Dye Release Study in Port Washington Narrows

Draft Sampling Plan

Prepared by PSNS ENVVEST CSO Modeling Subworking Group

Draft December 18, 2001

1. Introduction

In June of 2000 a Modeling Sub-Working Group of Stakeholders was established to address the issue of fecal coliform contamination of shellfish beds in Dyes Inlet from combined sewer overflows (CSOs) in the Port Washington Narrows. Participants in the working group included the Suquamish Tribe, Washington State Department of Health, the City of Bremerton, Kitsap County, CTC, PSNS, and SSC. The working group determined that shellfish beds in upper Dyes Inlet remain closed mainly due to uncertainty about CSO overflows in the Port Washington Narrows. A modeling study was proposed to model a "typical" CSO overflow event on incoming tide. Key issues were the lack of knowledge on current and transport patterns in upper Dyes Inlet, the need for data on CSO events and discharge parameters, and other data needed to support the modeling approach. The Navy and Stakeholder Team planned and cooperatively executed a drogue and current meter study for Dyes Inlet in the fall of 2000. The CSO subworking group also identified the need to conduct a dye-release study to confirm and validate the model. In partnership with the City of Bremerton, Washington State Department of Health, Suquamish Tribe, Kitsap County SSWM, and the Bremerton-Kitsap Health District a dye-release study is being developed to address this need.

2. Objectives

The objectives of the dye study are to:

(1) Simulate a CSO discharge event in the Port Washington Narrows on the incoming tide.

(2) Provide physical and chemical data sets for validating model performance.

(3) Develop data on ambient concentrations of fecal coliform and selected contaminants in the estuary.

3. Preliminary Model Runs

A three dimensional model capable of simulating tide and wind driven currents in Sinclair and Dyes Inlets has been developed using the model Curvilinear Hydrodynamics in 3-Dimensions (CH3D) (Wang and Richter 1999, Wang 2001, Wang et al. in prep). Originally developed by the Army Corps of Engineers for the Chesapeake Bay estuarine system, CH3D calculates time-varying 3-dimensional numerical flow fields for water surface, velocity, salinity, and temperature to simulate vertical and horizontal mixing (Johnson et al. 1991). CH3D uses curvilinear boundary-fitted numerical grids in the horizontal plane. The gridding in the vertical direction is z-grid, which divides the water column into many layers of equal thickness, with the number of layers varying from several layers for deeper regions to one layer for extremely shallow regions (< 3m). CH3D is capable of handling a variety of external forcing, including tides, winds, tributary flows, point and non-point sources, as well as baroclinic effects due to density differences between freshwater inflows and saline Inlet water (Johnson et al. 1991, Wang and Richter 1999). Its open code, flexibility in defining model grids, and process-based numerical scheme makes CH3D very versatile in developing applications for coastal and estuarine systems. Presently, the grid for CH3D had been refined, a Lagrangian particle tracking model within CH3D has been used to calibrate the model with data from the drogue study, and a module to simulate fecal coliform growth and die off in the marine environment based on the

Mancinni Equation has been added to the model code — CH3D-FC Launch CH3D-FC demo animation (P.F. Wang, SSC, personal communication).

Preliminary runs of the model were conducted to estimate the behavior of a dye release in various location and tidal conditions within the Port Washington Narrows. These results will be used to gage the length and duration of the dye release and develop a strategy for tracking the plume.

Tidal Variation and Magnitude pf_fort.xls

Simulated drogue tracks new drogue tracks.ppt

4. Selection of Study Dates

The dye study will be conducted during the "wet" period of the winter of 2001-2002. The "wet" period is defined as the condition when enough rainfall has fallen to thoroughly saturate soils and streams in the surrounding watershed are running at high levels. This represents the conditions that CSO events are most likely to occur. Another consideration was to conduct the dye study after construction of the new East Side Waste Treatment Plant was completed (Dec 2000) and brought on line (Jan 2001).

Due to logistic constraints and scheduling conflicts the dye study will be conducted in March or early April of 2001. The ideal scenario would be to start injecting dye at the beginning of a flood tide at daybreak during heavy rain with little or no wind and track the plume until sundown (~12 h). Based on the preliminary model runs, it appears that a flood tide of 3-5 ft would be sufficient for model confirmation and validation. Because the model simulates the whole Sinclair-Port Washington Narrows-Dyes Inlet system, the plume movement both up the Port Washington Narrows to Dyes Inlet and down the Narrows to Sinclair Inlet will be equally valid for obtaining scientifically defensible data for model confirmation and validation.

Tides for possible study dates. tracyton_tides.ppt

Predicted tides obtained from: http://tbone.biol.sc.edu/tide/

5. Technical Approach For Dye Study

5.1 Overview

5.1.1 Dye Release

The CSO outfalls in the Port Washington Narrows are shown in Figure 1. The project team visited the CSO outfall sites to recommend which outfall(s) would be used for injecting the dye. The dye would be injected into the outfall by metering a specified flow of concentrated dye into the outfall and flushing it through the pipe with water from a hydrant. The injection would begin just after low slack (+15 min) and continue until just before high tide (-15 min before high slack). At the start of the injection Vessel A, stationed over the discharge point, would release a self-tracking drogue to mark the "head" of the plume. Vessel A would remain on station until the dye was detected and then proceed to track the dye plume up the Port Washington Narrows. Vessel B would be stationed at Rocky Point, transects across the mouth of Dyes Inlet would be conducted continuously to monitor the movement of the plume out of the narrows into Dyes Inlet. Optional Vessel C would take up position at a point midway between the release point and Rock Point and conduct vertical profiles to detect the plume as it moves past.

