Central and Northern California Ocean Observing System (CeNCOOS)
Standard Operating Procedures for Instruments and Sensors (High Frequency Radar, Gliders, and in situ observing systems)
Revised: January 30, 2017

Scope: This document describes the instruments and sensors that CeNCOOS-supported investigators operate. These instruments are supported financially by CeNCOOS or operated in close partnership where CeNCOOS has influence over the operation. The document identifies what, where, and how the instruments are operated and maintained. This document is not intended to be an asset list, nor contain sensor details such as model number or serial number because this information exists elsewhere. The current (12/2016) asset list provided to IOOS appears as a table at the end. This document does not cover the data flow, curation, QC, or archive. Data flow and curation are described in the CeNCOOS data management plan.

1. High Frequency Radar (HFR) Sites

The development of the high frequency radar (HFR) program in California began in 2002 with the Coastal Ocean Currents Monitoring Program (COCMP). Sites were established with funding from the state before the program ended in 2010. The site locations are described in the Site Reference Booklet. Many of the radar are now maintained by SCCOOS and CeNCOOS. CeNCOOS follows the operating procedures, including maintenance and calibration described in References below. These procedures were developed by IOOSW and the HFR Steering Team.

References

Deployment and Maintenance of a high –frequency radar for ocean surface current mapping: best practices. 2008. Retrieved from http://cordc.ucsd.edu/projects/mapping/documents/SCCOOS-BestPractices.pdf
Coastal Ocean Currents Monitoring Program, Accessed 1/27/2017. Coastal Ocean Currents Monitoring Program. Retrieved from http://www.cocmp.org/.
Coastal Ocean Currents Monitoring Program. Accessed 1/27/2017. Site Reference (Booklet). Retrieved from http://www.cocmp.org/pdf/COCMPHFRadarBooklet.pdf.

2. Gliders

a. Trinidad glider

CeNCOOS supports the continuous operation of the Trinidad glider line by Oregon State University jointly with NANOOS. Jack Barth at OSU is the lead investigator. This project operates year-round sampling along the Trinidad Head line, using two autonomous 1000-m capable Seagliders. The gliders are hot swapped to maintain continuous sampling. The glider samples from approximately the 100-m isobath (~10km offshore) to 130W (~500 km offshore), repeating the line every 30 days. Data are returned to shore after every dive and then submitted by the investigator to the IOOS Glider Data Acquisition Center, CeNCOOS, NANOOS, and NOAA's NODC. The gliders are equipped with the following sensors: conductivity-temperature-depth (CTD), dissolved oxygen (Aanderaa 4831 optode), light backscatter (700 nm), chlorophyll fluorescence and Colored Dissolved Organic Matter (CDOM) fluorescence (WET Labs Ecopuck). The gliders also measure depth-

averaged velocity which can be combined with geostrophic estimates of relative velocity to get absolute velocity and hence transport. The data management and archive are described in the CeNCOOS data management plan. The deployments and operating statistics are described by CeNCOOS and appear in the IOOS Glider Days summary updated every six months.

b. Monterey glider

CeNCOOS supports the continuous operation of the Monterey glider line jointly with the Rudnick glider lab at SCRIPPS. As used off California, the underwater glider Spray profiles to 500 m or to the ocean bottom, whichever is shallower. The cycle from the surface to 500 m and back takes about three hours to complete, during which time Spray travels three km horizontally relative to the water. Spray position is measured by GPS at the beginning and end of each dive, allowing a dead reckoning estimation of depth average water velocity. Spray carries a pumped Sea-Bird CTD to measure pressure, temperature, and salinity, and a Seapoint fluorometer in the pumped stream. An acoustic Doppler current profiler measures depth dependent water velocity. Data is transferred by the Iridium satellite system once per dive, when commands to the glider can also be sent. A typical deployment lasts about 100 days. Recoveries and deployments are done using a small boat. The California Underwater Glider Network (CUGN) is operated along the traditional CalCOFI lines. Line 66.7 was begun in April 2007, and has been uninterrupted since April 2008. To date CUGN gliders have covered 220,000 km in 10,000 days, while doing 100,000 dives. We have pioneered efforts to make glider data available routinely in real-time. A CF-compliant netCDF format is used to transfer data on a regular 4-hour schedule to the SWFSC ERDDAP (http://coastwatch.pfeg.noaa.gov/erddap/tabledap/scrippsGliders.subset) where data may be publically downloaded. The data is immediately forwarded to the national glider data assembly center (NGDAC) run by IOOS. NDBC then downloads the data for routine distribution on GTS. All CUGN data has been routed though this data system since spring 2014. Access to delayed mode quality controlled data is provided through a website developed over the past year: http://spraydata.ucsd.edu.

