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Permanent Stormwater Control Facilities Operation and Maintenance (O&M) Manual

for:

Downtown 48 Apartments & Martindale Crossing Commercial Building

Located at:

1005 Rita Street and 133 West State Street in Sedro-Woolley, Washington, 98284

Prepared for:

Rita Street, LLC

Prepared by:

Ravnik and Associates, LLC
1633 Lindamood Ln, Burlington, WA 98233

Grantor – Rita Street, LLC
Grantee- Sedro-Woolley Public
Parcel number - P37585
Assessor number – 350424-3-005-006

Sec 24 TWP 35 R 04

UNOFFICIAL
BYK Mixed Use Site
Rita Street
Sedro-Woolley, WA 98284

**MAINTENANCE RESPONSIBILITIES
for
DRAINAGE FACILITIES**

All on-site permanent stormwater facilities (catch basins, pipes etc) shall be maintained in perpetuity in a manner that allows them to function as originally designed. The owner of the property or it's designated representative, is solely responsible for the inspection, maintenance, repair and replacement of all permanent stormwater facilities located on site and any and all costs associated therewith. The City of Sedro-Woolley is under no obligation to maintain or repair permanent stormwater facilities located on this site.

The owner or its designated representative shall submit an annual operation and maintenance report for the permanent stormwater facilities to the City of Sedro-Woolley Public Works Department on or before January 31st of each year for the previous year's inspection and maintenance activities. The report shall include any remedial actions taken, how the actions were completed, who performed them, any problems encountered, and any required follow-up actions such as maintenance, repair or replacement. Annual report and other maintenance records shall be maintained on-site and available to the City upon request.

The City shall have the right to enter onto the property for inspection and compliance purposes. Should inspection reports (either by the property owner or by the City) indicate the permanent stormwater facilities are not being properly maintained or show signs of failure and the property owner has not remedied any maintenance standards exceedances, the City of Sedro-Woolley reserves the right but not the obligation to perform work that is necessary to maintain the permanent stormwater facilities that has not been performed by the property owner, and recover any and all costs so incurred by the City from the property owner.

Project Site:

Refer to the accompanying civil site plan for the location of catch basins, pipes, water quality vaults, parking area, infiltration areas, etc. The parking lot conveys runoff to water quality vaults into an underlying bed of clean drainrock infiltration trench located along the easterly side of the site. Over time, water accumulated within the underlying drainrock infiltrates into the ground. During large storm events which exceed the infiltration trenches capacity to detain and infiltrate runoff, it will overflow via a riser into the storm system located along the easterly side of Rita Street. Runoff from the westerly half of Rita Street will also be routed to a water quality vault that discharges into an infiltration system located at the southerly end of the property. This retention pond/infiltration area will be located within a tract that is to be owned and maintained by the City.

Catch Basins throughout the site shall be inspected once a year to identify accumulated levels of silt and debris within catch basin sumps and general structure integrity. Refer to the Table 3.5 from the 2005 DOE Stormwater Manual regarding maintenance of control structures and catch basins.

Stormwater Conveyance Piping shall be inspected once each year, and at not more than five-year intervals, all storm water pipes shall be flushed. Flushed debris shall be contained and disposed offsite, not allowed to enter any infiltration facility.

Control Structure shall be inspected once a year to identify accumulated levels of silt, trash, or debris within structure along with any structural damage. With any material accumulation 0.5-feet in depth or greater, maintenance is needed to remove the material. Refer to the Table 3.5 from the 2005 DOE Stormwater Manual regarding maintenance of control structures and catch basins.

Aqua Swirl Vaults:

The Aqua Swirl Vaults shall be maintained as required by Aqua Shield for their AS-2 unit and per information provided with this O & M section. AquaShield recommends that periodic system inspections be performed to determine whether the disposal of captured material is needed to ensure proper operation of the Aqua-Swirl treatment system. It is important to keep in mind that all BMPs require some degree of maintenance. Maintenance cycles are ultimately dependent on site-specific pollutant loading conditions.

Upon installation and during construction, it is recommended that an Aqua-Swirl be inspected every three months and cleaned as needed. An Inspection and Maintenance Manual will be furnished by Aqua Swirl for each project installation for an end user(s) to track and document system operations. A typical maintenance event for the cleaning of the swirl chamber can be accomplished with a vacuum truck. The unit should be inspected and cleaned at the end of construction regardless of whether it has reached its capacity for sediment or oil storage. During the first year post-construction, the unit should again be inspected every three months and cleaned as needed. It is also recommended that the system be inspected and cleaned once annually regardless of whether it has reached its sediment or floatable pollutant storage capacity. For the second and subsequent years post-construction, the Aqua-Swirl™ can be inspected and cleaned once annually if the system did not reach full sediment or floatable pollutant capacity in the first year post-construction. If the Aqua-Swirl™ reached full sediment or floatable pollutant capacity in less than 12 months in the first year post-construction, the system should be inspected once every six months and cleaned as needed. AquaShield further recommends that external bypass (diversion) and convergence structures should be inspected and cleaned when feasible during inspection and maintenance events.

