-hour). If the spill can reach or has reached marine water, call the U.S. Coast Guard at (206) 217-6232.

Recommended BMPs

Although not required, the following BMPs are encouraged to further reduce the potential for stormwater contamination:

- Select the least toxic antifouling paint available.
- Routinely clean boat interiors and properly dispose of collected materials so that accumulated water, which must be drained from the boat, does not become contaminated.

3.6.6. BMP 37: Maintenance and Management of Roof and Building Drains at Industrial and Commercial Buildings

This BMP applies to businesses and public agencies where the roofs and sides of industrial or commercial buildings can be sources of pollutants when stormwater runoff results in the leaching of roofing materials, materials from building vents, air emissions, flashing, cleaning agents, and applied moss killers. Flaking paint and caulking can also be sources of pollutants.

Description of Pollutants

Vapors and entrained liquid and solid droplets and particles have been identified as potential pollutants in roof and building runoff. The pollutants identified include metals, solvents, low (acidic) and high (alkaline) pH, substances that increase biological oxygen demand (BOD), and organic compounds. Flaking paint or caulking may be a source of metals and organic compounds. PCBs may leach out of old paint coatings and caulking materials from buildings, such as those built or renovated between 1950 and 1980.

Entities that conduct specific industrial activities are required to obtain an Industrial NPDES Permit for their stormwater discharges. For more information about whether an entity needs an NPDES permit, refer to Ecology's website (<https://ecology.wa.gov/Water-Shorelines/Water-quality/Runoff-pollution/Stormwater>) or call Ecology at (360) 407-6000.

Required BMP Elements

The following BMPs or equivalent measures are required for all commercial and industrial buildings to prevent and reduce stormwater pollution:

- Implement BMP 1 through BMP 8 for all real property (refer to *Section 2.1*).
- If leachates or emissions from buildings are suspected sources of stormwater pollutants, sample and analyze the stormwater draining from the building and sediment from nearby catch basins.
- If a roof or building is identified as a source of stormwater pollutants, implement appropriate operational source control measures, such as air pollution control equipment, selection of alternative materials, operational changes, material recycling, process changes, remediation, or treatment.
- Sweep areas routinely to remove pollutant residues.
- If operational methods do not prevent or reduce zinc pollution from galvanized roofing or siding, paint/coat the galvanized surfaces as described in Publication 08-10-025, *Suggested Practices to Reduce Zinc Concentrations in Industrial Stormwater Discharges* (Ecology 2008) or treat the stormwater runoff.
- If operational BMPs are not sufficient to prevent stormwater contamination, structural controls must be implemented, including treatment or containment.

- Store any metal scrap generated from metal punching or other mechanical operations where it will not come in contact with stormwater.
- Place track mats under each rail/flange lubricator that is in service where track mats can be safely installed and maintained without danger to rolling stock or personnel.
- Install track mats at designated engine tie-up and/or outdoor locomotive parking locations (e.g., service tracks) in SWPPP-permitted areas when locomotives are unattended and idle for extended periods of time.
- Inspect and replace track mats, as necessary. Routinely inspect all track mats for tears or saturation and replace as necessary.
- Install spill containment pans/trays or track mats at designated locomotive and railcar maintenance facilities and fixed fueling areas to reduce environmental impacts due to potential spills under locomotives and other track equipment. Direct spill containment pans/trays to an oil/water separator where feasible for treatment or collect spilled chemicals for proper disposal.
- During locomotive fueling operations use drip pans or secondary containment to capture any fuel or oil seepage.
- Select cost-effective rail/flange lubricant that provides safe and effective rail operation while considering adverse environmental impacts. Consider both the chemical composition of the lubricant and the likelihood of off-rail transfer during rain events.
- Do not conduct heavy/major locomotive engine repairs on the rail line. Conduct heavy/major engine repairs at an established railroad maintenance facility.
- Store creosote-treated railroad ties in locations that reduce the potential to impact stormwater runoff.

3.6.15. BMP 46: Labeling Storm Drain Inlets on Your Property

This BMP applies to businesses and public agencies.

Description of Pollutants

Storm drain inlets themselves are not a source of pollutants; however, they can be used to discharge pollutants. Labels on storm drains can educate the public about prohibitions against dumping materials in storm drains.

Required BMP Elements

Required BMP elements are contained in *S442 – BMPs for Labeling Storm Drain Inlets on Your Property* in Volume IV of the SWMMWW (Ecology 2019).

3.6.17. BMP 48: Goose Waste

This BMP applies to the general public, businesses, and public agencies.

Description of Pollutants

Goose waste can contribute to algae growth in water due to its high nutrient content. Goose feces may contain pathogens that can affect people who use the water bodies.

Required BMP Elements

Required BMP elements are contained in *S452 – BMPs for Goose Waste* in Volume IV of the SWMMWW (Ecology 2019).

3.6.20. BMP 51: Irrigation

This BMP applies to businesses and public agencies that have irrigation systems.

Description of Pollutants

Improper irrigation can encourage pest problems, leach nutrients, and make a lawn completely dependent on artificial watering.

Required BMP Elements

Required BMP elements are contained in *S450 – BMPs for Irrigation* in Volume IV of the SWMMWW (Ecology 2019).

3.6.21. BMP 52: Dock Washing

This BMP applies to the general public, businesses, and public agencies that are involved in dock washing.

Description of Pollutants

Washing docks can result in the discharge of dirt and other pollutants that may be toxic to aquatic life.

Required BMP Elements

Required BMP elements are contained in *S434 – BMPs for Dock Washing* in Volume IV of the SWMMWW (Ecology 2019).

3.6.22. BMP 53: Roof Vents

This BMP applies to businesses and public agencies that have roof vents.

Description of Pollutants

This BMP applies to processes that vent emissions to the roof, result in the accumulation of pollutants on roofs, or both. Pollutants from these processes may build up on roofs and may pollute stormwater runoff.

Required BMP Elements

Required BMP elements are contained in *S447 – BMPs for Roof Vents* in Volume IV of the SWMMWW (Ecology 2019).

3.6.23. BMP 54: Streets and Highways

This BMP applies to businesses and public agencies that maintain and apply deicers/anti-icers to streets and highways.

Description of Pollutants

This BMP applies to maintenance and deicing/anti-icing of streets and highways. Chemicals used for deicing/anti-icing may be harmful to aquatic organisms.

Required BMP Elements

Required BMP elements are contained in *S406 – BMPs for Streets and Highways* in Volume IV of the SWMMWW (Ecology 2019).

CHAPTER 4 – REFERENCES

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Appendix C
Directors' Rule 10-2021, DWW-200
City of Seattle Stormwater Manual Volume II
Construction Stormwater Control
(Selected Pages)

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Volume 2: Construction Stormwater Control

City of Seattle
Stormwater Manual
July 2021

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CHAPTER 4 – STANDARDS AND SPECIFICATIONS FOR CONSTRUCTION EROSION AND SEDIMENTATION CONTROL

This chapter contains the standards and specifications for erosion and sediment control practices that form the backbone of erosion and sediment control planning in the City of Seattle (City). These best management practices (BMPs) are grouped according to their method of controlling erosion and sedimentation at project sites:

- Cover Practices (*Section 4.1*)
- Erosion Control Practices (*Section 4.2*)
- Sediment Control Practices (*Section 4.3*)

Refer to these sections for a list of BMPs in each category.

All temporary erosion and sediment control BMPs must be removed within 5 business days after final site stabilization is achieved, or after they are no longer needed, whichever is later. In either case, trapped sediment must be removed or stabilized on site and the disturbed areas permanently stabilized.

The standards and specifications for each BMP have been divided into six sections to facilitate the selection process and implementation:

1. Definition
2. Purpose
3. Conditions Where Practice Applies
4. Planning Considerations
5. Design Criteria
6. Maintenance

Note that “Conditions Where Practice Applies” always refers to site conditions. As site conditions change, BMPs must be changed to remain in compliance with the Stormwater Code.

4.2.1.6. *BMP E2.45: Dust Control*

Description

Reducing surface and air movement of dust during land-disturbing, demolition, and construction activities.

Purpose

To prevent surface and air movement of dust from exposed soil surfaces onto roadways, adjoining properties and into drainage channels and receiving waters (Figure 11).



Figure 11. Using a Water Truck for Dust Control.

Conditions Where Practice Applies

In areas (including roadways) subject to surface and air movement of dust where on and offsite damage is likely to occur if preventive measures are not taken.

Planning Considerations

Research at project sites has established an average dust emission rate of 1.2 tons/acre/month for active construction.

Construction activities inevitably result in the exposure and disturbance of soil. Fugitive dust is emitted both during the activities (i.e., excavation, demolition, vehicle traffic, human activity) and as a result of wind erosion over the exposed earth surfaces. Large quantities of dust are typically generated by “heavy” construction activities, such as road and street construction and subdivision, commercial and industrial development, which involve disturbance of significant areas of soil surface. Earthmoving activities are the major source, but traffic and general disturbance of the soil also generate significant dust emissions.

In planning for dust control, remember that the less soil is exposed at any one time, the less potential there will be for dust generation. Therefore, phasing a project and utilizing temporary stabilization practices upon the completion of grading can significantly reduce dust emissions. Also, limit traffic that will be on areas off the site roadways.

Design Criteria

- Minimize the period of soil exposure through use of temporary ground cover and other temporary stabilization practices (refer to Seeding and Mulching, BMPs E1.10 and E1.15, respectively).
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until surface is wet. Repeat as needed. To prevent carryout of mud onto street, refer to Stabilized Construction Access (BMP E2.10) and Tire Wash (BMP E2.15).
- Spray exposed soil areas with approved dust palliative. Oil should not be used for dust suppression. Refer to Ecology BMP C250 for information on chemical treatment.
- Building demolition should use sufficient water, such as from a hydrant or water truck(s), to thoroughly wet buildings and debris for dust suppression and control for water runoff from the site. Repeat as needed. To prevent carryout of mud onto the street, refer to Stabilized Construction Access (BMP E2.10) and Tire Wash (BMP E2.15).

Maintenance

Re-spray area as necessary to keep dust to a minimum.

4.2.2. *Permanent Erosion Control BMPs*

Permanent erosion control BMPs are implemented both during and upon completion of construction activities. Permanent erosion control reduces erosion wherever practicable and can be achieved primarily by minimizing erosion by installing permanent stabilizing structures and/or materials to new construction or existing sites. For example, by adding gradient terraces to an existing or newly constructed slope, erosion will be significantly reduced by creating a set of ridges and channels that intercept runoff and direct it to a controlled outlet. The benefit is that rill and gully formation will be minimized and toe of slope erosion will decrease as a result. Another benefit of permanent erosion control is that some of the following BMPs include using vegetation which may be incorporated into permanent cover BMPs described in *Section 4.1.2*.

Permanent erosion control BMPs should be designed by an engineer and may have additional criteria for flow control and water quality treatment requirements. Refer to *Volume 3 – Project Stormwater Control*.

The standards and specifications for permanent erosion control BMPs include:

- Riprap Channel Lining – refer to Ecology BMP C202
- Gradient Terracing – refer to Ecology BMP C131

4.3.1. *BMP E3.10: Filter Fence*

Description

A temporary sediment barrier consisting of a filter fabric stretched across and attached to supporting posts and entrenched. The filter fence is constructed of stakes and synthetic filter fabric with a rigid wire fence backing where necessary for support.

Purpose

Filter fence is used during construction operations to intercept and detain small amounts of sediment under sheet flow conditions from disturbed areas in order to prevent sediment from leaving the site, and to decrease the velocity of sheet flows (Figure 13).



Figure 13. Filter Fence Installed on a Slope.

Conditions Where Practice Applies

Filter fence may be used downslope of all disturbed areas and must be provided just upstream of the point(s) of runoff discharge from a site, before the flow becomes concentrated. They may also be used below disturbed areas where runoff may occur in the form of sheet and rill erosion, wherever runoff has the potential to impact downstream resources.

Planning Considerations

Laboratory work at the Virginia Highway and Transportation Research Council has shown that filter fence can trap a much higher percentage of suspended sediments than can straw bales, which have been disallowed by Ecology. The fence must be properly installed to fully function. The installation methods outlined here can improve performance.

Design Criteria

Refer to Figure 14 for design details.

- The drainage area must be 1 acre or less. On larger sites, the fence must be used in combination with sediment basin(s).
- Maximum slope steepness on the site (perpendicular to fence line) is 45 percent.
- Maximum sheet or overland flowpath length to the fence is 100 feet.
- Concentrated flows must not be greater than 0.5 cubic feet per second (cfs).
- Selection of a filter fabric is based on soil conditions at the project site. Soil conditions affect the apparent opening size (AOS) fabric specification. Soils also affect the characteristics of the support fence, which depend on the choice of tensile strength. The designer should specify a filter fabric that retains the soil found on the project site, yet will have openings large enough to permit drainage and prevent clogging. Refer to Table 7 for selection of the AOS.
- The material used in a filter fabric fence must have sufficient strength to withstand various stress conditions. The ability to pass flow through must be balanced with the material's ability to trap sediments.
- Support non-woven and regular strength slit film fabrics with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the fabric. Filter fence materials are available that have synthetic mesh backing attached.
- Filter fabric material must contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0°F to 120°F.
- One hundred percent biodegradable filter fence is available that is strong, long lasting, and can be left in place after the project is completed.
- The following design criteria must be used with a Large Project Construction Stormwater Control and Soil Management Plan (*Section 2.1.2*):
 - Purchase filter fabric in a continuous roll cut to the length of the barrier to avoid use of joints. When joints are necessary, splice filter cloth together only at a support post, with a minimum 6-inch overlap. Securely fasten both ends to the post.
 - Space posts a maximum of 6 feet apart and drive securely into the ground a minimum of 30 inches (where physically possible).
 - Excavate a trench approximately 8 inches wide and 12 inches deep along the line of posts and upslope from the barrier. Construct the trench to follow the contour.

- When slit film filter fabric is used, fasten a wire mesh support fence securely to the upslope side of the posts using heavy-duty wire staples at least 1 inch long, tie wires, or hog rings. Extend the wire into the trench a minimum of 4 inches and not more than 36 inches above the original ground surface.
- Wire slit film filter fabric to the fence. Extend 20 inches of the fabric into the trench. Extend the fabric not more than 36 inches above the original ground surface. Filter fabric should not be stapled to existing trees. Other types of fabric may be stapled to the fence.
- When extra-strength or monofilament fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, staple or wire the filter fabric directly to the posts. Use extra care when joining or overlapping these stiffer fabrics.
- Use properly compacted native material. This is the preferred alternative because the soil forms a more continuous contact with the trench below, and use of native materials cuts down on the number of trips that must be made on and off site.
- Remove filter fabric fences when they have served their useful purpose, but not before the upslope area has been permanently stabilized. Remove retained sediment and properly dispose of, or mulch and seed.

Table 7. Geotextile Standards.

Geotextile Property	Test Method	Geotextile Property Requirements
Polymeric Mesh AOS	ASTM D4751	0.60 mm max. for slit film woven (#30 sieve) 0.30 mm max. for all other geotextile types (#50 sieve) 0.15 mm min. for all fabric types (#100 sieve)
Water Permittivity	ASTM D4491	0.02 sec ⁻¹ min.
Grab Tensile Strength	ASTM D4632	180 lbs. min. for extra strength fabric 100 lbs min. for standard strength fabric
Grab Tensile Strength	ASTM D4632	30% max.
Ultraviolet Resistance	ASTM D4355	70% min.

Maintenance

- Inspect immediately after each rainfall, and at least daily during prolonged rainfall. Repair as necessary.
- Remove sediment when it reaches approximately one-third the height of the fence.
- Spread any sediment deposits remaining in place after the filter fence is no longer required to conform to the existing grade, prepare and seed.
- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the filter fence to a sediment pond.
- Check the uphill side of the fence for signs of the fence clogging and acting as a barrier to flow, and causing channelization of flows parallel to the fence. If this occurs, replace the fence or remove the trapped sediment.
- Replace filter fabric that has deteriorated due to ultraviolet breakdown.

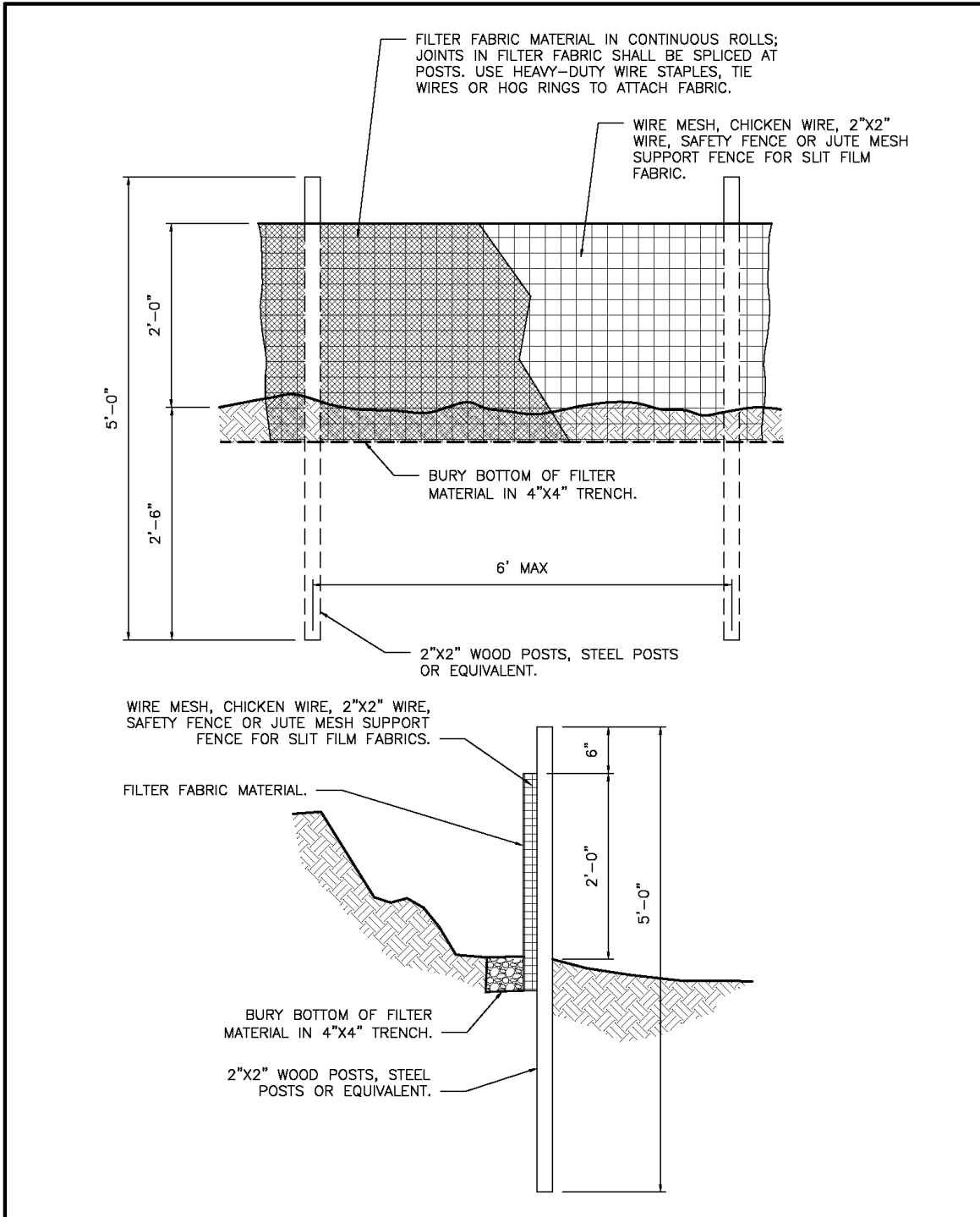


Figure 14. Filter Fence Details.

4.3.3. *BMP E3.25: Inlet Protection*

Description

A sediment filter or an excavated impounding area around a storm drain or catch basin.

Purpose

To prevent sediment from entering storm drainage systems prior to permanent stabilization of the disturbed area.

Conditions Where Practice Applies

Where downslope inlets are operational prior to permanent stabilization of the disturbed drainage area. Within the project site, protection should be provided for all inlets downslope and within 500 feet to a block of a disturbed or construction area, whichever is further, unless the runoff that enters the catch basin will be conveyed to a sediment pond or trap.

Drainage areas should be limited to 1 acre or less per inlet. Emergency overflows may be required where stormwater ponding would cause a hazard. If an emergency overflow is provided, additional end-of-pipe treatment may be required. Different types of structures are applicable to different conditions:

- Structures less than 12 inches deep – use other methods to protect the inlet (BMP E3.70 Street Sweeping and Vacuuming).
- Storm drain or catch basin filter sock – applicable on private properties or within the public right-of-way for structures greater than 12 inches deep.
- Block and gravel curb inlet protection – applicable for private properties only, on a paved surface. Sturdy, but limited filtration. Consists of a barrier formed around an inlet with concrete blocks and gravel (Figure 15).
- Curb and gutter barrier – applicable for private properties only, using a sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape (Figure 16). An 8- or 12-inch diameter compost sock may also be used in temporary, low-velocity applications.

Planning Considerations

- The best way to prevent sediment from entering the storm drain is to stabilize the site as quickly as possible, preventing erosion and stopping sediment at its source. Proper implementation of other BMPs, such as filter fence (BMP E3.10), straw wattles (BMP E3.35) and covering practices can eliminate or reduce the need for downstream inlet protection, and their implementation is mandatory. Clean out the stormwater drain or catch basin prior to implementing this BMP (refer to BMP E3.65 Cleaning Inlets and Catch Basins).
- Within the project site, remove BMP within 5 business days after final site stabilization is achieved or after it is no longer needed, whichever is longer. Daily removal is required when the BMP is necessary and approved to be installed in the street inlets/catch basins for short durations to protect the public drainage system or public combined sewer from pollution generating activities, such as sawcutting, utility excavation or paving.

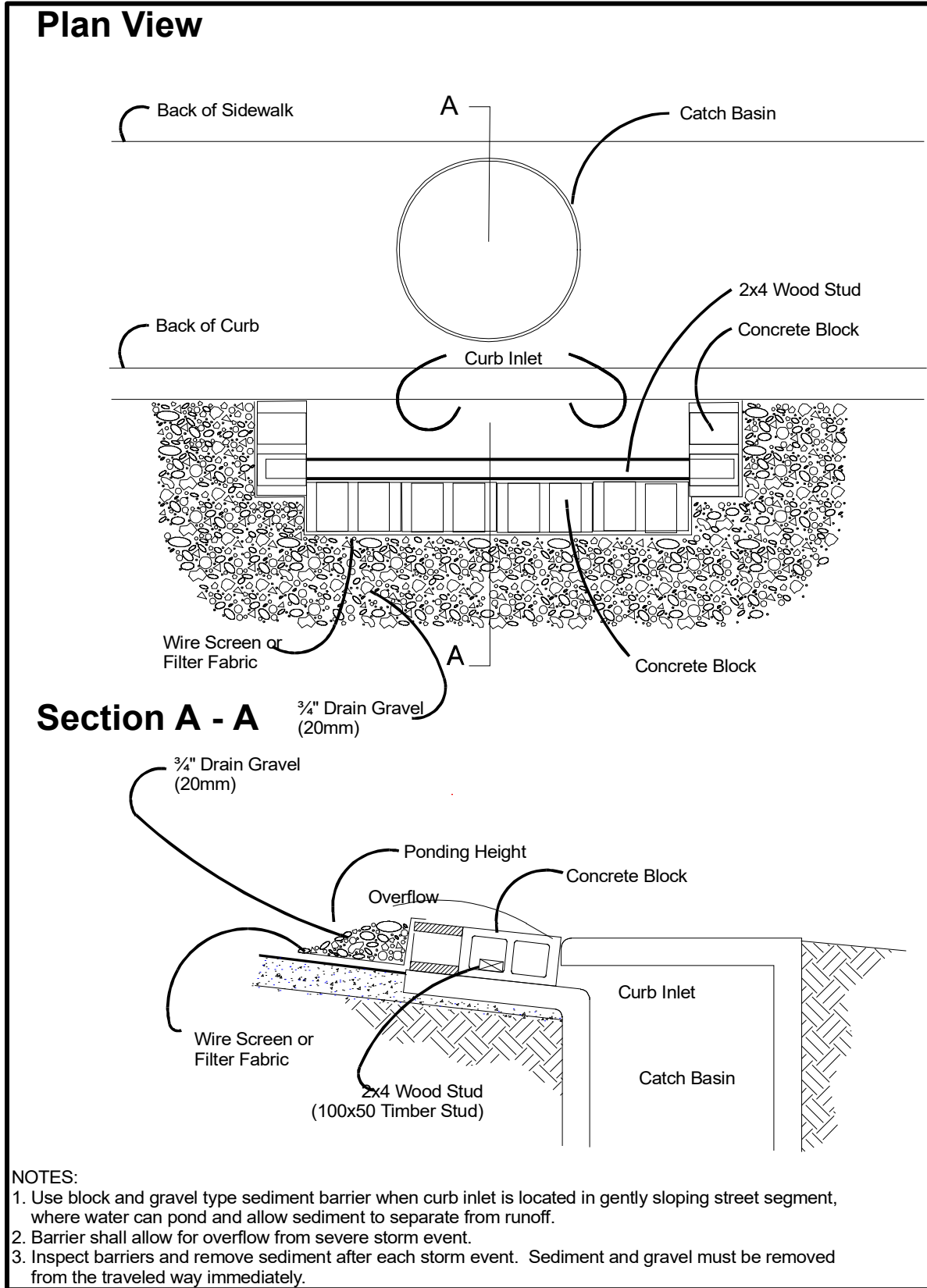


Figure 15. Block and Gravel Curb Inlet Protection.