Just before the dye injection stops, Vessel C will move to the injection point and upon receiving a signal that the dye injection has ceased will deploy a second self-tracking drogue to mark the "tail" of the plume. Vessel C will then take up a position midway between the injection point and the mouth of the narrows (eg. Manette Bridge). When the tail of the plume reaches that point, Vessel B will transit down the narrows and take up position running transects across the mouth of narrows where it enters into Sinclair Inlet. Vessel A will continue tracking the head of

the plume into Dyes Inlet until the signal is lost or the tide turns, then it will "follow" the plume back down the narrows.

The survey will end at dusk or anytime conditions on the water become unsafe.

5.1.2 Shake down cruises

"Shake down" cruises will be conducted at least 48 and 24 h before the scheduled dye release (T0) to assure that all equipment is calibrated and functioning properly and to collect physical-chemical data to characterize ambient conditions and develop a "backup" validation data set (eg. temperature, salinity, etc.) incase the dye study goes awry.

5.1.3 Discrete sampling for boundary and ambient conditions

Discrete samples will be collected at 9 stations within the estuary to characterize ambient conditions for fecal coliforms, conventional parameters, metals, and toxic organics. Replicate samples will be taken (at or near low tide) at each station during the shakedown cruises (T-48 h, T-24 h), during (T0) and after the dye study (T+24). Temperature, conductivity, sechi disk depth, etc. will be measured on site, and bottle samples will be collected for laboratory analysis. Bacterial samples will be analyzed by DOH, metals, toxic organics, and other parameters will be measured by the Navy's contract laboratory.
See Boundry_Ambient_monitoring.xls for stations, replicates and parameters.

5.1.4 Bacterial inputs from streams and storm water

If possible, the Bremerton-Kitsap Health District will schedule their monthly fecal sampling of streams and stormwater to coincide with the dye study (eg. ±72 h).

5.1.5 Stream monitoring

Base flow and storm event sampling of streams and selected storm water sampling being conducted for the ENVVEST TMDL study will also be scheduled to occur during the dye study (eg. ±72 h).

5.1.6 Current meter

An acoustic Doppler profiler will be deployed within the Port Washington Narrows about 14 days before the dye release and retrieved after completion of Spring-Neap tidal cycle.

5.1.7 Other TBD

5.2 Injection

It appears that the best site for a dye release would be from the Eastside CSO Treatment Facility, using the Manette outfall pipe. The best "backup" pipes that could be used for the dye study appear to be OF-2 on the east side of the Narrows, and OF-11 on the west side of the Narrows. Both of the backup pipes have a nearby fire hydrant located next to a storm grate that could be used to carry the dye to the pipe. No fire hydrant hoses would need to cross a street at these locations.

The Manette site has an advantage in not allowing any release of untreated CSO. Both of the backup sites have an advantage in having the possible hydrant water and dye enter a stormwater pipe separate from the sewer system that leads to the outfall pipe. Mike Dawda of Ecology NWRO has indicated that the use of fire hydrant water to conduct the dye study at the Port Washington Narrows is okay. He recommends that the Health Dept. be notified about the event, and that there be a small sign (and person) by the hydrant in case the public asks what is going on.

Further, it doesn't seem to matter whether the discharge pipe is a CSO-only pipe or whether it also discharges only stormwater at times.

Some initial calculations have been conducted to estimate the amount of dye needed for fluorometry work. Assuming that the Manette Eastside WWTP is used for the injection point, the hydraulic design capacity of the outfall pipe is 12 mgd. The design storm used by the City to help determine the capacity of the CSO treatment at the site is 10 mg over 48 hours (5 mgd average). This is considered to be the largest flow of CSO contribution reaching the treatment site. Currently, DOH has two gallons of Rhodamine WT dye on hand for the study. At a 20% active ingredient level, that is 0.4 gallon of A.I. dye. For 200 gpm (0.3 mgd) of hydrant flow over 3 hours, that is a total of 36,000 gallons of freshwater. At a target of 3 ppm of dye in the discharge, a total of 0.108 gallon of dye (A.I. basis) would be required. For increased flows, we should have enough dye on hand (assuming we don't need to repeat the study) to have a freshwater flow of about 1 mgd (600+ gpm) for three hours. The fire hydrant dye should provide 60-80 PSI at 600 gpm for 3 to 6 hours if needed. A couple hundred feet of fire hose will also be needed and the neighborhood will be notified before hand. A flow below 600 gpm should be sufficient and allow us to monitor dilutions of 10,000:1. But of course the more dye we use the higher the levels of dye we will observe in the open part of Dyes Inlet.

