TABLE B.3 - STORMWATER BMP POLLUTANT REMOVAL EFFICIENCIES

BMPS	DESCRIPTION		TSS				TP				Sol P	TN				Nitrate & Nitrite Nitrogen	Metals (Cd, Cu, Pb & Zn)	Cu	Pb		Zn		Pathogens[2]	Bacteria[9]	Organic Carbon[10]	Hydro-carbons
*Stormwater Ponds**,* [8]	and extended detention, and some elements of a shallow marsh equivalent capable of treating the full water quality volume. Addresses channel protection,		80%	80			G	51			66	G	33			43	G	57			66		G	70	43	81 [3]
	Micropool Extended Detention Pool (P-1)	Pond that treats majority of the water quality volume through extended detention, and incorporates a micropool at the outlet of the pond to prevent sediment resuspension,			80				65					55					40			20				
	Wet Pond (sometimes referred to as Retention Ponds)	Pond that provides storage for the entire water quality volume in the permanent pool.		79	60	46		49	45	46	62		32	35	46	36		58	75		65	60				
	Wet Extended Detention Pond	Pond that treats portion of the water quality volume by detaining storm flows above a permanent pool for a specified minimum detention time.		80				55			67		35			63		44			69					
	Multiple Pond System	Group of ponds that collectively treat the water quality volume.		91				76			69		n/a			87		n/a			n/a					
	Pocket Pond	A stormwater wetland design adapted for the treatment of runoff																								
*Stormwater Wetland***	Practices that include significant shallow marsh areas, and may also incorporate small permanent pools and extended detention storage to achieve full water		80%	76	65		G	49	25		36	G	30	20		67	F	40	65		44	35	G	78 [3]	25	n/a
	Shallow Wetland	A wetland that provides water quality treatment entirely in a wet shallow marsh.		83				43			29		26			73		33			42					
	Extended Detention Wetland	Wetland system that provides some fraction of water quality volume by detaining storm flows above the marsh surface. Wetland with extended detention storage provided above the wetland. The primary removal mechanism is settling in the wetland and the detention zone, but some pollutants are removed through biological action in the wetland.		69				39			32		56			35		n/a			-74					
	Pond /Wetland System	Wetland system that provides a portion of the water quality volume in the permanent pool of a wet pond that precedes the marsh for a specified minimum detention time.		71				56			43		19			40		58 [3]			56					
	Pocket Wetland	Shallow wetland design adapted fro the treatment of runoff from small drainage areas that has variable water levels and relies on groundwater for its permanent pool.																								
Infiltration Systems [5]	Practices that capture and temporarily store the full water quality volume before allowing it to infiltrate the soil.		80%	95 3			G	80			85 [3]	G	51			82 [3]	G	n/a			99 [3]		G			
	Infiltration Trench [3]	An infiltration practice that stores the water quality volume in the void spaces of a gravel trench before it is infiltrated into the ground. Can only capture a small amount of runoff (I.e. first flush) and therefore, often used in combination with another BMP such as detention basin.		n/a	75			100	60		100		42	55		82		n/a	65		n/a	65				

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BMPS	DESCRIPTION		TSS			TP			Sol P	TN			Nitrate & Nitrite Nitrogen	Metals (Cd, Cu, Pb & Zn)	Cu	Pb		Zn		Pathogens[2]	Bacteria [9]	Organic Carbon [10]	Hydro-carbons
Infiltration Systems [5] *continued*	*Infiltration Basin*	An infiltration practice that stores the water quality volume in a shallow depression, before it is infiltrated into the ground.			75			60				60				65			65				
	Dry Well	An infiltration practice similar in design to the infiltration trench and best suited for treatment of rooftop runoff																					
Filtration Systems	Use some combination of a granular filtration media such as sand, soil, organic material, carbon or a membrane to remove constituents found in runoff. Quantity control can be included by providing additional storage volume in an associated pond or basin. Generally filters are multichamber structure that treats runoff through filtration using a sediment forebay, a primary filter median and an underdrain collection system.		80%	86		G	59		3	G	38		-14	G	49			88		F	37	54	84 [3]
	Surface Sand Filter [3]	particles in a sediment chamber, and then filtering stormwater through a sand matrix.		87			59		-17 [3]		32		-13		49			80					
	Underground Sand Filter [3, 4]	A filtering practice that treats stormwater as it flows through underground settling and filtering chambers.		58			45		21		5		-87		32			56					
	Perimeter Sand Filter [3]	A filter that incorporates a sediment chamber and filter bed as parallel vaults adjacent to a parking lot.		79			41		68		47		-53		25			69					
	Organic Filter	Organic material such as compost or peat is used in the filter instead of sand.		88			61		30 [3]		41 [3]		-15		66 [3]			89					
	Bioretention [3]	soil matrix and is returned to the storm drain system. Includes		n/a			65		n/a		49		16		97			95					
*Open Channels***	Vegetated open channels that are designed to capture and treat the full water quality volume within dry or wet cells formed by check dams or other means.		80%	81		G	34		38	F	84 [3]		31	G	51			71		P			
	Dry Swale [3]	Open vegetated drainage channel or depression designed to detain water within dry cells formed by check dams or other means. Promotes filtration of stormwater runoff into the soil media. Permeable soil layer.		93			83		70		92		90		70			86					
	Wet Swale [3]	Open vegetated drainage channel or depression designed to retain water or intercept groundwater for water quality treatment in wet cell formed by check dams or other means. Creates a linear series of wetland cells.Wetland plants utilized.		74			28		-31		40		31		11			33					
Other Vegetated Systems (biofilters)	Grassed channel (also vegetated channels, grassed swales, vegetated swales) [3]	Grassed channels that collect and convey runoff usually to a basin or another BMP. Designed to treat shallow flows. Designed to filter stormwater runoff and meet velocity targets for the water quality design storm and the 2-year storm event.		68	60		29	20	40		n/a	10	-25		42	70		45	60				