Figure 16. Curb and Gutter Barrier.

- All methods for inlet protection are prone to plugging and require a high frequency of maintenance.
- Storm drains made operational before their drainage area is stabilized can convey large amounts of sediment to natural drainage channels. In cases of extreme sediment loading, the storm drain itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.
- Several types of inlet filters and traps have different applications that depend on site conditions and type of inlet. Other innovative techniques for accomplishing the same purpose are encouraged, but only after specific plans and details are submitted to and approved by the SDCI. Note that these various inlet protection devices are for drainage areas of less than 1 acre. Runoff from larger disturbed areas should be routed through a temporary sediment pond or trap (refer to Ecology BMPs C241 and E3.40).

Design Criteria

- Secure grates and spaces of all inlets to prevent seepage of sediment-laden water.
- All catch basin protection measures should include sediment sumps of 1 to 2 feet in depth with 25 percent side slopes.
- Installation procedure for a drain or catch basin filter sock:
 - For structures greater than 12 inches deep, the filter sock can be laid into the inlet as long as the overflow opening is in the direction of the outlet pipe.
 - Trim and remove filter sock material that extends beyond the grate.
 - Make provisions to decant accumulated sediment.
 - Install a high-flow bypass that will not clog under normal use at a project site.
- Installation procedures for block and gravel curb inlet protection:
 - Place two concrete blocks on their sides abutting the curb at either side of the inlet opening—these are spacer blocks.
 - Place a piece of lumber through the outer holes of each spacer block to align the front blocks.
 - Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
 - Place wire mesh with 1/2-inch openings over the outside vertical face.
 - Pile coarse aggregate against the wire to the top of the barrier.
- Installation procedures for curb and gutter sediment barrier:
 - Construct a horseshoe shaped berm.
 - If using riprap, create a face with coarse aggregate 3 feet high and 3 feet wide, at least 2 feet from the inlet.

Maintenance

- Inspections should be made on a regular basis, especially after large storm events. Inlet protection devices should be cleaned or removed and replaced when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer).
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

CHAPTER 5 – SOURCE CONTROL PRACTICES FOR CONSTRUCTION POLLUTANTS OTHER THAN SEDIMENT

5.1. Source Control Practices

The City of Seattle (City) is committed to protecting the public drainage system or public combined sewer, ponds, wetlands, lakes, streams, and coastal and estuarine water bodies from damage by sediment and other pollutants generated during construction activities. The focus of *Chapter 4* was on erosion and sediment control; however, potential pollutants other than sediment are common at project sites and may also impact stormwater and groundwater quality when they come into direct contact with runoff.

Potential pollutants include non-hazardous materials such as wood, paper, demolition debris, concrete, and metal scraps. There are also potential pollutants from hazardous materials and their associated wastes such as pesticides (e.g., insecticides, fungicides, herbicides, rodenticides), petrochemicals (e.g., oils, gasoline, asphalt degreaser) and other construction chemicals such as concrete products, sealer, paints, and washwater associated with these products.

The most economical and effective controls for pollutants other than sediment are good “housekeeping” practices, and an awareness by construction workers, planners, engineers, and developers of the need for and purpose of compliance with federal, state, and local regulations.

Please refer to the Stormwater Code and *Volume 4 – Source Control* for further information concerning controlling pollution at the source and preventing contamination of stormwater for all discharges. This volume should be reviewed to ensure that all Director’s Rules requirements are being met for each construction project.

The standards for each individual best management practice (BMP) are divided into six sections:

1. Description
2. Purpose
3. Conditions Where Practice Applies
4. Planning Considerations
5. Design Criteria
6. Maintenance

Note that some BMPs were divided into different sections to reflect their individual needs. As with erosion and sediment control BMPs, source control BMPs include “Conditions Where Practice Applies,” which always refers to site conditions. As site conditions change, BMPs must be changed to remain in compliance.

This chapter contains the standards and specifications for source control BMPs to properly manage construction pollutants other than sediment. They include:

- BMP C1.15: Material Delivery, Storage, and Containment (*Section 5.1.1*)
- BMP C1.20: Use of Chemicals During Construction (*Section 5.1.2*)
- BMP C1.25: Demolition of Buildings (*Section 5.1.3*)
- BMP C1.30: Building Repair, Remodeling, and Construction (*Section 5.1.4*)
- BMP C1.35: Sawcutting and Paving Pollution Prevention (*Section 5.1.5*)
- BMP C1.40: Temporary Dewatering (*Section 5.1.6*)
- BMP C1.45: Solid Waste Handling and Disposal (*Section 5.1.7*)
- BMP C1.50: Disposal of Asbestos and Polychlorinated Biphenyls (PCBs) (*Section 5.1.8*)
- BMP C1.55: Airborne Debris Curtain (*Section 5.1.9*)
- BMP C1.56: Concrete Handling and Disposal (*Section 5.1.10*)
- BMP C1.59: High pH Neutralization Using CO₂ (*Section 5.1.11*)

5.1.1. BMP C1.15: Material Delivery, Storage, and Containment

Description

Best practices for all deliveries, storage, and containment of materials, liquid and solid on a project site that may potentially pollute stormwater.

Purpose

The purpose of this BMP is to prevent, reduce, or eliminate the discharge of pollutants to the drainage system or receiving water from the delivery and storage of materials on site. This is achieved by minimizing the storage of hazardous materials on site, storing materials in a designated area, and installing secondary containment.

Conditions Where Practice Applies

These procedures are recommended for use at all project sites with delivery and storage of the following materials:

- Petroleum products such as fuel, oil and grease
- Soil stabilizers and binders (e.g., Polyacrylamide)
- Fertilizers, pesticides, and herbicides
- Detergents
- Asphalt and concrete compounds
- Hazardous chemicals such as acids, lime, adhesives, paints, solvents and curing compounds
- Any other material that may be detrimental if released to the environment

Planning Considerations

Dangerous solid wastes must be stored and handled according to special guidelines and may require a permit. Follow the regulations and requirements outlined by the Washington State Department of Ecology (Ecology) and, in some cases, King County.

Design Criteria

The following steps must be taken to minimize risk:

- Locate temporary storage area away from vehicular traffic, near the construction entrance(s), and away from drainage channels or storm drains.
- Keep Safety Data Sheets (SDS) on site for all materials stored. Keep chemicals in their original labeled containers.
- Minimize hazardous material storage on site.
- Handle hazardous materials as infrequently as possible.
- During the wet weather season (October 1 to April 30), consider storing materials in a covered area.

- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, in secondary containment.
- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.
- Store materials with secondary containment, such as a curbed paved area, pallets with built-in containment, or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.
- Use spill prevention and control measures for maintenance, fueling, and repair of heavy equipment and vehicles. Clean contaminated surfaces immediately following any spill incident.
- Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. Include secondary containment for onsite fueling tanks.

Secondary Containment Practices:

- Store all hazardous substances with a listed Reportable Quantity in approved containers and drums and in secondary containment. The list of Reportable Quantities is available on the U.S. Environmental Protection Agency's (U.S. EPA's) website (www2.epa.gov/superfund).
- Provide temporary secondary containment facilities with a spill containment volume able to contain precipitation from a 25-year, 24-hour storm event plus 10 percent of the total enclosed container volume of all containers; or 110 percent of the capacity of the largest container within its boundary, whichever is greater.
- Provide sufficient separation between stored containers to allow for spill cleanup and emergency response access.
- During the wet weather season (October 1 to April 30), cover each secondary containment facility during non-working days, prior to and during rain events.
- Provide secondary containment facilities that are impervious to the materials stored for a minimum contact time of 72 hours.

Maintenance

- Keep secondary containment facilities free of accumulated rainwater and spills. In the event of spills or leaks, collect accumulated rainwater and spills and place into drums. Treat these liquids as hazardous waste unless testing determines them to be non-hazardous.
- Keep material storage areas clean, organized and equipped with an ample supply of appropriate spill cleanup material (spill kit). For spill prevention and cleanup requirements, including spill kit instructions, refer to *Volume 4 – Source Control*.

5.1.2. *BMP C1.20: Use of Chemicals During Construction*

Description

Best practices for control, storage, cleaning and disposal of all chemicals used at a project site that may potentially pollute stormwater.

Purpose

A large percentage of potential pollutants from chemicals can be effectively controlled at project sites through implementation of source control and soil erosion and sedimentation control practices.

Conditions Where Practice Applies

This BMP applies to most project sites since many types of chemicals may be used during construction activities. These chemical pollutants include paints, acids, cleaning solvents, asphalt products, soil additives, concrete-curing compounds, and many others. These materials can be carried by sediment and water runoff from project sites.

Planning Considerations

Disposal of concrete products, additives, and curing compounds depends on the product. Some liquid wastes must be stored and handled according to special guidelines and may require a permit. Follow the regulations and requirements outlined by Ecology and, in some cases, King County.

Refer to *Volume 4 – Source Control* to see if additional source controls are required.

Design Criteria

- As in the case of other pollutants, good housekeeping is the most important means of controlling pollution.
- Use only the recommended amounts of chemical materials and apply them in a proper manner to further reduce pollution.
- Acid and alkaline solutions from exposed soil or rock units high in acid and alkaline-forming natural elements should be controlled using good site planning and preconstruction geological surveys. Refer to BMP C1.56 Concrete Handling and Disposal. Neutralization of these pollutants often provides the best treatment.
- The City requires project site operators to adjust the pH of stormwater if necessary to prevent violations of water quality standards. Refer to BMP C1.59 High pH Neutralization Using CO₂.
- Chemicals used in batch treatment or flow-through treatment must be approved in writing by Ecology prior to use. Formal approval from the City is based on Ecology's protocols. For a list of treatment chemicals that have been evaluated and are currently approved for use by Ecology refer to the Department's website (<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>).

- For paint disposal, the correct method of wastes varies with the material:
 - Wash-up waters from water-based paints may go into a sanitary sewer, which is regulated by the King County Industrial Waste Program (206) 263-3000.
 - Wastes from oil-based paints, cleaning solvents, thinners, and mineral spirits must be disposed of through a licensed waste management firm or treatment, storage, and disposal (TSD) facility.

Maintenance

- Seal fractures in the bedrock with grout and bentonite will reduce the amount of acid or alkaline seepage from excavations.
- Adequate treatment and disposal of concrete further reduces pollution.

5.1.5. BMP C1.35: Sawcutting and Paving Pollution Prevention

Description

Best practices to minimize and eliminate wastewater and slurry from sawcutting and paving operations including, but not limited to, the following:

- Sawing
- Surfacing
- Coring
- Grinding
- Roughening
- Hydro-demolition
- Bridge and road surfacing

Purpose

Sawcutting and paving operations generate slurry and wastewater that contain fine particles and high pH, both of which can violate the water quality standards in receiving waters.

Conditions Where Practice Applies

Any time sawcutting or paving operations take place.

Planning Considerations

This BMP is intended to minimize and eliminate wastewater and slurry from entering the public drainage control system and receiving waters. Wastewater may be permitted to be discharged to a sanitary sewer, which is regulated by Seattle Public Utilities and the King County Industrial Waste Program (206) 263-3000.

Design Criteria

- Vacuum slurry and cuttings during the activity to prevent migration off site. Do not allow slurry and cuttings to remain on permanent concrete or asphalt paving overnight.
- Dispose of collected slurry and cuttings in a manner that does not violate groundwater or surface water quality standards.
- Do not drain wastewater that is generated during hydro-demolition, surface roughening, or similar operations to any natural or constructed drainage conveyance. Dispose of wastewater in a manner that does not violate groundwater or surface water quality standards.
- Clean and dispose of waste material and demolition debris in a manner that does not cause contamination of water. If the area is swept with a pick-up sweeper, haul out the material to an appropriate disposal site.

Maintenance

Continually monitor operations to determine whether slurry, cuttings, or wastewater could enter the public drainage system or the public sewer. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventative measures such as berms, barriers, secondary containment, and vacuum trucks.

5.1.6. BMP C1.40: Temporary Dewatering

Description

The removal and appropriate discharge and release of groundwater, whether it is from a simple trench or a large excavation.

Purpose

Temporary dewatering is used when groundwater needs to be removed before certain operations can be performed, or to keep work conditions safe. It is typical for contractors to use ditch pumps and/or well points to dewater, but it is very important to identify and use the appropriate locations for discharge. Dewatering may require a temporary BMP for settling and/or filtering sediment-laden water. A temporary sediment pond or other equivalent facility is used to settle and/or filter the water. Properly designed and implemented temporary dewatering will:

- Prevent the discharged water from eroding soil on site
- Remove sediment from the collected water
- Choose the best location for discharge
- Preserve downstream natural resources and real property

Projects which are required to comply with Minimum Requirements for Flow Control (SMC 22.805.080) must account for dewatering discharge in determining an allowable release rate.

Conditions Where Practice Applies

Public or private properties with the following:

- Foundation excavations
- Utilities and infrastructure construction projects, including installation, repair and maintenance of:
 - Electrical conduits
 - Vaults/tanks
 - Sanitary sewer and public drainage systems
 - Phone and cable lines
 - Gas or other fuel lines
 - Other excavations or graded areas requiring dewatering

Clean, non-turbid dewatering water, such as well-point groundwater, may be discharged to the public combined sewer; systems tributary to receiving waters; or directly into receiving waters, provided the dewatering flow is discharged to a stabilized system and does not cause erosion or flooding of receiving waters or downstream systems. Clean dewatering water should not be routed through stormwater sediment ponds.

If dewatering must occur, a Side Sewer Permit for Temporary Dewatering (SSPTD) and a Discharge Authorization Letter from King County Industrial Waste may be required prior to commencing dewatering at the site. The SSPTD permit may include a separate Temporary Dewatering Plan, water quality treatment, and/or flow control requirements, as well as compliance monitoring requirements.

For a copy of the SSPTD Tip 503, go to the Seattle Department of Construction and Inspections (SDCI) Public Resources Center on the 20th floor of the Seattle Municipal Tower, 700 Fifth Avenue, Seattle, Washington 98124, or refer to SDCI's Tips web page (<http://web1.seattle.gov/DPD/CAMs/CamList.aspx>).

Planning Considerations

Prior to implementing temporary dewatering, minimize the amount of water that will be collected and the potential amount of sediment that may enter the water. Implement the following prior to temporary dewatering:

- For trench excavation, limit the trench length to 150 feet and place the excavated material on the up-gradient side of the trench.
- Install diversion ditches or berms to minimize the amount of clean stormwater runoff allowed into the excavated area.
- Dewatering in periods of intense, heavy rain, when the infiltrative capacity of the soil is exceeded, should be avoided.
- Never discharge to bare or newly vegetated areas.

Once the site has been prepared as described above, assess the site for the issues listed below to assist the City in determining which discharge option to approve:

- Water clarity. If the water is turbid (cloudy), there are dissolved and/or settleable solids in the water that should be filtered or settled out prior to discharge. Determine if contaminants are present in impounded water. Check for odors, discoloration, or oily sheen. Check any soils and/or groundwater testing results.
- If contamination may be or is present, the Director of SPU reserves the right to require sampling and analysis to prove that water quality is being protected. Highly turbid or contaminated dewatering water should be handled separately from stormwater. Contaminated groundwater is a prohibited discharge; however, it may be treated to become a permissible discharge if metals and other pollutants are mitigated to meet concentration thresholds in state water quality standards. If no such water quality standards exist for a pollutant, discharge limits should be based on the stricter standard of any other appropriate and relevant water quality criteria (i.e., Washington State water quality standards, U.S. EPA national recommended water quality criteria for aquatic life and human health, and the National Toxics Rule).
- Depending upon the type of downstream infrastructure and the desired discharge volume, the dewatering discharge flow rate may be required to be limited to a daily (measured by gallons or cubic feet per day) or instantaneous (measured by gallons or cubic feet per second) maximum.

Design Criteria

One of several types of dewatering facilities may be constructed, depending upon site conditions and the type of activities.

Water Removal

The removal of water from the excavated area can be accomplished by numerous methods. The most common of these are:

- Gravity drain through a daylight channel
- Mechanical pumping
- Siphoning
- Using the appropriate construction equipment to scoop and dump water from the excavation

Stabilize channels or any conveyance feature dug for discharging water from the excavated area. If flow velocities cause erosion within the channel, install a ditch lining, such as geotextile or heavy plastic sheeting.

Discharge Structure

Water conveyed by channels, ditches, pumps, hose, or equipment buckets should be discharged in a regulated manner to a stable structure. The structure must be:

- Appropriate to filter sediment
- Able to withstand the velocity of the discharged water to prevent erosion
- Sized and operated such that pumped water will flow through an energy dissipation device and converted to gravity flow prior to discharge to a downstream system
- Not overtop the structure

Typical constructed areas are:

- Sediment traps (refer to BMP E3.40)
- Portable sediment tanks (refer to BMP E3.50)
- Enclosure of hay bales, filter fabric (refer to BMP E3.10), or both
- Sediment filter bag

Sediment Removal – General

Sediment must be settled prior to discharge. All settling systems should be engineered and adequately sized for site conditions. Sediment removal is required when establishing wells for well-point dewatering but may be removed once the well and filter pack are established, and the discharge is found to be clean and non-turbid. General settling and filtering options include the following:

- Containment in a pond structure for a minimum of 4 hours or until water is clear (time will vary greatly depending upon gradation of sediment). Place a pump in a gravel bed at the bottom of the pond.
- Discharge to a manufactured / pre-made structure specifically designed for sediment removal, like a Silt Sak, Silt Bag, or other similar product. Pump to a settling tank with sampling ports.
- Transport off site in vehicle, such as a vacuum flush truck, for legal disposal.
- Filter through a sieve or other filter media (e.g., swimming pool filter). Simple onsite filter systems can be constructed including: wrapping the ends of the suction and discharge pipes with filter fabric; discharging through a series of drums filled with successively finer gravel and sand; and other filtering techniques like those described under inlet protection (BMP E3.25).
- Manufactured bags, polymers, or other systems. These systems do not always work on fine clay soils, and will only be allowed for use where approved. Chemical treatments should have state approval before they are used (refer to Ecology BMP C250 Construction Stormwater Chemical Treatment).
- Line or protect the flowpath in some way to prevent mobilization of additional sediment.
- Dry and reuse filtered material on site in a mixture with other site soils, or appropriately dispose of the material based on nature and levels of any contaminants present.

Vegetated Buffer

A well stabilized, onsite, vegetated area may serve as a dewatering facility if the area is appropriate to filter sediment and at the same time withstand the velocity of the discharged water without erosion. The discharge of sediment-laden water onto a vegetated area must not pose a threat to the survival of the existing vegetative stand through smothering by sedimentation.

Direct discharge of lightly sediment bearing water may be able to go directly into well-buffered areas with a 2 percent slope as long as a method of spreading flow into sheet flow is available.

Straw Bale/Filter Fabric Pit

An excavated or bermed sedimentation pond or structure can also be created using straw bale and filter fabric (refer to BMP E3.10 Filter Fence) to create a pit. Flow to the structure may not exceed the sediment removal structure's capacity to settle and filter flow or the structure's volume capacity. Wherever possible, the structure should also discharge to a well-vegetated buffer through sheet flow, should maximize the distance to the nearest receiving water, and should minimize the slope of the buffer area. Also, the excavated portion may need to be lined with geotextile to help reduce scour and to prevent the inclusion of soil from within the structure (refer to BMP E3.40 Sediment Trap).

Sediment Filter Bag

The filter bag should be constructed of non-woven geotextile material that will provide adequate filtering ability to capture larger soil particles from the pumped water. The bag should be constructed so that there is an inlet neck that may be clamped around the dewatering pump discharge hose so that all of the pumped water passes through the bag.

The filter bag should be used in combination with a straw bale/filter fence pit when located within 50 feet of a receiving water. When the distance is greater than 50 feet, the bag may be placed on well-established vegetation, or on an aggregate pad constructed of crushed rock at a minimum depth of 6 inches. The bag should never be placed on bare soil.

The capacity of the sediment filter bag should be adequate to handle the dewatering pump discharge, and should be based on the bag manufacturer's recommendation.

When used in conjunction with a straw bale/filter fence pit, a filter bag may be operated until the water in the pit reaches the crest of the emergency overflow. The pump must be shut off at this point. When placed on either a rock pad or well-established vegetation, the bag may be operated until the discharge from the bag reaches a receiving water. Unless the discharge is at least as clear as the receiving water, the pump must be shut off at this point.

When the bag has been completely filled with sediment, it should be cut open, re-graded in place, and immediately stabilized with either sod or erosion control mat.

Maintenance

- Check filtering devices frequently to make sure they are unclogged and operating correctly. Pay special attention to the buffer area for any sign of erosion and concentration of flow that may compromise the buffer area. Where possible, observe the visual quality of the effluent and determine if additional treatment can be provided.
- Make adjustments depending on the amount of sediment in the water being pumped.
- Repair and/or replace any equipment that does not function as designed.
- The accumulated sediment which is removed during maintenance must be spread on site and stabilized or disposed of at an approved disposal site.
- Systems should be filled in or otherwise removed when permanent dewatering controls are in place and connected to an approved treatment and receiving system.

5.1.7. BMP C1.45: Solid Waste Handling and Disposal

Description

Methods used to protect stormwater from pollution associated with the management, handling and disposal of all solid waste generated on a project site.

Purpose

Solid waste is one of the major pollutants caused by construction and can have direct impacts to stormwater as a potential pollutant if not managed and disposed of properly. Solid waste includes the following:

- Trees and shrubs removed during land clearing
- Wood and paper used in packaging and building materials
- Scrap metals and metal shavings
- Sanitary wastes
- Rubber, plastic, and glass pieces
- Masonry products
- Leftover food, food containers, beverage cans, coffee cups, lunch wrapping paper, aluminum foil, and plastic
- Cigarette packages and butts
- Unwanted or discarded construction and demolition products

Conditions Where Practice Applies

All project sites.

Planning Considerations

The major control mechanism for these pollutants is to provide adequate disposal facilities.

Design Criteria

- Collection containers: Project sites should have at least two containers; one for garbage or non-recyclable construction wastes and the other for recycling. Multiple containers for source-separated recyclables, such as clean wood and metal, are encouraged. Source-separating recyclables on the site means more recycling, less waste, and generally lower tipping fees/disposal costs. All containers located on the job site should be clearly marked, labeled with a list of acceptable materials, and kept closed when not in use. Any container designated for recycling should have at least 90% of its contents be recyclable and no garbage or items not accepted by the receiving facility. Garbage should not be deposited in a container designated for construction waste or for recycling.
- Remove garbage frequently to maintain project sites in a clean and attractive manner. Remove and dispose of accumulated solid waste at authorized disposal areas.

- Label waste containers and locate them in a covered area. Keep lids closed at all times.
- The City requires the recycling of readily recyclable construction and demolition waste materials and submittal of a Waste Diversion Report per SMC 21.36.089 and subsequent SPU Director's Rules related to construction materials disposal bans. In addition, the Seattle Department of Construction and Inspection now requires that a Waste Diversion Plan be part of the permit application for a building permit if the project is 750 square feet or greater and that a Salvage Assessment be performed for any job involving demolition. At the end of each project a Waste Diversion Report must be submitted to Seattle Public Utilities that documents through facility weight receipts where materials from the construction or demolition site went for reuse, recycling and disposal.
- Reuse and Recycling: Reuse on and off site reduces waste and is the most preferred method for handling materials. Several local firms provide salvage assessment and resale of building materials. Green building credits recognize reuse as well as recycling.
- Hauling: Reusables and recyclables may be hauled by any company you choose or you may "self-haul" yourself. Non-recyclable construction waste such as painted and treated wood or fiberglass insulation must be hauled only by the City's contracted hauler, Waste Management; or you may "self-haul" yourself to the appropriate receiving facility.
- Recyclable Materials from Project Sites: Current and future targeted materials and their handling, hauling and destination requirements are listed in Table 9.
- For more information about the City's construction and demolition waste recycling requirements, refer to the City's website (www.seattle.gov/utilities/businesses-and-key-accounts/construction/construction-waste).
- For assistance with finding recycling facilities, refer to the King County Green Tools web page (<https://kingcounty.gov/depts/dnrp/solid-waste/programs/green-building.aspx>).
- For assistance in determining where to take motor oil, pesticides, smoke alarms, fluorescent bulbs, and other hazardous materials, refer to the Local Hazardous Waste Management Program website (www.hazwastehelp.com).
- Selective (rather than wholesale) removal of trees is helpful in conservation of soil and reduction of wood wastes. Avoid indiscriminate removal of trees and other beneficial vegetation.

