



Marine and Sediment Assessment Group 2013 Work Plan

The best decisions are based on Sound information.

Date: February 6, 2013

To: Recipients

From: Scott Mickelson and Kim Stark

Subject: Transmittal of the 2013 Work Plan for the Marine and Sediment Assessment Group

This memorandum and attachments present the 2013 Work Plan for the Marine and Sediment Assessment Group of the King County Department of Natural Resources and Parks. The work plan includes both routine marine monitoring programs and Wastewater Treatment Division capital support projects such as the Brightwater marine outfall, Sediment Management Plan, and East Waterway and Lower Duwamish Waterway Superfund projects. Included with the memorandum are matrix tables that provide sampling locations, sampling frequency, and parameters measured for the 2013 routine monitoring programs, as well as maps showing sampling locations. Also included are summaries of projects in the proposal phase for 2013 and the Marine and Sediment Assessment Group's work accomplishments for 2012.

Station locations and analytical parameters may change from year to year. Any changes are based on an evaluation of previous years' data to determine if the data collected are meeting monitoring objectives for both the ambient and outfall monitoring programs and/or budgetary constraints. Marine and Sediment Assessment Group staff evaluate data each year to determine what changes are necessary, including what parameters should continue to be analyzed. A summary of how the marine monitoring program has changed over time, both in locations sampled and water quality constituents monitored, may be found on-line in the 2009 Work Plan at <http://green.kingcounty.gov/marine/Reports/2009-Marine-Group-Work-Plan.pdf>.

For the 2013 work plan, there are two major changes. Bacteria samples at the offshore outfall stations have previously been collected from each sampling depth, ranging from one to seven samples, based on total station depth. A thorough review of past bacteria data at these stations indicated that this vertical resolution was not providing sufficient additional information to warrant the sampling and analytical effort. Bacteria samples will now be collected from one to three sampling depths at each of the outfall monitoring stations. These depths include: the surface; the deepest depth; and an intermediate (trapping) depth at the deeper outfall stations, again, based on total station depth.

Starting in mid-2013, samples will be collected at eight stations and analyzed for quantitative phytoplankton species abundance using the new FlowCam instrument. These samples will aid in method development and building the image library necessary for future analyses. Samples will be collected monthly at the same time samples are collected for the subtidal ambient and outfall sampling program.

2013 Marine Offshore Water Column Monitoring Program

Water column samples will be collected monthly from 18 stations. Ten outfall monitoring stations are located at outfalls for the Brightwater, West Point, South, and Vashon wastewater treatment plants, the Alki and Carkeek combined sewer overflow (CSO) treatment plants, the Elliott West and Henderson/MLK/Norfolk CSO treatment facilities, the Barton Street CSO, and the Hanford CSO. Eight ambient monitoring stations are located at Point Jefferson, Elliott Bay, Fauntleroy/Vashon, East Passage, the Lower Duwamish Waterway (2 stations), and Quartermaster Harbor (two stations).

Discrete water samples will be collected from between one and seven depths at each offshore station, depending on the total station depth. Conductivity, temperature, depth (CTD) profiles will be conducted throughout the entire water column at 15 of the 18 stations – those stations sampled from King County’s research vessels *Liberty* or *Chinook*.

Laboratory analytes will include fecal coliform and enterococcus bacteria, chlorophyll-*a* and pheophytin pigments, suspended solids, and nutrients (ammonia, nitrite/nitrate nitrogen, orthophosphate phosphorus, and silica). Total nitrogen will be analyzed on a subset of 13 samples. Bacteria samples will be collected from one to three sampling depths at each of the outfall monitoring stations, including the surface (1 meter), the deepest depth, and an intermediate (trapping) depth at the deeper outfall stations. Bacteria samples will only be collected from the surface at ambient monitoring stations, with the exception of the Quartermaster Harbor and Duwamish River samples. Bacteria samples will be collected from both depths at each Quartermaster Harbor and Duwamish River station. All other laboratory parameters will be analyzed on samples collected from every depth.

Electronic *in situ* data will be collected at all but three offshore stations using a CTD sensor array. CTD data will include the following parameters; dissolved oxygen, salinity, temperature, density (calculated), transmissivity, photosynthetically active radiation (PAR), and fluorescence (as a measure of chlorophyll). Surface PAR and Secchi depth measurements will also be collected at all of the offshore stations collected from the *Liberty* or *Chinook*. Secchi depth is collected as well at the two Quartermaster Harbor stations. Field measurements for dissolved oxygen and temperature will be collected using a Hydrolab® instrument at the two Quartermaster Harbor stations and the Henderson/MLK/Norfolk CSO station.

2013 Marine Phytoplankton Monitoring Program

The phytoplankton sampling program will continue at the three sites sampled in previous years. Bi-weekly sampling and analysis will occur April through October at two stations (Point Jefferson and East Passage) and March through November at the Quartermaster Harbor site due to an extended bloom season at this location. Semi-quantitative analysis will occur for two depths at the Point Jefferson and East Passage stations (1m and the chlorophyll maximum layer as determined by the fluorometer on the CTD) and only at the 1m depth at the Quartermaster

Harbor site. Nutrient and chlorophyll-*a* samples will be collected and analyzed concurrent with the phytoplankton samples.

Starting in mid-2013, samples will be collected at eight stations and analyzed for quantitative phytoplankton species abundance using the new FlowCam instrument. These samples will aid in method development and building the image library necessary for future analyses. Samples will be collected monthly at the same time samples are collected for the subtidal ambient and outfall sampling program.

