CASEY & KELLER, INC.

LAND SURVEYORS- CIVIL ENGINEERS – PLANNERS

N.J. STATE BOARD OF PROFESSIONAL ENGINEERS & LAND SURVEYORS CERTIFICATE OF AUTHORIZATION NO. 24GA27985400

258 MAIN STREET, MILLBURN, NEW JERSEY, 07041

VOICE :**973-379-3280** FAX: **973-379-7993**

MAINTENANCE MANUAL
STORM WATER MANAGEMENT SYSTEM

PROPOSED TOWNHOMES
THE VILLAS AT ORANGE LAWN
305 RIDGEWOOD ROAD NORTH
Block 1304, Lot 6

Owner and Operator:

BNE REAL ESTATE GROUP
16 MICROLAB ROAD SUITE A
LIVINGSTON, NJ 07039

Prepared By:

Casey & Keller, Inc.
258 Main Street
Millburn, New Jersey 07041

OWNERSHIP INFORMATION

IMPORTANT NOTE TO PROPERTY OWNER:

Copies of this Manual must always remain on file with the person(s) or office responsible for maintenance. The owner is granted limited reproduction rights to this document to ensure that those responsible for maintenance—whether in-house or contracted to an outside entity have copies of this manual.

OWNER OF RECORD:

BNE REAL ESTATE GROP
16 MICROLAB ROAD SUITE A
LIVINGSTON, NJ 07039
Ph: 973-992-2443

TRANSFER OF OWNERSHIP:
EFFECTIVE DATE OF OWNERSHIP: _____

OWNER: _____

ADDRESS:
_____

PHONE: _____ FAX: _____

ALTERNATE PHONE: _____ EMAIL: _____

NOTES: _____

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NOTES: _____

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PART I—Inspection and Maintenance

A. AN OVERVIEW OF THE DRAINAGE SYSTEM

In general the stormwater management system is designed to minimize maintenance; however, like all buildings and grounds, it does require continued care to operate at maximum efficiency and consequently minimum cost. The inspection and maintenance can be conducted by the property owner, an operating entity (e.g., property manager), homeowners' association, through their in-house staff, or it can be contracted to a landscaping service or other business with experience in drainage facilities maintenance.

The stormwater system is composed of several features:

1. **INLETS**—In parking lots and driveways, rain (and melting snow) will travel across the ground as runoff to be collected into an underground piping system, by first dropping through metal grates into concrete boxes called inlets. The inlets have specially designed grates to prevent large pieces of debris and trash from getting into the inlet and pipes.
2. **PIPES**—The runoff travels underground through the pipes to a point of discharge. These pipes are usually made of reinforced concrete (RCP), high density polypropylene (HDPeP—usually black plastic), or polyvinyl chloride (PVC—usually white plastic). Most pipes are of solid wall construction to transport runoff water or to be used to temporarily detain water as part of the detention system. Other pipes may be perforated, which can be used to let water drain out through the holes into the surrounding ground or water from the ground can flow into the pipes depending on soils, ground conditions, elevations, and so forth.
3. **HEADWALL/ENDWALL**—The runoff will exit the pipes at a concrete wall (which may be called a headwall or interchangeably an endwall). These are all designed to let the flowing water spread out, slowing it down so that sediment and other materials can settle out of the water as well to reduce erosion potential.
4. **RIP-RAP**—These are stones usually 4 to about 12 inches in diameter at the end of the concrete headwall or a pipe with a special flared-end section (FES). They further slow down the runoff allowing more sediment to drop out of the water, and help keep the underlying soil from being washed away.
5. **BASIN**—The basin may be excavated down into existing ground or it may be formed by building earthen mounds ("berms") above ground. The basin holds back the runoff water either as a **d**etention (temporarily creating a pond as the water slowly drains out) or a **r**etention (a permanent pond whose water level rises up and down in response to storms) facility. The bio-detention type basin uses vegetation (trees and shrubs around the perimeter, groundcover and grasses in the bottom) to absorb and filter runoff water. These basins also feature sand beds beneath the bottom topsoil—some runoff water will filter down into the sand and then into a perforated collection pipe.
6. **DISCHARGE CONTROL STRUCTURES**—The pipes and basins then flow to the "heart" of the stormwater management system—the discharge control structure. Runoff water from underground pipes or directly from the basin flows into this box-like device, which may have trash racks and top grates to further eliminate any debris that may have made it all the way through the

system to this point. The box (usually of precast concrete or concrete block construction) may have an additional shorter wall inside with a small opening at the bottom. The small opening in the concrete wall (often covered with a metal plate with a hole in it) is designed to slow down the rate of water leaving the developed site in order to prevent flooding downstream properties. In larger rainstorms the runoff water will flow into the basin and pipes faster than it can flow out and will begin backing up creating a temporary pond. In even larger storms the runoff water may flow over the top of the discharge control structure grates—however, this is all accounted for in the design calculations.

