Stormwater Best Management Practices

A Handbook for Developers, Owners & Operators

www.peoriaaz.gov/stormwater

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Introduction

Post-construction stormwater management in areas undergoing new development or redevelopment is necessary because runoff from these areas has been shown to significantly affect receiving waterbodies. There are generally two forms of substantial impacts of post-construction runoff. The first is caused by an increase in the type and quantity of pollutants in stormwater runoff. As runoff flows over areas altered by development, it picks up harmful sediment and chemicals such as oil and grease, pesticides, heavy metals, and nutrients (e.g., nitrogen and phosphorus). These pollutants often become suspended in runoff and are carried to receiving waterbodies, such as recreation or amenity lakes, storage reservoirs, washes and rivers. Once deposited, these pollutants can enter the food chain through small aquatic life, eventually entering the tissues of fish and humans. The second kind of post-construction runoff impact occurs by increasing the quantity of water delivered to the waterbody during storms. Increased impervious surfaces (e.g., parking lots, driveways, and rooftops) interrupt the natural cycle of gradual percolation of water through vegetation and soil. Instead, water is collected from surfaces such as asphalt and concrete and routed to drainage systems where large volumes of runoff quickly flow to the nearest receiving waterbody. The effects of this process include streambank scouring and downstream flooding, which often lead to a loss of aquatic life and damage to property.

EPA requires the City of Peoria to develop, implement, and enforce a program to reduce pollutants in post-construction stormwater runoff from new development and redevelopment projects that result in the land disturbance of greater than or equal to 1 acre. Specifically, Peoria is required to:

- *Develop and implement strategies which include a combination of structural and/or non-structural best management practices (BMPs)*
- *Have an ordinance or other regulatory mechanism requiring the implementation of post-construction runoff controls to the extent allowable under State, Tribal or local law*
- *Ensure adequate long-term operation and maintenance of these controls*
- *Determine the appropriate BMPs and measurable goals for these minimum control measures*

More specifically, Peoria City Code Chapter 24 addresses stormwater regulatory compliance requirements. Chapter 24 requires that "any person applying for a permit, authorization, license, or permission for construction activity that will disturb one or more acres of land shall prepare a Stormwater Management Plan (SWMP) for the management of stormwater discharges." Additionally, this requires that the SWMP must include, among other things, the:

- *Description of post-construction stormwater runoff management measures*
- *Description of future activities*
- *Location of controls*
- *Inspection and maintenance plan*

The following tables provide inspection and maintenance BMPs recommended by the City of Peoria. This information is intended to provide guidance toward meeting the City's requirements. While this table is not all-inclusive and site specific conditions may require a differing set of BMPs, a Stormwater Management Plan which includes post-construction BMP inspection and maintenance is required as stated above.

Checklist

Check off each item as you complete it.

Detention/Retention Basins

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
General	Trash & Debris*	Any trash and debris which exceed 5 cubic feet per 1,000 square feet (this is approximately equal to the amount of trash it would take to fill one standard size garbage can). In general there should be no visible evidence of dumping. If less than threshold, all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site.
	Contamination and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants.	No contaminants or pollutants present.
	Tree growth and Hazard Trees	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e. slope mowing, silt removal, vactoring, or equipment movements).	Trees do not hinder maintenance activities. Remove hazard trees.
	Pet and wildlife waste/dead animals	Any accumulation of pet or wildlife waste or dead animals.	Pet and wildlife waste including dead animals cleared from site.
Side Slopes of Basin	Erosion*	Erosion 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 berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g. rock reinforcement, planting of grass, compaction. If erosion is occurring on a compacted berm a licensed civil or geotechnical engineer should be consulted to resolve source of erosion.
Storage Area	Sediment*	Accumulated sediment that exceeds 10% of the designed basin depth unless otherwise specified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed basin shape and depth; pond reseeded or landscape surface re-planted if necessary to control erosion and restore to development requirements.
	Liner (If Applicable)	Liner is visible and has more than three ¼ inch holes in it.	Liner is repaired or replaced. Liner is fully covered with material meeting development landscape requirements.