2013 Marine Moorings Program

Marine moorings that include *in situ* water quality data gathering sensors are currently deployed at three locations – the Seattle Aquarium (two depths), Dockton Park (one depth), and the Quartermaster Harbor Yacht Club (one depth). These marine mooring systems gather data at 15-minute intervals for dissolved oxygen, salinity, temperature, fluorescence (chlorophyll), turbidity, and pH. A SUNA sensor also collects nitrate data at the Quartermaster Harbor Yacht Club mooring site. Meteorological data are also collected by the mooring systems deployed at the Seattle Aquarium and Dockton Park.

A new buoy will be deployed in the Central Puget Sound Basin (location to be determined) sometime in 2013. This buoy will collect data from a single depth using the same suite of sensors as the other mooring deployments. Along with this suite of sensors, the SUNA sensor will be moved to this new location to collect nitrate data.

Continuous data gathering involves a high degree of data management, quality control, and website maintenance to make the data available publicly. The marine mooring web page was redesigned in 2009 to facilitate better public access to the data and enhanced data analysis and reporting tools. The Marine and Sediment Assessment Group will continue to provide support for web maintenance, quality control, and data analysis.

2013 Marine Beach Water Quality Monitoring Program

Water samples will be collected monthly from 20 marine beach stations and 1 stream station located in Piper's Creek. Nine outfall-vicinity monitoring stations are located inshore of the West Point (two stations) and Vashon treatment plant outfalls, the Alki (two stations), Carkeek, and Elliott West CSO treatment plant outfalls, and the South Magnolia and Barton CSO outfalls. All 20 of the monitoring stations will be sampled monthly for analysis of fecal coliform and enterococcus bacteria, temperature, salinity, and nutrients (ammonia, nitrite/nitrate nitrogen, and orthophosphate phosphorus). The Piper's Creek stream station will be monitored for bacteria, temperature, and nutrients. A subset of six beach water samples will also be analyzed for Total Nitrogen.

2013 Subtidal Sediment Monitoring Program

King County restructured its ambient marine subtidal sediment monitoring program in 2007 to both supplement the Washington State Department of Ecology's sediment monitoring program and to provide focused monitoring of sediment quality in Elliott Bay. Subtidal sediments are collected every two years from eight stations in Elliott Bay and every five years from six additional stations outside of Elliott Bay, including three stations in the main basin of Puget

Sound and three associated embayments. For this new sampling rotation, all 14 stations were first sampled in 2007 and the eight Elliott Bay stations were sampled again in 2009 and 2011. The six ambient stations were sampled for the second time in 2012.

In 2013, the eight Elliott Bay stations will be sampled. Sediment samples will be analyzed for conventional parameters (total solids, total organic carbon, particle size distribution, ammonia, sulfides), metals, and organics (semivolatile compounds, chlorinated pesticides, PCBs, and PDBEs). The sampling and analysis plan will be updated and amended as warranted for the 2013 sampling event. Data generated from the ambient subtidal sediment monitoring program are used, in part, to provide information for the County's KingStat environmental indicators program.

Brightwater Marine Outfall Technical Support

The following Brightwater marine outfall project work will be undertaken during 2013:

- Preparation of the final report summarizing results of the nearshore benthic surveys at the trench construction site for the Washington State Departments of Fish and Wildlife and Natural Resources.
- Preparation of the final report summarizing results of the baseline sediment characterization at the outfall diffuser for the Washington State Departments of Fish and Wildlife and Natural Resources.
- Consultant oversight and coordination for eelgrass survey activities and reports and preparation of the 2014 contract amendment.
- Conducting one ROV survey of the eelgrass transplant areas in early summer.
- Agency meetings and updates as necessary.
- A minimum of one ROV survey at the Brightwater outfall site at the -100 foot depth as part of the Biota and Structural Integrity special study. Up to three additional surveys may be performed in 2013, budget permitting. Preparation of a survey report detailing biota presence and relative abundance.

West Point, South, and Brightwater Treatment Plants – NPDES Permit Work

New NPDES permits for the West Point and South treatment plants were issued in 2009 and new NPDES permits for the Brightwater and Vashon treatment plants were issued in 2011. New permits for the West Point and South treatment plants are scheduled to be issued in 2014 with draft permits issued in 2013 for review and comment. The following work will be performed in 2013 in support of the wastewater treatment plant NPDES permits:

- Preparation of a draft report to be submitted to Ecology that summarizes a two-year receiving water characterization project for trace metals, bacteria, and conventional parameters. The draft will be submitted to Ecology for review and comment in June. A final report may be issued in 2013, based on when Ecology provides comments.
- Final reports will be issued on sediment characterization efforts at the Brightwater and South treatment plants, as well as sediment monitoring at 10 CSO outfall sites.
- The Marine and Sediment Assessment Group will provide technical assistance during negotiations on the upcoming draft West Point and South wastewater treatment plant NPDES permits.

Sediment Management Plan – CSO Outfall Sediment Monitoring

Sediment samples were collected from 10 CSO outfall monitoring sites in 2011 and analyzed for conventional, metal, and organic parameters. Data from this sampling effort will be used to: 1) populate and calibrate the County's near-field sediment recontamination model; 2) determine if any exceedences of Washington State Sediment Management Standards chemical criteria exist at the 10 CSO outfall sites; and 3) create a pre-construction sediment quality baseline at four of the locations, for which CSO control projects are currently underway. A report detailing the results of this sampling was submitted to Ecology in 2012 to meet one monitoring requirement of the West Point wastewater treatment plant NPDES permit.

