Stormwater Pollution Prevention Plan

McNeil Island Boatyard Facility

Prepared in accordance with the Boatyard General Permit of Washington State, effective June 1, 2011

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Gray & Osborne, Inc.

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Acronyms and Abbreviations

BMPs	Best Management Practices
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DMR	Discharge Monitoring Report
Ecology	Washington State Department of Ecology
ER	Engineering Report
GFAA	Graphite Furnace Atomic Absorption
MDL	method detection limit
mg/L	milligrams/liter
ML	minimum level
MSD	marine sanitation device
NPDES	National Pollutant Discharge Elimination System
POTW	publicly owned treatment works
RCW	Revised Code of Washington
SARA	Superfund Amendments and Reauthorization Act
SMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TCLP	toxicity characteristic leaching procedure
TSS	total suspended solids
USEPA	United States Environmental Protection Agency
µg/L	micrograms per liter
WAC	Washington Administrative Code

Certification

Certification by Responsible Company Official: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system design to assure that qualified personnel properly gathered and evaluated the information. Based on my inquiry of the person or persons who manage the systems or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name KENT NAGEN Title DIRECTOR OF CAPITAL PROGRAMS

Signature _____

Date 3/10/14

Note: this template for a boatyard stormwater pollution prevention plan was prepared for the express use of the Northwest Marine Trade Association and its boatyard members. The Responsible Company Official certifying this boatyard-specific stormwater pollution prevention plan is entirely responsible for the final product.

The original boatyard stormwater pollution prevention plan template was updated by the Clean Boating Foundation in accordance with the current Boatyard General Permit for the State of Washington (Ecology, June 2011). Questions regarding the template should be directed to the Clean Boating Foundation at 206-612-8919.

1. Pollution Prevention Team

The Pollution Prevention Team for this facility is outlined in Worksheet #1. The Pollution Prevention Team responsibilities include:

- Assisting the yard manager in the implementation, maintenance, and modification of this SWPPP;
- Holding regular meetings to review the overall operation of the BMPs;
- Sampling, inspections, operation and maintenance;
- Emergency situations; and
- Training of team members in the operation, maintenance, and inspections of BMPs.

2. Facility Assessment

2.1 Facility Description

The McNeil Island Boatyard conducts Boat Building and Repairing activities (Standard Industrial Code No. 3732). Activities conducted at the facility include:

- Pressure washing;
- Bottom and top side painting;
- Engine, prop, shaft, and rudder repair;
- Hull welding and grinding;
- Hull repair, joinery, and bilge cleaning;
- Transfer of fuel from the vessel to a tank truck;
- Lubrication repair and replacement; and
- Other activities necessary to maintain a vessel.

The facility covers an area of approximately 1.59 acres, approximately 69 percent of which is hard packed gravel and concrete and 31 percent is buildings. Ninety-three percent of the boatyard area is not directly affected by the vessel maintenance activities, but includes buildings with asphalt shingled roofs, hard-packed gravel driving/parking areas, and small concrete pads adjacent to the buildings. In addition, approximately 0.17 acres of building roof area outside of the designated boatyard is tributary to the boatyard. This building is not used for boatyard activities and is off-limits for any use due to the presence of lead paint in the interior of the building. All vessel washing, painting and repair activities take place in the approximately 4,800 sf marineway. The yard has the capacity to service or maintain one vessel at any given time. Approximately four vessels are hauled out of the water per year and approximately four vessels are pressure washed each year. In the event of an emergency repair, i.e., broken shaft, the vessel will be hauled out but not pressure washed and returned to service as quickly as possible. Maintenance activity is conducted year-round; the majority of the work takes place in the spring, summer, and fall.

The McNeil Island Boatyard maintains the fleet of vessels owned by the State of Washington to transport goods and personnel to the island. The fleet includes three passenger ferries, three tugs and three barges. In addition to the transportation fleet the State operates a fireboat and three patrol boats that serve McNeil Island. These boats are not hauled out at the boatyard. Routine maintenance of the vessels includes pressure washing of the hulls, hull and above water exterior and interior painting, engine repair, propeller, shaft and rudder repair, bilge cleaning and lubricant/oil replacement. The boatyard does not vacuum sand the hulls at this time. Limited cutting or scaling with a pneumatic needle gun or scraping with a wire brush is conducted when rust removal is required prior to painting or hull repair. Painting and maintenance of the vessels is confined to the concrete outdoor marineway pad.

Waste water from the pressure washing activities and solid waste, including paint scrapings, are collected and disposed of off-site. Solid wastes accumulated on the tarps/drop cloths are removed by vacuuming.

The facility work schedule is 8:00 AM to 4:00 PM, 5 days per week, weather permitting. Hull maintenance activities are not conducted during periods of high tide or rain.

Sources of stormwater pollution are generally confined to the vessel maintenance activities in the marineway. Potential pollutants from activities carried out in the marineway include solid wastes, i.e., barnacle shells, paint chips, rust particles, and trash, dissolved metals and oil/grease in pressure wash water, paint, solvents and petroleum products, including motor oil and lubricants. Limited stormwater pollution may be generated by vehicles accessing the site.

A temporary stormwater Chitosan Enhanced Sand Filtration (CESF) treatment system will be installed at the boatyard. The anticipated schedule for full implementation of the system is early December 2013. The temporary CESF system will remain in operation until permanent treatment BMPs are operational. It is anticipated that permanent treatment BMPs will be operational in the summer of 2014. The temporary system is designed to treat for the following pollutants:

- Settleable solids (SS) associated with paint chips, barnacles and other solids
- Total suspended solids (TSS)
- Turbidity
- Total zinc (Zn)
- Total copper (Cu)
- Total lead (Pb)

The system is sized to treat the water quality runoff volume, as determined by the WWHM, that is equal to the simulated daily volume that represents the upper limit of the range of daily volumes that accounts for 91 percent of the entire runoff volume over a multi-decade period of record (Chapter 4, Volume 5, Ecology 2012 Stormwater Management Manual for Western Washington).

The temporary system consists of:

1. Stormwater Collection – Stormwater is pumped from the marineway sump and the parking lot collection sump by 1 horsepower submersible pumps at a rate of approximately 60 gpm each for a combined transfer rate of approximately 120 gpm.
2. Surge Tank – The submersible pumps discharge to a surge tank with the capacity of approximately 8,400 gallons.
3. Pretreatment – As stormwater is pumped from the surge tank chitosan acetate, a coagulant that aids in settling suspended solids, is injected via a static mixer.
4. Settling Tank – A 21,000-gallon settling tank is used to provide gravity settling of suspended solids. The settling tank is also used to settle solids from the filtration media backwash water.
5. Filtration Pump – A 15-horsepower high pressure centrifugal pump transfers water from the settling tank through the filtration system media and to the discharge location.
6. Filtration System – The filtration system which consists of a sand filter, granulated activated carbon and ion exchange media. Polymer or additional chitosan acetate will be added upstream of the sand filter on an as needed basis.
7. Influent Monitoring Instrumentation – A monitoring module will continuously monitor influent turbidity, pH and flow at 15 minute intervals. Monitoring data is stored on the unit's programmable logic controller (PLC).
8. Effluent Monitoring Instrumentation. A monitoring module will continuously monitor effluent turbidity, pH and flow at 15 minute intervals. Monitoring data is stored on the unit's PLC.

The Industrial Stormwater Treatment Plan (ISTP) for this system is included in Appendix A. The system will be operated by a certified Chitosan Enhanced Sand Filtration (CESF) system operator.

A pilot study will be conducted to determine the pollutants present in stormwater from the marineway and access/parking lot and evaluate permanent treatment alternatives. The pilot study will determine the pollutant constituents and concentrations in the influent stormwater, the efficacy of the individual stages of the temporary treatment system to remove pollutants of interest and the efficacy of potential permanent treatment methodologies. The pilot study will be conducted in January 2014 and February 2014. A copy of the pilot study protocol is included in Appexdix B. An Engineering Report will be prepared that will evaluate permanent stormwater treatment BMPs for the Boatyard based on the results of the pilot study, capital and operation and maintenance cost evaluation and operational considerations. The Engineering Report will be completed by March 15, 2014 and the recommended BMPs installed in the fall of 2014.

2.2 Site Map

The McNeil Island Boatyard is located on the south side of McNeil Island in Pierce County. A Vicinity Map is provided on Figure 1 and Site Map of the Boatyard is provided on Figure 2. Waste water from hull washing operations is collected in the marineway drainage collection sump at the south end of the waterway and pumped to the 1,000-gallon storage vessel. When hull washing has been completed all wash water and solids are collected and stored and the marineway cleaned. After the marineway is clean the sump pump located in the marineway drainage collection sump is used to pump stormwater discharged from the marineway to the stormwater treatment system. A temporary treatment system will be installed by early December 2013 to provide stormwater treatment until permanent BMPs are in place. Surface runoff from the access/parking lot and tributary roof area is collected in a collection sump in the parking lot and is also pumped to the temporary stormwater treatment system. Treated stormwater is discharged to Puget Sound via gravity to the existing Stormwater Discharge 1 located to the west of the entrance to the marineway. Stormwater discharge in excess of the water quality flow is discharged from Stormwater Discharge 1 and 3.

The roof of the mechanical shop and the north facing roof on the abandoned mechanical shop discharge to a piped drainage system. Runoff from these buildings does not enter the boatyard area. The collected drainage is discharged to the east of the boatyard along with the main drainage line from the prison yard and main cell block (Stormwater Discharge 2).

The marineway becomes inundated with seawater, sand and debris during high tide events. Prior to predicted high tides the boatyard staff cleanup work areas and store all materials undercover. All maintenance operations cease during high tide. The stormwater collection pump in the marineway drainage collection sump is shut off during high tide events to prevent treating seawater in the stormwater treatment system.

Areas of pollutant contact include the concrete of the marineway and, to a much lesser extent, the gravel access and parking areas.

Figure 2 identifies the following:

- The confines of the Boatyard drainage basin as defined by work areas and roads, parking and building that contribute drainage to the Boatyard area. The Boatyard area includes 1.59 acres of impervious area. The marineway (0.11 acre), which is the area of highest potential to contribute to stormwater, is 6.9 percent of the total area.
- Stormwater Discharge 1 conveys the discharge from the temporary CESF treatment system and stormwater flows in excess of the water quality flow to Puget Sound. Stormwater Discharge 1 is the monitoring location.
- Stormwater Discharge 2 includes stormwater runoff collected from the roof of the Mechanical Building, the north facing roof of the Abandoned Mechanical Building, the north portion of the

Source: Washington State Coastal Atlas

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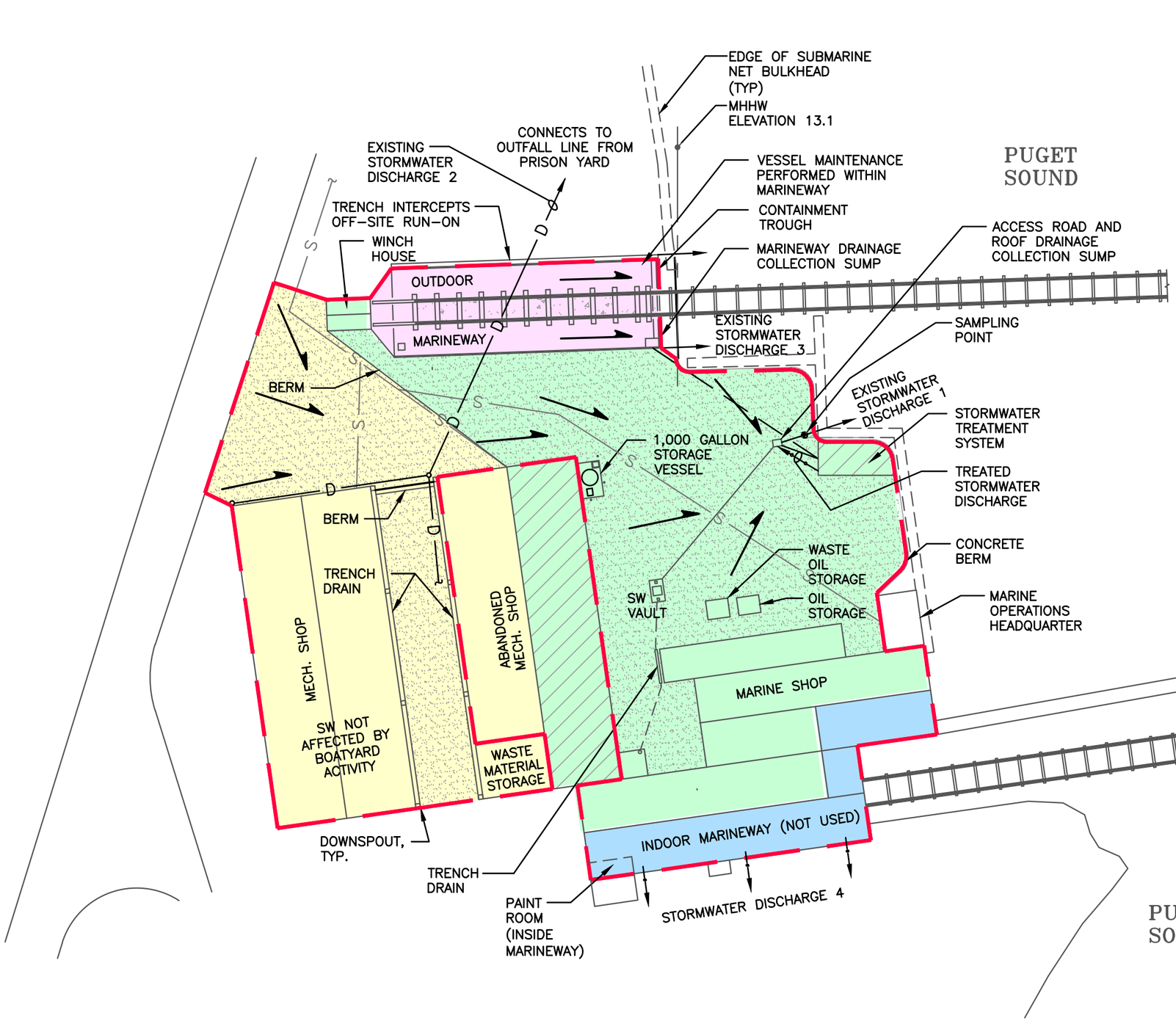
McNeil Island Boatyard
Stormwater Pollution Prevention Plan
Figure 1
Vicinity Map



SCALE: 1"=50'

LEGEND

- D — STORM DRAIN
- S — SEWER LINE
- TREATED WATER DISCHARGE
- PRESSURE LINE
- LIMITS OF BOATYARD
- DIRECTION OF SURFACE FLOW
- AREA TRIBUTARY TO STORMWATER DISCHARGE 1 (1.01 AC)
- AREA TRIBUTARY TO STORMWATER DISCHARGE 2 (0.55 AC)
- AREA TRIBUTARY TO STORMWATER DISCHARGE 3 (0.11 AC)
- ROOF AREA DISCHARGE 4 (0.10 AC)
- NON-BOATYARD ROOF AREA TRIBUTARY TO DISCHARGE 1
- CONCRETE
- HARDPACKED GRAVEL SURFACING

McNEIL ISLAND BOATYARD

STORMWATER POLLUTION PREVENTION PLAN

FIGURE 2

SITE PLAN

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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access road upstream of the berm and the gravel alleyway between the Mechanical Building and the Abandoned Mechanical Shop to a point of connection with the stormwater outfall line from the prison yard. The roof and gravel areas tributary to this outfall are not affected by boatyard activities.

- Stormwater Discharge 3 is located in the collection sump at the south end of the marineway. Stormwater Discharge 3 was previously used as the NPDES monitoring location. Stormwater flows in excess of the water quality flow and discharge during extreme high tide may discharge at this location.
- Stormwater Discharge 4 is located on the west of the side of the Indoor Marineway Building. Runoff from the west-facing roof of the Indoor Marineway and a portion of the west-facing roof of the marine shop discharges to the ground surface and infiltrates.
- Boatyard and non-boatyard areas tributary to Stormwater Discharges 1, 2, 3 and 4 and to ground are identified.
- The trench that collects off-site drainage from the east parking and Tower area is shown on the east side of the marineway. The off-site drainage discharges to Puget Sound to the southeast of the marineway.
- Sanitary sewer facilities are located in the Mechanical Building, Abandoned Mechanical Building, Marine Shop and Marine Operations Headquarters. The sanitary sewers discharge to the northeast to the Wastewater Treatment Plant Headworks Lift Station (remote from the Wastewater Treatment Plant).
- Surface drainage pattern for the access and parking areas and tributary roof areas. Stormwater drainage is collected in the collection sump and pumped to the stormwater treatment system. Treated stormwater is discharged to Stormwater Discharge 1.
- Surface drainage from the marineway discharges to the marineway containment trough and is collected in the marineway drainage sump.

2.3 Identification of Industrial Activity Areas

Worksheet #2 identifies areas associated with industrial activities. Industrial activity is confined to the marineway, the site of all vessel maintenance and repair activities, and to a lesser extent the material loading and unloading that occurs in the parking and access graveled areas. Materials are not stored out-of-doors. The temporary CESF stormwater treatment system consisting of closed tanks, pumps and hoses is located out-of-doors as well as a closed 1,000-gallon wash water storage vessel. These items do not pose a risk of stormwater pollution.

2.4 Inventory of Materials

Worksheet #3 provides an inventory of materials handled on the site that may have the potential to be exposed and contribute pollutants to stormwater. Currently all materials on the site are stored in closed containers indoors and are not exposed to stormwater. New and used motor oil, transmission fluid and antifreeze is stored in closed containers in a materials storage container equipped with a containment sump. Contribution of pollutants to stormwater is unlikely. BMPs for unloading/loading and transport of materials between the storage areas and the marineway are described in the "BMPs for Loading and Unloading Areas for Liquid and Solid Materials," Ecology Stormwater Management Manual for Western Washington, 2005. Used paint thinners, empty paint cans and used antifreeze is removed from the Boatyard by a commercial solvent vendor/recycler.

The Boatyard does not have fuel storage or dispensing capabilities. Boats must be fueled at the Island docks.

Worksheet #4 is intended to describe significant exposed materials on the site. Although, there is little risk of exposure of significant materials at the Boatyard since stored materials are not exposed to precipitation a list of all materials stored on site that are used at the Boatyard is included in Worksheet #4. This list will be updated if material use changes.

Potential sources of stormwater pollution are shown in Worksheet #5. Sources of potential stormwater pollutants include pressure washing, surface preparation, paint removal, painting and vehicle use. Vacuum sanding is not conducted at the Boatyard at this time. Liquids and solids produced during hull preparation and painting are collected for disposal offsite. Oil and grease and metals from vehicles may be deposited in the access/parking areas.

Worksheet #6 includes a list of significant spill or leaks of toxic or hazardous materials have occurred at the site. In the event of a spill or leak the relevant information will be included on Worksheet #6. The Boatyard follows BMPs to prevent spills. Spill prevention BMPs include:

- Only the minimum quantity of hazardous materials needed for boatyard operations are kept on-site to reduce the risk of accidental releases.
- The boatyard stores hazardous chemicals and waste in two outside storage lockers specifically designed for this purpose. The storage lockers are fire resistant and equipped with containment sumps.
- Paint and thinners are stored in a designated paint locker located under cover.

The Boatyard has the following equipment available to deploy in the event of a spill.

- Absorbent pads and clay pellets.
- A 1,000-foot expandable boom/sea curtain.
- Personal protective equipment including hard hats, safety goggles, rain gear, gloves, boots, life jackets and half face respirators.

The McNeil Island Spill Prevention Control and Countermeasure Plan Update, June 2003, Fulcrum Environmental Consulting, Inc. describes the minimum spill response training procedures for McNeil Island staff.

2.5 Non-Stormwater Miscellaneous Discharges

No routine non-stormwater discharges occur at the Boatyard. Unscheduled, emergency discharge of non-stormwater may occur during a building or vessel fire, as shown in Worksheet #7.

3. Monitoring Plan

Sampling of stormwater discharges is conducted in January, April, May, October, and November of each year. Visual observations of stormwater discharges is made weekly when boatyard activities are taking place, as discussed in Section 3.5. Monitoring for and sampling of non-stormwater discharges will occur as ordered by Ecology, as discussed in Section 3.6. The results of sampling and analysis are submitted to Ecology. If there is no discharge during the entire month, the monitoring report is submitted stating that no discharge occurred. Monitoring records are retained on site for a minimum of 5 years. Sampling of each type of discharge is discussed in the following sections.

Eric Heinitz, Environmental Specialist/Team Leader, Tom Stevens, Assistance Marine Operations Manager or qualified person designated by the Team Leader, is responsible for conducting stormwater sampling.

3.1 Stormwater Discharge Locations

The following locations discharge stormwater from the property (as indicated on Figure 2):

1. Discharge 1 – Discharge from the temporary CESF treatment facility (west of the marineway entrance) and overflow from the parking lot stormwater sump (stormwater in excess of the water quality treatment flow).
2. Discharge 2 – Discharge from the shop roofs and access roads.
3. Discharge 3 – Overflow from marineway collection sump during extreme high tides, or when stormwater flows exceed the water quality treatment flow.
4. Discharge 4 – Runoff from the west-facing roof of the indoor marineway building and a portion of the west-facing roof of the marine shop discharges to the ground surface and infiltrates.

3.2 Stormwater Sampling Locations and Rationale

Discharges to surface waters are monitored in accordance with the following list of designated sampling locations and the monitoring schedule (Table 1).

The following designated sampling locations are monitored (as indicated on Figure 2):

1. Discharge 1 – Discharge from the stormwater treatment facility and overflow from the parking lot stormwater sump (stormwater in excess of the water quality treatment flow).

Discharges 2 and 4 described in Section 3.1 are not monitored because stormwater is not affected by boatyard activities (S6.B). Discharge 3 – overflow from the marineway collection sump – is not monitored because it represents flows in excess of the water quality treatment flow. In accordance with the Stormwater Management Manual for Western Washington, the treatment system is designed to collect and treat 91 percent of the total stormwater generated by the tributary area indicated in Figure 2.

If stormwater discharges do not occur during the sampling period, then "no discharge" will be indicated on the DMR. Sampling results will be reported to Ecology in a DMR – either in a hard-copy paper version or via the online WAWebDMR form – by the 28th day of the month following the sample collection.

TABLE 1

STORMWATER MONITORING

Category	Parameter	Units	Sample Point	Minimum Sampling Frequency	Sample Type
Stormwater	Total Copper	µg/L	Discharge 1	One Sample in October, November, January, April, May	Grab or composite
"	Total Zinc	µg/L	Discharge 1	One Sample in October, November, January, April, May	Grab or composite
"	Visual Monitoring	NA	Facility	Weekly (See S6.D.)	Visual
"	Total Lead	µg/L	Discharge 1	One Sample in October, November, January, April, May	Grab or composite
Stormwater to marine waters	BOD, NO3+NO2-N	mg/L	Discharge 1	One sample in November or December of 2012	Grab or composite
Non Stormwater Misc Discharges	Parameters, frequency and location as directed by Ecology order.				

3.3 Sampling Procedures

The following is a brief summary of the sample collection procedures that are employed at the Boatyard. The McNeil Island Boatyard Quality Assurance Project Plan (QAPP) is included in Appendix C.

1. Sample is collected as close to the point of discharge as reasonably and safely practical.
2. All samples are collected in fresh laboratory-supplied sample bottles.
3. Once sample is collected, bottle is capped, sealed, and labeled with the date, time and location of the sample with waterproof markers. This information is transferred to the chain of custody document along with identification of parameters to be tested.
4. No sample is allowed outside the custody of the Team Leader or qualified staff until relinquished.
5. A chain of custody report is prepared and provided for all samples transported to the DOE accredited laboratory for analysis.

6. The following items are recorded at the time of sampling in a permanent lab record. The lab record is stored in bound notebooks kept in the Marine Operations Supervisors office:

    a. Time rainfall began;
    b. Sampling location (when there is more than one);
    c. Date of sampling;
    d. Time of sampling;
    e. How sample was collected (for example, "from a ditch by hand");
    f. Name of the sampler(s);
    g. Number, types (parameters) of samples collected;
    h. Unusual circumstances that may affect the sample results; and
    i. Visual observations, as detailed in Section 3.5.

7. Samples are sent to an Ecology approved laboratory for analyses of the applicable parameters, as indicated in Table 1.

3.4 Sample Analysis, Handling and Preservation

Samples are analyzed, handled, and preserved in accordance with Code of Federal Regulations Title 40, Part 136. Samples will be submitted to a laboratory accredited by the Washington Administrative Code *Accreditation of Environmental Laboratories*, Chapter 173-50 WAC. Copper, zinc and lead are analyzed using EPA method number 200.8 or a similar method. For copper, the required method detection level (MD) is 0.4 µg/L and the minimum quantitation level (ml) is 2.0 µg/L. For zinc, the required MD is 0.5 µg/L and the ml is 2.5 µg/L. For lead, the required MD is 0.1 µg/L and the ml is 0.5 µg/L.

Chain of custody procedures are followed for all samples. Custody refers to the physical responsibility for sample identifications, integrity, handling, and transportation; this responsibility is considered to be met if samples are in the responsible individual's physical possession or visual range after taking possession, secured so that no tampering can occur, or locked in an assess-controlled area. Field sample custody is the responsibility of the assigned staff; laboratory chain of custody is the responsibility of the laboratory's sample custodian. Chain of custody refers to the history of the transportation or carrier, and finally to the laboratory's sample custodian while maintaining custody at each step. Records of such transfers are maintained on the chain of custody forms provided by the laboratory. Each custodian signs the form when relinquishing or accepting sample custody. The laboratory sample custodian delivers copies of each completed chain of custody to the Marine Operations Supervisor, and routes hard copies with the associated analytical data package. The laboratory sample custodian physically certifies sample condition, integrity, and identification, and immediately reports any observed discrepancies in the condition of the samples to the Marine Operations Supervisor or Team Leader by fax, email or telephone.

3.5 Visual Monitoring

Visual monitoring of stormwater discharges at the stormwater sampling locations is conducted weekly when boatyard activities are occurring at the site as well as at the time of stormwater sampling. Visual monitoring is conducted by the Team Leader or qualified staff. Visual monitoring observations are recorded on the Worksheet #8 (Department of Ecology Boatyard Site Inspection Checklist, ECY 070-196). Completed copies of Worksheet #8 are stored in the bound SWPPP notebook kept in the Marine Operations Supervisors office. Visual monitoring reports are kept for a minimum of 5 years. Observations including presence of floating materials, visible sheen, discoloration, turbidity, odor, and other physical attributes of the stormwater discharges

will be recorded on Worksheet #8. Observations of the performance of the Best Management Practices (BMPs) described in this document will also be made, and if necessary, failing practices will be corrected.

Visual monitoring reports will be signed by the person making the inspection.

Any oil sheens observed during visual monitoring of stormwater discharges are reported on the next scheduled DMR. The DMR will include the exact dates and times, the probable cause, and the steps taken or planned to reduce, eliminate, and prevent further contamination.

3.6 Non-stormwater Discharge Monitoring

Upon order of Ecology, a survey of non-stormwater discharges will be conducted at the facility. These may include discharges from firefighting activities, fire protection system testing and maintenance, dechlorinated potable water, uncontaminated condensate, uncontaminated groundwater, and dewatering activities. Worksheet #9 will be used to record the observations of non-stormwater discharges if required. No routine non-stormwater discharges occur at the Boatyard. Unscheduled, emergency discharge of non-stormwater may occur during a building or vessel fire, as shown in Worksheet #7.

3.7 Health and Safety

Monitoring personnel are trained in proper safety procedures. Stormwater monitoring may subject sampling personnel to hazardous conditions, such as the following:

- Hazardous weather conditions (e.g., wind, lightning, flooding);
- Hazards associated with chemicals and biological hazards (e.g., rodents and snakes);
- Physical hazards (e.g., traffic, falling objects, sharp edges, slippery footing); and
- Lifting injuries from opening or removing access panels and manhole covers, etc.

