

# The State of the Columbia Slough

2009  
Annual Report

## Columbia Slough Sediment Project



ENVIRONMENTAL SERVICES  
CITY OF PORTLAND  
working for clean rivers

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# **Columbia Slough Sediment Program 2009 Annual Report**

## **1. Columbia Slough Sediment Program Background**

Since 1993, the City of Portland, Bureau of Environmental Services (BES) and the State Department of Environmental Quality (DEQ) have implemented actions to improve sediment quality in the Columbia Slough. Early studies and subsequent follow-up investigations indicate widespread, low-level contamination throughout the Slough's sediments with a few isolated areas of higher contamination. Routine dredging or capping actions alone will not be effective at reducing risks associated with the contamination because the Slough is shallow and the contamination is ubiquitous.

DEQ and the City devised a cleanup approach for the Columbia Slough which was documented in a Record of Decision (ROD) issued in July 2005. The approach consists of three primary elements:

1. Source control – Implementing actions that address the sources of contamination to reduce contaminant inputs. Addressing the sources of contamination is important because it will prevent recontamination of remediated sediments and allow natural recovery processes to effectively reduce existing contamination in the Slough
2. “Hot spot” cleanup – Dredging sediments that are contaminated at levels that exceed the general pervasive level of contamination throughout the Slough
3. Long-term monitoring – Evaluating the effectiveness of the actions taken and identify areas where more focused attention is necessary

An initial broad-scale sampling event was conducted in 1994/1995, results of which were documented in the Screening Level Risk Assessment (SLRA) for the Slough. Several smaller studies have been completed in the interim and provided the foundation for development of the remedial approach. A Feasibility Study for the Slough was completed in 2004 and the ROD signed in July 2005. Implementation of the ROD was officially initiated in 2006; however, many aspects of the remedial approach were already in progress. These actions were pulled into the framework established in the ROD.

In 2006, BES and DEQ signed an Intergovernmental Agreement (IGA) forming a partnership to jointly implement the remedial approach for sediment contamination in the Columbia Slough. The IGA establishes a workplan for both BES and DEQ to reduce releases of contaminants to the Slough to protective levels and conduct long-term monitoring of various parameters to assess progress.

BES and DEQ will implement programs and actions in a watershed, or geographic, approach. With a watershed approach, the actions mimic the natural soil, vegetation, and hydrologic functions of a watershed. The actions are targeted at the source of the problem rather than the symptoms, and they are multi-objective. The watershed approach also incorporates adaptive

management principals in that the sediment program will be modified based on data collected to optimize the actions to improve Columbia Slough watershed health.

The overall goal of the ROD and IGA is to reduce contaminant levels in the Slough sediment to concentrations that are protective of human health and the environment. Actions specified in the IGA to achieve this goal include:

- Controlling the sources of pollution to reduce the amount of contaminants reaching the slough
- Long-term monitoring of watershed conditions to determine long-term trends
- Updating the public and providing opportunities for the public to provide input
- Modifying actions as warranted based on the data collected (adaptive management)

Source control actions and priorities are specified in the *Columbia Slough Sediment Program Watershed Action Plan* which was finalized in October 2006. Source control activities include:

- Conducting in-depth investigations to identify and control sources of contamination and recommend remedial actions and future monitoring
- Constructing water quality facilities, such as swales, planters, rain gardens, and eco-roofs to treat stormwater before it is discharged to the slough
- Ensuring best management practices (BMPs) at private businesses and industries are implemented to reduce input from widespread sources of contamination
- Providing technical assistance to businesses that use or manage hazardous substances to help them reduce contaminant input to stormwater runoff
- Educating students and adults who live and/or work in the Slough watershed
- Increasing vegetation in drainage areas to increase soil stability and stormwater infiltration

This fourth Annual Report covers fiscal year (FY) 2009 (July 1, 2008 – June 30, 2009). The purpose of this report is to provide an update on the progress BES and DEQ are making in implementing the IGA and improving watershed health and to identify activities planned for the upcoming year.

Section 1 provides background information about the program. Section 2 describes the accomplishments for the year. Section 3 describes the actions planned for the next fiscal year (July 1, 2009 – June 30, 2010).

Many of the reports referenced are available on-line at either the BES or DEQ web site:  
[www.portlandonline.com/bes](http://www.portlandonline.com/bes)  
<http://www.deq.state.or.us/wmc/cu/NWR/ColumbiaSlough/index.htm>.

## **Watershed Action Plan**

In 2006, BES and DEQ completed the *Columbia Slough Sediment Watershed Action Plan* (the Plan) (found on line at: <http://www.portlandonline.com/bes/index.cfm?c=eeage>).

The Plan describes the actions that will be implemented to reduce sources of contamination to the Slough to protective levels so that natural recovery processes will be effective. The Plan recognizes on-going efforts and describes an approach for prioritizing areas in the watershed for

more focused efforts. The Plan provides a framework for ultimately addressing all sources of contamination to the Slough. The Plan includes a prioritization of storm sewer basins within the Slough Watershed so that comprehensive source control can be implemented sequentially beginning with the areas of greatest concern to Slough sediment.

BES identified five areas of the Slough watershed, described below, for targeted actions. These Target Areas were selected based on the amount of total suspended solids (TSS) discharged from the Municipal Separated Storm Sewer System (MS4), the presence of elevated levels of contamination in slough sediments, and opportunities for partnerships when implementing actions.

### **Interstate 5 to Martin Luther King Jr. Blvd.**

This stretch of the lower Slough is located between NE Bayard and NE MLK and receives drainage from an area of approximately 187 acres. This is a Target Area because of the quantity of TSS being discharged into this area, the elevated levels of contamination in the sediment, and the presence of three former CSO outfalls.

### **Marx-Whitaker Slough**

Marx-Whitaker Slough is a one-mile side-channel of the main Slough. It is located between NE 118<sup>th</sup> and NE 129<sup>th</sup>, and receives drainage from an area of approximately 434 acres. This reach is a Target Area because of the quantity of TSS reaching this slough (five outfalls within this Area rated high in total TSS discharged) and the elevated level of contamination in the sediment. There are clear sources of TSS (the agricultural fields and high traffic volume roads) where actions will be targeted.

