State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
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CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

May 14, 2012

Joel Garbon
Product Manager
7564 Standish Place
Suite 112
Rockville, MD 20855

Re: Final Certification
Jellyfish® Filter by Imbrium Systems

Expiration Date: December 1, 2016
TSS Removal Rate: 80%

Dear Mr. Garbon:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Imbrium Systems. has requested a Final Certification for the Jellyfish® Filter.

This project falls under the "Transition for Manufactured Treatment Devices July 15, 2011". The Jellyfish Filter by Imbrium Systems qualified for Category C. Manufactured Treatment Devices Seeking Final Certifications - In Process which are MTDs that have commenced field testing on or before August 1, 2011.

NJDEP received the required information from signed statement sby the NJCAT Technical Director and the manufacturer listing the indicating that the requirements of the 2009 NJDEP Field Testing Protocols have been met or exceeded. NJDEP also received a signed statement from the third party testing entity, University of Florida, indicating that the testing requirements have been met or exceeded. The NJCAT letter also includes a recommended certification TSS removal rate and the required maintenance plan.

The NJDEP certifies the use of the Jellyfish Filter by Imbrium Systems at TSS removal rate of 80%, subject to the following conditions:

1. The Jellyfish Filter is designed according to the NJ Water Quality Design Storm in N.J.A.C. 7:8-5.5.
2. The peak inflow of the water quality design storm is limited to the following:

For each hi-flow cartridge, the maximum inflow is 1.48 gpm and a maximum inflow drainage area is 0.012 impervious acres, for each inch of cartridge length.

For each draindown cartridge, the maximum inflow 0.74 gpm and the maximum inflow drainage area is 0.006 impervious acres for each inch of cartridge length.

Example: For a 54-inch hi-flo cartridge length, the maximum inflow is 80 gpm and the maximum inflow drainage area is 0.65 impervious acres.

Maximum treatment flow rates for typical Jellyfish Filter models are provided in Table 1.

Maximum treatment flow rates and maximum inflow drainage areas for various cartridge lengths are provided in Table 2.

3. The bottom of the Jellyfish tentacles is a minimum of 2 feet above the bottom of the vault. The sedimentation area in the vault shall be a minimum of 4 ft^2 per cartridge.
4. The Jellyfish Filter is certified as an off-line system only.
5. The Jellyfish Filter cannot be used in series with a settling chamber (such as a hydrodynamic separator) or a media filter (such as a sand filter), to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.
6. The maintenance plan for sites using this device shall incorporate, at a minimum, the maintenance requirements for the Jellyfish Filter shown in Appendix A below.

In addition to the attached, any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8, must include a detailed maintenance plan. The detailed maintenance plan must include all of the items identified in Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance of the New Jersey Stormwater Best Management Manual.

NJDEP anticipates proposing further adjustments to this process through the readoption of the Stormwater Management Rules. Additional information regarding the implementation of the Stormwater Management Rules, N.J.A.C. 7:8, are available at www.njstormwater.org. If you have any questions regarding the above information, please contact Ms. Sandra Blick of my office at (609) 633-7021.

Sincerely,

Ed Frankel, P.P., Section Chief
Bureau of Nonpoint Pollution Control

C: Chron File
Richard Magee, NJCAT
Mark Pedersen, DLUR
Elizabeth Dragon, BNPC

Table 1
Maximum Treatment Flow Rates for
Standard (54" Cartridge Length) Jellyfish® Filter Models