7. **GUTTERS/DOWNSPOUTS/SPLASH PADS**—Under state and local stormwater regulations, runoff water flowing off of roofs is considered "clean" and does not necessarily have to be directed to the detention system which maybe basins, ponds, drywells, underground pipes and so forth. In general, allowing the water to flow through areas of dense vegetation (woodlands, meadows, and so forth, but not basic lawn areas) is sufficient to clean the water even further.
8. **SWALES**- These are shallow depressions in lawn areas that help direct runoff to inlets and other drainage structures. It is important that swales not be filled in with soil or blocked by sheds or other structures.
9. **DRYWELLS**- In general these are large concrete cylinders (similar to concrete manholes) with numerous openings in the side walls and open bottoms. The concrete cylinders are placed below ground and are almost always surrounded by several feet of clean crushed stone beneath the cylinder and along its side walls. A plastic type filter cloth (called a "geotextiles" is placed between the stone and the surrounding soil to keep soil particles from getting into the spaces between the stones. Runoff water is piped to the drywells where it first slows into the concrete cylinders. If the inflow of water is large enough, the openings in the stone will fill with water and the cylinder will fill with water. This rising water will pass through the openings in the cylinder grove walls into the surrounding stone. If the inflow is sufficiently large the concrete cylinder may fill to the top and spill out through an overflow pipe or bubble out through a grate covering the top of the cylinder.

B. GENERAL MAINTENANCE

All detention or retention components expected to receive and/or trap debris and sediment must be inspected for clogging and excessive debris and sediment accumulation at least four times annually as well as after every storm exceeding one inch of rainfall. The primary location for debris and particularly sediment accumulation will be near the inflow pipe of the dry basin. Additional components may include forebay, inflow pints, trash racks, outlet structures, and riprap or gabion aprons. Disposal of debris, trash, sediment, and other waste material should be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste regulations. Although the stormwater detention basin has been designed for minimal maintenance, it does require frequent inspection and periodic maintenance. The responsibility for the stormwater management system rests with the owner. The owner may opt to contract out for inspection and maintenance services, however, members of the owner's in-house maintenance staff or other representatives should periodically conduct their own visual inspection. Landscaping services will be required for this project and the landscapers, whether in-house or under contract, should be instructed to examine the basin and the earthen embankment during the course of their work and report any problems.

After several storm events or an extreme storm event, inspect for: signs of clogging of the inlet or outlet structures and sediment accumulation. Inspect for: trash and debris; clogging of the outlet

structures and any pilot channels; excessive erosion; sediment accumulation in the basin and inlet/outlet structures; tree growth on dam or embankment; the presence of burrowing animals; standing water where there should be none; vigor and density of the grass turf on the basin side slopes and floor; differential settlement; cracking; leakage; and slope stability.

The estimated annual cost to perform the required maintenance is approximately $ 2,600.00.

<u>Monthly</u>	
Grass mowing	
Filling burrowed holes	
Leaves pick up	
Cleaning discharge structure	
Picking up debris	$120.00/month (mainly in the warm months)
<u>Quarterly or as Needed</u>	
Removing silt build up	$200.00/session
<u>As Needed(Three Years)</u>	
Sand bed replacement	$400.00
Restoring Structures (Discharge, Headwalls)	$300.00/structure

The costs should be shown in an annual report of the maintenance operation that should be submitted to the Township Engineer by April 1st of every year.

C. INSPECTIONS

Informal inspections should be conducted at least four (4) times per year and after every significant rainfall by the owner/operator or its consultant/contractor using the format found in ***Report on Conditions***. ***Annual Reports*** follow a similar format as found in this manual. The reports from these inspections do not have to be submitted to the Township unless requested, but should be kept on file as part of the facility's permanent record. An annual report shall be submitted to the Township Engineer. Failure of the owner/operator to perform the required inspection within the specified time frames or failure to submit the required reports on the conditions of the facility may result in fines and/or any other remedy allowed by law.

<u>PHOTOGRAPHS</u>—It is highly recommended that the inspector take photographs of problems areas and attach the photos to the report. Captions with each photo can help document specific problem areas, describe the actual problem, and provide recommendations for correcting those particular problems. These photos should be part of the maintenance record and can easily be referred to over the years to see if the same type problems keep coming up and whether such problems are just a regularly occurring consequence of the type of facility or if it is something unique. For certain maintenance procedures a series of photos may help explain the different steps necessary to do a certain activity—this could be especially helpful for a maintenance action that may only be required once every several years. Before and after photographs may be helpful as well.

D. MAINTENANCE WORK

It normally takes a certain amount of hours to completely drain the maximum design storm runoff volume from a detention or retention basin. This normal drain time should then be used to evaluate the basin's actual performance. If significant increases or decreases in the normal drain time are observed, the basin's outlet structure and both groundwater and tailwater levels must be evaluated and appropriate measures taken to comply with the maximum drain time requirements. Maintenance requirement for the detention facility shall be as follows:

1. Provide routine grass mowing and removal of grass clippings.
2. Inspect trash racks, channels, inlet and outlet structures, orifice, weir, discharge control structure, grates, and other appurtenances on a monthly basis and after each storm event and remove any blockages and debris. The above should also be inspected in advance of any large predicted storms.
3. Provide annual inspections to monitor the presence of debris and litter, the conditions of all structures, sediment accumulation, vegetation encroachment, riprap, and all aspects of the facility's operation.
4. Sediment deposition should be continuously monitored and removed as quickly as possible.
5. Vegetation should be maintained for critical area stabilization as specified in the vegetative practices contained in the *Standards for Erosion and Sediment Control in New Jersey*. Trees, including seedlings and saplings, must not be allowed to become established on the embankment of basins and ponds and must be removed.
6. Examine the earthen embankments for any signs of erosion, depressions, animal burrows, or signs of mass movement. If there are signs that animals (e.g., muskrats) are burrowing into the earthen embankment, they should live-trapped and removed from the area. The cause of any erosion or other problems should be investigated and promptly remedied.
7. After several storm events or an extreme storm event, inspect for: signs of clogging of the inlet or outlet structures and sediment accumulation.
8. Inspect semi annually for: trash and debris; clogging of the outlet structures and any pilot channels; excessive erosion; sediment accumulation in the basin and inlet/outlet structures; the presence of burrowing animals; standing water where there should be none; differential settlement; cracking; leakage; and slope stability.
9. Inspect that the outlet structures, pipes, and downstream channels are free of debris and are operational.
10. Note signs of pollution, such as oil sheens, discolored water, or unpleasant odors.
11. Check for sediment accumulation in the facility.
12. Check for proper operation of control gates, valves or other mechanical devices.
13. Perform structural repairs to inlet and outlets, replace components as necessary.
14. Clean and remove debris from inlet and outlet structures.
15. Repair damage to inlet or outlet structures, control gates, valves, or other mechanical devices; repair undercut or eroded areas.
16. Monitor sediment accumulations, and remove sediment when the pond volume has become reduced significantly.