Table 9. Handling, Hauling, and Destination Requirements for Targeted Materials.

Targeted Materials	Banned from Disposal	Collection Method and Hauling	Facilities^a
Land Clearing (such as trees, shrubs, stumps)	Yes	Self-haul or Order drop box from a private recycler Grind and use on site	City transfer stations Private drop sites for yard waste Composting facilities Wood waste recyclers
Asphalt Paving	Yes	Self-haul or Order drop box from a private hauler or recycler	Concrete recyclers Sand and gravel operations Mixed waste recyclers
Bricks	Yes, if whole	Reuse on or off site Self-haul to a reuse store or private recycler	Reuse stores Sand and gravel operations
Concrete	Yes, if unpainted	Reuse on or off site as fill only if appropriate for groundwater conditions Self-haul	Concrete recyclers, Sand and gravel operations Mixed waste recyclers
Cardboard and Paper	Yes	Use City provided curbside recycling containers or commercial recycling cart service if available for the building site Self-haul	City transfer stations Many private recyclers
Metal (ferrous and non-ferrous)	Yes	Use City provided curbside recycling container if available for building site Self-haul	City transfer stations Many private recyclers
New Construction Gypsum Scrap	Yes	Self-haul Drop box from a private recycler	Drywall recyclers Mixed waste recyclers
Carpet	Yes, starting in July 2022 ^b	Self-haul Drop box from a private hauler or recycler	Take back offered through flooring stores for installers Some mixed waste recyclers if clean
Plastic Film Wrap	Yes, starting in July 2022 ^b	Self-haul Drop box from a private hauler or recycler	Mixed waste recyclers if clean
Wood	Yes, if unpainted and untreated wood over 6 inches in length	Self-haul Drop box from a private hauler or recycler	City transfer stations Private drop sites and recycling facilities
Tear-off Asphalt Roofing Shingles	Yes, starting in July 2022 ^b	Self-haul to a private recycler	Private asphalt shingle recyclers Some mixed waste recyclers

**Table 9 (continued). Handling, Hauling, and Destination Requirements
for Targeted Materials.**

Targeted Materials	Banned from Disposal	Collection Method and Hauling	Facilities*
Food Waste (such as from lunches)	Yes for food but not the wrappings or containers	Use City provided curbside organics container or commercial cart service if available for the building site	
Tin and Aluminum Cans: Glass and Plastic Bottles and Jars	Yes	Use City provided curbside recycling container or commercial recycling cart service if available for the building site Self-haul	City transfer stations Private recyclers
Cups	Yes	Use City provided curbside recycling container or commercial recycling cart service if available for the building site	City transfer stations Private recyclers
Other Non-Recyclable Waste Materials		Self-haul to City transfer stations for disposal Order a container from Waste Management, the City's contractor for the hauling of non-recyclable construction wastes at 1-800-592-9995	

^a For a list of construction waste recycling facilities, refer to the City's website (www.seattle.gov/utilities/businesses-and-key-accounts/construction/construction-waste/recycling-requirements/certified-facilities).

^b Refer to Director's Rule SW-640 (formerly DR SW-405.3) for the effective date for bans on carpet, plastic film wrap, and tear-off asphalt roofing shingles.

Maintenance

Soil erosion and sediment control structures capture much of the solid waste from project sites. Frequently remove litter from these structures to reduce the amount of solid waste despoiling the landscape.

5.1.10. BMP C1.56: Concrete Handling

Description

Concrete work includes storage, mixing, pouring, placement, finishing, removal, saw cutting, or cleanup of concrete materials, slurry, or process water associated with these activities.

Purpose

To prevent or reduce the discharge of fine particles and high pH process water and slurry from concrete materials. Concrete spillage or concrete discharge to waters of the state is prohibited.

Conditions Where Practice Applies

Anytime concrete is used, removed, or disposed of, including, but not limited to, placement and maintenance of:

- Curbs
- Sidewalks
- Roads
- Bridges
- Foundations
- Floors
- Runways

Anytime cured or uncured concrete is used, removed or disposed of, or water that has come in contact with uncured concrete is present, it must be disposed of properly. Activities that use, remove, or dispose of concrete include, but are not limited to, sawing slurry, coring, grinding, roughening, hydro-demolition, bridge and road surfacing.

Planning Considerations

Washwater and stormwater that has contacted uncured cement will become high-pH waters, which must be collected and treated before release to the public drainage system or public combined sewer. Concrete should not be placed during heavy rain events.

Wash concrete truck drums and other concrete handling equipment at an approved offsite location or in designated concrete washout areas only. Do not wash out concrete trucks on the ground (including formed areas awaiting concrete) or into storm drains, open ditches, streets, or streams. Refer to BMP C1.58 for information on concrete washout areas.

Refer to BMP C1.59 for pH adjustments requirements. Refer to the Construction Stormwater General Permit for pH monitoring requirements if the project involves one of the following activities:

- Significant concrete work (greater than 1,000 cubic yards poured concrete or recycled concrete used over the life of a project)

- The use of engineered soils amended with (but not limited to) Portland cement-treated base, cement kiln dust, or fly ash
- Discharge of stormwater to receiving waters on the 303(d)list (Category 5) for high pH

Education:

- Discuss the concrete management techniques described in this BMP with the ready-mix concrete supplier before any deliveries are made.
- Educate employees and subcontractors on the concrete waste management techniques described in this BMP.
- Arrange for contractor's superintendent or CESCL to oversee and enforce concrete waste management procedures.
- Install a sign adjacent to each temporary concrete washout area (BMP C1.58) to inform concrete equipment operators about utilizing the proper facilities.

Contracts:

Incorporate requirements for concrete waste management into concrete supplier and subcontractor agreements.

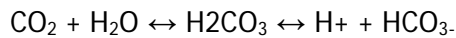
Design Criteria

- Within 15 feet of receiving waters, always use forms or solid barriers for concrete pours, such as pilings.
- Return unused concrete remaining in the truck and pump to the originating batch plant for recycling.
- Prefabricated containers are most resistant to damage and protect against spills and leaks. Companies may offer delivery service and provide regular maintenance and disposal of solid and liquid waste.
- Use approximately 7 gallons of washwater or less to wash one truck chute.
- Use approximately 50 gallons of washwater or less to wash out the hopper of a concrete pump truck.
- Washout facilities (BMP C1.58) should be maintained to provide adequate holding capacity with a minimum freeboard of 12 inches.
- Washout facilities (BMP C1.58) must be cleaned or new facilities must be constructed and ready for use once the washout is 75 percent full.
- Do not allow process water generated during hydro-demolition, surface roughening or similar operations to drain to any natural or constructed drainage conveyance including stormwater systems. Dispose of process water in a manner that does not violate groundwater or surface water quality standards.
- Wash off hand tools including, but not limited to, screeds, shovels, rakes, floats, and trowels into formed areas or into a designated concrete washout area (BMP C1.58) only.

- Handle and dispose of cleaning waste material and demolition debris in a manner that does not cause contamination of water. Dispose of sweeping material from a pick-up sweeper at an appropriate disposal site.
- Wash equipment difficult to move, such as concrete pavers, in areas that do not directly drain to natural or constructed stormwater conveyances.
- Do not allow washdown from areas, such as concrete aggregate driveways, to drain directly to natural or constructed stormwater conveyances.
- Never wash off concrete into the footprint of an area where an infiltration feature will be installed.
- Contain washwater and leftover product in a lined container when no formed areas are available. Dispose of contained concrete in a manner that does not violate groundwater or surface water quality standards.
- The following steps will help reduce stormwater pollution from concrete wastes:
 - Do not allow excess concrete to be dumped on site, except in designated concrete washout areas.
 - If self-installed concrete washout areas are used, below-grade structures are preferred over above-grade structures because they are less prone to spills and leaks. Self-installed above-grade structures should only be used if excavation is not practical.

The Chemical Process

When carbon dioxide (CO₂) is added to water (H₂O), carbonic acid (H₂CO₃) is formed which can further dissociate into a proton (H⁺) and a bicarbonate anion (HCO₃⁻) as shown below:



The free proton is a weak acid that can lower the pH. Water temperature has an effect on the reaction as well. The colder the water temperature is the slower the reaction occurs and the warmer the water temperature is the quicker the reaction occurs. Most construction applications in Washington State have water temperatures in the 50°F or higher range so the reaction is almost instantaneous.

Design Criteria

Treatment Process

High pH water may be treated using continuous treatment, continuous discharge systems. These manufactured systems continuously monitor influent and effluent pH to ensure that pH values are within an acceptable range before being discharged. All systems must have fail safe automatic shut off switches in the event that pH is not within the acceptable discharge range. Only trained operators may operate manufactured systems. System manufacturers often provide trained operators or training on their devices.

The following procedure may be used when not using a continuous discharge system:

1. Make every effort to isolate the potential high pH water in order to treat it separately from other stormwater on site.
2. Store water in an acceptable storage facility, detention pond, or containment cell prior to treatment.
3. Transfer water to be treated to the treatment structure. Ensure that treatment structure size is sufficient to hold the amount of water that is to be treated. Do not fill tank completely, allow at least 2 feet of freeboard.
4. Sample the water for pH and note the clarity of the water. Generally, less CO₂ is necessary for clearer water. Record this information in the stormwater treatment logbook.
5. In the pH adjustment structure, add CO₂ until the pH falls in the range of 6.9 to 7.1. Remember that pH water quality standards apply so adjusting pH to within 0.2 pH units of receiving water (background pH) is recommended. It is unlikely that pH can be adjusted to within 0.2 pH units using dry ice. Compressed carbon dioxide gas should be introduced to the water using a carbon dioxide diffuser located near the bottom of the tank, this will allow carbon dioxide to bubble up through the water and diffuse more evenly.
6. Slowly discharge the water making sure water does not get stirred up in the process. Release about 80 percent of the water from the structure leaving any sludge behind.
7. Discharge treated water through a pond or drainage system.
8. Excess sludge needs to be disposed of properly as concrete waste. If several batches of water are undergoing pH treatment, sludge can be left in the treatment structure for the next batch treatment. Dispose of sludge when it fills 50 percent of tank volume.

Sites that must implement flow control for the developed site must also control stormwater release rates during construction. All treated stormwater must go through a flow control facility before being released to receiving waters or systems which require flow control.

Maintenance Standards

Safety and Materials Handling

- Handle all equipment in accordance with Occupational Safety and Health Administration (OSHA) rules and regulations
- Follow manufacturer guidelines for materials handling

Operator Records

Each operator should provide:

- A diagram of the monitoring and treatment equipment
- A description of the pumping rates and capacity the treatment equipment is capable of treating

Each operator should keep a written record of the following:

- Client name and phone number
- Date of treatment
- Weather conditions
- Project name and location
- Volume of water treated
- pH of untreated water
- Amount of CO₂ needed to adjust water to a pH range of 6.9 to 7.1
- pH of treated water
- Discharge point location and description

A copy of this record should be given to the project proponent/owner/contractor who must retain the record for 3 years.

Appendix D
Directors' Rule 10-2021, DWW-200
City of Seattle Stormwater Manual Appendix G
Stormwater Control Operations and Maintenance
Requirements
(Selected Pages)

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City of Seattle

Appendix G - Stormwater Control Operations and Maintenance Requirements

City of Seattle
Stormwater Manual
July 2021

Note:

Some pages in this document have been purposely skipped or blank pages inserted so that this document will copy correctly when duplexed.

This appendix contains the maintenance requirements for the following typical stormwater BMPs and components:

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No. 2 - Infiltration BMPs				
Maintenance Component	Recommended Inspection Frequency¹	Defect or Problem	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Facility – General Requirements	A, W	Trash and debris	Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can)	Trash and debris cleared from site
	M (March – October)	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to City personnel or the public	<ul style="list-style-type: none"> • Noxious and nuisance vegetation removed according to applicable regulations • No danger of noxious vegetation where City personnel or the public might normally be
	A, W, E	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries, or paint	<ul style="list-style-type: none"> • Materials removed and disposed of according to applicable regulations • Source control BMPs implemented if appropriate • No contaminants present other than a surface oil film
	A	Grass/groundcover	Grass or groundcover exceeds 18 inches in height	Grass or groundcover mowed to a height no greater than 6 inches
Infiltration Pond, Top or Side Slopes of Dam, Berm or Embankment	A	Rodent holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes	Rodents removed or destroyed and dam or berm repaired

No. 2 - Infiltration BMPs				
Maintenance Component	Recommended Inspection Frequency¹	Defect or Problem	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Infiltration Pond, Top or Side Slopes of Dam, Berm or Embankment (continued)	A	Tree growth	<ul style="list-style-type: none"> • Tree growth threatens integrity of dams, berms or slopes, does not allow maintenance access, or interferes with maintenance activity • If trees are not a threat to dam, berm, or embankment integrity or not interfering with access or maintenance, they do not need to be removed. 	Trees do not hinder facility performance or maintenance activities
	A	Erosion	<ul style="list-style-type: none"> • Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion • Any erosion observed on a compacted slope 	<p>Slopes stabilized using appropriate erosion control measures</p> <p>If erosion is occurring on compacted slope, a licensed engineer should be consulted to resolve source of erosion.</p>
	A	Settlement	Any part of a dam, berm or embankment that has settled 4 inches lower than the design elevation	<p>Top or side slope restored to design dimensions</p> <p>If settlement is significant, a licensed engineer should be consulted to determine the cause of the settlement.</p>
Infiltration Pond, Tank, Vault, Trench, or Small Basin Storage Area	A	Sediment accumulation	If 2 inches or more sediment is present or a percolation test indicates facility is working at or less than 90 percent of design	Facility infiltrates as designed

No. 2 - Infiltration BMPs				
Maintenance Component	Recommended Inspection Frequency¹	Defect or Problem	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Infiltration Pond, Tank, Vault, Trench, or Small Basin Storage Area (continued)	A	Liner damaged (If Applicable)	Liner is visible or pond does not hold water as designed	Liner repaired or replaced
Infiltration Tank Structure	A	Plugged air vent	Any blockage of the vent	Tank or vault freely vents
	A	Tank bent out of shape	Any part of tank/pipe is bent out of shape more than 10 percent of its design shape	Tank repaired or replaced to design
	A	Gaps between sections, damaged joints or cracks or tears in wall	<ul style="list-style-type: none"> • A gap wider than ½ inch at the joint of any tank sections • Any evidence of soil particles entering the tank at a joint or through a wall 	No water or soil entering tank through joints or walls
Infiltration Vault Structure	A	Damage to wall, frame, bottom, and/or top slab	<ul style="list-style-type: none"> • Cracks wider than ½ inch • Any evidence of soil entering the structure through cracks • Qualified inspection personnel determines that the vault is not structurally sound 	Vault is sealed and structurally sound
Inlet/Outlet Pipes	A	Sediment accumulation	Sediment filling 1/3 or more of the pipe	Inlet/outlet pipes clear of sediment
	B, W, E	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables)	No trash or debris in pipes

No. 2 - Infiltration BMPs				
Maintenance Component	Recommended Inspection Frequency ¹	Defect or Problem	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Inlet/Outlet Pipes (continued)	A	Damaged	<ul style="list-style-type: none"> Cracks wider than ½ inch at the joint of the inlet/outlet pipes Any evidence of soil entering at the joints of the inlet/outlet pipes 	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe
Access Maintenance Hole	A	Cover/lid not in place	<ul style="list-style-type: none"> Cover/lid is missing or only partially in place Any open maintenance hole requires immediate maintenance 	Maintenance hole access cover/lid in place and secure
	A	Locking mechanism not working	<ul style="list-style-type: none"> Mechanism cannot be opened by one maintenance person with proper tools Bolts cannot be seated Self-locking cover/lid does not work 	Mechanism opens with proper tools
	A	Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 lbs of lift	Cover/lid can be removed and reinstalled by one maintenance person
	A	Ladder rungs unsafe	Missing rungs, misalignment, rust, or cracks	Ladder meets design standards and allows maintenance person safe access
Large Access Doors/Plate	A	Damaged or difficult to open	Large access doors or plates cannot be opened/removed using normal equipment	Replace or repair access door so it can open as designed
	A	Gaps, does not cover completely	Large access doors not flat and/or access opening not completely covered	Doors close flat and covers access opening completely

No. 2 - Infiltration BMPs				
Maintenance Component	Recommended Inspection Frequency¹	Defect or Problem	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Large Access Doors/Plate (continued)	A	Lifting rings missing, rusted	Lifting rings not capable of lifting weight of door or plate	Lifting rings sufficient to lift or remove door or plate
Infiltration Pond, Tank, Vault, Trench, or Small Basin Filter Bags	A	Plugged	Filter bag more than 1/2 full	Replace filter bag or redesign system
Infiltration Pond, Tank, Vault, Trench, or Small Basin Pre-Settling Ponds and Vaults	A, W	Sediment accumulation	6 inches or more of sediment has accumulated	Pre-settling occurs as designed
Infiltration Pond, Rock Filter	A	Plugged	High water level on upstream side of filter remains for extended period of time or little or no water flows through filter during heavy rain storms	Rock filter replaced; evaluate need for filter and remove if not necessary
Infiltration Pond Emergency Overflow Spillway	A	Rock missing	<ul style="list-style-type: none"> • Only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil at the top of out flow path of spillway • Rip-rap on inside slopes need not be replaced 	Spillway restored to design standards
	A	Tree growth	Tree growth impedes flow or threatens stability of spillway	Trees removed

No. 2 - Infiltration BMPs				
Maintenance Component	Recommended Inspection Frequency ¹	Defect or Problem	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Drain Rock	A, W	Water ponding	<ul style="list-style-type: none"> • If water enters the facility from the surface, inspect to see if water is ponding at the surface during storm events • If buried drain rock, observe drawdown through observation/ maintenance port or cleanout 	<ul style="list-style-type: none"> • Clear piping through facility when ponding occurs • Replace rock material/sand reservoirs as necessary • Tilling of subgrade below reservoir may be necessary (for trenches) prior to backfill

¹ Inspection frequency:

A = Annually; B = Biannually; M = Monthly; E = Recommend that additional inspections be performed as appropriate after major events (e.g., >1 inch of precipitation in 24 hours or environmental incident that causes contaminant release; Q = Quarterly (four times per year); W = Recommend that at least one inspection occur during the wet season, preferably after trees have lost their leaves

No. 3 - Detention Pipes and Vaults				
Maintenance Component	Recommended Inspection Frequency¹	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Facility – General Requirements	A, E	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries, or paint	<ul style="list-style-type: none"> • Materials removed and disposed of according to applicable regulations • Source control BMPs implemented if appropriate • No contaminants present other than a surface oil film
Pipe or Vault Storage Area	B, W, E	Trash and debris	Any trash and debris accumulated in vault or pipe (includes floatables and non-floatables)	No trash or debris in vault or pipe
	A	Sediment accumulation	Accumulated sediment depth exceeds 10 percent of the diameter of the storage area for ½ length of storage vault or any point depth exceeds 15 percent of diameter	All sediment removed from storage area
Pipe or Vault Structure	A	Plugged air vent	Any blockage of the vent	Pipe or vault freely vents
	A	Pipe bent out of shape	Any part of vault/pipe is bent out of shape more than 10 percent of its design shape	Pipe or vault repaired or replaced to design
	A	Gaps between sections, damaged joints or cracks or tears in wall	<ul style="list-style-type: none"> • A gap wider than ½ inch at the joint of any pipe or vault sections • Any evidence of soil particles entering the pipe or vault at a joint or through a wall 	No water or soil entering pipe or vault through joints or walls

No. 3 - Detention Pipes and Vaults				
Maintenance Component	Recommended Inspection Frequency ¹	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Vault Structure	A	Damage to wall, frame, bottom, and/or top slab	<ul style="list-style-type: none"> Cracks wider than ½ inch Any evidence of soil entering the structure through cracks Qualified inspection personnel determines that the vault is not structurally sound 	Vault sealed and structurally sound
Inlet/Outlet Pipes	A	Sediment accumulation	Sediment filling 1/3 or more of the pipe	Inlet/outlet pipes clear of sediment
	B, W, E	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables)	No trash or debris in pipes
	A	Damaged	<ul style="list-style-type: none"> Cracks wider than ½ inch at the joint of the inlet/outlet pipes Any evidence of soil entering at the joints of the inlet/outlet pipes 	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe
Access Maintenance Hole	A	Cover/lid not in place	<ul style="list-style-type: none"> Cover/lid is missing or only partially in place Any open maintenance hole requires immediate maintenance 	Maintenance hole access cover/lid in place and secure
	A	Locking mechanism not working	<ul style="list-style-type: none"> Mechanism cannot be opened by one maintenance person with proper tools Bolts cannot be seated Self-locking cover/lid does not work 	Mechanism opens with proper tools

No. 3 - Detention Pipes and Vaults				
Maintenance Component	Recommended Inspection Frequency¹	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Access Maintenance Hole (continued)	A	Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 lbs of lift	Cover/lid can be removed and reinstalled by one maintenance person
	A	Ladder rungs unsafe	Missing rungs, misalignment, rust, or cracks	Ladder meets design standards and allows maintenance person safe access
Large Access Doors/Plate	A	Damaged or difficult to open	Large access doors or plates cannot be opened/removed using normal equipment	Replace or repair access door so it can open as designed
	A	Gaps, does not cover completely	Large access doors not flat and/or access opening not completely covered	Doors close flat and covers access opening completely
	A	Lifting rings missing, rusted	Lifting rings not capable of lifting weight of door or plate	Lifting rings sufficient to lift or remove door or plate

¹ Inspection frequency:

A = Annually; B = Biannually; M = Monthly; E = Recommend that additional inspections be performed as appropriate after major events (e.g., >1 inch of precipitation in 24 hours or environmental incident that causes contaminant release; Q = Quarterly (four times per year); W = Recommend that at least one inspection occur during the wet season, preferably after trees have lost their leaves

No. 4 - Flow Control Structure & Control Device				
Maintenance Component	Recommended Inspection Frequency¹	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
The Flow Control Structure and Control Device shall conform with design criteria shown upon the approved plans or the design standards in place at the time of construction. This includes but is not limited to, orifice diameter(s), orifice elevation(s) overflow elevation. Reference Standard Plans No. 270, 271, and 272.				
Structure	A	Trash and debris	Trash or debris of more than ½ cubic foot which is located immediately in front of the structure opening or is blocking capacity of the structure by more than 10 percent	No trash or debris blocking or potentially blocking entrance to structure
			Trash or debris in the structure that exceeds 1/3 the depth from the bottom of basin to invert the lowest pipe into or out of the basin.	No trash or debris in the structure
			Deposits of garbage exceeding 1 cubic foot in volume	No condition present which would attract or support the breeding of insects or rodents
	A	Sediment	Sediment exceeds 60 percent of the depth from the bottom of the structure to the invert of the lowest pipe into or out of the structure or the bottom of the control device section or is within 6 inches of the invert of the lowest pipe into or out of the structure or the bottom of the control device section	Sump of structure contains no sediment

No. 4 - Flow Control Structure & Control Device				
Maintenance Component	Recommended Inspection Frequency ¹	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Structure (continued)	A	Damage to frame and/or top slab	Corner of frame extends more than ¾ inch past curb face into the street (If applicable)	Frame is even with curb
			Top slab has holes larger than 2 square inches or cracks wider than ¼ inch	Top slab is free of holes and cracks
			Frame not sitting flush on top slab, i.e., separation of more than ¾ inch of the frame from the top slab	Frame is sitting flush on top slab
	A	Cracks in walls or bottom	<ul style="list-style-type: none"> Cracks wider than ½ inch and longer than 3 feet Any evidence of soil particles entering structure through cracks Maintenance person judges that structure is unsound 	Structure is sealed and structurally sound.
			<ul style="list-style-type: none"> Cracks wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe Any evidence of soil particles entering structure through cracks 	No cracks more than ¼-inch wide at the joint of inlet/outlet pipe
	A	Settlement/ misalignment	Structure has settled more than 1 inch or has rotated more than 2 inches out of alignment	Basin replaced or repaired to design standards

No. 4 - Flow Control Structure & Control Device				
Maintenance Component	Recommended Inspection Frequency ¹	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Structure (continued)	A	Damaged pipe joints	<ul style="list-style-type: none"> Cracks wider than ½ inch at the joint of the inlet/outlet pipes Any evidence of soil entering the structure at the joint of the inlet/outlet pipes 	No cracks more than ¼-inch wide at the joint of inlet/outlet pipes
	A, E	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries, or paint	<ul style="list-style-type: none"> Materials removed and disposed of according to applicable regulations Source control BMPs implemented if appropriate No contaminants present other than a surface oil film
	A	Ladder rungs missing or unsafe	Ladder is unsafe due to missing rungs, misalignment, rust, cracks, or sharp edges	Ladder meets design standards and allows maintenance person safe access.
Control Device	A	Damaged or missing	Riser section is not securely attached to structure wall and outlet pipe structure should support at least 1,000 lbs of up or down pressure	T section securely attached to wall and outlet pipe
			Structure is not in upright position (allow up to 10 percent from plumb)	Structure in correct position
			Connections to outlet pipe are not watertight or show signs of deteriorated grout	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed
			Any holes—other than designed holes—in the structure	Structure has no holes other than designed holes