4. Best Management Practices

The Boatyard General Permit for the State of Washington (Ecology, June 2011) requires the implementation of Best Management Practices (BMPs) to meet the following stormwater requirements:

- No discharge of oil;
- No discharge of floatables;
- No change in receiving water turbidity or color;
- No discharge of process water;
- Total Copper concentration in stormwater less than the maximum daily benchmark of 147 ug/L and the seasonal average benchmark of 50 ug/L;
- Total Zinc concentration in stormwater less than the maximum daily benchmark of 90 ug/L and the seasonal average benchmark of 85 ug/L.

This SWPPP uses the Presumptive Approach to demonstrate that the stormwater management BMPs implemented at the facility comply with state water quality standards and satisfy the technology-based treatment requirements of 40 CFR Part 125.3 and Chapter 90.48 RCW. The stormwater management BMPs were approved by Ecology and outlined in *Stormwater Management Manual for Western Washington* (Ecology, February 2005).

Activities conducted at the McNeil Island Boatyard are limited to hull washing, limited repairs to the hull, hull and topside painting and mechanical repairs on the McNeil Island fleet. All washing, painting and repair work is carried out in the marineway, therefore, BMPs that address collection of wash water and debris associated with hull preparation, painting and general mechanical repair and general good housekeeping practices, including the use of covered storage, site cleanliness and spill prevention are emphasized in the BMPs followed at the Boatyard.

4.1 Mandatory Boatyard BMPs

The following mandatory BMPs will be implemented at this site. Worksheet #10 provides documentation on how these BMPs will be implemented at the site.

4.1.1 Use of Vacuum Sander

The McNeil Island Boatyard does not prepare hull surfaces by vacuum sanding at this time. If operations change in the future BMP guidance for the use of vacuum sanders and disposal of the wastes generated will be developed and implemented. The vacuum sander minimum requirements will include the following:

- Sanding limited to the use of a vacuum sander or rotary tool meeting the minimum performance standards for all antifouling paint removal.
- Tarps or drop clothes will be secured below and around the sanding area to collect solid materials not captured by the sander.
- All solids will be collected by vacuuming and placed in covered container.

4.1.2 Tidal Grids

The McNeil Island Boatyard does not use tidal grids.

4.1.3 In-Water Vessel Maintenance and Repair

The McNeil Island Boatyard does not conduct vessel maintenance or repair in-water. If in the future operations change and in-water work is required the appropriate BMPs will be developed.

4.1.4 Upland Vessel Maintenance and Repair

All vessel maintenance and repair work at the McNeil Island Boatyard is conducted in the marineway. Pressure wash water is collected in the containment trough at the south end of the marineway and pumped to the 1,000-gallon storage vessel for holding until the waste is transported off-island for disposal. Solids generated during the pressure washing are collected and stored in sealed containers prior to hauling away for disposal.

Prior to stripping, scraping, rust repair, painting, coating and/or varnishing any portion of a vessel drop cloths and traps are secured beneath the work area and when possible over the work area. All particles, oils, grits, dusts, flakes, chips, drips, sediments, debris and other solids are collected by vacuuming and properly disposed of to prevent their release into the environment and entry into waters of the state. Solid wastes are collected and stored in sealed containers prior to hauling away for disposal. Wash water wastes are collected and stored in the 1,000 gallon storage vessel. Waste oil is transported to the McNeil Island Fuel Depot and used antifreeze is stored in sealed containers and disposed of off-island.

The marineway is tidied, all materials removed and all collected wastes cleaned up by the end of the work day.

The marineway is cleaned and secured prior to predicted high tides. No work is allowed in the marineway during high tides.

4.1.5 Solids Management

All vessel maintenance and repair work at the McNeil Island Boatyard is conducted in the marineway. Solids generated during pressure washing including particles, oils, grit, barnacles, sediments, and debris are collected and stored in sealed containers prior to hauling away for disposal. Solids generated during stripping, scraping, rust repair, painting or coating including oils, grits, dusts, flakes, chips, drips, sediments, debris and other solids are collected in drop cloths or tarps secured under the work area. The solids collected on the tarps/drop cloths are collected by vacuuming. Work on the hull does not occur during rain events, and precautions are taken to keep the solids dry. Solids are collected and deposited in covered containers and properly disposed of to prevent release into the environment and discharge to waters of the state. Solids are not washed into the storm drainage system or surface waters.

The marineway is tidied, all materials removed and all collected wastes cleaned up by the end of the work day.

The marineway is cleaned and secured prior to predicted high tides. No work is allowed in the marineway during high tides. No hull recoating work is conducted on a marine railway unless the boat is at least one boat length from the high water level or unless all dust, debris and paint is contained and prevented from being exposed to the weather.

The marineway is cleaned of all solids, debris and garbage prior to being submerged to prevent such materials from being washed into waters of the state.

The storm drains, catch basins and treatment system will be visually inspected weekly and cleaned, either manually or with a vacuum device, on a routine basis to prevent the entry of solids into waters of the state.

4.1.6 Paint and Solvent Use

All vessel maintenance and repair work at the McNeil Island Boatyard is conducted in the marineway. Drop cloths and traps are secured under the work area before paint or solvent transfer, mixing, painting and solvent use begins. When possible a tarp is secured over the work area. Painting work does not occur during rain events or high tide. No hull recoating work is conducted in the marineway unless the boat is at least one boat length from the high water level or unless all dust, debris and paint is contained and prevented from being exposed to the weather.

Paints and solvents are stored in sealed containers indoors and are taken to the marineway on an as needed basis. The marineway is tidied, all materials removed and all collected wastes cleaned up by the end of the work day.

Paints containing tributyltin are not currently used at the Boatyard. The use of paint containing tributyltin is prohibited from use on any vessel less than 25 meters in length (82 feet) except as applied by a licensed applicator for the painting of aluminum hulls of a vessel that is less than 25 meters in length, and for the painting of outboard motors and outdrives of vessels less than 25 meters in length. Only persons with a current Washington State Department of Agriculture pesticide applicator's license are allowed to purchase, handle and apply tributyltin.

4.1.7 Oils and Bilge Water Management

Petroleum products and bilge water transfer at the McNeil Island Boatyard occurs in the marineway only. Overwater transfers do not occur.

Hydraulic fluids, oily wastes and petroleum products are pumped out of the vessel as needed and transported to the McNeil Island Tank Farm or stored in sealed containers in a covered area for disposal off-island to prevent these wastes being discharged to waters of the state. Bilge water is pumped out of the vessel, as needed, and stored in sealed containers in a covered area to prevent bilge water discharge to waters of the state.

Drip pans or other containment devices are used during all petroleum product transfer operations to catch incidental leaks and spills.

4.1.8 Sacrificial Anode (Zincs) Management

New and spent zincs are stored indoors. Spent zincs are recycled off-island. Zinc anodes are transported to and from the marineway only when needed and are not exposed to rain. Zincs used as sacrificial anodes are not disposed of into waters of the state.

4.1.9 Chemical Management

Solid chemical products, chemical solutions, paints, oils, solvents, acids, caustic solutions and waste materials, including used batteries, zinc anodes and lead and copper waste, are stored under cover on an impervious surface. Used materials are disposed of off-island.

4.1.10 Wash Pad Decontamination

All hull pressure washing activities are conducted on the marineway. Immediately following hull pressure washing all solids, debris and sludge on the marineway is collected and placed in a covered container. The

concrete pad is pressure washed and the pressure wash waste water collected and stored in the 1,000 gallon storage vessel prior to actively pumping stormwater from the marineway to the stormwater treatment system. No hull pressure wash water will be allowed to commingle with stormwater sent to the stormwater treatment system. In the event of a rain event during hull pressure washing and wash pad decontamination procedures the stormwater run off generated on the marineway is collected along with the wash water and stored in the 1,000 gallon storage vessel for disposal off-island.

4.1.11 Sewage and Gray Water Discharges

The vessels maintained at the McNeil Island Boatyard do not have sanitary or grey water systems on board. No BMP is required.

4.2 Operational Source Control BMPs

Operational source control BMPs are discussed below. Implementation is outlined in Worksheet #11.

4.2.1 Pollution Prevention Team

The responsibilities and makeup of the pollution prevention team are presented in Section 1.

The Pollution Prevention Team priorities include:

- Assisting the yard manager in the implementation, maintenance, and modification of this SWPPP;
- Holding regular meetings to review the overall operation of the BMPs;
- Sampling, inspections, operation and maintenance;
- Emergency situations; and
- Training of team members in the operation, maintenance, and inspections of BMPs.

The schedule for implementation of these priorities is included in Worksheet #11. All staff training is recorded on Worksheet #12. Annual stormwater sampling and SWPPP implementation staff training on the updated SWPPP occurred on November 22, 2013 and follow-up training will occur by September 1st in subsequent years. Good housekeeping, preventative maintenance and spill prevention and emergency cleanup staff training occurred on November 22, 2013 and follow-up training will occur by September 1st in subsequent years.

4.2.2 Good Housekeeping

Good housekeeping activities are followed at McNeil Island Boatyard to prevent the potential of pollutants coming in contact with stormwater. Sources of pollutants include, hull pressure washing wastewater, particulate and solid wastes generated by hull maintenance and painting, debris and garbage in the marineway and parking areas, used fuel transfer from vessels to the tanker truck, transfer of new and used oil to the vessel from the storage area and loading and unloading of new and used materials. The following Ecology BMP guidance information (Ecology, Stormwater Management Manual for Western Washington, 2012) is included in Appendix D.

- S401 BMPs for the Building, Repair and Maintenance of Boats and Ships.
- S412 BMPs for the Loading and Unloading Areas for Liquid or Solid Material.
- S417 BMPs for the Maintenance of Stormwater Drainage and Treatment Systems.

- S420 BMPs for Painting/Finishing/Coating of Vehicles/Boats/Buildings/Equipment.
- S421 BMPs for Parking and Storage of Vehicles and Equipment.
- S426 BMPs for Spills of Oil and Hazardous Substances.

Good housekeeping activities that are implemented on an as needed basis include the following.

- The marineway is tidied, all materials removed and all collected wastes cleaned up by the end of the work day.

- The marineway is cleaned and secured prior to predicted high tides. No work is allowed in the marineway during high tides.

- No hull recoating work is conducted on a marine railway unless the boat is at least one boat length from the high water level or unless all dust, debris and paint is contained and prevented from being exposed to the weather.

- The marineway is cleaned of all solids and garbage prior to being submerged to prevent such materials from being washed into waters of the state.

- Any spillage on the marineway, or vessel deck areas is cleaned up immediately and the wastes are properly disposed.

- All accessible work, service and storage areas are cleaned weekly to remove debris, and any other potential stormwater pollutants.

- Paint, paint thinner, solvents, used oils, oil filters, as well as any other recyclable materials are recycled. Paint, paint thinner and solvents are collected by an off-island disposal/recycling contractor.

- Oils, debris, sludge, etc. from all BMP systems, including catch basins, sedimentation basins, and conveyance systems, is cleaned regularly to prevent the contamination of stormwater.

- Solid and liquid pollutant leaks and spills including oils, solvents, fuels, and dust on soil, vegetation, or paved area exposed to stormwater are promptly contained and cleaned up.

- Greasy rags, oil filters, air filters, batteries, spent coolant, and degreasers are properly disposed.

- All leaking connections, pipes, hoses, valves, etc., which can contaminate stormwater are promptly repaired.

- Solid absorbents, e.g., clay and peat absorbents and rags are used for cleanup of liquid spills/leaks, where practicable.

Prohibited Activities:

Activities that have a significant potential for introduction of pollutants into stormwater runoff from the Boatyard and are prohibited in the Boatyard include the following:

- Waste materials are not poured or dumped down floor drains, sinks, or outdoor storm drain inlets that discharge to surface water. If floor drains are connected to storm drains or to surface water, plug the drain or connect to the sanitary sewer system.

- Prohibit outside spray painting, blasting or sanding activities during windy or rain conditions that render containment ineffective.

- Do not burn paint and/or use spray guns on topsides or above decks.

4.2.3 Preventive Maintenance

The following preventive maintenance activities are followed at McNeil Island Boatyard. The preventative maintenance activities prevent the discharge of potential pollutants onto surfaces that may come in contact with stormwater.

- Drain oil and fuel from filters before disposal. Discard empty oil and fuel filters, oily rags, and other oily solid waste into appropriately closed and properly labeled containers and in compliance with the Uniform Fire Code.

- Store liquids in steel or rigid plastic drums that are corrosion resistant to the weather and fluid content, non-absorbent, water tight, rodent-proof, and equipped with a close fitting cover.

- Solid wastes contaminated with liquids or other potential pollutant materials will be stored in dumpsters, garbage cans, drums and comparable containers that are durable, corrosion resistant, non-absorbent, non-leaking, and equipped with either a solid cover or screen cover to prevent littering. Store all materials under cover.

- Store cracked batteries in a covered secondary container.

- Inspect stormwater treatment system regularly for proper performance and maintain system on manufacturer's suggested schedule or as needed.

4.2.4 Applicable Boatyard Structural Source Control BMPs

The McNeil Island marineway is uncovered. The following BMP is followed to prevent stormwater contact with potential pollutants generated as a result of vessel maintenance.

- Use drop cloths, plastic or tarpaulin barriers beneath the hull to contain and collect waste and spent materials. Clean and vacuum regularly to remove debris.

- Berms have been constructed to prevent sheet flow run-off from the boatyard as well as run-on of non-boatyard stormwater. A perimeter berm consisting of concrete pilings and concrete curb is installed where the parking lot is adjacent to the shoreline to contain stormwater and prevent sheet flow discharge of untreated stormwater to the Sound. A berm is also installed across the entrance roadway to prevent run-on of off-site stormwater to the boatyard. The berms will be maintained to ensure integrity of the facilities.

4.2.5 Spill Prevention and Reporting and Emergency Cleanup

Robust spill prevention protocols and effective emergency cleanup response in the event of a spill are employed at the Boatyard to prevent or limit the potential for stormwater pollution due to spills or leaks. Spill prevention BMPs include staff training in spill prevention and response. The following specific BMPs are employed to prevent spill related stormwater pollution.

- All staff response workers will receive a minimum of 16 hours of Hazardous Waste Operations and Emergency Response (HAZWOPER) training and a HAZWOPER annual refresher training thereafter.

- Inventory spill prevention equipment and augment as necessary.

- Prevent the discharge of unpermitted liquid or solid wastes and process wastewater, to ground or surface water or to storm drains which discharge to surface water or to the ground. Identify floor drains in potential pollutant source areas that are connected to storm drains, surface water, or to the ground. Eliminate illicit non-stormwater discharges within 30 days of discovery.

- All oily parts cleaning, steam cleaning, or pressure washing of equipment or containers is conducted inside a building and/or on an impervious contained area such as a concrete pad. Contaminated stormwater from such an area is directed to the stormwater treatment facility.

- Use drip pans to collect leaks and spills from equipment such as trucks and other vehicles that are stored outside. Empty drip pan immediately after a spill or leak is collected in an uncovered area.

- Stop, contain, and clean up all spills immediately upon discovery. Do not flush absorbent materials or other spill cleanup materials to a storm drain or to surface water. Collect the contaminated absorbent material as a solid and place in appropriate disposal containers.

- Place and maintain emergency spill containment and cleanup kit(s) at outside areas where there is a potential for fluid spills. These kits should be appropriate for the materials being handled and the size of the potential spill, and readily accessible to personnel responsible for spill response.

- Spills are recorded on Worksheet #6.

- Notify Ecology, the National Response Center, the Washington Emergency Management Division and the local sewer authority immediately (within 1 hour) if a spill of reportable quantities has reached or may reach a sanitary or storm sewer, ground water, or surface water. A spill of reportable quantity is any amount of material that can cause sheen or any amount of material that can pose a threat to human health or the environment. Take reasonable steps to minimize any adverse impacts to waters of the state and to correct the problem. If you call in the spill report, follow up with written documentation covering the event within 30 days unless Ecology waives or extends this requirement. The 24-hour call numbers are listed below:

National Response Center
1-800-424-8802

Washington Emergency Management Division
1-800-258-5990

Department of Ecology
(SWRO) 360-407-6300

4.2.6 Employee Training

All employees who work in pollutant source areas are trained in identifying pollutant sources and in understanding pollutant control measures, spill prevention and response, good housekeeping, and environmentally acceptable material handling/management practices on an annual basis. Training is scheduled and implemented by the Pollution Prevention Team. The course materials used in the training program, dates of training and attendees are recorded in Worksheet #12.

4.2.7 Inspections, Reporting and Recordkeeping

- Submit all collected data to Ecology on the required DMR.
- Summarize and report monitoring data collected during the previous month on the form provided in the SWPPP.
- Postmark no later than the twenty-eighth (28th) day of the month following the sampling, unless otherwise specified.
- Send report(s) to the appropriate regional office of the Department of Ecology.
- Retain records of all monitoring information for a minimum of five years.
- Include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for the boatyard general permit.

For each measurement or sample taken, the following information is recorded:

1. Date, exact place, method, and time of sampling;
2. Individual who performed the sampling or measurement;
3. Dates the analyses were performed;
4. Name of the person(s) who performed the analyses;
5. Analytical techniques or methods used; and
6. Results of all analyses.

4.2.8 Illicit Discharges

Identify any illicit (unpermitted) discharges of pressure wash process wastewater, domestic wastewater and noncontact cooling water to stormwater sewers or to surface waters and ground waters of the state. Document any identified illicit discharges at the facility on Worksheet #13. Eliminate illicit discharges following recommended BMPs from Volume IV of Ecology's SWMM for Western Washington.

Procedures to identify illicit discharges include:

- Conduct a field survey of buildings, particularly older buildings, and other industrial areas to locate storm drains from buildings and paved surfaces. Note where these join the public storm drain(s).
- During non-stormwater conditions, inspect each storm drain for non-stormwater discharges. Record all such discharges.
- Identify all connections of illicit discharges to storm drains or to surface waters and take the actions necessary to eliminate such discharges.

4.3 Enhanced/Additional BMPs

The Boatyard may need to implement enhanced/additional BMPs in addition to the operational and structural source control BMPs listed in Sections 4.1 and 4.2, if necessary because of a notice from Ecology, facility changes, self-inspection, or if monitoring values exceed benchmark values. A schedule for implementation must be entered into the SWPPP within thirty (30) days of a determination of necessary improvements or exceedance of benchmark values. The trigger, identification and implementation schedule for enhanced/additional BMPs are documented in Worksheet #14. Note that if the trigger is the benchmark exceedance of a specific pollutant, then the enhanced/additional BMP analysis will be limited to controlling this specific pollutant.

The Boatyard General Permit for the State of Washington (Ecology, June 2011) requires adaptive management if benchmarks are exceeded. The three levels of response are:

Level One Response – Each time a sample exceeds a benchmark, a facility inspection is conducted to identify and evaluate possible sources responsible for the benchmark exceedance and the SWPPP is updated to identify and evaluate additional source control methods to address the benchmark exceedance. Operational source control BMPs are documented in Worksheet #11. Enhanced/additional BMPs are documented in Worksheet #14.

Level Two Response – Whenever four samples exceed a benchmark, a Source Control Study is conducted to identify and evaluate possible structural source control and treatment BMPs to address the benchmark exceedance. The Source Control Study at a minimum considers covering hull preparation areas, treatment of stormwater, and diversion of stormwater to the municipal sewage treatment plant. The Source Control Study is submitted to Ecology.

Level Three Response – Whenever six samples exceed a benchmark, an Engineering Report is prepared to document selection and design of a structural source control or treatment BMP to address the benchmark exceedance. The Engineering Report is submitted to Ecology within 3 months of initiating a Level Three Response and the SWPPP is updated. Enhanced/additional BMPs are documented in Worksheet #14. Before implementation of the preferred option, a modification of coverage is obtained from Ecology.

The McNeil Island Boatyard has triggered a Level Three Response. The Boatyard must prepare Level Three Response documentation to discuss the structural and/or operational BMPs that will be implemented at the Boatyard to achieve compliance with the permit. The Engineering Report will be completed by March 15, 2014 and the recommended BMPs installed in the fall of 2014. A temporary CESF stormwater treatment system will be installed and operational by early December 2013 to treat the water quality runoff volume, as determined by the WWHM model. The CESF treatment system will remain in place until permanent treatment BMPs are operational.

A pilot study will be conducted to determine the pollutants of concern, the efficacy of the various treatment technologies included in the temporary CESF treatment train and other viable treatment options. The results of the pilot study will be incorporated in the Engineering Report. The Engineering Report will evaluate additional operational BMPs, including but not limited to:

- Install additional controls at pressure wash pad to prevent pressure wash water from reaching drainage system;
- Cover pollutant causing activity;
- Berm or slope the ground surface in work areas to prevent run-on of uncontaminated stormwater and runoff of contaminated stormwater to outside areas;
- Enclose pollutant causing activity in a building; and
- Divert stormwater to the municipal sewage treatment plant.

The Engineering Report will also evaluate permanent treatment BMPs for the Boatyard. Appropriate treatment BMPs will be selected based on the pollutant requiring removal and other site specific criteria. Volume V of the *Stormwater Management Manual for Western Washington* (Ecology, February 2005) will be used to select treatment BMPs.

The potential treatment BMPs for implementation the McNeil Island Boatyard include:

- Catch basin inserts;
- Oil water separation;
- Wet Pond/Wet Vault;
- Sand Filter;
- Media Filter Aquip (StormwaterRx, etc.)
- Biofiltration Swale;
- Constructed Wetland;
- Infiltration with appropriate pretreatment;
- Manufactured Storm Drain Structures (Stormceptor, Vortechnics, etc.); and
- Treatment trains including pH adjustment, precipitation and filtration.

Design, construction, and operation of treatment BMPs will be in accordance with Volume V of the *Stormwater Management Manual for Western Washington* (Ecology, February 2005).

5. References

Guidance Manual for Preparing/Updating a Stormwater Pollution Prevention Plan for Industrial Facilities (Ecology, April 2004).

The Boatyard General Permit (Ecology, June 1, 2011).

Stormwater Management Manual for Western Washington – SWMM (Ecology, February 2005).

Stormwater Management Manual for Western Washington – SWMM (Ecology, August 2012).

SWPPP Worksheets

Pollution Prevention Team	**Worksheet #1** **Completed by: Nancy Lockett, P.E.** **Title: Engineer** **Date: November 13, 2013**

Responsible Official: Robert Epperson Title: : Marine Operations Supervisor

Team Leader: Eric Heinitz, Environmental Specialist Office Phone: 360-725- 8397

Responsibilities:

Responsible Official: Signatory authority, direct supervision of BMP compliance and sampling compliance, submittal of DMRs

Team Leader, staff training (sampling, BMP implementation), permit compliance, meetings with staff to review permit compliance and BMP implementation

(1) Tom Stevens Title: Asst. Marine Operations Supervisor

Office Phone: 253-512-6508

Responsibilities:

Daily management and responsibility for operation and maintenance of the Boatyard including BMPs. Staff assignments for sampling and BMP implementation. Lead in emergency situations. Stormwater sampling and weekly visual monitoring when boatyard activities are taking place.

(2) John Johnson Title: Shipwright Supervisor

Office Phone: 253-512-6508

Responsibilities:

BMP vessel maintenance and repair implementation.

(3)_____ Title:_____

Office Phone:_____

Responsibilities:

._____

Identify Areas Associated With Industrial Activity	Worksheet #2 Completed by: Nancy Lockett, P.E. Title: Engineer Date: November 13, 2013	
Edit these areas to only include those occurring at the boatyard, or add additional areas which may be sources of pollution. Discuss the potential of these areas and activities as potential pollutant sources and identify any pollutant that may be generated by that activity.		
Industrial Area or Activity	**Potential Stormwater Pollutant from Area or Activity**	**Likelihood of being present in your stormwater discharge. If yes, describe reason.**
Loading or unloading of dry bulk materials or liquids	Oil and grease, paint, solvents	Paints and solvents are stored under cover in the Indoor Waterway Building. Anti-freeze and oils are stored in locked storage lockers equipped with containment sumps located in the gravel parking area. BMPs for unloading and loading closed containers and transfer of closed containers between the storage areas and the marine waterway are discussed in this SWPPP. The potential for stormwater pollution during unloading and loading of closed containers and movement of materials is slight.
Outdoor storage of materials or products	None	No outdoor storage occurs at the boatyard
Outdoor work and repair areas	Metals, oil and grease, paint, solvents, suspended solids	Vessel maintenance and repair work is confined to the Outdoor Waterway area. All work is done over a concrete slab. Pressure wash water is collected and stored prior to transport off-island for disposal. Traps/visqueen is used to collect solids from washing and hull preparation work (scraping with wire brush and cutting/scaling with a pneumatic needle gun). Waste solids are collected in a covered container and transported off-site for disposal. Stormwater runoff from the waterway may contain residual metals (Cu, Pb, Zn), total suspended solids and oil and grease. Stormwater from the waterway is collected and treated through a treatment system designed to reduce concentrations of potential pollutants to the allowable discharge concentrations.
Dust or particulate generating processes	Metals	The use of wire brushes or pneumatic needle guns to prepare the washed hull for painting may contribute particulate pollutants. Work on the exterior of the vessels is done under tarps to contain dust. All solids deposited on the tarps are removed by vacuuming.
Roofs or other surfaces exposed to air emissions from enclosed vessel repair	None	Roofing material is composed of asphalt shingles. There is no source of air emissions that would cause deposits on the roofs. The potential for stormwater pollution from the roofs tributary to the boatyard is slight.

Onsite waste treatment, storage or disposal	**Metals, oil and grease, suspended solids**	**Pressure wash waste water and solids from the hull cleaning and limited scraping are collected and stored in closed containers on –site prior to transport off-island for disposal. Solids and spent media from the stormwater treatment system are collected and stored in closed containers prior to transport off-island for disposal. Hull wash water may be treated in the future and discharged to the WWTP.**
Vehicle and vessel fueling, maintenance and/or cleaning	**Oil and grease, Diesel fuel,**	**Vehicle and vessels are not fueled in the boatyard area. Vehicle maintenance is not conducted in the Boatyard. In the event diesel fuel is removed from the vessel in order to repair the fueling system, fuel is pumped out of the vessel with a tank truck and the fuel is transported to the McNeil Island Fuel Farm. Vessel maintenance and repair work is confined to the Outdoor Waterway area.**
Roofs or other surfaces composed of materials that may be mobilized by stormwater (galvanized or copper)	**None**	**Roofing material in the boatyard consists of asphalt shingles.**

Material Inventory

Worksheet #3

Completed by: Nancy Lockett, P.E.

Title: Engineer

Date: November 19, 2013

List materials handled, treated, stored, or disposed of at the site that may potentially be exposed to precipitation or runoff. Also indicate if any spills or leaks of pollutants have occurred during the three years prior to the effective date of the permit. (Including any pollutants no longer handled on-site.)