Based on the results of the 2011 sampling event, additional sampling will be conducted at six of the CSO sites previously monitored and at one new site. A total of 45 samples will be collected for sediment chemistry analysis, along with bioassay testing on 3 to 4 of the samples. Work will include preparation of a new sampling and analysis plan, field oversight during sampling, data analysis, and preparation of a follow-up monitoring report.

Lower Duwamish and East Waterway Superfund Projects Data Validation

Formal data validation will be completed on several large projects under the umbrella of the Lower Duwamish and East Waterway Superfund projects, as well as Source Control projects. These data validation efforts include:

- the bulk air deposition project;
- the Green/Duwamish stream sediment project;
- the Green River whole water and suspended sediment project; and
- the Brandon CSO basin characterization project.

Inter-Laboratory Nutrient Calibration Study

King County will continue to partner with the Washington State Department of Ecology on an inter-laboratory nutrient calibration study. The goals of the study are to:

- determine direct comparability of nutrient data currently collected and analyzed for central Puget Sound sites;
- provide a means to share data and utilize each agency's results collected for current and historical monitoring projects in Puget Sound;
- provide an understanding (degree, extent, and affected species) of similarities/differences of nutrient results provided by each agency to be used for a combined water quality index assessment and trend analysis for Central Basin stations; and
- provide comparative data for evaluation of laboratory performance and methods, should a transition or need for utilization of another analytical lab arise for future monitoring/projects.

To date, three rounds of nutrient standards analysis and two rounds of field side-by-side split sample analysis have been completed. Based on the results of these rounds of sampling, the following work will be undertaken in 2013, in support of this ongoing inter-laboratory calibration effort:

- Twice during 2013 (to be determined), standards for all four nutrients will be submitted to both laboratories in a range of concentrations similar to the previous pilot studies, to be analyzed as a continuing inter-laboratory calibration check.
- Staff of King County and Ecology will prepare a technical report, to be issued as an Ecology publication, summarizing a precision and accuracy analysis of the data resulting from the work performed in 2011, 2012, and 2013.

Delivery of nutrient standards to the University of Washington will be coordinated between agency staff. King County and the University of Washington laboratories will follow their standard protocols for analysis of nutrients.

Miscellaneous 2013 Work Items

- Support for the completion of Phase II of the Marine Monitoring web page, including uploading historical data and creation of web reporting tools.
- Support for the completion of a new, web-based, marine water quality monitoring reporting system, beginning with the 2008 and 2009 data reports.
- Support for the creation of a new marine benthic data website, including design, data population, testing, and reporting tools.
- Performance measure and environmental indicator updates.
- Preparation of sections for the RWSP Update report.
- Preparation of the 2014 marine and sediment assessment group work plan.
- Technical support for the EPA Quartermaster Harbor Nitrogen Study grant and preparation of the marine water quality monitoring report.
- Technical support for the Wastewater Treatment Division’s Sediment Management Plan.
- Technical support for the Puget Sound Partnership.
- Data downloading and analysis for outside agencies, educational facilities, private entities, and the general public.
- Participation in and presentation at the Marine Waters Work Group workshop on 2012 monitoring data. Follow-up to the workshop will include an analysis and write-up of King County marine data for the 2012 Puget Sound Marine Waters Overview report.
- Preparation of a talk and/or poster and participation in the Coastal and Estuarine Research Federation (CERF) 2013 biennial meeting.

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King County Marine and Sediment Assessment Group – 2012 List of Accomplishments

The following work items were accomplished by staff of the King County Marine and Sediment Assessment Group during 2012.

Ambient and Outfall Monitoring Programs

- Coordinated and implemented the collection of marine water, sediment, and phytoplankton samples for both the ambient and outfall monitoring programs.
- Completed internal programmatic annual review.
- Updated the KingStat marine environmental indicators.
- Provided sections for the annual RWSP update report.
- Completed a major update to the marine photos webpage.

- Completed analysis and quality control of 2011 marine data, including mooring data.
- Provided King County data write-ups for various 2011 data for the 2011 Puget Sound Marine Waters Overview Report published by PSEMP's Marine Waters Workgroup and assisted report preparation as co-editor.
- Completed several of the data summaries for the new annual reporting format on the marine group webpage.
- Completed a technical memo for the 2008 through 2010 marine phytoplankton data. Also completed a phytoplankton article for the section's SciFYI newsletter.
- Co-presented a poster at the regional Pacific Estuarine Research Society on the County's marine phytoplankton program and 2008 to 2011 results. Also chaired a conference session.
- Oversaw ongoing operation of the marine moorings as well as removal of the defunct Alki buoy. Performed quality control checks of the mooring data and did an analysis to determine if there was individual sonde bias and worked to improve data quality and efficiency of the mooring program.
- Participated in several outreach events such as gave a talk to the Marker Buoy Dive Club, participated in the Seattle Aquarium's Family Science Weekend, gave a presentation at the Vashon High School as part of the Quartermaster Harbor EPA grant project, served on the Marine Tech Science Advisory Panel for the Highline School District Marine Tech Program.
- Revised the sampling and analysis plan for the quintennial ambient subtidal sampling program and completed sampling at three deep Puget Sound main basin stations and three shallow embayment stations (Salmon Bay, Fauntleroy Cove, Quartermaster Harbor).