Also need to check if the hydrant water needs to be dechlorinated prior to discharge.

5.3 Field Survey

The field survey will be conducted to measure the Rhodamine dye and other ancillary parameters that will help identify the plume and provide data for modeling. At least one of the vessels will be outfitted with the Mini-MESC system. The Mini-MESC real-time system employs both a towed sensor package along with an onboard GPS navigation receiver and bottom depth sensor. Sensors in the towed package consisted of a conductivity, temperature, and depth profiler (CTD), outfitted with pH and dissolved oxygen sensors, and a flourometer. A V-Fin depressor is used to keep the instrument package stable and submerged to the appropriate depth.

A list of all parameters measured or derived, their units of measure, and their frequency of measurement are provided in Mini_Mesc.doc.

At least two additional vessels will be required. Each vessel will need GPS capability. Depending on what sensors are available, vessels will be outfitted and tasked accordingly.

Cell phones and marine radios will be used to keep in contact with the boat crews and injection ops.

5.4 Data Collection

Crews will be assigned to boats and checked on the various tasks that need to be performed.

Vessels

Enforment Boat - Tribe 26ft cabin crusier (B)
Landing craft – Tribe 24ft cabin outboard (C)
Almar – DOH 23 ft (A)
another vessel to be named later

Sensors

Fluorometers
MiniMESC system = Enforment boat
flowthrough fluorometer

Turner 3100 – Kitsap County discrete samples
fluorometer Turner – DOH ?

Refractometer

Hydo labs - Bremerton

YSI - DOH

GPS – hand held units for each boat, tracking

laptops computers, City, Tribe, PSNS

collect samples from discharge line for intercalibration

collect salinity/temp profile during low, mid, and high tide

cell phone/marine radio

digital camera/video

People

Injection Crew – two hydrant/ pump,
dye injector/sampler taker
Vessel Crews – skipper
navigator
sampler
assistant (?)
Photo journalist
Command Center

5.4.1 Continuous Data

5.4.2 Discrete Sampling

Sample bottles

5.5 Data Processing

Need to work out details

5.6 Model Confirmation and Validation

PF to provide…

6. Data Needs

Wind Data

Rainfall Data

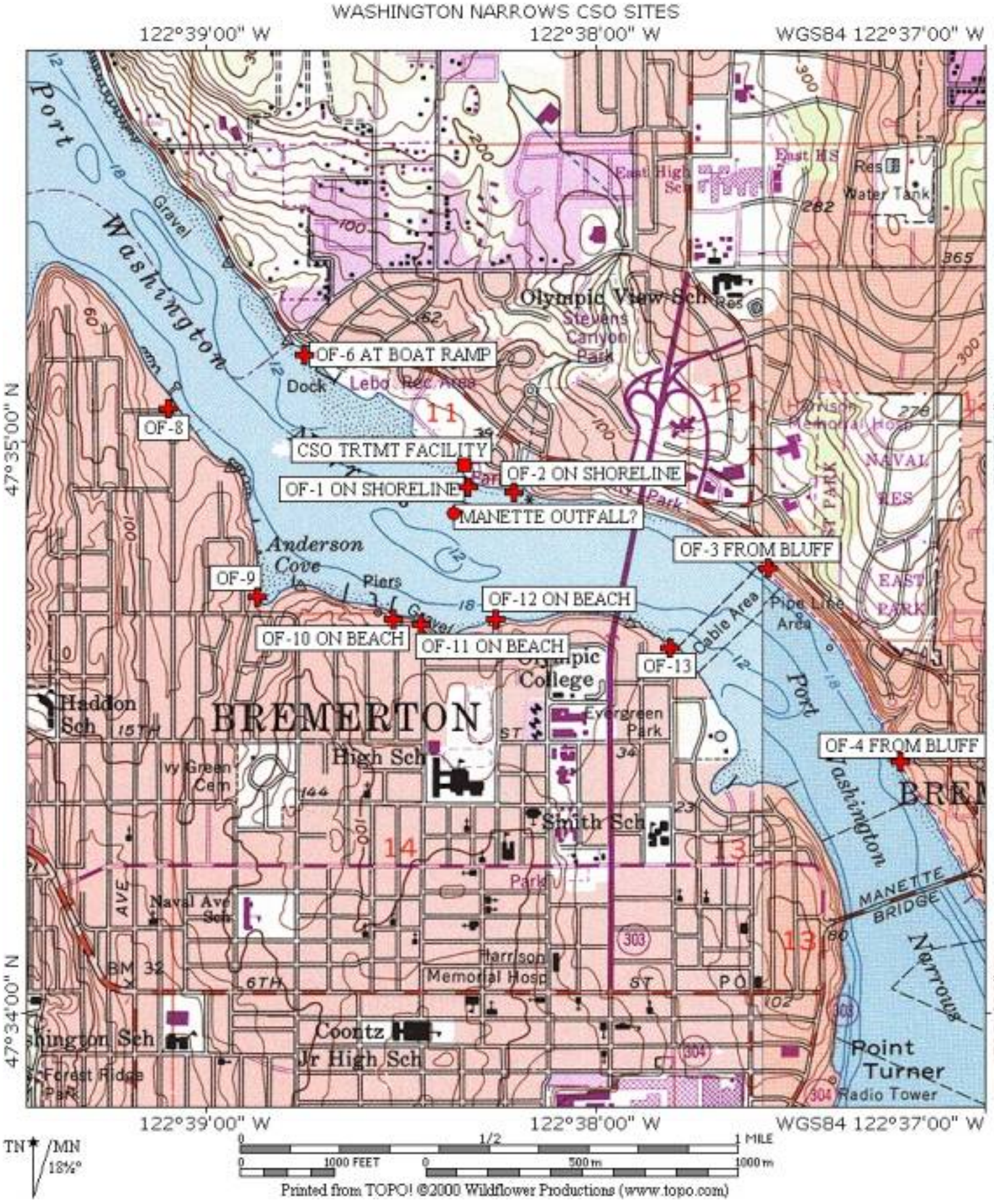
other..