Essential elements of a swirl chamber inspection include observing floating materials and measuring the accumulated sediment at the base of the swirl chamber. These two activities can be performed at the ground surface and there is no need to enter the device. A typical maintenance event includes the vacuuming and disposal of floatable pollutants and sediment from the swirl chamber. Proper health and safety protocols should be followed during all inspection and maintenance events. AquaShield recommends that all materials removed during

the maintenance process be handled and disposed in accordance with all applicable federal, state and local guidelines. Depending on the influent pollutant characteristics of the system drainage area, it may be appropriate to perform Toxicity Characteristics Leaching Procedure (TCLP) analyses on representative samples of the removed material to ensure that the handling and disposition of materials complies with applicable environmental regulations.



Aqua-Swirl[®]
Stormwater Treatment System

Inspection and Maintenance Manual



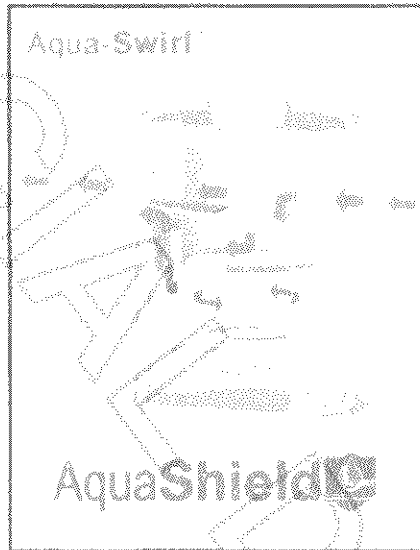
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Chattanooga, TN 37343
Toll free (888) 344-9044
Phone: (423) 870-8888
Fax: (423) 826-2112
Email: info@aquashieldinc.com
www.aquashieldinc.com

November 2016

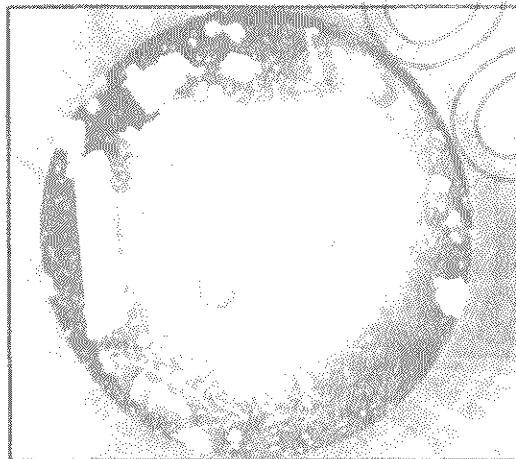


Aqua-Swirl® Stormwater Treatment System

The Aqua-Swirl® Stormwater Treatment System (Aqua-Swirl®) is a vortex-type hydrodynamic separator designed and supplied by AquaShield™, Inc. (AquaShield™). Aqua-Swirl® technology removes pollutants including suspended solids, debris, floatables and free-floating oil from stormwater runoff. Both treatment and storage are accomplished in the single swirl chamber without the use of multiple or hidden, blind access chambers.



Aqua-Swirl® Stormwater Treatment System



Floatable debris in the Aqua-Swirl®



System Operation

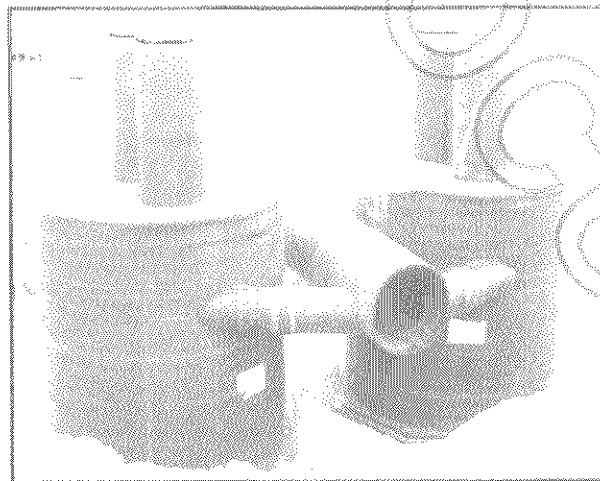
The treatment operation begins when stormwater enters the Aqua-Swirl® through a tangential inlet pipe that produces a circular (or vortex) flow pattern that causes contaminants to settle to the base of the unit. Since stormwater flow is intermittent by nature, the Aqua-Swirl® retains water between storm events providing both dynamic and quiescent settling of solids. The dynamic settling occurs during each storm event while the quiescent settling takes place between successive storms. A combination of gravitational and hydrodynamic drag forces encourages the solids to drop out of the flow and migrate to the center of the chamber where velocities are the lowest.