NPDES Permit-Related Work

- Completed the draft South Treatment Plant NPDES sediment monitoring summary report, which was submitted to Ecology along with data to EIM in fulfillment of one of the permit monitoring requirements.
- Completed the draft Brightwater Marine Outfall NPDES baseline sediment characterization summary report, which was submitted to Ecology along with data to EIM in fulfillment of one of the permit monitoring requirements.
- Completed the draft CSO sediment monitoring report, which was submitted to Ecology along with data to EIM in fulfillment of one of the permit monitoring requirements of the West Point NPDES permit as well as the Sediment Management Plan update.
- Completed the final two rounds of sampling for the NPDES receiving water characterization study, in fulfillment of one requirement of the West Point, South Plant, Brightwater, and Vashon NPDES permits.

Brightwater Marine Outfall

- Completed the fourth post-construction eelgrass SCUBA diver survey and data report. The eelgrass plants were still doing well in 2012.
- Completed one underwater video ROV survey at the eelgrass transplant site (with the ESS ROV team). The ROV team also collected great video footage of how the outfall pipes are providing habitat for various marine organisms which has resulted in a new special study.

- Sent all 2012 eelgrass reports to agency representatives per permit requirements.

Lower Duwamish Waterway and East Waterway Superfund Projects

- Completed data validation of nine years' sediment monitoring data for the Duwamish/Diagonal sediment remediation project.
- Completed two other major data validation efforts for the Brandon CSO basin effluent characterization study and the Green River baseflow characterization.

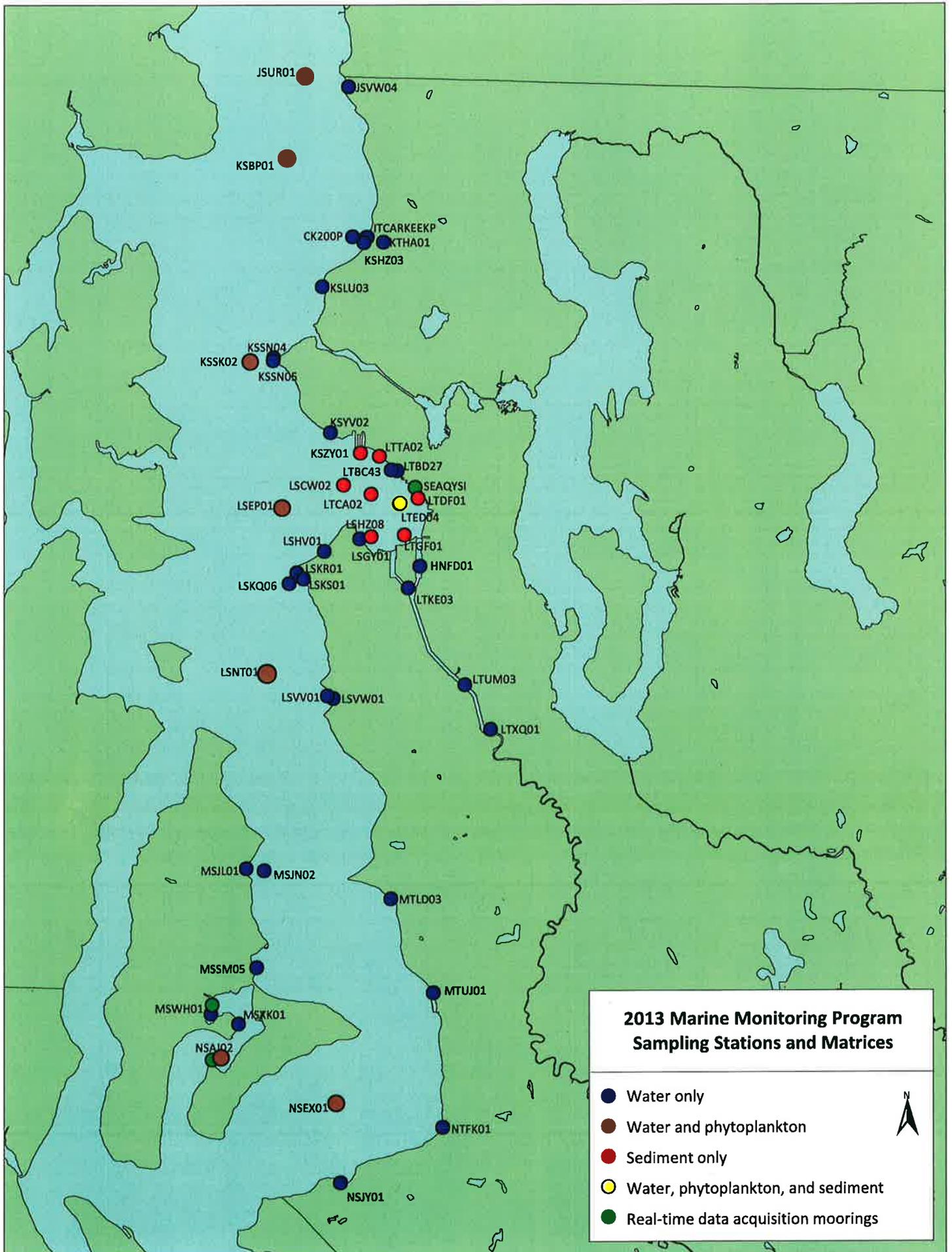
Miscellaneous Project Work

- Provided support for the EPA Quartermaster Harbor Nutrient Management Study grant.
- Completed two side-by-side field sampling events for the King County/Ecology/UW interlaboratory nutrient calibration study. Also completed two nutrient standard analytical efforts, coordinated with Ecology and the King County and UW laboratories.
- Completed 13 major data download/analysis requests for internal clients, outside agencies, educational institutions, consultants, and the general public.
- Participated in regional monitoring groups associated with the Puget Sound Partnership (such as the Nearshore Monitoring Subgroup and the Marine Waters Working Group) and the Washington State BEACH Program. Vice-chair of the Marine Waters Workgroup.