### **Buffalo Slough**

Buffalo Slough is a one-mile side-channel of the middle Slough. It is located between NE 33<sup>rd</sup> and NE 42<sup>nd</sup>, and it receives drainage from an area of approximately 42 acres. This reach is a Target Area because of the quantity of TSS discharged into the reach in the past and because it has elevated levels of contamination.

### **Cully Neighborhood**

This area, from NE 42<sup>nd</sup> to NE 82<sup>nd</sup>, is adjacent to the Cully neighborhood in northeast Portland. BES will focus on two outfalls, OF 77 and OF 77a, which are located near NE 69<sup>th</sup>. The drainage area is approximately 103 acres. This is a Target Area because of the quantity of TSS being discharged from the two outfalls.

### **St Johns Landfill**

The St Johns Landfill is located in the near Rivergate north of Columbia Blvd. and drains an area of approximately 208 acres. This Target Area is a priority because of the quantity of TSS being discharged from two outfalls. Also, opportunities exist for collaboration with DEQ-required investigations at the landfill and other contaminated sites in this section of the Slough.

## **2. Fiscal Year 2009 Actions Accomplished**

### **2.1 Target Areas**

Activities in FY2009 primarily focused on the I-5 to MLK and Marx-Whitaker Target Areas which were identified as the highest priority areas in the Watershed Action Plan.

#### **I-5 to MLK Target Area**

Work continued on the source investigation report for outfalls 60, 61, 61a, 62, 62a, 63 and 64. These outfalls discharge to the Slough near I-5. Stormwater runoff from I-5 itself discharges to the Slough via ODOT Outfall 61a.

As part of the source investigation, BES is reviewing available site records to identify current and past businesses and to evaluate pathways and types of contaminants to the Slough from individual sources. Site inspections are being conducted in a joint manner with DEQ to further evaluate source control measures that are needed.

DEQ developed and implemented a plan for sampling sediments in this segment of the Slough using settlement funds from parties with properties that likely contributed to the contamination. Eight responsible parties in this segment of the Slough reached an agreement with DEQ to contribute funds for investigation and cleanup of Slough sediments in exchange for release from liability for sediment contamination. The consent judgments required that parties complete upland source control actions to ensure that further releases of contamination to the Slough are prevented. DEQ collected three incremental, 22 composite, and 12 bioassay sediment samples from the segment of the Slough between City outfalls 59 and 65. Samples are currently being analyzed and a report will be prepared in 2010. This data will help to inform the need for further site discovery and provide the basis for evaluating remedial options.

#### **Marx-Whitaker Target Area**

Portland Parks and Recreation (PP&R) owns 15 acres of land in the vicinity of NE 122<sup>nd</sup> and NE Shaver. This land was farmed for many years, and erosion from this property contributed significant quantities of sediment to Marx-Whitaker Slough. PP&R, which stopped leasing their property for farming, completed a master plan for a park on the property. Beech Park will feature passive and active recreation. The park will also have stormwater management swales which will reduce stormwater runoff and sediment from entering the city's storm sewer system.

#### **Buffalo Slough Target Area**

No new activity in the Buffalo Slough Target Area occurred during the year. DEQ Site Assessment staff initiated site discovery efforts in the upper portion of the Buffalo Slough to identify likely sources of the elevated chromium in sediments.

#### **Cully Neighborhood Target Area**

The Portland Department of Transportation hired a consultant to develop options for greenstreets in this area. BES conducted site visits to identify sources of TSS discharged from OF 77a, and to identify potential greenstreet sites.

## **St. Johns Landfill**

Metro continued to work with DEQ on the investigation and risk assessment associated with the landfill. The draft Remedial Investigation Report is expected to be available in early 2010.

## **2.1 Site Cleanup**

### **Specific Site Actions**

Significant progress has been made on investigation and cleanup of sites in each section of the Slough Watershed. Highlights for FY2009 are summarized below by Slough segment.

#### **Lower Slough**

There are currently 30 active cleanup sites in the lower Columbia Slough watershed. At most sites the initial phases of investigation on the upland portions of the properties have been conducted. At some sites, sampling has been completed in the Slough itself. Highlights include the following:

- Source control actions have been determined at Dynea site (ECSI # 161), 2301 N. Columbia Blvd.
- A preliminary site characterization was completed at Harbor Oil (ECSI # 24) on Force Lake. Draft Human Health Risk Assessment and Ecological Risk Assessment reports have been submitted.
- A focused feasibility study for upland soil contamination is under development for the Blasen Family LLC property (ECSI #3785) located at 1601 N Columbia Blvd.
- DEQ-approved work plans were developed for an investigation at Columbia Steel Casting Co. (ECSI #130) to evaluate possible metals impacts from groundwater and stormwater runoff to Wapato Wetlands.
- The former Joslyn Wood Manufacturing Corporation (ECSI #130), located on the Columbia Steel Casting Co. property at 10425 North Bloss Ave., completed periodic (5-year) sampling of monitoring wells in the area of a former wood treatment pond.
- Groundwater cleanup started at the South Larsen site (ECSI #3337), 10145 N. Portland Rd.
- A feasibility study for in-water remediation has been prepared for the Pacific Carbide and Alloys (ECSI # 268) site located at 9901 N Hurst Ave.
- Source control actions (native vegetation plantings) at the Wastech site (ECSI # 1271) located at 701 Hunt St. was determined to be adequate.
- A remedy was selected for the upland portion of the Pacific Meat site (ECSI # 145) located at 2701 N Newark St., and a Consent Judgment for in-water Slough cleanup was signed. A Remedial Design and Remedial Action Work Plan was prepared.
- A feasibility study was prepared for Precision Equipment (ECSI # 152) site located at 8440 N Kerby Ave.
- Source control actions were implemented at the former Columbia Aluminum and Recycling Company (CARCO) site (ECSI #3389).
- Groundwater investigation work continued and source control actions were initiated at Madacam Aluminum and Bronze (ECSI #3389). Actions included removal of contaminated sediment from pipes associated with their outfall and installation of a filtration system at the outfall.

