Presettling/Sedimentation Basin — BMP 16

Description

A presettling basin provides pretreatment of runoff in order to remove suspended solids that can impact other primary treatment BMPs. A presettling basin has no “permanent pool” volume; runoff is detained so that particulates can settle out before being discharged to another BMP. Runoff treated by a presettling basin should be further treated by a water quality filtration BMP, a wet pond-type BMP, or a biofilter. Presettling basins may need to be located “off-line” from the primary conveyance/detention system if used to protect infiltration or filtration BMPs from siltation.

Applications

Presettling basins basically fill one purpose: to protect more sensitive downstream facilities such as wetlands, from excessive sediment loads. Little effort is put on landscaping. The emphasis is on access for maintenance. Presettling basins are often constructed of concrete for easier sediment removal by heavy equipment. Presettling basin remove little or no pollutants besides those directly associated with sediments, such as some of the metals.

Limitations

Drainage area – 10+ ac.	Max slope – 10%
Minimum bedrock depth – 3 ft	Minimum water table – 2 ft
NRCS soil type – C, D	Freeze/thaw – good
Drainage/flood control – no	

Targeted Pollutants

Sediment – 60%
Phosphorus – 30%
Trace metals

Design Parameters

Site Constraints
Constraints are similar to wet ponds. Presettling basins tend to be smaller in size, however, and are easier to fit into small spaces.

Pool Volume
The temporary pool volume should be equal to the runoff volume of one-third of the 2-year, 24-hour design storm. Review Appendix D for additional information on sizing the detention facility.

Pond Configuration and Geometry
Presettling basins are normally single-celled. The total pond area and volume should be consistent with the sizing criteria given in Appendix D. If possible, a long, narrow basin is preferred, as this is less prone to short-circuiting and tends to maximize available treatment area. The length-to-width ratio should be at least 3:1 and preferably 5:1. The inlet and outlet should be at opposite ends of the pond where feasible. If this is not possible, then baffles can be installed to increase the flow path and water residence time.

Interior side slopes may be vertical, if concrete. Otherwise, they should be no steeper than 3H: 1V. Exterior embankment slopes should be 2H: 1V or less. The bottom of the basin should have a 2% slope to allow complete drainage.

Berm Embankment/Slope Stabilization
If a basin has embankments higher than 6 feet should require design by a geotechnical-civil engineer licensed in the state of Idaho. For berm embankments of 6 feet or less (including 1 foot freeboard), the minimum top width should be 6 feet or as recommended by the geotechnical-civil engineer.

Pond berm embankments should be constructed on native consolidated soil (or adequately compacted and stable fill soils analyzed by a geotechnical report) free of loose surface soil materials, roots and other organic debris.

Exposed earth on the side slopes and bottom should be sodded or seeded with the appropriate seed mixture as soon as is practicable. If necessary, geotextile or matting may be used to stabilize slopes while seeding and sodding become established.

Inlet Structure and Isolation/Diversion Structure
The inlet structure design should be adequate for isolating the water quality volume (i.e., runoff volume from the 6-month, 24-hour storm) from the larger design storms and to convey the peak flows for the larger design storms past the basin. The water quality volume should be discharged uniformly and at low velocity into the presettling basin in order to maintain near quiescent conditions that are necessary for effective treatment. It is desirable for the heavier suspended material to drop out near the front of the basin; thus, a drop inlet structure is recommended in order to facilitate sediment removal and maintenance. Energy dissipation devices may be necessary in order to reduce inlet velocities that exceed 3 feet per second.

Off-line Isolation/Diversion Structure
Presettling basins may need to be located off-line when used to protect filtration BMPs from siltation. Off-line systems are designed to capture and treat one-third of the 2-year, 24-hour design storm; this is typically achieved by using isolation/diversion baffles and weirs. A typical approach for achieving isolation of the water quality volume is to construct an isolation/diversion weir in the stormwater channel such that the height of the weir equals the maximum height of the water in the downstream facility during the water quality storm. When additional runoff greater than the water quality storm enters the stormwater channel, it will spill over the isolation/diversion weir and mixing with the already isolated water quality volume will be minimal.

Outlet Structure
The outlet structure conveys the water quality volume from the presettling basin to the primary treatment BMP (e.g., wetland, sand filtration basin). A perforated pipe or equivalent is the recommended outlet structure. The 24-hour

drawdown time should be achieved by installing a throttle plate or other flow control device at the end of the riser pipe (the discharges through the perforations should not be used for drawdown time design purposes).
A trash rack should be provided for the outlet. Openings in the rack should not exceed one-third the diameter of the vertical riser pipe. The rack should be made of durable material, resistant to rust, and ultraviolet rays. The bottom rows of perforations of the riser pipe should be protected from clogging. To prevent clogging of the bottom perforations it is recommended that geotextile be wrapped over the pipe's bottom rows and that a cone of 1 to 3 inch diameter gravel be placed around the pipe. If a geotextile is not used then the gravel cone should not include any gravel small enough to enter the riser pipe perforations.

Overflows

Presettling basin design should take into consideration the possibility of overflows. An overflow device should be installed in all facilities to bypass flows over or around the restrictor system. The most common overflow event is during snowmelt, but overflows may also result from higher intensity or longer duration storms than the design storm or result from plugged orifices or inadequate storage due to sediment buildup in the facility.

Construction Guidelines

Widely acceptable construction standards and specifications such as those developed by the NRCS or the U.S. Army Corps of Engineers for embankment ponds and reservoirs may aid in building the impoundment. Additional information is also available from the Idaho Transportation Department’s Design manual.

Maintenance

Failure of large impoundment structures can cause significant property damage and even loss of life. Only professional engineers registered in the state of Idaho who are qualified and experienced in impoundment design should design such structures. Where they exist, local safety standards for impoundment design should be followed. Impoundment structures should also be regularly inspected for signs of failure, such as seepage or cracks in the walls or berm. Include an access road in the design and ensure that it can handle the weight of heavy equipment.

Safety, Signage and Fencing

Basins that are readily accessible to populated areas should incorporate all possible safety precautions. Dangerous outlet facilities should be protected by enclosure. Warning signs should be used wherever appropriate. In the case of dry ponds, posted signs may help prevent calls about the flooded playground. Signs should be placed so that at least one is clearly visible and legible from all adjacent streets, sidewalks or paths.

Heavy Metal Contamination

Presettling basins are less likely to build up excessive levels of heavy metals from sediments washed off impervious areas than wet ponds. Routine maintenance should remove and properly dispose of any significant sediment deposits.