**All components should be inspected annually. Components with an asterisk should also be inspected after storm events of 1 inch of rain or more within 24 hours.*

Detention/Retention Basins Cont'd

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
Basin Berms	Settlements*	Any berm which has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more sever problems with the berm or outlet works. A licensed civil or geotechnical engineer should be consulted to determine the source of settlement.	Berm fully restored to design specifications.
	Piping	Discernable water flow through basin berm. Ongoing erosion with potential for erosion to continue. Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/Spillway and Berms over 4 feet in height.	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of berm due to uncontrolled overtopping. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. If root system is small (base less than 4 inches diameter) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
Emergency Overflow/Spillway	Emergency Overflow/Spillway	Only one layer of rock exists above native soil in area 5 square feet or larger, or exposure of native soil at the top of outflow path or spillway. (Rip-rap on inside slopes need not be replaced.)	Rocks and pad depth restored to design standards.
	Erosion*	See "Side Slopes of Basin" (p.1)	

Please note: *Ponding in excess of 36 hours can lead to mosquito growth and must be controlled as per City Code Chapter 24, Section 24-142 and Maricopa County Environmental Health Code Chapter III, Regulation 2.*

**All components should be inspected annually. Components with an asterisk should also be inspected after storm events of 1 inch of rain or more within 24 hours.*

Wetponds/Lakes

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
General	Trash and Debris	Accumulation that exceeds 1 CF per 1000-SF of pond/lake area.	Trash and debris removed.
	Inlet/Outlet Pipe	Inlet/outlet pipe clogged with sediment and/or debris material.	No clogging or blockage in the inlet and outlet piping.
	Sediment Accumulation in Pond Bottom*	Sediment accumulations in pond bottom that exceeds the depth of sediment zone plus 6 inches.	Sediment removed from pond bottom.
	Oil Sheen on Water	Prevalent and visible oil sheen.	Oil removed from water using oil-absorbent pads or vactor truck. Source of oil is located and corrected.
	Erosion*	Erosion of the pond/lake side slopes and/or scouring of the pond bottom, that exceeds 6 inches, or where continued erosion is prevalent.	Slopes stabilized using proper erosion control measures and repair methods.
	Settlement of Pond Dike/ Berm*	Any part of these components that has settled 4 inches or lower than the design elevation, or inspector determines dike/berm unsound.	Dike/berm is repaired to specifications.
	Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.	Rocks replaced to specifications.

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Debris Barriers (e.g., Trash Racks)

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
General	Trash and Debris*	Trash or debris that is plugging more than 20% of the opening in the barrier.	Barrier cleared to design flow capacity. Free of trash and debris.
Metal	Damaged/ Missing Bars	Bars that are bent out of shape resulting in any opening more than 3 inches.	Bars in place with no bends more than ¼ inch and no opening greater than 3 inches.
		Bars missing or entire barrier missing.	Bars in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Barrier replaced or repaired to design standards.

Debris Barriers Cont'd

Metal	Inlet/Outlet Pipe	Debris barrier is missing, damaged or not properly attached to pipe or structure.	Barrier firmly attached to pipe or structure.
	Fastening/ Securing Hardware	Missing, corroded, or damaged mounting, latching, hinging or locking hardware.	Restore or replace hardware in accordance with design standards.

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Infiltration

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
General	Trash and Debris*	See "Detention/Retention Basins" (p.1)	See "Detention/Retention Basins" (p.1)
	Contaminants and Pollution	See "Detention/Retention Basins" (p.1)	See "Detention/Retention Basins" (p.1)
Storage Area	Sediment*	Water ponding in detention/retention basin after rainfall ceases and appropriate time allowed for infiltration.	Sediment is removed and/ or facility is maintained so that infiltration system works according to design. Ponding in excess of 36 hours can lead to mosquito growth and must be controlled as per Maricopa County Environmental Health Code Chapter III, Regulation 2.
Filter Bags (if applicable)	Filled with Sediment and Debris*	Sediment and debris fill bag more than ½ full.	Filter bag is replaced or system is redesigned.
Rock Filters	Sediment and Debris	Little or no water flows through filter during heavy rain storms.	Gravel in rock filter is replaced.
Side Slopes of Basin	Erosion*	See "Detention/Retention Basins" (p.1)	See "Detention/Retention Basins" (p.1)
Emergency Overflow Spillway and Berms	Tree Growth	See "Detention/Retention Basins" (p.2)	See "Detention/Retention Basins" (p.2)
	Piping*	See "Detention/Retention Basins" (p.2)	See "Detention/Retention Basins" (p.2)
	Rock Missing	See "Detention/Retention Basins" (p.2)	See "Detention/Retention Basins" (p.2)
	Erosion*	See "Detention/Retention Basins" (p.1)	See "Detention/Retention Basins" (p.2)
Pre-settling Basins and Vaults	Facility or Sump Filled with Sediment and/or Debris	6 inch or designed sediment trap depth of sediment.	Sediment is removed.