Maintenance equipment primarily involves mowers, trimmers, wheelbarrows, and related lighter duty landscaping equipment. Provisions must be made for heavier duty equipment that may be necessary for sediment removal or the cleaning of pipes, channels, trash racks, and so forth.

Under no circumstances are maintenance activities such as trash rack cleaning to be conducted during large storm events, when the spillway and other structures are ice covered, or at other times

that may be dangerous to workers and support personnel. The owner/operator and contractors shall follow all applicable local, state, and federal safety rules.

For those facilities that incorporate a manufactured device (e.g. to remove suspended solids, floating debris, etc.), the owner is to consult with the manufacturer's recommendations and requirements. Documents and contact information for any such manufacturers are found elsewhere in this manual.

E. LANDSCAPING

Maintenance of appropriate landscaping is critical to the safe operation and protection of the bio-retention/detention / wet pond facility and specifically to the integrity of the earthen embankments. The earthen embankments are to be protected with a dense turf grass or other approved groundcover and as specified in the *Standards for Erosion and Sediment Control in New Jersey*. The turfgrass beneath the emergency spillway and the downstream slope will be underlain with a long-life PVC turf reinforcement mat or approved alternative. Mowing and/or trimming of vegetation must be performed on a regular schedule based on specific site conditions. Grass should be mowed at least once a month during the growing season. Vegetated areas must also be inspected at least annually for erosion and scour. Vegetated areas should also be inspected at least annually for unwanted growth, which should be removed with minimum disruption to the remaining vegetation. When establishing or restoring vegetation, biweekly inspections of vegetation health should be performed during the first growing season or until the vegetation is established. Once established, inspections of vegetation health, density and diversity should be performed at least twice annually during both the growing and non-growing season. The vegetative cover should be maintained at 85%. All use of fertilizers, mechanical treatments, pesticides and other means to ensure optimum vegetation health must not compromise the intended purpose of the wet pond / bio-retention. All vegetation deficiencies should be addressed without the use of fertilizers and pesticides whenever possible.

Landscaping maintenance is to include all necessary work to maintain the groundcover in a healthy state. Such work may include supplemental watering, the use of natural fertilizers, placement of topsoil, replacement of dead or dying plants, and other incidental work. Tree seedlings and saplings are to be removed from all areas of the basin bottom, embankments, and other areas that might compromise the function and stability of the detention facility. Similarly, noxious weeds and invasive plants are to be controlled and prevented from negatively affecting the facility.

F. MAINTENANCE REPORTS

Maintenance records as a minimum are to contain the following information:

1. Name of inspector(s) and the date
2. Weather conditions at the time of the inspection
3. Type of maintenance being conducted (monthly, yearly, post-storm, etc.)
4. Condition of facilities inspected
5. Work recommended
6. Date work begins
7. Date work is completed
8. List of materials and equipment used
9. Future anticipated maintenance work
10. Comments

G. LOCAL AGENCIES

The following agencies are listed for the owner/operator's reference:

Hudson, Essex & Passaic Soil Conservation District
15 Bloomfield Ave.
North Caldwell, New Jersey 07006
Tel.—(973) 364-0786
Fax.—(973) 364-0784

Essex County Engineering Department
900 Bloomfield Ave.
Verona, New Jersey 07044
Tel.—(973) 226-8506
Fax.—(973) 226-7469

Township of South Orange Engineering Department
300 Walton Avenue
South Orange, New Jersey 07079
Tel.—(973) 378-7741

New Jersey Department of Environmental Protection
Division of Land Use Regulation
P.O. Box 439—501 East State Street
Station Plaza 5—Second Floor
Trenton, New Jersey 08625
Tel—609-777-0454
Website— www.nj.gov/dep/landuse

PART II—Contech Jellyfish Filter

CONTECH ENGINEERED SOLUTIONS

Jellyfish® Filter Manhole Installations
Inspection and Maintenance Manual

CONTECH Engineered Solutions
1-800-548-4667

Inspection and Maintenance Overview

The primary purpose of the Jellyfish® Filter is to capture and remove pollutants from stormwater runoff. As with any filtration system, these pollutants must be removed to maintain the filter's maximum treatment performance. Regular inspection and maintenance are required to insure proper functioning of the system.

Maintenance frequencies and requirements are site specific and vary depending on pollutant loading. Maintenance activities may be required in the event of an upstream chemical spill or due to excessive sediment loading from site erosion or extreme runoff events. It is a good practice to inspect the system after major storm events.

Inspection activities are typically conducted form surface observations and include:

- Observe if standing water is present
- Observe if there is any physical damage to the deck or cartridge lids
- Observe the amount of debris in the Maintenance Access Wall (MAW)

Maintenance activities typically include:

- Removal of oil, floatable trash and debris
- Removal of collected sediments
- Rinsing and re-installing the filter cartridges
- Replace filter cartridge tentacles, as needed.