Manhole Diameter (ft)	Model No.	Hi-Flo Cartridges (54" Length)	Draindown Cartridges (54" Length)	Maximum Treatment Flow Rate (gpm / cfs)
Catch Basin		varies	varies	varies
4	JF4-2-1	2	1	200 / 0.45
6	JF6-3-1	3	1	280 / 0.62
	JF6-4-1	4	1	360 / 0.80
	JF6-5-1	5	1	440 / 0.98
	JF6-6-1	6	1	520 / 1.16
8	JF8-6-2	6	2	560 / 1.25
	JF8-7-2	7	2	640 / 1.43
	JF8-8-2	8	2	720 / 1.60
	JF8-9-2	9	2	800 / 1.78
	JF8-10-2	10	2	880 / 1.96
10 [1]	JF10-11-3	11	3	1000 / 2.23
	JF10-12-3	12	3	1080 / 2.41
	JF10-13-3	13	3	1160 / 2.58
	JF10-14-3	14	3	1240 / 2.76
	JF10-15-3	15	3	1320 / 2.94
	JF10-16-3	16	3	1400 / 3.12
12 [2]	JF12-17-4	17	4	1520 / 3.39
	JF12-18-4	18	4	1600 / 3.57
	JF12-19-4	19	4	1680 / 3.74
	JF12-20-4	20	4	1760 / 3.92
	JF12-21-4	21	4	1840 / 4.10
	JF12-22-4	22	4	1920 / 4.28
	JF12-23-4	23	4	2000 / 4.46
	JF12-24-4	24	4	2080 / 4.63
Vault		varies	varies	varies

[1] The MTFR for a 10-ft diameter unit occurs with Model JF10-16-3. Since this leaves 4 unoccupied cartridge receptacles in the 10-ft diameter deck, the design engineer has the option to add up to 4 additional cartridges to increase the sediment capacity of the system, however may not increase the MTFR above that of the JF10-16-3.

[2] The MTFR for a 12-ft diameter unit occurs with Model JF12-24-4. Since this leaves 4 unoccupied cartridge receptacles in the 12-ft diameter deck, the design engineer has the option to add up to 4 additional cartridges to increase the sediment capacity of the system, however may not increase the MTFR above that of the JF12-24-4.

Table 2
Maximum Treatment Flow Rate and
Maximum Inflow Drainage Area
for Various Jellyfish® Cartridge Lengths

Cartridge Length (inches)	Maximum Treatment Flow Rate (gpm)	Maximum Inflow Drainage Area (impervious acres)
15	Hi-Flo 22 Draindown 11	Hi-Flo 0.18 Draindown 0.09
27	Hi-Flo 40 Draindown 20	Hi-Flo 0.32 Draindown 0.16
40	Hi-Flo 60 Draindown 30	Hi-Flo 0.48 Draindown 0.24
54	Hi-Flo 80 Draindown 40	Hi-Flo 0.65 Draindown 0.32

Appendix A

Imbrium Systems Jellyfish® Filter
Inspection and Maintenance Information

Jellyfish® Filter Inspection and Maintenance
Regular inspection and maintenance are proven, cost-effective ways to maximize water resource protection for all stormwater pollution control practices, and are required to insure proper functioning of the Jellyfish Filter. Inspection of the Jellyfish Filter is easily performed from the surface, while proper maintenance requires a combination of procedures conducted from the surface and with worker entry into the structure. The Jellyfish Filter's patented technology has no moving parts, keeping the process simple.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

When is inspection needed?

- Post-construction inspection is required prior to putting the Jellyfish Filter into service.
- A minimum of two inspections are required during the first year of operation to accurately assess the sediment and floatable pollutant accumulation, and to ensure that the automatic backwash feature is functioning properly.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections must also be performed immediately after an oil, fuel or other chemical spill.

When is maintenance service needed?

- For optimum performance, the unit must be cleaned out once the sediment depth reaches 12 inches of accumulation. Generally, the minimum cleaning frequency is once annually, although the frequency can be based on historical inspection results.
- Filter cartridges must be cleaned and re-commissioned, or replaced, every 12 months or when the automatic backwash feature no longer functions, whichever occurs first. The automatic backwash function will be disabled if the filter cartridges become saturated with sediment. This saturated condition is indicated if the backwash pool contains more than 3 inches depth of water after 12 or more hours of dry weather have elapsed since the most recent rainfall/runoff event.
- The unit must be cleaned out immediately after an oil, fuel or chemical spill.

