

Solids Settling Basin Design and Maintenance

SD-FS-108 May 2021

Open feedlots will shed water from the surface of the feedlot as runoff. The runoff will carry manure and bedding, which include nutrients. Waste Separation Facility (632) is the NRCS practice that can be used to design a Solids Settling Basin (SSB) to separate runoff water and the manure and sediment that has eroded from the feedlot surface. This practice is part of a comprehensive nutrient management plan that encompasses the collection, storage, and application of all nutrients, wastewater, manure solids, and other byproducts generated by an animal feeding operation.

Design of Settling Basins

An SSB can be designed to function in two different ways. The first method of operation is a passive method in which gravity drains the water out slowly while the SSB is filling and for a time after a storm. Solids will stop moving with the water when the runoff water velocity slows enough to allow the sediment to drop out. Therefore, the basin shape, size, outlet, and bottom slope are designed to allow the water velocity to slow long enough for the solids to settle. Common settling basin floor slopes range from 0.25 percent to 2 percent grade, typically performing best at grades from 0.5-1 percent.



Figure 1. Earthen basin using a hog panel as a screen – passive controlled basin.



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Settling Basin Design

- Design criteria is set by South Dakota Department of Environment and Natural Resources
- Storage Components

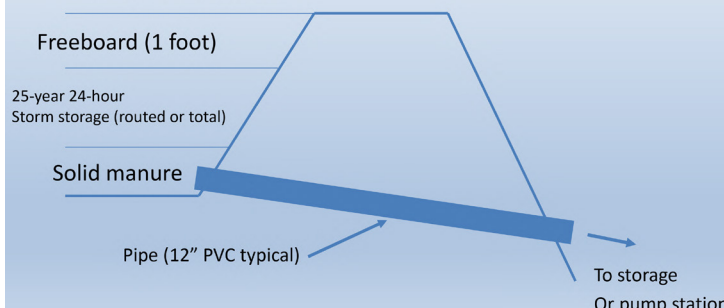


Figure 2. Diagram of typical passive settling basin profile.

An SSB can also be designed to operate in an active manner. Active management of settling basins typically consists of using a pump to transfer water to a higher elevation or different location not possible by gravity. Examples of this could include using a valve or gate to control timing of water release, management of water in an irrigation manner, or other scenarios where a producer must regularly operate and maintain the SSB. An SSB that is designed for active management will typically be sized larger than a passive system because it will typically be designed to store all of the water from a 25-year 24-hour storm before it is released.

When designing SSBs to NRCS criteria, all outflow from the SSB must be delivered to a holding pond for long term storage (NRCS CPS 313 – Waste Storage Facility) or conveyed to a vegetative treatment area (NRCS CPS 635 – VTA).

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Maintenance of Solids Settling Basins

- Removal of manure solids and other sediment from the basin bottom is the most frequent maintenance requirement.
- This removal is typically accomplished with a tractor with loader, payloader, excavator, skidsteer, or other equipment that can scoop and load manure and sediment. Skidsteers with rubber tracks have been found to be highly effective in removing solid from basins with earthen floors.
- Full or partial coverage of the basin floor with concrete is highly recommended. Concrete floors help to ensure that equipment can access the bottom of a wet basin for solids removal during wet seasons without causing ruts and pockets to develop in the basin floor, which is a common maintenance concern with all earthen floors.
- Concrete curbs and walls can also be highly desirable features of a settling basin as they can significantly help improve the ability to remove manure as well as the efficiency of the removal process.
- When manure and sediment removal is completed, care should be taken to inspect the outlet structures (pipes, pickets, screens, pumps). Any issues with water leakage, broken screens, or other issues related to outlet structures should be repaired or otherwise remediated.
- Manure solids removed from SSBs are most commonly applied to cropland immediately after removal. This application of manure solids should follow the nutrient management plan developed for the animal feeding operation. Phosphorus levels of the soil and the manure being applied should be carefully considered when applying manure and



Figure 3. Liquid manure pump for moving water out of the SSB to a holding pond or vegetative treatment area (See VTA Fact Sheet).

sediment from SSBs. Manure and soil testing are highly recommended prior to application to ensure that the nutrient application is in accordance with the nutrient management plan.

- If land application is not possible at the time of solids removal from the settling basin, the removed solids can be stockpiled until field application of the manure is possible. If the operation has a permit with the SD DENR, there are specific requirements for how long, in what location, and under what conditions solids may be stockpiled. The NRCS and agronomic consultants also provide information regarding stockpiling as part of the nutrient management plan for and operation.
- Maintenance of the feedlot surface will also provide benefits in terms of SSB maintenance. Regular removal of manure from the feedlot surface will prevent some of the solids from going into the SSB.



Figure 4. Sediment buildup against a wire mesh filter screen.



Figure 5. Collection basin with concrete push walls and a picket fence screen mounted in the concrete box outlet.