No. 4 - Flow Control Structure & Control Device				
Maintenance Component	Recommended Inspection Frequency¹	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Shear Gate (if applicable)	A	Damaged or missing	Cleanout gate is missing	Replace cleanout gate
			Cleanout gate is not watertight	Gate is watertight and works as designed.
			Gate cannot be moved up and down by one maintenance person	Gate moves up and down easily and is watertight.
			Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
Orifice Plate	A	Damaged or missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	A	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate	Plate is free of all obstructions and works as designed
Overflow Pipe	A	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe	Pipe is free of all obstructions and works as designed
	A	Deformed or damaged lip	Lip of overflow pipe is bent or deformed	Overflow pipe does not allow overflow at an elevation lower than design
Inlet/Outlet Pipe	A	Sediment accumulation	Sediment filling 1/3 or more of the pipe	Inlet/outlet pipes clear of sediment
	B, W, E	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes
	A	Damaged	<ul style="list-style-type: none"> • Cracks wider than ½ inch at the joint of the inlet/outlet pipes • Any evidence of soil entering at the joints of the inlet/outlet pipes 	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe

No. 4 - Flow Control Structure & Control Device				
Maintenance Component	Recommended Inspection Frequency ¹	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Metal Grates (If Applicable)	A	Unsafe grate opening	Grate with opening wider than 7/8 inch	Grate opening meets design standards
	B, W, E	Trash and debris	Trash and debris that is blocking more than 20 percent of grate surface	Grate free of trash and debris. footnote to guidelines for disposal
	A	Damaged or missing	Grate missing or broken member(s) of the grate	Grate is in place and meets design standards
Maintenance Hole Cover/Lid	A	Cover/lid not in place	<ul style="list-style-type: none"> Cover/lid is missing or only partially in place Any open structure requires urgent maintenance 	Cover/lid protects opening to structure
	A	Locking mechanism Not Working	<ul style="list-style-type: none"> Mechanism cannot be opened by one maintenance person with proper tools Bolts cannot be seated Self-locking cover/lid does not work 	Mechanism opens with proper tools
	A	Cover/lid difficult to Remove	One maintenance person cannot remove cover/lid after applying 80 lbs. of lift	Cover/lid can be removed and reinstalled by one maintenance person

¹ Inspection frequency:

A = Annually; B = Biannually; M = Monthly; E = Recommend that additional inspections be performed as appropriate after major events (e.g., >1 inch of precipitation in 24 hours or environmental incident that causes contaminant release; Q = Quarterly (four times per year); W = Recommend that at least one inspection occur during the wet season, preferably after trees have lost their leaves

No. 5 - Catch Basins and Maintenance Holes				
Maintenance Component	Recommended Inspection Frequency¹	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Structure	A	Sediment	Sediment exceeds 60 percent of the depth from the bottom of the catch basin to the invert of the lowest pipe into or out of the catch basin or is within 6 inches of the invert of the lowest pipe into or out of the catch basin	Sump of catch basin contains no sediment
	B, W, E	Trash and debris	Trash or debris of more than ½ cubic foot which is located immediately in front of the catch basin opening or is blocking capacity of the catch basin by more than 10 percent	No trash or debris blocking or potentially blocking entrance to catch basin
	A		Trash or debris in the catch basin that exceeds 1/3 the depth from the bottom of basin to invert the lowest pipe into or out of the basin	No trash or debris in the catch basin
	A		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane)	No dead animals or vegetation present within catch basin
	A		Deposits of garbage exceeding 1 cubic foot in volume	No condition present which would attract or support the breeding of insects or rodents

No. 5 - Catch Basins and Maintenance Holes				
Maintenance Component	Recommended Inspection Frequency ¹	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Structure (continued)	A	Damage to frame and/or top slab	Corner of frame extends more than ¾ inch past curb face into the street (If applicable).	Frame is even with curb
			Top slab has holes larger than 2 square inches or cracks wider than ¼ inch.	Top slab is free of holes and cracks.
			Frame not sitting flush on top slab, i.e., separation of more than ¾ inch of the frame from the top slab	Frame is sitting flush on top slab.
	A	Cracks in walls or bottom	<ul style="list-style-type: none"> • Cracks wider than ½ inch and longer than 3 feet • Any evidence of soil particles entering catch basin through cracks • Maintenance person judges that catch basin is unsound 	Catch basin is sealed and structurally sound
			<ul style="list-style-type: none"> • Cracks wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe • Any evidence of soil particles entering catch basin through cracks 	No cracks more than ¼-inch wide at the joint of inlet/outlet pipe
	A	Settlement/ misalignment	Catch basin has settled more than 1 inch or has rotated more than 2 inches out of alignment	Basin replaced or repaired to design standards

No. 5 - Catch Basins and Maintenance Holes				
Maintenance Component	Recommended Inspection Frequency¹	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Structure (continued)	A	Damaged pipe joints	<ul style="list-style-type: none"> Cracks wider than ½ inch at the joint of the inlet/outlet pipes Any evidence of soil entering the catch basin at the joint of the inlet/outlet pipes 	No cracks more than ¼-inch wide at the joint of inlet/outlet pipes
	A, E	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries, or paint	<ul style="list-style-type: none"> Materials removed and disposed of according to applicable regulations Source control BMPs implemented if appropriate No contaminants present other than a surface oil film
Inlet/Outlet Pipe	A	Sediment accumulation	Sediment filling 1/3 or more of the pipe	Inlet/outlet pipes clear of sediment
	B, W, E	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables)	No trash or debris in pipes
	A	Damaged	<ul style="list-style-type: none"> Cracks wider than ½ inch at the joint of the inlet/outlet pipes Any evidence of soil entering at the joints of the inlet/outlet pipes 	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe
Catch Basin Outlet Trap (Reference Standard Plan No. 267)	A	Missing	When the required outlet trap is not installed upon the outlet pipe	Outlet trap installed and prevents floatables from being discharged
	A	Permanently installed	When the trap is grouted to the outlet pipe and is not removable to allow for maintenance and inspection	Outlet trap removable for maintenance and inspection

No. 5 - Catch Basins and Maintenance Holes				
Maintenance Component	Recommended Inspection Frequency ¹	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Catch Basin Outlet Trap (Reference Standard Plan No. 267) (continued)	A	Damaged	Cracks, broken welds, seams or any other conditions that allows water to be discharged from other than the submerged portion of the trap	Water will be discharged from the submerged portion of the trap.
Metal Grates (Catch Basins)	A	Unsafe grate opening	Grate with opening wider than 7/8 inch	Grate opening meets design standards
	B, W, E	Trash and debris	Trash and debris that is blocking more than 20 percent of grate surface	Grate free of trash and debris. footnote to guidelines for disposal
	A	Damaged or missing	<ul style="list-style-type: none"> Grate missing or broken member(s) of the grate Any open structure requires urgent maintenance 	Grate is in place and meets design standards
Maintenance Hole Cover/Lid	A	Cover/lid not in place	<ul style="list-style-type: none"> Cover/lid is missing or only partially in place Any open structure requires urgent maintenance 	Cover/lid protects opening to structure
	A	Locking mechanism Not Working	<ul style="list-style-type: none"> Mechanism cannot be opened by one maintenance person with proper tools Bolts cannot be seated Self-locking cover/lid does not work 	Mechanism opens with proper tools
	A	Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 lbs. of lift	Cover/lid can be removed and reinstalled by one maintenance person

¹ Inspection frequency:

A = Annually; B = Biannually; M = Monthly; E = Recommend that additional inspections be performed as appropriate after major events (e.g., >1 inch of precipitation in 24 hours or environmental incident that causes contaminant release; Q = Quarterly (four times per year); W = Recommend that at least one inspection occur during the wet season, preferably after trees have lost their leaves

No. 10 - Wet and Continuous Inflow Biofiltration Swales				
Maintenance Component	Recommended Inspection Frequency¹	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance Is Performed
Facility – General Requirements	M	Trash and debris	Any trash and/or debris accumulated at the site	No trash or debris at the site
	B, E	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries, or paint	<ul style="list-style-type: none"> Materials removed and disposed of according to applicable regulations Source control BMPs implemented if appropriate No contaminants present other than a surface oil film
Swale Section	B, E	Sediment accumulation	Sediment depth exceeds 2 inches in 10 percent of the swale treatment area	No sediment deposits in treatment area
	B, E	Erosion/scouring	Eroded or scoured swale bottom due to channelization or high flows	<ul style="list-style-type: none"> No eroded or scoured areas in biofiltration swale Cause of erosion or scour addressed
	B	Water depth	Water not retained to a depth of about 4 inches during the wet season	Water depth of 4 inches throughout swale for most of wet season
	B	Vegetation ineffective	<ul style="list-style-type: none"> Vegetation sparse; does not provide adequate filtration Vegetation crowded out by very dense clumps of cattail or nuisance vegetation 	<ul style="list-style-type: none"> Wetland vegetation fully covers bottom of swale No cattails or nuisance vegetation present
	B	Insufficient water	Wetland vegetation dies due to lack of water	Wetland vegetation remains healthy (may require converting to grass-lined biofiltration swale)
Flow Spreader	B	Concentrated flow	Flow from spreader not uniformly distributed across entire swale width	Flows are spread evenly over entire swale width

No. 10 - Wet and Continuous Inflow Biofiltration Swales				
Maintenance Component	Recommended Inspection Frequency ¹	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance Is Performed
Inlet/Outlet Pipe	A	Sediment accumulation	Sediment filling 1/3 or more of the pipe	Inlet/outlet pipes clear of sediment
	B, W, E	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables)	No trash or debris in pipes
	A	Damaged	<ul style="list-style-type: none"> • Cracks wider than ½ inch at the joint of the inlet/outlet pipes • Any evidence of soil entering at the joints of the inlet/outlet pipes 	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe

¹ Inspection frequency:

A = Annually; B = Biannually; M = Monthly; E = Recommend that additional inspections be performed as appropriate after major events (e.g., >1 inch of precipitation in 24 hours or environmental incident that causes contaminant release; Q = Quarterly (four times per year); W = Recommend that at least one inspection occur during the wet season, preferably after trees have lost their leaves

No. 17 - Proprietary Technology Filter Cartridge Systems (example: BayFilter, FloGard PerkFilter, StormFilter)				
Maintenance Component	Recommended Inspection Frequency^{1,2}	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
In addition to the specific maintenance criteria provided below, all manufacturers' requirements shall be followed.				
Facility – General Requirements	A, E	Trash and debris	Any trash or debris or organic material which impairs the function of the facility	<ul style="list-style-type: none"> ● Trash and debris removed from facility ● Flow receives treatment instead of bypassing
	A, E	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries, or paint	<ul style="list-style-type: none"> ● Materials removed and disposed of according to applicable regulations ● Source control BMPs implemented if appropriate ● No contaminants present other than a surface oil film
	A	Life cycle	Once per year	Facility is re-inspected and any needed maintenance performed
Vault Treatment Area	Varies – Refer to Manufacturer's requirements.	Sediment on vault floor	Varies – Refer to Manufacturer's requirements.	Vault is free of sediment
	Varies – Refer to Manufacturer's requirements.	Sediment on top of cartridges	Varies – Refer to Manufacturer's requirements.	Vault is free of sediment
	Varies – Refer to Manufacturer's requirements.	Multiple scum lines above top of cartridges	Thick or multiple scum lines above top of cartridges	Cause of plugging corrected and canisters replaced if necessary

No. 17 - Proprietary Technology Filter Cartridge Systems (example: BayFilter, FloGard PerkFilter, StormFilter)				
Maintenance Component	Recommended Inspection Frequency^{1,2}	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Vault Structure	A	Damage to wall, frame, bottom, and/or top slab	<ul style="list-style-type: none"> • Cracks wider than ½ inch • Any evidence of soil particles entering the structure through the cracks • Qualified inspection personnel determines the vault is not structurally sound 	Vault replaced or repaired to design specifications
	A	Baffles damaged	Baffles corroding, cracking warping, and/or showing signs of failure	Repair or replace baffles to specification
Filter Media	A, E	Standing water in vault	Varies – Refer to Manufacturer’s requirements.	No standing water in vault 24 hours after a rain event
	A	Short circuiting	Flows do not properly enter filter cartridges	Flows go through filter media
Underdrains and Clean-Outs	A	Sediment/debris	Underdrains or clean-outs partially plugged or filled with sediment and/or debris	Underdrains and clean-outs free of sediment and debris
Inlet/Outlet Pipe	A	Sediment accumulation	Sediment filling 1/3 or more of the pipe	Inlet/outlet pipes clear of sediment
	B, W, E	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables)	No trash or debris in pipes
	A	Damaged	<ul style="list-style-type: none"> • Cracks wider than ½ inch at the joint of the inlet/outlet pipes • Any evidence of soil entering at the joints of the inlet/outlet pipes 	Cracks repaired, and no evidence of soil entering

No. 17 - Proprietary Technology Filter Cartridge Systems (example: BayFilter, FloGard PerkFilter, StormFilter)				
Maintenance Component	Recommended Inspection Frequency^{1,2}	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Access Maintenance Hole	A	Cover/lid not in place	<ul style="list-style-type: none"> Cover/lid is missing or only partially in place Any open maintenance hole requires immediate maintenance 	Maintenance hole access cover/lid in place and secure
	A	Locking mechanism not working	<ul style="list-style-type: none"> Mechanism cannot be opened by one maintenance person with proper tools Bolts cannot be seated Self-locking cover/lid does not work 	Mechanism opens with proper tools
	A	Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 lbs of lift	Cover/lid can be removed and reinstalled by one maintenance person
	A	Cover/lid rocking or noisy	Lid rocking when driven over	Cover/lid not rocking
	A	Ladder rungs unsafe	Missing rungs, misalignment, rust, or cracks	Ladder meets design standards and allows maintenance person safe access
Large Access Doors/Plate	A	Difficult to open	Large access doors or plates cannot be opened/removed using normal equipment	Replace or repair access door so it can open as designed.
	A	Damaged	Hatch doors show major dents and stress	Replace to support surface loading and uses
	A	Gaps, does not cover completely	Large access doors not flat and/or access opening not completely covered.	Doors close flat and cover access opening completely.

No. 17 - Proprietary Technology Filter Cartridge Systems (example: BayFilter, FloGard PerkFilter, StormFilter)				
Maintenance Component	Recommended Inspection Frequency^{1,2}	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Large Access Doors/Plate (continued)	A	Lifting rings missing, rusted	Lifting rings not capable of lifting weight of door or plate.	Lifting rings sufficient to lift or remove door or plate.

¹ Inspection frequency:

A = Annually; B = Biannually; M = Monthly; E = Recommend that additional inspections be performed as appropriate after major events (e.g., >1 inch of precipitation in 24 hours or environmental incident that causes contaminant release; Q = Quarterly (four times per year); W = Recommend that at least one inspection occur during the wet season, preferably after trees have lost their leaves

² Inspection frequencies provided are recommendations only. Proprietary technologies shall be inspected on a frequency as recommended by the manufacturer.

No. 18 - API Oil/Water Separators				
Maintenance Component	Recommended Inspection Frequency¹	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Facility – General Requirements	A, E	Trash and debris	Any trash or debris which impairs the function of the facility	Trash and debris removed from facility
	A, E	Contaminants and pollution	Floating oil in excess of 1 inch in first chamber, any oil in other chambers or other contaminants of any type in any chamber	No contaminants present other than a surface oil film
Vault Treatment Area	A, E	Sediment accumulation	Sediment accumulates exceeds 6 inches in the vault	No sediment in the vault.
	A, E	Discharge water not clear	Inspection of discharge water shows obvious signs of poor water quality-effluent discharge from vault shows thick visible sheen	Effluent discharge is clear
	A, E	Trash or debris accumulation	Any trash and debris accumulation in vault (floatables and non-floatables)	Vault is clear of trash and debris
	A, E	Oil accumulation	Oil accumulations that exceed 1 inch, at the surface of the water in the oil/water separator chamber	No visible oil depth on water
Vault Structure	A	Damage to wall, frame, bottom, and/or top slab	<ul style="list-style-type: none"> • Cracks wider than ½ inch • Any evidence of soil particles entering the structure through the cracks • Maintenance/inspection personnel determines that the vault is not structurally sound 	Vault replaced or repaired to design specifications
	A	Baffles damaged	Baffles corroding, cracking, warping and/or showing signs of failure	Repair or replace baffles to specifications

No. 18 - API Oil/Water Separators				
Maintenance Component	Recommended Inspection Frequency ¹	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Gravity Drain	A	Inoperable valve	Valve will not open and close	Valve opens and closes normally
	A	Valve will not seal	Valve does not seal completely	Valve completely seals closed
Inlet/Outlet Pipe	A	Sediment accumulation	Sediment filling 1/3 or more of the pipe	Inlet/outlet pipes clear of sediment
	B, W, E	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables)	No trash or debris in pipes
	A	Damaged	Cracks, broken welds, seams or any other conditions that allows water to be discharged from other than the submerged portion of the tee	Water will be discharged from the submerged portion of the tee
	A	Missing	When the required inlet or outlet tee is not installed	Tees installed
	A	Permanently installed	When the tee is grouted to the inlet or outlet pipe and is not removable to allow for maintenance and inspection	Tee removable for maintenance and inspection
Access Maintenance Hole	A	Cover/lid not in place	<ul style="list-style-type: none"> Cover/lid is missing or only partially in place Any open maintenance hole requires immediate maintenance 	Maintenance hole access cover/lid in place and secure
	A	Locking mechanism not working	<ul style="list-style-type: none"> Mechanism cannot be opened by one maintenance person with proper tools Bolts cannot be seated Self-locking cover/lid does not work 	Mechanism opens with proper tools
	A	Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 lbs of lift	Cover/lid can be removed and reinstalled by one maintenance person

No. 18 - API Oil/Water Separators				
Maintenance Component	Recommended Inspection Frequency ¹	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Access Maintenance Hole (continued)	A	Ladder rungs unsafe	Missing rungs, misalignment, rust, or cracks	Ladder meets design standards and allows maintenance person safe access
Large Access Doors/Plate	A	Damaged or difficult to open	Large access doors or plates cannot be opened/removed using normal equipment	Replace or repair access door so it can open as designed
	A	Gaps, does not cover completely	Large access doors not flat and/or access opening not completely covered	Doors close flat and cover access opening completely
	A	Lifting rings missing, rusted	Lifting rings not capable of lifting weight of door or cover/lid	Lifting rings sufficient to lift or remove cover/lid

¹ Inspection frequency:

A = Annually; B = Biannually; M = Monthly; E = Recommend that additional inspections be performed as appropriate after major events (e.g., >1 inch of precipitation in 24 hours or environmental incident that causes contaminant release; Q = Quarterly (four times per year); W = Recommend that at least one inspection occur during the wet season, preferably after trees have lost their leaves

No. 19 - Coalescing Plate Oil/Water Separators				
Maintenance Component	Recommended Inspection Frequency¹	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Facility – General Requirements	A, E	Trash and debris	Any trash or debris which impairs the function of the facility	Trash and debris removed from facility
	A, E	Contaminants and pollution	Floating oil in excess of 1 inch in first chamber, any oil in other chambers or other contaminants of any type in any chamber	No contaminants present other than a surface oil film
Vault Treatment Area	A, E	Sediment accumulation in the forebay	Sediment accumulation of 6 inches or greater in the forebay	No sediment in the forebay
	A, E	Discharge water not clear	Inspection of discharge water shows obvious signs of poor water quality – effluent discharge from vault shows thick visible sheen	Repair function of plates so effluent is clear
	A, E	Trash or debris accumulation	Trash and debris accumulation in vault (floatables and non-floatables)	Trash and debris removed from vault
	A, E	Oil accumulation	Oil accumulation that exceeds 1 inch at the water surface in the in the coalescing plate chamber	No visible oil depth on water and coalescing plates clear of oil
Coalescing Plates	A	Damaged	Plate media broken, deformed, cracked and/or showing signs of failure	Replace that portion of media pack or entire plate pack depending on severity of failure
	A, E	Sediment accumulation	Any sediment accumulation which interferes with the operation of the coalescing plates	No sediment accumulation interfering with the coalescing plates

No. 19 - Coalescing Plate Oil/Water Separators				
Maintenance Component	Recommended Inspection Frequency ¹	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Vault Structure	A	Damage to wall, frame, bottom, and/or top slab	<ul style="list-style-type: none"> Cracks wider than ½ inch Any evidence of soil particles entering the structure through the cracks Maintenance inspection personnel determines that the vault is not structurally sound 	Vault replaced or repaired to design specifications
	A	Baffles damaged	Baffles corroding, cracking, warping and/or showing signs of failure	Repair or replace baffles to specifications
Ventilation Pipes	A	Plugged	Any obstruction to the ventilation pipes	Ventilation pipes are clear
Shutoff Valve	A	Damaged or inoperable	Shutoff valve cannot be opened or closed	Shutoff valve operates normally
Inlet/Outlet Pipe	A	Sediment accumulation	Sediment filling 1/3 or more of the pipe	Inlet/outlet pipes clear of sediment
	B, W, E	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables)	No trash or debris in pipes
	A	Damaged	Cracks, broken welds, seams or any other conditions that allows water to be discharged from other than the submerged portion of the tee	Water will be discharged from the submerged portion of the tee
	A	Missing	When the required inlet or outlet tee is not installed	Tees installed
	A	Permanently installed	When the tee is grouted to the inlet or outlet pipe and is not removable to allow for maintenance and inspection	Tee removable for maintenance and inspection

No. 19 - Coalescing Plate Oil/Water Separators				
Maintenance Component	Recommended Inspection Frequency ¹	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Access Maintenance Hole	A	Cover/lid not in place	<ul style="list-style-type: none"> Cover/lid is missing or only partially in place Any open maintenance hole requires immediate maintenance 	Maintenance hole access cover/lid in place and secure
	A	Locking mechanism not working	<ul style="list-style-type: none"> Mechanism cannot be opened by one maintenance person with proper tools Bolts cannot be seated Self-locking cover/lid does not work 	Mechanism opens with proper tools
	A	Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 lbs of lift	Cover/lid can be removed and reinstalled by one maintenance person
	A	Ladder rungs unsafe	Missing rungs, misalignment, rust, or cracks	Ladder meets design standards and allows maintenance person safe access
Large Access Doors/Plate	A	Damaged or difficult to open	Large access doors or plates cannot be opened/removed using normal equipment.	Replace or repair access door so it can be opened as designed
	A	Gaps, does not cover completely	Large access doors not flat and/or access opening not completely covered	Doors close flat and cover access opening completely
	A	Lifting rings missing, rusted	Lifting rings not capable of lifting weight of door or plate	Lifting rings sufficient to lift or remove door or plate

¹ Inspection frequency:

A = Annually; B = Biannually; M = Monthly; E = Recommend that additional inspections be performed as appropriate after major events (e.g., >1 inch of precipitation in 24 hours or environmental incident that causes contaminant release; Q = Quarterly (four times per year); W = Recommend that at least one inspection occur during the wet season, preferably after trees have lost their leaves

No. 20 - Catch Basin Filter Socks				
Maintenance Component	Recommended Inspection Frequency^{1,2}	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Media Insert ²	M	Visible oil	Visible oil sheen passing through media	Media insert replaced
	M	Insert does not fit catch basin properly	Flow gets into catch basin without going through media	All flow goes through media
	M	Filter media plugged	Filter media plugged	Flow through filter media is normal
	M	Oil absorbent media saturated	Media oil saturated	Oil absorbent media replaced
	M	Water saturated	Catch basin insert is saturated with water, which no longer has the capacity to absorb	Insert replaced
	M	Service life exceeded	Regular interval replacement due to typical average life of product	Media replaced at manufacturer's recommended interval

¹ Inspection frequency:

A = Annually; B = Biannually; M = Monthly; E = Recommend that additional inspections be performed as appropriate after major events (e.g., >1 inch of precipitation in 24 hours or environmental incident that causes contaminant release; Q = Quarterly (four times per year); W = Recommend that at least one inspection occur during the wet season, preferably after trees have lost their leaves

² Inspection frequencies provided are recommendations only. Catch basin filter socks shall be inspected on a frequency as recommended by the manufacturer.

Appendix E
Stormwater Manual for Western Washington
Volume II - Construction Management Stormwater
Pollution Prevention and
Volume IV – Source Control BMPs
(Selected Pages)

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Volume II

Construction Stormwater Pollution Prevention

Stormwater Management Manual for Western Washington

Prepared by:

Washington State Department of Ecology
Water Quality Program

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Crushed rock, gravel base, etc., shall be added as required to maintain a stable driving surface and to stabilize any areas that have eroded.