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The attachments that accompany this work plan include:

- A color-coded map showing the locations of all 2013 routine marine monitoring stations and marine moorings.
- A table of all routine marine monitoring sampling locations with stratum sampled (stream, beach, offshore), matrices monitored, and station coordinates.
- Maps and analytical matrix tables for each of the three routine marine monitoring programs for 2013 – offshore water column, beach water, and subtidal sediment.

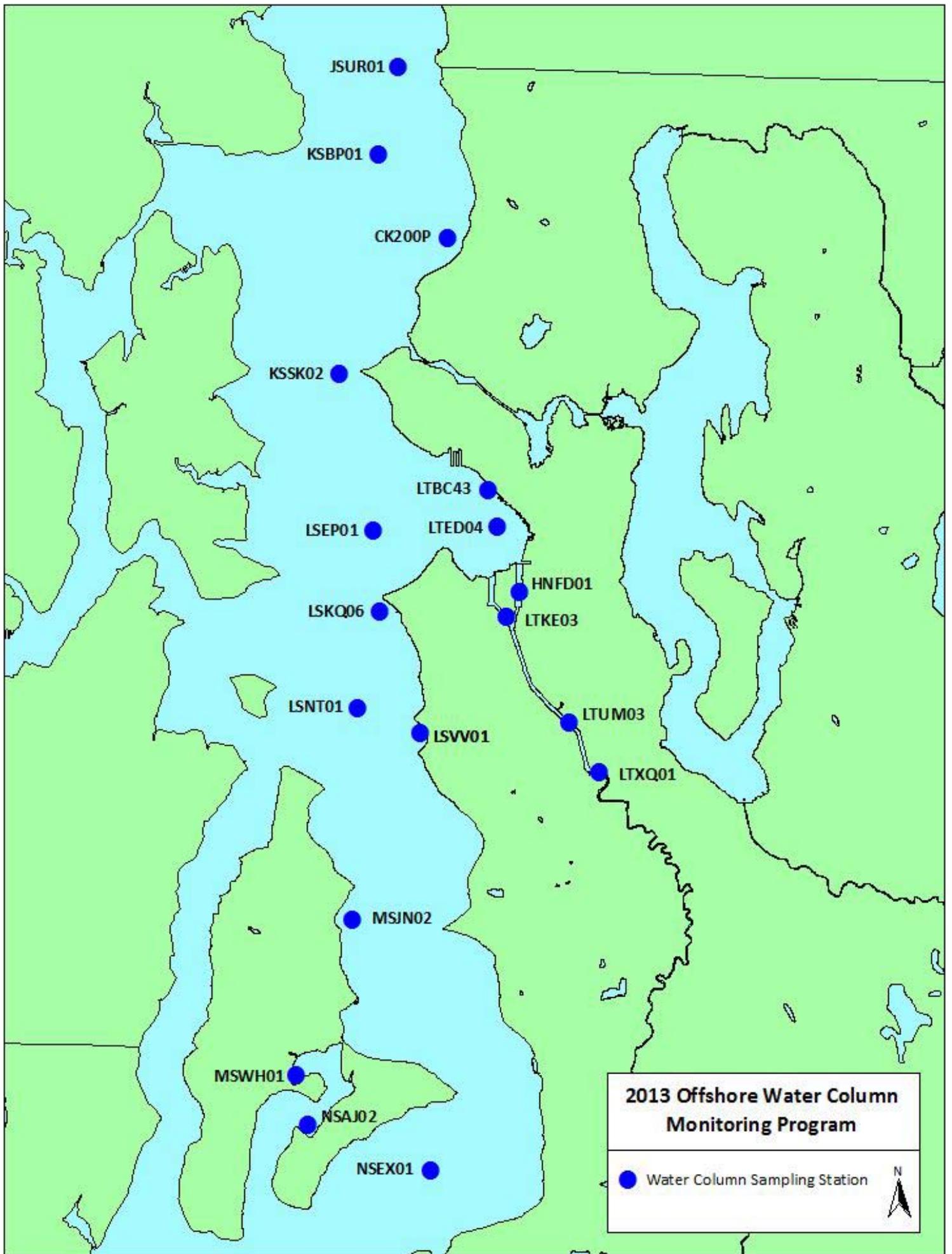


2013 Routine Marine Monitoring Program

Sampling Stations, Matrices Sampled, and Station Coordinates - FINAL

Locator	Description	Stratum	Matrices	Northing ¹	Easting ¹
JSVW04	Richmond Beach/Point Wells	Beach	Water	286171	1257194
ITCARKEEKP	Carkeek Park	Beach	Water	263756	1259915
KSHZ03	Piper's Creek Mouth	Beach	Water	263736	1259784
KTHA01	Piper's Creek	Stream	Water	262962	1262305
KSLU03	Golden Gardens	Beach	Water	256354	1253305
KSSN04	West Point North	Beach	Water	245729	1246032
KSSN05	West Point South	Beach	Water	245272	1245980
KSYV02	Magnolia CSO	Beach	Water	234547	1254488
LTBD27	SAM Sculpture Park	Beach	Water	228851	1264297
LSGY01	Seacrest Park	Beach	Water	218711	1258776
LSHV01	Alki Beach	Beach	Water	216852	1253532
LSKR01	Alki North	Beach	Water	213666	1249416
LSKS01	Richey Viewpoint	Beach	Water	212668	1250283
LSVW01	Fauntleroy Cove	Beach	Water	194969	1254846
MTLD03	Normandy Park	Beach	Water	165142	1263285
MTUJ01	Des Moines Creek Park	Beach	Water	151129	1269533
NTFK01	Redondo Beach	Beach	Water	131067	1270899
NSJY01	Dumas Bay Park	Beach	Water	122831	1255835
MSJL01	Vashon - Gorsuch Creek	Beach	Water	169666	1241897
MSSM05	Vashon - Tramp Harbor	Beach	Water	154908	1243459
MSXK01	Vashon - Burton Acres Park	Beach	Water	146481	1240772
JSUR01	Point Wells	Offshore	Water/Phyto	287580	1250910
KSBP01	Jefferson Head	Offshore	Water/Phyto	275439	1248062
CK200P	Carkeek CSO TP Outfall	Offshore	Water	263819	1257728
KSSK02	West Point TP Outfall	Offshore	Water/Phyto	245121	1242740
LTBC43	Elliott West CSO TP Outfall	Offshore	Water	228985	1263430
SEAQYSI	Seattle Aquarium	Offshore	Mooring	225168	1267840
LTED04	Elliott Bay	Offshore	Water/Sediment/Phyto	223909	1264675
KSZY01	Elliott Bay	Offshore	Sediment	231983	1258639
LTAA02	Elliott Bay	Offshore	Sediment	231054	1261260
LSCW02	Elliott Bay	Offshore	Sediment	227106	1256271
LTCA02	Elliott Bay	Offshore	Sediment	226303	1260915
LTDF01	Elliott Bay	Offshore	Sediment	225367	1267270
LSHZ08	Elliott Bay	Offshore	Sediment	218767	1259170
LTGF01	Elliott Bay	Offshore	Sediment	218854	1265592
HNFD01	East Waterway	Offshore	Water	214139	1267488
LTKE03	Duwamish River	Offshore	Water	211418	1265871
LTUM03	Duwamish River	Offshore	Water	196629	1274591
LTXQ01	Henderson/MDL CSO TP Outfall	Offshore	Water	190313	1278053
LSEP01	South TP Outfall	Offshore	Water/Phyto	223360	1247399
LSKQ06	Alki CSO TP Outfall	Offshore	Water	212065	1248334
LSNT01	Fauntleroy/Vashon	Offshore	Water/Phyto	198653	1245194
LSVV01	Barton CSO Outfall	Offshore	Water	195347	1253935
MSJN02	Vashon TP Outfall	Offshore	Water	169328	1244585
NSEX01	East Passage	Offshore	Water/Phyto	134701	1255331
MSWH01	Quartermaster Harbor	Offshore	Water/Mooring	147976	1236667
NSAJ02	Quartermaster Harbor	Offshore	Water/Mooring/Phyto	140223	1239011

¹North American Datum 1983 (NAD83) - State Plane Coordinate System - Washington North 4601