It is recommended that Jellyfish Filter inspection and maintenance be performed by professionally trained individuals, with experience in stormwater maintenance and disposal services. Maintenance procedures may require manned entry into the Jellyfish structure. Only professional maintenance service providers trained in confined space entry procedures should enter the vessel. Procedures, safety and damage prevention precautions, and other information, included in these guidelines, should be reviewed and observed prior to all inspection and maintenance activities.

Inspection Timing

Inspection of the Jellyfish Filter is key in determining the maintenance requirements for, and to develop a history of the site's pollutant loading characteristics. In general, inspections should be performed at the times indicated below; *or per the approved project stormwater quality documents (if applicable), whichever is more frequent.*

- Post-construction inspection is required prior to putting the Jellyfish Filter into service. All construction debris or construction-related sediment within the device must be removed, and any damage to system components repaired.
- A minimum of two inspections during the first year of operation to assess the sediment and floatable pollutant accumulation, and to ensure proper functioning of the system.
- Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the first year of operation. Minimum frequency should be once per year.
- Inspection is recommended after each major storm event.
- Immediately after an upstream oil, fuel or other chemical spill.

Inspection Tools and Equipment

The following equipment and tools are typically required when performing a Jellyfish Filter inspection:

- Access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Tape measure
- Flashlight
- Camera
- Inspection and maintenance log documentation
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

Inspection Procedure

The following procedure is recommended when performing inspections:

- Provide traffic control measures as necessary.
- Inspect the MAW for floatable pollutants such as trash, debris, and oil sheen.
- Measure oil and sediment depth by lowering a sediment probe through the MAW opening until contact is made with the floor of the structure. Retrieve the probe, record sediment depth, and presences of any oil layers and repeat in multiple locations within the MAW opening. *Sediment depth of 12 inches or greater indicates maintenance is required.*
- Inspect cartridge lids. Missing or damaged cartridge lids to be replaced.
- Inspect the MAW, cartridge deck, and backwash pool weir, for cracks or broken components. If damaged, repair is required.
- **Dry weather inspections:** inspect the cartridge deck for standing water.
    - No standing water under normal operating condition.
    - Standing water **inside** the backwash pool, but not outside the backwash pool, this condition indicates that the filter cartridges need to be rinsed.
    - Standing water **outside** the backwash pool may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.
- **Wet weather inspections:** observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW.
    - **Less than 6 inches**, flow should be exiting the cartridge lids of each of the draindown cartridges (i.e. cartridges located outside the backwash pool).
    - **Greater than 6 inches**, flow should be exiting the cartridge lids of each of the draindown cartridges and each of the hi-flo cartridges (i.e. cartridges located inside the backwash pool), and water should be overflowing the backwash pool weir.
    - **18 inches or greater** and relatively little flow is exiting the cartridge lids and outlet pipe, this condition indicates that the filter cartridges are occluded with sediment and need to be rinsed.

Maintenance Requirements

Required maintenance for the Jellyfish Filter is based upon results of the most recent inspection, historical maintenance records, or the site specific water quality management plan; whichever is more frequent. In general, maintenance requires some combination of the following:

- Sediment removal for depths reaching 12 inches or greater, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.

- Floatable trash, debris, and oil must be removal.
- Filter cartridges rinsed and re-installed as required by the most recent inspection results, or within 12 months of the most recent filter rinsing, whichever occurs sooner.
- Replace filter cartridge if rinsing does not remove accumulated sediment from the tentacles, or if tentacles are damaged or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.
- Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.
- The unit must be cleaned out and filter cartridges inspected immediately after an upstream oil, fuel, or chemical spill. Filter cartridge tentacles should be replaced if damaged by the spill.

Maintenance Tools and Equipment

The following equipment and tools are typically required when performing Jellyfish Filter maintenance:

- Vacuum truck
- Ladder
- Garden hose and low pressure sprayer
- Rope or cord to lift filter cartridges from the cartridge deck to the surface
- Adjustable pliers for removing filter cartridge tentacles from cartridge head plate
- Plastic tub or garbage can for collecting effluent from rinsed filter cartridge tentacles
- Access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Tape measure
- Flashlight
- Camera
- Inspection and maintenance log documentation
- Safety cones and caution tape
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Proper safety equipment for confined space entry
- Replacement filter cartridge tentacles if required

Maintenance Procedure

The following procedures are recommended when maintaining the Jellyfish Filter:

- Provide traffic control measures as necessary.
- Open all covers and hatches. Use ventilation equipment as required, according to confined space entry procedures.
- **Caution:** Dropping objects onto the cartridge deck may cause damage.
- Perform **Inspection Procedure** prior to maintenance activity.
- To access the cartridge deck for filter cartridge service, descend the ladder and step directly onto the deck. **Caution:** Do not step onto the maintenance access wall (MAW) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.
- **Filter Cartridge Rinsing Procedure**
    - Remove a cartridge lid.
    - Remove the cartridge from the receptacle using the lifting loops in the cartridge head plate. **Caution:** Should a snag occur, do not force the cartridge upward as damage to the tentacles may result. Rotate the cartridge with a slight sideways motion to clear the snag and continue removing the cartridge.