Material	Purpose/Location	Quantity (Units) (Indicate per/wk. or yr.)			Exposed (Yes/No)	Likelihood of contact With stormwater. If Yes, describe reason.	Past Spill or Leak	
		Used	Produced	Stored			Yes	No
New Motor Oil	Servicing vessel engines.[1]	100 gallons per month		250 gallons	NO	Unlikely		No
Used Motor Oil	From servicing vessel engines.[1]		<100 gallons per month	None[2]	NO	Unlikely		No
Automatic Transmission Fluid	Used in vessels (in boatyard and in service).[1]	5 gallons/year		5 gallons	NO	Unlikely.		No
Gasoline	Used to power pressure washer.	15 gallons per year		None	NO	Unlikely		No
Hydraulic Fluid	Used in vessels (in boatyard and in service). [1]	10 gallons per year		10 gallons	NO	Unlikely		No
Antifreeze	Used in vessels (in boatyard and in service). [1]	25 gallons per year		<50 gallons	NO	Unlikely		No

Used Antifreeze	Collected from vessels during service/repair. [1]		35 gallons per year	None	NO	Unlikely		No
T-10 Thinner	Used for thinning paint and equipment cleanup during vessel maintenance operations.[3]	20 gallons per year		20 gallons	NO	Unlikely		No
Juton Red paint	Used on vessel during maintenance operations. [3]	100 gallons per year.		60 gallons	NO	Unlikely		No
Rust converter	Used on vessel in the boat yard[3].	20 gallons per year		10 gallons	NO	Unlikely		No
Used Batteries	Used on vessels.	1	12	None[4]	NO	Unlikely		No
Zinc Anodes	Used on vessels[5].	Ordered on as-needed basis		6 units	NO	Unlikely		No

1 – Storage in closed container in materials storage building equipped with a spill containment sump.

2 – No onsite storage. All used motor oil sent to the waste oil tank at the upland fuel yard.

3 – Paint and thinners stored in paint lockers/room in marine shop.

4 – Used batteries are immediately sent off-island.

5 – Stored indoors on pallets.

Description of Exposed Significant Material	Worksheet #4 Completed by: Nancy Lockett Title: Engineer Date: November 17, 2013

Based on your material inventory, list significant materials that are currently exposed.

List of Exposed Significant Materials	Quantity Exposed (units)	Location (as indicated on the site map)	Method of storage, handling, treatment, or disposal (e.g., sealed drum standing outside, or covered pile, drum, tank)
Bilge Water	None	Storage room on west side of Abandoned Maintenance Building	Bilge water is stored in sealed drums under cover in the Abandoned Maintenance Building. Bilge water is transported off-island for disposal. A maximum of 1,500 gallons of bilge water may be stored at any one time.
Pressure Wash Water	Maximum 1000 gallons	In boatyard in 1000 Gallon Storage Vessel.	Waste pressure wash water is stored in the 1000 gallon conical vessel prior to transport off-island for disposal. The vessel is water tight and the contents are not exposed to precipitation.
New/Used Oil	None	Storage Building in parking area	New/Used oil is stored in sealed containers in a locked, watertight storage cabinet equipped with a containment sump
Paints and Thinners	None	Marine Shop	Paint and thinners stored in sealed containers inside Marine Shop.

Potential Pollutant Source Identification

Worksheet #5
Completed by: Nancy Lockett

Title: Engineer
Date: November 17, 2013

List all potential stormwater pollutants from onsite activities.

u	Potential Stormwater Pollutant	Likelihood of pollutant being present in your stormwater discharge. If yes, explain
Pressure washing	Cu, Pb, Zn, suspended solids, oil	Unlikely. Pressure washing operations are not conducted during wet weather and all waste pressure wash water is collected and stored in a sealed holding tank.
Surface preparation	Cu, Pb, Zn, suspended solids	Unlikely. Limited surface preparation is conducted at the boatyard. Surface preparation activities include a manually operated wire brush and pneumatic needle gun. Vacuum sanding is not done at the boatyard. Tarps are spread under the work area to collect paint, rust and metal. Collected solids are stored in closed containers.
Paint removal	Cu, Pb, Zn, suspended solids	Unlikely. Limited paint removal is conducted at the boatyard. Paint removal activities include a manually operated wire brush and pneumatic needle gun Vacuum sanding is not done at the boatyard. Tarps are spread under the work area to collect paint, rust and metal. Collected solids are stored in closed containers.
Sanding	None	Vacuum sanding is not done at the boatyard at this time.
Painting	Paint, thinners, rust prevention products	Unlikely. Tarps are spread under the work area during painting operations. Collected

		solids are vacuumed off the tarps and stored in closed containers. Paint spills are collected on the tarps.
Engine/vessel maintenance and repairs	**Oil and grease, metals.**	**Unlikely. Engine repair is typically done inside of the vessel and is not exposed to precipitation.**
Material handling and storage (listed in Worksheet #3)	**Oil and grease, paints, thinners.**	**Unlikely. All materials are stored under cover. BMPs for loading/unloading and transport between the storage area and the marineway are included in the SWPPP.**
Cooling water	**NA**	
Pump testing	**NA**	
Gray water	**NA**	**All sanitary facilities and sinks have been removed from the vessels.**
Sanitary waste	**NA**	**All sanitary facilities and sinks have been removed from the vessels.**
Vehicles	**Oil and grease, metals**	**Yes. Sources of potential pollution include oil leaks, metals from break pad wear and rusting.**
Engine bilge water	**Oil and grease, metals**	**Unlikely. Any engine bilge water removed from the vessel is pumped into containers. The sealed containers are stored under cover until transport off-island for disposal.**

List of Significant Spills and Leaks	Worksheet #6 Completed by: Nancy Lockett, P.E. Title: Engineer Date: November 20, 2013

List all spills and leaks (as indicated on Worksheet #3) of toxic or hazardous pollutants that were significant. Significant spills and leaks include but are not limited to, release of oil or hazardous substances in excess of reportable quantities. Although not required, it is recommended to list spills and leaks of non-hazardous materials.

Date (month/day/year)	Location (as indicated on site map)	Description				Response Procedure		Preventive Measure Taken
		Type of Material	Quantity	Source, If Known	Reason for Spill/Leak	Amount of Material Recovered	Material No longer exposed to Storm-water (Yes/No)	
4/3/2013	Boatyard Parking Lot	Diesel	35 gallons	Tug Boat Fuel Tank	Discharge hose disconnected from fuel truck	Unknown. All liquids and contaminated soil collected. No impact to receiving water.	Yes	Staff stationed at fuel connections during transfer.

Non-Stormwater Miscellaneous Discharges	Worksheet #7 Completed by: Nancy Lockett Title: Engineer Date: November 17, 2013

Edit these discharges to only include those occurring at the boatyard. For those occurring, specify volume, frequency of discharge, expected duration of discharge and Best Management Practices employed to assure they are uncontaminated.

Discharge From	Volume	Frequency	Duration	BMP
Fire Fighting Activities	Unknown	Emergency	Unknown	Storage of flammable oils, waste oils, and transmission fluid in fire rated storage container with a containment sump. Good housekeeping BMPs to keep Boatyard clean and flammable materials and potential stormwater pollution generating materials properly stored.
Fire protection system testing and maintenance	NA			
Dechlorinated potable water	NA			
Uncontaminated condensate	NA			
Uncontaminated groundwater	NA			
Dewatering activities	NA			

Worksheet #8
BOATYARD
SITE INSPECTION CHECKLIST

Boatyard Name:		Date:		Time:	
Permit No.:	WAG-03- 0000	Inspector:			

G=Good; F=Fair; P=Poor		Y=Yes; N=No	
Site BMPs: *Complete only sections that apply to site.*	**Overall Condition**	**Need Repair?**	**Comments/Observations**
Pressure Wash Wastewater			
● Is all pressure wash wastewater prevented from entering surface waters or stormwater drains/conveyances that lead to surface waters?	G F P	Y N	
Vacuum Sanding Area(s)			
● Are remaining particles, dust, and chips collected each day?	G F P	Y N	
● Is the sanding area kept dry?	G F P	Y N	
In-Water Vessel Maintenance/Repair			
● Are the repairs, modifications or coating of topside or superstructure surface limited to 25% of vessel surface(s)?	G F P	Y N	
● Are drop cloths, tarpaulins, or other devices used to: collect or contain solids or liquids, and prevent release into surface water?	G F P	Y N	
● Is clean up of all collected materials done daily to prevent release into surface water?	G F P	Y N	
● Is the cleaning, repair or coating of any part of vessels hull prevented?	G F P	Y N	
Upland Vessel Maintenance Repair			
● During and after sanding, scraping, sandblasting, painting, coating and/or varnishing vessel(s), are all solids, dust, drips and/or oils collected and properly managed to prevent release into surface water?	G F P	Y N	
● Are drop cloths, tarpaulins, or other devices used around vessel(s) to collect or contain solids and prevent release into surface water?	G F P	Y N	
● Is clean up of all collected materials done daily to prevent release into surface water?	G F P	Y N	
● Are the vessel work areas kept dry?	G F P	Y N	
Wash Pad Decontamination			
● Is the wash pad cleaned of all debris, paint waste, sludge, or other solids each time before stormwater is pumped or discharged from the pad to surface waters?	G F P	Y N	

BOATYARD
SITE INSPECTION CHECKLIST

Site BMPs: *Complete only sections that apply to site.*	**Overall Condition**	**Need Repair?**	**Comments/Observations**
Solids Management			
● At all work, storage and service area(s) of boatyard: are particles, oils, dusts, flakes, chips, drips, or other solids collected and properly managed to prevent entry into surface water?	**G F P**	**Y N**	
● When solids-generating activity occurs, is the clean up of all collected solids done daily to prevent release into surface water?	**G F P**	**Y N**	
● Are solids kept dry as possible during collection?	**G F P**	**Y N**	
● Are solids prevented from washing into surface waters or stormwater collection system?	**G F P**	**Y N**	
● Are sediment traps installed in all storm drains to intercept and retain solids before discharge to surface waters?	**G F P**	**Y N**	
● Are sediment traps, storm drains, and catch basins inspected weekly?	**G F P**	**Y N**	
● Are sediment traps, storm drains, and catch basins cleaned routinely to prevent solids entry into surface waters?	**G F P**	**Y N**	
●Are railways and dry docks cleaned of all solids prior to being submerged?	**G F P**	**Y N**	
Paint and Solvent Use			
● Are drip pans, drop cloths, tarpaulins, or other devices used during: surface prep, paint and solvent transfer, paint mixing, and application to prevent release into surface water?	**G F P**	**Y N**	
● Is painting of hull surface (except minor touch up with non-metallic paints) prevented over surface water?	**G F P**	**Y N**	
● Is paint and solvent mixing done at secure locations onshore or onboard vessel(s)?	**G F P**	**Y N**	
● Are paints containing tributyltin prohibited from use on hull, outboard motor and/or outdrives on vessel(s) less than 82 feet?	**G F P**	**Y N**	
Sacrificial Anode (Zincs) Management			
● Are you ensuring zincs used as anodes are NOT disposed into surface waters?	**G F P**	**Y N**	
● Are spent zincs stored in covered containers and recycled?	**G F P**	**Y N**	

BOATYARD
SITE INSPECTION CHECKLIST

Site BMPs: *Complete only sections that apply to site.*	**Overall Condition**	**Need Repair?**	**Comments/Observations**
Oils & Bilge Water Management			
● Are hydraulic fluids, oily wastes, and petroleum products prevented from entering surface waters?	**G F P**	**Y N**	
● Are there visible sheen(s) on surface waters?	**G F P**	**Y N**	
● Are bilge waters containing solvents, detergents, emulsifying agents or dispersants prevented from entering surface waters?	**G F P**	**Y N**	
● Are drip pans and other containment devices used during all petroleum transfer operations to prevent spills/leaks?	**G F P**	**Y N**	
● Are absorbent pads/booms available during petroleum transfer operations occurring over surface waters?	**G F P**	**Y N**	
Chemical Management			
● Are solid chemical products, solutions, paints, oils, solvents, acids, caustic solutions, and waste materials, *including used batteries and lead and copper waste*, stored under cover on impervious surface?	**G F P**	**Y N**	
● All chemical liquids stored on durable impervious surface capable of containing 110% of total tank and/or container volume?	**G F P**	**Y N**	
Sewage & Gray Water Discharges			
● Are vessel owners notified in writing that this permit prohibits discharge of sewage *(including galley water)* into surface waters?	**G F P**	**Y N**	
● Is vessel sanitary waste discharged to sanitary sewer or to holding tanks?	**G F P**	**Y N**	
● Is a list of contractors providing holding tank pump-out services made available to customers?	**G F P**	**Y N**	

If you need this publication in an alternate format, please call the Water Quality Program at 360-407-6401. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

BOATYARD
SITE INSPECTION CHECKLIST

Will existing BMPs previously listed in this checklist need to be modified or removed? Will new BMPs be installed? YES ☐ NO ☐ *If you checked YES,* list the action items to be completed in this table:

Actions to be Completed	Date Completed/ Initials
1.	
2.	
3.	
4.	
5.	
6.	
7.	

(If you have more than seven actions, attach separate sheet(s) as necessary.)

STORMWATER AND PRESSURE WASH WASTEWATER DISCHARGES OFF SITE

- If the stormwater discharge is off site, inspect all discharge locations. Are oil sheens, flakes, chips, floating materials, solids, visible "cloudiness", or discolored stormwater leaving the site? YES ☐ NO ☐
- Is pressure wash water mixing with stormwater and/or leaving the site? YES ☐ NO ☐
- Did you take water quality samples as part of this inspection? YES ☐ NO ☐

If you answered YES to any of the above:

- Record the observations(s) below (attach separate sheet, if necessary), AND
- List the "action items to be completed" above (as necessary).

DESCRIPTION OF STORMWATER DISCHARGE(S) LEAVING SITE:

STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AND PERMIT COMPLIANCE

Is the boatyard in compliance with the SWPPP and permit requirements? YES ☐ NO ☐

If you answered NO to the above question:

- Write the tasks necessary to bring the site into compliance on the "Actions to be Completed" table above, and include the dates each job WILL BE COMPLETED.
- Have you reported the non-compliance to the Dept. of Ecology? YES ☐ NO ☐
- Do you need to modify your SWPPP? YES ☐ NO ☐

Sign the following certification:

"I certify under penalty of law that this report and all attachments are to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Inspection completed on:_____ By: (print+signature)_____

Non-Stormwater Discharge Monitoring	Worksheet #9 Completed by:_____ Title:_____ Date:_____

The non-stormwater discharge inspection shall determine the presence of non-stormwater discharges such as fire fighting activities, fire protection system testing and maintenance, dechlorinated potable water, uncontaminated condensate, uncontaminated groundwater, and dewatering activities to the stormwater drainage system. **Such discharges are conditionally approved provided they are in compliance with all applicable discharge limitations, including compliance with state water quality standards.**

Date	Discharge Location (as indicated on the site map)	Method Used to Test or Evaluate Discharge	Describe Results from Test for Presence of Non-Stormwater Discharge	Identify Potential Significant Sources	Person who Conducted The Test

Mandatory Boatyard BMP Identification	Worksheet #10 Completed by: Nancy Lockett, P.E. Title: Engineer Date: November 13, 2013

Describe the BMPs that are needed for the facility to address existing and potential pollutant sources identified in the SWPPP. The description shall include the following minimum requirements.

BMPs	Brief Description of Activities or Improvements
Use of Vacuum Sander	NA. The Boatyard does not use vacuum sanding equipment. If operations change in the future and vacuum sanding is used BMPs for guidance in using vacuum sanders and disposal of the wastes generated will be developed. If vacuum sanding is used drop cloths and traps will be secured under the work area and around work area, if possible. Any debris or particulates generated from the sanding operation that are not captured by the sander will be removed and stored in a covered container for disposal.
Tidal Grids	NA. The Boatyard does not use tidal grids.
In-Water Vessel Maintenance and Repair	NA. The Boatyard does not perform in-water vessel maintenance or repair.
Upland Vessel Maintenance and Repair	1. All vessel maintenance and repair will take place in marineway. 2. All pressure wash water will be collected and stored for disposal off-site. 3. Drop cloths or tarps will be secured under the work site, and if possible over the work site, during scraping, rust repair and painting operations. 4. Solid wastes are removed from the tarps or drop cloths by vacuuming. 5. Site will be tidied and all materials and wastes removed by the end of each work day. 6. Site will be cleaned and secured prior to high tide events. No work is permitted during high tide.

Mandatory Boatyard BMP Identification	Worksheet #10 Completed by: Nancy Lockett, P.E. Title: Engineer Date: November 13, 2013

Describe the BMPs that are needed for the facility to address existing and potential pollutant sources identified in the SWPPP. The description shall include the following minimum requirements.

BMPs	Brief Description of Activities or Improvements
Solids Management	1. All vessel maintenance and repair will take place in marineway. 2. All solid waste generated during pressure washing, hull maintenance and repair or topside maintenance and repair will be collected and stored in a covered container for disposal off-site. The method of disposal will prevent discharge of the solid waste to the environment or waters of the state. 3. Drop cloths or tarps will be secured under the work site, and if possible over the work site, during scraping, rust repair and painting operations. 4. All solids removed from drop cloths/tarps by vacuuming. 5. Site will be tidied and all materials and wastes removed by the end of each work day. 6. Site will be cleaned and secured prior to high tide events. No work is permitted during high tide. 7. Hull recoating is not allowed unless the boat is at least one boat length from the high water level or all dust, debris and point is contained and prevented from being exposed to the weather. 8. Storm drains, catch basins and the stormwater treatment system will be inspected weekly to ensure suspended solids are not discharged to Puget Sound.
Paint and Solvents Use	1. All vessel coating will take place in the marineway. 2. Drop cloths or tarps will be secured under the work site, and if possible over the worksite, paint or solvent transfer, mixing, painting and solvent use begins. 3. Painting will not be conducted during rain events or high tides.
Oil and Bilge Water Management	1. All petroleum product and bilge water transfer will take place in the marineway and not over water. 2. All petroleum products or bilge water will be stored in sealed containers in a covered area for disposal off-site or off-island. 3. Drip pans or other containment devices will be used during petroleum product transfer to catch incidental leaks and spills.

Mandatory Boatyard BMP Identification	Worksheet #10 Completed by: Nancy Lockett, P.E. Title: Engineer Date: November 13, 2013

Describe the BMPs that are needed for the facility to address existing and potential pollutant sources identified in the SWPPP. The description shall include the following minimum requirements.

BMPs	Brief Description of Activities or Improvements
Sacrificial Anode Management	1. New and spent sacrificial zinc anodes will be stored indoors. Spent zinc anodes are recycled off-island.
Chemical Management	1. Store chemicals, paints, oils, solvents, batteries and waste materials in appropriate containers in covered areas on impervious surfaces. 2. Dispose of used materials off-island.
Wash Pad Decontamination	1. All solids, debris and sludge will be removed from marineway immediately following pressure washing. 2. The marineway concrete slab will be pressure washed (wash water collected in the wash water storage vessel) prior to pumping stormwater from the marineway to the stormwater treatment system.
Sewage and Gray Water Discharges	1. No BMP required. Vessels maintained at the Boatyard do not have sanitary or grey water systems.

Other Minimum Source Control BMP Implementation	Worksheet #11 Completed by: Nancy Lockett, P.E. Title: Engineer Date: November 13, 2013

Develop a plan for implementing each BMP. Describe the steps necessary to implement the BMP, the schedule for completing those steps (list dates) and the person(s) responsible for implementation.

BMPs	Description of Action(s) Required for Implementation	Schedule Milestone and Completion Date(s)	Person Responsible for Action
Pollution Prevention Team	1. Stormwater Sample Collection and SWPPP Implementation Training Annually and BMP Review Meetings	2013 Training Completed – 11/22/13 Training will be completed by September 1st in following years	Eric Heinitz
	2. Conduct Weekly Visual Monitoring	Once/week	Tom Stevens
	3.Conduct Monthly Sampling	November sample – completed	Tom Stevens
	4.Submit DMR to Ecology	Submit DMR to DOE (28th day of the month following sampling)	Bob Epperson
	5. Update SWPPP as needed	As needed	Eric Heinitz
Good Housekeeping	1.Good Housekeeping BMP training	Complete staff training - 11/22/13	Eric Heinitz
	2. Conduct BMP review meetings. Review current procedures, determine if additional measures are required and assign staff to implement.	Conduct Twice/Year	Eric Heinitz/Bob Epperson
	3.Ensure implementation of Good Housekeeping BMPs on a daily basis	On-going	Tom Stevens

Preventive Maintenance	**1. Preventive Maintenance BMP training**	**Complete staff training 11/22/13**	**Eric Heinitz**
	2. Conduct BMP review meetings. Review current procedures, determine if additional measures are required and assign staff to implement.	**Conduct Twice/Year**	**Eric Heinitz/Bob Epperson**
	3.Ensure implementation preventative maintenance procedures on a daily basis	**On-going**	**Tom Stevens**
Spill Prevention and Emergency Cleanup	**1.New staff training or annual refresher course for existing staff**	**As needed. Annual refresher course by September**	**Bob Epperson**
	2.Inventory and augment spill response equipment	**Annually by September**	**Tom Stevens**
	3. Spill incident recordkeeping and notification	**As needed**	**Bob Epperson**
Inspections, Reporting and Recordkeeping	**1.Conduct sampling per the permit**	**January, April, May, October and November**	**Tom Stevens**
	2. Weekly visual inspections when boatyard activities are conducted	**Weekly when boatyard activities are conducted.**	**Tom Stevens**
	3.Submit DMR to DOE	**28th day following sample month**	**Bob Epperson**
	4.Complete Engineering Report (Level 3)	**2/15/14**	**Gray & Osborne**

Employee Training	Worksheet #12 Completed by: Eric Heinitz Title: Environmental Specialist 5 Date: November 22, 2013		
Describe the annual training of employees on the SWPPP, addressing spill response, good housekeeping, and material management practices.			
Training Topics **1.) Boatyard Staff**	**Brief Description of Training Program/Materials (e.g., film, newsletter course)**	**Schedule for Training (list dates)**	**Attendees**
Spill Prevention and Response	SWPPP, BMPs, Spill Response Equipment	11/22/2013	John Johnson, Tom Stevens, Marty Rankin, Sedra Zlock
Good Housekeeping	BMP Manual, SWPPP	11/22/2013	John Johnson, Tom Stevens, Marty Rankin, Sedra Zlock
Preventative Maintenance	BMPs, SWPPP	11/22/2013	John Johnson, Tom Stevens, Marty Rankin, Sedra Zlock
2.) P2 TEAM:			
SWPPP Implementation	SWPPP & McNeil Island Boatyard Stormwater Management Plan	11/22/2013	John Johnson, Tom Stevens, Marty Rankin, Sedra Zlock
Monitoring Procedures	Sample Collection Kit, Stormwater Sampling Manual	11/22/2013	John Johnson, Tom Stevens, Marty Rankin, Sedra Zlock

Department of Corrections
WASHINGTON STATE

McNeil Island Boatyard

Stormwater Pollution Prevention Plan

Training Agenda

November 22, 2013

Training Topics:

1. SWPPP Implementation
2. Monitoring Procedures
3. Spill Prevention and Response
4. Good Housekeeping
5. Material Management Practices

Attendance:

Name (Please Print)	Agency	Position
John J Johnson	DOC	Shipwright Supervisor
Tom Stevens	DOC	Marine Op. Supervisor
Mary Rankin	Doc	Shipwright Supv.
Sedra Block	DOC	Admin. Asst.

IllicitDischarges	Worksheet #13 Completed by: _____ Title: _____ Date: _____

Include all illicit discharges identified during the field survey of facility, along with a brief description of how each illicit discharge connects to the stormwater sewer or surface and ground waters of the state and a plan to eliminate each illicit discharge. Has the identified illicit discharge been eliminated? Yes or No.

Illicit Discharge Identified	Description of how discharge connects to waters of the state	Plan to eliminate discharge	Discharge eliminated?

Enhanced/Additional BMP Implementation	Worksheet #14 Completed by:_____ Title:_____ Date:_____

Describe the trigger and activities associated with any enhanced/additional BMPs. These are BMPs needed to prevent the discharge of pollutants despite implementation of mandatory and minimum source control BMPs. Describe the steps necessary to implement the BMP (i.e., any construction or design) and the schedule for completing those steps (list dates).

Trigger for Enhanced/Additional BMP	Enhanced/Additional BMP	Brief Description of Activities or Improvements	Schedule Milestone and Completion Date(s)

Appendix A
Industrial Stormwater Treatment Plan

Industrial Stormwater Treatment Plan

McNeil Island Boatyard Facility

Prepared For

Gray & Osborne, Inc.

701 Dexter Ave N. Suite 200
Seattle WA, 98109

Prepared By

Clear Creek Systems, Inc.

12604 Interurban, Ave South, Suite 100
Tukwila, WA
(206) 695-2120

Prepared On

December 12, 2013

Purpose

This Industrial Stormwater Treatment Plan (ISTP) has been prepared by Clear Creek Systems, Inc. (CCS) to fulfill the following functions:

- Provide the portion of the facility Stormwater Pollution Prevention Plan (SWPPP) that addresses the implementation, operations, monitoring and maintenance associated with the industrial stormwater treatment system.

- Provide a site-specific description of design criteria, pollutant removal mechanisms, operational capacities and performance goals of the industrial stormwater treatment system.

- Provide the necessary information to demonstrate that this installation of Chitosan Enhanced Sand Filtration (CESF) is consistent with the requirements of Ecology's Request for Chemical Treatment Form and the Use Level Designation (ULD) for CESF.

- Provide an overview of the industrial stormwater treatment system's operational, monitoring and maintenance requirements.

Introduction

CCS was contracted by Gray & Osborn (G&O) to provide, install, operate, monitor and maintain an industrial stormwater treatment system at the McNeil Island Boatyard Facility on McNeil Island. The boatyard facility consists of approximately 1.59 acres that is covered by packed gravel, concrete and buildings. Prior to the implementation of the industrial stormwater treatment system, stormwater was collected and conveyed to one of three discharge points that outfall to Puget Sound. The McNeil Island Boatyard Facility and the location of industrial stormwater treatment system are shown in Attachment 1.

An industrial stormwater treatment system is being installed to reduce concentrations of pollutants that may exist in stormwater runoff:

- Settleable solids (SS) associated with paint chips, barnacles and other solids
- Total suspended solids (TSS)
- Turbidity
- Total zinc (Zn)
- Total copper (Cu)
- Total lead (Pb)

The treatment system consists of settling tanks, a Chitosan Enhanced Sand Filtration (CESF) system, granular activated carbon (GAC) and Ion Exchange Resins (IX) as shown in Attachment 2. The treatment system is being implemented as a pilot treatment system to supplement (not replace) conventional best management practices (BMPs) for the management and treatment of industrial stormwater runoff.

Regulatory Background

The McNeil Island Boatyard Facility is covered under a Washington State Department of Ecology (Ecology) Boatyard General Permit (Permit No. WAG031308). The facility has reached a Level 3 Response under the Boatyard General Permit and the implementation of this industrial stormwater treatment system will provide the following:

- Immediate implementation of a full scale pilot treatment system to reduce pollutant concentrations within industrial stormwater runoff.

- System performance feedback related to pollutant reduction efficiency, operational requirements, maintenance requirements and treatment system optimization.

- Engineering information related to the design, performance, operations, maintenance, monitoring and costs associated with implementing a permanent industrial stormwater treatment system.

- The opportunity for facility personnel, engineering firm (G&O) and the equipment vendor (CCS) to work together to evaluate system performance and integrate optimization into the treatment system operations and final design.

Since the industrial stormwater treatment system includes the use of CESF, Ecology requires the following:

- Submittal of a Request for Chemical Treatment Form and formal written authorization by Ecology – Attachment 3

- Implementation of CESF consistent with the ULD for the chitosan that will be utilized in the CESF system (StormKlear™ LiquiFloc™) – Attachment 4

Project Approach

CCS is implementing a 40 gpm range chitosan-enhanced sand filtration (CESF) system utilizing StormKlear™ LiquiFloc™, an Ecology-approved chitosan polymer. CESF is a proven technology that has been utilized to treat billions of gallons of construction stormwater/dewatering water in Washington State during the past decade. CESF is a flow through treatment technology which includes automated water quality monitoring and both the CESF process and the StormKlear™ LiquiFloc™ polymer have been approved for use by Ecology (Attachment 4). The location of the CESF system is shown in Attachment 1 and the general equipment configuration is shown in Attachment 2. CESF will be utilized to reduce turbidity and pollutants that are preferentially adhered to suspended sediment prior to final polish filtration with GAC and IX.