7. References

Johnson, B. H., Kim, K. W., Heath, R. H., Butler, H. L., and Hsieh, B. B. 1991. "User's Guide for a Three-Dimensional Numerical Hydrodynamic, Salinity, and Temperature Model of Chesapeake Bay," Technical Report HL-91-20, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Wang, P.F and K.E. Richter 1999. A Hydrodynamic Modeling Study Using CH3D for Sinclair Inlet, Draft Report. Space and Naval Warfare Systems Center, San Diego, CA, November 3, 1999.

Wang, P.F. 2001. Dispersion resulting from aggregating hydrodynamic properties in water quality modeling. International Journal of Engineering Science, 39:95-112.


WASHINGTON NARROWS CSO SITES
122°39'00" W
122°38'00" W
WGS84 122°37'00" W
47°35'00" N
47°34'00" N
OF-6 AT BOAT RAMP
OF-8
CSO TRTMT FACILITY
OF-2 ON SHORELINE
OF-1 ON SHORELINE
MANETTE OUTFALL?
OF-3 FROM BLUFF
OF-9
OF-12 ON BEACH
OF-10 ON BEACH
OF-11 ON BEACH
OF-13
OF-4 FROM BLUFF
Port Washington Narrows
Olympic View Sch
Stevens Canyon Park
Lebo Rec Area
Anderson Cove
Piers
Gravel
Cable Area
Pipe Line Area
Olympic College
BREMERTON
High Sch
Haddon Sch
Evergreen Park
Ivy Green Cem
Smith Sch
Naval Ave Sch
Harrison Memorial Hosp
Coontz Jr High Sch
Forest Ridge Park
Point Turner
Radio Tower
MANETTE BRIDGE
East High Sch
Water Tank
NAVAL RES
EAST PARK
TN 18½° MN
1/2
1 MILE
1000 FEET
500 m
1000 m
Printed from TOPO! ©2000 Wildflower Productions (www.topo.com)

Oct. 3 2001 2:07:31 PM **Bremerton CSO Outfalls Site visit Oct. 3, 2001**

Name	Organization	Phone	email
Chance Berthiaume	City of Bremerton	(360) 478-5929	cherthiaume@ci.bremerton.wa.us
Dan Adams	City of Bremerton		dadams@ci.bremerton.wa.us
Frank Meriwether	Dept. of Health Shellfish	(360) 236-3321	frank.meriwether@doh.wa.gov
Bob Johnston	MESO-NW/PSNS	(360) 782-0112	johnston@spawar.navy.mil

Letter from DOH to City of Bremerton on site visit.
dyescsos.doc

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1. OF-6 (Out Fall 6) Located at Lion's Park Boat Ramp 15-inch Concrete ("Serviceable, end of outfall crushed and restricts discharge")

OF-6. Coordinates taken at boat launch on shoreline: 47º 35.15' N, 122º 38.75' W [35' 9" N, 38' 45" W]. According to city's notes, the end

of the outfall is crushed, restricting discharge. The end of the outfall may be in relatively shallow water out of the main Narrows flow. Fire hydrant flow could go into a stormwater grating on the street then out through this CSO pipe.- (DOH 9 Oct 2001)
47 35.15 122 38.75 (at base of boat ramp)

MVC-111S.JPG Oct. 3 2001 12:35:10 PM

2. Pine Road Storm Water Outfall. Major Storm Water Outfall for East Bremerton

47 35.18 122 38.79

MVC-112S.JPG Oct. 3 2001 12:36:24 PM

MVC-113S.JPG Oct. 3 2001 12:36:44 PM

MVC-114S.JPG Oct. 3 2001 12:37:08 PM

MVC-115S.JPG Oct. 3 2001 12:37:28 PM

MVC-116S.JPG Oct. 3 2001 12:37:54 PM

MVC-117S.JPG Oct. 3 2001 12:38:18 PM

MVC-118S.JPG Oct. 3 2001 12:45:06 PM

3. OF-2 Located South of new treatment facility; 15-inch concrete (Serviceable). The Overflow 2

and Stephenson Creek outfalls are located at the end of Lent Lane in East Bremerton