Following construction, these areas shall be restored to pre-construction condition or better to prevent future erosion.

Perform street cleaning at the end of each day or more often if necessary.

BMP C120: Temporary and Permanent Seeding

Purpose

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.

Between July 1 and August 30 seeding requires irrigation until 75 percent grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch or an erosion control blanket until 75 percent grass cover is established.

Review all disturbed areas in late August to early September and complete all seeding by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.

Mulch is required at all times for seeding because it protects seeds from heat, moisture loss, and transport due to runoff. Mulch can be applied on top of the seed or simultaneously by hydroseeding. See [BMP C121: Mulching](#) for specifications.

Seed and mulch all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions, or geotextiles) which will prevent erosion. See [BMP T5.13: Post-Construction Soil Quality and Depth](#).

Design and Installation Specifications

General

- Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over the top of hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed

before water flow; install sod in the channel bottom — over top of hydromulch and erosion control blankets.

- Confirm the installation of all required surface water control measures to prevent seed from washing away.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. See [BMP C121: Mulching](#) for specifications.
- Areas that will have seeding only and not landscaping may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Re-install native topsoil on the disturbed soil surface before application. See [BMP T5.13: Post-Construction Soil Quality and Depth](#).
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. To overcome this, consider increasing seed quantities by up to 50 percent.
- Enhance vegetation establishment by dividing the hydromulch operation into two phases:
 - Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
 - Phase 2- Install the rest of the mulch and tackifier over the first lift.

Or, enhance vegetation by:

- Installing the mulch, seed, fertilizer, and tackifier in one lift.
- Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
- Hold straw in place with a standard tackifier.

Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:

- Irrigation.
- Reapplication of mulch.
- Repair of failed slope surfaces.

This technique works with standard hydromulch (1,500 pounds per acre minimum) and Bonded Fiber Matrix/ Mechanically Bonded Fiber Matrix (BFM/MBFMs) (3,000 pounds per acre minimum).

- Seed may be installed by hand if:
 - Temporary and covered by straw, mulch, or topsoil.
 - Permanent in small areas (usually less than 1 acre) and covered with mulch, topsoil, or erosion blankets.
- The seed mixes listed in [Table II-3.4: Temporary and Permanent Seed Mixes](#) include

recommended mixes for both temporary and permanent seeding.

- Apply these mixes, with the exception of the wet area seed mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used. Apply the wet area seed mix at a rate of 60 pounds per acre.
- Consult the local suppliers or the local conservation district for their recommendations. The appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used, depending on the soil type and hydrology of the area.

Table II-3.4: Temporary and Permanent Seed Mixes

Common Name	Latin Name	% Weight	% Purity	% Germination
Temporary Erosion Control Seed Mix				
A standard mix for areas requiring a temporary vegetative cover.				
Chewings or annual blue grass	<i>Festuca rubra var. commutata</i> or <i>Poa anna</i>	40	98	90
Perennial rye	<i>Lolium perenne</i>	50	98	90
Redtop or colonial bentgrass	<i>Agrostis alba</i> or <i>Agrostis tenuis</i>	5	92	85
White dutch clover	<i>Trifolium repens</i>	5	98	90
Landscaping Seed Mix				
A recommended mix for landscaping seed.				
Perennial rye blend	<i>Lolium perenne</i>	70	98	90
Chewings and red fescue blend	<i>Festuca rubra var. commutata</i> or <i>Festuca rubra</i>	30	98	90
Low-Growing Turf Seed Mix				
A turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.				
Dwarf tall fescue (several varieties)	<i>Festuca arundinacea var.</i>	45	98	90
Dwarf perennial rye (Barclay)	<i>Lolium perenne var. barclay</i>	30	98	90
Red fescue	<i>Festuca rubra</i>	20	98	90
Colonial bentgrass	<i>Agrostis tenuis</i>	5	98	90
Bioswale Seed Mix				
A seed mix for bioswales and other intermittently wet areas.				
Tall or meadow fes-	<i>Festuca arundin-</i>	75-80	98	90

Table II-3.4: Temporary and Permanent Seed Mixes (continued)

Common Name	Latin Name	% Weight	% Purity	% Germination
cue	<i>acea</i> or <i>Festuca elatior</i>			
Seaside/Creeping bentgrass	<i>Agrostis palustris</i>	10-15	92	85
Redtop bentgrass	<i>Agrostis alba</i> or <i>Agrostis gigantea</i>	5-10	90	80
Wet Area Seed Mix				
A low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.				
Tall or meadow fescue	<i>Festuca arundinacea</i> or <i>Festuca elatior</i>	60-70	98	90
Seaside/Creeping bentgrass	<i>Agrostis palustris</i>	10-15	98	85
Meadow foxtail	<i>Alepocurus pratensis</i>	10-15	90	80
Alsike clover	<i>Trifolium hybridum</i>	1-6	98	90
Redtop bentgrass	<i>Agrostis alba</i>	1-6	92	85
Meadow Seed Mix				
A recommended meadow seed mix for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. Consider the appropriateness of clover, a fairly invasive species, in the mix. Amending the soil can reduce the need for clover.				
Redtop or Oregon bentgrass	<i>Agrostis alba</i> or <i>Agrostis oregonensis</i>	20	92	85
Red fescue	<i>Festuca rubra</i>	70	98	90
White dutch clover	<i>Trifolium repens</i>	10	98	90

Roughening and Rototilling

- The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Backblading or smoothing of slopes greater than 4H:1V is not allowed if they are to be seeded.
- Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum,

permanent areas shall use soil amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.

Fertilizers

- Conducting soil tests to determine the exact type and quantity of fertilizer is recommended. This will prevent the over-application of fertilizer.
- Organic matter is the most appropriate form of fertilizer because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form.
- In general, use 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. Always use slow-release fertilizers because they are more efficient and have fewer environmental impacts. Do not add fertilizer to the hydromulch machine, or agitate, more than 20 minutes before use. Too much agitation destroys the slow-release coating.
- There are numerous products available that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal provides a good source of long-term, slow-release, available nitrogen.

Bonded Fiber Matrix and Mechanically Bonded Fiber Matrix

- On steep slopes use Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products. Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils. Generally, products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.
- Install products per manufacturer's instructions.
- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include:
 - BFMs and MBFMs do not require surface preparation.
 - Helicopters can assist in installing BFM and MBFMs in remote areas.
 - On slopes steeper than 2.5H:1V, blanket installers may require ropes and harnesses for safety.
 - Installing BFM and MBFMs can save at least \$1,000 per acre compared to blankets.

Maintenance Standards

Reseed any seeded areas that fail to establish at least 75 percent cover (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such as sodding, mulching, nets, or blankets.

- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. Reseed and protect by mulch any eroded area.
- Supply seeded areas with adequate moisture, but do not water to the extent that it causes run-off.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

BMP C121: Mulching

Purpose

Mulching soils provides immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture, holding fertilizer, seed, and topsoil in place, and moderating soil temperatures. There are a variety of mulches that can be used. This section discusses only the most common types of mulch.

Conditions of Use

As a temporary cover measure, mulch should be used:

- For less than 30 days on disturbed areas that require cover.
- At all times for seeded areas, especially during the wet season and during the hot summer months.
- During the wet season on slopes steeper than 3H:1V with more than 10 feet of vertical relief.

Mulch may be applied at any time of the year and must be refreshed periodically.

For seeded areas, mulch may be made up of 100 percent:

- cottonseed meal;
- fibers made of wood, recycled cellulose, hemp, or kenaf;

- compost;
- or blends of these.

Tackifier shall be plant-based, such as guar or alpha plantago, or chemical-based such as polyacrylamide or polymers.

Generally, mulches come in 40-50 pound bags. Seed and fertilizer are added at time of application.

Recycled cellulose may contain polychlorinated biphenyl (PCBs). Ecology recommends that products should be evaluated for PCBs prior to use.

Refer to [BMP C126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#) for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.

Any mulch or tackifier product used shall be installed per the manufacturer’s instructions.

Design and Installation Specifications

For mulch materials, application rates, and specifications, see [Table II-3.6: Mulch Standards and Guidelines](#). Consult with the local supplier or the local conservation district for their recommendations. Increase the application rate until the ground is 95% covered (i.e. not visible under the mulch layer). Note: Thickness may be increased for disturbed areas in or near sensitive areas or other areas highly susceptible to erosion.

Where the option of “Compost” is selected, it should be a coarse compost that meets the size gradations listed in [Table II-3.5: Size Gradations of Compost as Mulch Material](#) when tested in accordance with Test Method 02.02-B found in *Test Methods for the Examination of Composting and Compost* (Thompson, 2001).

Table II-3.5: Size Gradations of Compost as Mulch Material

Sieve Size	Percent Passing
3"	100%
1"	90% - 100%
3/4"	70% - 100%
1/4"	40% - 100%

Mulch used within the ordinary high-water mark of surface waters should be selected to minimize potential flotation of organic matter. Composted organic materials have higher specific gravities (densities) than straw, wood, or chipped material. Consult the Hydraulic Permit Authority (HPA) for mulch mixes if applicable.

Maintenance Standards

The thickness of the mulch cover must be maintained.

Any areas that experience erosion shall be remulched and/or protected with a net or blanket. If the erosion problem is drainage related, then the problem shall be fixed and the eroded area remulched.

Table II-3.6: Mulch Standards and Guidelines

Mulch Material	Guideline	Description
Straw	Quality Standards	Air-dried; free from undesirable seed and coarse material.
	Application Rates	2"-3" thick; 5 bales per 1,000 sf or 2-3 tons per acre
	Remarks	Cost-effective protection when applied with adequate thickness. Hand-application generally requires greater thickness than blown straw. The thickness of straw may be reduced by half when used in conjunction with seeding. In windy areas straw must be held in place by crimping, using a tackifier, or covering with netting. Blown straw always has to be held in place with a tackifier as even light winds will blow it away. Straw, however, has several deficiencies that should be considered when selecting mulch materials. It often introduces and/or encourages the propagation of weed species and it has no significant long-term benefits. It should also not be used within the ordinary high-water elevation of surface waters (due to flotation).
Hydromulch	Quality Standards	No growth inhibiting factors.
	Application Rates	Approx. 35-45 lbs per 1,000 sf or 1,500 - 2,000 lbs per acre
	Remarks	Shall be applied with hydromulcher. Shall not be used without seed and tackifier unless the application rate is at least doubled. Fibers longer than about 3/4 - 1 inch clog hydromulch equipment. Fibers should be kept to less than 3/4 inch.
Compost	Quality Standards	No visible water or dust during handling. Must be produced per WAC 173-350 , Solid Waste Handling Standards, but may have up to 35% biosolids.
	Application Rates	2" thick min.; approx. 100 tons per acre (approx. 750 lbs per cubic yard)
	Remarks	More effective control can be obtained by increasing thickness to 3". Excellent mulch for protecting final grades until landscaping because it can be directly seeded or tilled into soil as an amendment. Compost used for mulch has a coarser size gradation than compost used for BMP C125: Topsoiling / Composting or BMP T5.13: Post-Construction Soil Quality and Depth . It is more stable and practical to use in wet areas and during rainy weather conditions. Do not use near wetlands or near phosphorous impaired water bodies.
Chipped Site Vegetation	Quality Standards	Gradations from fines to 6 inches in length for texture, variation, and interlocking properties. Include a mix of various sizes so that the average size is between 2- and 4- inches.
	Application Rates	2" thick min.;

Table II-3.6: Mulch Standards and Guidelines (continued)

Mulch Material	Guideline	Description
	Remarks	<p>This is a cost-effective way to dispose of debris from clearing and grubbing, and it eliminates the problems associated with burning. Generally, it should not be used on slopes above approx. 10% because of its tendency to be transported by runoff. It is not recommended within 200 feet of surface waters. If permanent seeding or planting is expected shortly after mulch, the decomposition of the chipped vegetation may tie up nutrients important to grass establishment.</p> <p>Note: thick application of this material over existing grass, herbaceous species, and some groundcovers could smother and kill vegetation.</p>
Wood-Based Mulch	Quality Standards	No visible water or dust during handling. Must be purchased from a supplier with a Solid Waste Handling Permit or one exempt from solid waste regulations.
	Application Rates	2" thick min.; approx. 100 tons per acre (approx. 750 lbs. per cubic yard)
	Remarks	This material is often called "wood straw" or "hog fuel". The use of mulch ultimately improves the organic matter in the soil. Special caution is advised regarding the source and composition of wood-based mulches. Its preparation typically does not provide any weed seed control, so evidence of residual vegetation in its composition or known inclusion of weed plants or seeds should be monitored and prevented (or minimized).
Wood Strand Mulch	Quality Standards	A blend of loose, long, thin wood pieces derived from native conifer or deciduous trees with high length-to-width ratio.
	Application Rates	2" thick min.
	Remarks	Cost-effective protection when applied with adequate thickness. A minimum of 95-percent of the wood strand shall have lengths between 2 and 10-inches, with a width and thickness between 1/16 and 1/2-inches. The mulch shall not contain resin, tannin, or other compounds in quantities that would be detrimental to plant life. Sawdust or wood shavings shall not be used as mulch. [Specification 9-14.4(4) from the <i>Standard Specifications for Road, Bridge, and Municipal Construction</i> (WSDOT, 2016)

BMP C122: Nets and Blankets

Purpose

Erosion control nets and blankets are intended to prevent erosion and hold seed and mulch in place on steep slopes and in channels so that vegetation can become well established. In addition, some nets and blankets can be used to permanently reinforce turf to protect drainage ways during high flows.

Nets (commonly called matting) are strands of material woven into an open, but high-tensile strength net (for example, coconut fiber matting). Blankets are strands of material that are not tightly woven, but instead form a layer of interlocking fibers, typically held together by a biodegradable or photodegradable netting (for example, excelsior or straw blankets). They generally have lower tensile strength than nets, but cover the ground more completely. Coir (coconut fiber) fabric comes as both nets and blankets.

Conditions of Use

Erosion control netting and blankets shall be made of natural plant fibers unaltered by synthetic materials.

Erosion control nets and blankets should be used:

- To aid permanent vegetated stabilization of slopes 2H:1V or greater and with more than 10 feet of vertical relief.
- For drainage ditches and swales (highly recommended). The application of appropriate netting or blanket to drainage ditches and swales can protect bare soil from channelized runoff while vegetation is established. Nets and blankets also can capture a great deal of sediment due to their open, porous structure. Nets and blankets can be used to permanently stabilize channels and may provide a cost-effective, environmentally preferable alternative to riprap.

Disadvantages of nets and blankets include:

- Surface preparation is required.
- On slopes steeper than 2.5H:1V, net and blanket installers may need to be roped and harnessed for safety.
- They cost at least \$4,000-6,000 per acre installed.

Advantages of nets and blankets include:

- Installation without mobilizing special equipment.
- Installation by anyone with minimal training
- Installation in stages or phases as the project progresses.
- Installers can hand place seed and fertilizer as they progress down the slope.
- Installation in any weather.
- There are numerous types of nets and blankets that can be designed with various parameters in mind. Those parameters include: fiber blend, mesh strength, longevity, biodegradability, cost, and availability.

An alternative to nets and blankets in some limited conditions is [BMP C202: Riprap Channel Lining](#). Ensure that [BMP C202: Riprap Channel Lining](#) is appropriate before using it as a substitute for nets and blankets.

Design and Installation Specifications

- See [Figure II-3.3: Channel Installation \(Clackamas County et al., 2008\)](#) and [Figure II-3.4: Slope Installation](#) for typical orientation and installation of nets and blankets used in channels and as slope protection. Note: these are typical only; all nets and blankets must be installed per manufacturer's installation instructions.
- Installation is critical to the effectiveness of these products. If good ground contact is not achieved, runoff can concentrate under the product, resulting in significant erosion.
- Installation of nets and blankets on slopes:
 1. Complete final grade and track walk up and down the slope.
 2. Install hydromulch with seed and fertilizer.
 3. Dig a small trench, approximately 12 inches wide by 6 inches deep along the top of the slope.
 4. Install the leading edge of the net/blanket into the small trench and staple approximately every 18 inches. NOTE: Staples are metal, "U"-shaped, and a minimum of 6 inches long. Longer staples are used in sandy soils. Biodegradable stakes are also available.
 5. Roll the net/blanket slowly down the slope as the installer walks backward. NOTE: The net/blanket rests against the installer's legs. Staples are installed as the net/blanket is unrolled. It is critical that the proper staple pattern is used for the net/blanket being installed. The net/blanket is not to be allowed to roll down the slope on its own as this stretches the net/blanket, making it impossible to maintain soil contact. In addition, no one is allowed to walk on the net/blanket after it is in place.
 6. If the net/blanket is not long enough to cover the entire slope length, the trailing edge of the upper net/blanket should overlap the leading edge of the lower net/blanket and be stapled. On steeper slopes, this overlap should be installed in a small trench, stapled, and covered with soil.
- With the variety of products available, it is impossible to cover all the details of appropriate use and installation. Therefore, it is critical that the designer consult the manufacturer's information and that a site visit takes place in order to ensure that the product specified is appropriate. Information is also available in WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Division 8-01 and Division 9-14 ([WSDOT, 2016](#)).
- Use jute matting in conjunction with mulch ([BMP C121: Mulching](#)). Excelsior, woven straw blankets and coir (coconut fiber) blankets may be installed without mulch. There are many other types of erosion control nets and blankets on the market that may be appropriate in certain circumstances.
- In general, most nets (e.g., jute matting) require mulch in order to prevent erosion because they have a fairly open structure. Blankets typically do not require mulch because they usually provide complete protection of the surface.
- Extremely steep, unstable, wet, or rocky slopes are often appropriate candidates for use of synthetic blankets, as are riverbanks, beaches and other high-energy environments. If

synthetic blankets are used, the soil should be hydromulched first.

- 100-percent biodegradable blankets are available for use in sensitive areas. These organic blankets are usually held together with a paper or fiber mesh and stitching which may last up to a year.
- Most netting used with blankets is photodegradable, meaning it breaks down under sunlight (not UV stabilized). However, this process can take months or years even under bright sun. Once vegetation is established, sunlight does not reach the mesh. It is not uncommon to find non-degraded netting still in place several years after installation. This can be a problem if maintenance requires the use of mowers or ditch cleaning equipment. In addition, birds and small animals can become trapped in the netting.

Maintenance Standards

- Maintain good contact with the ground. Erosion must not occur beneath the net or blanket.
- Repair and staple any areas of the net or blanket that are damaged or not in close contact with the ground.
- Fix and protect eroded areas if erosion occurs due to poorly controlled drainage.

Figure II-3.3: Channel Installation

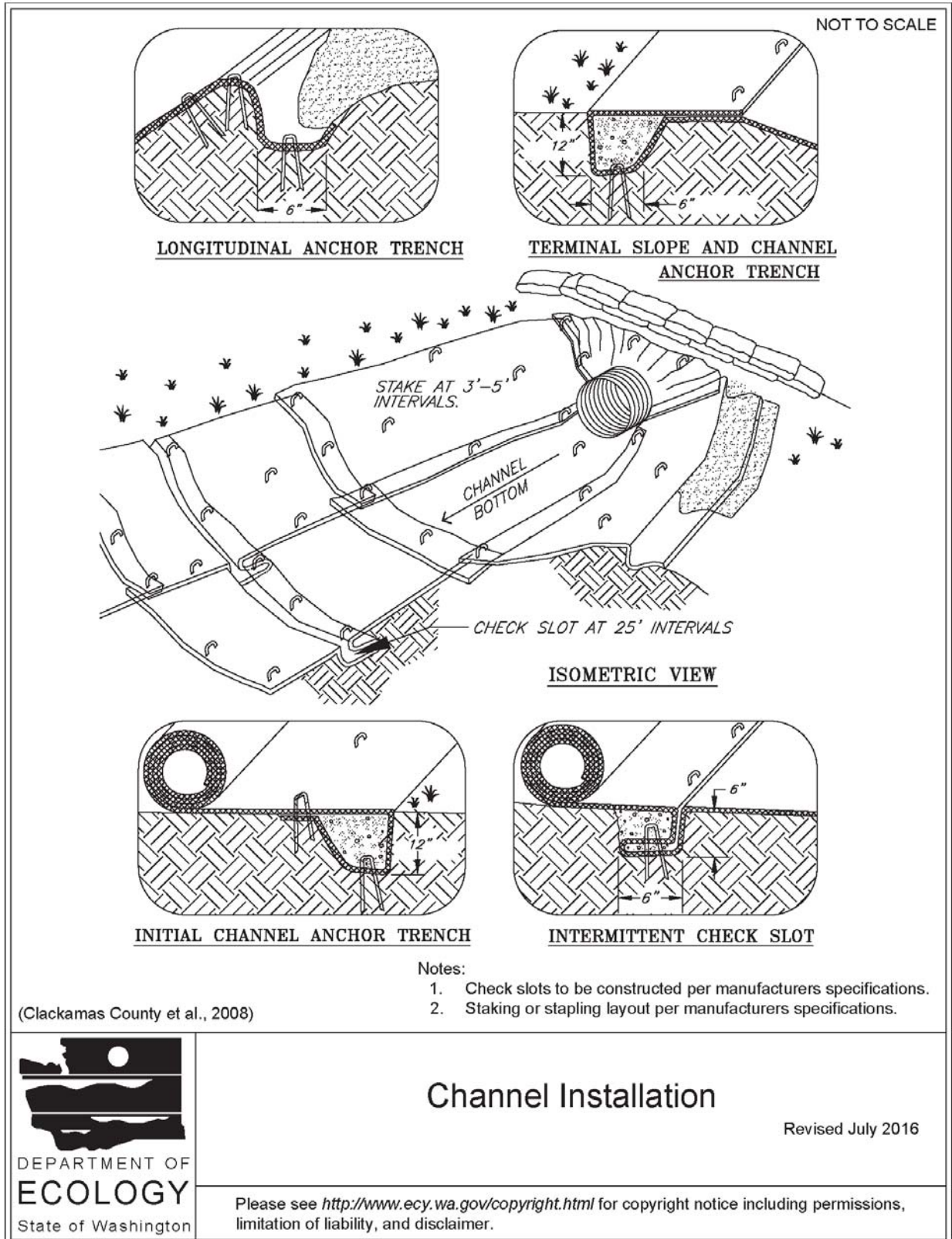
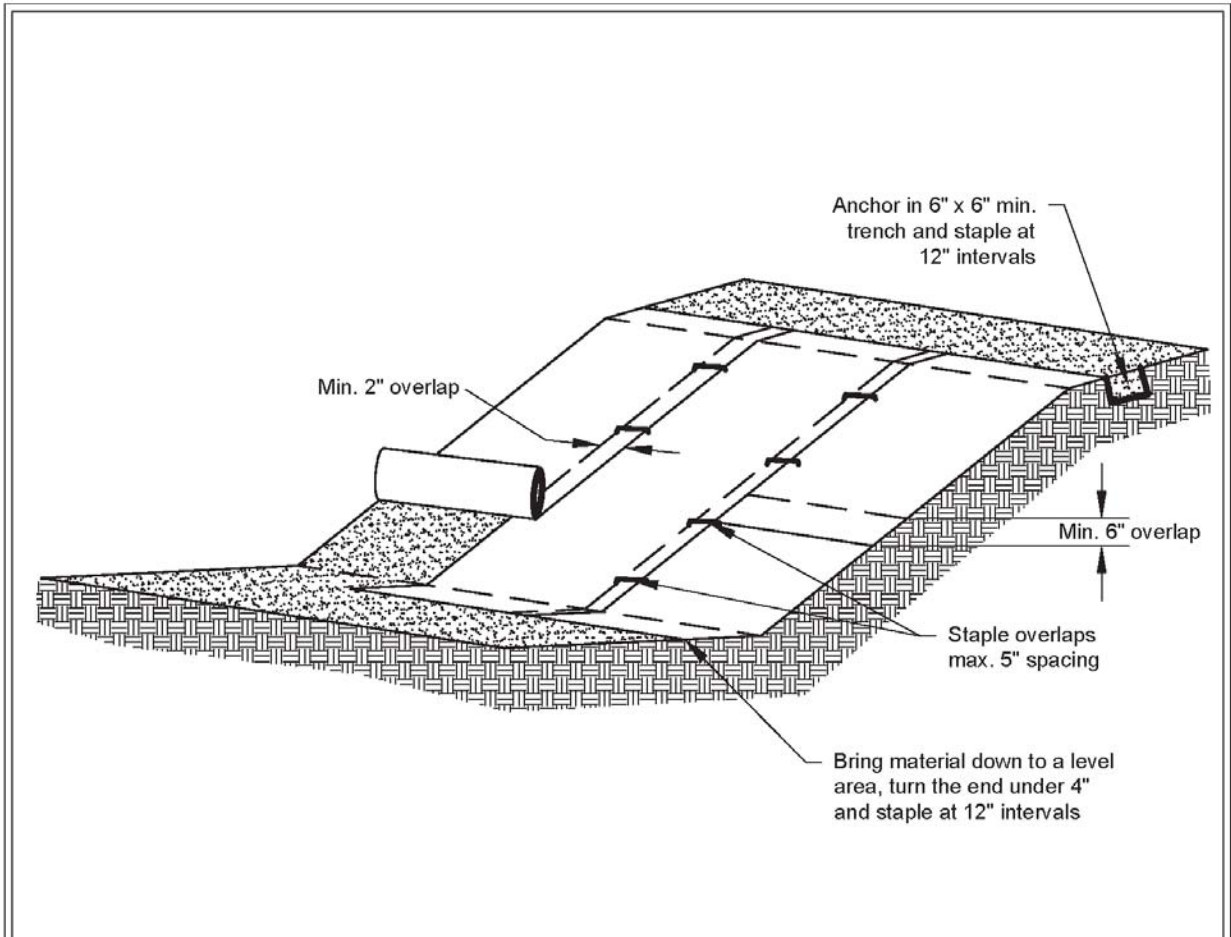


Figure II-3.4: Slope Installation



Notes:

1. Slope surface shall be smooth before placement for proper soil contact.
2. Stapling pattern as per manufacturer's recommendations.
3. Do not stretch blankets/matting tight - allow the rolls to mold to any irregularities.
4. For slopes less than 3H:1V, rolls may be placed in horizontal strips.
5. If there is a berm at the top of the slope, anchor upslope of the berm.
6. Lime, fertilize, and seed before installation. Planting of shrubs, trees, etc. should occur after installation.