Industrial Stormwater Treatment System Sizing

The industrial stormwater treatment system has been sized consistent with Ecology's guidance for sizing off line treatment facilities utilizing the Western Washington Hydrology Model 3 (WWHM 3). The following criteria were utilized as input data for the modeling:

- Site size = 1.59 acres
- Cover practice = 100% impervious
- Surge capacity (tanks) = 21,000 gallons

The model output flow rate is 0.65 cfs or approximately 30 gallons-per-minute (gpm). The treatment system has been sized to 40 gpm to compensate for throughput losses that occur during routine filtration system backwash cycles. Since the modeling output is for the offline treatment system flow rate which takes into account the surge capacity provided by the treatment system surge tank, the pumping rate from the collection points has been sized to 60 gpm each.

Treatment System Equipment

The 40 gpm industrial stormwater treatment system is shown in the attached schematic drawing (Attachment 2) and includes following major components:

- (3) 1-hp 2" submersible pumps to transfer stormwater runoff from an oil/water separator vault, a catch basin and the marine way to the surge tank.
- (1) 8,400 gallon surge tank to provide surge capacity and sufficient operational flow time for pretreatment polymer addition between the surge tank and the settling tank.
- (1) 5-hp 3" submersible transfer pump to transfer water from the surge tank to the settling tank.
- (1) 21,000 gallon settling tank to provide primary settling following pretreatment with StormKlear™ LiquiFloc™.
- (1) 15-hp filtration system pump to transfer water from the settling tank, through the filtration steps and to the discharge location.
- (1) Sand media filtration skid for the reduction of suspended sediment and turbidity following polymer treatment with StormKlear™ LiquiFloc™.
- (2) CM-18 media vessels (1) each for GAC and IX media.
- (1) Treatment system monitoring module which includes influent/effluent monitoring instrumentation for pH, turbidity and flow, chemical metering pumps, chitosan storage, pressure transducers, system automation and remote access telemetry.
- Miscellaneous interconnecting piping, valving, hoses and fittings.

Industrial Stormwater Treatment Process & Controls

The industrial stormwater treatment system consists of a variety of treatment steps and unit processes that work together to treat stormwater runoff prior to offsite discharge.

1. Stormwater Collection and Conveyance

Stormwater runoff drains to three existing collection points as shown in Attachment 1:

- Existing boatyard oil/water separator
- Existing catch basin
- Existing marine way collection sump

Each collection point has been outfitted with a 1-hp submersible pump capable of conveying up to 60 gpm from the collection point to the 8,400 gallon surge tank via 2 inch diameter hose and polyvinyl chloride (PVC) piping.

The pumping system at each collection point is controlled by float level controls. As water within the collection point reaches a predetermined level, the submersible pump is energized when the float level control reaches the vertical (up) position. Each submersible pump continues to transfer water from the collection point to the surge tank until the water level (and float level control) within the collection point reaches a low turn off level (down position). As rainfall and runoff continues, the submersible pumps turn on and off as necessary to transfer stormwater runoff to the surge tank.

The marine way collection point is susceptible to influence and flooding during a high tide event. In order to prevent the submersible pump within the marine way collection point from transferring tidal water to the treatment system, a high tide pump turnoff interlock has been installed. When the tidal stage reaches a critical elevation (sufficient to flood the marine way collection point) a sensor sends a signal to the treatment system programmable logic controller (PLC) and the PLC activates an interlock that disables the marine way submersible pump. The PLC will send an alarm notification to notify designated facility staff (and CCS) that the marine way submersible pump has been disabled. The interlock and PLC are reset manually by facility operations staff following a high tide event.

2. Stormwater Surge Tank – 8,400 Gallons

A single 8,400 gallon surge tank receives intermittent flows (on an as needed basis) from the three submersible pumps, one of which is located in each of three collection points. The surge tank provides primary settling and the surge capacity necessary to provide a consistent transfer and pretreatment flow rate between the surge tank and the settling tank. The surge tank includes a high tank level interlock that is enable when a float level control within the tank reaches the vertical (up) position. In the unlikely event that this scenario occurs, an alarm notification will be sent to facility

staff (and CCS) and the submersible pumps within the collection points will be disabled. When the float level control reaches the down position, the interlock will be reset and the submersible pumps will be enabled for normal operations.

3. Pretreatment System

When the stormwater within the 8,400 gallon surge tank reaches a predetermined level, a sonic level sensor sends a signal to the system PLC. The PLC energizes the pretreatment pump motor control panel which starts the 5-hp submersible pretreatment pump. A pressure transducer within the pretreatment transfer line sends a signal to the PLC when pressure is sensed within the pipe. The PLC sends a signal to the chitosan pretreatment pump and a predetermined dose rate of StormKlear™ LiquiFloc™ (typically 0.25-0.50 ppm) is delivered to the flow of water between the surge tank and the settling tank. An inline totalizing flow meter sends a signal to the PLC and the flow rate and total flow volume are recorded in the PLC and can be accessed remotely via a web-based telemetry.

4. Stormwater Settling Tank – 21,000 Gallons

A single 21,000 gallon settling tank receives intermittent flow (on an as needed basis) from the surge tank via the pretreatment system. The settling tank provides primary settling and clarification for pretreated stormwater that is transferred from the surge tank and backwash water that is generated during routine filtration system backwash cycles. The settling tank also provides storage necessary to provide for a continuous filtration system runtime of at least 100 minutes. The surge tank includes a high tank level interlock that is enable when a float level control within the tank reaches the vertical (up) position. In the unlikely event that this scenario occurs, an alarm notification will be sent to facility staff (and CCS) and the submersible pretreatment pump within the surge tank will be disabled. When the float level control reaches the down position, the interlock will be reset and the submersible pump and the pretreatment chemical metering system will be enabled for normal operations.

5. CESF System

A CESF system is utilized to reduce suspended solids, turbidity and pollutants associated with suspended sediment. When the stormwater within the 21,000 gallon settling tank reaches a predetermined level, a sonic level sensor sends a signal to the system PLC. The PLC energizes the pretreatment pump motor control panel which starts the 15-hp CESF system pump. A pressure transducer within the transfer line sends a signal to the PLC when pressure is sensed within the pipe. The PLC sends a signal to the chitosan pretreatment pump and a predetermined dose rate of StormKlear™ LiquiFloc™ (typically 0.25-0.50 ppm) is delivered to the flow of water between the CESF system pump and the sand filtration system.

A sample of the sand filter influent flow is sent to the Monitoring Module instrumentation cluster where influent pH and turbidity are measured. The pH sensor and turbidimeter each send a signal to the PLC and the measurements are recorded in the PLC and can be accessed remotely via web-based telemetry. The PLC has been programmed to provide alarm notifications if either pH or turbidity levels approach or exceed preset alarm levels.

The sand filtration system consists of a 3-pod 24-inch diameter industrial sand media filtration skid with integrated valves, pressure gauges, steel piping and a totalizing mechanical flow meter. The sand filtration skid also includes an automatic backwash control panel which controls the frequency and sequencing of backwash cycles based on differential pressure or a preset time interval. When a backwash cycle occurs, two filtration pods continue in positive filtration mode (producing clean water) while the third filtration pod is backwashed with a portion of the clean water produced by the other two pods. The backwash cycles through each pod and then all three pods return to positive filtration mode. The backwash water enters a header pipe that discharges to the rear end of the settling tank where it settles and is eventually reprocessed.

Pressure sensors are installed on the influent and effluent piping of the sand filtration skid and wired to the PLC where the pressures are logged and can be accessed remotely via web-based telemetry. The PLC has been programmed with preset high pressure alarms that will notify facility staff (and CCS) if the influent or effluent sand filter pressure exceeds the preset value.

The CESF system includes a Monitoring Module that provides the following primary functions:

- Houses monitoring system electronic instrumentation including influent and effluent pH sensors and turbidimeters, PLC and the telemetry system.

- Hoses the polymer storage and delivery system including a 275 gallon polymer storage tank with secondary containment, pretreatment polymer metering pump, filtration system polymer metering pump, polymer injection quills and polymer dose rate calibration cylinders.

- Provides storage for miscellaneous treatment system necessities including hand held water quality monitoring instruments, calibration solutions, laboratory gear, residual chitosan test kit and the treatment system operations and maintenance logs.

6. Adsorptive Media

The industrial stormwater treatment system includes two separate adsorptive media vessels:

- **(1) – 18 cubic foot (cf) vessel containing GAC**

The effluent from the sand filtration skid is routed to a single 18 cf pressure vessel containing virgin coconut GAC. The GAC adsorbs hydrocarbons and other organic compounds that may not be removed by the CESF process. The GAC also serves as a protective media ahead of the IX resins to reduce the potential for fouling of the IX resins by surface coating. Pressure sensors are installed on the influent and effluent piping of the GAC vessel and wired to the PLC where the pressures are logged and can be accessed remotely via web-based telemetry. The PLC has been programmed with preset high pressure alarms that will notify facility staff (and CCS) if the influent or effluent GAC vessel pressure exceeds the preset value. In the event that high pressure is detected, the GAC vessel will be manually backwashed by a treatment system technician.

- **(1) – 18 cf vessel containing IX resins**

The effluent from the GAC vessel is routed to a single 18 cf pressure vessel containing IX resins. The IX resins provide final polishing by exchanging sodium ions for heavy metal ions such as copper, zinc and lead. Pressure sensors are installed on the influent and effluent piping of the IX resin vessel and wired to the PLC where the pressures are logged and can be accessed remotely via web-based telemetry. The PLC has been programmed with preset high pressure alarms that will notify facility staff (and CCS) if the influent or effluent IX resin vessel pressure exceeds the preset value. In the event that high pressure is detected, the IX vessel will be manually backwashed by a treatment system technician.

7. Treatment System Discharge Monitoring

A sample of the adsorptive media effluent is sent to the Monitoring Module instrumentation cluster where effluent pH and turbidity are measured. The pH sensor and turbidimeter each send a signal to the PLC and the measurements are recorded in the PLC and can be accessed remotely via web-based telemetry. The PLC has been programmed to provide alarm notifications if either pH or turbidity levels approach or exceed preset alarm levels.

In addition, the PLC controls the activation of an automated discharge and recirculation valve. In the event that either pH or turbidity exceeds the preset acceptable values for discharge, the PLC sends a signal to the automated valves, actuating the recirculation valve and closing the discharge valve. If the discharge criteria are met while the treatment system is in recirculation, the PLC will change the position of the valves and the discharge will continue. The discharge from the treatment system is to a stabilized marine outfall.

Discharge monitoring and sampling for permit compliance are beyond the scope of this ISTP. These activities will be conducted by others consistent with the Boatyard General Permit requirements and the project SWPPP.

Routine Treatment System Operations and Monitoring

The treatment system has been designed and installed for automated operations. In general, the treatment system will start and stop on an as needed basis depending on water levels in the collection points, the surge tank and the settling tank. Each of the unit processes described above includes automation that that is wired into the treatment system PLC. The PLC provides the following functions:

- Provides motor controls to start and stop all treatment system pumps.
- Provides interlocks to prevent tidal water from being pumped into the treatment system, tanks from overflowing and discharges of treated water that do not meet the preset discharge criteria for pH or turbidity.
- Provides telemetry for remote system monitoring and alarm notifications

Ecology requires flow through CESF systems to include continuous monitoring of sand filter influent and effluent pH, turbidity and flow. The CESF system, supplied by CCS, includes a monitoring system capable of achieving this requirement. Data is logged at required intervals and can be viewed or downloaded by CESF operations personnel from remote locations. The data logging system can be programmed to control the valve system that directs the discharge to a bypass in the event that predetermined pH and turbidity values are not met.

Remote System Surveillance and Alarm Notification

The stormwater treatment system includes a web-enabled PLC that provides telemetry and alarm notifications. The PLC system can be accessed remotely by authorized personnel through a secure website. Periodic operations checks, especially during periods of heavy rain are routine for checking operational data including but not limited to:

- Rainfall quantity
- Tank level
- System pressures/differential pressure
- Flow rate
- Total volume treated
- Total volume discharge
- Turbidity – influent/effluent
- pH – influent/effluent

In addition to providing operational data the telemetry system provide alarm notifications for specific interlocks. Alarm notifications can be programmed to be delivered via email, text or telephone to the personnel designated by the PLC programmer.

Routine Preventative Maintenance & Operational Inspections

CCS will conduct routine preventative maintenance and operation inspections on a weekly basis. During the weekly inspection, the following major tasks will be undertaken:

- Inspection and functionality check of all major components
- Calibration of monitoring instrumentation
- Data download from the PLC
- Manual filtration system backwash
- Calibration of the chemical metering system
- Documentation of maintenance and inspection procedures
- Residual chitosan testing – (See Attachment 5 for the Residual Chitosan Test Procedure)

A copy of the treatment system maintenance and inspection forms is included in Attachment 6.

Quality Assurance and Quality Control (QA/QC)

QA/QC procedures are an important component of delivering quality data and demonstrating compliance with State water quality standards and NPDES permit requirements. Project QA/QC requirements include:

- Properly trained technicians
- Routine equipment calibration and cleaning consistent with manufacture's recommendations
- Comparison of pH and turbidity data collected from the automated monitoring system and manual measurements with hand-held instruments
- Proper sampling procedures, duplicate samples, spilt samples and method blanks
- Data review and validation by qualified project management

Water Treatment Contingency Plan

Ecology's use designation for CESF requires a provision in the project SWPPP which includes a contingency plan for treatment upsets and the presence of residual chitosan in the effluent. There are a number of circumstances that can cause a treatment system upset which can be rectified through preventive measures and corrective actions. Major treatment system upsets are rare however minor issues do occur from time to time. Examples of the most common operational issues and the means to resolve them are provided below:

- **Equipment failure** – CESF systems include mechanical, electrical and chemical components that must all work in conjunction with one another to achieve water clarification. The most common equipment failures include pumps, generators, electronic components, pipe leaks and other minor issues. Preventative measures to reduce such issues include proper maintenance and inspection of treatment system equipment. Spare equipment will be kept onsite or within reasonable distance for those components that are more prone to failure. Course of action – In the event of an equipment failure, the treatment system operator should cease operations and

the component should be replaced with spare parts. Larger equipment components such as a pumps, generators and filters are available from a number of local rental companies.

- **Plumbing failure** – Plumbing components such as pvc pipes and hoses can develop leaks, break or become damaged by construction activities, prolonged exposure to sun and freezing temperatures. Preventative measures - Spare parts and hoses will be left onsite to address minor issues and drains will be installed to prevent freeze damage. Most of the hard piping on this project consists on high density polyethylene piping which is more durable and less prone to failure than PVC piping. Corrective actions – In the event of a break or leakage, the treatment system will be shut down and the faulty components will be replaced with onsite materials or materials available from local suppliers.

- **pH upset** – Construction activities frequently include concrete pours, concrete demolition and soil hardening materials which can cause the pH to increase to levels above 8.5. Although unusual, low pH conditions can arise from the presence of high concentrations of organic acids leaching form detritus such as fall leaf litter, straw mulch or compost. Preventative measures – The CESF operator will conduct weekly site evaluations and discuss the scope of concrete work with the construction contractor to minimize the potential for high pH impacts. The CESF operator will conduct weekly site evaluations and discuss the scope of work related to potential sources of detritus material. Corrective actions – In the event pH becomes elevated, gaseous carbon dioxide from a local supplier will be utilized to neutralize pH consistent with BMP C252. In the event that low pH conditions occur, sodium bicarbonate or another base such as sodium hydroxide will be utilized to increase pH to an acceptable range for CESF water treatment and discharge (pH = 6.5 – 8.5).

- **Treatment chemistry interference** – Occasionally, issues can arise with the effectiveness of the treatment chemistry. In the unlikely event that chitosan is ineffective at removing sediment, other approved polymers will be screened and treatment will continue in a batch configuration until the issue is resolved. If treatability issues arise from leaching organic material, approved polymers such as polyaluminum chloride or alum will be used in conjunction with CESF to achieve requisite discharge values. In the event that alternative treatment actions are required, CCS will contact Ecology to inform them of the intended treatment resolution.

- **Detection of residual chitosan** – The residual chitosan test is colorimetric and detects the starch-like structure of chitosan. From time to time, a false positive can be detected due to the presence of another starch on the filter paper that is used for the test. Preventative measures include storing filter papers in a sealed container, handling the filter paper while wearing a new pair of disposable gloves, and following the correct test procedure (See Attachment 5). Corrective measures – In the event of a positive residual chitosan, the treatment system will be put into recirculation mode while additional samples are collected and the polymer dose rate is verified and recorded. The sample will be split and two additional residual chitosan tests will be performed (by separate treatment system operators when possible). If they both come back negative, the system will be redirected to discharge and more frequent testing will occur. In the unlikely event that the test results are positive, the system will be shut down and the chemical and mechanical components of the treatment system will be evaluated to determine the root cause of the issue. The test results will be reported immediately to Ecology.

- **Pretreated water is below 50 NTU** - From time to time, pretreatment may result in a turbidity below 50 NTU, especially when pretreated stormwater is allowed to settle in a pretreatment pond or series of tanks for a long period of time. If this situation occurs, the CESF operator will immediately conduct more frequent jar tests to determine the appropriate pretreatment dose rate and adjust the chitosan delivery rate for pretreatment that results in a pretreatment turbidity greater than 50 NTU. In addition, the treatment system operator will conduct more frequent residual chitosan tests.

Health and Safety Plan (HASP)

CCS maintains an active health and safety program and we have developed a site specific HASP for this project to cover our activities at the site.

Engineering Firm Contact Information:

Nancy Lockett, P.E.
Gray & Osborn
206-284-0860
nlockett@g-o.com

Facility Contact Information:

Robert Epperson
Marine Operations Supervisor
(360) 725-8397
rpepperson@doc1.wa.gov

Eric Heinitz
Environmental Specialist
(360) 725-8397
efheinitz@doc1.wa.gov

Tom Stevens
Asst. Marine Operations Supervisor
(253) 512-6508
testevens@doc1.wa.gov

Clear Creek Systems, Inc. Personnel:

Jason Martino
NW Operations Manager & Sr. Project Manager
(661) 201-8562
jmartino@clearcreeksystems.com

Clinton Lindgren
Water Treatment System Technician
(206) 778-7568
clindgren@clearcreeksystems.com

Eddie Sanchez
Water Treatment System Technician
(425) 737-7715
esanchez@clearcreeksystems.com

The information contained within this ISTP and its attachments were prepared by a Certified Professional in Stormwater Quality and Certified Professional in Erosion and Sediment Control.

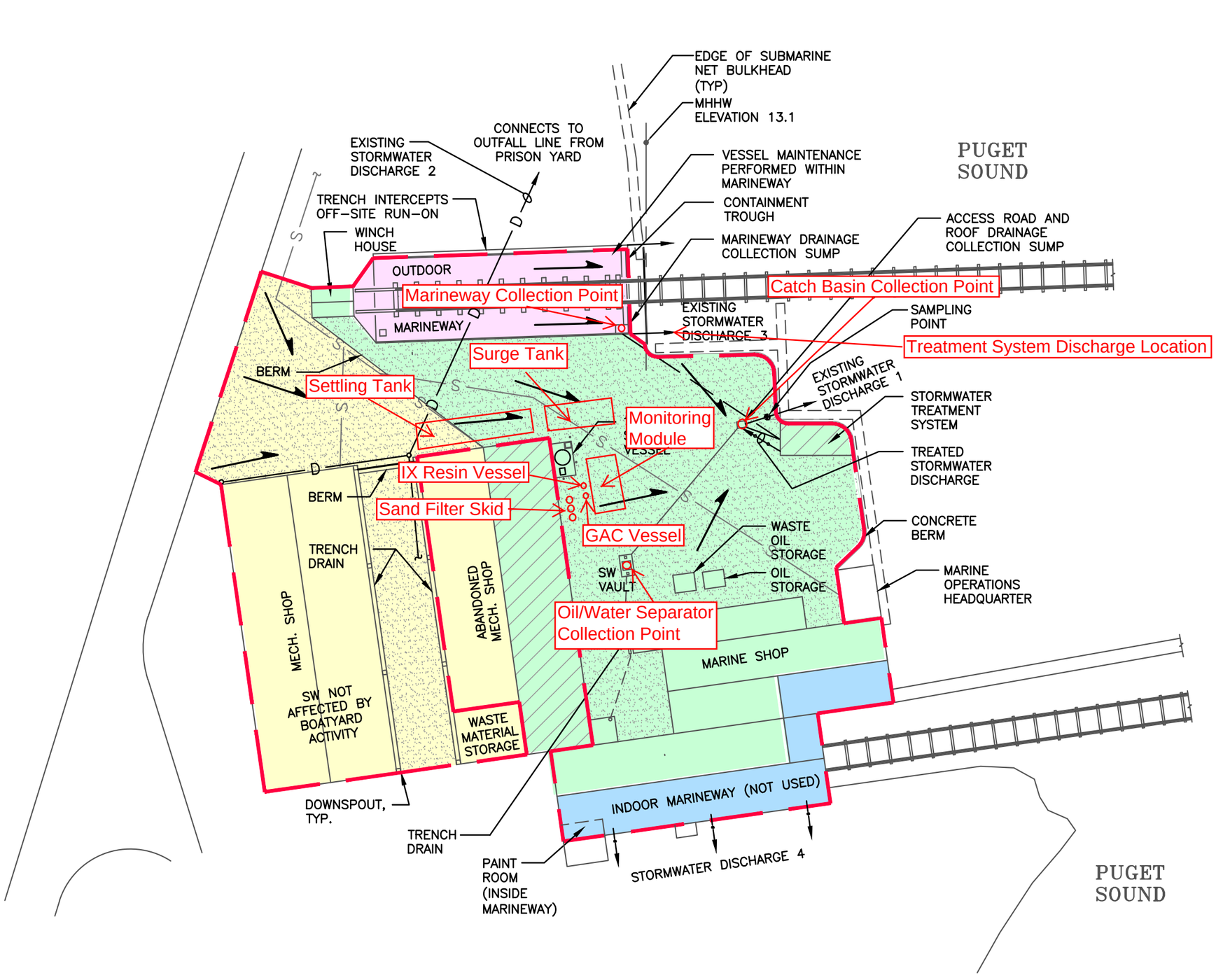
Jason Ziemer, CPESC & CPSWQ
Clear Creek Systems, Inc.
12604 Interurban Ave. South, Suite 100
Tukwila, Washington 98168
(253) 670-4054
jziemer@clearcreeksystems.com

CPSWQ No. 0651

CPESC No. 5468

ATTACHMENT 1

SITE DRAWING – TREATMENT SYSTEM LOCATION



SCALE: 1"=50'

LEGEND

- D — STORM DRAIN
- S — SEWER LINE
- TREATED WATER DISCHARGE
- PRESSURE LINE
- LIMITS OF BOATYARD
- DIRECTION OF SURFACE FLOW
- AREA TRIBUTARY TO STORMWATER DISCHARGE 1 (1.01 AC)
- AREA TRIBUTARY TO STORMWATER DISCHARGE 2 (0.55 AC)
- AREA TRIBUTARY TO STORMWATER DISCHARGE 3 (0.11 AC)
- ROOF AREA DISCHARGE 4 (0.10 AC)
- NON-BOATYARD ROOF AREA TRIBUTARY TO DISCHARGE 1
- CONCRETE
- HARDPACKED GRAVEL SURFACING

McNEIL ISLAND BOATYARD

STORMWATER POLLUTION PREVENTION PLAN

FIGURE 2

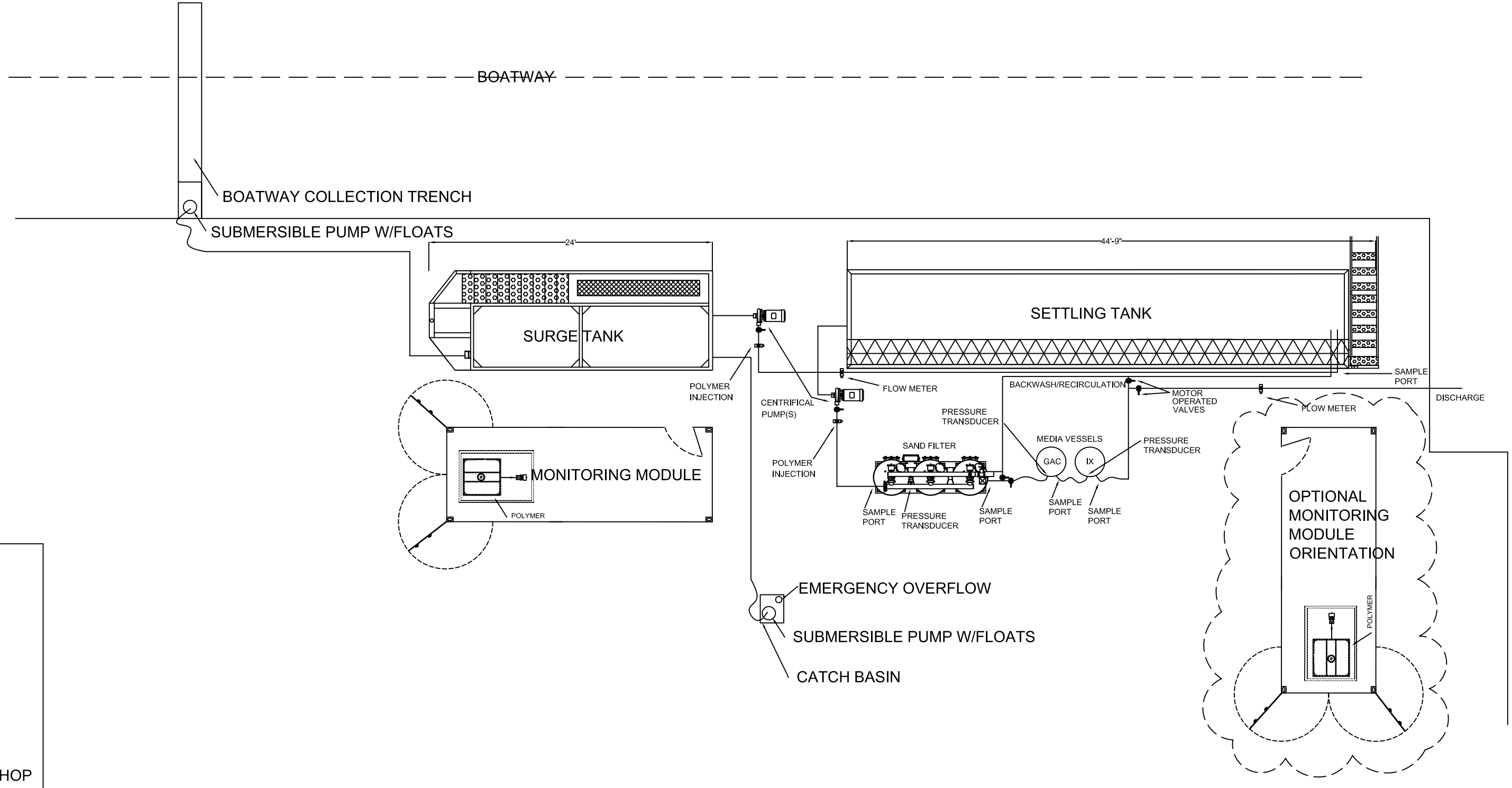
SITE PLAN

Gray & Osborne, Inc.
CONSULTING ENGINEERS

M:\WSDOC\13586 MICC Boatyard Regulatory Compliance\SITE PLAN.dwg, 11/21/2013 5:50:22 PM, mnagel

ATTCHMENT 2

TREATMENT SYSTEM SCHEMATIC DRAWING & Pictures



NOTES:

1.

2.

3.