c. Short-term deployment glider (Kudela)

CeNCOOS occasionally operates a glider owned by UCSC (R. Kudela, PI). The glider is deployed whenever funds become available for its deployment. The deployments are conducted by the Monterey Glider technician at MBARI. The glider is maintained by UCSC (Kudela).

References:

Teledyne Webb Slocum Glider Operators Handbook. http://maracoos.org/certification/doc/Gliders/TWRManuals/glider_operators_handbook.pdf

Teledyne Webb Slocum Glider User Manual. http://maracoos.org/certification/doc/Gliders/TWRManuals/slocum_manual.pdf.

Rudnick, D. L., R. Baltes, M. Crowley, O. Schofield, C. M. Lee, and C. Lembke, 2012: A national glider network for sustained observation of the coastal ocean. Oceans 2012, doi: 10.1109/OCEANS.2012.6404956.

Ohman, M. D., D. L. Rudnick, A. Chekalyuk, R. E. Davis, R. A. Feely, M. Kahru, H.-J. Kim, M. R. Landry, T. R. Martz, C. L. Sabine, and U. Send, 2013: Autonomous ocean measurements in the California Current Ecosystem. Oceanography, 26, 18-25, doi:10.5670/oceanog.2013.41.

3. Shore Stations

Includes buoys and fixed installations. Instruments are grouped by the operating institution.

California Polytechnical Institute

a. Sites:

Morro Bay and San Luis Bay

-BM1 is located at the northern T-pier in Morro Bay (35° 22.248'N, 120° 51.540'W) and measures water at a depth of 2 meters below MLLW.

-BS1 is located in the southern end of Morro Bay on a pole that sits in the water (35° 20.028'N, 120° 50.820'W). The weather station is ~3 meters above MLLW.

-AWAC is located at 13 meters below MLLW, 30 meters south of the Cal Poly pier in San Luis Bay (35° 10.170'N, 120° 44.447'W).

-Met Station is located on the Cal Poly Pier is located ~17 meters above MLLW (35° 10.203'N, 120° 44.449'W).

-Profiler is located on the Cal Poly Pier (35° 10.208'N, 120° 44.437'W)

b. Operator: Ryan Walter, Ian Robbins, Grant Waltz

c. Instruments and Sensors:

-Morro Bay BM1: Seabird 37SIP CTD, Aanderaa 3835 oxygen, Wetlabs FLNTURT (chlorophyll/backscatter), Satlantic ISUS-x (nitrate), Satlantic STORX (datalogger/telemetry).

-Morro Bay BS1: Novalynx weather system (wind speed/direction, air temperature, relative humidity, barometric pressure, precipitation, solar radiation, Satlantic STORX (datalogger/telemetry).

-San Luis Bay:

Nortek AWAC (waves and currents)

-Aanderaa weather station (wind speed/direction, air temperature, relative humidity, barometric pressure, precipitation, net atmospheric radiation, solar radiation

Water Profiler: Seabird 37 SIP CTD, Wetlabs FLNTUS (chlorophyll/backscatter), Wetlabs transmissometer, Wetlabs UBAT (bioluminescence)

d. Sampling Protocols:

-Morro Bay instruments turn on every 15 minutes and record for 2 minutes.

San Luis Bay: AWAC records currents every 20 minutes for 10 minutes and averages waves for 20 minutes

-Weather station takes a measurement every 2 minutes.