- A screening assessment of Bob's Metals (ECSI #5094), located at 1815 N Columbia Blvd., was completed. A Source Control Evaluation Agreement was drafted to move forward on this site.
- A screening assessment of two Ferguson/Familian sites, located at 1945 N. Columbia (ECSI # 2847) and 2121 N. Columbia Blvd. (ECSI #3860) was completed.
- DEQ's Site Assessment and Water Quality Program (Stormwater and UICs) performed an updated assessment of the Hoffman Property (ECSI #2846) located at 9038 N. Denver Avenue. DEQ referred the site to EPA Region 10 for Site Investigation.
- An assessment of the Blasen & Blasen Lumber Corp. property (ECSI #4140) located at 2155 N. Columbia Blvd. was initiated.
- An assessment was initiated at MB Terminals located at 3841 N Columbia Blvd. (ECSI # 339).
- A site assessment was initiated at the BPA St Johns substation (ECSI #1858), 12375 N. Columbia Blvd.
- Responsible parties at the Union Carbide site signed a Consent Judgment for settlement of contribution to Slough contamination which also included a natural resource damage payment toward Columbia Slough habitat restoration.
- Additional methane investigation activities, including vapor point installation and monitoring, were conducted at the Hanson Pipe site located at 1601 N. Columbia Blvd
- A remedial investigation was completed and a feasibility study work plan was approved for the Fuel Processors/Merit Oil Site, located at 4150 N. Suttle Road. Additional wetland sediment sampling was conducted to assist with remedial design.

### **Middle Slough**

There are currently nine active cleanup sites in the middle Columbia Slough. For the most part these sites involve contaminated groundwater that is not expected to adversely impact the Slough. Based on sediment data collected in 2008 a No Further Action determination was made for the AMC site located at 4635 NE Cornfoot Rd near the Portland Airport. Groundwater cleanup was completed at the Cadet Manufacturing site, 6225 NE 105<sup>th</sup> Ave.

### **Whitaker Slough**

This tributary to the main stem of the middle Slough has seven active cleanup projects including those in the vicinity of Johnson Lake which is connected to Whitaker Slough.

A remedy was selected for Johnson Lake. Upland remedial action at the adjacent Owens Brockway facility was initiated with capping of the lake to follow. Owens negotiated a settlement with DEQ for release from liability for sediment cleanup. The settlement included \$100,000 to be used for investigation and cleanup of sediments and \$50,000 for natural resource recovery in the middle Slough. In addition, up to \$25,000 will be paid for natural resource recovery in the vicinity of Johnson Lake, pending permit evaluation for the



Start of remedial action at Johnson Lake

Lake remedy.

DEQ reached agreement on a Consent Judgment with responsible parties for the Portland Willamette site on a small inlet of the Whitaker Slough at NE 59<sup>th</sup> Place. The parties paid \$350,000 to DEQ which DEQ will use for investigation, removal, and remedial action in the Whitaker Slough inlet. The parties also paid \$50,000 to DEQ for natural resource damages.

BES continued to work with agricultural property owners to reduce runoff from the farmed fields located at NE 122<sup>nd</sup> Ave and NE Shaver. Erosion from the fields carries TSS and pesticide-contaminated stormwater. Portland Parks and Rec. planted the fifteen acres which they own and manage with a cover crop to reduce erosion.

### **Peninsula Drainage Canal**

DEQ provided a level 1 No Further Action determination for this short segment of the Slough which is the dividing point between the lower and middle Slough. No sites have been identified along this segment as contributing contamination to the sediments and additional options for source control appear to be limited. Contamination detected in the sediment generally falls within the baseline range established for the Slough but some contaminants exceed risk-based concentrations. Long-term monitoring of the Slough will continue to include this segment and is anticipated to show declining concentrations of contaminants as source control efforts in other portions of the watershed take effect and sediments recover naturally through deposition of clean sediments and degradation of contaminants.

### **Buffalo Slough**

There are currently no active cleanup projects in Buffalo Slough. DEQ evaluated sediment data in this segment to identify areas where baseline concentrations are exceeded and site discovery efforts, and eventually sediment cleanup actions, are warranted. DEQ Site Assessment started evaluations of two sites that may have released chromium to the sediments.

### **Upper Slough**

There are four active cleanup projects in the upper Slough. Two of these, Reynolds Metals (5100 NE Sundial Rd., Troutdale) and Boeing (19000 NE Sandy Blvd.) are in active phases of groundwater cleanup that are not expected to impact Columbia Slough sediments.

## **2.3 NPDES Permits**

DEQ issues NPDES permits to businesses and industries in the Slough watershed. BES has a Memorandum of Agreement to administer the 1200-COLS permits for those facilities within the City of Portland. DEQ retains oversight for the other general and individual permits as well as the 1200-COLS permits issued to facilities outside the City, the Portland International Airport, Oregon Air National Guard, the St Johns Landfill, and the City's leaf compost facility and wastewater treatment plant. There are currently 173 general NPDES permits within the Columbia Slough watershed:

1200-COLS permits (industrial storm water): 140

1700-A permits (wash water): 2

1200-C permits (construction storm water): 23

100-J permits (non-contact cooling water): 8

The COLS permit is unique to the Slough and has benchmarks, not limits, for stormwater discharges. Benchmarks are guideline concentrations designed to assist the permittee in determining whether their Stormwater Pollution Control Plan is reducing pollutant concentrations. DEQ does not take direct enforcement action on benchmarks. Instead, permittees are required to submit Action Plans to identify Best Management Practices (BMPs) to meet benchmarks. If the benchmark is not met after the fourth year of their 1200-COLS permit, then the DEQ will revoke the facility's coverage under the general permit and require them to apply for an individual permit.