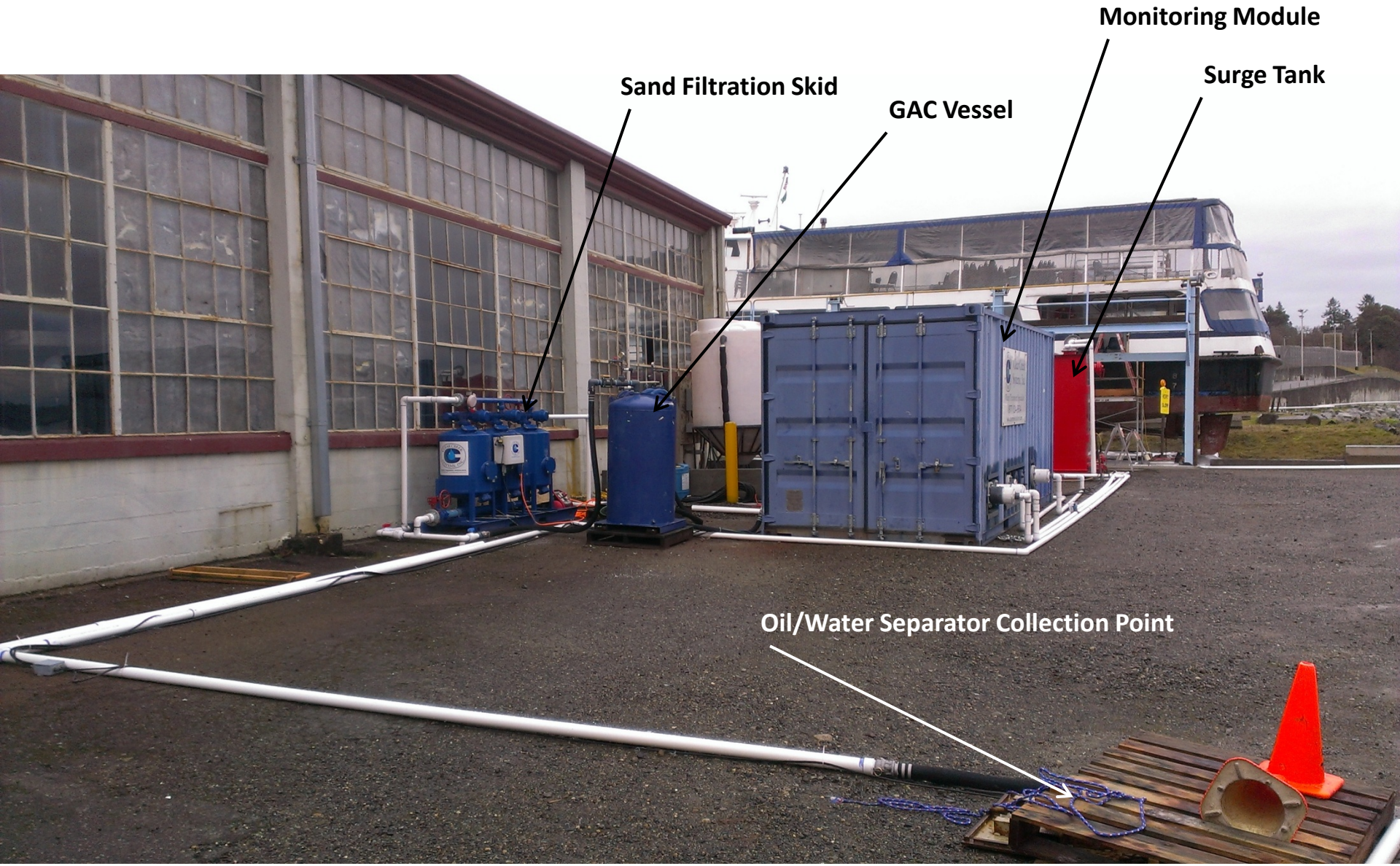
TITLE OF DRAWING:
CLEAR CREEK SYSTEMS INC. - 40 GPM SYSTEM WITH MEDIA

VERSION: 1

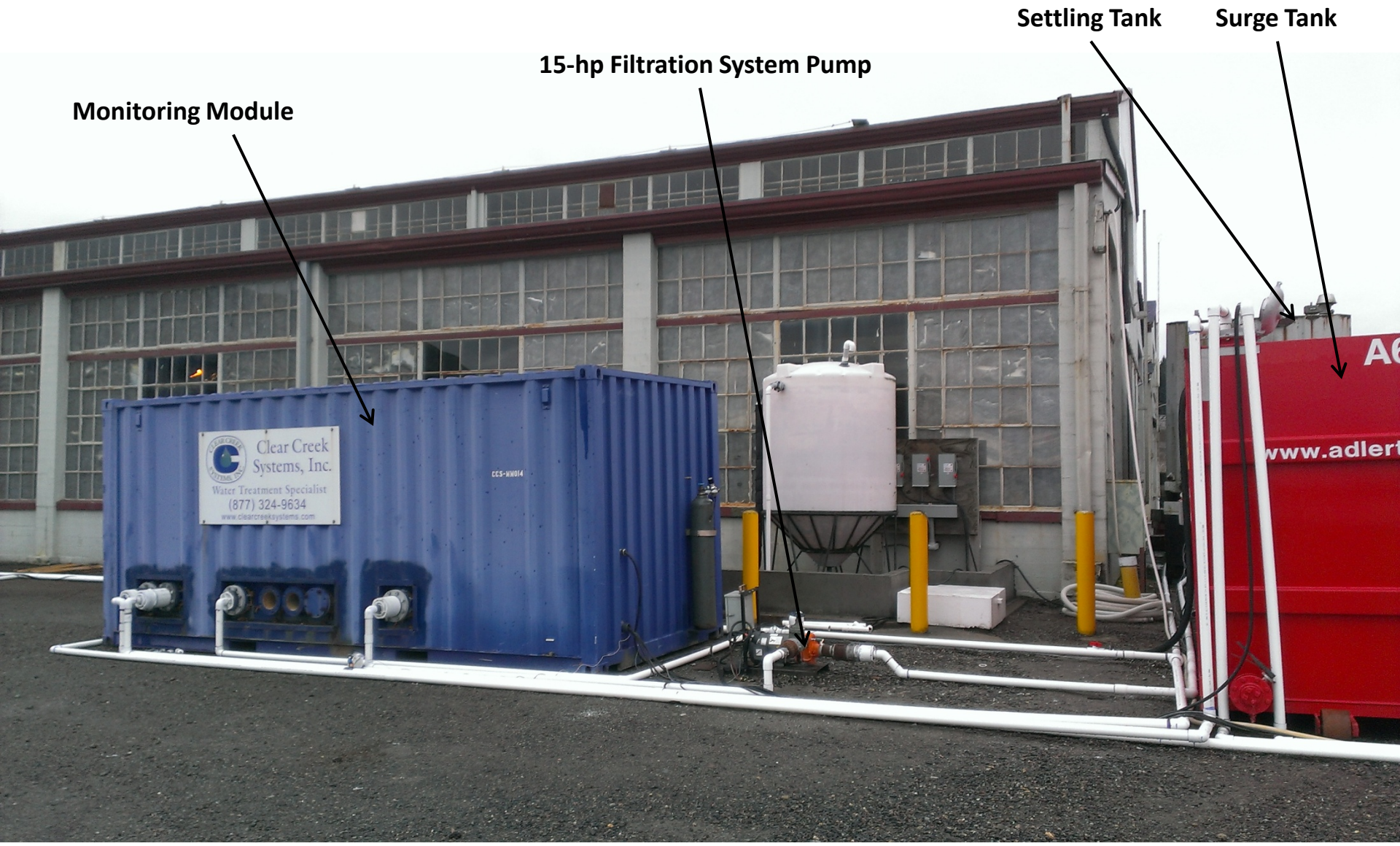
DRAWN BY: JSM

DATE: 11/16/13

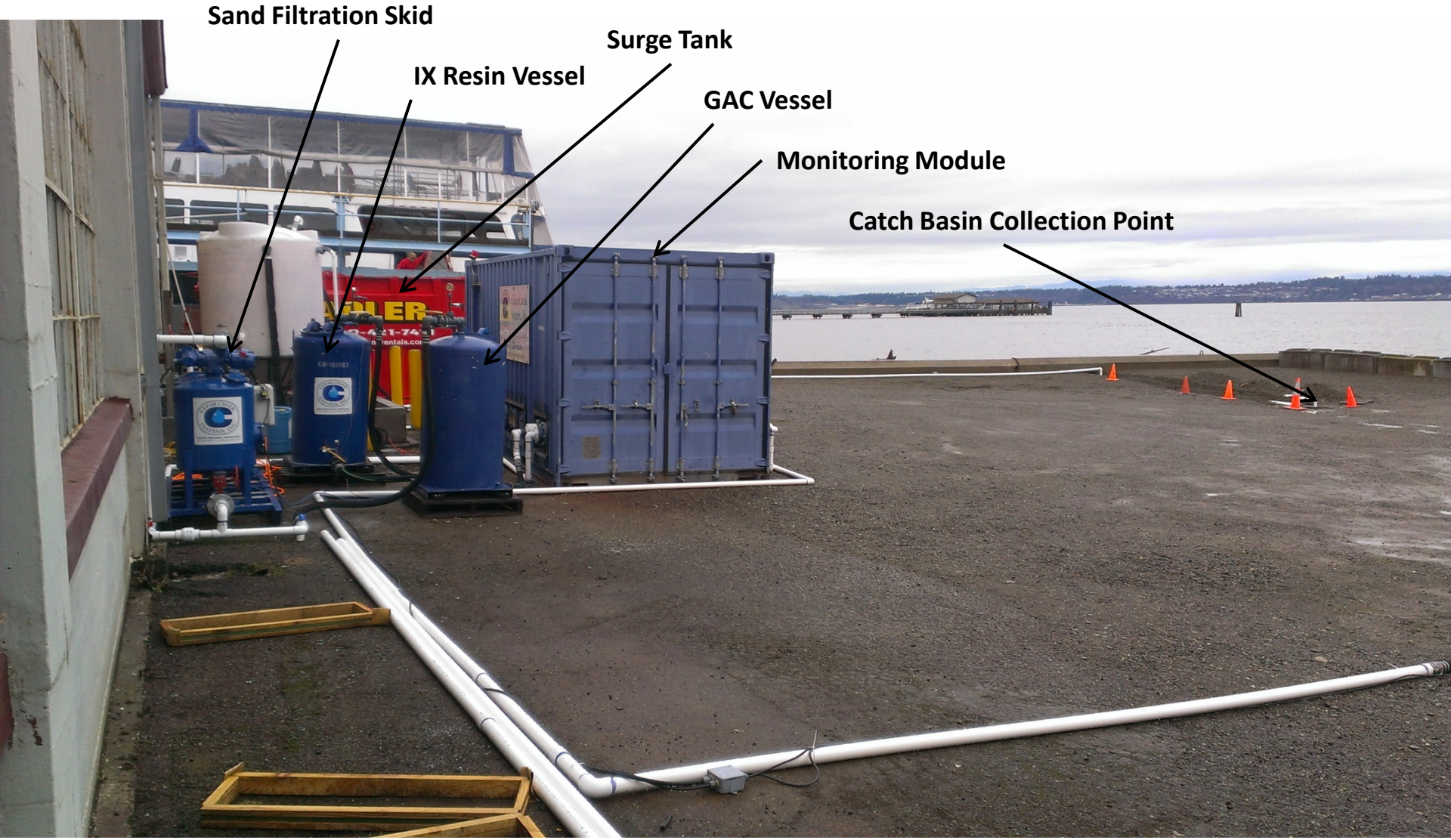
McNEIL ISLAND BOATYARD FACILITY
INDUSTRIAL STORMWATER TREATMENT SYSTEM



McNEIL ISLAND BOATYARD FACILITY
INDUSTRIAL STORMWATER TREATMENT SYSTEM



McNEIL ISLAND BOATYARD FACILITY
INDUSTRIAL STORMWATER TREATMENT SYSTEM



ATTACHMENT 3

ECOLOGY'S REQUEST FOR CHEMICAL TREATMENT FORM

DEPARTMENT OF
ECOLOGY
State of Washington

Request for Chemical Treatment Form

Permit Number WAG031308

☒ **Industrial Stormwater Permit**
☐ **Construction Stormwater Permit**

Permittee Information

Permittee name: Washington State Department of Corrections

Permittee company name: Washington State Department of Corrections

Permittee address: Attn: Eric Heinitz, Environmental Specialist, P.O. Box 41112

7345 Linderson Way SW

Tumwater, WA 98501

Permittee phone number: 360-725-8397

Site Information

Site name: McNeil Island Boatyard

Site address: McNeil Island

Proper parcel number, if known:

Site contact name: Bob Epperson, Marine Operations Supervisor

Site contact phone number: 253-512-6508

Name of receiving water body: Puget Sound

Treatment System Operator Information

Operator or Company Name: Clear Creek Systems, Inc.

Operator address: 12604 Interurban Avenue South

Suite 100

Tukwila, WA 98168

Operator phone number: 206-695-2120

Check Treatment Option Being Requested

☐ Chitosan enhanced sand filtration with discharge to infiltration
☐ Chitosan enhanced sand filtration with discharge to temporary holding ponds (batch)
☐ Chitosan enhanced sand filtration with discharge to surface waters (flow-through) – **Streams Only**
☐ Electrocoagulation
☒ Other Chitosan enhance sand filtration with marine discharge (flow-through).

Check chemical being requested

☐ FlocClear™ (2% chitosan acetate solution)
☒ StormKlear™ LiquiFloc™ (1% chitosan acetate solution)
☐ ChitoVan™ (1% chitosan acetate solution)
☐ StormKlear ™ LiquiFloc ™ (3% Chitosan acetate solution)
☐ Other _____

Estimate of Treatment Period

Begin date: November 29, 2013 End date: July 31, 2014

I hereby certify that the following information is correct:

- The Stormwater Pollution Prevention Plan (SWPPP) includes the chemical treatment system specifications and design.
- The best management practices (BMPs) on the site use all known, available, and reasonable methods of treatment (AKART) and I ensure that these BMPs will be maintained at AKART.
- I reviewed the best management practices on site or those proposed in the SWPPP and believe they will not interfere with the use of chemical treatment.
- I verified through jar tests that the site soil is conducive to chemical treatment.
- I verified that any treated discharged water enters a stream or a stormwater system that discharges to flowing fresh water, not to lakes, marine environments, or other quiescent water bodies.
- I verified that the CESF operators received Ecology-approved training.
- I read, understand, and will follow all conditions and design criteria in the applicable use level designation(s).
- I notified the appropriate local government of the intent to use chemical treatment on a site located in their jurisdiction, and they agree that the system design and use of chemicals is acceptable.
- I will keep the use level designation, operation and maintenance manual, and training certificate on-site prior to the use of chitosan acetate.
- Where necessary, a licensed engineer designed the system correctly including system sizing, pond sizing, and flow requirements.
- I verify that discharge will not affect downstream conveyance systems or stream channels.

Permittee name (printed) LYLE MORSE

Permittee signature [signature] Date: 11/22/13

Operator name (printed) Jason Ziemer

Operator signature [signature] Date: 11/20/2013

Your authorization to use the requested chemical treatment begins once Ecology reviews and approves your completed application.

Please send your completed request to:

Doug Howie
Department of Ecology
Water Quality Program
PO Box 47600
Olympia, WA 98504-7600

To send electronically, scan signed and dated application and email to: douglas.howie@ecy.wa.gov

To ask about the availability of this document in a format for the visually impaired, call the Water Quality Program at 360-407-6401. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

ATTACHMENT 4

STORMKLEAR™ LIQUIFLOC™ USE LEVEL DESIGNATION

WASHINGTON STATE DEPARTMENT OF ECOLOGY

September 2013

USE DESIGNATIONS FOR EROSION AND SEDIMENT CONTROL

For

Chitosan-Enhanced Sand Filtration using 1% StormKlear® LiquiFloc™ chitosan acetate solution

Ecology's Decision:

Based on Ecology's review of HaloSoure Inc.'s (HI) application submissions and the findings by the Chemical Technical Review Committee (CTRC), Ecology is hereby issuing the following use designations for the Chitosan Enhanced Sand Filtration (CESF) technology for adequately controlling small particulate turbidity (clays, silt, etc.) in stormwater discharges at construction sites:

1. **General Use Level Designation for the CESF technology with the discharge of chitosan acetate treated water to retention systems capable of infiltrating all storms to the ground with no discharge to surface water. The operator shall base the design of the infiltration system on the criteria in Volume V of Ecology's most recent Stormwater Manual for Western Washington (SWMMWW) or Chapter 6 of the Stormwater Management Manual for Eastern Washington (SWMMEW). The operator shall strictly adhere to the design and operational criteria for the CESF specified in this document. You must keep records showing that you achieved total retention on site.**

2. **General Use Level Designation for the CESF technology with a discharge of chitosan acetate treated water from the sand filters to temporary holding ponds or basins then discharged to surface water (batch treatment). The operator shall strictly adhere to the design and operational criteria specified in this document.**

3. **General Use Level Designation for the CESF technology with the chitosan acetate treated discharges conveyed directly or indirectly to surface water (flow-through system). The operator may direct discharge to streams, lakes, and marine waters.**

This designation has no expiration date, but it may be amended or revoked by Ecology and is subject to all conditions contained in this use level designation.

Conditions Applicable to CESF under this designation

1. **Formal written approval from Ecology is required for the use of chemical treatment at each site. You must obtain written approval from the appropriate Ecology regional office.**

2. **This use level designation applies only to StormKlear® LiquiFloc™ (1% chitosan acetate solution).**

3. **The chitosan dose rate for water entering the filters shall not exceed 1 mg/L StormKlear® LiquiFloc™ (as chitosan by weight). Operators must record all calibration results simultaneously with the flowrates. Operators must keep all records on site.**

4. **The operator shall implement source control procedures to the maximum extent feasible to minimize the need for the use of additional chitosan acetate for the pretreatment of stormwater.**

5. **Operators may use additional StormKlear® LiquiFloc™ (amounts greater than 1 mg/L chitosan by weight) to pretreat water that exceeds 600 NTU. Operators may use a portion of the 1 mg/L StormKlear® LiquiFloc™ to pretreat water less than or equal to 600 NTU. Pretreatment must occur in a tank or basin dedicated to pretreatment. All pretreated water must enter the sand filters. Pretreated water must have no less than 50 NTU and no more than 600 NTU before final dosing. This will help ensure that free chitosan does not enter the CESF system. In addition, 1 mg/L StormKlear® LiquiFloc™ (chitosan by weight) is sufficient to treat water in this range. The operator must continuously monitor water exiting the pretreatment tanks for turbidity. An automatic integrated turbidity sensor shall be located on the output from the pretreatment tanks or basins. This sensor will alert the operator when turbidity values fall outside of the 50 to 600 NTU range. If this occurs, operators can reroute the out of spec water to the untreated stormwater pond, shut the system down, or conduct additional residual chitosan tests. One of these actions must occur each time the alarm goes off. The operator must use jar tests to determine proper pretreatment dosing and proper treatment dosing.**

6. **This approval applies to discharges to streams, lakes, and marine water bodies. HaloSource provided additional aquatic toxicity testing for discharges to other waterbodies.**

7. **The operator shall conduct jar tests at startup to determine the dosage level of chitosan acetate solution. Additional jar tests will be conducted when influent turbidity changes by 20% or greater. The operator shall record jar test results**

in the daily operating log. If the results of the jar test indicate that the dose needs adjustment, the operator shall document the jar testing results and the indicated dose rate change in the daily operating log.

8. **During CESF operation, the operator shall continuously monitor water quality influent and effluent for pH, turbidity, and flow. For batch treatment systems, the operator must continuously monitor only water discharged from the batch treatment basins or tanks for pH, turbidity, and flow during discharge.**

9. **The operator shall continuously meter and record discharge flowrate. For batch treatment systems, the operator must continuously monitor only water discharged from the batch treatment basins or tanks for flowrate.**

10. **The operator shall monitor the effluent for residual chitosan or aquatic toxicity. If you monitor effluent for aquatic toxicity, you must use the most sensitive test reported in the intended use plan. If you monitor the effluent for residual chitosan, you must collect and analyze a discrete grab sample of homogeneous sand filter discharge within 30 minutes of the onset of operation and 2 hours after startup to confirm a discharge concentration below 0.2 ppm. You must repeat the test is to be repeated whenever there is a change in dosage, or a significant change in influent turbidity or flowrate (20% or greater). For batch treatment systems, you need to monitor only water discharged from the batch treatment basins or tanks. For batch treatment systems, you must collect and analyze an additional grab sample of the potential batch treatment discharge for aquatic toxicity or residual chitosan before any discharge from treatment basins or tanks can occur.**

11. **The operator shall complete an Operating Period Information Form for each operating period (system startup, operation, and shutdown). At a minimum, the form shall include the following:**
    - **A record of each recycle event**
    - **A record of each backwash event**
    - **Actions taken when a recycle event occurs**
    - **Actions taken when excessive backwashing is occurring**
    - **A record of pump calibration**
    - **A record of chitosan use for pretreatment**
    - **A record of chitosan dosage immediately prior to filters**
    - **A record of test results for chitosan residual in the effluent**

Weekly, the supervisor shall examine the forms completed the previous week. The supervisor shall sign each daily form indicating his review. The form shall document actions taken in response to any abnormal conditions observed by the operator.

12. **At all construction sites, at the end of the operating period, a delegated responsible person shall record their assessment of the operational efficiency of the CESF process, any upsets, the sand filter discharge chitosan**

concentrations, and any other relevant observations that relate to CESF proper operation. They must also certify the acceptability of the CESF discharge to surface water.

13. **Discharges from the CESF system shall not cause or contribute to receiving water quality violations and shall comply with the discharge requirements of the State of Washington Construction Stormwater General Permit, AKART, and local government requirements for turbidity and other applicable pollutants. The operator must use this designation document as the basis for Stormwater Pollution Prevention Plans (SWPPPs) for all construction projects where you plan to use chitosan treatment.**

14. **Discharges from the CESF system under these designations shall achieve performance goals of a maximum instantaneous discharge of 10 NTU turbidity and a discharge pH within a range of 6.5-8.5. These limits reduce interferences associated with the residual chitosan test.**

15. **The CESF facility contractor shall guarantee that the CESF system, when used as directed, will not produce treated water that exhibits aquatic toxicity caused by chitosan added as a treatment agent.**

16. **The CESF system operators shall trained technicians certified through an Ecology-approved training program that includes classroom and field instruction. The CESF operator must remain on-site during CESF operation. The technician must have the following minimum training requirements:**

Prerequisites:

- **Current certification as a Certified Erosion and Sediment Control Lead (CESCL), through an Ecology-approved CESCL training course.**
- **Fundamental knowledge of, high-pressure sand filter systems.**
- **Fundamental knowledge of water pumping and piping systems.**
- **Fundamental knowledge of stormwater discharge regulations for applicable region/locale.**
- **Fundamental knowledge of stormwater quality testing procedures and methods for parameters applicable to the region/locale.**

Classroom (8 hours)

- **Stormwater regulatory framework and requirements**
- **Stormwater treatment chemistry (chitosan, pH, coagulation, filtration, etc.)**
- **Stormwater treatability (how to do jar testing)**
- **Treatment system components and their operation**
- **Treatment system operation**
- **Troubleshooting**

In the field (32 hours)

- **Operating the treatment system**
- **Entering data in the system operations log**
- **Testing turbidity and pH**
- **Optimizing chitosan dose rate**

- **Water quality sampling and testing (turbidity and pH)**
- **Residual Chitosan Test**

17. **The SWPPP is to include a field procedure, accepted by the Department of Ecology, for detecting residual chitosan in stormwater discharges sensitive to 0.2 ppm.**

18. **During the planning of the project, the operator must evaluate the adverse potential impacts on chitosan efficiency of the use of other erosion and sediment control practices.**

<u>Design Criteria for CESF Systems:</u>

1. **You must design systems using the relevant portions of the most current versions of BMP C250 and BMP C251 of the SWMMWW and the SWMMEW. System design must consider downstream conveyance system integrity.**

2. **The facility shall employ a minimum of three (3) sand filter pods to ensure adequate backwashing capacity. The operator must discharge backwash slurry from the sand filters to a holding cell that is separate from the temporary storage cell for the incoming turbid stormwater. The overflow from the backwash slurry detention cell can overflow into the detention basin for the incoming turbid stormwater.**

3. **The operating flow rate shall not exceed 15 GPM per square foot of sand bed filtration area.**

4. **You must use filtration media approved in the Sand Filtration Treatment Facilities section (Volume V, Chapter 8) of the most recent Stormwater Management Manual for Western Washington in the filter pods. Minimum sand bed depth shall be 18 inches, underlain with a minimum of 6 inches of 1-inch crushed rock.**

5. **The CESF system shall include a flow-regulating valve on the input to and output of the sand filter. These regulating valves will reduce the maximum output of the pump as required and facilitate proper backwash.**

6. **The CESF system treated water output shall be equipped with an automatic integrated turbidity and pH sensor capable of shutting the system down if the output turbidity or pH exceeds preset values. You shall install an audible alarm and warning light on the treatment system to alert the operator in the event of a system failure.**

7. **You shall completely enclose the CESF control system (including metering pump, chitosan storage, and instrumentation) in a secure structure with locking door. You shall store the chitosan liquid concentrate in a non-corrosive storage tank. You shall install secondary containment on the Chitosan storage tank,**

metering pump, and tubing. There shall be an anti-siphon valve on the metering pump discharge tubing.

8. **The operator shall perform Chitosan injection with a LMI-brand C77 chemical metering pump, or equivalent. The operator must calibrate the metering pump within 15 minutes of the beginning of each operating period. You shall recalibrate the metering pump when a significant change occurs in either the flow or influent turbidity.**

Applicant: HaloSource, Inc., chitosan vendor and technical consultant

Frank Kneib, National Sales Manager

Applicant Address: 1631 220th Street SE, Suite 100
Bothell, Washington 98021

Application Documents:

- Application for Conditional Short Term Use Designation for Chitosan Enhanced Sand Filtration, July 1, 2003, Peter Moon, P.E. and Paul Geisert, P.E., Price Moon Enterprises, Inc. for Natural Site Solutions, LLC. (NSS)
- Chitosan-Enhanced Sand Filtration. Engineering Report .with Addendum, NSS, May 15th, 2003
- Chitosan-Enhanced Sand Filtration System. Operation and Maintenance Manual. NSS, April 30, 2003.
- Toxicity Evaluations of Chitosan-based Products, Liqui-Floc and Gel-Floc: December 2002 and March 2003, AMEC Earth & Environmental Northwest Bioassay Laboratory, 5009 Pacific Hwy. East, Suite 2, Fife, WA 98424. (253) 922-4296.
- Understanding the Freshwater Aquatic Toxicity of Chitosan When Used in Engineered Sand Filtration Stormwater Treatment Systems; March 27, 2003. John Macpherson, CPESC, NSS.
- Analytical Testing Demonstrating the Inability of a Solution of Chitosan Acetate to Penetrate a Model Sand Filter; John Macpherson, NSS.
- Quality Assurance Project Plan, Third Version, January 12, 2004, John MacPherson, NSS
- Technical Engineering Evaluation Report (TEER) For The Chitosan-Enhanced Sand Filtration Technology for Flow-Through Operations, Gary Minton, February 28, 2006
- Rainbow trout (Oncorhynchus mykiss) Chronic Toxicity Screening of Stormwater Treated by Chitosan Enhanced Sand Filtration Flow-Through System – Redmond, Washington, ECO-Endeavors, Inc, June 2, 3004
- Toxicity testing for Liqui-Floc: Final Report, Nautilus Environmental, LLC, September 30, 2004
- Colorimetric Determination of Residual Chitosan in Treated Stormwater: Field Test, Natural Site Solutions, LLC, July, 2004
- Certification of Residual Chitosan Test by AM TEST Laboratories, October 27, 2005

- Chitosan-Enhanced Sand Filtration System Using StormKlear™ LiquiFloc™ Operations and Maintenance Manual, HaloSource, February, 2007
- Expanded Approval of CESF Treatment Using Liquifloc 1%, Department of Ecology, September 19, 2013

Applicant's Use Level Request:

General use level designation for the operation of chitosan-enhanced sand filtration (CESF) technology for the reduction of turbidity in construction site stormwater.