- Thread a rope or cord through the lifting loops and lift the filter cartridge from the cartridge deck to the top surface outside the structure.
- **Caution:** Immediately replace and secure the lid on the exposed empty receptacle as a safety precaution. Never expose more than one empty cartridge receptacle.
- Repeat the filter cartridge removal procedure until all of the cartridges are located at the top surface outside the structure.
- Disassemble the tentacles from each filter cartridge by rotating counter-clockwise. Remove the tentacles from the cartridge head plate.
- Position a receptacle in a plastic tub or garbage can such that the rinse water is captured. Using a low-pressure garden hose sprayer, direct a wide-angle water spray at a downward 45° angle onto the tentacle membrane, sweeping from top to bottom along the length of the tentacle. Rinse until all sediment is removed from the membrane. **Caution:** Do not use a high pressure sprayer or focused stream of water on the membrane. Excessive water pressure may damage the membrane.
- Remove rinse water from rinse tub or garbage can using a vacuum hose as needed.
- Slip the O-ring over the pipe nipple on the top end of the tentacle and reassemble onto the cartridge head plate; hand tighten.
- If rinsing is ineffective in removing sediment from the tentacles, or if tentacles are damaged, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Contech to order replacement tentacles.
- Lower a rinsed filter cartridge to the cartridge deck. Remove the cartridge lid on a receptacle and carefully lower the filter cartridge into the receptacle until the head plate gasket is seated squarely on the lip of the receptacle. **Caution:** Should a snag occur when lowering the cartridge into the receptacle, do not force the cartridge downward; damage may occur. Rotate the cartridge with a slight sideways motion to clear the snag and complete the installation.
- Replace the cartridge lid on the exposed receptacle. Check the fit before completing rotation to a firm hand-tight attachment. Rinse away any accumulated grit from the receptacle threads if needed to get a proper fit.
- Repeat cartridge installation until all cartridges are installed.

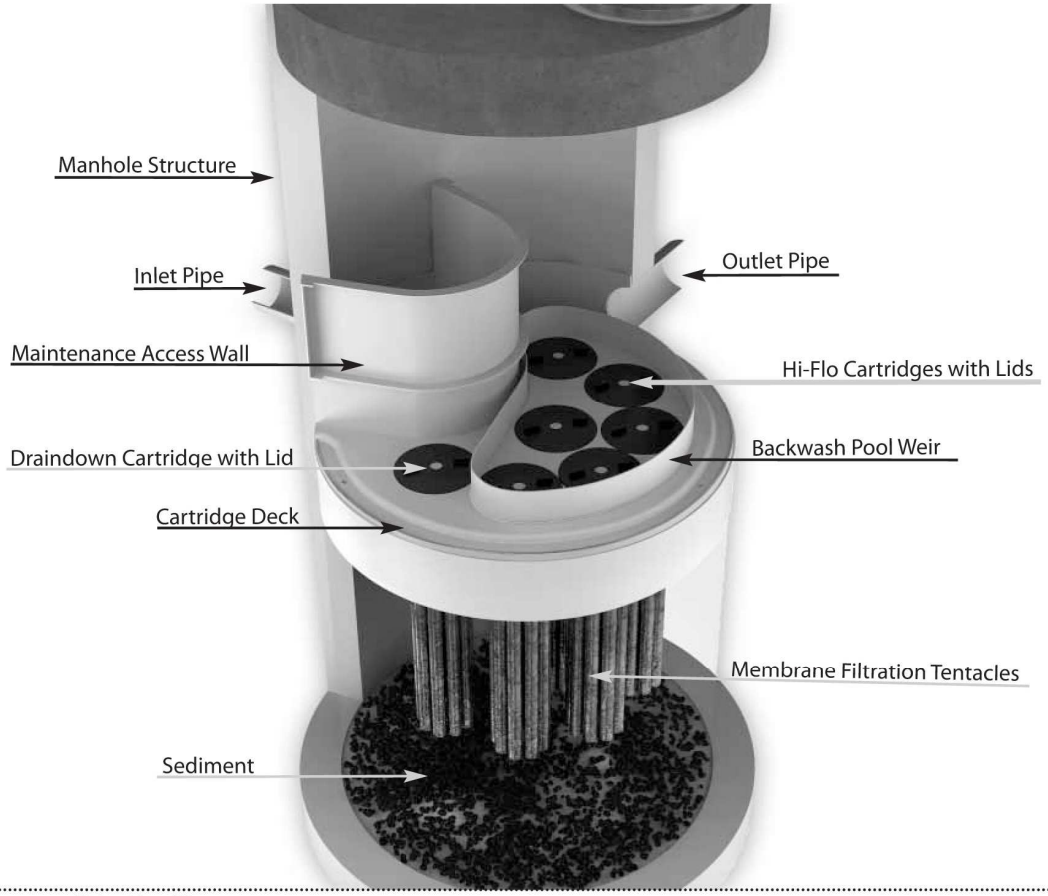
- **Vacuum Cleaning Procedure**
  - **Caution:** Perform vacuum cleaning of the Jellyfish Filter only after filter cartridges have been removed from the system. Access the lower chamber for vacuum cleaning **only through the maintenance access wall (MAW) opening**, being careful not to damage the flexible plastic separator skirt that is attached to the underside of the deck. The separator skirt surrounds the filter cartridge zone, and could be torn if contacted by the wand. **Do not lower the vacuum wand through a cartridge receptacle**, as damage to the receptacle will result.
  - To remove floatable trash, debris, and oil, lower the vacuum hose into the MAW opening and vacuum floatable pollutants off the surface of the water. Alternatively, floatable solids may be removed by a net or skimmer.
  - Using a vacuum hose, remove the water from the lower chamber to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank.
  - Remove the sediment from the bottom of the unit through the MAW opening.
  - For larger diameter Jellyfish Filter manholes (8-ft, 10-ft, 12-ft diameter), complete sediment removal may be facilitated by removing a cartridge lid from an empty receptacle and inserting a jetting wand (not a vacuum wand) through the receptacle. Use the sprayer to rinse loosened sediment toward the vacuum hose in the MAW opening, being careful not to damage the receptacle..
  - After the unit is clean, re-fill the lower chamber with water if required by the local jurisdiction, and re-install filter cartridges.
  - Dispose of sediment, floatable trash and debris, oil, spent tentacles, and water according to local regulatory requirements.