### **Industrial Inspections COLS Permit**

City oversight of stormwater discharges to the Columbia Slough included the following activities over the past year:

- BES manages 75 COLS permitted facilities.
- A total of 81 facilities that discharge stormwater to the MS4 were inspected, and 44 non-permitted facilities were inspected.
- A total of 86 facilities that do not discharge to the MS4 were inspected. Of these, 55 were permitted and 31 were non-permitted facilities

### **Construction Permits**

A total of 1,098 active private construction permits in the Slough watershed are subject to erosion control inspection. A total of 1,522 inspections of private sites were conducted (some sites were inspected more than once).

### **2.4 Industrial Process Water**

There are currently six individual NPDES permits on the Columbia Slough: Dynea Overlays, Portland Meadows, Portland Water Bureau Groundwater Pump Station, Oregon Fresh Farms (aka Lucky Farms), and two Port of Portland permits for the Airport – one for construction dewatering and one for deicing and anti-icing activities. The Port's deicing permit was renewed this year with a requirement that the Port construct an enhanced deicing wastewater system that will minimize discharges to the Slough (primarily by diverting discharges to the Columbia River).

### **2.5 Hazardous Waste Technical Assistance**

No technical assistance outreach efforts were conducted in the Slough watershed over the past year.

### **2.6 Long-term Monitoring**

The Columbia Slough Watershed Long-Term Monitoring Plan (LTMP) describes monitoring that BES will conduct in the Slough watershed over the next ten years and more. This is a dynamic plan, and as technology and monitoring approaches change, the LTMP can also be changed. The following sections highlight monitoring efforts that the LTMP covers. The LTMP can be accessed on line at [www.portlandonline.com/bes/index.cfm?c=33221&a=175915](http://www.portlandonline.com/bes/index.cfm?c=33221&a=175915)

### **Fish Tissue Monitoring**

Fish tissue sampling will be conducted every ten years to assess the level of contamination in fish from the slough. The next sampling event will occur in 2015. The most recent report, *Columbia Slough Fish Tissue Analysis, 2005 Sampling Event* can be found at <http://www.portlandonline.com/bes/index.cfm?c=44908&>

### **Sediment Monitoring**

The Columbia Slough Sediment report was completed. The study started in 2006 when 78 sediment samples were collected for analysis of toxic contaminants. The 2006 data were compared to Columbia Slough Screening Levels. Several metals, PAHs, and pesticides were frequently detected above their screening levels. Since PCBs were infrequently detected they did not have a high percentage of samples above screening levels. A number of areas had elevated contaminant concentrations, including Whitaker Slough and the lower Slough near I-5 and the eastern end of Wapato Slough. The general pattern of sediment contamination in 2006 is consistent with patterns in 1994. The key contaminants in 1994 continue to exceed screening levels in 2006. Spatial variability in contaminants was roughly similar in the two sampling events. However, there was a consistent pattern of higher contaminant concentrations in 2006 than in 1994 for many contaminants. The report is available at <http://www.portlandonline.com/bes/index.cfm?c=49910&>

### **In-line Sediment Sampling**

A new sediment sampling approach was initiated. The purpose of the sampling is to attempt to draw a link between sediment contamination and stormwater discharges from the MS4. Four outfalls were sampled: outfalls 99, 100, 104a, and 104b. Crews were unable to collect samples from outfalls 99 and 104a because there were no sediments present at the access manhole, and the pipes are too small for crews to access to collect samples. Crews were able to get limited samples from Outfalls 100 and 104b. Preliminary results show the presence of pesticides and no PCBs.



Looking north on NE 122<sup>nd</sup> Avenue, this is the first sampling manhole for outfall 100

## Water Quality Monitoring

Water quality samples were taken at ten sites throughout the Columbia Slough. Continuous, 15-minute, samples were taken for temperature, pH, conductivity and dissolved oxygen. Grab samples were taken monthly for the following analytes, and the flow and depth at which the sample was collected was documented:

- Chlorophyll a
- BOD-5
- Conductivity (specific)
- Copper (total and dissolved)
- Flow Direction and velocity
- Dissolved oxygen
- E. coli
- Hardness (total)
- Lead (total and dissolved)
- Mercury
- Nickel (total and dissolved)
- Nitrogen (ammonia, nitrate and total Kjeldah)
- PH
- Phosphorus (total and ortho phosphate)
- Secchi disc
- Temperature
- Total suspended solids
- Zinc (total and dissolved)

Table 1 lists water quality sample sites and the type of samples taken (continuous, grab or both)

Sampling Site	Location	Continuous	Grab
GRF	Bridge roughly 500 ft east of Fairview Lake weir		X
AWB	NE Airport Way Bridge		X
158	NE 158 <sup>th</sup> Ave. Bridge	X	X
92B	NE 92 <sup>nd</sup> Ave. Bridge (main stem)	X	X
47S	NE 47 <sup>th</sup> Ave. Bridge (south arm)		X
21B	NE 21 <sup>st</sup> Ave Bridge (main stem)	X	X
VNB	N Vancouver St Bridge	X	X
PED	Columbia Blvd Wastewater Treatment Plan Pedestrian Bridge		X
SJB	St. John's Landfill Bridge		X

Table 2 summarizes results of the monitoring program

Analyte	Regulation	Results
BOD - 5	TMDL	Samples at all sites met the standard
Chlorophyll a	TMDL OAR-41-150(1)(b)	Many samples did not meet the standards. Chlorophyll a has been increasing in the lower Slough since 2003. Increases may be related to the change in sample collection method that occurred in July 2000, but this has not been verified.
Conductivity - specific		A preliminary investigation was conducted. The Willamette River has specific conductance close to 100 $\mu$ S/cm; the Slough has specific conductance close to 200 $\mu$ S/cm.
Copper	OAR 340 Table20	Samples at all sites met the standard
Copper, dissolved		Samples at all sites met the standard