Applicant's Performance Claims:

For construction site stormwater runoff with a turbidity of less than 600 NTU (influent), a properly engineered and deployed *Chitosan-Enhanced Sand Filtration System* will remove greater than 95% of the turbidity, producing effluent that will consistently meet the State surface water discharge standards.

Chemical Technical Review Committee (CTRC) Recommendation:

The CTRC finds sufficient evidence to recommend to Ecology to grant a GULD for flow-through treatment that can remove turbidity from stormwater at construction sites within acceptable limits for chitosan enhanced sand filtration using StormKlear® LiquiFloc™ 1% chitosan acetate.

Findings of Fact:

1. A CESF system charged with #30 crushed silica sand has demonstrated the ability to reduce turbidity caused by the disturbance of sediment on construction sites by 97.44 percent (overall average) when operated at a flowrate of approximately 15 gallons per minute per square foot of filtration surface area. This translates to a flowrate of approximately 500 GPM when using a 48-inch diameter, 4-pod sand filter module. HaloSource monitored over 1500 operating periods over a two-year period. Data from these operating periods show that discharge graphs were always below 10 NTU. Any discharge that exceeded 10 NTU was recycled. Recycle rates ranged from 4-17%.

2. Influent turbidity levels above 600 NTU demonstrated the potential to cause a slow degradation of the turbidity removal performance by the system resulting in eventual system failure. CESF systems shall be limited to influent turbidity levels of 600 NTU or less. Turbidity levels above 600 NTU shall be allowed additional settlement time or be pretreated.

3. Water with a pH range outside the CESF treatment window of 6.5 to 8.5 shall be pretreated to achieve this range. This application did not cover the pretreatment process.

4. In the CESF treatment systems that have been constructed and operated to date, we have observed no aquatic toxicity in the treated filtrate.

5. The chitosan acetate polymer component, used for water treatment, is non-toxic to humans and other mammals, which makes it somewhat unique in the universe of treatment agents. Chitosan acetate does, however, exhibit toxicity to rainbow trout. Therefore, you should use Chitosan acetate at a maximum dose rate of 1 mg/L as chitosan acetate by weight as a conservative measure to ensure no possibility of toxicity to rainbow trout in receiving water.

6. HaloSource provided a design/operation/maintenance manual, which includes information on selecting, sizing, assembling, operating and maintaining a CESF system.

7. NSS and HaloSource provided a significant amount of aquatic toxicity data demonstrating that they expect the discharge residual of the chitosan acetate polymer to be within toxicity levels acceptable to Ecology when used as directed.

8. NSS and HaloSource provided other supporting information including system limitations and constraints, system specifications and warranty information.

Description of the Technology:

Chitosan-enhanced sand filtration (CESF) is a stand-alone construction site water treatment technology, which is comprised of four basic components:

- Stormwater transfer pump
- Chitosan addition
- Pressurized multi-pod sand filtration
- Interconnecting treatment system piping

You can use CESF as a flow-through stormwater treatment technology that utilizes chitosan, a natural biopolymer, in conjunction with pressurized sand filtration to remove turbidity (suspended sediment). Each treatment system is designed and installed to be operated on an as need basis, pumping water from a retention basin whenever the water level of the retention basin is high enough to warrant processing. When someone transfers stormwater from the retention basin to the sand filtration unit, they introduce chitosan to stormwater to coagulate suspended solids producing larger particles, which they retain within a sand filter. The filtration systems are equipped with automatic backwash systems, which will backwash the collected sediment from the individual filter pods as necessary to maintain the hydraulic capacity of the filtration media. This feature allows the treatment system to operate on a continuous flow-through basis. A link to a diagram of the system is included here:

Recommended Research and Development

Ecology encourages HaloSource, Inc. to pursue continuous improvements to the CESF system. To that end, Ecology recommends the following actions:

- Further field testing is necessary to determine the optimum dose rate for various influent concentrations.
- Conduct further research to create a more reliable residual chitosan test. Develop a test that quantifies chitosan concentrations.
- Determine how different soil types affect chitosan treatment.
- Determine aquatic threshold for marine species.

Contact Information:

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Fax: 425-556-4120
Cell: 602-334-3474
Email: fkneib@halosource.com

Applicant Website: www.halosource.com

Ecology web link: http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html

Ecology: Douglas C. Howie, P.E.
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

Revision History

Date	Revision
April 2008	Original Draft use-level-designation document
August 2010	Modified contact information
September 2013	Added ability to discharge to lakes and marine waters

EXPANDED APPROVAL OF CESF TREATMENT USING LIQUIFLOC 1%
September 19, 2013

The chitosan-enhanced sand filtration (CESF) stormwater treatment system using HaloKlear LiquiFloc™ containing 1% chitosan acetate has been granted General Use Level Designation in Washington State. Natural Site Solutions, LLC submitted the original Intended Use Plan dated November 18, 2004 to describe how the LiquiFloc concentration will be kept below its toxic threshold to key species. The intended use plan describes how a CESF system is operated so that the chitosan dose concentration is always below the most sensitive toxic threshold. After being dosed to a concentration that is below the toxic threshold, the chitosan concentration in the stormwater will be reduced further by binding to suspended solids and then binding to the sand filter before being discharged.

The following list includes the toxicity tests and species that were performed and has added the results from the mysid 7-day survival and growth test. The approval is now expanded to include discharges to any surface water in the state, including lakes and marine waters.

Toxicity Tests and Results

Toxicity Testing Results for LiquiFloc 1% (as mg/L of chitosan acetate)

Test	**Endpoint**	**EC_{50} (mg/L)**	**EC_{25} (mg/L)**
Daphnia pulex 48-hr acute	survival	23.2	18.3
rainbow trout 96-hr acute	survival	1.73	1.28
fathead minnow 96-hr acute	survival	6.42	1.26
rainbow trout 7-day survival & growth	survival	1.54	1.21
	weight	> 2.5	> 2.5
fathead minnow 7-day survival & growth	survival	> 10	9.32
	weight	> 10	6.88
rainbow trout embryo viability	viability	> 10	> 10
fathead minnow embryo-larval survival & teratogenicity	survival	> 10	> 10
	development	10	10
mysid 7-day survival & growth	survival	> 4	> 4
	weight	> 4	0.98

Intended Discharge Concentration

The intended discharge concentration is conservatively estimated to be 0.1 mg/L. The Residual Chitosan Field Screening Test has been performed hundreds of times on treatment system effluent. The detection limit of this procedure is 0.1 mg/L and no chitosan has ever been detected in effluent. In addition, clean water containing 2 mg/L of chitosan was passed through a sand filter in a bench scale test and no chitosan was detected in the filtrate using a procedure with a detection limit of 0.03 mg/L.

Safety Margin for the Most Sensitive Response (mysid weight)

The toxic thresholds are all greater than three times the intended discharge concentrations. Therefore, the safety margins are not considered to be narrow. In addition, 14-day flow-through toxicity testing with rainbow trout was done in 2004 at a construction site in Redmond, Washington with the result of 100% survival. No confidence building period of flow-through or *in-situ* toxicity testing is needed. The data support the future approval of chitosan concentrations above 1.06 mg/L in very turbid stormwater prior to sand filtration without needing to change the goal of the intended use plan of keeping the dose concentration below the toxic threshold.

Maintenance of Safety Margin

Chitosan acetate can effectively treat stormwater turbidity up to 600 NTU without using a concentration above 1.06 mg/L. 1.06 mg/L chitosan is below its toxic threshold of 1.21 mg/L in clear water. In addition, chitosan will be removed from solution by binding to solids and by being withheld in the sand filter. The safety margin will certainly be maintained if the treatment concentration is kept to 1.06 mg/L or below. Any mechanical failure of the positive displacement metering pump will immediately cause a reduction in LiquiFloc dosing so pump failure is only a problem for treatment effectiveness and not safety margin maintenance.

The following dose rate table shall be used to ensure both treatment plant effectiveness and a chitosan concentration below 1.06 mg/L prior to sand filtration.

Dose Rate Table for LiquiFloc (1% chitosan acetate) Based on Flow and Turbidity

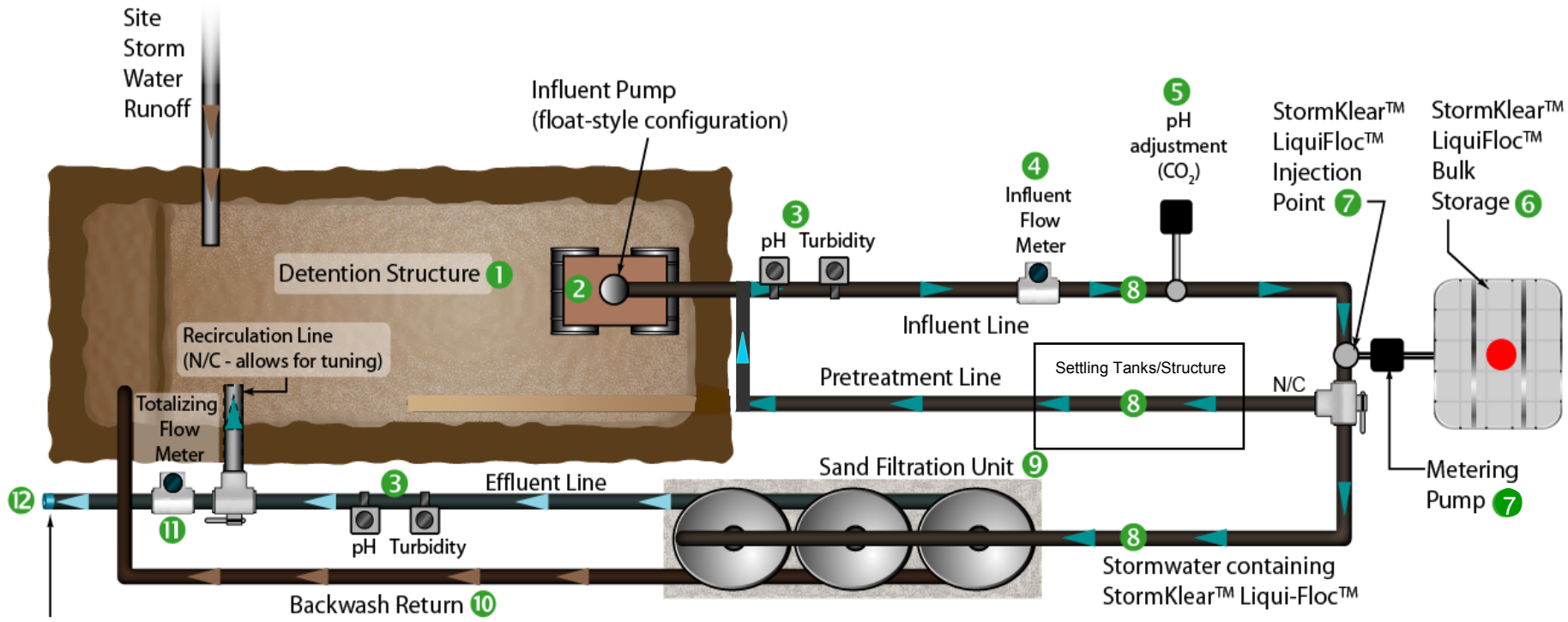
turbidity	stormwater flow rate	LiquiFloc dose rate	chitosan concentration
50 - 200 NTU	200 gpm	20 ml/min or 0.32 gph	0.26 mg/L
	300 gpm	30 ml/min or 0.48 gph	
	400 gpm	40 ml/min or 0.64 gph	
	500 gpm	50 ml/min or 0.8 gph	
	600 gpm	60 ml/min or 0.96 gph	
	700 gpm	70 ml/min or 1.11 gph	
200 - 400 NTU	200 gpm	40 ml/min or 0.64 gph	0.53 mg/L
	300 gpm	60 ml/min or 0.96 gph	
	400 gpm	80 ml/min or 1.27 gph	
	500 gpm	100 ml/min or 1.6 gph	
	600 gpm	120 ml/min or 1.91 gph	
	700 gpm	140 ml/min or 2.23 gph	
400 - 600 NTU	200 gpm	80 ml/min or 1.27 gph	1.06 mg/L
	300 gpm	120 ml/min or 1.91 gph	
	400 gpm	160 ml/min or 2.54 gph	
	500 gpm	200 ml/min or 3.17 gph	
	600 gpm	240 ml/min or 3.81 gph	
	700 gpm	280 ml/min or 4.45 gph	

Checking formula:
chitosan concentration in mg/L = (ml/min LiquiFloc x 0.01 x 1 g/ml x 1000 mg/g)/system flow rate in liters/min
liters/min = gpm x 3.78 liters/gal

Safety Margin Checklist

- Only HaloKlear LiquiFloc™ containing 1% chitosan acetate shall be used.
- The metering pump shall be calibrated using a calibration cylinder at startup and every time that the LiquiFloc dose rate needs changed. The calibration shall be recorded in the log. The stroke frequency shall be set as high as possible and the stroke length adjusted to provide the correct dosing.
- The system flow rate and the turbidity of both influent and effluent shall be measured hourly and recorded in the log.
- No chitosan-treated water shall be discharged to surface water without first being sand-filtered.
- Secondary containment for the LiquiFloc storage container and the metering pump shall be at least equal to the volume of the storage container.
- Spill adsorbent material shall be readily available to immobilize any spill of LiquiFloc during handling.
- If the treatment system is located less than 50 feet from surface water, a 1-foot high earthen berm shall be constructed and maintained down-gradient as additional spill containment.
- The occasional use of the Residual Chitosan Field Screening Test to confirm a discharge concentration below 0.1 is encouraged in order to further build confidence in CESF system safety.

Schematic Diagram of CESF System



Clarified effluent to outfall (<10 NTU; pH 6.5-8.5)

Note: Pretreatment line shown is conceptual, additional equipment/piping may be required.
If you use pretreatment dosing, you can read water quality after settling at the influent pH and turbidity location.

Rev2.1

ATTACHMENT 5

STORMKLEAR™ LIQUIFLOC™ RESIDUAL CHITOSAN TEST PROCEDURE

StormKlear Residual Chitosan Test Instructions

Reliable and effective TSS and turbidity control

- BMPs for sediment control
- Dewatering
- General water treatment

StormKlear® water treatment products are natural, proven and cost-effective flocculants for sediment control.

StormKlear®
by HaloSource

RESIDUAL CHITOSAN TEST

DESCRIPTION

This test determines the presence of free residual chitosan in treated stormwater. The test is designed as a “Pass/Fail”, with the “Fail” criteria as values exceeding 0.1 mg/l free chitosan.

The test compares a field water sample with a blank and a standard solution of 0.1 mg/l chitosan. If there is greater than 0.1 ppm of free residual chitosan then a brown pink purple color with develop on the test filter. If the color is as dark as the standard then the test is a fail and the treated water has more than 0.1 ppm of chitosan.

EQUIPMENT SUPPLIED IN KIT

- Two 1 liter bottles
- One filter holder
- One 140 ml syringe
- One 3 ml syringe
- Three plastic eyedroppers
- Sodium sulfate solution
- StormKlear Liquifloc™ 1% chitosan acetate sample
- Three 1 liter open tubs
- 200 glass fiber filters
- One 10 ml syringe
- One 1 ml syringe
- One forceps
- Iodine test solution

NOT SUPPLIED IN THE KIT

Clean water for making a blank solution, standard solution & general rinsing between stages (distilled water if in a lab, tap water if in the field, but not the stormwater).

1.0 MAKE UP THE STANDARD SOLUTION

1.1 Fill both the 1 liter jars with clean water up to the ring just below the neck (as shown below).

1.2 With the 10 ml syringe, draw out 10 ml of Liquifloc 1% and transfer it into one of the 1 liter jars. Cap and mix well.

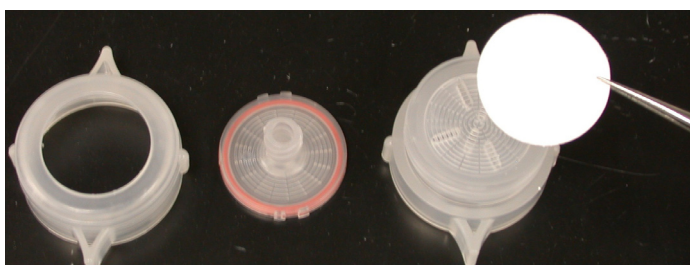
1.3 With the 1 ml syringe, draw out 1 ml of the solution above and put it in the second liter bottle. Cap and mix well. This is the 0.1 ppm or mg/L chitosan standard.

2.0 TEST PROCEDURE

2.1 The following steps are the same for the blank (done on clean water), the standard solution, and the test sample:

2.2 Collect at least 200 ml of sample in one of the 1 liter tubs.

2.3 With the forceps, load a clean glass filter into the filter holder and secure.



2.4 With the 140 ml syringe, filter a little over 200 ml of sample by following these directions; fill the syringe with sample, then secure the filter holder on the end of the syringe, and expel the material through the filter into the second 1 liter tub. This takes more than one draw, so remove the filter before refilling the syringe.

- Do not expel the sample out too forcefully; this “craters” the filter & can affect the results.
- Do not draw sample back up through the filter because this will damage it.
- If the sample has high turbidity, more than one filter may have to be used. Turbidities above 100 NTU generally use too many filters to be practical.
- The filters are one time use only.

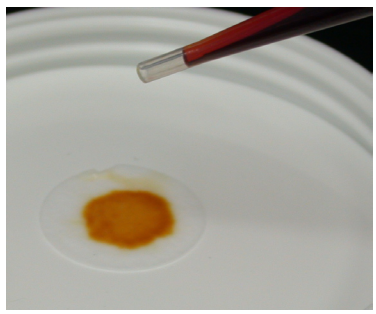
2.5 With the 3 ml syringe, draw out 2 ml of the sodium sulfate solution, add it to the filtered sample tub & mix (the syringe itself is a handy mixer in the field; wash between uses).

2.6 Load a clean glass filter into the filter holder and secure.

2.7 With the 140 ml syringe, filter 200 ml sample, secure the filter holder on the end, then expel the material through the filter (discard the filtrate).

2.8 Open the filter holder and with the forceps, transfer the wet pad to the worksheet.

2.9 With the eyedropper, place one drop of iodine into the center of the pad (as shown in picture below). Filter (in the same manner as the test sample) the blank and standard 0.1 ppm solutions and collect the filters to compare with the test sample.



2.10 There should be some immediate color, but allow 5 to 60 minutes for more color to develop. Compare the test sample with the blank and the standard.

- The blank should be light yellow color.
- The standard should have a light brown/pink-purple color.
- If the sample has a lighter color than the standard, then it has less than 0.1 mg/l free chitosan—“Pass”. If it is as brown/pink-purple, or darker brown/black, then it is “Fail”.
- For multiple samples, they can all be placed on the worksheet, then iodine treated at the same time, so the colors develop concurrently.
- Note: do not place the wet pad on unprotected paper; the starch in the paper will turn the pad a bright blue and spoil the test.

2.11 Rinse out tubs & syringes with clean water, such as tap or deionized water, between each sample.

HaloSource, Inc.

StormKlear Water Treatment Solutions are a product of HaloSource, Inc. HaloSource manufactures reliable, tested and effective water treatment solutions, including some of the leading products in the pool and spa industry. Their significant experience in storm water treatment technologies has been a result of more than 15 years as a water science technologies company.

StormKlear® by HaloSource

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Rev. 5054-02

ATTACHMENT 6

MAINTENACE & INSPECTION FORMS

Preventative Maintenance & Inspection Log Sheet

McNeil Island Boatyard Stormwater Treatment System Maintenance Log Sheet

Technician:	**Location:**
Date:	**Weather:**
Time:	**Site Contact:**

1. **Stormwater Collection and Conveyance**

- **Existing Boatyard Oil/Water Separator Pump Station**

Pump Condition	Working? *Yes/No* Proper flow? *Yes/No* Free of solids? *Yes/No*
Float Condition	Set to correct height/position? *Yes/No* Activate/Deactivate Pump? *Yes/No*

Notes	

- **Existing Catch Basin (Parking Lot) Pump Station**

Pump Condition	Working? *Yes/No* Proper flow? *Yes/No* Free of solids? *Yes/No*
Float Condition	Set to correct height/position? *Yes/No* Activate/Deactivate Pump? *Yes/No*

Notes	

- **Existing Marine Way Collection Sump Pump Station**

Pump Condition	Working? *Yes/No* Proper flow? *Yes/No* Free of solids? *Yes/No*
Float Condition	Set to correct height/position? *Yes/No* Activate/Deactivate Pump? *Yes/No*

Preventative Maintenance & Inspection Log Sheet

Notes	

- **High Tide Float Interlock**

Set at correct level/position? *Yes/No* Notes:
Deactivate marine way pump at “closed” position (high tide)? *Yes/No*
Manual reset reactivate marine way pump? *Yes/No*

Notes	

2. **Stormwater Surge Tank – 8,400 Gallons**

High Float	Set to correct height/position? *Yes/No* Deactivate collection pumps? *Yes/No*
Sonic Level	Set to correct height/position? *Yes/No* Activate/Deactivate pumps? *Yes/No*
Sediment	Sediment present? *Yes/No* If Yes, then level?
Water Quality	Oil sheen present? *Yes/No* Notes:
Tank Condition	Leaks? *Yes/No* Notes:

Notes	

Preventative Maintenance & Inspection Log Sheet

3. Pretreatment System

Transfer Pump	Working? *Yes/No* Proper flow? *Yes/No* Free of solids? *Yes/No*
Transfer Pressure Switch	Activate/Deactivate pretreatment pump under pressure? *Yes/No*
Pretreatment Polymer Pump	Working? *Yes/No* Draw down measurement: _____ *gph* PPM:
Pretreatment Flow meter	Registering flow? *Yes/No* Totalizer: _____ *gallons*

Notes	

4. Stormwater Settling Tank – 21,000 Gallons

High Float	Set to correct height/position? *Yes/No* Deactivate transfer pump? *Yes/No*
Sonic Level	Set to correct height/position? *Yes/No* Activate/Deactivate system pump? *Yes/No*
Sediment	Sediment present? *Yes/No* If Yes, then level?
Water Quality	Oil sheen present? *Yes/No* Notes:
Tank Condition	Leaks? *Yes/No* Notes:

Notes	

5. CESF System

- **Pre Sand Filter**

System Pump	Working? *Yes/No* Proper flow? *Yes/No* Free of solids? *Yes/No*
System Pressure Switch	Activate/Deactivate pretreatment pump under pressure? *Yes/No*
Polishing Polymer Pump	Working? *Yes/No* Draw down measurement: _____ *gph* PPM:
Piping	Describe piping condition:

Preventative Maintenance & Inspection Log Sheet

Notes	

- **Sand Filter**

Sand Level	Sand level in each pod (distance from top of side): ____ *inches* Sand added? *Yes/No*
Sand Quality	Sand dirty? *Yes/No* Gravel on top of sand? *Yes/No* Notes:
Backwash	Sand in backwash? *Yes/No; If yes, then adjust as needed so that minimal sand released*
Pressures	Normal Operations (psi) *Inf:* ___ *Eff:* ___ During Backwash (psi) *Inf:* ___ *Eff:*
Flow rate	Normal Operations flow rate? ___ *gpm* Backwash flow rate? ____ g*pm*
Pressure Transducer	Does reading verify with pressure gauge? *Yes/No*
Backflush Setting	Interval: ____ Duration: ____ Delay: ____ Differential Pressure Switch:
Piping	Describe piping condition:

Notes	

- **Monitoring Module**

Turbidimeters	Readings verify with hand held turbidimeter? *Yes/No; If no, then recalibrate*
pH sensors	Calibrate with pH buffer. Do readings verify with hand held pH probe? *Yes/No; If no, then recalibrate*
Polymer tote	Polymer level in tote: _____ Polymer needed? *Yes/No* Leaks? *Yes/No*
Tools	List tools needed on site:

Sample return	Working? *Yes/No* Notes:
Piping	Describe piping condition:
Tubing	Describe piping condition:

Notes	

6. **Adsorptive Media**

- **GAC Vessel**

Normal operations	Pressures (psi) *Inf:* ___ *Eff:* ___ *Differential:*
Normal operations	Turbidity (NTU) *Inf:* ___ *Eff:*
Post backwash (if needed)	Pressures (psi) *Inf:* ___ *Eff:* ___ *Differential:*
Post backwash (if needed)	Turbidity (NTU) *Inf:* ___ *Eff:*
Pressure Transducer	Does reading verify with pressure gauge? *Yes/No*
Hoses	Describe hose condition:

Notes	

- **IX Vessel**

Normal operations	Pressures (psi) *Inf:* ___ *Eff:* ___ *Differential:*
Normal operations	Turbidity (NTU) *Inf:* ___ *Eff:*
Post backwash (if needed)	Pressures (psi) *Inf:* ___ *Eff:* ___ *Differential:*
Post backwash (if needed)	Turbidity (NTU) *Inf:* ___ *Eff:*
Pressure Transducer	Does reading verify with pressure gauge? *Yes/No*

Preventative Maintenance & Inspection Log Sheet

Hoses	Describe hose condition:

Notes	

7. Treatment System Discharge

Actuated Valves	Change accordingly when switched between recirculate/discharge? *Yes/No* Change accordingly when pH/turbidity is out of specification? *Yes/No*
Residual Chitosan	Residual chitosan test: *Negative/Positive*
Discharge Flow meter	Registering flow? *Yes/No* Totalizer: _____ *gallons*
Discharge Water Quality	Turbidity: _____ NTU pH:
Piping	Describe piping condition:
Outfall	Erosion at outfall? *Yes/No* Notes:

Notes	

Summary Notes and Action Items:

Appendix B
McNeil Island Boatyard
Stormwater Treatment Pilot Study Protocol

McNEIL ISLAND BOATYARD
STORMWATER TREATMENT PILOT STUDY PROTOCOL
Revised January 2014

PROTOCOL PURPOSE

The purpose of this protocol is to describe a plan for the identification of potential stormwater and pressure wash water pollutants, the effectiveness of the temporary chitosan enhanced sand filter (CESF) treatment component methodologies, and potential permanent treatment methodologies for removal of total suspended solids (TSS), copper, zinc and lead from stormwater runoff generated at the McNeil Island Boatyard.

OBJECTIVES

The objectives of the pilot study are as follows:

1. To determine the potential stormwater pollutants, including oil/grease, total suspended solids, copper, zinc, lead and pH, present in stormwater runoff from the marineway and the access road/parking areas of the Boatyard.

2. To assess the effectiveness of the component treatment processes included in the temporary CESF treatment train (chitosan acetate precipitation, sand filtration, activated carbon contact and ion exchange) for removing total suspended solids, copper, zinc and lead from stormwater runoff.

3. To assess the effectiveness of potential permanent stormwater treatment systems appropriate for use at the Boatyard.

Table 1 lists the discharge limitations contained in the Boatyard General Permit for stormwater runoff to marine water.

TABLE 1

Boatyard General Permit Regulatory Standards

Stormwater		
Water Quality Parameter	**Seasonal Average Benchmark**	**Maximum Daily Benchmark**
Copper	50 µg/L	147µg/L
Zinc	85µg/L	90 µg/L

Table 2 lists the pilot study treatment goals.

TABLE 2

Pilot Study Treatment Goals

Water Quality Parameter	Seasonal Average Benchmark Maximum Daily Benchmark
Copper	50 µg/L
Zinc	85µg/L

PROJECT DESIGN

Stormwater Sampling

The pilot study will include collection and sampling of stormwater runoff from the access road/parking lot and maineway.