The treated flow then exits the Aqua-Swirl® behind the arched outer baffle. The top of the baffle is sealed across the treatment channel, thereby eliminating floatable pollutants from escaping the system. A vent pipe is extended up the riser to expose the backside of the baffle to atmospheric conditions, preventing a siphon from forming at the bottom of the baffle.



Custom Applications

The Aqua-Swirl® system can be modified to fit a variety of purposes in the field, and the angles for inlet and outlet lines can be modified to fit most applications. The photo below demonstrates the flexibility of Aqua-Swirl® installations using a “twin” configuration in order to double the water quality treatment capacity. Two Aqua-Swirl® units were placed side by side in order to treat a high volume of water while occupying a small amount of space.



Custom designed AS-9 Twin Aqua-Swirl®



Retrofit Applications

The Aqua-Swirl[®] system is designed so that it can easily be used for retrofit applications. With the invert of the inlet and outlet pipe at the same elevation, the Aqua-Swirl[®] can easily be connected directly to the existing storm conveyance drainage system. Furthermore, because of the lightweight nature and small footprint of the Aqua-Swirl[®], existing infrastructure utilities (i.e., wires, poles, trees) would be unaffected by installation.

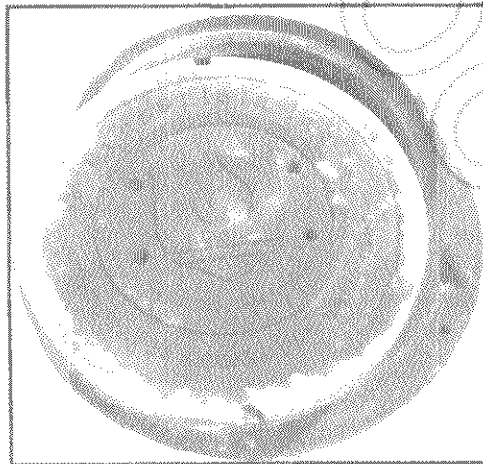


Aqua-Swirl[®] System Maintenance

The long term performance of any stormwater treatment structure, including manufactured or land based systems, depends on a consistent maintenance plan. Inspection and maintenance functions are simple and easy for the Aqua-Swirl[®] allowing all inspections to be performed from the surface.

It is important that a routine inspection and maintenance program be established for each unit based on: (a) the volume or load of the contaminants of concern, (b) the frequency of releases of contaminants at the facility or location, and (c) the nature of the area being drained.

In order to ensure that our systems are being maintained properly, AquaShield[™] offers a maintenance solution to all of our customers. We will arrange to have maintenance performed.



Aqua-Swirl[®] manhole cover



Inspection

The Aqua-Swirl® can be inspected from the surface, eliminating the need to enter the system to determine when cleanout should be performed. In most cases, AquaShield™ recommends a quarterly inspection for the first year of operation to develop an appropriate schedule of maintenance. Based on experience of the system's first year in operation, we recommend that the inspection schedule be revised to reflect the site-specific conditions encountered. Typically, the inspection schedule for subsequent years is reduced to semi-annual inspection.



Maintenance

The Aqua-Swirl® has been designed to minimize and simplify the inspection and maintenance process. The single chamber system can be inspected and maintained entirely from the surface thereby eliminating the need for confined-space entry. Furthermore, the entire structure (specifically, the floor) is accessible for visual inspection from the surface. There are no areas of the structure that are blocked from visual inspection or periodic cleaning. Inspection of any free-floating oil and floatable debris can be directly observed and maintained through the manhole access provided directly over the swirl chamber.