-Water column profiler does a profile from the surface to the bottom of the water column every 30 minutes, using a winch that is autonomously controlled by a computer running LabView.

e. Maintenance:
-The Morro Bay BM1 station is lifted out of the water and scrubbed and cleaned once a month. This process requires 2 people to lift the pole to a position where it can be cleaned.
-The Morro Bay BS1 station is cleaned and downloaded once a month. The anemometer is lubed once a month and the solar panel is cleaned. This station is only reachable by boat and requires 2 people.
-The San Luis Bay AWAC is cleaned quarterly. This is done with 2 people scuba diving and scrubbing the instrument.
-The San Luis Bay weather station is lubed and cleaned every 6 months as stated by Aanderaa cleaning protocols.
-The San Luis Bay water current profiler is cleaned quarterly. This involves flushing the CTD, cleaning any grime off the FLNTUS and transmissometer windows. The UBAT is disassembled and cleaned on the inside with paper towels.

f. Reference sampling:
-Chlorophyll samples are taken at the Cal Poly pier once a week for Cal Poly's SCCOOS HAB sampling program and can be referenced back to the profiler chlorophyll numbers.

g. Telecommunications:
-The Morro Bay stations collect their data on a Satlantic STORX and relay their data via cellular modem to a server on Cal Poly's campus, where the data are processed into txt, mat, and csv files that are then sent to CeNCOOS, , and Cal Poly's SLOSEA website.
-The Cal Poly pier data are all sent via hardline from the Cal Poly Pier to Cal Poly's campus, where they are processed and displayed on Cal Poly's FTP site, Cal Poly's dive log site, CeNCOOS, and COAST websites.

h. References:
http://www.aanderaa.com/media/pdfs/Oxygen-Optode-3835-4130-4175.pdf
http://www.seabird.com/sites/all/modules/pubdlcnt/pubdlcnt.php?file=http://www.seabird.com/sites/default/files/documents/37SIP_rs232_018_0.pdf&nid=1259
http://wetlabs.com/sites/all/modules/pubdlcnt/pubdlcnt.php?file=http://wetlabs.com/sites/default/files/documents/WLECOMasterben.pdf&nid=972
http://satlantic.com/sites/all/modules/pubdlcnt/pubdlcnt.php?file=http://satlantic.com/sites/default/files/documents/ISUS-V3-Manual_0.pdf&nid=406
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http://www.nortek-as.com/lib/brochures/datasheet-awac/view
http://www.aanderaa.com/productsdetail.php?Automatic-Weather-Station-23

<u>San Francisco State University, Romberg Tiburon Center</u>
a. Sites:
Tiburon and Carquinez
-Tiburon Station: YSI is deployed in a 0.2 m PVC mooring pipe that immobilizes the YSI at 1 meter below mean low tide. The pipe is attached to a pier piling at the Romberg Tiburon

Center for Environmental Studies, SFSU, near the deep water channel that lies a few hundred meters north of the Tiburon Peninsula.

-Carquinez Station: YSI is deployed in a 0.2 m PVC mooring pipe that immobilizes the YSI at 1 meter below mean low tide. The pipe is attached to a dock piling at the California Maritime Academy at the major fresh water input to the bay at Carquinez Strait.

b. Operator: Adam Paganini

c. Instruments and Sensors:
-YSI 6600 V2 Multi-parameter sonde with conductivity, temperature, chlorophyll, depth, turbidity, and a pH sensor.

d. Sampling Protocols:
YSIs at both Tib and Car are set to capture data from each sensor every 6 minutes continuously.

e. Maintenance:
-Each sonde is cleaned once a month by pulling it up and spraying with a hose. Staggered, every 5 weeks the sondes are pulled and each sensor is calibrated using best practices from the YSI 6600 V2 manual. Standard operating procedures are followed.

f. Reference sampling:
-Every 7 days 500mL x 3 of bay water approximately 3 ft from where the sensor is measuring is collected as a reference sample for chlorophyll.

g. Telecommunications:
-The data are telemetered using hard wired ethernet collected on a Windows CPU and are sent to the ERRDAP, which is a NOAA data server that gives you a simple, consistent way to download subsets of gridded and tabular scientific datasets in common file formats and make graphs and maps.

h. References:
ERDDAP Tiburon: http://oceanview.pfeg.noaa.gov/erddap/tabledap/rtcctdRTCysirt.html ERDDAP
Carquinez: http://oceanview.pfeg.noaa.gov/erddap/tabledap/rtcctdCMAysirt.html

2012, YSI 6-Series Multiparameter Water Quality Sondes User Manual, Revision J, 1700/1725 Brannum Lane, Yellow Springs, Ohio