OF-2. Coordinates taken on shoreline: 47º 34.91' N, 122º 38.21' W [34' 55"N, 38' 13" W]. The closest manhole to the outfall is covered by sod at the new park. But a hydrant and stormwater grating are available directly across the street from the park. - (DOH 9 Oct 2001)
47 34.91 122 38.21

MVC-122S.JPG Oct. 3 2001 1:04:58 PM

MVC-123S.JPG Oct. 3 2001 1:05:24 PM

MVC-140S.JPG Oct. 3 2001 1:56:14 PM Park above Stephenson Creek

4. Stephenson Creek, storm water drainage for area around Harrison Hospital and Wheaton Way

47 34.93 122 38.20 (at drain pipe opening onto beach)

MVC-121S.JPG Oct. 3 2001 1:04:48 PM

MVC-124S.JPG Oct. 3 2001 1:05:36 PM

MVC-125S.JPG Oct. 3 2001 1:06:52 PM Drain pipe opening onto beach

MVC-126S.JPG Oct. 3 2001 1:08:12 PM

MVC-127S.JPG Oct. 3 2001 1:08:26 PM

MVC-128S.JPG Oct. 3 2001 1:08:44 PM

5. OF-1 20-inch CI pipe; extends to elevation of of 110ft; open end diffuser

OF-1. Coordinates taken on shoreline: 47º 34.92' N, 122º 38.33' W [34' 55" N, 38' 20" W]. This outfall is said to be exposed on VERY low tides. - (DOH 9 Oct 2001)
47 34.92 122 38.33

MVC-131S.JPG Oct. 3 2001 1:14:46 PM This is the approximate location of the treatment plant outfall, but the picture is of an abandoned storm outfall

MVC-120S.JPG Oct. 3 2001 12:55:52 PM Looking back toward bank of treatment facility

MVC-119S.JPG Oct. 3 2001 12:55:38 PM

6. Old Manette WWTP Outfall, goes to center of channel; ("20-inch CI pipe with 36-inch RPC extension; extends to an elevation of 85 ft; diffuser has 21 5-3/4 inch diameter ports located on alternate sides, with a concrete plug at the

end") currently not being used. When new East Side Treatment Plant comes online in Dec 2001, it will be used to discharge treated CSO flow to the Narrows.

Manette Outfall (from Eastside CSO Treatment Facility). Coordinates taken on shoreline: 47º 34.96' N, 122º 38.34' W [34' 58"N, 38' 20" W]. No flow of any kind is directed through this outfall at this time. According to as-built diagrams, the diffuser starts about 300 feet from shore, and is about 80 feet long. There are 21 ports in the diffuser, which is located at about -24 feet at MLLW. This diffuser has been recently examined and is said to be in good condition. The Treatment Facility is scheduled to be completed by the end of this year. Water and power will be available on the site for a dye study. - (DOH 9 Oct 2001).
47 34.93 122 38.36 where the pipe run perpendicular from the shore to the center of the channel

MVC-129S.JPG Oct. 3 2001 1:14:08 PM Approximate location of outfall pipe from WWTP

MVC-130S.JPG Oct. 3 2001 1:14:24 PM

7. East Side WW Treatment Plant under construction

MVC-132S.JPG Oct. 3 2001 1:30:00 PM

MVC-133S.JPG Oct. 3 2001 1:31:26 PM 100,000 gal storage tank

MVC-134S.JPG Oct. 3 2001 1:31:50 PM treatment

MVC-135S.JPG Oct. 3 2001 1:31:58 PM

MVC-136S.JPG Oct. 3 2001 1:35:06 PM

MVC-137S.JPG Oct. 3 2001 1:35:18 PM manhole access to outfall from East Side WWTP

MVC-138S.JPG Oct. 3 2001 1:35:48 PM

MVC-139S.JPG Oct. 3 2001 1:36:26 PM

8. OF-3 located behind Bowling Alley, steep bank about 100 ft above beach (12-inch)

OF-3. Coordinates taken on top of the bluff near the Bay Bowl bldg: 47º 34.78' N, 122º 37.56' W [34' 47" N, 37' 34"W]. Outfall on beach is near a green 10-12" PVC stormwater pipe. City information indicates the end of the outfall is crushed. - (DOH 9 Oct 2001)
47 34.78 122 37.56 (from top of bank)

MVC-141S.JPG Oct. 3 2001 2:07:10 PM

MVC-142S.JPG Oct. 3 2001 2:07:30 PM View of Port Washington Narrows from Overflow 3. Overflow 13/CE-1 is to the right at far shore.