- **Chemical Spills**
    - **Caution:** If a chemical spill has been captured by the Jellyfish Filter, do not attempt maintenance. Immediately contact the local hazard response agency, and contact Contech Engineered Services.

Below is a cut-away schematic of the Jellyfish Filter manhole with key components identified (6-ft diameter manhole is depicted).

FIGURE 1

Jellyfish Filter and Components



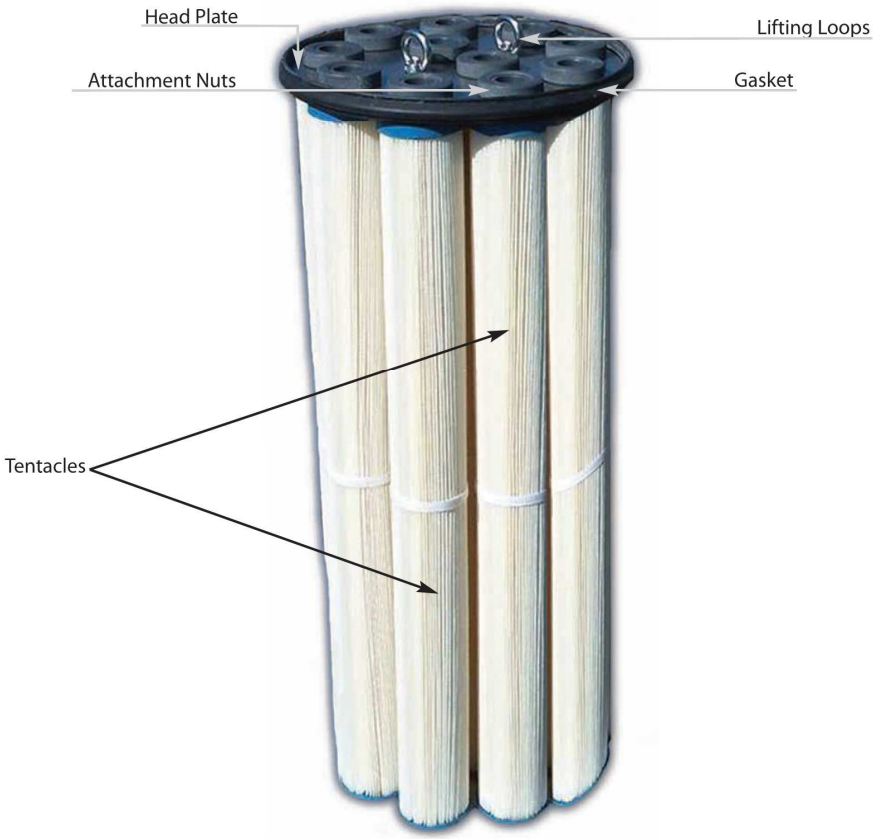
Note: Separator Skirt Not Shown

The Jellyfish Filter has no moving parts to wear out and therefore maintenance activities are generally focused on pollutant removal and filter cartridge service.

Below is a schematic of a Jellyfish Filter membrane filtration cartridge. Tentacles can be easily removed from the head plate and rinsed or replaced as needed.

FIGURE 2

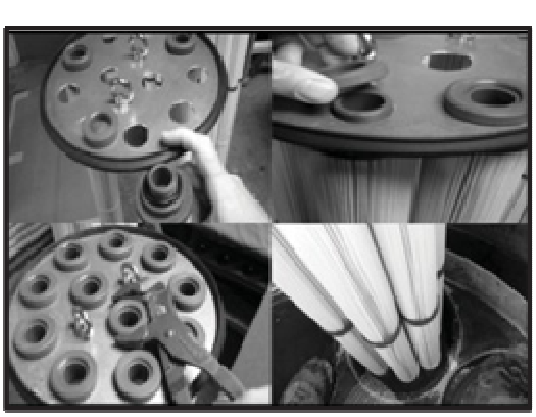
Jellyfish Membrane Filtration Cartridge



The depth of sediment and oil can be measured from the surface by using a sediment probe or dipstick tube equipped with a ball check valve and inserted through the Jellyfish Filter's maintenance access wall opening. The large opening provides convenient access for inspection and vacuum removal of water and pollutants.

A maintenance worker stationed on the surface uses a vacuum hose to evacuate water, sediment, and floatables from the Jellyfish Filter by inserting the vacuum wand through the maintenance access wall opening.

A view of a Jellyfish Filter cartridge deck from the surface showing all the cartridge lids intact and no standing water on the deck (left image), and inspection of the flexible separator skirt from inside the maintenance access wall opening (right image).



Assembly of a Jellyfish Filter cartridge (left) and installation of a filter cartridge into a cartridge receptacle in the deck (right).

Rinsing of dirty filter cartridge tentacles with a low-pressure garden hose sprayer, and using a plastic garbage container to capture rinse water.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to the Jellyfish Filter's long and effective service life.