Analyte	Regulation	Results
Dissolved oxygen	TMDL OAR 340 - 41-445	Samples have shown major DO depressions during winter months. The low DO in winter may be due to de-icing agents used at the airport and discharged to the Slough. Upper Slough samples have shown DO depressions during summer months which may be due to the decomposition of algae and plants.
E. coli	TMDL	Some samples did not meet the standards, particularly in the upper and middle Slough. Possible sources of E. coli include large avian populations in adjacent wetlands, pump stations, old cesspools/septic systems, and illicit discharge.
Hardness		Not investigated
Lead	TMDL	A few samples did not meet the standard
Lead, dissolved	TMDL	Samples at all sites met the standard
Nitrogen - nitrate	OAR 340 Table20	Samples at all sites met the standard for drinking water, however nitrogen is abundantly available for plants. In the upper Slough, results were higher in winter months. The lower Slough shows a downward trend.
Nitrogen – ammonia		Not yet investigated
Nitrogen - Kjeldahl		Not yet investigated
pH	TMDL	Sites in the upper Slough have high pH during the spring and summer, likely due to eutrophication.
Phosphorus - ortho phosphate (dissolved)	EPA 1986	Some sites in the middle and upper Slough did not meet the standard. Orthophosphates may accumulate because algal and macrophyte growth is limited due to turbidity, or due to algal decomposition and the subsequent release of orthophosphates back into the water column.
Phosphorus - total	TMDL	Some total phosphorus samples did not meet the standard, primarily in August and September. Samples taken in the middle Slough met the standard more frequently.
Temperature	TMDL	Most sites do not meet the 18 degree C standard for 7-day average of daily maximum temperature from June – August.
Total Suspended Solids(TSS)	NPDES 1200-COLS	Samples taken in the upper and lower Slough generally do not meet the standard; though TSS levels tend to be lower in the winter and late spring. Samples taken in the middle Slough generally met the standard.
Zinc	OAR 340 Table20	Samples at all sites met the standard
Zinc, dissolved	OAR 340 Table20	Samples at all sites met the standard

### **Stormwater Monitoring**

Stormwater monitoring in Marx-Whitaker Slough was conducted during 2007/2008, and the final report was prepared in 2009. The monitoring proposal consisted of taking grab samples from four outfalls during two storm events. The outfalls sampled, 99, 100, 104a, and 104b, are part of the MS4. In general, sampling results were inconclusive. It was determined that grab samples do not give an accurate picture of pollutants from stormwater, and that additional monitoring is necessary given that stormwater monitoring is inherently variable.

### **Best Management Practices (BMP) Effectiveness Monitoring**

BMP effectiveness monitoring is no longer being conducted.

### **Sediment and Fish Tissue Monitoring Using Semi-permeable Membrane Devices (SPMDs)**

SPMDs are an innovative approach to assessing water column concentrations of various hydrophobic organic compounds of concern in the Columbia Slough, including polycyclic aromatic hydrocarbons, (PAHs), organochlorine (OC) compounds, and polychlorinated biphenols (PCBs).

Following the successful study of Buffalo Slough in 2003/04 using SPMDs, a second study was initiated in 2007 in the lower Slough. The purpose of the study was to determine if SPMDs are an effective for long-term watershed monitoring in an urban watershed. In general, the study found that SPMDs may be used for watershed monitoring. Additionally, the data suggest that stormwater runoff “may be a predominant source of PAHs in the slough but that OCs (organochlorine compounds) are ubiquitous, entering the slough by a variety of pathways.” (from *Investigation of Hydrophobic Contaminants in an Urban Slough System Using Passive Sampling – Insights from Sampling Rate Calculations*, 2007, by Kathleen McCarthy)

The final report is available at <http://www.springerlink.com/content/6767j61h30065338>

### **Bio-Monitoring**

Results from fish sampling conducted by the City of Portland and Oregon Department of Fish and Wildlife (ODFW) indicated usage of the whole lower Slough by juvenile Chinook. The sampling effort consisted of eight sample sites from the mouth to the upstream extent of the lower Slough. The data show unclipped adipose fins on juvenile Chinook at the most upstream extent of the lower Slough.

## **2.7 Stormwater Management**

### **Stormwater Facility Inventory**

BES conducted an inventory of all potential sites for stormwater management facilities in the Marx-Whitaker Target Area. Almost 100 sites were identified. The highest priority sites are those along busy roads such as NE 122<sup>nd</sup> Avenue and NE Sandy Blvd.

Design of six green street facilities on NE 122<sup>nd</sup> Avenue between NE Shaver and NE Beech commenced. The facilities will manage stormwater from approximately 86,500 square feet of right-of-way. The area drains to outfall 100, which is a priority outfall in the Slough watershed.

When complete, the facilities will remove pollutants from stormwater runoff before it enters the Slough.

### **NE 92<sup>nd</sup> Avenue Stormwater Facility**

The NE 92<sup>nd</sup> Avenue water quality facility was completed. The facility will treat stormwater from 44.5 acres of private industrial property and 36 acres of public right of way, including Columbia Boulevard, a high-volume road. It also provides hazardous spill containment in the groundwater protection area.

### **NE 148<sup>th</sup> Avenue Stormwater Facility**

Design of stormwater facility at NE 148<sup>th</sup> Avenue in the Columbia Slough Watershed continued. When complete, the facility will treat 294 acres of mixed land use (primarily residential).

### **Whitaker Ponds Rain Garden**

BES, in partnership with the Columbia Slough Watershed Council and Portland Parks and Recreation, built a stormwater retrofit rain garden at Whitaker Ponds Nature Park. The rain garden is a visible demonstration of residential-scale stormwater retrofit options at a frequently-visited education center. The site is visited annually by more than 3,000 school children and more than 500 school teachers and parents. The rain garden manages 750 square feet of roof and some blacktop runoff.