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Vaults, Tanks, and Pipes

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
Storage Area	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
	Debris and Sediment*	Accumulated sediment depth exceeds 10% of the diameter of the storage area for ½ height of storage vault or any depth exceeds 15% of diameter. *(Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than ½ the length of tank.)*	All sediment and debris removed from storage area.
Storage Area	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability.)	All joints between tank/pipe sections are sealed.
	Tank/Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability.)	Tank/pipe repaired or replaced to design specifications.
	Vault Structure Includes Cracks in Wall, Bottom, Damage To Frame and/or Slab.	Cracks wider than ½ inch and any evidence of soil particles entering the structure through the cracks, or maintenance personnel determine that the vault is not structurally sound. Cracks wider than ½ inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.	Vault replaced or repaired to design specifications and is structurally sound. No cracks more than ¼ inch wide at the joint of the inlet/outlet pipe.
Manhole	Cover Not In Place	Cover is missing or only partially in place. Any open manhole requires immediate maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than ½ inch of thread. *(May not apply to self-locking lids.)*	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely fastened to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	See "Catch Basins" (p.15)	See "Catch Basins" (p.15)	See "Catch Basins" (p.15)

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Wetvaults

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
General	Trash/Debris Accumulation*	Trash and debris accumulated in vault, pipe or inlet/outlet (includes floatables and non-floatables.)	Remove trash and debris from vault.
	Sediment Accumulation In Vault*	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6 inches.	Remove sediment from vault.
	Damaged Pipes	Inlet/outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced to design specifications.
	Access Cover Damaged/Not Working	Cover cannot be opened or removed by one maintenance person	Cover repaired or replaced to design specifications.
	Ventilation	Ventilation area blocked or plugged.	Blocking material removed or cleared from ventilation.
	Vault Structure Damage-Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab	Maintenance/inspection personnel determine vault is not structurally sound.	Vault replaced or repaired to design specifications
		Cracks wider than ½ inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through cracks.	Vault repaired so that no cracks exist wider than ¼ inch at the joint of inlet/outlet pipe.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection personnel.	Baffles repaired or replaced to design specifications.
	Access Ladder Damage	Ladder is unsafe due to missing rungs, misalignment, not securely fastened to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.

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Typical Biofiltration Swale

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RECOMMENDED MAINTENANCE TO CORRECT PROBLEM
General	Sediment Accumulation on Grass*	Sediment depth exceeds 2 inches.	Remove sediment deposits on grass treatment area of bioswale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.
	Standing Water	When water stands in the swale between rain events and does not drain freely.	Remove sediment or trash blockages, improve grade from head to foot of swale, remove clogs from check dams, add underdrains or convert to wet biofiltration swale.
	Flow Spreader*	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.	Level spreader and clean so that flows are spread evenly over entire swale width.
	Constant Baseflow	When small quantities of water continually flow through swale even when it has been dry for extended periods and an eroded, muddy channel has formed in the swale bottom.	Add a low-flow pea-gravel drain the length of the swale or by-pass the baseflow around the swale.
	Poor Vegetation Coverage*	When grass is sparse or bare or eroded patches occur in more than 10% of swale bottom.	Determine why grass growth is poor and correct condition. Re-plant with plugs or sod, or re-seed into loosened fertile soil.
	Vegetation*	When grass becomes excessively tall (greater than 10 inches); when nuisance weeds and other vegetation starts to take over.	Mow vegetation or remove nuisance vegetation so that flow is not impeded. Grass should be mowed to a height of 3 to 4 inches. Remove grass clippings.
	Excessive Shading	Grass growth is poor because sunlight does not reach swale.	If possible, trim back over-hanging limbs and remove brushy vegetation on adjacent slopes.
	Inlet/ Outlet*	Inlet/outlet areas clogged with sediment and/or debris.	Remove material so that there is no clogging or blocking of inlet and outlet area.
	Trash and Debris Accumulation*	Trash and debris accumulated in the bioswale.	Remove trash and debris from bioswale.