What conditions can compromise the Jellyfish Filter's performance?

- If sediment accumulates beyond 12 inches in depth, filter cartridge life and sediment removal efficiency may be reduced.
- If filter cartridges become saturated with sediment, the system may not provide filtration treatment at the designed water quality flow rate, and unfiltered water may bypass the filter cartridges.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured and may cause fouling of the filter cartridges.
- If debris clogs the inlet of the system, removal efficiency of sediment, hydrocarbons, and gross pollutants may be reduced.
- If a downstream blockage occurs, a backwater condition may occur in the system and removal efficiency of sediment, hydrocarbons, and gross pollutants may be reduced.

What training is required?

The Jellyfish Filter is inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins. Since some of the maintenance procedures require manned entry into the Jellyfish structure, only professional maintenance service providers trained in confined space entry procedures should enter the vessel. Service provider companies typically have personnel who are trained and certified in confined space entry procedures according to local, state, and federal standards.

For typical inspection and maintenance activities, no specific supplemental training is required for the Jellyfish Filter. Information provided in this document or the Jellyfish Filter Owner's Manual contains sufficient guidance to maintain the system properly.

What equipment is typically required for inspection?

- Manhole access cover lifting tool
- Oil dipstick or sampling tool
- Sediment probe
- Flashlight
- Camera
- Data log
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

How is the Jellyfish Filter inspected?

- The Jellyfish filter system can be inspected from the surface through the standard surface manhole access cover or custom doors.
- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick. Sediment and oil depth are measured through the maintenance access wall.
- Visual inspection for floatable pollutant accumulation such as litter and hydrocarbons is also performed by shining a flashlight into the maintenance access wall.
- Visual inspection of the backwash pool (6-inch high kidney-shaped or oval-shaped

weir) should also be performed to check for standing water in the pool. If at least 12 hours of dry weather have elapsed since the most recent rainfall/runoff event and the backwash pool contains more than 3 inches of water, this condition indicates that the filter cartridges are saturated with sediment and should be cleaned or replaced.
- Inspections also involve a visual inspection of the internal components of the system for obvious damage.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal, if necessary
- Manhole access cover lifting tool
- Oil dipstick or sampling tool
- Sediment probe
- Flashlight
- Camera
- Data log
- Safety cones and caution tape
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required
- Replacement cartridges are required if manual cleaning and re-commissioning of existing cartridges is not possible or adequate to restore proper system function.
- Jellyfish Cartridge Backflush Pipe

How is the Jellyfish Filter maintained?

- The Jellyfish Filter can be maintained through the standard surface manhole access cover. All access covers should be removed to provide additional light and ventilation. If custom doors were installed instead of frames and covers, open all doors.
- If the filter cartridges are to be manually backflushed (see procedure below), perform the manual backflush service prior to vacuum removal of sediment, floatable, and water (i.e. perform the manual backflush with the lower chamber full of water).
- Insert the oil dipstick or sampling tool into the maintenance access wall. If oil is present, pump off the oil layer into separate containment using a small pump and tubing. Some maintenance service providers may elect to use the vacuum hose if the oil amount is small.
- Maintenance cleaning of accumulated floatable litter and sediment is performed with a vacuum hose inserted through the maintenance access wall.
- Using the vacuum hose, decant 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 using the vacuum hose.
- For larger Jellyfish Filters, (8-ft, 10-ft, 12-ft diameter), complete sediment removal

may be facilitated by inserting a garden hose sprayer through a hole in the cartridge deck where a blank cartridge lid (no orifice in the cartridge lid) or filter cartridge has been removed. Use the garden hose sprayer to break up sediment on the bottom of vessel that is farthest from the maintenance access wall, being careful not to cut or otherwise damage the filter tentacle membranes with excessive water pressure. (Note: Use of a garden hose sprayer is recommended. Do not use a high pressure jet sprayer or power washer, as excessive water pressure may damage the filter tentacle membranes.) Rinse the loosened sediment toward the maintenance access wall for easy vacuum removal.