Ordering Replacement Parts

Jellyfish Filter cartridges, replacement tentacles, cartridge lids, and other system components can be ordered by contacting: **Contech Engineered Solutions, 1-800-548-4667**

PART III—Sand Bed Filter

A. INSTALLATION AND OPERATION

The specifications for the sand in the sand bed must be a clean medium aggregate concrete sand in accordance with AASHTO M-6 or ASTM C-33. A gravel layer will serve as bedding material for the underdrain pipes. It must be at least 2 inches in thickness of gravel above and below the pipes. It should consist of 1/2" to 1-1/2" clean broken stone or pea gravel (AASHTO M-43). The underdrain piping must be rigid Schedule 40 PVC pipe in accordance with AASHTO M278. Perforated underdrain piping should have a minimum of 3/8- inch diameter perforations at 6-inch centers with four perforations per annular row. The portion of drain piping beneath the sand bed must be perforated. All remaining underdrain piping, including cleanouts, must be nonperforated. All joints must be secure and watertight. Cleanouts must be located at the upstream and downstream ends of the perforated section of the underdrain and extend to or above the surface of the sand bed. Additional cleanouts should be installed as needed.

B. MAINTENANCE PROCEDURE

Maintenance requirement for the sand bed filter shall be as follows:

1. The sand bed should be inspected for debris and sediment at least four times annually.
2. The infiltration rate should be tested two times annually. (This can be performed by soils testing service.
3. Inspect for clogging and excessive debris after every storm exceeding one inch of rainfall. The above should also be inspected in advance of any large predicted storms. Weather data and weather forecasts can be obtained from various meteorological services (both government and private).
4. All sediment removal should take place after the sand bed is dry.
5. Water should infiltrate 72 hours after the end of the stormwater quality design storm. Corrective measures should be taken if water is not infiltrating correctly.

Maintenance equipment primarily involves shovels, hoes, wheelbarrows, and related lighter duty landscaping equipment. Provisions must be made for heavier duty equipment that may be necessary for sediment removal or the cleaning of pipes, sand, and so forth.

PART IV—Guters and Leaders

As part of good maintenance procedure it is recommended that the gutters and leaders be periodically inspected and cleaned. The building drainage system should particularly be inspected during the autumn when falling and blowing leaves and miscellaneous materials can easily clog drain pipes, plug downspouts, and cover inlet grates. Gutters and leaders should also be inspected in the springtime for debris, correct pitch, loose connections, and other various problems that may have occurred over the winter. It is also suggested that the system be examined whenever large storms are predicted.

Debris removed from the drainage system should be examined for reuse. That is, it can be separated into trash, recyclables, and organic matter. Organic materials such as leaves and twigs could possibly be composted if there is sufficient room at the site for such activity.

Equipment for gutter and leader cleaning could include ladders, "grab" poles, rakes, plumber's snakes, and garden hoses. Heavy duty rubber or leather work gloves, non-slip work shoes, and protective eyewear are also recommended.

PART V—Dry Wells (Manholes)

Effective dry well performance requires regular and effective maintenance. *Chapter 8: Maintenance and Retrofit of Stormwater Management Measures of the New Jersey DEP's Manual of Best Management Practices* provides information and requirements for preparing a maintenance plan for stormwater management facilities, including dry wells. Some of the specific maintenance requirements for dry wells are presented below.

GENERAL MAINTENANCE

A dry well should be inspected at least four times annually as well as after every storm exceeding 1 inch of rainfall. If a test well is provided the water level in the test well should be the primary means of measuring infiltration rates and drain times. Pumping stored runoff from an impaired or failed dry well can also be accomplished through the test well. Therefore, adequate inspection and maintenance access to the test well must be provided. Disposal of debris, trash, sediment, and other waste material removed from a dry well should be done at suitable disposal/recycling sites and in compliance with local, state, and federal waste regulations.

If no test well is provided, the concrete cylinders of the drywell system can be examined for proper drainage. It would normally take 26 hours to drain the maximum design storm runoff volume from the dry wells. This normal drain time should be used to evaluate the dry well's actual performance. If significant increases in the normal drain time are observed or if it exceeds the 72 hour maximum, appropriate measures must be taken to comply with the drain time requirements and maintain the proper functioning of the dry well.

OTHER MAINTENANCE CRITERIA

In addition to checking the insides of the concrete cylinders for debris and sediment, the inflow and overflow pipes, as well as those pipes connecting the different cylinders must be examined for obstructions and damage. When it is necessary for workers to enter a drywell cylinder to remove debris or sediment they must be provided with ladders, hardhats, harnesses, and other safety equipment. The requirements of the Occupational Safety and Health Administration (OSHA) must be followed.

PART VI—Inlets

Inlets and discharge control devices should be inspected after several storms to ensure that they are functioning properly and that there is no erosion or debris problems developing. Source of sediment contamination should be identified and controlled when native soil is exposed or erosion channels are present. Inspect for sediment and debris buildup. Sediment buildup exceeding 2 inches in depth or that begins to constrict the flow path should be removed. The Inlet control devices should particularly be inspected during the autumn when falling and blowing leaves and miscellaneous materials can easily clog drain pipes, plug downspouts, and cover inlet grates. Clean out leaves, trash, debris, etc.