Typical Biofiltration Swale, cont'd

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RECOMMENDED MAINTENANCE TO CORRECT PROBLEM
General	Erosion/ Scouring*	Eroded or scoured swale bottom due to flow channelization, or higher flows.	For ruts and bare areas less than 12 inches wide, repair the damaged areas by filling with crushed gravel. If bare areas are large, generally greater than 12 inches wide, the swale should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident, or re-plant with plugs.

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Filter Strips

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RECOMMENDED MAINTENANCE TO CORRECT PROBLEM
General	Sediment Accumulation on Grass*	Sediment depth exceeds 2 inches.	Remove sediment deposits. Re-level so slope is even and flows pass evenly through strip.
	Vegetation*	When grass becomes excessively tall (greater than 10 inches); when nuisance weeds and other vegetation starts to take over.	Mow vegetation or remove nuisance vegetation so that flow is not impeded. Grass should be mowed to a height of 3 to 4 inches. Remove grass clippings.
	Trash and Debris Accumulation*	Trash and debris accumulated on the filter strip.	Remove trash and debris from filter.
	Erosion/ Scouring*	Eroded or scoured areas due to flow channelization, or higher flows.	For ruts and bare areas less than 12 inches wide, repair the damaged areas by filling with crushed gravel. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident, or re-plant with plugs.
	Flow Spreader*	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire filter width.	Level spreader and clean so that flows are spread evenly over entire filter width.

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Sand Filters (Above Ground/Open)

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
Above Ground (open sand filter)	Sediment Accumulation on Top Layer	Sediment depth exceeds ½ inch.	No sediment deposit on surface of sand filter that would impede permeability of the filter section.
	Trash and Debris Accumulation*	Trash and debris accumulated on sand filter bed.	Trash and debris removed from sand filter bed.
	Sediment/ Debris in Clean-Outs	When the clean-outs become full of partially plugged with sediment or debris.	Sediment removed from clean-outs.
	Sand Filter Media*	Drawdown of water through the sand filter media takes longer than 24 hours and/or flow through the overflow pipes occurs frequently.	Top several inches of sand are scraped. may require replacement of entire sand filter depth depending on extent of plugging (a sieve analysis is helpful to determine if the lower sand has too high proportion of fine material).
	Prolonged flows	Sand is saturated for prolonged periods of time (several weeks) and does not dry out between storms due to continuous base flows or prolonged flows from detention facilities.	Low continuous flows are limited to a small portion of the facility by using a low wooden divider or slightly depressed sand surface.
	Short Circuiting	When flows become concentrated over one section of the sand filter rather than dispersed.	Flow and percolation of water through sand filter is uniform and dispersed across entire filter area.
	Erosion Damage to Slopes	Erosion damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.	Slopes should be stabilized using appropriate erosion control measure(s); e.g. rock reinforcement, planting of grass, compaction.
	Rock Pad Missing or Out of Place	Soil beneath rock is visible.	Rock pad replaced or rebuilt to design specifications.
	Flow Spreader*	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.	Spreader leveled and cleaned so that flows are spread evenly over sand filter.
	Damaged Pipes	Any part of piping that is crushed or deformed more than 20% or any other failure to the piping.	Pipe repaired or replaced.

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Sand Filters (Below Ground/Enclosed)

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
Below Ground Vault	Sediment Accumulation on Sand Media*	Sediment depth exceeds ½ inch.	No sediment deposits on sand filter section which would impede permeability of the filter section.
	Sediment Accumulation in Vault*	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6 inches.	No sediment in first chamber of vault.
	Trash/Debris Accumulation*	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault and inlet/outlet piping.
	Sediment in Drain Pipes/ Cleanouts*	When drain pipes, cleanouts become full with sediment and/ or debris.	Sediment and debris removed.
	Short Circuiting	When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area.	Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover. Maintenance person cannot remove cover using normal lifting pressure.	Cover repaired to proper working specifications or replaced.