NOT TO SCALE



Slope Installation

Revised June 2016

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BMP C123: Plastic Covering

Purpose

Plastic covering provides immediate, short-term erosion protection to slopes and disturbed areas.

Conditions of Use

Plastic covering may be used on disturbed areas that require cover measures for less than 30 days, except as stated below.

- Plastic is particularly useful for protecting cut and fill slopes and stockpiles. However, the relatively rapid breakdown of most polyethylene sheeting makes it unsuitable for applications greater than six months.
- Due to rapid runoff caused by plastic covering, do not use this method upslope of areas that might be adversely impacted by concentrated runoff. Such areas include steep and/or unstable slopes.
- Plastic sheeting may result in increased runoff volumes and velocities, requiring additional on-site measures to counteract the increases. Creating a trough with wattles or other material can convey clean water away from these areas.
- To prevent undercutting, trench and backfill rolled plastic covering products.
- Although the plastic material is inexpensive to purchase, the cost of installation, maintenance, removal, and disposal add to the total costs of this BMP.
- Whenever plastic is used to protect slopes, install water collection measures at the base of the slope. These measures include plastic-covered berms, channels, and pipes used to convey clean rainwater away from bare soil and disturbed areas. Do not mix clean runoff from a plastic covered slope with dirty runoff from a project.
- Other uses for plastic include:
 - Temporary ditch liner.
 - Pond liner in temporary sediment pond.
 - Liner for bermed temporary fuel storage area if plastic is not reactive to the type of fuel being stored.
 - Emergency slope protection during heavy rains.
 - Temporary drainpipe (“elephant trunk”) used to direct water.

Design and Installation Specifications

- Plastic slope cover must be installed as follows:
 1. Run plastic up and down the slope, not across the slope.
 2. Plastic may be installed perpendicular to a slope if the slope length is less than 10 feet.

3. Provide a minimum of 8-inch overlap at the seams.
 4. On long or wide slopes, or slopes subject to wind, tape all seams.
 5. Place plastic into a small (12-inch wide by 6-inch deep) slot trench at the top of the slope and backfill with soil to keep water from flowing underneath.
 6. Place sand filled burlap or geotextile bags every 3 to 6 feet along seams and tie them together with twine to hold them in place.
 7. Inspect plastic for rips, tears, and open seams regularly and repair immediately. This prevents high velocity runoff from contacting bare soil, which causes extreme erosion.
 8. Sandbags may be lowered into place tied to ropes. However, all sandbags must be staked in place.
- Plastic sheeting shall have a minimum thickness of 0.06 millimeters.
 - If erosion at the toe of a slope is likely, a gravel berm, riprap, or other suitable protection shall be installed at the toe of the slope in order to reduce the velocity of runoff.

Maintenance Standards

- Torn sheets must be replaced and open seams repaired.
- Completely remove and replace the plastic if it begins to deteriorate due to ultraviolet radiation.
- Completely remove plastic when no longer needed.
- Dispose of old tires used to weight down plastic sheeting appropriately.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

BMP C124: Sodding

Purpose

The purpose of sodding is to establish turf for immediate erosion protection and to stabilize drainage paths where concentrated overland flow will occur.

- PAM designated for these uses should be "water soluble" or "linear" or "non-crosslinked". Cross-linked or water absorbent PAM, polymerized in highly acidic (pH<2) conditions, are used to maintain soil moisture content.
- The PAM anionic charge density may vary from 2-30 percent; a value of 18 percent is typical. Studies conducted by the United States Department of Agriculture (USDA)/ARS demonstrated that soil stabilization was optimized by using very high molecular weight (12-15 mg/-mole), highly anionic (>20% hydrolysis) PAM.
- PAM tackifiers are available and being used in place of guar and alpha plantago. Typically, PAM tackifiers should be used at a mixing rate of no more than 0.5-1 lb. per 1000 gallons of water in a hydromulch machine. Some tackifier product instructions say to use at an application rate of 3 – 5 lbs per acre, which can be too much. In addition, pump problems can occur at higher application rates due to increased viscosity.

Maintenance Standards

- PAM may be reapplied on actively worked areas after a 48-hour period.
- Reapplication is not required unless PAM treated soil is disturbed or unless turbidity levels show the need for an additional application. If PAM treated soil is left undisturbed, a reapplication may be necessary after two months. More PAM applications may be required for steep slopes, silty and clayey soils (USDA Classification Type "C" and "D" soils), long grades, and high precipitation areas. When PAM is applied first to bare soil and then covered with straw, a reapplication may not be necessary for several months.
- Loss of sediment and PAM may be a basis for penalties per [RCW 90.48.080](#).
- PAM may affect the treatment efficiency of chitosan flocculent systems.

BMP C130: Surface Roughening

Purpose

Surface roughening aids in the establishment of vegetative cover, reduces runoff velocity, increases infiltration, and provides for sediment trapping through the provision of a rough soil surface. Horizontal depressions are created by operating a tiller or other suitable equipment on the contour or by leaving slopes in a roughened condition by not fine grading them.

Use this BMP in conjunction with other BMPs such as [BMP C120: Temporary and Permanent Seeding](#), [BMP C121: Mulching](#), or [BMP C124: Sodding](#).

Conditions for Use

- All slopes steeper than 3H:1V and greater than 5 vertical feet require surface roughening to a depth of 2 to 4 inches prior to seeding.
- Areas that will not be stabilized immediately may be roughened to reduce runoff velocity until seeding takes place.

- Slopes with a stable rock face do not require roughening.
- Slopes where mowing is planned should not be excessively roughened.

Design and Installation Specifications

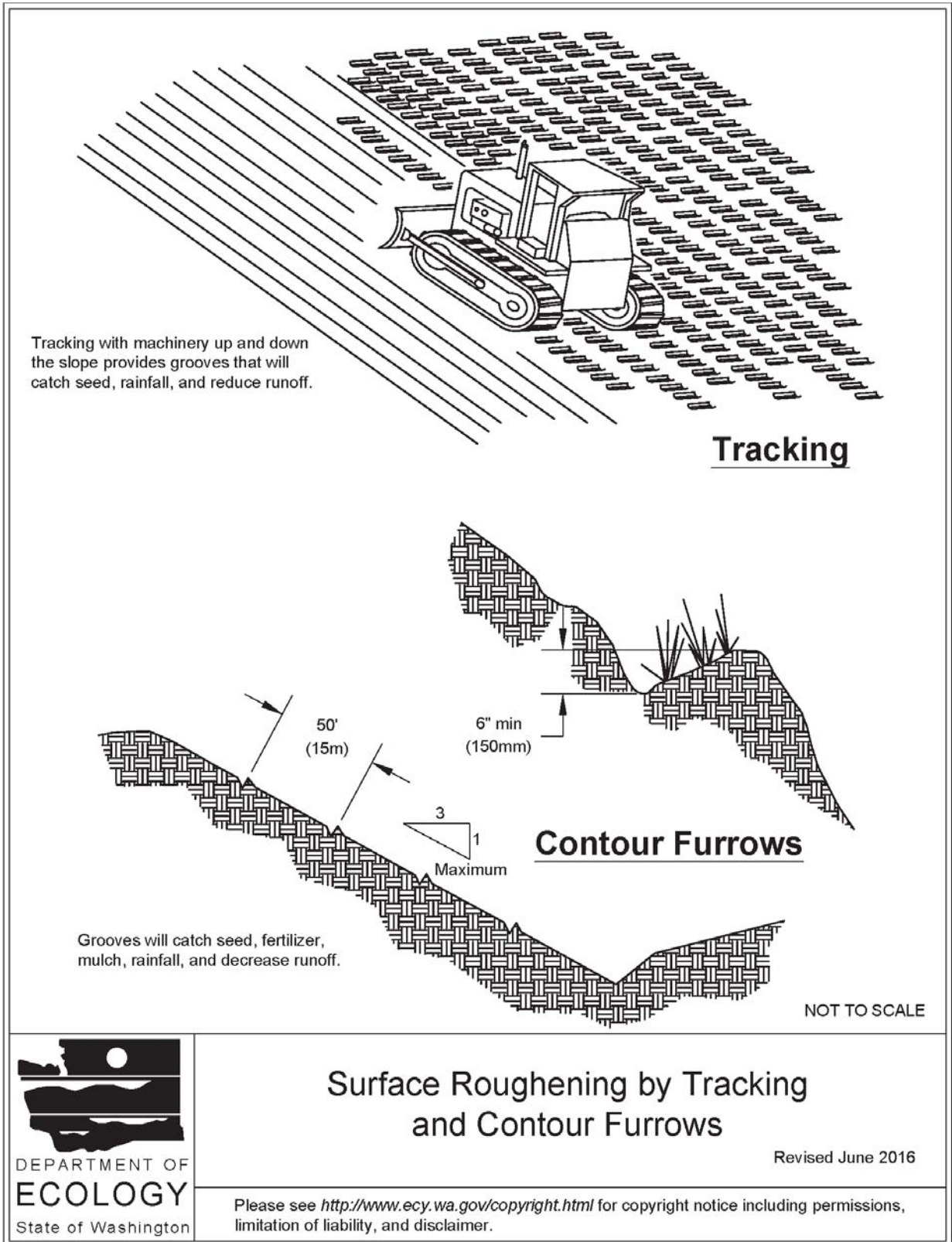
There are different methods for achieving a roughened soil surface on a slope, and the selection of an appropriate method depends upon the type of slope. Roughening methods include stair-step grading, grooving, contour furrows, and tracking. See [Figure II-3.5: Surface Roughening by Tracking and Contour Furrows](#). Factors to be considered in choosing a roughening method are slope steepness, mowing requirements, and whether the slope is formed by cutting or filling.

- Disturbed areas that will not require mowing may be stair-step graded, grooved, or left rough after filling.
- Stair-step grading is particularly appropriate in soils containing large amounts of soft rock. Each "step" catches material that sloughs from above, and provides a level site where vegetation can become established. Stairs should be wide enough to work with standard earth moving equipment. Stair steps must be on contour or gullies will form on the slope.
- Areas that will be mowed (these areas should have slopes less steep than 3H:1V) may have small furrows left by disking, harrowing, raking, or seed-planting machinery operated on the contour.
- Graded areas with slopes steeper than 3H:1V but less than 2H:1V should be roughened before seeding. This can be accomplished in a variety of ways, including "track walking," or driving a crawler tractor up and down the slope, leaving a pattern of cleat imprints parallel to slope contours.
- Tracking is done by operating equipment up and down the slope to leave horizontal depressions in the soil.

Maintenance Standards

- Areas that are surface roughened should be seeded as quickly as possible.
- Regular inspections should be made of the area. If rills appear, they should be re-roughened and re-seeded immediately.

Figure II-3.5: Surface Roughening by Tracking and Contour Furrows



BMP C140: Dust Control

Purpose

Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

Conditions of Use

Use dust control in areas (including roadways) subject to surface and air movement of dust where on-site or off-site impacts to roadways, drainage ways, or surface waters are likely.

Design and Installation Specifications

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until the surface is wet. Repeat as needed. To prevent carryout of mud onto the street, refer to [BMP C 105: Stabilized Construction Access](#) and [BMP C 106: Wheel Wash](#).
- Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local governments may approve other dust palliatives such as calcium chloride or PAM.
- PAM ([BMP C 126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#)) added to water at a rate of 0.5 pounds per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may reduce the quantity of water needed for dust control. Note that the application rate specified here applies to this BMP, and is not the same application rate that is specified in [BMP C 126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#), but the downstream protections still apply.

Refer to [BMP C 126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#) for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.

- Contact your local Air Pollution Control Authority for guidance and training on other dust control measures. Compliance with the local Air Pollution Control Authority constitutes

compliance with this BMP.

- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- Techniques that can be used for unpaved roads and lots include:
 - Lower speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
 - Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
 - Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles (those smaller than .075 mm) to 10 to 20 percent.
 - Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
 - Encourage the use of alternate, paved routes, if available.
 - Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
 - Limit dust-causing work on windy days.
 - Pave unpaved permanent roads and other trafficked areas.

Maintenance Standards

Respray area as necessary to keep dust to a minimum.

BMP C150: Materials on Hand

Purpose

Keep quantities of erosion prevention and sediment control materials on the project site at all times to be used for regular maintenance and emergency situations such as unexpected heavy rains. Having these materials on-site reduces the time needed to replace existing or implement new BMPs when inspections indicate that existing BMPs are not meeting the Construction SWPPP requirements. In addition, contractors can save money by buying some materials in bulk and storing them at their office or yard.

Conditions of Use

- Construction projects of any size or type can benefit from having materials on hand. A small commercial development project could have a roll of plastic and some gravel available for immediate protection of bare soil and temporary berm construction. A large earthwork project, such as highway construction, might have several tons of straw, several rolls of plastic, flexible

thickness is 2 feet.

- For outlets at the base of steep slope pipes (pipe slope greater than 10 percent), use an engineered energy dissipator.
- Filter fabric or erosion control blankets should always be used under riprap to prevent scour and channel erosion. See [BMP C122: Nets and Blankets](#).
- Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. This work may require a Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife. See [I-2.11 Hydraulic Project Approvals](#).

Maintenance Standards

- Inspect and repair as needed.
- Add rock as needed to maintain the intended function.
- Clean energy dissipator if sediment builds up.

BMP C220: Inlet Protection

Purpose

Inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use

Use inlet protection at inlets that are operational before permanent stabilization of the disturbed areas that contribute runoff to the inlet. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by a sediment trapping BMP.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters can add significant amounts of sediment into the roof drain system. If possible, delay installing lawn and yard drains until just before landscaping, or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18-inches of sod around each finished lawn and yard drain.

[Table II-3.10: Storm Drain Inlet Protection](#) lists several options for inlet protection. All of the methods for inlet protection tend to plug and require a high frequency of maintenance. Limit contributing drainage areas for an individual inlet to one acre or less. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table II-3.10: Storm Drain Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding may occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30'x30'/acre
Block and gravel drop inlet protection	Yes	Paved or Earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No	Paved or Earthen	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or Earthen	Frequent maintenance required.
Curb Inlet Protection			
Curb inlet protection with wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
Culvert Inlet Protection			
Culvert inlet sediment trap	N/A	N/A	18 month expected life.

Design and Installation Specifications

Excavated Drop Inlet Protection

Excavated drop inlet protection consists of an excavated impoundment around the storm drain inlet. Sediment settles out of the stormwater prior to entering the storm drain. Design and installation specifications for excavated drop inlet protection include:

- Provide a depth of 1-2 ft as measured from the crest of the inlet structure.
- Slope sides of excavation should be no steeper than 2H:1V.
- Minimum volume of excavation is 35 cubic yards.
- Shape the excavation to fit the site, with the longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water.
- Clear the area of all debris.

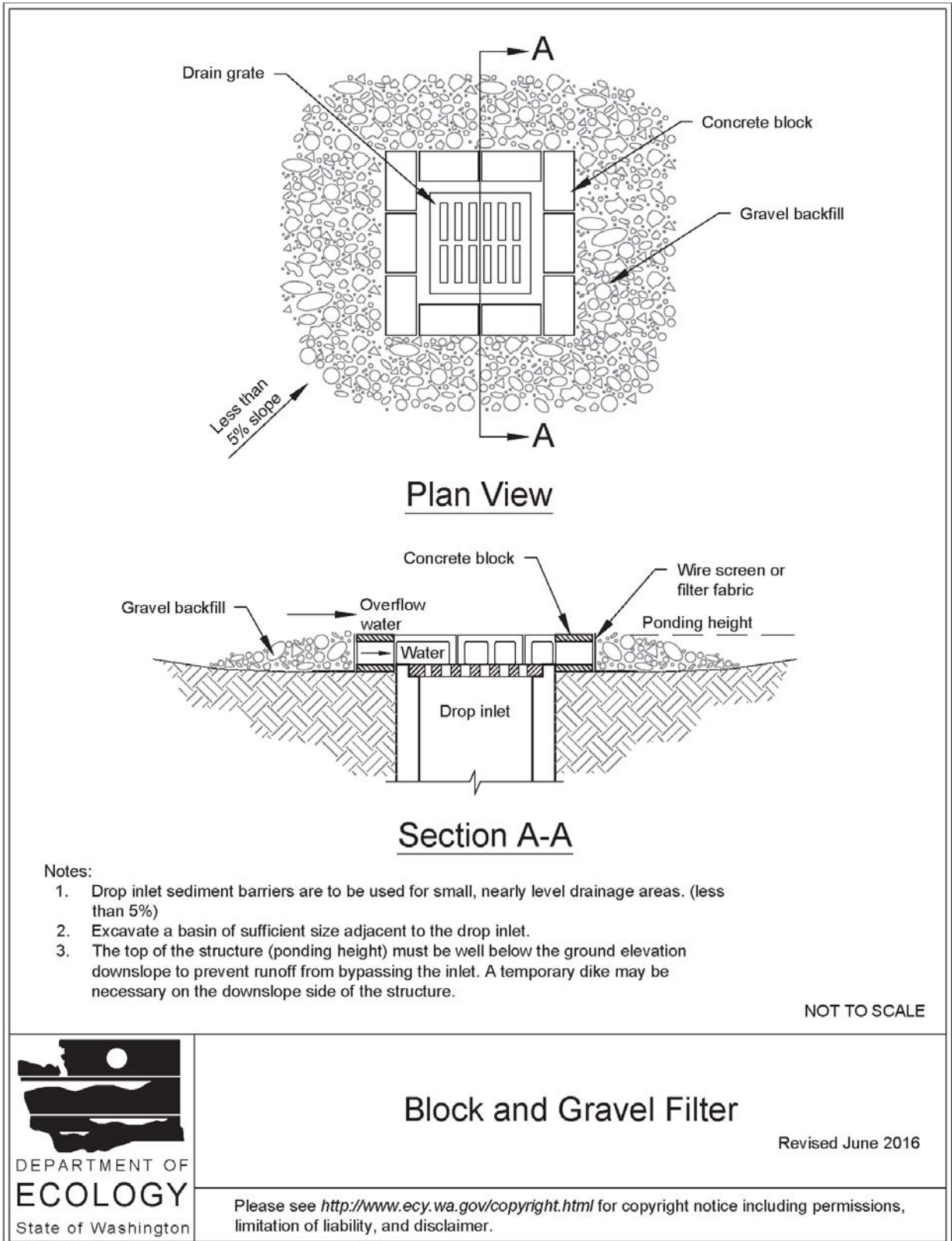
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- Build a temporary dike, if necessary, to the down slope side of the structure to prevent bypass flow.

Block and Gravel Filter

A block and gravel filter is a barrier formed around the inlet with standard concrete blocks and gravel. See [Figure II-3.17: Block and Gravel Filter](#). Design and installation specifications for block gravel filters include:

- Provide a height of 1 to 2 feet above the inlet.
- Recess the first row of blocks 2-inches into the ground for stability.
- Support subsequent courses by placing a pressure treated wood 2x4 through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side to allow for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel to just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel berm surrounding the inlet, as follows:
 - Provide a slope of 3H:1V on the upstream side of the berm.
 - Provide a slope of 2H:1V on the downstream side of the berm.
 - Provide a 1-foot wide level stone area between the gravel berm and the inlet.
 - Use stones 3 inches in diameter or larger on the upstream slope of the berm.
 - Use gravel ½- to ¾-inch at a minimum thickness of 1-foot on the downstream slope of the berm.

Figure II-3.17: Block and Gravel Filter



Gravel and Wire Mesh Filter

Gravel and wire mesh filters are gravel barriers placed over the top of the inlet. This method does not provide an overflow. Design and installation specifications for gravel and wire mesh filters include:

- Use a hardware cloth or comparable wire mesh with ½-inch openings.
 - Place wire mesh over the drop inlet so that the wire extends a minimum of 1-foot beyond each side of the inlet structure.
 - Overlap the strips if more than one strip of mesh is necessary.
- Place coarse aggregate over the wire mesh.
 - Provide at least a 12-inch depth of aggregate over the entire inlet opening and extend at least 18-inches on all sides.

Catch Basin Filters

Catch basin filters are designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements, combine a catch basin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way. Design and installation specifications for catch basin filters include:

- Provides 5 cubic feet of storage.
- Requires dewatering provisions.
- Provides a high-flow bypass that will not clog under normal use at a construction site.
- Insert the catch basin filter in the catch basin just below the grating.

Curb Inlet Protection with Wooden Weir

Curb inlet protection with wooden weir is an option that consists of a barrier formed around a curb inlet with a wooden frame and gravel. Design and installation specifications for curb inlet protection with wooden weirs include:

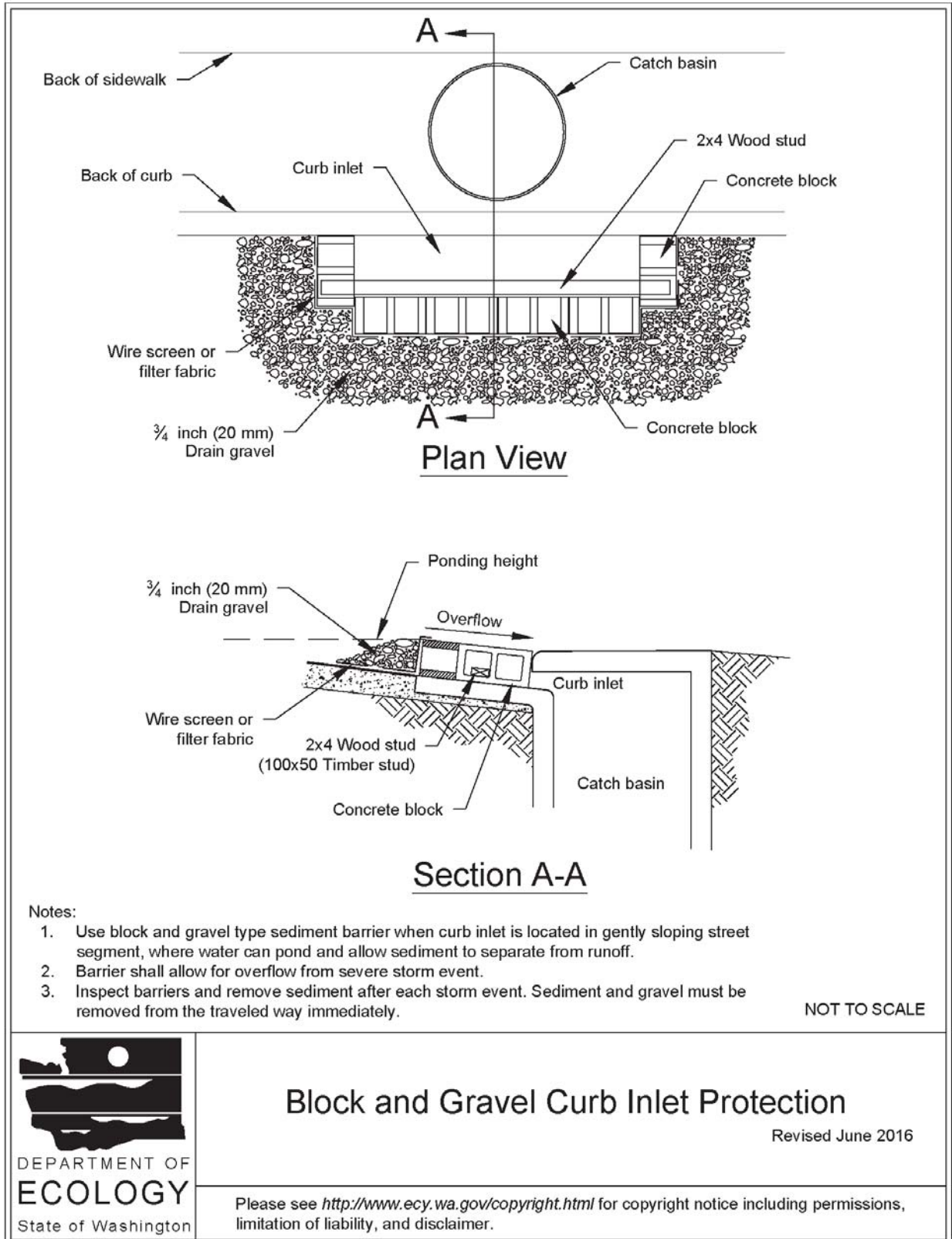
- Use wire mesh with ½-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on the frame anchors.