Maintain records of all inspections and maintenance activity. Include estimate of sediment and/or debris removed. Indicate sediment and/or debris disposal methods. Ongoing, with documentation of each monthly inspection report

PART VII—Project Contracts

CONTRACTOR NAME: ____

ADDRESS: ____

PHONE #: ____________ FAX #: ____________ EMAIL: ____________

TYPE OF SERVICES PROVIDED: ______________________________

CONTRACT DURATION: ______________________________

COMMENTS: ____

CONTRACTOR NAME: ____

ADDRESS: ____

PHONE #: ____________ FAX #: ____________ EMAIL: ____________

TYPE OF SERVICES PROVIDED: ______________________________

CONTRACT DURATION: ______________________________

COMMENTS: ____

CONTRACTOR NAME: ____

ADDRESS: ____

PHONE #: ____________ FAX #: ____________ EMAIL: ____________

TYPE OF SERVICES PROVIDED: ______________________________

CONTRACT DURATION: ______________________________

COMMENTS: ____

CONTRACTOR NAME: ____

ADDRESS: ____

PHONE #: ____________ FAX #: ____________ EMAIL: ____________

TYPE OF SERVICES PROVIDED: ______________________________

CONTRACT DURATION: ______________________________

COMMENTS: ____

Part VIII—Report on Conditions

[Periodic/Special Inspection Reports]

Date: _____ **Time:** _____ **No.**_____

Reason (circle one**): Routine Post-Storm Other**

_____

_____

Weather Conditions: _____

_____

Location: (e.g., "West Dry Detention Basin," "Underground Detention System—Parking Lot A" etc.)

A)_____

B)_____

C)_____

_____

_____

Facility Inspected (Not all features will be found at the site):

____Underground Detention System
____Rain Garden/Sand Filter
____Manholes
____Headwall/Endwall
____Detention Basin (Dry)
____Discharge Control Structure
____Rip-Rap
____Manufactured Devices
____Basin Vegetation
____Storm Sewer Inlet
____Pipelines
____Retention Basin (Wet)
____Gabion Dam
____Trash Racks/Grates

Other: _____

Other: _____

Other: _____

What was found: _____

_____

_____

_____

_____

(What was found continued): _____

_____

_____

_____

_____

_____

Need for Work: **EMERGENCY/URGENT**

Near-Term Future As Part of Scheduled Maintenance

Comments and Recommendations: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

PHOTOS TAKEN ___Yes ___No

Inspector: _____

Signed: _____

_____

_____

PART IX—Annual Inspection Form

ANNUAL INSPECTION FORM—305 RIDGEWOOD ROAD NORTH

Name of Inspector(s): _____ Date: _____

_____

Weather Conditions: _____

A. Inspection Checklist

Completed	Type of Inspection	Condition
_____	Visual Inspection of Spillway	_____
_____	Visual Inspection of Basin	_____
_____	Visual Inspection of Discharge Control Structure	_____
_____	Visual Inspection of Outlet Pipe and Rip-rap	_____
_____	Extent of Tree Growth and Objectionable Vegetation	_____
_____	Inspect Condition of Embankment Vegetation	_____
_____	Inspect Inlets for Debris	_____
_____	Clean Trash Rack	_____
_____	Remove Other Debris	_____
_____	Sand Bed Filter	_____
As Required:		
_____	Inspect Basin Interior	_____
_____	Inspect Sediment Accumulation	_____
_____	Inspect Water Levels	_____

B. Comments and Recommendations

_____

_____

_____

_____

_____

C. Follow Up

Date Work Started: _____ Notes: _____

Date Work Completed: _____ Notes: _____

Materials & Equipment: _____

_____

Person Completing this Section: _____ Date: _____

(Print Name)

Signed: _____

PART X—Maintenance Log

for
Stormwater Management Facilities

Name of Facility: _____
Location:_____

A. Preventative Maintenance

Date:

Work Item (✓) completed

1. Cutting Grass

A. Bottoms										
B. Embankments and Side Slopes										
C. Perimeter Areas										
D. Access Areas and Roads										
E. Other:										

2. Grass Maintenance

A. Fertilizing										
B. Re-Seeding										
C. De-Thatching										
D. Pest Control										
E. Other:										

3. Vegetative Cover

A. Fertilizing										
B. Pruning										
C. Pest Control										
D. Other:										

4. Trash and Debris Removal

A. Bottoms										
B. Embankments and Side Slopes										
C. Perimeter Areas										
D. Access Areas and Roads										
E. Inlets										
F. Outlets and Trash Racks										
G. Other:										

5. Sediment Removal

A. Inlets										
B. Outlets and Trash Racks										
C. Bottoms										
D. Other:										

6. Mechanical Components

A. Valves										
B. Sluice Gates										
C. Pumps										
D. Fence Gates										
E. Locks										
F. Access Hatches										
G. Other:										

7. Elimination of Potential Mosquito Breeding Habitats

8. Pond Maintenance

A. Aeration Equipment										
B. Debris & Trash Removal										
C. Weed Removal										
D. Other:										

9. Other Preventative Maintenance

A.										
B.										
C.										

B. Corrective Maintenance

Work Items

1. Removal of Debris & Sediment										
2. Structural Repairs										
3. Dam, Embankment & Slope Repairs										
4. Dewatering										
5. Pond Maintenance										
6. Control of Mosquitoes										
7. Erosion Repair										
8. Fence Repair										
9. Elimination of Trees, Brush, Roots & Animal Borrows										
10. Snow & Ice Removal										
11. Other:										

C. Aesthetic Maintenance

Work Item

1. Graffiti Removal										
2. Grass Trimming										
3. Weeding										
4. Other:										

Remarks (Refer to Item No., If Applicable):

_____

_____

_____

_____

_____

_____

_____

_____