Sand Filters (Below Ground/Enclosed), cont'd

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
Below Ground Vault	Ventilation	Ventilation area blocked or plugged.	Blocking material removed or cleared from ventilation area. A specified % of vault surface area must provide ventilation to the vault interior (see design specifications).
	Vault Structure Damaged; Includes cracks in walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than ½ inch or evidence of soil particles entering the structure through cracks, or maintenance/inspection personnel determine vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than ½ inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than ¼ inch at the joint of the inlet/outlet pipe.
	Baffles/Internal Walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection personnel.	Baffles repaired or replaced to design specifications.
	Access Ladder Damaged.	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and/or misaligned.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.

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MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
Below Ground Vault	Sediment Accumulation on Media*	Sediment depth exceeds ¼ inches.	No sediment deposits which would impede permeability of the compost media.
	Sediment Accumulation in Vault*	Sediment depth exceeds 6 inches in first chamber.	No sediment deposits in vault bottom of first chamber.
	Trash/Debris Accumulation*	Trash and debris accumulated on compost filter bed.	Trash and debris removed from compost filter bed.
	Sediment in Drain Pipes/ Clean-Outs*	When drain pipes and/or clean-outs become full with sediment and/or debris.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or sediment.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open cover using normal lifting pressure, corrosion/ deformation of cover.	Cover repaired or replaced to design specification.
	Vault Structure; Includes Cracks in Wall, Bottom, damage to Frame and/or Top Slab	Cracks wider than ½ inch or evidence of soil particles entering the structure through cracks, or maintenance/inspection personnel determine vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than ½ inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than ¼ inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/ inspection personnel.	Baffles repaired or replaced to design specifications.
	Access Ladder Damaged.	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and/or misaligned.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.
Below Ground Cartridge Type	Filter Media*	Drawdown of water through media takes longer than one hour and/or overflow occurs frequently.	Media cartridges replaced.
	Short Circuiting	Flows do not properly enter filter cartridge.	Filter Cartridges replaced.

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Baffle Oil/Water Separators (API Type)

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
General	Monitoring	Inspection of discharge water for obvious signs of poor water quality.	Effluent discharge from vault should be clear with no visible sheen.
	Sediment Accumulation*	Sediment depth in bottom of vault exceeds 6 inches in depth.	No sediment deposits on vault bottom that would impede flow through the vault and/or reduce separation efficiency.
	Trash/Debris Accumulation*	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault and inlet/outlet piping.
	Oil Accumulation*	Oil accumulations that exceed 1 inch, at the surface of the water.	Extract oil from vault by vactoring. Disposal in accordance with state and local rules and regulations.
	Damaged Pipes	Inlet or outlet piping damaged or broken.	Pipe repaired or replaced to design specifications.
	Access Cover Damaged/ Not Working	Cover cannot be opened; one person cannot open cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired or replaced to design specification.
	Vault Structure; Includes Cracks in Wall, Bottom, damage to Frame and/or Top Slab	Cracks wider than ½ inch or evidence of soil particles entering the structure through cracks, or maintenance/inspection personnel determine vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than ½ inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than ¼ inch at the joint of the inlet/ outlet pipe.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection personnel.	Baffles repaired or replaced to design specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and/or misaligned.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.

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Coalescing Plate Oil/Water Separators

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
General	Monitoring	Inspection of discharge water for obvious signs of poor water quality.	Effluent discharge from vault should be clear with no visible sheen.
	Sediment Accumulation*	Sediment depth in bottom of vault exceeds 6 inches in depth and/or visible signs of sediment on plates.	No sediment deposits on vault bottom and plate media that would impede flow through the vault and/or reduce separation efficiency.
	Trash/Debris Accumulation*	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault and inlet/outlet piping.
	Oil Accumulation*	Oil accumulations that exceeds 1 inch at the surface of the water.	Extract oil from vault by vactoring. Coalescing plates are cleaned thoroughly by rinsing and flushing. Should be no visible oil depth on water. Disposal in accordance with state and local rules and regulations.
	Damaged Coalescing Plates	Plate media broken, deformed, cracked and/or showing signs of failure.	A portion of the media pack or the entire plate pack is replaced depending on severity of failure.
	Damaged Pipes	Inlet or outlet piping damaged or broken.	Pipe repaired or replaced to design specifications.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection personnel.	Baffles repaired or replaced to design specifications.
	Vault Structure; Includes Cracks in Wall, Bottom, damage To Frame and/or Top Slab	Cracks wider than ½ inch or evidence of soil particles entering the structure through cracks, or maintenance/inspection personnel determine vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than ½ inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than ¼ inch at the joint of the inlet/outlet pipe.

