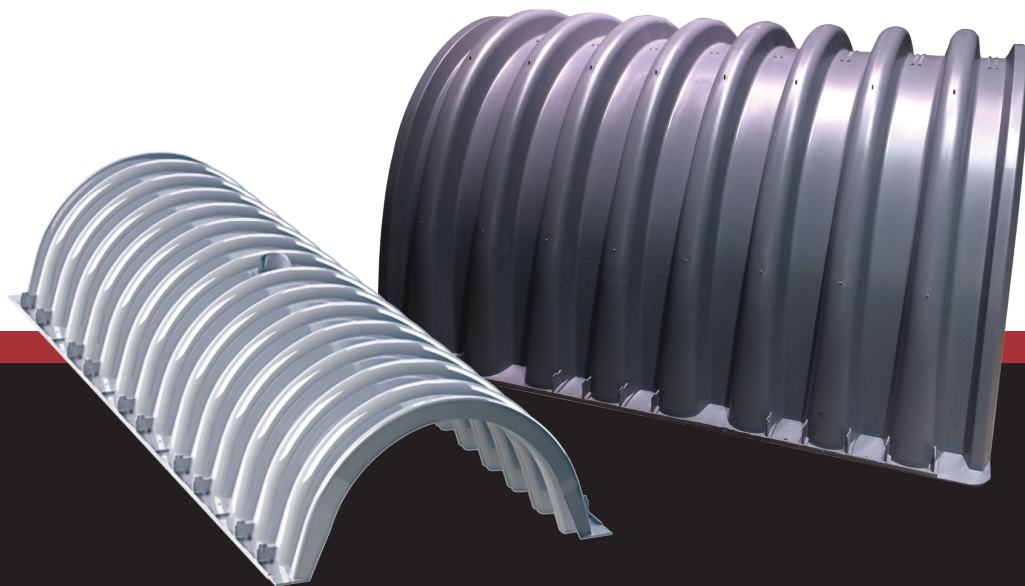




STORMKEEPER[™]

STORMWATER CHAMBER
SEDIMENT STRIP

Operation and Maintenance Manual



StormKeeper[™] Chamber Systems
for StormWater Management

Regularly scheduled inspection and proper maintenance will help ensure underground stormwater storage systems function as designed. After the construction project is closed it is the responsibility of the owner to maintain all stormwater conveyance, storage and treatment in accordance with local, county, state or federal requirements. Moreover, it shall be the responsibility of the owner or their agent to research and implement applicable safety, hazard, and health regulations; and obtain the necessary approvals, consents or permits from applicable agencies, private land owners, or public road authorities.

The frequency of these activities is site specific and ultimately based upon documented findings over time. Factors affecting frequency include but are not limited to the following: large storm events, extended dry/wet periods, upstream conditions, ground cover establishment, site activity, and the presence of any temporary or permanent water quality treatment measures upstream of the underground storage system. Installations require frequent inspections initially while vegetation is being re-established and soil erosion control measures remain in place. Well maintained soil erosion controls are critical in mitigating the potential for sediment infiltration. During construction it shall be the responsibility of the owner's engineer to determine acceptable sediment accumulations before cleaning procedures are required. Trash and debris shall be removed as discovered.

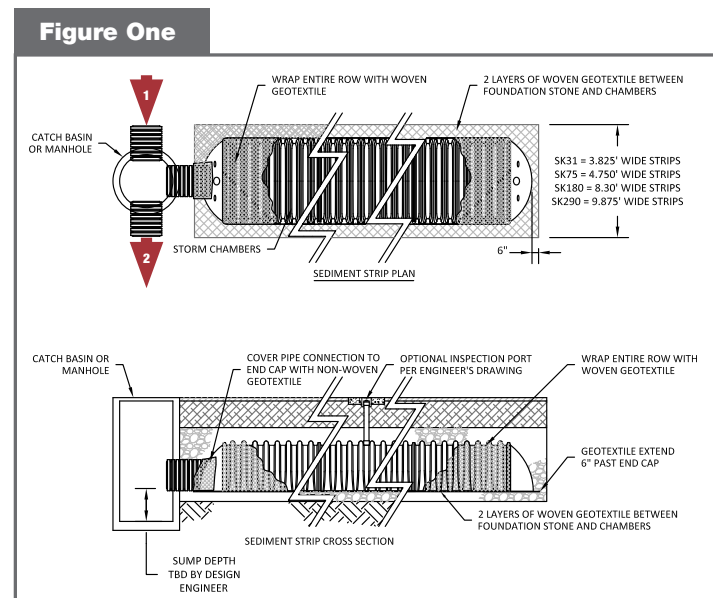
When properly designed the StormKeeper™ system can capture and accumulate sediment for removal. In essence, pollutants can be prevented from entering the stone voids and the potential for occlusion at the infiltration surface is largely mitigated. For chamber systems designed to detain and release water at a restricted rate into a drainage outlet, a filtering process with a level of water quality treatment has been added. In either case a sustainability feature is created and the system will continue to function as designed. The primary means of capturing sediment for removal involves diverting the initial stormwater flow, which carries the bulk of the sediment and other pollutants, to a designated chamber row that is hydraulically isolated from adjacent rows. The designated row is underlain with an appropriate geotextile to facilitate the capture and accumulation of pollutants. Water in the designated row eventually reaches a pre-determined elevation in which it becomes hydraulically connected to adjacent chamber rows so that water is allowed to fill the remaining portion of the chamber system. The designated row in a StormKeeper™ chamber system is referred to as the Sediment Strip.