Block and Gravel Curb Inlet Protection

Block and gravel curb inlet protection is a barrier formed around a curb inlet with concrete blocks and gravel. See [Figure II-3.18: Block and Gravel Curb Inlet Protection](#). Design and installation specifications for block and gravel curb inlet protection include:

- Use wire mesh with ½-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

Figure II-3.18: Block and Gravel Curb Inlet Protection

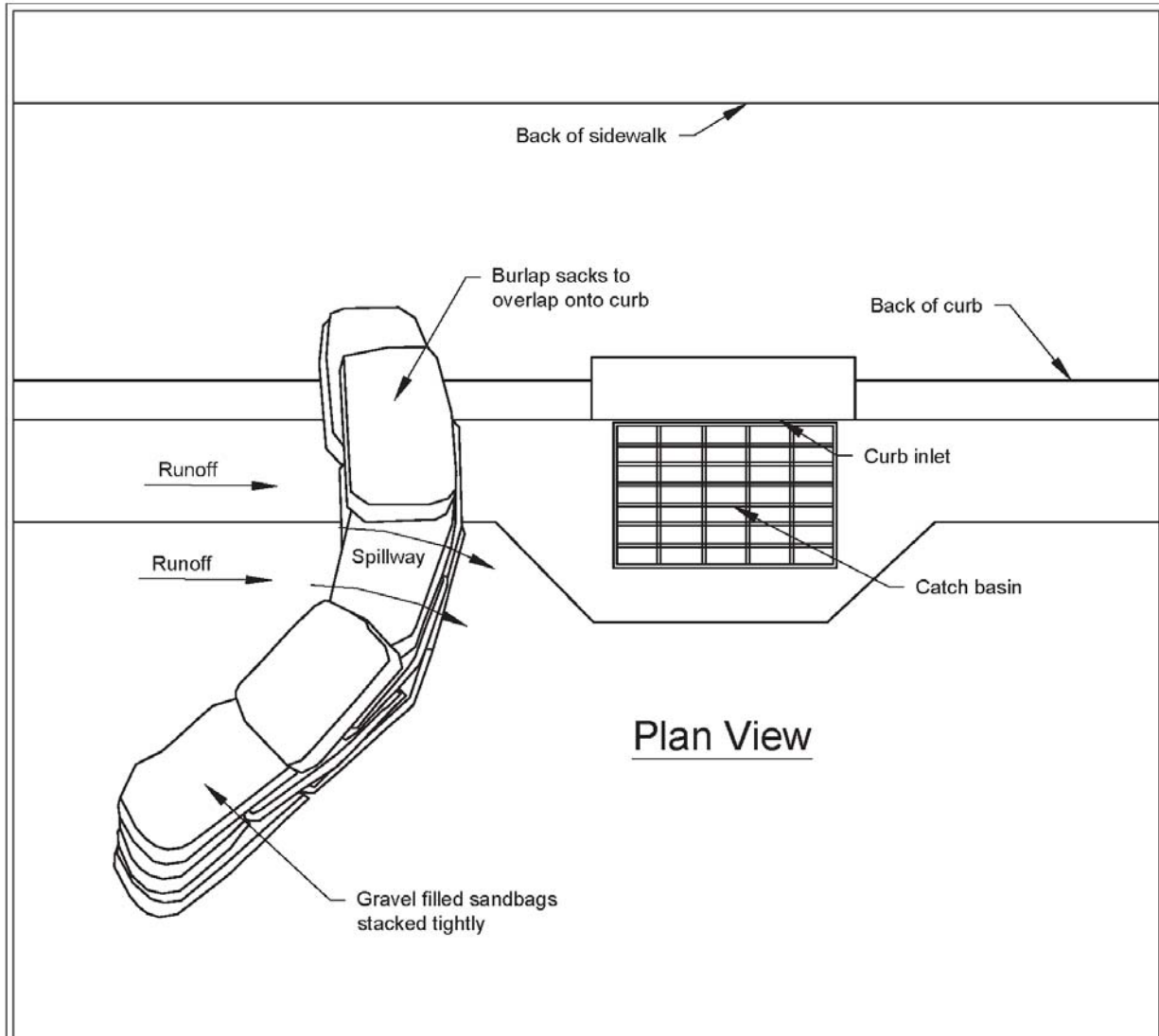


Curb and Gutter Sediment Barrier

Curb and gutter sediment barrier is a sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See [Figure II-3.19: Curb and Gutter Barrier](#). Design and installation specifications for curb and gutter sediment barrier include:

- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 2 feet from the inlet.
- Construct a horseshoe shaped sedimentation trap on the upstream side of the berm. Size the trap to sediment trap standards for protecting a culvert inlet.

Figure II-3.19: Curb and Gutter Barrier



Notes:

1. Place curb type sediment barriers on gently sloping street segments, where water can pond and allow sediment to separate from runoff.
2. Sandbags of either burlap or woven 'geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

NOT TO SCALE



Curb and Gutter Barrier

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Maintenance Standards

- Inspect all forms of inlet protection frequently, especially after storm events. Clean and replace clogged catch basin filters. For rock and gravel filters, pull away the rocks from the inlet and clean or replace. An alternative approach would be to use the clogged rock as fill and put fresh rock around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

BMP C231: Brush Barrier

Purpose

The purpose of brush barriers is to reduce the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

- Brush barriers may be used downslope of disturbed areas that are less than one-quarter acre.
- Brush barriers are not intended to treat concentrated flows, nor are they intended to treat substantial amounts of overland flow. Any concentrated flows must be directed to a sediment trapping BMP. The only circumstance in which overland flow can be treated solely by a brush barrier, rather than by a sediment trapping BMP, is when the area draining to the barrier is small.
- Brush barriers should only be installed on contours.

Design and Installation Specifications

- Height: 2 feet (minimum) to 5 feet (maximum).
- Width: 5 feet at base (minimum) to 15 feet (maximum).
- Filter fabric (geotextile) may be anchored over the brush berm to enhance the filtration ability of the barrier. Ten-ounce burlap is an adequate alternative to filter fabric.

Volume IV

Source Control BMP Library

Stormwater Management Manual for Western Washington

Prepared by:

Washington State Department of Ecology
Water Quality Program

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- Operators may use a manually operated positive control valve for uncovered wash pads, but a pneumatic or electric valve system is preferable. The valve may be on a timer circuit and opened upon completion of a wash cycle. After draining the sump or separator, the timer would then close the valve.
- Minimize the use of water and detergents in washing operations when practicable.
- Use phosphate-free biodegradable detergents when practicable.
- Use the least hazardous cleaning products available.
- Consider recycling the washwater.

Operators may use soluble/emulsifiable detergents in the wash medium and should use it with care and the appropriate treatment. Carefully consider the selection of soaps and detergents and treatment BMPs. Oil/water separators are ineffective in removing emulsified or water soluble detergents. Another treatment appropriate for emulsified and water soluble detergents may be required.

Exceptions:

- At gas stations (for charity car washes) or commercial parking lots, where it is not possible to discharge the washwater to a sanitary sewer, a temporary plug or a temporary sump pump can be used at the storm drain to collect the washwater for off-site disposal such as to a nearby sanitary sewer.
- New and used car dealerships may wash vehicles in the parking stalls as long as employees use a temporary plug system to collect the washwater for disposal as stated above, or an approved treatment system for the washwater is in place.

At industrial sites, contact Ecology for NPDES Permit requirements even when not using soaps, detergents, and/or other chemical cleaners in washing trucks.

S434 BMPs for Dock Washing

Description of Pollutant Sources: Washing docks (or wharves, piers, floats, and boat ramps) can result in the discharge dirt, bird feces, soaps, and detergents that can be toxic to aquatic life, especially after they take on contaminants while cleaning. The BMPs in this section do not address dry docks, graving docks, or marine railway cleaning operations.

Pollutant Control Approach: Use dry methods and equipment (scraping, sweeping, vacuuming) to remove debris and contaminants prior to cleaning with water to prevent these substances from entering surface water.

Applicable Operational BMPs:

Surface Preparation and Spot Cleaning

- Scoop and collect debris and bird feces.
- Sweep, capture, and dispose of debris from the dock as solid waste. Sweep or vacuum docks to minimize the need for chemical cleaners.

- During cleaning activities, if debris, substances, or wash water could enter surface waters through drains, temporarily block the drains and collect the water for proper disposal.
- Hose down the area if necessary and collect water as feasible.
- Try spot cleaning with water and a coarse cloth before using soaps or detergents.
- If a cleaner is needed for spot cleaning:
 - Mix it in a bucket and use it to scrub down only the areas that need extra attention.
 - Start with vinegar and baking soda and move to other options as needed. Spot clean using a rag if harsher cleaning products are needed.
 - Avoid or minimize the use of petroleum distillates, chlorinated solvents, and ammoniated cleaning agents.
 - Use degreasers or absorbent material to remove residual grease by hand and do not allow this material to enter surface water.
 - Keep cleaners in sealed containers. Keep cleaner containers closed securely when transporting between the shore and docks.
 - Properly dispose of the dirty bucket water.
- Minimize the scour impact of wash water to any exposed soil at the landward end(s) of the dock or below the dock. Place a tarp over exposed soil, plant vegetation, or put berms to contain eroded soil.

Dock Washing and Disposal

- To the extent practicable, collect any wash water generated from hosing down, pressure washing, or cleaning dock areas, and dispose of it properly.
- The following video, provided courtesy of the Port of Seattle, highlights the methods they have developed to collect wash water generated during dock washing.

Video: Dock Scrubbing at Port of Seattle (YouTube Link): <https://www.youtube.com/watch?v=7RBFdjC3K1Q>
- Try pressure washing using light pressure. This uses less water and decreases the need for soap and scrubbing when washing the dock. Avoid using excessive pressure, which may damage the dock or send flakes of paint and other material into the water.
- Do not place any debris and substances resulting from cleaning activities in shoreline areas, riparian areas, or on adjacent land where these substances may erode into waters of the state.
- Where treated wood associated with the structure being washed are present, use non-abrasive methods and tools that, to the maximum extent practicable, minimize removal of the creosote or treated wood fibers when it removes marine growth from creosote or any other treated wood.
- Do not discharge removed marine growth to waters of the state where such marine growth

would accumulate on the sea bed.

- Do not discharge emulsifiers, dispersants, solvents, or other toxic deleterious materials to waters of the state.

S441 BMPs for Potable Water Line Flushing, Water Tank Maintenance, and Hydrant Testing

Description of Pollutant Sources: Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in systems. Flushing done improperly can result in the discharge of solids to receiving waters. Hydrant testing may result in the discharge of rust particles.

Chemicals used in line flushing and tank maintenance are highly toxic to aquatic organisms and can degrade receiving waters.

Pollutant Control Approach: Dechlorinate and pH adjust water used for flushing, tank maintenance, or hydrant testing. Dispose of the water to the sanitary sewer if possible.

Applicable Operational BMPs:

- Remove solids from associated curbs and gutters before flushing water. Use erosion and sediment control BMPs such as [BMP C235: Wattles](#), [BMP C220: Inlet Protection](#), etc. to collect any solids resulting from flushing activities.
- If using super chlorination or chemical treatment as part of flushing, discharge water to the sanitary sewer. If sanitary sewer is not available, the water may be infiltrated to the ground as long as all of the following are met:
 - The water is dechlorinated to a total residual chlorine of 0.1 ppm or less.
 - Water quality standards are met.
 - A diffuser is used to prevent erosion.
 - The water does not cross property lines.
- Discharging water to a drainage system requires approval from the local jurisdiction. Check with the local jurisdiction to determine their requirements for approval. Most jurisdictions will require the water to be dechlorinated to a total residual chlorine concentration of 0.1 ppm or less and pH adjusted if necessary. Water must be volumetrically and velocity controlled to prevent resuspension of sediments or pollutants in the Municipal Separate Storm Sewer System (MS4).
- Do not over apply dechlorination agents. This can deplete the dissolved oxygen concentration and reduce the pH in discharge / receiving waters.

Optional Operational BMPs:

- If possible, design flushing to convey accumulated material to strategic locations, such as to the sanitary sewer or to a treatment facility; thus, preventing re-suspension and overflow of a

- Consider installing an aircraft de/anti-icing chemical recovery system, or contract with a chemical recycler.

Applicable BMPs for Airport Runways/Taxiways:

- Avoid excessive application of all de/anti-icing chemicals, which could contaminate stormwater.
- Store and transfer de/anti-icing materials on an impervious containment pad or an equivalent containment area and/or under cover in accordance with [S429 BMPs for Storage or Transfer \(Outside\) of Solid Raw Materials, Byproducts, or Finished Products](#). Consider other material storage and transfer approaches only if the de/anti-icer material will not contaminate stormwater.

Recommended Additional BMPs for Airport Runways/Taxiways:

- Include limits on toxic materials and phosphorous in the specifications for de/anti-icers, where applicable.
- Consider using anti-icing materials rather than deicers if it will result in less adverse environmental impact.
- Select cost-effective de/anti-icers that cause the least adverse environmental impact.

S406 BMPs for Streets and Highways

Description of Pollutant Sources: These BMPs apply to the maintenance and deicing/anti-icing of streets and highways. Deicing products can be conveyed during storm events to inlets/catch basins or to receiving waters after application. Leaks and spills of these products can also occur during their handling and storage. Equipment and processes used during maintenance can contribute pollutants such as oil and grease, suspended solids, turbidity, high pH, and metals.

Pollutant Control Approach: Apply good housekeeping practices, preventative maintenance, properly train employees, and use materials that cause less adverse effects on the environment.

Applicable BMPs:

Deicing and Anti-Icing Operations

- Adhere to manufacturer's guidelines and industry standards of use and application.
- Store and transfer de and anti-icing materials on impervious containment pads, or an equivalent spill/leak containment area in accordance with [S429 BMPs for Storage or Transfer \(Outside\) of Solid Raw Materials, Byproducts, or Finished Products](#).
- Sweep/clean up accumulated de and anti-icing materials and grit from roads as soon as possible after the road surface clears.
- Minimize use in areas where runoff or spray from the roadway immediately enters sensitive areas such as fish-bearing streams.

Maintenance Operations

- Use drip pans or absorbents wherever concrete, asphalt, asphalt emulsion, paint product, and drips are likely to spill, such as beneath discharge points from equipment.
- Cover and contain nearby storm drains to keep runoff from entering the drainage system.
- Collect and contain all solids, slurry, and rinse water. Do not allow these to enter gutters, storm drains, or drainage ditches or onto the paved surface of a roadway or driveway.
- Designate an area onsite for washing hand tools and collect that water for disposal.
- Conduct all fueling of equipment in accordance with [S419 BMPs for Mobile Fueling of Vehicles and Heavy Equipment](#).
- Do not use diesel fuel for cleaning or prepping asphalt tools and equipment.
- Sweep areas as frequently as needed. Collect all loose aggregate and dust for disposal. Do not hose down areas into storm drains.
- Store all fuel, paint, and other products on secondary containment.
- Conduct paint striping operations during dry weather.

Recommended Additional BMPs:

- Where feasible and practicable, use roadway deicing chemicals that cause the least adverse environmental impact. Apply only as needed using minimum quantities. Consider the Pacific Northwest Snowfighters Qualified Products List when selecting roadway de-icers and anti-icers.
- Intensify roadway and drainage structure cleaning in early spring to help remove particulates from road surfaces.
- Include limits on toxic metals in the specifications for de/anti-icers.
- Install catch basin inserts to collect excess sediment and debris as necessary. Inspect and maintain catch basin inserts to ensure they are working correctly.
- Research admixtures (e.g. corrosion inhibitors, surfactants) to determine what additional pollutants may be an issue. Verify with the local jurisdiction if there are any restrictions on admixtures.

S415 BMPs for Maintenance of Public and Private Utility Corridors and Facilities

Description of Pollutant Sources: Corridors and facilities at petroleum product pipelines, natural gas pipelines, water pipelines, electrical power transmission corridors, and rights-of-way can be sources of pollutants such as herbicides used for vegetation management, and eroded soil particles from unpaved access roads. At pump stations, waste materials generated during maintenance activities may be temporarily stored outside. Additional potential pollutant sources include the leaching of

the storage area is not under a roof to protect it from rainfall, manage runoff by directing it to a stormwater treatment area. ([FDACS, 2014](#))

S450 BMPs for Irrigation

Description of Pollutant Sources: Irrigation consists of discharges from irrigation water lines, landscape irrigation, and lawn or garden watering. Excessive watering can lead to discharges of chlorinated potable water runoff into drainage systems; it can also cause erosion; and negatively affect plant health. Improper irrigation can encourage pest problems, leach nutrients, and make a lawn completely dependent on artificial watering. Mosquito breeding habitats may form through excessive watering.

Pollutant Control Approach: Limit the amount and location of watering to prevent runoff and discharges to drainage systems.

Applicable Operational BMPs:

- Irrigate with the minimum amount of water needed. Never water at rates that exceed the infiltration rate of the soil.
- Maintain all irrigation systems so that irrigation water is applied evenly and where it is needed.
- Ensure sprinkler systems do not overspray vegetated areas resulting in excess water discharging into the drainage system.
- Inspect irrigated areas for excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.
- Inspect irrigated areas regularly for signs of erosion and / or discharge.
- Place sprinkler systems appropriately so that water is not being sprayed on impervious surfaces instead of vegetation.
- Repair broken or leaking sprinkler nozzles as soon as possible.
- Appropriately irrigate lawns based on the species planted, the available water holding capacity of the soil, and the efficiency of the irrigation system.
 - The depth from which a plant normally extracts water depends on the rooting depth of the plant. Appropriately irrigated lawn grasses normally root in the top 6 to 12 inches of soil; lawns irrigated on a daily basis often root only in the top 1 inch of soil.
- Do not irrigate plants during or immediately after fertilizer application. The longer the period between fertilizer application and irrigation, the less fertilizer runoff occurs.
- Do not irrigate plants during or immediately after pesticide application (unless the pesticide label directs such timing).
- Reduce frequency and / or intensity of watering as appropriate for the wet season (October 1 to April 30).

- Place irrigation systems to ensure that plants receive water where they need it. For example, do not place irrigation systems downgradient of plant's root zones on hillsides.

Recommended Operational BMPs:

- Add a tree bag or slow-release watering device (e.g., bucket with a perforated bottom) for watering newly installed trees when irrigation system is not present.
- Water deeply, but infrequently, so that the top 6 to 12 inches of the root zone is moist.
- Use soaker hoses or spot water with a shower type wand when an irrigation system is not present.
 - Pulse water to enhance soil absorption, when feasible.
 - Pre-moisten soil to break surface tension of dry or hydrophobic soils/mulch, followed by several more passes. With this method, each pass increases soil absorption and allows more water to infiltrate prior to runoff.
- Identify trigger mechanisms for drought-stress (e.g., leaf wilt, leaf senescence, etc.) of different species and water immediately after initial signs of stress appear.
- Water during drought conditions or more often if necessary to maintain plant cover.
- Adjust irrigation frequency / intensity as appropriate after plant establishment.
- Annually inspect irrigation systems to ensure:
 - That there are no blockages of sprayer nozzles.
 - Sprayer nozzles are rotating as appropriate.
 - Sprayer systems are still aligned with the plant locations and root zones.
- Consult with the local water utility, Conservation District, or Cooperative Extension office to help determine optimum irrigation practices.
- Do not use chemigation and fertigation in irrigation systems. This will help avoid over application of pesticides and fertilizers.

S442 BMPs for Labeling Storm Drain Inlets On Your Property

Description of Pollutant Sources: Waste materials dumped into storm drain inlets can have severe impacts on receiving waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Pollutant Control Approach: The stencil, affixed sign, or metal grate contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Applicable Operational BMPs:

- Label storm drain inlets in residential, commercial, industrial areas, and any other areas where contributions or dumping to storm drains is likely.
- Stencil or apply storm drain markers adjacent to storm drain inlets to help prevent the improper disposal of pollutants. Or, use a storm drain grate stamped with warnings against polluting.
- Place the marker in clear sight facing toward anyone approaching the inlet from either side.
- Use a brief statement and / or graphical icons to discourage illegal dumping. Examples include:
 - “No Dumping – Drains to Stream”
 - “No Pollutants – Drains to Puget Sound”
 - “Dump No Waste – Drains to Lake”
 - “No Dumping – Puget Sound Starts Here”
- Check with your local government agency to find out if they have approved specific signage and / or storm drain message placards for use. Consult the local agency stormwater staff to determine specific requirements for placard types and methods of application.
- Maintain the legibility of markers and signs. Signage on top of curbs tends to weather and fade. Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.
- When painting stencils or installing markers, temporarily block the storm drain inlet so that no pollutants are discharged from the labeling activities.

Optional Operational BMPs:

Use a stencil in addition to a storm drain marker or grate to increase visibility of the message.

Reference for this BMP: [\(CASQA, 2003\)](#)

Figure IV-7.6: Storm Drain Inlet Labels



Storm Drain Inlet Labels

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slurry.

- Equip the driller to quickly respond to unusual conditions that may arise.
- Locate and prepare access roadways to minimize the amount of excavation and the potential for erosion.
- Contain accumulated uncontaminated water and sediment on site and pump into a storage tank or direct through a geotextile filtration system (or equivalent system) before discharging to the surrounding ground surface. Contaminants may include, but are not limited to, hydraulic fluids, contaminants in the soil and/or groundwater, polymers, and other drilling fluid additives.
- Keep all sediment-laden water out of storm drains and surface waters. If sediment-laden water does escape from the immediate drilling location, block flow to any nearby waterways or catch basins using fabric, inlet protections, sand bags, erosion fences, or other similar methods. Immediately notify Ecology and the local jurisdiction if sediment-laden water impacts the storm sewer system or surface waters.
- Divert any concentrated flows of water into the site using sandbags or check dams up-slope from the site.
- Dispose of soil cuttings and accumulated sediment appropriately. If cuttings or other soils disturbed in the drilling process are to be temporarily stockpiled on site, they must be covered and surrounded by a berm or filter device. See [S429 BMPs for Storage or Transfer \(Outside\) of Solid Raw Materials, Byproducts, or Finished Products](#).
- Stabilize exposed soils at the end of the job, using mulch or other erosion control measures. See [S425 BMPs for Soil Erosion and Sediment Control at Industrial Sites](#).
- Contain spent drilling slurry on site and allow it to dewater, or haul to an appropriate, approved disposal site.
- Restore disturbed areas with mulch (see [BMP C121: Mulching](#)) and seeding or hydroseeding (see [BMP C120: Temporary and Permanent Seeding](#)).

S447 BMPs for Roof Vents

Description of Pollutant Sources: This activity applies to processes that vent emissions to the roof and/or the accumulation of pollutants on roofs. Processes of special concern are stone cutting, metal grinding, spray painting, paint stripping, galvanizing and electroplating. Pollutants from these processes may build up on roofs and may pollute stormwater roof runoff.

Pollutant Control Approach: Evaluate the potential sources of stormwater pollutants and apply source control BMPs where feasible.

Applicable BMPs:

- Identify processes that are vented and may contribute pollutants to the roof. Pollutants of concern include and are not limited to:

- Metal dust
 - Grease from food preparation
 - Solvents
 - Hydrocarbons
 - Fines
 - Stone dust
- Look for chemical deposition around vents, pipes, and other surfaces.
 - Install and maintain appropriate source control measures such as air pollution control equipment (filters, scrubbers, and other treatment). ([City of San José Environmental Services, 2004](#))
 - Check that your scrubber solution is appropriate for the chemistry of the fumes.
 - Install vent covers and drip pans where there are none.
 - Prevent leaks in pipefittings and containment vessels with routine maintenance.
 - Consider instituting operational or process changes to reduce pollution.
 - If proper installation and maintenance of air pollution control equipment does not prevent pollutant fallout on your roof, additional treatment of the roof runoff may be necessary.
 - Install/provide appropriate devices for roof runoff before it is discharged off site. This may include approved water quality treatment BMPs or structural stormwater treatment systems.
 - Maintain air filters and pollution control equipment on a regular basis to ensure they are working properly. (The smell of odors from outside the building indicates that the pollution control equipment may need maintenance or evaluation.)
 - When cleaning accumulated emissions from roof tops, collect the washwater and loose materials using a sump pump, wet vacuum or similar device. Discharge the collected runoff to the sanitary sewer after approval by the local sewer authority, or have a waste disposal company remove it.