- To access the cartridge deck for manual cleaning or replacement of filter cartridges, descend the ladder that is built into structure's sidewall, observing all precautions for safe and proper confined space entry. Note that the cartridge deck may be slippery. Care should be taken to avoid stepping directly onto the backwash pool weir, as damage may result.
- A manual backflush of the cartridges is recommended to remove a high percentage of accumulated sediment from the filtration tentacles, restore flow capacity, and extend the service life of the cartridges. A Jellyfish Cartridge Backflush Pipe (12-inch diameter x 40-inch length aluminum pipe with flapper valve) may be purchased from Imbrium Systems that allows each cartridge to be selectively backwashed using water that is supplied from either (a) the previously decanted water stored in a vactor truck compartment; (b) clean water from a separate water truck delivered to the site; or (c) water from a nearby fire hydrant or other clean water source. NOTE: Manual backflushing of the cartridges is best performed with the lower chamber full of water (i.e. prior to vacuuming out the sediment, floatables, and water). This ensures that a uniform backflush pressure is applied across all of the filter media surface area.
- **Manual backflush procedure**: Twist the threaded cartridge lid on the cartridge receptacle counter-clockwise to remove the lid and expose the cartridge head. (**NOTE: Do not step directly onto an exposed cartridge head when a cartridge lid is removed, as excessive downward force may damage the cartridge receptacle and result in injury if the cartridge head is forced through the receptacle and into the lower chamber.**) Place the Jellyfish Cartridge Backflush Pipe over the cartridge receptacle such that the gasket on the bottom of the Backflush Pipe is seated on the rim of the cartridge receptacle. Fill the Backflush Pipe with water (approximately 16 gallons). Pull the cord to open the flapper valve and backflush the water through the cartridge. Refill the Pipe and backflush a second time. The full Pipe contents should drain down to the top of the open flapper valve (30 inches from the top of the Pipe) within approximately 15 seconds to remove a high percentage of accumulated sediment and restore the flow capacity of the cartridge. Remove the Pipe and re-install the lid hand-tight. For the most thorough backflushing, backflush the Draindown Cartridge(s) first, followed by the Hi-Flo Cartridges, then finish with a final single backflush on the Draindown Cartridge(s). (NOTE: The Hi-Flo Cartridges are those cartridges within the kidney-shaped 6-inch high backwash pool weir. The Draindown Cartridges are those cartridges outside the backwash pool weir. See the diagram below for reference.) When backflushing a cartridge, it is important to keep the lids in place on all other cartridges both as a safety precaution and so that water displaced from the lower chamber during backflushing is properly filtered when discharged to the top of the cartridge deck.

- **Optional manual rinsing procedure**: If manual backwashing using the Jellyfish Cartridge Backflush Pipe is ineffective in restoring adequate cartridge flow capacity, cartridges may be removed, manually rinsed, and re-commissioned. With the threaded cartridge lid removed, slowly and carefully remove the cartridge from the receptacle using the lifting loops in the cartridge head. (NOTE: Should a snag occur, do not force the cartridge upward as this may result in damage to the tentacles. Instead, gently rotate the cartridge with a slight sideways motion to clear the snag and remove the cartridge.) Remove the cartridge from the vessel, as rinsing is best performed outside the vessel. Immediately replace the lid on the exposed receptacle/hole as a safety precaution. Using a garden hose sprayer, direct the water spray at an angle across the tentacle membrane surface, starting at the top of the tentacle and working downward. For most effective rinsing, remove each tentacle from the cartridge head plate by unscrewing the attachment nut, and perform a 360 degree rinse of each tentacle. Re-attach the rinsed tentacles to the head plate and re-commission the cleaned cartridge. If manual rinsing cannot be performed, or if inspection upon rinsing indicates damage to the tentacles, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Imbrium Systems to order replacement tentacles.
- New cartridges are lightweight (less than 20 pounds), and can be easily lowered down to a worker on the cartridge deck. Care should be taken not to bend or otherwise damage the tentacles during the handling and installation procedures.
- For maximum safety, it is recommended that each cartridge be removed and replaced one at a time, such that there is never more than one cartridge receptacle/hole exposed.
- After vacuuming out sediment, floatables, and water, re-fill the lower chamber with water where required by the local jurisdiction.