## **2.8 Vegetation**

### **Revegetation**

The City planted over 4,466 trees and shrubs throughout the Slough watershed. BES has three revegetation and street tree planting programs:

- Through partnerships with businesses and other private landowners, the BES Watershed Revegetation Program plants native vegetation on both public and private properties. Funding comes from landowners, grants, and BES funds. A total of 3,440 plants were planted on 19 acres. The total included 828 deciduous trees, 157 coniferous trees, and 2,455 shrubs.
- Through a contract with BES, Friends of Trees planted 650 trees primarily in tree-deficient areas of the Slough watershed.
- Through a partnership with SOLV, 376 native plants were planted and 2,630 pounds of invasive vegetation were removed from one site.

### **2.9 Education and Stewardship**

BES provides environmental education to students at 46 schools in the Slough watershed. Instruction for students includes the following activities:

- Reached 1,236 students (grades K-12) with classroom programs that provide hands-on, interactive science education about stormwater and other environmental issues.
- Involved 1,473 students (K-12) in education field programs that offer watershed investigations and field assessments, such as how to measure water quality and conduct macroinvertebrate sampling as indicators of water quality health. Also included are stormwater tours, boat tours, and restoration experiences along streams and wetlands.

- A total of 453 students combined education with natural area restoration service projects at Whitaker Ponds and Big Four Corners.
- Canoe trips on the Columbia Slough were offered for 171 students in the Columbia Slough Watershed. To be eligible for the trip all students completed special classroom studies and a stewardship project. The focus of the tours was on Slough history, how land use impacts waterways, combined sewer overflow history, stormwater pollution, and how personal actions can help prevent stormwater pollution.
- The Watershed Awareness Program was presented to 168 students, grades 3-6. This program focuses on common non-point sources of pollution found in a watershed and how to prevent stormwater pollution.
- The permanent storm drain curb marker program continued. The program is a community and school stewardship activity to increase awareness of stormwater pollution and help prevent the public from disposing household or lawn chemicals into the storm drain. Volunteers also distribute doorhangers containing stormwater pollution prevention messages and clean river tips to nearby residences.
- BES educators participated in six community events, with a total of 991 participants. These were the Children's Clean Water Festival, Columbia Slough Regatta, Explorando El Columbia Slough, Sustainable Living Show, Arbor Day, and the City of Portland Native American Month Brown Bag. All events included stormwater pollution prevention messages.

### **Stewardship Activities and Community Events**

BES provides outreach and education for adults in the Slough watershed, including:

- Co-sponsored and participated in numerous community events, including Slough 101, Wetlands 101, Groundwater 101, Explorando El Columbia Slough, Canoe the Slough, Columbia Slough Small Craft Regatta, Aquifer Adventure, Corps of Rediscovery, two Soup on the Slough events, two watershed cycling events, a Great Blue Heron week event, three Wild in the City events, and five neighborhood association picnics or gatherings in which stormwater was a topic of instruction. The City was a co-sponsor of the Columbia Slough Watershed Awards program. The total participation was approximately 3,000 persons.

- Participated in three training programs for 15 “Eyes on the Slough” volunteer monitors. The volunteers paddle each reach of the Columbia Slough monthly and report on water quality and landscape conditions.



Eyes on the Slough volunteers with some of the garbage that they removed from the Slough

- BES staff participated in developing projects for the Columbia Slough Watershed Council Action Plan. The Action Plan identifies numerous stormwater watershed restoration projects and activities for the Council and its partners.
- In the City Nature East Zone (natural resources), Portland Parks & Recreation conducted extensive weed removal and native plantings around the city including Big 4 Corners and Whitaker Ponds.

- Co-sponsored 10 Stewardship Saturdays events at three sites in the watershed. The events involved about 100 individual volunteers and 350 volunteer hours. Volunteers planted native trees and shrubs, removed invasive vegetation, and provided stormwater education.



The 2009 Corps of Rediscovery crew

- BES staff conducted the “Corps of Rediscovery” canoe tour of the Columbia Slough. The tour starts from the Slough’s headwaters at Fairview Lake and ends at the Slough’s confluence with the Willamette River at Kelly Point Park. In all, 22 people made the 19-mile canoe trip including staff from BES, other city bureaus, nonprofit groups, and citizens.

**Community Watershed Stewardship Grants**

BES provided three Stewardship grants totaling \$19,953 to support stormwater management projects and outreach activities implemented by volunteers. The three projects are:

- Columbia Slough Watershed Council – Eyes on the Slough Program \$ 4,853
- N/NE Minority Youth & Young Adults Being Connected to Community –Restoration Project \$ 5,100
- Oregon Humane Society – Naturescaping and Habitat Restoration Project \$ 10,000

The Community Watershed Stewardship Program also awards gift certificates for native plants to help start or maintain projects beneficial to Portland watersheds. In the Columbia Slough, five mini-grants were awarded totaling \$1,300.

### **South Shore Ground Water Protection Outreach and Education**

The Portland Water Bureau administers the South Shore Well Field Wellhead Protection Program to protect the city's back-up drinking water. The program also protects Slough sediments from spills, illegal dumping, and other actions that may contribute contaminants to the Slough. The well field is located in the Columbia Slough watershed. The Water Bureau completed the sixth year of its education and outreach program for affected residents and businesses to help them comply with requirements of the Columbia South Shore Well Field Wellhead Protection Program.

For the general public, the Water Bureau participated with Metro in their Hazardous Materials Round-Up at the Parkrose K-Mart (in the wellhead protection area). Over 300 people properly disposed of household hazardous materials. The Water Bureau also conducted the groundwater module of Slough School, Groundwater 101, Subs on the Slough, Cycle the Well Field, Aquifer Adventure, Clean Water Festival. A total of 1,259 people participated in these events.

In partnership with the Columbia Slough Watershed Council, the Water Bureau conducted presentations and workshops and published two articles in the Columbia Corridor Association newsletter. The Water Bureau conducted 38 site visits and 15 phone consultation. They gave away 24 spill kits, spill response signs, secondary containment pallets, and stormdrain covers.