University of California Santa Cruz
a. Sites:
-Santa Cruz Wharf (SCW)

b. Operator: Kendra Negrey

c. Instruments and Sensors:
-YSI 6600V2 multi-paramter sonde with temperature, conductivity, depth, pH, dissolved oxygen, turbidity, and chlorophyll sensors.
-WeatherHawk Series 500 weather station – measures wind speed, wind direction, temperature, relative humidity, barometric pressure, solar radiation, and rain.

d. Sampling Protocols:
-Both water and weather instruments capture data every 5 minutes continuously.
-YSI is deployed in a flow system – water pumped from about 1 meter below mean low tide into a 0.2m PVC tube. Flow rate is about a 1L/min.
-WeatherHawk is mounted above Santa Cruz Wharf Headquarters.

e. Maintenance
-YSI sonde and sensors are wiped down with fresh water weekly. Every 3 months (or sooner if necessary) the sensors are evaluated and recalibrated if needed. Calibration procedures in the YSI 6600 V2 manual are followed.
-WeatherHawk station requires minimal maintenance. Data are monitored daily and if/when readings are suspect, customer support is contacted for troubleshooting.

f. Reference sampling:
Weekly water samples are collected at the SCW. Temperature, salinity, and chlorophyll measurements from the weekly sampling are compared to YSI readings.

g. Telecommunications:
YSI data are telemetered using the STORM 3 system – data are transmitted via cellular modem to Xylem's StormCentral database.
WeatherHawk data are telemetered using hard wired Ethernet and uploaded to a Weather Underground personal weather station (KCASANTA313).

h. References:
http://oceandatacenter.ucsc.edu/SCOOP/
https://www.ysi.com/File%20Library/Documents/Manuals/069300-YSI-6-Series-Manual-RevJ.pdf
http://weatherhawk.com/documents/500-series.pdf

<u>Humbolt State University</u>
a. Site:
Trinidad Pier, Humboldt (aka. Chevron Dock), South Bay, and Indian Island
-Trinidad Pier: 41deg 03'18.020"N, 124deg 08'49.573"W: YSI is deployed in a 4" flexible plastic stilling well approximately 1.65m above the sea floor, and 1.5m to 5m below the surface. The stilling well and data logger enclosure are located on the Trinidad fishing pier in Trinidad Harbor, CA.
-Humboldt: 40deg 46'38.880"N, 124deg 11'47.750"W: YSI is deployed in a 4" PVC stilling well approximately .5m to 3.5m below the surface. The stilling well and data logger enclosure are located on the Chevron Fuel Dock in central Humboldt Bay, CA.
-South Bay: 40deg 43'24.220"N, 124deg 13'23.830"W: YSI is deployed in a 4" PVC stilling

well approximately 1m to 4m below the surface. The stilling well is attached to a short single pilling in the South Bay of Humboldt Bay, CA. This station currently has no telemetry equipment, and is only accessible by boat.
-Indian Island: 40deg 48'54.108" N, 124deg 09'25.920"W: YSI is deployed in a 4" PVC stilling well approximately .5m to 3.5m below the surface. The stilling well and data logger enclosure are attached to a single pilling immediately off of the North-Eastern corner of Indian Island, CA.

b. Operator: Kyle Weis, Dr. Brian Tissot (PI), Wiyot Tribe (Indian Island maintenance)

c. Instruments and Sensors:
-Four YSI 6600 V2 Multi-parameter sonde with conductivity, temperature, chlorophyll, depth, turbidity, optical dissolved oxygen, and pH sensors. The Humboldt station is also equipped with an Li-200 Pyronometer and an Li-190 PAR solar radiation sensor. The Indian Island site uses a YSI 6600EDS sonde and a Clark type dissolved oxygen probe.

d. Sampling Protocols:
All Stations sample all parameters every 15min, and the data are logged internally in the sonde. The data transmission interval is hourly for the Trinidad and Humboldt stations, and every 15 min for the Indian Island station. The South Bay site does not transmit data, it only logs internally.