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What is required for proper disposal?

- Disposal requirements for recovered pollutants and spent filter cartridges may vary depending on local guidelines. In most areas the sediment and spent filter cartridges, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.

What about oil spills?

- Petroleum-based pollutants captured by the Jellyfish Filter (oil/chemical/fuel spills) should be removed and disposed of by a licensed waste management company.
- Although the Jellyfish Filter captures virtually all free oil, a sheen at the outlet **does not** mean the unit isn't working. A rainbow or sheen can be visible at oil concentrations of less than 10 mg/L (ppm).

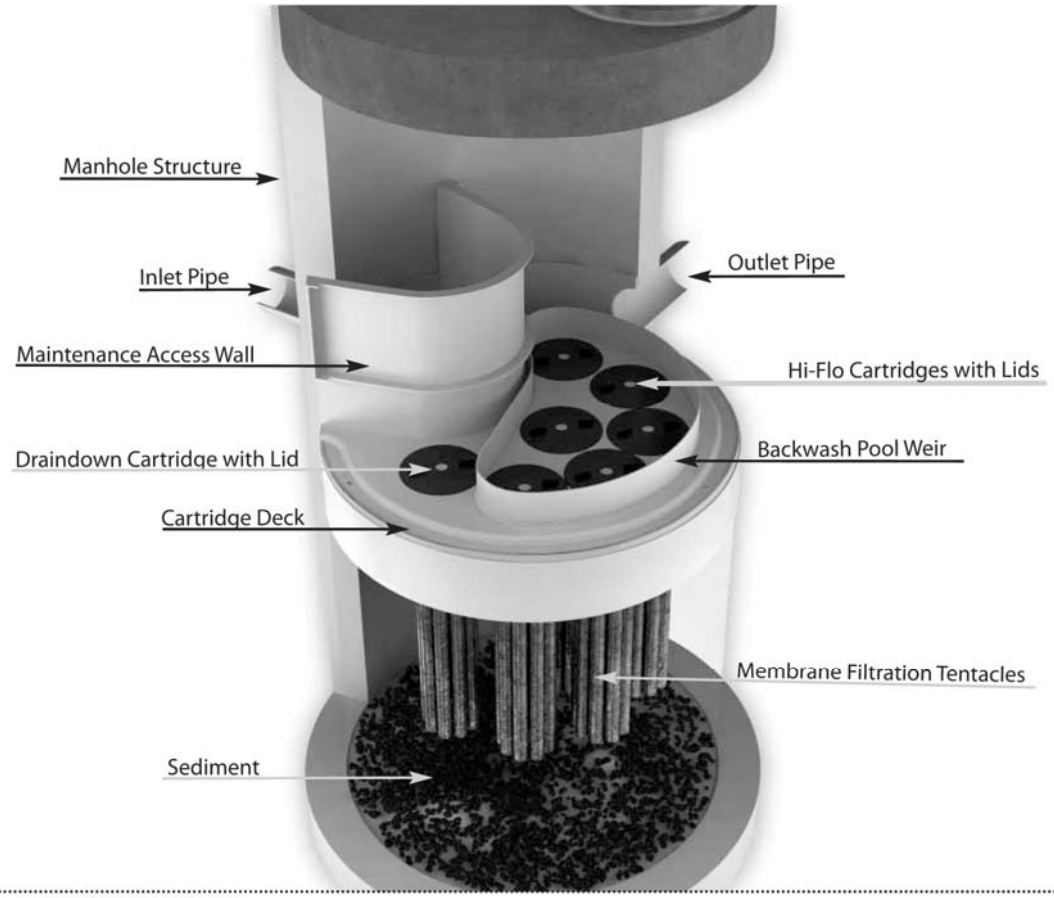
What factors affect the costs involved with inspection/maintenance?