S451 BMPs for Building, Repair, Remodeling, Painting, and Construction

Description of Pollutant Sources: This activity refers to:

- The construction of buildings and other structures.
- Remodeling of existing buildings and houses.
- General exterior building repair work.

Suggested Operational BMPs:

- Lightly spray water on the work site to control dust and grit that could blow away. Do not use oils for dust control. Never spray to the point of water runoff from the site.
- Clean tools over a ground cloth or within a containment device such as a tub.
- Consider using filtered vacuuming to collect waste that may be hard to sweep, such as dust on a drop cloth.
- If conducting work in wet weather conditions, consider setting up temporary cover when scraping or pressure-washing lead-based paint.

S452 BMPs for Goose Waste

Description of Pollutant Sources: Goose waste deposited near water or in water can contribute nutrients and algae growth. Goose feces may contain pathogens and contribute to the spread of diseases. Swimmers itch (schistosome or cercarial dermatitis) is caused by a parasite that can be spread by goose droppings, but does not mature or reproduce in humans.

Pollutant Control Approach: To help decrease geese pollution to water sources, remove waste periodically and use deterrent management practices.

Applicable Operational BMPs:

This BMP is for areas of chronic accumulation of goose waste that impact stormwater systems.

- If possible, pick up goose waste using shovels, brooms, rakes, power sweepers, and trash cans. Properly dispose of goose waste in the garbage.
- Do not blow, sweep, or wash goose waste into waterways or storm sewer systems.
- Regularly clean goose waste from areas of chronic deposition where deterrence measures are impractical.
- Do not feed wild geese or any other wild animals.
- In recreational areas post signs discouraging the feeding of geese and other wild animals.

Optional Operational BMPs:

- Change the habitat from goose friendly to goose resistant. Reduce lawn areas and increase the height of shoreline vegetation (tall grass, shrubs); as geese are reluctant to walk through tall vegetation.
- Create a natural geese barrier. 20 to 100 feet of herbaceous vegetation at least 3 feet in height to discourage geese. A narrow, winding path through the plantings will allow for beach access, while preventing geese from having a direct line of sight through the planted area.
- Make bank slopes steeper than 4:1 to discourage geese by preventing a clear view of the bank top and potential predators. Or, separate the beach from the grass with a few steep steps, which makes the ascent too difficult for most geese.

and other permitting authorities (such as the local police department) before using.

- **Lasers:** Relatively low-power, long-wavelength lasers provide an effective means of dispersing geese under low light conditions. The birds view the light as a physical object or predator coming toward them and generally fly away to escape. Never aim lasers in the direction of people, roads, or aircraft.
- Geese's favorite food is new shoots of grass. Low lying grass also allows easy access to the water for protection from predators. Let grass grow to six inches or taller. Stop fertilizing and watering the lawn to reduce the palatability of the lawn.
- Minimize open sight lines for geese to less than 30 feet.
- Plant shrubs or trees along ponds to limit takeoff and landing opportunities.

Refer to: http://www.humanesociety.org/assets/pdfs/wild_neighbors/canada_goose_guide.pdf and <https://wdfw.wa.gov/species-habitats/species/branta-canadensis> for additional information.

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Appendix IV-B: Management of Street Waste Solids and Liquids

Introduction

This appendix addresses street waste as defined in [chapter 173-350 WAC](#), Solid waste handling standards. [WAC 173-350](#) is the governing rule for management of typical street waste solids. Ecology adopted revisions to this rule that became effective September 1, 2018, in part to provide clarity on managing soils impacted by release of contaminants, such as street waste. Ecology has solid waste guidance to help ensure handlers of street waste manage it in accordance with [WAC 173-350](#). End users and other authorities may have their own requirements for street waste reuse and handling.

- Per [WAC 173-350](#):
 - **"Street waste"** means solids or dewatered materials collected from stormwater catch basins and similar stormwater treatment and conveyance structures, and materials collected during street and parking lot sweeping.

"Street waste," as defined here, does not include solids and liquids from street washing using detergents, cleaning of electrical vaults, vehicle wash sediment traps, restaurant grease traps, industrial process waste, sanitary sewage, mixed process, or combined sewage/stormwater wastes. Wastes from oil/water separators at sites that load fuel are not included as street waste. Street waste also does not include flood debris, landslide debris, and chip seal gravel.

Regulations for Street Waste Management

Street waste is solid waste. While street waste from routine road maintenance is likely not dangerous waste, it is presumed to be solid waste under [WAC 173-350](#). This Rule classifies Street Waste as a likely "contaminated soil," which is included in the definition of "solid waste." Since stormwater conveyance structures are places where contaminants from streets can accumulate at concentrations that could be harmful for indiscriminant placement, material from such structures is presumed to be "contaminated soil."

- Per [WAC 173-350](#):
 - **"Contaminated soil"** means soil containing one or more contaminants from a release and when moved from one location to another for placement on or into the ground:
 - a. Contains contaminants at concentrations that exceed a cleanup level under [chapter 173-340 WAC](#), Model Toxics Control Act—Cleanup, that would be established for existing land use at the location where soil is placed; or
 - b. Contains contaminants that affect pH, and pH of the soil is below 4.5 or above 9.5 or is not within natural background pH limits that exist at the location where soil is placed.

Unless excluded in [WAC 173-350-020](#), contaminated soil is solid waste and must be managed at a solid waste handling facility in conformance with this chapter or [chapter 173-351 WAC](#), Criteria for municipal solid waste landfills. Characterization of material may be required based on solid waste facility acceptance standards. Examples of potentially contaminated soil may include, but are not limited to, street waste, petroleum contaminated soil, engineered soil, and soil likely to have contaminants from a release associated with industrial or historical activities.

Based on test results, street waste to contain contaminants at concentrations that would require either disposal at a permitted solid waste disposal facility, or treatment at a permitted solid waste handling facility for use.

Owners/operators storing or treating street waste prior to disposal or use are typically subject to permitting under the section in [WAC 173-350](#) dealing with “piles used for storage and treatment,” since most storage and treatment takes place in outdoor piles. Indoor or other storage or treatment is subject to permitting under the section dealing with “transfer stations and drop boxes.” To obtain a permit, an owner/operator will need to meet design standards, operating requirements, including characterization procedures and concentration limits if propose to use materials, and record keeping and reporting.

Note: Decant facilities are not subject to solid waste permitting if they will not have intermediate storage or treatment of decanted solids between the decant part of a facility operating in conformance with water quality rules and placement into transfer vehicles going to permitted solid waste facilities.

Street waste solids may contain contaminants at levels too high to allow unrestricted use. Street waste will need to meet the definition in [WAC 173-350](#) for “clean soil” in order for its management or use outside of permitted solid waste handling facilities. “Clean soil” is tied to meeting contaminant concentrations so as not to create a cleanup site where placement of materials would occur.

- Per [WAC 173-350](#):
 - **"Clean soil"** means soil that does not contain contaminants from a release. It also includes soil that contains one or more contaminants from a release and when moved from one location to another for placement on or into the ground:
 - a. Does not contain contaminants at concentrations that exceed a cleanup level under [chapter 173-340 WAC](#), Model Toxics Control Act—Cleanup, that would be established for existing land use at the location where soil is placed; or
 - b. Contains contaminants that affect pH, but pH of the soil is between 4.5 and 9.5 or within natural background pH limits that exist at the location where soil is placed.

Examples of potentially clean soil may include, but are not limited to, soil from undeveloped lands unlikely to have impacts from release of contaminants associated with area-wide or local industrial or historical activities. This includes similar soils over which development may have occurred but land use is unlikely to have led to a release, such as use for residential housing, or over which development provided protection from impacts from a release, such as coverage by pavement. Soil with substances from natural background conditions, as natural background is defined in [WAC 173-350-100](#), is clean soil under this section.

Street waste that will go directly to a permitted landfill or transfer station is not subject to the standards of [WAC 173-350](#), though operators will need to adhere to receiving facility acceptance criteria. For street waste that will not go directly to a permitted landfill or transfer station, an operator needs to consult with their jurisdictional health department to see what solid waste regulations apply to street waste management. In Washington, [chapter 70.95 RCW](#), Solid waste management – Reduction and recycling, gives jurisdictional health departments primary authority over solid waste handling and permitting.

As stated earlier, guidance will be available soon with more specificity on how to manage “contaminated soil” under the recently revised [WAC 173-350](#).

Contaminants in Street Waste Solids

Street waste does not typically classify as dangerous waste. The owner of the stormwater facility and/or collector of street waste is considered the waste generator and responsible for deciding whether the waste designates as dangerous waste. However, sampling has historically shown that material from routine maintenance of roads and stormwater facilities does not classify as dangerous waste.

It is possible that street waste from spill sites has high enough concentration of contaminants to classify it as dangerous waste. Street waste suspected to be dangerous waste should not be collected with other street waste to avoid creating a larger volume of dangerous waste. Street waste with obvious contamination (unusual color, staining, corrosion, unusual odors, fumes, and oily sheen) should be left in place or segregated until tested. Base testing activities on probable contaminants. If collecting potentially dangerous waste because of emergency conditions, or if the waste becomes suspect after it is collected, an owner/operator should handle and store it separately until a determination as to proper disposal is made. Dangerous waste must be handled following [chapter 173-303 WAC](#), Dangerous waste regulations.

Test results from sampling street waste show that it contains contaminants including total petroleum hydrocarbons (TPH), carcinogenic polycyclic aromatic hydrocarbons (c-PAHs), and several metals. These contaminants can be at concentrations high enough to be harmful to human health and the environment unless managed appropriately. The following tables provide a summary of some past test results.

Table IV-B.1: Typical TPH Levels in Street Sweeping and Catch Basin Solids

Reference	Street Sweeping (mg/kg)	Catch Basin Solid (mg/kg)
Snohomish County (1) (Landau, 1995)	390 - 4300	
King County (1) (Herrera, 1995)		123 - 11049 (Median 1036)
Snohomish County & Selected Cities (1) (W&H Pacific, 1994)	163 - 1500 (Median 760)	163 -1562 (Median 760)

Table IV-B.1: Typical TPH Levels in Street Sweeping and Catch Basin Solids (continued)

Reference	Street Sweeping (mg/kg)	Catch Basin Solid (mg/kg)
City of Portland (2) (Bretsch, 2000)		MDL - 1830 (Median 208)
City of Seattle - Diesel Range (2) (Seattle Public Utilities and Herrera, 2009)	330 - 520	780 - 1700
City of Seattle - Motor Oil (2) (Seattle Public Utilities and Herrera, 2009)	2000 - 2800	3500 - 7000
Oregon (1) (Collins, 1998)	1600 - 2380	
Oregon (3) (Collins, 1998)	98 - 125	
(1) Method WTPH 418.1; does not incorporate new methods to reduce background interference due to vegetative material (2) Method NWTPH-Dx (3) Method WTPH - HCID		

Table IV-B.2: Typical c-PAH Values in Street Waste Solids and Related Materials

Sample Source	City of Everett					WSDOT	
	Street Sweepings	Soil	3-Way Topsoil	Vactor Solids	Leaf & Sand	Sweepings - Fresh	Sweepings - Weathered
Benzo(a)anthracene	0.1U	0.076U	0.074U	0.21	0.45	0.56	0.40
Chrysene	0.14	0.09	0.074U	0.32	0.53	0.35	0.35
Benzo(b)fluoranthene	0.11	0.076U	0.074U	0.27	0.52	0.43	0.51
Benzo(k)fluoranthene	0.13	0.076U	0.074U	0.25	0.38	0.39	0.40
Benzo(a)pyrene	0.13	0.076U	0.074U	0.26	0.5	0.41	0.33U
Indeno(1,2,3-cd)pyrene	0.1U	0.076U	0.074U	0.19	0.39	NR	NR

Table IV-B.2: Typical c-PAH Values in Street Waste Solids and Related Materials (continued)

Sample Source	City of Everett					WSDOT	
	Street Sweepings	Soil	3-Way Topsoil	Vactor Solids	Leaf & Sand	Sweepings - Fresh	Sweepings - Weathered
Dibenzo(a,h)-anthracene	0.1U	0.076U	0.074U	0.081	0.12	0.39	0.33U
Revised MTCA Benzo (a)pyrene [ND=PQL]	0.215	0.134	0.134	0.388	0.727	0.708	0.597
Benzo (a)pyrene [ND = 1/2 PQL]	0.185	0.069	0.067	0.388	0.727	0.708	0.366
Benzo (a)pyrene [See * below]	0.185	0.069	0	0.388	0.727	0.708	0.366
Benzo (a)pyrene [ND = 0]	0.155	0.001	0	0.388	0.727	0.708	0.135

* If the analyte was not detected for any PAH, then ND=0; If analyte was detected in at least 1 PAH, then ND=1/2PQL; If the average concentration (using ND=1/2 PQL) is greater than the maximum detected value, then ND=Maximum value.

Table IV-B.3: Typical Metals Concentrations in Catch Basin Sediments

PARAMETER	Ecology 1993	Thurston 1993	King County 1995	King county 1995	City of Seattle 2003 through 2011
Metals: Total (mg/kg)	(Min - Max)	(Min - Max)	(Min - Max)	Mean	Min - Max (Mean)
As	< 3 - 24	.39 - 5.4	4 -56	0.250	<5 - 50 (9.3)
Cd	0.5 - 2.0	< 0.22 - 4.9	0.2 - 5.0	0.5	
Cr	19 - 241	5.9 - 71	13 - 100	25.8	
Cu	18 - 560	25 - 110	12 - 730	29	9.1 - 3,280 (166)
Pb	24 - 194	42 - 640	4 - 850	80	3 - 3,690 (154)
Ni	33 - 86	23 - 51	14 - 41	23	

**Table IV-B.3: Typical Metals Concentrations in Catch Basin Sediments
(continued)**

PARAMETER	Ecology 1993	Thurston 1993	King County 1995	King county 1995	City of Seattle 2003 through 2011
Metals: Total (mg/kg)	(Min - Max)	(Min - Max)	(Min - Max)	Mean	Min - Max (Mean)
Zn	90 - 558	97 - 580	50 - 2000	130	44 - 4170 (479)
Hg	0.04 - 0.16	0.24 - 0.193			<0.03 - 3.8 (0.16)

**Table IV-B.4: Pollutants in Catch Basin Solids - Comparison to
Dangerous Waste Criteria**

PARAMETER	Range of Values in Catch Basin Waste	Range of Values in Catch Basin Waste	Dangerous Waste Criteria
METALS	Total Metals (mg/kg)	TCLP Metals (mg/kg)	TCLP values (mg/l)
As	<3 - 56	< 0.02 - 0.5	5.0
Cd	< 0.22 - 5	0.0002 - 0.03	1.0
Cr	5.9 - 241	0.0025 - 0.1	5.0
Cu	12 - 730	0.002 - 0.88	none
Pb	4 - 850	0.015 - 3.8	5.0
Ni	23 - 86	< 0.01 - 0.36	none
Zn	50 - 2,000	0.04 - 6.7	none
Hg	0.02 - 0.19	0.0001 - 0.0002	0.2

Data from [\(Thurston County, 1993\)](#), [\(Herrera, 1995\)](#) and [\(Serdar, 1993\)](#)

Street Waste Liquids

General Procedures:

Street waste collection should emphasize retention of solids in preference to liquids.

Street waste solids are the principal objective in street waste collection and are substantially easier to store and treat than liquids.

Street waste liquids require treatment before their discharge. Street waste liquids, which include eductor and street sweeping truck decant and drainage from piles and containers, usually contain high amounts of suspended and total solids and adsorbed metals. Treatment requirements depend on the discharge location.

The entity responsible for operation and maintenance of the system must approve discharges to sanitary sewer and storm sewer systems. Ecology will not generally require waste

discharge permits for discharge of stormwater decant to sanitary sewers or to stormwater treatment BMPs constructed and maintained in accordance with this manual.

Listed below is the required order of preference for disposal of liquid from collection of Street Wastes.

1. **Discharge of Street Waste liquids to a municipal sanitary sewer connected to a Public Owned Treatment Works (POTW).** Discharge to a municipal sanitary sewer requires the approval of the sewer authority. Approvals for discharge to a POTW will likely contain pretreatment, quantity, and location conditions to protect the POTW. Following the local sewer authority's conditions is a permit requirement.
2. **Discharge of Street Waste liquids may be allowed into a Basic or Enhanced Runoff Treatment BMP, if option 1 is not available.** Only discharge street waste liquid into the storm sewer system under the following conditions:
 - The preferred disposal option of discharge to sanitary sewer is not reasonably available.
 - The discharge is to a Basic or Enhanced Runoff Treatment BMP. If pretreatment does not remove visible sheen from oils, the Runoff Treatment BMP must be able to prevent the discharge of oils causing a visible sheen.
 - The discharge from the eductor truck is as near to the inlet of the Runoff Treatment BMP as practical, to minimize contamination or recontamination of the collection system.
 - The storm sewer system owner/operator has granted approval and has determined that the Runoff Treatment BMP will accommodate the increased loading. Part of the approval process may include pretreatment conditions to protect the Runoff Treatment BMP. Following local pretreatment conditions is a requirement of this permit.
 - Ecology must approve in advance flocculants for the pretreatment of street waste liquids. The liquids must be non-toxic under the circumstances of use.

The discharger shall determine if reasonable availability of sanitary sewer discharge exists, by evaluating such factors as distance, time of travel, load restrictions, and capacity of the Runoff Treatment BMP.

3. **Operators may return water removed from stormwater ponds, vaults, and oversized catch basins to the storm sewer system.** Stormwater ponds, vaults, and oversized catch basins contain substantial amounts of liquid, which hampers the collection of solids and poses problems in hauling the removed waste away from the site. Water removed from these facilities may be discharged back into the pond, vault, or catch basin provided:
 - Operators may discharge clear water removed from a stormwater treatment structure directly to a down gradient cell of a treatment pond or into the storm sewer system.
 - Turbid water may be discharged back into the structure it was removed from if the removed water has been stored in a clean container (eductor truck, Baker tank, or other appropriate container used specifically for handling stormwater or clean water); and

there will be no discharge from the treatment structure for at least 24 hours.

- The storm sewer system owner/operator must approve the discharge.

Table IV-B.5: Typical Street Waste Decant Values Compared to Surface Water Quality Criteria

PARAMETER	State Surface Water Quality Criteria		Range of Values Reported	
	Freshwater Acute (ug/l - dissolved metals)	Freshwater Chronic (ug/l - dissolved metals)	Total Metals (ug/l)	Dissolved Metals (ug/l)
Arsenic	360	190	100 - 43,000	60 - 100
Cadmium*	2.73	0.84	64 - 2,400	2 - 5
Chromium (total)			13 - 90,000	3 - 6
Chromium (III)*	435	141		
Chromium (VI)	0.5	10		
Copper*	13.04	8.92	81 - 200,000	3 - 66
Lead*	47.3	1.85	255 - 230,000	1 - 50
Nickel*	1114	124	40 - 330	20 - 80
Zinc*	90.1	82.3	401 - 440,000	1,900 - 61,000
Mercury	2.10	0.012	0.5 - 21.9	

**Hardness dependent; hardness assumed to be 75 mg/L*

Table IV-B.6: Typical Values for Conventional Pollutants in Street Waste Decant

PARAMETER	Ecology 1993	(Min - Max)	King County 1995	(Min - Max)
Values as mg/l; except where stated	Mean		Mean	
pH	6.94	6.18 - 7.98	8	6.18 - 11.25
Conductivity (umhos/cm)	364	184 - 1,110	480	129 - 10,100
Hardness (mg/l CaCO ₃)	234	73 - 762		
Fecal Coliform (MPN/100 ml)	3,000			
BOD	151	28 - 1,250		

Table IV-B.6: Typical Values for Conventional Pollutants in Street Waste Decant (continued)

PARAMETER	Ecology 1993	(Min - Max)	King County 1995	(Min - Max)
Values as mg/l; except where stated	Mean		Mean	
COD	900	120 - 26,900		
Oil & Grease	11	7.0 - 40	471	15 - 6,242
TOC	136	49 - 7,880	3,670	203 - 30,185
Total Solids	1,930	586 - 70,400		
Total Dissolved Solids	212	95 - 550		
Total Suspended Solids	2,960	265 - 111,000		
Settleable Solids (ml/l/hr)	27	2 - 234	57	1 - 740
Turbidity (ntu)	1,000	55 - 52,000	4,673	43 - 78,000

Table IV-B.7: Street Waste Decant Values Following Settling

PARAMETER; Total Metals in mg/l	Portland - Inverness Site Min - Max	King County - Renton Min - Max	METRO Pretreatment Discharge Limits
Arsenic	0.0027 - 0.015	< MDL - 0.12	4
Cadmium	0.0009 - 0.0150	< MDL - 0.11	0.6
Chromium	0.0046 - 0.0980	0.017 - 0.189	5
Copper	0.015 - 0.8600	0.0501 - 0.408	8
Lead	0.050 - 6.60	0.152 - 2.83	4
Nickel	0.0052 - 0.10	0.056 - 0.187	5
Silver	0.0003 - 0.010	< MDL	3
Zinc	0.130 - 1.90	0.152 - 3.10	10
Settleable Solids; ml/L	No Data	0.02 - 2.0	7
Nonpolar FOG	5.7 - 25	5 - 22	100
Ph (std)	6.1 - 7.2	6.74 - 8.26	5.0 - 12.0
TSS	2.8 - 1310		
Recorded Total Monthly Flow; Gallons	Data not available	31,850 - 111,050	
Recorded Max. Daily	Data not available	4,500 - 18,600	25,000 GPD

**Table IV-B.7: Street Waste Decant Values Following Settling
(continued)**

PARAMETER; Total Metals in mg/l	Portland - Inverness Site Min - Max	King County - Renton Min - Max	METRO Pretreatment Discharge Limits
Flow; Gallons			
Calculated Average Daily Flow; GPD	Data not available	1,517 - 5,428	
1) Data from King County's Renton Facility (data from 1998 - 1999) and the City of Portland's Inverness Site (data from 1999 - 2001); detention times not provided			

Collection Site Assessment

Ecology suggests a collection site assessment to identify spills or locations that potentially contain dangerous wastes.

The collection site assessment will aid in determining if waste is a dangerous waste and in deciding what to test for if dangerous waste is suspected. The collection site assessment will also help determine if the waste meets the requirements of the receiving facility.

There are three steps to a collection site assessment:

1. A **historical review** of the site for spills, previous contamination and nearby cleanup sites or dangerous waste facilities.

The historical review will be easier if done on an area wide basis prior to scheduling any waste collection. The historical review should be more thorough for operators who have never collected waste at the site before. At a minimum, the historical review should include operator knowledge of the area's collection history or records from previous waste collections.

Private operators should ask the owner of the site for records of previous contamination and the timing of the most recent cleaning. Ecology's Hazardous Substance Information Office maintains a Toxic Release Inventory and a Facility/Site Database, tracking more than 15,000 sites.

Ecology's online Facility/Site Database is available at www.ecy.wa.gov/fs/.

The database allows anyone with web-access to search for facility information by address, facility name, town, zip code, and SIC code, etc. It lists why Ecology is tracking each one (NPDES, TSCA, RCRA, Clean Air Act, etc.), as well as who to call within Ecology to find out more about the given facility. EPA's toxic release website is http://i-aspub.epa.gov/triexplorer/tri_release.chemical

2. A **visual inspection** for potential contaminant sources such as a past fire, leaking tanks and electrical transformers, and surface stains.

Take a look at the area for contaminant sources prior to collection of the waste. If the inspection finds a potential contaminant source, delay the waste collection until the potential contaminant is assessed.

A second portion of the visual inspection is a good housekeeping assessment of the area. Locations with poor housekeeping commonly cut corners in less obvious places. Inspect these sites in greater detail for illegal dumping and other contamination spreading practices.

3. **Sweeping route, catch basin, waste, and container inspection** before and during collection.

The inspection of the waste and catch basin or vault is the last and perhaps most critical step in the collection site assessment.

For example, if the stormwater facility has an unusual color in or around it, then it is possible someone dumped something near it or into it. Some colors to be particularly wary of are yellow/green from antifreeze dumping and black and rainbow sheen from oil and/or grease dumping. In addition, if the inspector observes any staining or corrosion, then a solvent may have been dumped.

Fumes are also good indicators of potential contamination. Avoid deliberate smelling of catch basins for worker safety, but suspicious odors may be encountered from catch basins thought to be safe. Some suspicious odors are rotten eggs (hydrogen sulfide is present), gasoline or diesel fumes, or solvent odors. If unusual odors are noted, contact a dangerous waste inspector before cleaning the basin.

Finally, operator experience is the best guide to avoid collection of contaminated waste.

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