### **2.10 Maintenance**

The City of Portland Office of Transportation, Maintenance Operations maintains the city's public stormwater infrastructure to prevent contaminated sediment from reaching the slough:

- 59 inlets were inspected/maintained and 569 were cleaned
- 333 linear feet of culverts were cleaned and 1,560 feet of ditches were cleaned
- 102 public surface water quality facilities were inspected twice.
- Six surface public stormwater management facilities (dry ponds, wet ponds, spill ponds, constructed treatment wetlands, vegetated swales, infiltration basins, and sand filters) were cleaned and three were repaired.
- 13 subsurface public stormwater management facilities (sedimentation structures, canister filters) were cleaned. None needed repair.
- 13 inlets, ten inlet leads (153 linear feet), and two culverts (52 linear feet) were repaired or constructed
- 58 tons of material was removed during maintenance. Most material was from cleaning ditches and culverts.

## **Street Sweeping**

Maintenance Operations sweeps streets to remove debris and reduce the amount of TSS in runoff. Citywide, major arterials are swept 10 or 11 times per year. All residential streets with curbs are swept one or two times a year. Streets swept in the Columbia Slough:

Arterials—43 miles

Non-arterials—60 miles

Total—103 miles

Total material collected—1,376 cubic yards

## **Maintenance Inspection Program**

The City's Maintenance Inspection Program (MIP) provides technical assistance to property owners on the operation and maintenance (O&M) of private stormwater management facilities. It ensures that property owners follow site-specific, BES-approved O&M Plans. The program also collects information on stormwater management facility deficiencies and corrective actions taken to address deficiencies. A total of 53 new facilities on 19 properties were added to the City MIP database. A total of 376 facility inspections were conducted at 122 properties.

## **2.11 Spill Response and Illegal Connections**

### **Spill Response**

The BES Spill Response Hotline received 1,300 calls during the day and 438 after-hours complaint calls. The calls are tracked on a citywide basis only. The calls include complaints about pollution, spills, sanitary sewer overflows, dye tests, and seepage discharges.

BES and the Portland Water Bureau installed signs in the Columbia South Shore to protect the well-head protection area from spills. The signs list the BES spill response hotline number and read: "TO REPORT SPILLS CALL (503) 823-7180."

### **Illegal Connections**

BES inspected all stormwater discharge pipes during summer (dry weather) to identify illegal connections and illicit discharges. Any illegal connections are investigated and removed.

## **2.12 Enforcement, Zoning, and Regulations**

### **Regulatory Improvement Code Amendment Process (RICAP)**

Regulatory Improvement is an ongoing program to improve codes and processes that affect development. In the past year, the City adopted code amendments to the fourth workplan (RICAP 4). This package included several changes to support watershed health and onsite stormwater management, including:

- Amending how lot width is measured to ensure that lot has adequate space for a house. This may help with onsite stormwater management by creating lots of a more regular shape.
- For land divisions, requiring flag lots to share driveway access where feasible to limit impervious surfaces; also limiting building coverage on flag lots.
- For land divisions, providing staff with more discretion to require private alleys to be public and serve adjoining lots to remove duplicative private infrastructure.

- Allowing residential driveways to be gravel if they are accessed from a non-improved alley. This should help limit impervious surfaces.
- Requiring greater tree protection measures for trees proposed for preservation during a land division.

### **Stormwater Management Manual**

BES implements the City of Portland *Stormwater Management Manual* (SWMM) which requires new and re-development projects to manage stormwater runoff on-site when 500 square feet or more of impervious surface is created. By implementing the manual, the quantity of stormwater and pollutants reaching the Slough are reduced. The 2008 revision of the SWMM (which took effect October 2008) was completed. The revision incorporated the key elements such as soil and design specs for stormwater facilities and clarification of the application of the stormwater disposal hierarchy. Also, the manual was reorganized to improve its use, new forms and submittal guides were incorporated, and a new Presumptive Approach Calculator (PAC) that allows more flexibility in sizing vegetated facilities using infiltration testing results was also included.

### **Urban Forest Management Plan Action Plan**

Citywide Tree Policy Review and Regulatory Improvement Project staff completed an extensive community stakeholder process to explore key issues and potential solutions. Project staff synthesized the potential solutions into concepts that were presented in various public forums, culminating in a work session with the Portland Planning Commission. Key proposals include structural and content related revisions to city codes, administrative rules, and procedures. The proposals are intended to clarify and improve the cohesiveness, efficiency, and effectiveness of the City's tree regulations. The proposals are also intended to help improve the quantity and quality of the city's trees to support urban forest management, watershed health, and other goals and compliance efforts.

Bureau of Planning and Sustainability staff initiated a research project to evaluate what the City's responsibilities would be if it were to assume maintenance of trees in the right-of-way.

## **3. Future Actions Fiscal Year 2010**

### **3.1 Target Areas**

BES and DEQ will work on source investigations in the Target Areas. The source investigation of outfalls 60, 61, 61a, 62, 62a, 63, and 64 in the lower Slough will be completed. The source investigation will provide a summary of the conditions of the catchment areas of these outfalls and it will list actions for DEQ, BES, and others to conduct to reduce sediment and associated contaminants from reaching the slough. DEQ will prepare a report of the sediment sampling conducted in the lower Slough as part of the settlement agreement efforts. BES will start an update of the Marx-Whitaker source investigation which was completed in 1997. BES will investigate the sources of total suspended solids in the Cully Target Area.

DEQ will increase site discovery and assessment efforts in Target Areas of the Slough. Site discovery efforts will continue in the Buffalo Slough Target Area. DEQ Site Discovery efforts will be coordinated with City source investigations.

### **3.2 Site Cleanup**

#### **Specific Site Actions**

Significant investigation/cleanup actions anticipated over the upcoming year are highlighted below:

- Johnson Lake cleanup will continue with completion of the upland swale and capping of the lake.
- DEQ will evaluate results for the sediment sampling conducted in the lower Slough segment.
- DEQ will select remedial actions for the in-water portion of the Pacific Carbide and Alloys site.
- Stormwater source control evaluations will be completed at the Precision and Wastech sites.
- Cleanup of the uplands and the Slough bank at the Pacific Meat site will be completed.
- A stormwater treatment system will be installed at the former Union Carbide facility and a stormwater source control evaluation will be conducted at this site.
- Risk assessments will be completed at the Harbor Oil site and a feasibility study will be initiated.