Samples of stormwater runoff will be collected from: (1) the access road and roof drainage collection sump; and (2) the marineway drainage collection sump; and (3) the inlet to the temporary CESF treatment train (a commingled sample) by authorized boatyard staff. Runoff generated from discrete storm events (no precipitation during the preceding 24-hours) that occur during regularly staffed hours will be collected. If possible, samples that represent the first flush period (within the first 30 minutes of the formation of a discrete stormwater discharge) will be collected. Samples will be sent to an accredited laboratory for analysis of TSS, oil/grease, copper, zinc and lead. A portion of the sample will be taken to the WWTP for pH determination.

Temporary CESF Treatment Train Unit

The temporary CESF treatment unit is being supplied by Clear Creek Systems, Inc. as a subcontract to Gray & Osborne, Inc. Gray & Osborne, Inc. is under contract with the Washington State Department of Corrections. The CESF treatment unit will be utilized as a pilot testing facility for the processes included in the CESF unit as described below. The temporary treatment system is designed to treat for the following pollutants:

- Settleable solids (SS) associated with paint chips, barnacles and other solids
- TSS
- Turbidity
- Total zinc
- Total copper
- Total lead

The treatment system design flow rate is 40 gpm. A surge tank is used to equalize the maximum flow rate pumped from the stormwater collection sumps (120 gpm) and water quality volume.

The following components make up the CESF treatment train:

- Stormwater Collection – Stormwater is pumped from the access road and roof drainage collection sump and the marineway collection sump at a rate

of approximately 60 gpm each for a combined transfer rate of approximately 120 gpm.

- Surge tank – The collected stormwater is discharged into a surge tank with the capacity of approximately 8,400 gallons.
- Pretreatment – Chitosan acetate is injected through an injection quill and static mixer between the surge tank and the settling tank. Chitosan acetate is a coagulant that aids the settling of suspended sediment.
- Settling tank – A 21,000 gallon settling tank provides gravity settling of chitosan-treated stormwater. The settling tank is also utilized for settling filtration media backwash water. Water is pumped from the settling tank to the filtration media.
- Sand filtration – Sand media filtration is the first treatment methodology utilized in the temporary treatment system. Sand filtration provides particulate filtration. If necessary, additional chitosan acetate is injected upstream of the sand media filter.
- Granular Activated Carbon (GAC) filtration – an 18 cubic foot GAC vessel is used to protect the ion exchange resins (next filtration step) from surface coating and fouling due to hydrocarbons.
- Ion Exchange Resins – An 18 cubic foot ion exchange resin media vessel is utilized to remove dissolved metals.

Influent and effluent is continuously monitored for turbidity, pH and flow rate. In addition, pressure sensors located prior to the sand media filter, GAC vessel and ion exchange media vessel provide information regarding the back pressure in the system which indicates the amount of fouling of the medias.

Permanent Treatment Technologies

Permanent treatment technologies, such a passive enhanced media filtration system, will also be pilot tested for its ability to remove copper, zinc and lead from the commingled stormwater.

Pilot System Testing

The efficacy of the various units of the temporary CESF treatment system will be determined by utilizing the temporary CESF treatment system as a pilot system. The goal of this analysis is to determine if the CESF process is appropriate for the intended use, and if it is, to optimize process design and unit sizing.

The GAC vessel operates in tandem with the ion exchange vessel, therefore the two vessels are considered one unit process. Influent, effluent and mid-treatment samples will be collected and sent to an accredited laboratory for analysis for TSS, oil/grease, copper, zinc and lead under the operating regimes discussed below. The samples will be analyzed for pH at the WWTP laboratory. Influent and effluent turbidity, flow and headloss across the treatment processes will be recorded from the continuous monitoring instrumentation. Stormwater treated during operating regimes other than Normal Operation will not be allowed to discharge to Puget Sound. During the duration of the investigation of different operating regimes the effluent will be collected and at the end of the investigation the collected stormwater will be discharged to the surge tank to receive treatment through the full treatment train. A CESF certified operator will be available to assist with the pilot study.

All operating regimes will be operated at the design flow rate of the CESF system (40 gpm). The full complement of operating regimes will be run and samples collected on two separate days.

A 50 gallon sample of the commingled stormwater from the Boatyard will be delivered to vendors of selected potential permanent treatment systems to determine the efficacy of the process to remove copper, zinc and lead and to aid in treatment unit sizing.

The Boatyard will be able to maintain normal operations during the periods the pilot test is conducted.

The Pilot Study Monitoring Schedule is shown in Table 3.

TABLE 3

Pilot Study Monitoring Schedule

Parameter	Sample Method	Total Number of Samples Collected Per Operational Regime per Day	Test Method
Copper	Manual/Continuous Flow	3	EPA 200.8
Zinc	Manual/Continuous Flow	3	EPA 200.8
pH	Manual/Continuous Flow	3	PH Probe (SM 450)
Turbidity	Continuous	Continuous	On-line Turbidimeter
Flow	Continuous	Continuous	Flow meter
Headloss	Continuous	Continuous	Gauges

As the pilot study progresses, the frequency of monitoring may be adjusted according to water quality results.

The operational regimes that will be evaluated include the following.

1. Normal Operation: The treatment system will be run in normal operational mode. Samples of the influent and effluent will be collected as well as samples after the settling tank, sand media filter and GAC vessel.

2. Operation without Chitosan Acetate. Approximately 400 gallons of stormwater from the surge tank will be pumped to a separate vessel and allowed to settle for 30 minutes. The stormwater will be discharged directly into the sand filter media at 40 gpm. The sand media filter, GAC and ion exchange modules will operate normally. Samples of the influent, effluent, and settled stormwater will be collected as well as samples after the sand filter and GAC vessel.

3. Operation without Sand Media Filter. Stormwater will be treated with chitosan acetate and transferred to the treatment system settling tank as occurs in normal operation. Water from the settling tank will be

discharged directly to the GAC vessel and the ion exchange vessel. Samples of the influent, and effluent will be collected as well as a sample after the GAC vessel.

4. Operation without GAC Vessel and Ion Exchange Vessel. Stormwater will be treated with chitosan acetate, settled and filtered through the sand media as occurs in normal operation. The stormwater will not be discharged to the GAC or ion exchange vessels. Samples of the influent will be collected as well as a sample after the sand filter.

The laboratory analysis data will be evaluated to determine the following:

1. Pollutant constituent concentration and percent removal at the various steps of the treatment process if chitosan acetate is not introduced into the influent stream. Settling, sand media filtration, and GAC/ion exchange treatment continued.

2. Pollutant constituent concentration and percent removal at the various steps of the treatment process if the stormwater is not processed through the sand media filtration. Chitosan acetate addition, settling, GAC/ion exchange treatment continued.

3. Pollutant constituent concentration and percent removal at the various steps of the treatment process if the stormwater is not processed through the GAC/ion exchange treatment components. Chitosan acetate addition, settling, and sand media filtration continued.

If the results of the various operating schemes described above indicate that a coagulant such as chitosan acetate is beneficial bench scale testing to evaluate the optimum dosage of coagulant will be conducted.

SAMPLE COLLECTION

The EPA SOP#1229 for Trace Metal Clean Sampling of Natural Waters will be followed to minimize contamination sources and maintain integrity of the sample. These procedures are commonly referred to as “clean hands, dirty hands” techniques.

The clean hands, dirty hands techniques require one member of a two-person sampling team to be designated as “dirty hands” and the second member is designated as “clean hands”. All operations involving contact with the sample bottle and transfer of the sample from the sample collection device to the sample bottle are handled by the individual designated as “clean hands”. “Dirty hands” is responsible for preparation and handling of any machinery, piping revisions, etc. and for all other activities that do not involve direct contact with the sample.

Preparation for Sampling

In preparation for sampling the prepared sample bottles (500 mL or 1 L) will be obtained from an accredited laboratory in sufficient quantity to meet the sampling needs. The sample team will determine how the samples will be collected for each location on the temporary treatment system and have procedures clearly defined prior to sampling. It is anticipated that samples will be collected by manual collection and continuous flow sampling.

One of the personnel who will participate in the sampling task will be assigned to perform the following pre-sample checks.

a. Inventory sampling kits supplied by the commercial laboratory and ascertain that (a) all necessary bottles have been supplied and that (b) bottles requiring acid preservation contain an aliquot of preservative. NOTE: Bottles are not to be removed from their plastic bags.

b. Under the sample ID section of the Chain-of-Custody forms, begin recording the individual bottle identifications. If necessary, mark the outside of a plastic bag to identify the sample to be taken.

c. Check that all necessary sampling equipment is properly cleaned and available. Sampling equipment includes laboratory provided sample bottles, powderless latex gloves (shoulder length and wrist length), laboratory provided cooler and ice packs.

d. Prepare field logbook for sampling episode.

e. Put all of the commercial laboratory "Ice-Packs" in the freezer to prepare for sample transport.

f. Make sure the sample bottles are labeled with:

- The parameter to be analyzed (Cu, Zn, FOG)
- The date and the sample location
- Any additional information such as an accession number for laboratory identification

The following procedures will be followed during sampling:

"Clean hands" will handle all operations involving contact with the sample bottle and with transfer of the sample from the sample collection device to the sample bottle if the sample is not directly collected in the bottle.

"Dirty hands" is responsible for all activities that do not involve direct contact with the sample such as moving sample coolers and documentation.

Manual Sampling

Manual sampling is the collection of surface samples directly into the sample bottle. All sampling personnel will put on clean gloves before commencing sample collection.

1. "Clean hands" will put on shoulder length gloves and "dirty hands: will put on wrist length gloves.

2. "Dirty hands" will open the cooler or storage container, remove the double bagged sample bottle from storage and unzip the outer bag.

3. "Clean hands" opens the inside bag containing the sample bottle, removes the bottle, and reseals the inside bag. "Dirty hands" then reseals the outer bag.

4. "Clean hands" unscrews the cap and, while holding the cap upside down, discards the dilute acid solution from the bottle into a bucket for wastes.

5. "Clean hands" submerges the sample bottle, and allows the bottle to partially fill with sample. "Clean hands" screws the cap on the bottle, shakes the bottle several times. And empties the rinsate away from the site. After two more rinsings, "clean hands" holds the bottle under water and allows bottle to fill with sample. After the bottle has filled and while the bottle is still inverted so that the mouth of the bottle is underwater, "clean hands" replaces the cap of the bottle. The sample will never contact the air.

6. Once the bottle lid has been replaced, "dirty hands" reopens the outer plastic bag, and "clean hands" opens the inside bag, places the bottle inside it, and zips the inner bag.

7. "Dirty hands" zips the outer bag.

8. Documentation – After each sample is collected, the sample number is documented in the sampling log and any unusual observations concerning the sample and the sampling are documented.

Continuous Flow Sampling

Continuous flow sampling technique will be used if the sample is discharged through a sample port or spigot on the treatment system.

1. "Clean hands" and "dirty hands: will put on wrist length gloves.

2. "Dirty hands" will open the cooler or storage container, remove the double bagged sample bottle from storage and unzip the outer bag.

3. "Clean hands" opens the inside bag containing the sample bottle, removes the bottle, and reseals the inside bag. "Dirty hands" then reseals the outer bag.

4. "Clean hands" unscrews the cap and, while holding the cap upside down, discards the dilute acid solution from the bottle into a bucket for wastes.

5. "Dirty hands" opens the sample port or spigot.

6. "Clean hands" collects the sample by rinsing the sample bottle and cap three times and collecting the sample from the flowing stream.

7. Once the bottle lid has been replaced, "dirty hands" reopens the outer plastic bag, and "clean hands" opens the inside bag, places the bottle inside it, and zips the inner bag.

8. "Dirty hands" zips the outer bag.

9. Documentation – After each sample is collected, the sample number is documented in the sampling log and any unusual observations concerning the sample and the sampling are documented.

Sample Shipping

1. Once all of the samples to be shipped have been collected, they will be placed in their respective commercial laboratory supplied coolers along with the “Ice-Packs” provided.

2. All Chain-of-Custody forms shall be fully completed and signed by the individual taking the coolers to the shipper. The Chain-of-Custody forms will be placed in an unsealed “window” affixed to the outside of the cooler and the coolers/samples must remain within the direct control of individual taking the coolers to the shipper in conformance with Chain-of-Custody procedures.

3. The labeled and addressed coolers are to be delivered to the accredited laboratory

Appendix C
McNeil Island Quality Assurance Project Plan

McNeil Island Boatyard

Quality Assurance Project Plan

November 2013

Prepared By: Nancy Lockett, P.E.
Gray & Osborne, Inc.

1 INTRODUCTION

1.1 BACKGROUND

The McNeil Island Boatyard's goal with this Quality Assurance Project Plan (QAPP) is to consistently produce accurate, credible analytical data necessary to meet the requirements of the Boatyard General Permit of Washington State (effective date June 1, 2011). This will be accomplished by adhering to established sampling schedules, sampling and testing methods, calibration procedures, maintenance, storage, transportation and record keeping practices as described in this QAPP. All schedules, methods, procedures and practices are established from approved methods as specified throughout this manual. All QA/QC policies required by those approved methods will be utilized. Equipment protocol and maintenance will follow manufacturer specifications.

All field samples and data will be collected and recorded by Boatyard staff. The Stormwater Pollution Prevention (SWPPP) Team Leader is responsible for implementation of field quality assurance and quality control (QA/QC) policies. An independent laboratory registered or accredited under the provisions of Accreditation of Environmental Laboratories, Chapter 173-50 WAC, will perform the sample analysis.

The SWPPP Team Leader will participate, provide technical guidance, and oversee the activities dedicated to this project. Inasmuch as possible, the primary sampling team will be the SWPPP Team Leader and the Assistant Marine Operations Supervisor or authorized staff. The SWPPP Team Leader or Assistant Marine Operations Supervisor may direct others in specific duties, as necessary due to scheduling demands. These duties include: field collection of samples and data, transport of samples, control of chain of custody, recording and maintaining data, cleaning, storage and inventory of equipment and supplies.

Stormwater samples will be collected at Stormwater Discharge 1. Grab samples will be collected for analysis of copper (Cu), Zinc (Zn), biological oxygen demand (BOD) and Nitrate-Nitrite as N (NO3+NO2-N). If other parameters such as turbidity, temperature, dissolved oxygen, conductivity and pH are analyzed, the data will be recorded by use of calibrated field instruments. Collected stormwater samples will be shipped and/or delivered to a DOE accredited laboratory for analysis.

2 SAMPLING DESIGN

2.1 SAMPLES

Stormwater samples will be collected at Stormwater Discharge 1 during a rainfall event.

The stormwater monitoring schedule per the Boatyard General Permit is shown in Table 1.

TABLE 1

Stormwater Monitoring Schedule

Constituent	Units	Minimum Sampling Frequency
Total Copper	µg/L	One sample in October, November, January, April and May
Total Zinc	µg/L	One sample in October, November, January, April and May
BOD	mg/L	One sample in November or December 2012
NO_3+NO_2-N	mg/L	One sample in November or December 2012

Water samples will be drawn at the sampling port located downstream of the Access Road and Roof Drainage Collection Sump. Samples will be taken from approximately 2 inches below the surface by use of clean sampling bottles and immediately transferred to the appropriate bottle for parameter testing. The collected samples will be delivered or shipped to an accredited laboratory for further analysis.

Sample bottles must be polyethylene, glass or fluoropolymer. Each grab sample must be preserved within 15 minutes of collection. Samples should be sent to the laboratory as soon as possible after collection but in no event should the sample be held for more than 48 hours before arriving at the laboratory.

In the event of extremely shallow or no flow, the staff will be responsible for documenting this condition on the Discharge Monitoring Report (DMR). All sampling schedules will be adhered to. By sampling once a month, the data should account for the temporal and spatial variability expected from the samples. Documentation of rescheduling will be recorded along with data collected. All data collected will be recorded in the field. Data will originally be printed in indelible ink on bench sheets and stored in binders. Data will also be transferred and stored in an electronic database.

No sample will be held longer than 48 hours prior to testing.

2.2 REPRESENTATIVENESS

The primary considerations regarding representativeness in this plan are variations in analyte values due to stochastic factors such as flow variation and weather. The standard procedures used to collect field data and water samples, as described in this plan, will help ensure that the samples collected are representative of the sampling sites at the time of collection.

3 SAMPLING PROCEDURES

3.1 SAMPLE COLLECTION

The purpose of the sampling is to collect an uncontaminated sample that is representative of the concentration of metals, BOD or NO3+NO2-N typically associated with

stormwater runoff from the Boatyard. Data will be made available to all interested parties if needed. All data recorded will originally be printed in indelible ink on bench sheets and stored in binders or it will be written on "write in rain" paper with pencil and transferred to an electronic database. All data will be entered into a computerized database and stored on a CD or alternate backup system. Data will be kept for a minimum of 5 years. The SWPPP Team Leader will review all data prior to release.

All testing equipment, if needed, is maintained to manufacturer specifications and recorded in a logbook.

Field protocol for grab sampling is derived from EPA and DOE standards for obtaining grab samples. Field data for Cu, Zn, BOD and NO3+NO2-N will be collected by use of the following:

1. All items that come into contact with the water source to be sampled will first be cleaned using soap and hot water and rinse with distilled water unless the sample containers from the laboratory are used for collection. The purpose of this preliminary cleaning is to remove any particulate, viscous or oily materials that have collected on the wetted surfaces of any sampling device(s).

2. One of the personnel who will participate in the sampling task will be assigned to perform the following pre-sample checks.

    a. Inventory sampling kits supplied by the commercial laboratory and ascertain that (a) all necessary bottles have been supplied and that (b) bottles requiring acid preservation contain an aliquot of preservative. NOTE: Bottles are not to be removed from their plastic bags.

    b. Under the sample ID section of the Chain-of-Custody forms, begin recording the individual bottle identifications. If necessary, mark the outside of a plastic bag to identify the sample to be taken.

    c. Check that all necessary sampling equipment is properly cleaned and available. Sampling equipment includes laboratory provided sample bottles, clean grab sample collection bottle, powderless latex gloves, laboratory provided cooler and ice packs.

    d. Prepare field logbook for sampling episode.

    e. Put all of the commercial laboratory "Ice-Packs" in the freezer to prepare for sample transport.

f. Make sure the sample bottles are labeled with:

- The parameter to be analyzed (Cu, Zn, BOD, NO3+NO2-N)
- The date and the sample location, and depth
- Any additional information such as an accession number for laboratory identification

3. Sample Protocol

a. Remove the cap from the bottle just before sampling. Avoid touching the inside of the bottle or the cap. If you accidentally touch the inside of the bottle, use another one.

b. Hold the bottle near its base and plunge it (opening downward) below the water surface. Collect a water sample 2 to 3 inches beneath the surface.

c. Turn the bottle underwater to capture the sample.

d. Leave a 1-inch air space. Do not fill the bottle completely (so that the sample can be shaken just before analysis). Recap the bottle carefully, remembering not to touch the inside.

e. Fill in the bottle number on the appropriate field data sheet. This is important because it tells the lab coordinator which bottle goes with which site.

f. Place the samples in the cooler for transport to the lab.

g. Wash your hands thoroughly after collecting samples. Also, be careful not to touch your eyes, ears, nose, or mouth until you've washed your hands.

4. Sample Shipping

a. Once all of the samples to be shipped have been collected, they will be placed in their respective commercial laboratory supplied coolers along with the “Ice-Packs”, provided.

b. All Chain-of-Custody forms shall be fully completed and signed by the individual taking the coolers to the shipper. The Chain-of-Custody forms will be placed in an unsealed “window” affixed to the outside of the cooler and the coolers/samples must remain within the direct control of individual taking the coolers to the shipper in conformance with Chain-of-Custody procedures.

c. The labeled and addressed coolers are to be delivered to the accredited laboratory

3.2 SAMPLE IDENTIFICATION

Each sample shall be uniquely identified by location, type of sample and date. Masking tape may be used as sample label material or labels may be provided by the laboratory. Labels shall be firmly affixed to the sample container, and the sample identifier shall be written on the sample label in indelible ink. Identification numbers shall be recorded on the field data sheets for each sample as specified above, and on the chain of custody/sample analysis request form supplied by the analytical laboratory.

4 MEASUREMENT PROCEDURES

4.1 LABORATORY PROCEDURES/ANALYSIS

The analytical methods to be used are shown in Table 2.

TABLE 2

Analytical Methods and Detection Limits

Analyte	Detection Level (µg/L)	Quantitation Level (µg/L)	Analytical Method
Copper	0.4	2.0	EPA 200.8
Zinc	0.5	2.5	EPA 200.8
BOD	-	-	Standard Method 5210B-2001
NO_3+NO_2-N	-	-	EPA 353.2

4.2 SAMPLE CUSTODY

Custody refers to the physical responsibility for sample identification, integrity, handling, and transportation; this responsibility is considered to be met if samples are in the responsible individual's physical possession or visual range after taking possession, secured so that no tampering can occur, or locked in an access-controlled area. Field sample custody is the responsibility of the assigned staff; laboratory chain of custody is the responsibility of the laboratory's sample custodian. Chain of custody (COC) refers to the history of the transportation of the samples from the water quality technician, to the transporter or carrier, and finally to the laboratory's sample custodian while maintaining custody at each step. Records of such transfers are maintained on the chain of custody forms provided by the laboratory. Each custodian shall sign the form when relinquishing or accepting sample custody. The laboratory sample custodian shall deliver copies of each completed chain of custody to the SWPPP Team Leader, and shall route hard copies with the associated analytical data package. The laboratory sample custodian shall physically certify sample condition, integrity, and identification, and shall immediately

report any observed discrepancies in the condition of the samples to the SWPPP Team Leader by fax, email or telephone.

5 QUALITY CONTROL PROCEDURES

Quality control (QC) procedures provide the means of controlling the precision and bias of the results. Careful adherence to the established procedures for sample collection, preservation and storage as listed below will help minimize errors due to sampling and sample instability.

5.1 FIELD QC PROCEDURES

Field forms and logbooks will be used to document field activities and record additional field observations. Time of collection will be noted in the field notebook and on sample COC forms. The specific parameters to be measured on a particular sample will be clearly listed on the COC form. The SWPPP Team Leader, Assistant Marine Operations Supervisor, or staff other than the actual recorder, will review COC forms prior to sample shipment to the laboratory to minimize transcription errors.

5.2 LAB QC PROCEDURES

All accredited lab operations have a written protocol, which provides sequential steps to be followed to ensure consistency of product. This protocol outlines the quality procedures taken when conducting laboratory tests. Specifically, the following QC parameters will be monitored:

- A blank will be run with each set of samples before the analysis to ensure integrity of the media, apparatus, and analyst technique.
- Discard all reagents that have reached their expiration date.
- Aseptic technique is practiced throughout the method.

All personnel performing any lab operations are trained to follow the protocol requirements for the duty performed.

6 DATA MANAGEMENT PROCEDURES

6.1 DATA REDUCTION

The laboratory has primary responsibility for performing analyses that meet method and project requirements for lab samples, performing data reduction, and documenting all information pertinent to sample analysis and data quality. Upon completion of analyses, all raw data will be reviewed by the laboratory to ensure that the acceptance requirements have been met. Laboratory supervisors are responsible for ensuring that exceptions to QC criteria are corrected in a timely manner. The SWPPP Team Leader will be notified of any QC criteria issues and the resulting corrective actions undertaken.

6.2 DATA MANAGEMENT

The analytical result for each sample parameter will be uniquely reported (i.e., only one value per sample parameter) by the laboratory. The laboratory shall provide a case narrative discussing any problems with the analyses, corrective actions taken, changes to the reference method, and an explanation of data qualifiers.

6.3 DATA REVIEW

In addition to internal laboratory QC procedures, data validation of chemistry data will be performed by the SWPPP Team Leader. Validation will include a review of all laboratory and field quality control data to determine validity of analytical results. COC forms will be checked to verify sample stability and integrity.

All analytical data packages received from the laboratory shall be validated by the SWPPP Team Leader in order to ensure that the laboratory has met all contractual requirements and applicable reference method requirements. The review shall include the following items:

- Specific problems associated with the analysis, as identified in the narrative summary;
- Chain of custody records for all samples, emphasizing identification, sampling dates, sample shipping and receipt dates, and sample holding times; cross-check dates against the field sampling records; and
- The completeness of the data package, as necessary to meet the minimum requirements of this plan, and as necessary to adequately evaluate the data.
- All conversations with the analytical laboratory to resolve questions related to the data package shall be documented.

Appendix D
Source Control BMPs
(Ecology, Stormwater Management Manual for Western Washington, 2012)

2.2 Pollutant Source-Specific BMPs

Where required by local code or by an Ecology NPDES Stormwater General Permit, implement the applicable (mandatory) source control BMPs at:

- Commercial properties
- Industrial properties
- Multifamily properties
- Boatyards
- Sand and gravel mining operations

The Industrial Stormwater General Permit requires covered facilities to consider the recommended source control BMPs for Level 1 and 2 corrective actions.

Industrial sites covered by individual industrial stormwater permits must comply with the specific source control and treatment BMPs listed in their permits. Operators under individual industrial stormwater permits may include additional BMPs from this manual, if desired.

The source-specific BMPs described in this section, may be applied to control the sources of pollutants identified in Appendix IV-A. Ecology encourages all operators of facilities that implement pollutant-generating sources in Appendix IV-A to review their SWPPPs and use both the applicable (mandatory) and recommended BMPs where possible.

There are some emerging technologies that can be used as source controls. If these technologies

S401 BMPs for the Building, Repair, and Maintenance of Boats and Ships

Description of Pollutant Sources: Sources of pollutants for the building, repair, and maintenance of boats and ships at boatyards, shipyards, ports, and marinas include pressure washing, surface preparation, paint removal, sanding, painting, engine maintenance and repairs, and material handling and storage, if conducted outdoors.

Potential pollutants include spent abrasive grits, solvents, oils, ethylene glycol, washwater, paint over-spray, cleaners/detergents, anti-corrosive compounds, paint chips, scrap metal, welding rods, resins, glass fibers, dust, and miscellaneous trash. Pollutant constituents include TSS, oil and grease, organics, copper, lead, tin, and zinc.

Pollutant Control Approach: Apply good housekeeping, preventive maintenance, and cover and contain BMPs in and around work areas.

Applicable Operational BMPs: Ecology's NPDES Boatyard General Permit requires coverage of all boatyards in Washington State which engage in the construction, repair and maintenance of small vessels, 85% of which are 65 feet or less in length, or revenues from which constitute more than 85% of gross receipts. Ecology may require coverage under an individual NPDES permit for large boatyards and shipyards in Washington State not covered by the Boatyard General Permit or Industrial Stormwater General Permit (ISGP). The applicable operational BMPs are:

- Clean regularly all accessible work, service, and storage areas to remove debris, spent sandblasting material, and any other potential stormwater pollutants.
- Avoid the use of soaps, detergents and other chemicals that need to be rinsed or hosed off in the water. If necessary, consider applying sparingly so that a sponge, towel or rag can be used to remove residuals. Consider instead washing the boat in a suitable controlled area (see S431 BMPs for Washing and Steam Cleaning Vehicles/ Equipment/ Building Structures) while it is out of the water.
- Sweep rather than hose debris on the dock. Collect and convey hose water to treatment if hosing is unavoidable,
- Collect spent abrasives regularly and store under cover to await proper disposal.
- Dispose of greasy rags, oil filters, air filters, batteries, spent coolant, and degreasers properly.
- Drain oil filters before disposal or recycling.
- Immediately repair or replace leaking connections, valves, pipes, hoses and equipment that causes the contamination of stormwater.
- Use drip pans, drop cloths, tarpaulins, or other protective devices in all paint mixing and solvent operations unless carried out in impervious contained and covered areas.
- Convey sanitary sewage to pump-out stations, portable on-site pump-outs, or commercial mobile pump-out facilities or other appropriate onshore facilities.
- Maintain automatic bilge pumps in a manner that will prevent automatic pumping of waste material into surface water.
- Prohibit uncontained spray painting, blasting or sanding activities over open water.
- Do not dump or pour waste materials down floor drains, sinks, or outdoor storm drain inlets that discharge to surface water. Plug floor drains connected to storm drains or to surface water. If necessary, install a regularly operated sump pump.