9. OF-4 next to former Navy housing complex. 15-inch cast iron ("serviceable, exposed at extreme low tide)

OF-4. Coordinates taken from bluff: 47º 34.44' N, 122º 37.22' W [34' 26"N,

37'13"W]. The end of this outfall is exposed at very low tides. No hydrant water appears to be readily available at this site. - (DOH 9 Oct 2001)
47 34.44 122 37.22 (from bank above beach)
MVC-143S.JPG Oct. 3 2001 2:13:54 PM
MVC-144S.JPG Oct. 3 2001 2:14:22 PM
MVC-145S.JPG Oct. 3 2001 2:14:56 PM
MVC-146S.JPG Oct. 3 2001 2:18:26 PM Looking down man hole, showing transducer (top), weir (center), sanitary sewer (right side), and CSO (left side)
MVC-147S.JPG Oct. 3 2001 2:20:42 PM Platform for Isco sampler
MVC-148S.JPG Oct. 3 2001 2:21:30 PM
MVC-149S.JPG Oct. 3 2001 2:22:24 PM
MVC-150S.JPG Oct. 3 2001 2:22:38 PM Sample control panel; clockwise from top left: modem, flow meter for in channel flow meter, CSO flow meter, voltage suppressor, and battery backup and power disconnect.
MVC-151S.JPG Oct. 3 2001 2:22:58 PM

10. OF-7a (24 inch conrete) & OF-7b (14 inch ductile iron) located at the tip of East Bremerton also colocated with 24-inch storm drain

OF-7 (at Trenton and Lower Shore roads). Coordinates taken on fishing pier: 47º 34.12' N, 122º 36.48' W [34'7"N, 36'29"W]. OF-7A and OF-7B are parallel CSO outfalls from the same manhole station. A third pipe that is visible on the beach is a separate stormwater outfall pipe. - (DOH 9 Oct 2001)

47 34.12 122 36.48

MVC-152S.JPG Oct. 3 2001 2:37:46 PM Sampling infrastructure at OF-7a & 7b
MVC-153S.JPG Oct. 3 2001 2:38:34 PM 24 Storm water outfall for the Trenton Avenue basin
MVC-154S.JPG Oct. 3 2001 2:39:20 PM
MVC-155S.JPG Oct. 3 2001 2:40:16 PM Nice silver!
MVC-156S.JPG Oct. 3 2001 2:40:22 PM Very nice!

11. OF-13 located north of Evergreen Park, at end of Park Avenue by wastewater lift station CE-1. Main lift station for Warren Ave basin

OF-13 (at yellow Pipeline Crossing sign). Coordinates taken at the end of the outfall: 47º 34.64' N, 122º 37.81' W [34'38"N, 37'49"W]. This is a bank discharge pipe exposed at lower tide levels. - (DOH 9 Oct 2001)

MVC-157S.JPG Oct. 3 2001 2:52:24 PM Valves for controlling flow across the Narrows to CE-1 Pump station
MVC-158S.JPG Oct. 3 2001 2:54:38 PM Going to Overflow 13 outfall at base of wall
MVC-159S.JPG Oct. 3 2001 2:55:58 PM Overflow 13 outfall is in the middle of the photo
MVC-160S.JPG Oct. 3 2001 2:56:12 PM Overflow 4 is in the middle of the photo
MVC-161S.JPG Oct. 3 2001 2:56:46 PM Looking across Narrows at OF-3 at the Bowling Alley

12. OF-12 located at the end of Ohio street,

behind Olympic College. Also a storm drain 24" concrete, extends to an elevation of 103 ft, open ended diffuser

OF-12 (off of the south end of Ohio Street). Coordinates taken on beach: 47º 34.69' N, 122º 38.26' W [34'41"N, 38'16"W]. The outfall is apparently in good condition, and a fire hydrant and stormwater grating is located a block south on 17th Street. - (DOH 9 Oct 2001)
47 34.69 122 38.14
MVC-162S.JPG Oct. 3 2001 3:25:16 PM Looking at Overflow 1
MVC-163S.JPG Oct. 3 2001 3:25:28 PM Manhole access to Overflow 12
MVC-164S.JPG Oct. 3 2001 3:26:00 PM ISCO sampler
MVC-165S.JPG Oct. 3 2001 3:26:44 PM Overflow 12 weir box
MVC-166S.JPG Oct. 3 2001 3:27:34 PM

13. OF-11 "12-inch [which] connects to 42-inch storm drain, extends to elevation 104 open ended diffuser"

OF-11 (off south end of High Avenue). Coordinates taken on beach: 47º 34.68' N, 122º 38.44' W [34'41"N, 38'26"W]. This is a relatively new pipe (built in the mid-80's). Of the various Anderson Cove basin CSO sites, this outfall is the most likely to overflow (by design). There is a fire hydrant and nearby stormwater grate one block south on 17th. - (DOH 9 Oct 2001)
47 34.68 122 38.44
MVC-167S.JPG Oct. 3 2001 3:38:12 PM
MVC-168S.JPG Oct. 3 2001 3:38:26 PM Looking across Narrows at East Side WWTP under construction
MVC-169S.JPG Oct. 3 2001 3:38:36 PM

14. OF-10 near "old boat & RV wrecking yard"; 10 inch concrete,

OF-10. Coordinates taken on beach: 47º 34.71' N, 122º 38.52' W [34'43"N, 38'31"W]. This is an older outfall that may have breaks in it. - (DOH 9 Oct 2001)
47 34.71 122 38.52 (climbed down to beach)
MVC-170S.JPG Oct. 3 2001 3:46:22 PM Overflow 10 weir box
MVC-171S.JPG Oct. 3 2001 3:47:28 PM
MVC-172S.JPG Oct. 3 2001 3:50:40 PM
MVC-173S.JPG Oct. 3 2001 3:50:54 PM
MVC-174S.JPG Oct. 3 2001 3:51:12 PM