**All components should be inspected annually. Components with an asterisk should also be inspected after storm events of 1 inch of rain or more within 24 hours.*

Catch Basin Inserts

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
General	Sediment Accumulation*	When sediment forms a cap over the insert media of the insert and/or unit.	No sediment cap on the insert media and its unit.
	Trash and Debris Accumulation*	Trash and debris accumulates on insert unit creating blockage/restriction.	Trash and debris removed from insert unit. Runoff freely flows into catch basin.
	Media Insert Not Removing Oil*	Effluent water from media insert has a visible sheen.	Effluent water from media insert is free of oils and has no visible sheen.
	Media Insert Water Saturated*	Catch basin insert is saturated with water and no longer has capacity to absorb.	Remove and replace media insert.
	Media Insert Oil Saturated*	Media oil saturated due to petroleum spill that drains into catch basin.	Remove and replace media insert.
	Media Insert Use Beyond Normal Product Life*	Media has been used beyond the typical average life of media insert product.	Remove and replace media at regular intervals, depending in insert product life expectancy.

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Catch Basins, Manholes, and Inlets

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
General	Trash and Debris*	Trash and debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of basin by more than 10%.	No trash or debris located immediately in front of catch basin or on grate opening.
		Trash or debris (n basin) that exceeds 60% of sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No trash or debris in catch basin.
		Trash or debris in any inlet or outlet pipe blocking more than ⅓ its height.	Inlet and outlet pipes free of trash and debris.
		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 the catch basin.
	Sediment*	Sediment (in basin) that exceeds 60 % of sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in catch basin.
	Structural Damage to Frame and/ or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than ¼ inch. (The intent is to ensure no material is running into basin.)	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e. separation of more than ¼ inch of the frame from the top of slab. Frame not securely attached.	Frame sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance/inspection personnel judges structure unsound.	Basin replace or repaired to design specifications.
		Grout has separated or cracked 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.	Pipe is regrouted and secure at basin wall.

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Catch Basins, Manholes, and Inlets, cont'd

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
General, Cont'd	Settlement/ Misalign-ment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design specifications.
	Vegetation	Vegetation growing across and blocking more than 10% of basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than 6 inches tall and less than 6 inches apart.	No vegetation or root growth present.
	Contami-nation and Pollution	Any evidence of oil, gasoline, contami-nants or other pollutants.	No pollution present.
Catch Basin Cover	Cover Not In Place	Cover is missing or only partially in place. Any open catch basin requires immediate maintenance.	Catch basin cover is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one person with proper tools. Bolts into frame lid have less than ½ inch of thread.	Mechanism opens with proper tools.
	Cover Difficult To Remove	One person cannot remove lid after applying normal lifting pressure. (The intent is to keep cover from sealing off access for maintenance or inspection.)	Cover can be removed by one person.
Ladder	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and/or misaligned.	Ladder replaced or repaired to specifications, and is safe to use as deter-mined by inspection personnel.
Metal Grates	Grate Opening Unsafe	Any grates with openings wider than ⅞ inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing	Grate missing or broken member(s) of grate.	Grate is replaced or repaired to design specifications.

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Control Structure/Flow Restrictor

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
General	Trash and Debris Including Sediment*	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash, debris, and sediment removed.
	Structural Damage	Structure is not securely attached to manhole wall.	Structure is securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are watertight; Structure repaired or replaced and performs to design specifications.
		Any holes other than design holes in structure.	Structure has no holes other than design holes.
Clean-out Gate	Damaged or Missing	Clean-out gate is not watertight or is missing.	Gate is watertight and performs to design specifications.
		Gate cannot be moved up or own by one maintenance person.	Gate moves up or down easily and is watertight.
		Chain/rod leading to plate is missing or damaged.	Chain/rod is in place and performs as designed.
		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design specifications.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and performing to design specifications.
	Obstructions*	Any trash, debris, sediment or vegetation blocking plate.	Plate is free of all obstructions and performs to design specifications.
Overflow Pipe	Obstructions*	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and performs to design specifications.
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires immediate maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one person with proper tools. Bolts into frame lid have less than ½ inch of thread.	Mechanism opens with proper tools.