**2013 Offshore Water Column
Monitoring Program**

● Water Column Sampling Station



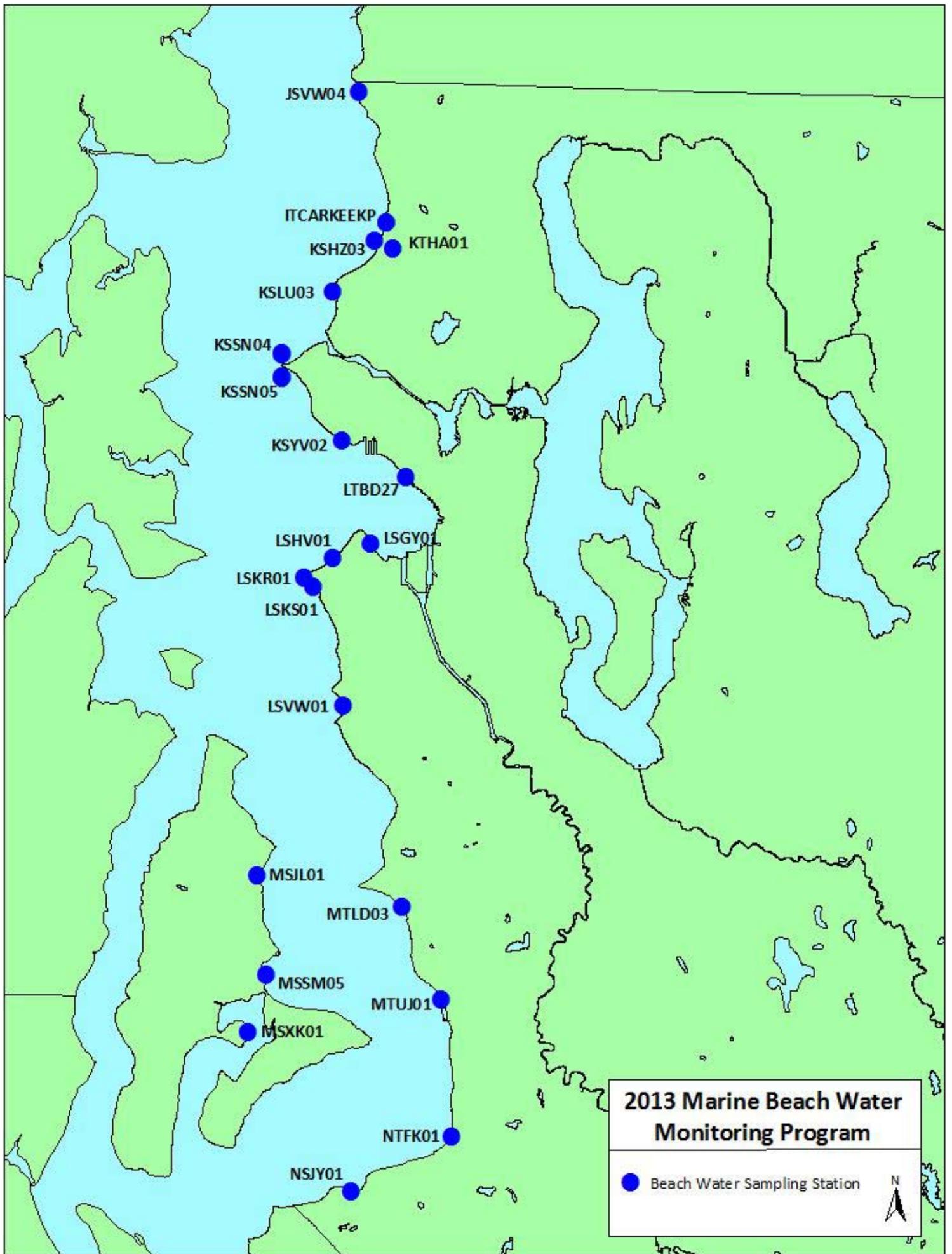
**2013 Marine Offshore Monitoring Program
Additional Monthly Phytoplankton Sampling - FINAL**

Station	Depth (m)	Conventionals					CTD							Phyto		
		Ammonia Nitrogen	Nitrite + Nitrate Nitrogen	Orthophosphorus	Silica	Chlorophyll-a	Phaeophytin	Chlorophyll, Field	Density, Field	Dissolved Oxygen, Field	Light Intensity (PAR), Field	Salinity, Field	Sample Temperature, Field	Surface Light Intensity (PAR), Field	Transmissivity, Field	Semiquantitative ²
KSBP01	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	2.5, 3.5, 5.5, 8, 10 ¹	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
NSAJ02	1	1	1	1	1	1										1