15. OF-9 Anderson Cove; 12-inch, connects to 36-inch Storm Drain, serviceable exposed at low tide. Doesn't overflow anymore, downstream of others

OF-9 (in Anderson Cove). Coordinates taken at end of pipe, which is exposed on lower tides: 47º 34.73' N, 122º 38.87' W [34"44"N, 38'52"W]. - (DOH 9 Oct 2001)
47 34.73 122 38.874
MVC-175S.JPG Oct. 3 2001 4:00:26 PM Overflow 9 outfall at Frank's feet
MVC-176S.JPG Oct. 3 2001 4:00:42 PM Standing on the outfall
MVC-177S.JPG Oct. 3 2001 4:01:10 PM Looking out into Anderson Cove

16. OF-8 also connects to storm water. 24-inch cast iron; serviceable, exposed at low tide

OF-8 (kind of near the abandoned pier pilings that stick out about 50 yards into the Narrows). Coordinates taken near the end of the pipe, which is a bank discharge: 47º 35.06' N, 122º 39.10' W [35'4"N, 39'6"W]. - (DOH 9 Oct 2001)
47 35.06 122 39.10
MVC-178S.JPG Oct. 3 2001 4:13:46 PM Overflow 8 outfall / primary purpose is stormwater outfall
MVC-179S.JPG Oct. 3 2001 4:14:20 PM
MVC-180S.JPG Oct. 3 2001 4:14:56 PM
MVC-181S.JPG Oct. 3 2001 4:15:12 PM

Bremerton CSO Outfalls Site Visit Oct. 27 2001 12:10:00 PM

Name	Organization	Phone	email
Chance Berthiaume	City of Bremerton	(360) 478-5929	cherthiaume@ci.bremerton.wa.us
Dan Adams	City of Bremerton		dadams@ci.bremerton.wa.us
Jerry Sherrell	PSNS	(360) 476-4594	frank.meriwether@doh.wa.gov
Bob Johnston	MESO-NW/PSNS	(360) 782-0112	johnston@spawar.navy.mil

17. Callow Ave. storm water outfall for West Bremerton consists of 84-inch concrete outfall which discharges to the west of the carrier berth. OF-17 is a 54-inch concrete pipe drains CSO, it comes out further east within PSNS. Outfall discharges subtidally from under the parking lot inside PSNS near Missouri Gate. Manhole in parking lot provides access. Serviceable.

47° 33' 37' 122° 38' 12"

MVC-206S.JPG Oct. 16 2001 12:41:46 PM Underwater discharge

MVC-207S.JPG Oct. 16 2001 12:41:54 PM Can see suspended sediment in plume

MVC-208S.JPG Oct. 16 2001 12:42:08 PM Carrier parked adjacent to outfall, outfall location in foreground

MVC-209S.JPG Oct. 16 2001 12:42:26 PM Location of manhole cover for access

MVC-210S.JPG Oct. 16 2001 12:43:18 PM Shoreline towards PSNS

from outfall.

MVC-211S.JPG Oct. 16 2001 12:43:54 PM View down 84" stormwater system manhole by carrier

MVC-214S.JPG Oct. 16 2001 12:51:54 PM O/F 17 weir at Callow and Farragut (Charlseton Gate)

MVC-215S.JPG Oct. 16 2001 12:52:10 PM O/F 17 weir, by Charleston Gate

MVC-212S.JPG Oct. 16 2001 12:46:00 PM Dredge over CAD site, adjacent to discharge outfall

MVC-213S.JPG Oct. 16 2001 12:46:12 PM Outfall discharges into this "cove", dredge over CAD site in background

MVC-216S.JPG Oct. 16 2001 12:52:50 PM Manhole access near Charleston Gate at PSNS; collection for outfall 54-inch outfall

MVC-218S.JPG Oct. 16 2001 12:56:08 PM 72" stormwater manhole near Charleston Gate at PSNS

MVC-217S.JPG Oct. 16 2001 12:53:26 PM Street drain near Charleston Gate at PSNS

MVC-220S.JPG Oct. 16 2001 12:58:10 PM Sampling infrastructure inside City's space in PSNS parking structure

MVC-221S.JPG Oct. 16 2001 12:58:30 PM Detail of sampling system

MVC-222S.JPG Oct. 16 2001 1:19:18 PM Manhole access on

Montgomery Ave.

MVC-223S.JPG Oct. 16 2001 1:19:40 PM Inside manhole on Montgomery Ave.

MVC-224S.JPG Oct. 16 2001 1:20:08 PM Detail inside manhole on Montgomery Ave

MVC-225S.JPG Oct. 16 2001 1:20:58 PM Montgomery Ave.