Control Structure/Flow Restrictor cont'd

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
Manhole	Cover Difficult to Remove	One person cannot remove lid after applying normal lifting pressure. (The intent is to keep cover from sealing off access for maintenance or inspection.)	Cover can be removed by one person.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and/or misaligned.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel
Catch Basin	See "Catch Basins" (p.15)	See "Catch Basins" (p.15)	See "Catch Basins" (p.15)

**All components should be inspected annually. Components with an asterisk should also be inspected after storm events of 1 inch of rain or more within 24 hours.*

Energy Dissipaters

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
External			
Rock Pad	Missing or Moved Rock	Only one layer of rock exists above native soil in area 5 square feet or larger, or an exposure of native soil.	Rock pad replaced to design specifications.
	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design specifications.
Dispersion Trench	Pipe Plugged With Sediment*	Accumulated sediment that exceeds 20% of design depth.	Pipe cleaned/flushed to perform to design specifications.
	Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.	Trench redesigned or rebuilt to design specifications.
	Perforations Plugged*	Over ½ of perforations on pipe are plugged with debris and/or sediment.	Perforated pipe cleaned or replaced.
	Water Flows Out Top of "Distributor" Catch Basin*	Maintenance/inspection personnel observes or receives credible report of water flowing out during any storm event.	Facility redesigned or repaired or replaced to design specifications.
	Receiving Area Over-Saturated*	Water in receiving area is causing or has potential to cause landslide problems.	No danger of landslides.

Energy Dissipaters cont'd

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
Internal			
Manhole/ Chamber	Worn, Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to ½ original size or any concentrated worn spot exceeding 1 square foot which would render structure unsound.	Structure repaired or replaced to design specifications.
	Other Defects	See "Catch Basins" (p.15)	See "Catch Basins" (p.15)

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Conveyance Systems

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
Pipes	Sediment and Debris*	Accumulated sediment that exceeds 20% of pipe diameter.	Pipe cleaned of all sediment and debris.
	Vegetation	Vegetation that reduces free movement of water through pipes.	All vegetation removed so water flows freely through pipe.
	Damaged Pipe	Protective coating is damaged; rust is causing more than 50% deterioration to any part of pipe.	Pipe repaired or replaced to design specifications.
		Any dent that decreases cross section area of pipe more than 20% or puncture that impacts performance.	Pipe repaired or replaced to design specifications.
Open Ditches	Trash and Debris*	See "Detention/Retention Basins"	Trash and debris cleared from ditches.
	Sediment*	Accumulated depth exceeds 20% of design depth.	Ditch cleaned/flushed of all sediment.
	Vegetation	Vegetation that reduces free movement of water through ditches.	Water flows freely through ditches.
	Erosion Damage to Slopes and Channel Bottom*	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 berm embankment.	Slopes stabilized using appropriate erosion control measure(s); i.e. rock reinforcement, planting of grass, compaction.
	Rock Lining Out of Place or Missing	Maintenance/inspection personnel observe native soil beneath rock lining.	Rock lining replaced to design specifications.
Catch Basins	See "Catch Basins" (p.15)	See "Catch Basins" (p.15)	See "Catch Basins" (p.15)

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Culverts

MAINTENANCE COMPONENT	DEFECT	CONDITIONS REQUIRING MAINTENANCE	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
Structural Condition	Sediment or Debris	Accumulated sediment that exceeds 20% of pipe diameter.	Minimal sediment and debris.
	Vegetation Blockage	Flow into or through the culvert is impeded.	Vegetation cut to 4 inch height, root structure left intact. Minimal disturbance of bank.
	Pipe Damage	Corrosion affecting more than 50% of wall area. Bent or crushed ends. Large dents that reduce pipe cross-section by more than 20%. Cracks or holes that allow ground water seepage.	Culvert repaired or replaced to design standards.
	Headwall Damage	Cracks greater than ½ inch wide, buckling/bulging headwall, erosion behind or around ends of headwall.	Headwall repaired or replaced to design standards.

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NOTES

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