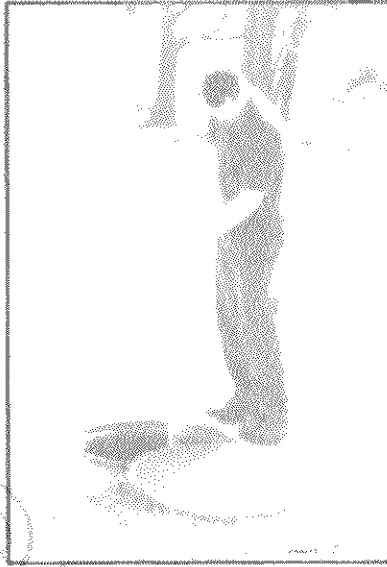
Aqua-Swirl® Inspection Procedure

To inspect the Aqua-Swirl®, a hook is typically needed to remove the manhole cover. AquaShield™ provides a customized manhole cover with our distinctive logo to make it easy for maintenance crews to locate the system in the field. We also provide a permanent metal information plate affixed inside the access riser which provides our contact information, the Aqua-Swirl® model size, and serial number.

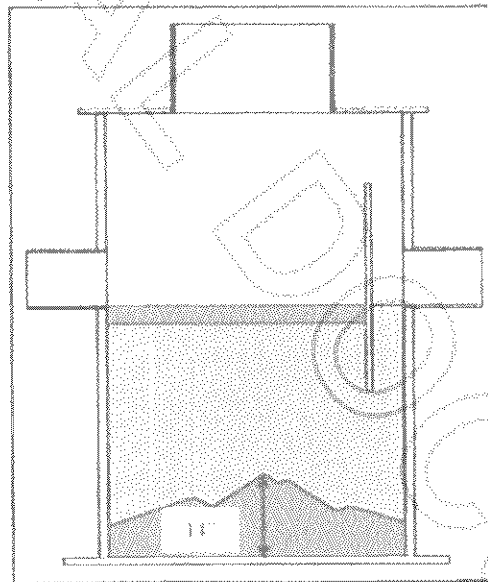
The only tools needed to inspect the Aqua-Swirl® system are a flashlight and a measuring device such as a stadia rod or pole. Given the easy and direct accessibility provided, floating oil and debris can be observed directly from the surface. Sediment depths can easily be determined by lowering a measuring device to the top of the sediment pile and to the surface of the water.

It should be noted that in order to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the *top* of the sediment pile. Keep in mind that the finer sediment at the top of the pile may offer less resistance to the measuring device than the larger particles which typically occur deeper within the sediment pile.

The Aqua-Swirl® design allows for the sediment to accumulate in a semi-conical fashion as illustrated below. That is, the depth to sediment as measured below the water surface may be less in the center of the swirl chamber; and likewise, may be greater at the edges of the swirl chamber.



Sediment inspection using a stadia rod



Maximum recommended sediment depth prior to cleanout is 14 inches for all Aqua-Swirl® models

Aqua-Swirl® Cleanout Procedure

Cleaning the Aqua-Swirl® is simple and quick. Free-floating oil and floatable debris can be observed and removed directly through the 30-inch service access riser provided. A vacuum truck is typically used to remove the accumulated sediment and debris. An advantage of the Aqua-Swirl® design is that the entire sediment storage area can be reached with a vacuum hose

from the surface reaching all the sides. Since there are no multiple or limited (blind) access chambers in the Aqua-Swirl[®], there are no restrictions to impede on-site maintenance tasks.

Disposal of Recovered Materials

AquaShield[™] recommends that all maintenance activities be performed in accordance with appropriate health and safety practices for the tasks and equipment being used. AquaShield[™] also recommends that all materials removed from the Aqua-Swirl[®] and any external structures (e.g. bypass features) be handled and disposed in full accordance with any applicable local and state requirements.



Vacuum (vactor) truck quickly cleans the single open access swirl chamber

***Aqua-Swirl[®] Inspection and Maintenance Work Sheets
on following pages***

Aqua-Swirl® Inspection and Maintenance Manual Work Sheets

SITE and OWNER INFORMATION

Site Name: _____
Site Location: _____
Date: _____ Time: _____
Inspector Name: _____
Inspector Company: _____ Phone #: _____
Owner Name: _____
Owner Address: _____
Owner Phone #: _____ Emergency Phone #: _____

INSPECTIONS

I. Floatable Debris and Oil

1. Remove manhole lid to expose liquid surface of the Aqua-Swirl®.
2. Remove floatable debris with basket or net if any present.
3. If oil is present, measure its depth. Clean liquids from system if one half (½) inch or more oil is present.

Note: Water in Aqua-Swirl® can appear black and similar to oil due to the dark body of the surrounding structure. Oil may appear darker than water in the system and is usually accompanied by oil stained debris (e.g. Styrofoam, etc.). The depth of oil can be measured with an oil/water interface probe, a stadia rod with water finding paste, a coliwasa, or collect a representative sample with a jar attached to a rod.