NSEX01	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	2.5, 3.5, 5.5, 8, 10 ¹	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total Samples/Records per Month		5	5	5	5	5	4	4	4	4	4	4	4	4	4	5
Total Samples/Records for 2013		37	37	37	37	37	28	28	28	28	28	28	28	28	28	37

2.5, 3.5, 5.5, 8, 10¹ - Sample will be analyzed on water collected from one of these depths, representing the "chlorophyll max".

Semiquantitative² - Samples collected from all three stations twice a month from April through October.

Samples collected twice a month from NSAJ02 in March and November as well.



2013 Marine Beach Water Monitoring Program

● Beach Water Sampling Station

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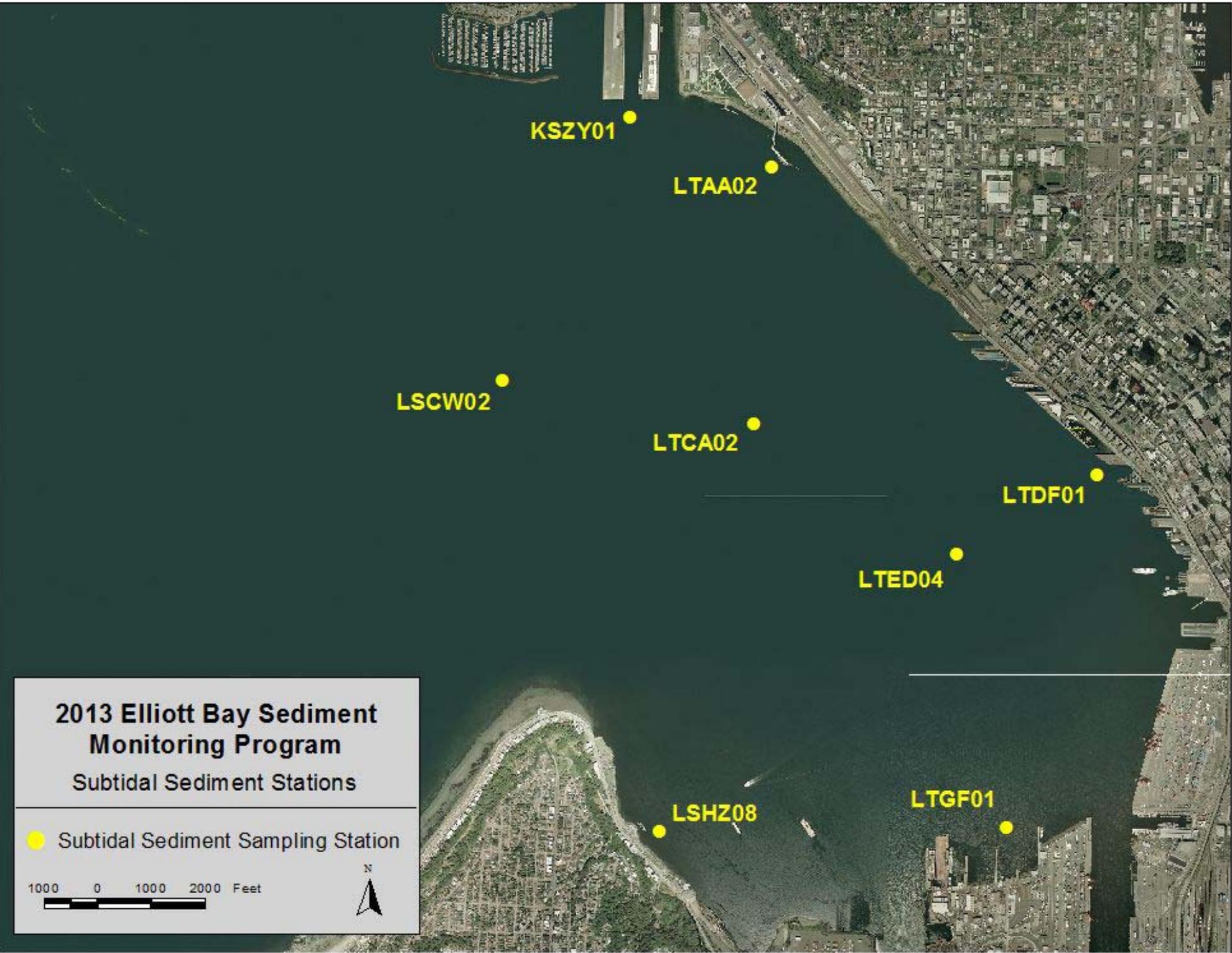
2013 Marine Beaches Monitoring Program