- Inspection and maintenance costs are based on unit size, cartridge count, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations. Maintenance costs are anticipated to be substantially lower in instances where dirty cartridges are manually cleaned and re-commissioned rather than replaced with new cartridges.

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

FIGURE 1

Jellyfish Filter and Components

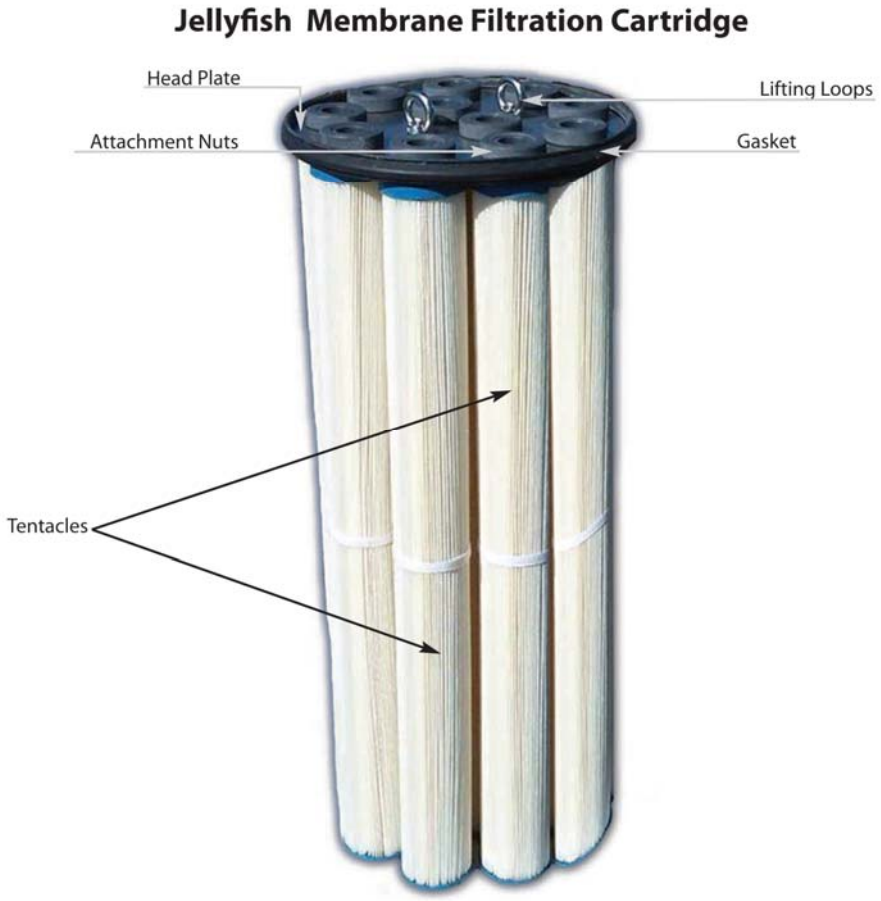


Note: Separator Skirt Not Shown

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. The extraordinarily high surface area of the membrane filtration tentacles provides superior flow and sediment capacity as well as low head loss. Tentacles can be easily removed from the head plate and replaced.

FIGURE 2



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. The large opening in the maintenance access wall 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 debris from the system.

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, Jellyfish Cartridge Backflush Pipes (for manual backflushing), and other system components can be ordered by contacting:

Imbrium Systems Corporation
1-888-279-8826
www.imbriumsystems.com

(revised 3-28-12)