18. OF-16 Pacific Ave drainage basin outfall. Major outfall drains heart of downtown Bremerton. Includes CSO and storm water. 24-inch concrete storm drain which passes through the CIA of PSNS and discharges into Sinclair Inlet near the end of Pier 7 (to the north of Pier 7 just beyond the end of Pier 8). Condition of the outfall is unknown.

47° 33' 37" 122° 37 44"

MVC-226S.JPG Oct. 16 2001 1:25:44 PM Location of collection point on Park Ave & 4th

MVC-227S.JPG Oct. 16 2001 1:26:32 PM Inside manhole on Park Ave, showing feeder drains

MVC-228S.JPG Oct. 16 2001 1:26:48 PM Detail of feeder drains

MVC-229S.JPG Oct. 16 2001 1:27:16 PM Down Park Ave to Shipyard

MVC-230S.JPG Oct. 16 2001 1:27:26 PM Outfall runs in this direction under the CIA at PSNS


INGERSOLL-RAND


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WARNING
NO STEP
NOT FOR HUMAN SUPPORT


WARNING
NO STEP
NOT FOR HUMAN SUPPORT


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NOTICE


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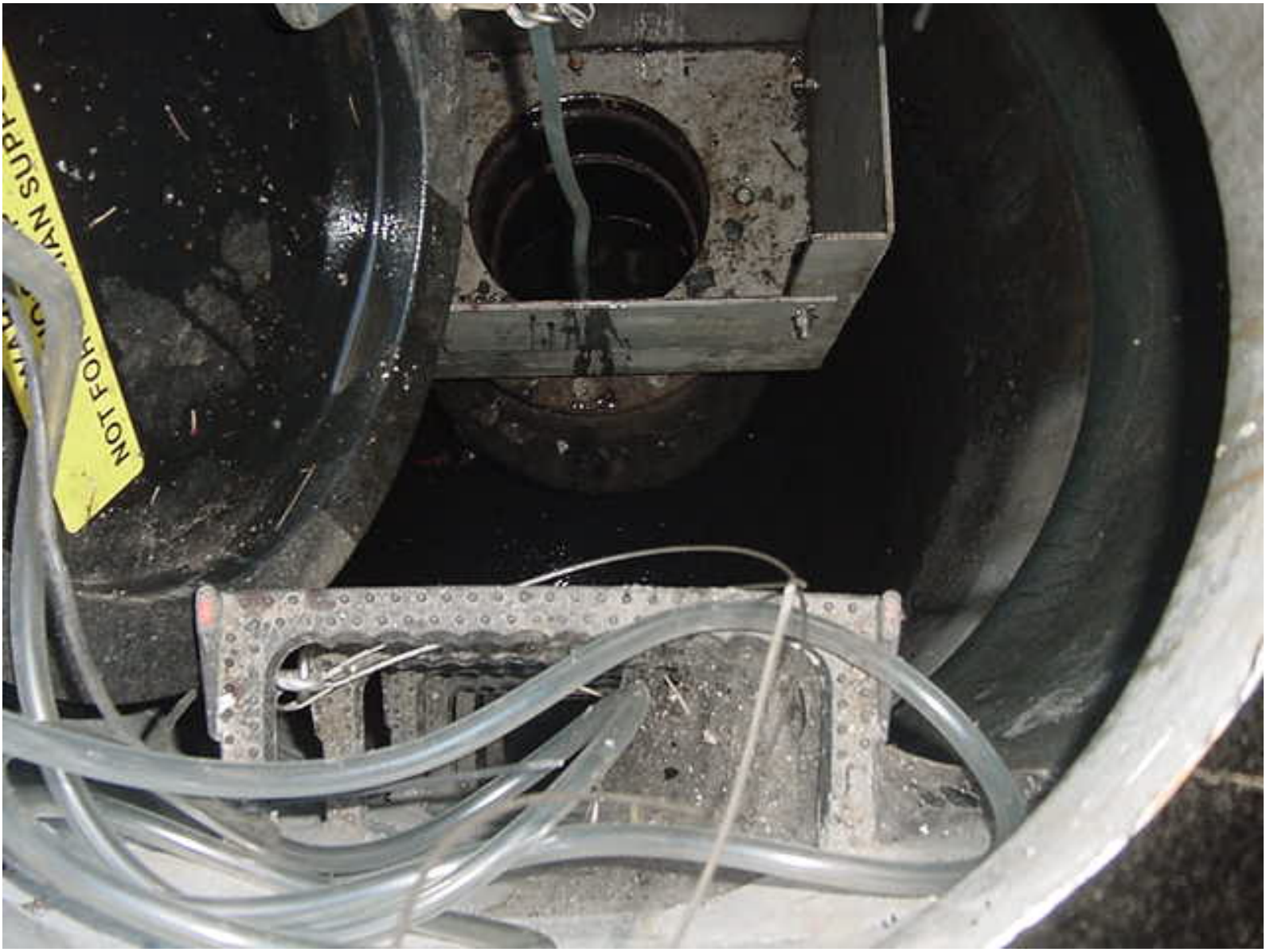
NOTICE


NOTICE


ISCO


NOT FOR


NO
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