Monthly Water Quality Sampling Matrix - FINAL

Locator	Station Description	Bacteria		Conventionals					Field
		Enterococcus	Fecal Coliform	Ammonia Nitrogen	Nitrite + Nitrate Nitrogen	Total Nitrogen	Orthophosphorus	Salinity	Sample Temperature, Field
JSVW04	Richmond Beach	1	1	1	1	1	1	1	1
ITCARKEEKP	Carkeek Park - North	1	1	1	1		1	1	1
KSHZ03	Carkeek Park - Piper's Creek Mouth	1	1	1	1	1	1	1	1
KTHA01	Carkeek Park - Piper's Creek Upstream	1	1	1	1		1		1
KSLU03	Golden Gardens	1	1	1	1		1	1	1
KSSN04	West Point - North	1	1	1	1		1	1	1
KSSN05	West Point - South	1	1	1	1		1	1	1
KSYV02	Magnolia CSO	1	1	1	1		1	1	1
LTBD27	SAM Sculpture Park Beach	1	1	1	1		1	1	1
LSGY01	Seacrest Park	1	1	1	1		1	1	1
LSHV01	Alki Beach	1	1	1	1		1	1	1
LSKR01	Alki Beach - Alki Plant North	1	1	1	1		1	1	1
LSKS01	Richey Viewpoint	1	1	1	1		1	1	1
LSVW01	Fauntleroy Cove	1	1	1	1	1	1	1	1
MTLD03	Normandy Park	1	1	1	1		1	1	1
MTUJ01	Des Moines Creek Park	1	1	1	1		1	1	1
NTFK01	Redondo Beach	1	1	1	1	1	1	1	1
NSJY01	Dumas Bay Park	1	1	1	1	1	1	1	1
MSJL01	Vashon Island - Gorsuch Road	1	1	1	1		1	1	1
MSSM05	Vashon Island - Tramp Harbor	1	1	1	1		1	1	1
MSXK01	Vashon Island - Burton Acres Park	1	1	1	1	1	1	1	1

Total Samples/Records per Month 21 21 21 21 6 21 20 21

Total Samples/Records for 2013 252 252 252 252 72 252 240 252



**2013 Elliott Bay Sediment
Monitoring Program**
Subtidal Sediment Stations

● Subtidal Sediment Sampling Station

1000 0 1000 2000 Feet



**2013 Marine Offshore Monitoring Program
Ambient Subtidal Sediment Sampling Matrix - FINAL**

Locator	Station Description	Laboratory										Field						
		BNAs (incl. Total Nonylphenols)	Chlorinated Pest/PCBs	PBDEs	Butyltin Isomers	Total Metals	Total Solids	Total Organic Carbon	PSD	Ammonia	Total Sulfide	Sample Start Time	Sample Depth	Sediment Sampling Depth	Sediment Sampling Range	SampcoordX	SampcoordY	Sediment Description
KSZY01	Elliott Bay - Pier 90/91	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LTAA02	Elliott Bay - Grain Terminal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LSCW02	Elliott Bay - Outer	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LTCA02	Elliott Bay - North Central	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LTDF01	Elliott Bay - Central Waterfront	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LTED04	Elliott Bay - South Central	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LSHZ08	Elliott Bay - Cove 2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LTGF01	Elliott Bay - Harbor Island	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total Samples/Records for 2013		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

Notes

Samples will be collected from the 0 to 2 cm depth stratum.

Samples will be composited from a single deployment of dual van Veen grab samplers, unless additional deployments are needed to get sufficient sediment for all analyses.

Metals will include Al, As, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Se, Ag, Sn, and Zn.

All analyses will be performed following QA1 guidance.