- Prohibit outside spray-painting, blasting, or sanding activities during windy conditions that render containment ineffective.
- Do not burn paint and/or use spray guns on topsides or above decks.
- Immediately clean up any spillage on pier, wharf, boat, ship deck, or adjacent surface areas and dispose of the wastes properly.
- In the event of an accidental discharge of oil or hazardous material into waters of the state or onto land with a potential for entry into state waters, immediately notify the yard, port, or marina owner or manager, local jurisdiction, the Department of Ecology, and the National Response Center(see Section 2.1, of this volume). If the spill can reach or has reached marine water, call the U.S. Coast Guard at 1-800-424-8802.

Applicable Structural Source Control BMPs:

- Use fixed platforms with appropriate plastic or tarpaulin barriers as work surfaces and for containment when performing work on a vessel in the water to prevent blast material or paint overspray from contacting stormwater or the receiving water. Keep use of such platforms to a minimum and do not perform extensive repair or construction in the water (anything in excess of 25 percent of the surface area of the vessel above the waterline).
- Use plastic or tarpaulin barriers beneath the hull and between the hull and dry dock walls to contain and collect waste and spent materials. Clean and sweep regularly to remove debris.
- Enclose, cover, or contain blasting and sanding activities to the maximum extent practicable to prevent abrasives, dust, and paint chips, from reaching storm sewers or receiving waters. Use plywood and/or plastic sheeting to cover open areas between decks when sandblasting (scuppers, railings, freeing ports, ladders, and doorways).
- Direct deck drainage to a collection system sump for settling and/or additional treatment.
- Store cracked batteries in covered secondary containers.
- Apply source control BMPs given in this chapter for other activities conducted at the marina, boat yard, shipyard, or port facility (S409 BMPs for Fueling at Dedicated Stations, S431 BMPs for Washing and Steam Cleaning Vehicle/Equipment/Building Structures, and S406 BMPs for Spills of Oil and Hazardous Substances).

Recommended Additional Operational BMPs:

- Consider recycling paint, paint thinner, solvents, used oils, oil filters, pressure wash wastewater and any other recyclable materials.
- Perform paint and solvent mixing, fuel mixing, etc. on shore.

Integrated Pest Management

An IPM program might consist of the following steps:

Step 1: Correctly identify problem pests and understand their life cycle

Step 2: Establish tolerance thresholds for pests.

Step 3: Monitor to detect and prevent pest problems.

Step 4: Modify the maintenance program to promote healthy plants and discourage pests.

Step 5: Use cultural, physical, mechanical or biological controls first if pests exceed the tolerance thresholds.

Step 6: Evaluate and record the effectiveness of the control and modify maintenance practices to support lawn or landscape recovery and prevent recurrence.

For an elaboration of these steps, refer to Appendix IV-F.

S412 BMPs for Loading and Unloading Areas for Liquid or Solid Material

Description of Pollutant Sources: Operators typically conduct loading/unloading of liquid and solid materials at industrial and commercial facilities at shipping and receiving, outside storage, fueling areas, etc. Materials transferred can include products, raw materials, intermediate products, waste materials, fuels, scrap metals, etc. Leaks and spills of fuels, oils, powders, organics, heavy metals, salts, acids, alkalis, etc. during transfer may cause stormwater contamination. Spills from hydraulic line breaks are a common problem at loading docks.

Pollutant Control Approach: Cover and contain the loading/unloading area where necessary to prevent run-on of stormwater and runoff of contaminated stormwater.

Applicable Operational BMPs:

At All Loading/ Unloading Areas:

- A significant amount of debris can accumulate at outside, uncovered loading/unloading areas. Sweep these surfaces frequently to remove loose material that could contaminate stormwater. Sweep areas temporarily covered after removal of the containers, logs, or other material covering the ground.
- Place drip pans, or other appropriate temporary containment device, at locations where leaks or spills may occur such as hose connections, hose reels and filler nozzles. Always use drip pans when making and breaking connections (see Figure 2.2.2). Check loading/ unloading equipment such as valves, pumps, flanges, and connections regularly for leaks and repair as needed.

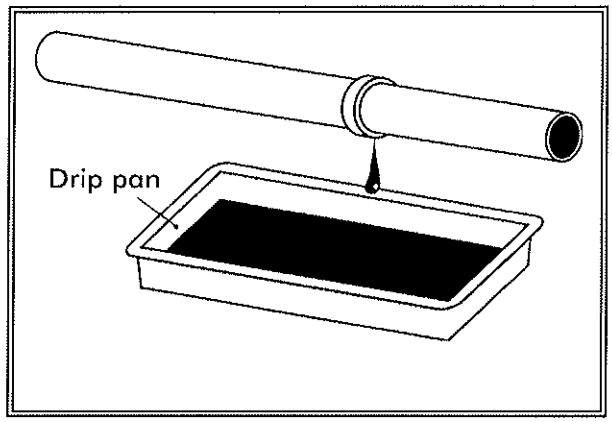

Figure 2.2.2 – Drip Pan

At Tanker Truck and Rail Transfer Areas to Above/Below-ground Storage Tanks:

- To minimize the risk of accidental spillage, prepare an "Operations Plan" that describes procedures for loading/unloading. Train the employees, especially fork lift operators, in its execution and post it or otherwise have it readily available to all employees.
- Report spills of reportable quantities to Ecology.
- Prepare and implement an Emergency Spill Cleanup Plan for the facility (See S406 BMPs for Spills of Oil and Hazardous Substances) which includes the following BMPs:
  - Ensure the cleanup of liquid/solid spills in the loading/unloading area immediately, if a significant spill occurs, and, upon completion of the loading/unloading activity, or, at the end of the working day.
  - Retain and maintain an appropriate oil spill cleanup kit on-site for rapid cleanup of material spills. (See S406 BMPs for Spills of Oil and Hazardous Substances).
  - Ensure that an employee trained in spill containment and cleanup is present during loading/unloading.

At Rail Transfer Areas to Above/below-ground Storage Tanks: Install a drip pan system as illustrated (see Figure 2.2.3) within the rails to collect spills/leaks from tank cars and hose connections, hose reels, and filler nozzles.

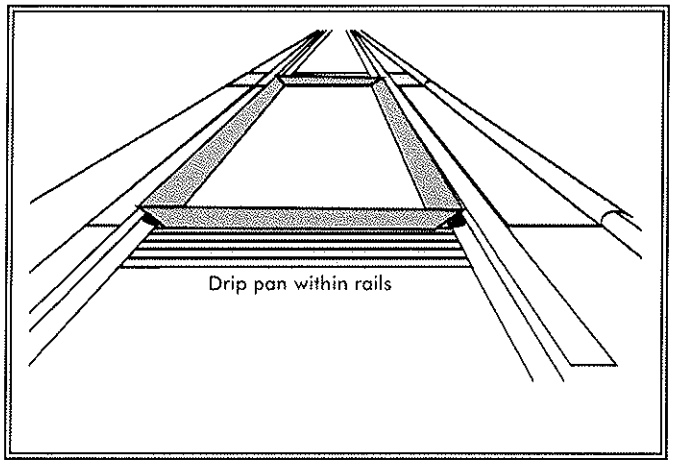

Figure 2.2.3 – Drip Pan Within Rails

Loading/Unloading from/to Marine Vessels: Facilities and procedures for the loading or unloading of petroleum products must comply with Coast Guard requirements specified in Appendix IV-D R.5.

Transfer of Small Quantities from Tanks and Containers: Refer to BMPs Storage of Liquids in Permanent Above-Ground Tanks, and Storage of Liquid, Food Waste, or Dangerous Waste Containers, for requirements on the transfer of small quantities from tanks and containers, respectively.

Applicable Structural Source Control BMPs:

At All Loading/ Unloading Areas:

- Consistent with Uniform Fire Code requirements (Appendix IV-D R.2) and to the extent practicable, conduct unloading or loading of solids and liquids in a manufacturing building, under a roof, or lean-to, or other appropriate cover.
- Berm, dike, and/or slope the loading/unloading area to prevent run-on of stormwater and to prevent the runoff or loss of any spilled material from the area.
- Place curbs along the edge of the shoreline, or slope the edge such that the stormwater can flow to an internal storm sewer system that leads to an approved treatment BMP. Avoid draining directly to the surface water from loading areas.
- Pave and slope loading/unloading areas to prevent the pooling of water. Minimize the use of catch basins and drain lines within the interior of the paved area or place catch basins in designated "alleyways" that are not covered by material, containers, or equipment.
- Retain on-site the necessary materials for rapid cleanup of spills.

Recommended Structural Source Control BMP: For the transfer of pollutant liquids in areas that cannot contain a catastrophic spill, install an automatic shutoff system in case of unanticipated off-loading interruption (e.g. coupling break, hose rupture, overfill, etc.).

At Loading and Unloading Docks:

- Install/maintain overhangs, or door skirts that enclose the trailer end (see Figures 2.2.4 and 2.2.5) to prevent contact with rainwater.
- Design the loading/unloading area with berms, sloping, etc. to prevent the run-on of stormwater.

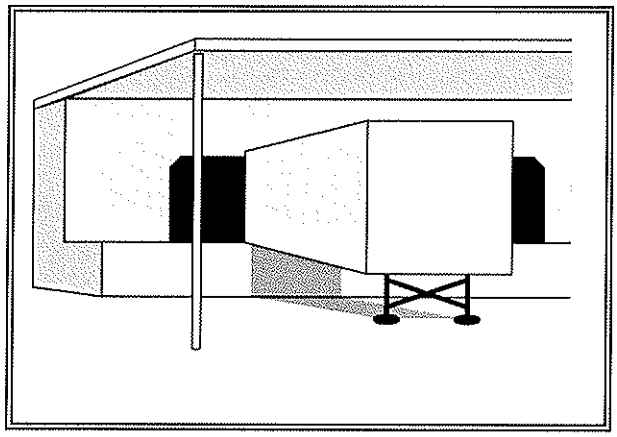

Figure 2.2.4 – Loading Dock with Door Skirt

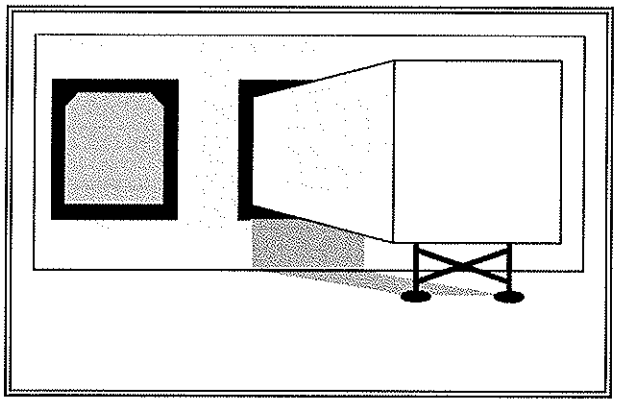

Figure 2.2.5 – Loading Dock with Overhang

At Tanker Truck Transfer Areas to Above/Below-Ground Storage Tanks:

- Pave the area on which the transfer takes place. If any transferred liquid, such as gasoline, is reactive with asphalt, pave the area with Portland cement concrete.

- Slope, berm, or dike the transfer area to a dead-end sump, spill containment sump, a spill control oil/water separator, or other spill control device. The minimum spill retention time should be 15 minutes at the greater flow rate of the highest fuel dispenser nozzle through-put rate, or the peak flow rate of the 6-month, 24-hour storm event over the surface of the containment pad, whichever is greater. The capacity of the spill containment sump should be a minimum of 50 gallons with adequate additional volume provided for grit sedimentation.

S413 BMPs for Log Sorting and Handling

Description of Pollutant Sources: Log yards are paved or unpaved areas where logs are transferred, sorted, debarked, cut, and stored to prepare them for shipment or for the production of dimensional lumber, plywood, chips, poles, or other products. Log yards are generally maintained at sawmills, shipping ports, and pulp mills. Typical pollutants include oil and grease, BOD, settleable solids, total suspended solids (including soil), high and low pH, heavy metals, pesticides, wood-based debris, and leachate

The following are pollutant sources:

- Log storage, rollout, sorting, scaling, and cutting areas
- Log and liquid loading areas
- Log sprinkling
- Debarking, bark bin and conveyor areas
- Bark, ash, sawdust and wood debris piles, and solid wastes
- Metal salvage areas
- Truck, rail, ship, stacker, and loader access areas
- Log trucks, stackers, loaders, forklifts, and other heavy equipment
- Maintenance shops and parking areas
- Cleaning areas for vehicles, parts, and equipment
- Storage and handling areas for hydraulic oils, lubricants, fuels, paints, liquid wastes, and other liquid materials
- Pesticide usage for log preservation and surface protection
- Application of herbicides for weed control
- Contaminated soil resulting from leaks or spills of fluids

Ecology's Baseline General Permit Requirements:

Industries with log yards are required to obtain coverage under the Industrial Stormwater General Permit for discharges of stormwater associated with industrial activities. The permit requires preparation and on-site retention of an Industrial Stormwater Pollution Prevention Plan

Recommended Treatment BMPs:

Install biofiltration swales and filter strips – (See Chapter 9, Volume V) to treat roadside runoff wherever practicable and use engineered topsoils wherever necessary to maintain adequate vegetation. These systems can improve infiltration and stormwater pollutant control upstream of roadside ditches.

S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems

Description of Pollutant Sources: Facilities include roadside catch basins on arterials and within residential areas, conveyance systems, detention facilities such as ponds and vaults, oil/water separators, biofilters, settling basins, infiltration systems, and all other types of stormwater treatment systems presented in Volume V. Oil and grease, hydrocarbons, debris, heavy metals, sediments and contaminated water are found in catch basins, oil and water separators, settling basins, etc.

Pollutant Control Approach: Provide maintenance and cleaning of debris, sediments, and oil from stormwater collection, conveyance, and treatment systems to obtain proper operation.

Applicable Operational BMPs:

Maintain stormwater treatment facilities per the operations and maintenance (O&M) procedures presented in Section 4.6 of Volume V in addition to the following BMPs:

- Inspect and clean treatment BMPs, conveyance systems, and catch basins as needed, and determine necessary O&M improvements.
- Promptly repair any deterioration threatening the structural integrity of stormwater facilities. These include replacement of clean-out gates, catch basin lids, and rock in emergency spillways.
- Ensure adequacy of storm sewer capacities and prevent heavy sediment discharges to the sewer system.
- Regularly remove debris and sludge from BMPs used for peak-rate control, treatment, etc. and discharge to a sanitary sewer if approved by the sewer authority, or truck to an appropriate local or state government approved disposal site.
- Clean catch basins when the depth of deposits reaches 60 percent of the sump depth as measured from the bottom of basin to the invert of the lowest pipe into or out of the basin. However, in no case should there be less than six inches clearance from the debris surface to the invert of the lowest pipe. Some catch basins (for example, WSDOT Type 1L basins) may have as little as 12 inches sediment storage below the invert. These catch basins need frequent inspection and cleaning to prevent scouring. Where these catch basins are part of a stormwater collection and treatment system, the system

owner/operator may choose to concentrate maintenance efforts on downstream control devices as part of a systems approach.

- Clean woody debris in a catch basin as frequently as needed to ensure proper operation of the catchbasin.
- Post warning signs; "Dump No Waste - Drains to Ground Water," "Streams," "Lakes," or emboss on or adjacent to all storm drain inlets *where possible*.
- Disposal of sediments and liquids from the catch basins must comply with "Recommendations for Management of Street Wastes" described in Appendix IV-G of this volume.

Additional Applicable BMPs: Select additional applicable BMPs from this chapter depending on the pollutant sources and activities conducted at the facility. Those BMPs include:

- S425 BMPs for Soil Erosion and Sediment Control at Industrial Sites
- S427 BMPs for Storage of Liquid, Food Waste, or Dangerous Waste Containers
- S406 BMPs for Spills of Oil and Hazardous Substances
- S410 BMPs for Illicit Connections to Storm Drains
- S430 BMPs for Urban Streets

S418 BMPs for Manufacturing Activities - Outside

Description of Pollutant Sources: Manufacturing pollutant sources include outside process areas, stack emissions, and areas where manufacturing activity has taken place in the past and significant exposed pollutant materials remain.

Pollution Control Approach: Cover and contain outside manufacturing and prevent stormwater run-on and contamination, where feasible.

Applicable Operational BMP:

- Sweep paved areas regularly, as needed, to prevent contamination of stormwater.
- Alter the activity by eliminating or minimizing the contamination of stormwater.
- **Applicable Structural Source Control BMPs:** Enclose the activity (see Figure 2.2.6): If possible, enclose the manufacturing activity in a building.
- Cover the activity and connect floor drains to a sanitary sewer, if approved by the local sewer authority. Berm or slope the floor as needed to prevent drainage of pollutants to outside areas. (Figure 2.2.7)

- Two, five-gallon buckets with lids.

- Use automatic shutoff nozzles for dispensing the fuel. Replace automatic shut-off nozzles as recommended by the manufacturer.
- Maintain and replace equipment on fueling vehicles, particularly hoses and nozzles, at established intervals to prevent failures.

Applicable Structural Source Control BMPs: Include the following fuel transfer site components:

- Automatic fuel transfer shut-off nozzles.
- An adequate lighting system at the filling point.

S420 BMPs for Painting/ Finishing /Coating of Vehicles/Boats/ Buildings/ Equipment

Description of Pollutant Sources: Surface preparation and the application of paints, finishes, and/or coatings to vehicles, boats, buildings, and/or equipment outdoors can be sources of pollutants. Potential pollutants include organic compounds, oils and greases, heavy metals, and suspended solids.

Pollutant Control Approach: Cover and contain painting and sanding operations and apply good housekeeping and preventive maintenance practices to prevent the contamination of stormwater with painting over sprays and grit from sanding.

Applicable Operational BMPs:

- Train employees in the careful application of paints, finishes, and coatings to reduce misuse and over spray. Use drop cloths underneath outdoor painting, scraping, sandblasting work, and properly clean and temporarily store collected debris daily.
- Do not conduct spraying, blasting, or sanding activities over open water or where wind may blow paint into water.
- Wipe up spills with rags and other absorbent materials immediately. Do not hose down the area to a storm sewer, receiving water, or conveyance ditch.
- On marine dock areas sweep rather than hose down debris. Collect any hose water generated and convey to appropriate treatment and disposal.
- Use an effective runoff control device if dust, grit, washwater, or other pollutants may escape the work area and enter a catch basin. The containment device(s) must be in place at the beginning of the workday. Collect contaminated runoff and solids and properly dispose of such wastes before removing the containment device(s) at the end of the workday.

- Use a ground cloth, pail, drum, drip pan, tarpaulin, or other protective device for activities such as outdoor paint mixing and tool cleaning, or where spills can contaminate stormwater.
- Properly dispose of all wastes and prevent all uncontrolled releases to the air, ground, or water.
- Clean brushes and tools covered with non-water-based paints, finishes, or other materials in a manner that allows collection of used solvents (e.g., paint thinner, turpentine, xylol, etc.) for recycling or proper disposal.
- Store toxic materials under cover (tarp, etc.) during precipitation events and when not in use to prevent contact with stormwater.

Applicable Structural Source Control BMPs: Enclose and/or contain all work while using a spray gun or conducting sand blasting and in compliance with applicable air pollution control, OSHA, and WISHA requirements. Do not conduct outside spraying, grit blasting, or sanding activities during windy conditions that render containment ineffective.

Recommended Additional Operational BMPs:

- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers. Dump pollutants collected in portable containers into a sanitary sewer drain, NOT a stormwater drain.
- Recycle paint, paint thinner, solvents, pressure washwater, and any other recyclable materials.
- Use efficient spray equipment such as electrostatic, air-atomized, high volume/low pressure, or gravity feed spray equipment.
- Purchase recycled paints, paint thinner, solvents, and other products, if feasible.

S421 BMPs for Parking and Storage of Vehicles and Equipment

Description of Pollutant Sources: Public and commercial parking lots such as retail store, fleet vehicle (including rent-a-car lots and car dealerships), equipment sale and rental parking lots, and parking lot driveways, can be sources of toxic hydrocarbons and other organic compounds, including oils and greases, metals, and suspended solids.

Pollutant Control Approach: If the parking lot is a **high-use site** as defined below, provide appropriate oil removal equipment for the contaminated stormwater runoff.

Applicable Operational BMPs:

- If washing a parking lot, discharge the washwater to a sanitary sewer, if allowed by the local sewer authority, or other approved wastewater treatment system, or collect washwater for off-site disposal.

- Do not hose down the area to a storm sewer or receiving water. Vacuum sweep parking lots, storage areas, and driveways regularly to collect dirt, waste, and debris.

Applicable Treatment BMPs: An oil removal system such as an API or CP oil and water separator, catch basin filter, or equivalent BMP, approved by the local jurisdiction, is necessary for parking lots meeting the threshold vehicle traffic intensity level of a *high-use site.*

Vehicle High-Use Sites

Establishments subject to vehicle high-use intensity are significant sources of oil contamination of stormwater. Examples of potential high use areas include customer parking lots at fast food stores, grocery stores, taverns, restaurants, large shopping malls, discount warehouse stores, quick-lube shops, and banks. If the PGIS for a high-use site exceeds 5,000 square feet in a threshold discharge area, an oil control BMP from the Oil Control Menu (in Volume V) is necessary. A high-use site at a commercial or industrial establishment has one of the following characteristics: (Gaus/King County, 1994)

- Is subject to an expected average daily vehicle traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area: or
- Is subject to storage of a fleet of 25 or more diesel vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.).

S422 BMPs for Railroad Yards

Description of Pollutant Sources: Pollutant sources can include:

- Drips/leaks of vehicle fluids onto the railroad bed
- Human waste disposal
- Litter
- Locomotive/railcar/equipment cleaning areas
- Fueling areas
- Outside material storage areas
- Erosion and loss of soil particles from the railroad bed
- Maintenance and repair activities at railroad terminals
- Switching and maintenance yards
- Herbicides used for vegetation management.

Waste materials can include waste oil, solvents, degreasers, antifreeze solutions, radiator flush, acids, brake fluids, soiled rags, oil filters, sulfuric acid and battery sludges, and machine chips with residual machining oil and toxic fluids/solids lost during transit. Potential pollutants include oil and grease, TSS, BOD, organics, pesticides, and metals.

S425 BMPs for Soil Erosion and Sediment Control at Industrial Sites

Description of Pollutant Sources: Industrial activities on soil areas; exposed and disturbed soils; steep grading; etc. can be sources of sediments that can contaminate stormwater runoff.

Pollutant Control Approach: Limit the exposure of erodible soil, stabilize, or cover erodible soil where necessary to prevent erosion, and/or provide treatment for stormwater contaminated with TSS caused by eroded soil.

Applicable BMPs:

Cover Practice Options:

- Vegetative cover such as grass, trees, shrubs, on erodible soil areas.
- Covering with mats such as clear plastic, jute, synthetic fiber.
- Preservation of natural vegetation including grass, trees, shrubs, and vines.

Structural Practice Options:

- Vegetated swale
- Dike
- Silt fence
- Check dam
- Gravel filter berm
- Sedimentation basin
- Proper grading.

(For design information refer to Volume II, "Standards and Specifications for BMPs").

S426 BMPs for Spills of Oil and Hazardous Substances

Description of Pollutant Sources: Federal law requires owners or operators of facilities engaged in drilling, producing, gathering, storing, processing, transferring, distributing, refining, or consuming oil and/or oil products to have a Spill Prevention and Emergency Cleanup Plan (SPECP). The SPECP is required if the above ground storage capacity of the facility, is 1,320 gallons or more of oil. Additionally, the SPECP is required if any single container with a capacity in excess of 660 gallons and which, due to their location, could reasonably be expected to discharge oil in harmful quantities, as defined in 40 CFR Part 110, into or upon the navigable waters of the United States or adjoining shorelines {40 CFR 112.1 (b)}. Onshore and offshore facilities, which, due to their location, could not reasonably be expected to discharge oil into or upon

the navigable waters of the United States or adjoining shorelines are exempt from these regulations {40 CFR 112.1(1)(i)}. State Law requires owners of businesses that produce dangerous wastes to have a SPECP. These businesses should refer to Appendix IV-D R.6. The federal definition of oil is oil of any kind or any form, including, but not limited to petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil.

Pollutant Control Approach: Maintain, update, and implement a Spill Prevention and Emergency Cleanup Plan.

Applicable Operational BMPs: The businesses and public agencies identified in Appendix IV-A required to prepare and implement a Spill Prevention and Emergency Cleanup Plan shall implement the following:

- Prepare a Spill Prevention and Emergency Cleanup Plan (SPECP), which includes:
  - A description of the facility including the owner's name and address.
  - The nature of the activity at the facility.
  - The general types of chemicals used or stored at the facility.
  - A site plan showing the location of storage areas for chemicals, the locations of storm drains, the areas draining to them, and the location and description of any devices to stop spills from leaving the site such as positive control valves.
  - Cleanup procedures.
  - Notification procedures used in the event of a spill, such as notifying key personnel. Agencies such as Ecology, local fire department, Washington State Patrol, and the local Sewer Authority, shall be notified.
  - The name of the designated person with overall spill cleanup and notification responsibility.
- Train key personnel in the implementation of the SPECP. Prepare a summary of the plan and post it at appropriate points in the building, identifying the spill cleanup coordinators, location of cleanup kits, and phone numbers of regulatory agencies to contact in the event of a spill.
- Update the SPECP regularly.
- Immediately notify Ecology, the local jurisdiction, and the local Sewer Authority if a spill may reach sanitary or storm sewers, ground water, or surface water, in accordance with federal and Ecology spill reporting requirements.

- Immediately clean up spills. Do not use emulsifiers for cleanup unless there is an appropriate disposal method for the resulting oily wastewater. Do not wash absorbent material down a floor drain or into a storm sewer.
- Locate emergency spill containment and cleanup kit(s) in high-potential spill areas. The contents of the kit shall be appropriate for the type and quantities of chemical liquids stored at the facility.

Recommended Additional Operational BMP: Spill kits should include appropriately lined drums, absorbent pads, and granular or powdered materials for neutralizing acids or alkaline liquids where applicable. In fueling areas: Package absorbent material in small bags for easy use and make available small drums for storage of absorbent and/or used absorbent. Deploy spill kits in a manner that allows rapid access and use by employees.

S427 BMPs for Storage of Liquid, Food Waste, or Dangerous Waste Containers

Description of Pollutant Sources: Steel and plastic drums with volumetric capacities of 55 gallons or less are typically used at industrial facilities for container storage of liquids and powders. The BMPs specified below apply to container(s) located outside a building. Use these BMPs when temporarily storing accumulated food wastes, vegetable or animal grease, used oil, liquid feedstock, cleaning chemicals, or Dangerous Wastes (liquid or solid). These BMPs do not apply when Ecology has permitted the business to store the wastes (Appendix IV-D R.4). Leaks and spills of pollutant materials during handling and storage are the primary sources of pollutants. Oil and grease, acid/alkali pH, BOD, COD are potential pollutant constituents.

Pollutant Control Approach: Store containers in impervious containment under a roof, or other appropriate cover, or in a building. When collection trucks directly pick up roll-containers, ensure a filet is on both sides of the curb to facilitate moving the dumpster. For storage areas on-site for less than 30 days, consider using a portable temporary secondary system like that shown in Figure 2.2.8 in lieu of a permanent system as described above.