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BMPS	DESCRIPTION		TSS				TP				Sol P	TN				Nitrate & Nitrite Nitrogen	Metals (Cd, Cu, Pb & Zn)	Cu	Pb		Zn		Pathogens[2]	Bacteria [9]	Organic Carbon [10]	Hydro-carbons
Other Vegetated Systems (biofilters) continued	Vegetated Filter Strips	Grass or other vegetation planted within uniformly graded areas which accepts sheet flow runoff from adjacent surfaces such as parking lots, highways and rooftops. Slows runoff velocity and filters out sediments and other pollutants through filtration and infiltration. Used in combination with riparian/wetland buffer to			65	60-80		40	30				40	30				45			60				
	Vegetated Buffers (grassed and treed) I.e. Wetland and Riparian buffers	Native or planted vegetation along edges of sensitive environmental resources which slows runoff velocity and filters out sediment and pollutants. Controls erosion of banks.				53-70			53-70					35-65											
Other Infiltration Systems	Porous pavement systems [3]	permeable layer of pavement or other stabilized permeable surface (I.e. porous asphalt, porous concrete, modular perforated concrete block, cobble pavers with porous joints or		95	90			65	65		10		83	85		n/a		n/a	100		99	100				
Dry Ponds ie Detention Basins, Dry Extended Detention Ponds, Extended Detention Basins/Ponds [6]	Basins designed to temporarily detain runoff for some minimum time and releases shortly after storm event (usually within 24 hours) . Reduces peak flow rate of stormwater discharges. Used for water quantity control only.			47	45	20		19	25	20	-6		25	30	25	3.5		26 [3]	50		26	20				
Oil/Grit Separators (also called oil and water separators) & Other Hydrodynamic Structures includes non-proprietary systems noted below and proprietary systems.[2, 7]	Specifically designed, baffled inlets, remove or segregate trash, debris and some amount of sediment and petroleum hydrocarbons from stormwater. Operate by principles of sedimentation for grit and phase separation for oil. Minimal flow attenuation and not designed for significant detention storage.			-8	51			-41	5		40		n/a	5		47		-22	15		17	5				
	Stormceptors (Trademark)	Proprietary oil/grit separator uses a bypass chamber & treatment chamber to trap and retain nps pollutants.		25				19			21		n/a			6		30			21					
	Grit Chambers / Water Quality Inlets	Consists of 3 bays: forebay for sediment trapping, separator section for oil separation and afterbay allows for some settling but generally stormwater is routed out to another BMP or storm drain system.			35	30			5	10				20	10				15	30		5				
	Deep Sump Catch Basins	Modified catch basin with the outlet pipe 4' below the inlet pipe. Allows suspended solids to settle out and oil and grease to float on surface of pool of water. Eventually oil and grease attach to sediment. Must be cleaned out for it to be effective.																								

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Catch Basin Insert	Designed to be suspended from storm drain inlet structure. Treats only the designed flow rate, should have a high-flow bypass to prevent resuspension and																								
In-line storage in the storm drain network	Collection of stormwater runoff from parking lots and roadways; allows for percolation of runoff. Provides storage within storm drain system to detain flows.																								

Notes:

Practices noted in italics are noted as effective BMPs for addressing water quality by NYSDEC. Includes 5 categories of effective BMPS: stormwater wetlands, stormwater ponds, filtration systems, infiltration systems and open channels. NYSDEC noted BMPs as effective if met water quality goals: 80% TSS (suspended inorganic and inorganic material) reduction; 40% TP removal and a proven record of longevity in the field. G=good pollutant removal (>30% TN, >60% metals, >70%) F= fair (15-30% TN, 30-60%

Footnote

[1] = Pollutant Removal Efficiencies from sources noted in color.

[2] Pathogens = Coliform, Streptococci, E. coli removal measured as by NYSDEC 2001.

[3] = Data is based on fewer than 5 data points for the pollutant removals from the National Pollutant Removal Performance Database for Stormwater Treatment Practices 2nd Edtn.

[4] = Assumed vertical sand filter is same as underground sand filter for National Pollutant Removal Database values.

[5=] Infiltration Practices Group pollutant removal efficiencies according to National Pollutant Removal Database 2nd Edtn. based on median value for Infiltration Trench & Porous Pavement methods.

[6] = Stormwater Dry Ponds group's median pollutant removal efficiency from National Pollutant Removal Performance Database incorporate efficiencies of Quality Control Pond & Dry Extended Detention Pond. Group median utilized for Dry Extended Pond pollutant removal efficiency.

[7] = Pollutant removal efficiency noted for Oil Grit separators separate and distinct from Stormceptor (trademark) value from National Pollutant Removal Performance Database 2nd Edtn.

[8 =] Assumed stormwater wetlands same as stormwater wet ponds for bacteria, organic carbon and hydrocarbon pollutant removal efficiency per National Pollutant Removal Performance Database 2nd Edtn.

[9] = Bacteria data include fecal streptococci, enterococci, fecal coliform, E. coli and total coliform as per National Pollutant Removal Performance Database 2nd Edtn.

[10 =] Excludes carbon data includes BOD, COD and TOC removal data.

n/a indicates that the data is not available

** Pollutant removal values from National Pollutant Removal Performance Database for group do not necessarily reflect all stormwater treatments listed in the group and may incorporate additional treatment types not included in

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