II. Sediment Accumulation

1. Lower measuring device (e.g. stadia rod) into swirl chamber through service access provided until top of sediment pile is reached.
2. Record distance to top of sediment pile from top of standing water: _____ inches.
3. Maximum recommended sediment depth prior to cleanout is 14 inches for all models. Consult system shop drawing for treatment chamber depth as measured from the inlet pipe invert to base of the unit.

III. Diversion Structures (External Bypass Features)

If a diversion (external bypass) configuration is present, it should be inspected as follows:

1. Inspect weir or other bypass feature for structural decay or damage. Weirs are more susceptible to damage than off-set piping and should be checked to confirm that they are not crumbling (concrete or brick) or decaying (steel).
2. Inspect diversion structure and bypass piping for signs of structural damage or blockage from debris or sediment accumulation.
3. When feasible, measure elevations on diversion weir or piping to ensure it is consistent with site plan designs.
4. Inspect downstream (convergence) structure(s) for sign of blockage or structural failure as noted above.

CLEANING

Schedule cleaning with local vacor company or AquaShield™ to remove sediment, oil and other floatable pollutants. The captured material generally does not require special treatment or handling for disposal. Site-specific conditions or the presence of known contaminants may necessitate that appropriate actions be taken to clean and dispose of materials captured and retained by the Aqua-Swirl®. All cleaning activities should be performed in accordance with property health and safety procedures.

AquaShield™ always recommends that all materials removed from the Aqua-Swirl® during the maintenance process be handled and disposed in accordance with local and state environmental or other regulatory requirements.

MAINTENANCE SCHEDULE

I. During Construction

Inspect the Aqua-Swirl® every three (3) months and clean the system as needed. The Aqua-Swirl® should be inspected and cleaned at the end of construction regardless of whether it has reached its maintenance trigger.

II. First Year Post-Construction

Inspect the Aqua-Swirl® every three (3) months and clean the system as needed.

Inspect and clean the system once annually regardless of whether it has reached its sediment or floatable pollutant storage capacity.

III. Second and Subsequent Years Post-Construction

If the Aqua-Swirl® did not reach full sediment or floatable pollutant capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl[®] reached full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction period, the system should be inspected once every six (6) months and cleaned as needed. The Aqua-Swirl[®] should be cleaned annually regardless of whether it reaches its sediment or floatable pollutant capacity.

IV. Bypass Structures

Bypass structures should be inspected whenever the Aqua-Swirl[®] is inspected. Maintenance should be performed on bypass structures as needed.

MAINTENANCE COMPANY INFORMATION

Company Name: _____

Street Address: _____

City: _____ State/Prov.: _____ Zip/Postal Code: _____

Contact: _____ Title: _____

Office Phone: _____ Cell Phone: _____

ACTIVITY LOG

Date of Cleaning: _____ (Next inspection should be 3 months from this date for first year).

Time of Cleaning: Start: _____ End: _____

Date of Next Inspection: _____

Floatable debris present: Yes No

Notes: _____

Oil present: Yes No Oil depth (inches): _____

Measurement method and notes: _____

STRUCTURAL CONDITIONS and OBSERVATIONS

Aqua-Swirl®

TABULAR MAINTENANCE SCHEDULE

Date Construction Started: _____

Date Construction Ended: _____

During Construction

Activity	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Inspect and Clean as needed			X			X			X			X
Inspect Bypass and maintain as needed			X			X			X			X
Clean System*												X*

* The Aqua-Swirl® should be cleaned once a year regardless of whether it has reached full pollutant storage capacity. In addition, the system should be cleaned at the end of construction regardless of whether it has reach full pollutant storage capacity.

First Year Post-Construction

Activity	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Inspect and Clean as needed			X			X			X			X
Inspect Bypass and maintain as needed			X			X			X			X
Clean System*												X*

* The Aqua-Swirl® should be cleaned once a year regardless of whether it has reached full pollutant storage capacity.

Second and Subsequent Years Post-Construction

Activity	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Inspect and Clean as needed												X*
Inspect Bypass, maintain as needed												X*
Clean System*												X*

* If the Aqua-Swirl® did not reach full sediment or floatable pollutant capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl® reached full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction period, the system should be inspected once every six (6) months or more frequently if past history warrants, and cleaned as needed. The Aqua-Swirl® should be cleaned annually regardless of whether it reaches its full sediment or floatable pollutant capacity.