STORMKEEPER™ SEDIMENT STRIP

(Figure One) Two strong layers of woven geotextile under the bottom of the Sediment Strip chambers provide a strong base for waterjetting to facilitate the cleaning operation. Inspection of the sediment strip can be accomplished through the diversion manhole or through inspection ports which can be installed along the strip.

¹Flow directed to the chamber system is first collected in an inlet manhole with an internal weir. The weir acts as a flow diverter and allows runoff at the beginning of a storm event to enter the sediment strip for filtration. Once the weir height is reached the Sediment Strip has received its design flow and the "first flush" has been treated.

²Additional chamber rows are connected to a manifold header that is connected to the inlet manhole on the overflow side of the weir. Stormwater overtopping the weir enters the manifold and is conveyed to the remaining chamber rows to meet storage requirements.



INSPECTION & MAINTENANCE

The inspection and maintenance frequency of the Sediment Strip is largely dependent on municipal regulations. The frequency will also be impacted by the rainfall intensity, pollutant loading, and other site conditions. At a minimum the sediment strip should be inspected every six months until the site is stabilized and annually thereafter. Once a sediment loading baseline is established for the stabilized site inspection frequencies may be adjusted accordingly.

Inspection is facilitated by the use of manholes and inspection ports. Inspection ports allow visual access without manual entry. Once the sediment depth reaches an average of three inches a maintenance cycle should be implemented.

Inspection steps:

1. Inspect sediment strip for sediment
 - A. Using inspection port
 - I. Remove lid on inline basin
 - II. Using a flashlight and stadia rod, measure the depth of sediment and record on a maintenance log.
 - III. Lower a camera into the sediment strip for visual inspection of sediment levels (optional).
 - IV. If sediment is at or above 3" proceed to step 2 below. If not, proceed to step 3.
 - B. Using upstream structures
 - I. Remove cover from structure at upstream end of sediment strip.
 - II. Using a flashlight, inspect down the sediment strip through the outlet pipe.
 - III. Mirrors on poles or cameras may be used to avoid a confined space entry.
 - IV. Follow OSHA regulations for confined space entry if entering a manhole.
 - V. If sediment is at or above 3" proceed to step 2 below. If not, proceed to step 3.
2. Clean out sediment strip using trucks furnished with water jetting and vacuum equipment.
 - A. Fixed culvert cleaning nozzle with rear facing spread of 48" or more is preferred.
 - B. Remove manhole lid/grate to access manhole cavity
 - C. Lower the hose and nozzle into the structure and sediment strip inlet stub above the manhole sump.
 - D. The vacuum hose may be positioned in the manhole sump as the jetting action propels the nozzle into and up the sediment strip.
 - E. Once the nozzle reaches the end of the sediment strip, pull back accumulated material towards the manhole with the jetting action while the nozzle is reeled back towards the manhole.
 - F. While material is being pulled back, the vacuum action is removing material from the sump.
 - G. Repeat the process until a clear effluent is observed.
 - H. Vacuum structure sump as required.
3. Replace all covers, grates, filters, lids, etc.
4. Record observations and actions.
5. Inspect and clean basins and manholes upstream of the stormkeeper system.

When a maintenance cycle is required only the Sediment Strip will require clean out. Access to the Sediment Strip is provided via a manhole located at the end of the row. The recommended practice of cleaning the Sediment Strip is standard jetting and vactoring methods. The process utilizes a high pressure water nozzle that propels itself from the manhole end of the Sediment Strip to the end opposite, flushing the sediments towards the manhole for extraction by vactoring. As the unit is retrieved the sediment is completely flushed towards the vactoring operation. Nozzle selection shall ensure safe and efficient pressures for jetting against the woven geotextile bottom. The process should only be used on Sediment Strips and is not applicable to other portions of the StormKeeper™ Chamber system.



Perform the following tasks monthly and after major storm events while the soil erosion control permit is open, the site is under construction, or vegetation has not been completely re-established:

- Inspect and document sediment, trash and debris build-up. Remove accumulations as necessary.
- If applicable, inspect and document sediment, trash and debris build-up in pre-treatment devices.
- Remove accumulations as necessary.
- Ensure inlet and outlet structures are freely flowing and free of debris and sediment build-up.
- Inspect ground surface above system for depressions or sinkholes which should be immediately addressed with the contractor upon discovery.
- Note signs of pollution such as oil sheens, discolored water, unpleasant odors.
- Check for proper operation of flow control devices, control gates, valves or other mechanical devices (including pre-treatment devices)

Once site construction is complete, all disrupted areas restored, and vegetation completely reestablished, the above items may serve as a baseline maintenance routine, along with any other actions that may have been incorporated into the initial protocol during the construction phase. The frequency of these operations shall be based upon experience gained during the earlier phase and increased until a desired equilibrium is attained. Documented activities noting the date, sediment accumulations, previous significant storm events, et al, will enable better discretion in this regard.

Sediment removal can be managed manually by bucketing and hoisting. However, this operation is more efficiently managed through the use of sewer cleaning equipment such as a vactor truck. The foregoing relates inspection and maintenance efforts that help ensure underground systems used for stormwater storage continue to function as intended by identifying some regular inspection and maintenance practices and frequencies.

It should be recognized by all concerned parties that the manufacturer is not the authority on inspection and maintenance procedures, and that these guidelines represent a starting point for a more detailed and relevant plan to be developed through experience.

About Lane

As a full-line manufacturer of corrugated metal and plastic drainage products, Lane Enterprises operates plants throughout the United States producing various types of buried structures for the construction industry.

For more than 90 years Lane has partnered with contractors and engineers to supply reliable products. Our focus on quality, responsiveness, and technical expertise has established a long history of successful partnerships within the industries we serve.