### **3.3 NPDES Permits**

BES will continue to inspect all permitted industries once per year, and conduct stormwater sampling as needed. BES will also continue inspecting non-permitted industries discharging to the MS4 and evaluating the need to permit these industries. BES will continue to locate and map non-City outfalls in the Columbia Slough and Willamette River Watersheds. BES will continue to work with permitted industries to remove exposure to the extent that they can qualify for no exposure certification.

### **3.4 Industrial Process Water**

Industrial process water activities in the Slough will focus primarily on implementing the airport de-icing and anti-icing discharge management.

### **3.5 Hazardous Waste Technical Assistance**

Hazardous waste technical assistance will be coordinated with City source investigations for the Target Areas identified in the Watershed Action Plan. No specific activities are planned for the upcoming year.

### **3.6 Long-term Monitoring**

#### **Fish Tissue**

No fish tissue sampling is planned for the next year.

### **Sediment Sampling**

No slough-wide sediment sampling is planned for the next year. In-line sediment sampling in the MS4 in the Marx-Whitaker and/or I-5 to MLK Target Areas may be conducted.

### **Water Quality**

Water quality sampling will continue as in past years. Water quality samples (continuous and grab samples) will be taken for temperature, pH, conductivity and dissolved oxygen. Grab samples will be taken monthly for the following analytes, as well as the flow and depth at which the sample is collected:

- Chlorophyll a
- BOD-5
- Conductivity (specific)
- Copper (total and dissolved)
- Flow Direction and velocity
- Dissolved oxygen
- E. coli
- Hardness (total)
- Lead (total and dissolved)
- Mercury
- Nickel (total and dissolved)
- Nitrogen (ammonia, nitrate and total Kjeldah)
- PH
- Phosphorus (total and ortho phosphate)
- Secchi disc
- Temperature
- Total suspended solids
- Zinc (total and dissolved)

### **Stormwater Monitoring**

Stormwater from outfalls in Marx-Whitaker Slough will be sampled at least once during the winter. Analytes include metals, pesticides, and possibly PCBs.

### **BMP Effectiveness Monitoring**

No BMP effectiveness monitoring will be conducted.

### **Bio-Monitoring**

BES will continue monitoring a variety of species of concern. Some of the species are on the federal Threatened and Endangered list and some are on the State of Oregon list of sensitive species. The final report of the 2008 fish species monitoring in the lower Slough conducted by Oregon Department of Fish and Wildlife will be completed. BES will conduct quarterly fish monitoring at the Slough's confluence with the Willamette River. BES will also monitor birds, amphibians, turtles, and macrophytes at various sites around the Slough.



Cedar waxwings in the Upper Slough

### **3.7 Stormwater Management**

BES will continue the design of a stormwater management facility at NE 148<sup>th</sup> Avenue which will treat runoff from 294 acres of mixed land use (primarily residential). BES will also begin to obtain permits for the facility. BES will continue the design of six green street facilities on NE 122<sup>nd</sup> Avenue between NE Fremont and NE Shaver. It is expected that the facilities will be constructed during the next fiscal year. These facilities will manage stormwater from a two-acre segment of NE 122<sup>nd</sup> Avenue which is a high traffic volume street.

### **3.8 Vegetation**

The BES Revegetation Team will continue to monitor and maintain restored lands in the Slough Watershed. Friends of Trees will plant at least 500 trees along the right-of-way. The BES partnership with SOLV will continue, and citizens will continue to plant native vegetation in association with the BES Stewardship Grant Program. A second rain garden at Whitaker Ponds Natural Area will be designed.

### **3.9 Education and Stewardship**

BES will continue science education outreach to community youth to increase students' knowledge and awareness of urban watershed and water quality issues, to foster a connection to local greenspaces and streams, and to educate youth about how they can protect their watersheds.

BES will lead tours of innovative stormwater facilities such as green streets, bioswales, stormwater planters, ecoroofs, and porous pavement throughout the watershed. BES will also lead boat tours of the Columbia Slough for student groups who have participated in Clean Rivers Education programs and who have completed a stewardship project.

BES will work with community partners to remove invasive species along the Slough and revegetate riparian areas.

The Water Bureau will continue providing technical assistance to regulated businesses and general outreach to the public under the Columbia South Shore Well Field Wellhead Protection Program.

### **3.10 Maintenance**

The City of Portland will continue street sweeping throughout the watershed. Stormwater facilities such as culverts, drainage ditches, water quality facilities will also be cleaned and maintained. Debris will be cleaned out and any repairs to stormwater facilities will be made as needed. A specific goal is to inspect all public stormwater management facilities at least once.

### **3.11 Spill Response and Illegal Connections**

BES will continue removing illicit discharges and connections to the storm sewer system as they are identified during Illicit Discharge Elimination Program, spill response, pretreatment, or stormwater permit inspection. BES will also continue the 24-hour complaint hotline for citizens to call when they see spills, CSOs, pollution, illegal dumping, etc.

### **3.12 Enforcement, Zoning, and Regulations**

#### **Regulatory Improvement Code Amendment Process (RICAP)**

The Bureau of Planning and Sustainability will seek City Council approval of the RICAP 5 package, including the package of “green” amendments, by November 2009, with implementation in December 2009.

#### **Tree Codes**

The Bureau of Planning and Sustainability (BPS) will complete the Citywide Tree Policy Review and Regulatory Improvement Project to clarify and improve the City’s tree regulations and to support Urban Forestry canopy targets and other objectives, watershed health goals, and other city goals. The draft code language will be open for public comments, and the final draft will go to the Portland Planning Commission.

#### **Urban Forest Management Plan Action Plan**

The overall proposal, with draft code language, will be released and evaluated through the City’s public hearings process in fall/winter 2009/10.