e. Maintenance
-At monthly intervals, the sondes are removed and replaced with a clean and newly calibrated sonde. Prior to removal of the deployed sonde, the newly calibrated sonde is lowered to the approximate depth of the deployed sonde, and a measurement is taken. This gives a good indication of any in situ sensor drift that may have occurred during the deployment. The deployed sonde is removed, the stiling well is brushed with a chimney brush, and the newly calibrated sonde is deployed. Back at the lab, the deployed sonde is post calibrated in lab standards (again, for future drift corrections), cleaned, and calibrated for turnaround at the next station. All new calibrations are done to standards specified in the YSI 6600 manual, post calibrations are done with minimal cleaning to get a better picture of fouling and sensor drift.
-The Indian Island sonde is maintained by the Wiyot Tribe of Northern CA as part of their environmental monitoring program. There maintenance regime is similar to the other stations, and done according to YSI procedures.
-The Li-Cor solar radiation sensors are cleaned monthly with a damp cloth, and recalibrated every two years.

f. Reference sampling:
-Monthly spot sampling at each station is performed for chlorophyll and turbidity. Samples are collected with a horizontal Niskin type sampler at the approximate depth of the deployed sonde. Turbidity samples are analyzed at the lab with a Hach 2100P turbidimeter, and chlorophyll samples are filtered, extracted, and analyzed with a Turner 7200 flourometer.

g. Telecommunications:
-The Trinidad Pier and Humboldt sites use a YSIEconet 6300 datalogger and a Verizon cellular modem to transmit data to the YSIEconet.com data hosting website. YSIEconet.com then posts new hourly data to a public website, which is read by CeNCOOS servers and posted on CeNCOOS.org. The Indian Island site uses a Waterlog Storm3 datalogger and Verizon cellular modem, and YSI's Storm Central data hosting platform. Data are transferred to the CeNCOOS servers via an FTP transfer every 15 minutes and posted to the CeNCOOS.org website. The South Bay site currently does not transmit data. It should be noted that in the near future all stations will be upgraded to the Storm Central setup, and the South Bay station will be brought online.

h. References:
http://www.cencoos.org/data/shore/trinidad
http://www.cencoos.org/data/shore/humboldt
http://www.cencoos.org/data/shore/indianisland

YSI 6-Series Multiparameter Water Quality Sondes User Manual, Revision J, 2012.
1700/1725 Brannum Lane, Yellow Springs, Ohio

University of California Davis
a. Sites:
Hog Island Oyster Company Burke-O-Lator
Burke-O-Lator measurements occur at depth of 9 feet
Hog Island Oyster Company, Marshall, California

b. Operator: Tessa Hill, Terry Sawyer

c. Instruments and Sensors:
Burke-O-Lator measures salinity, water temperature, and carbonate chemistry parameters of Tomales Bay: partial pressure of CO2 (pCO2), dissolved inorganic carbon (DIC), total alkalinity (TA), pH and aragonite saturation state (omega).

d. Sampling Protocols:
Measures all parameters once every two minutes
Currently, DIC measurements are offline

e. Maintenance
Water sampling equipment and instrument are cleaned regularly
Chemical standards are replaced every 2-6 months
Equipment maintenance (e.g., replacement of parts) is conducted as needed

f. Reference sampling:
-CTD casts and bottle sampling for DIC, TA & pH occur at least once per month

g. Telecommunications:

Data are automatically logged into IPACOA database and are publicly available at http://www.ipacoa.org/Explorer as "CeNCOOS Burkolator at Hog Island Oyster Farm"

h. References
http://www.ipacoa.org/Explorer

a. Sites:
Bodega Marine Laboratory (BML) shoreline observations
-On the shoreline of Horseshoe Cove, the instrument is housed in the facility's pump house inside a 150 liter bucket with seawater supplied via a 2" PVC pipe from a main intake pipe.

b. Operator: Grant Susner

c. Instruments and Sensors:
-Sea-Bird 16+ with Sea-Bird conductivity cell, and thermistor. A Seapoint Chlorophyll Fluorometer is attached to the SBE 16+ via a 10x gain cable.

d. Sampling Protocols:
CTD samples every five minutes.

e. Maintenance
The CTD is pulled annually for factory calibration. It is removed for cleaning several times a week.

f. Reference sampling:
None is conducted.

g. Telecommunications:
Data are sent via serial connection to a serial server where they are pulled via UDP and stored to a BML database.

h. References:
boon.ucdavis.edu/seawater.html

a. Sites:
Tomales Bay buoy
Th buoy is located in approximately 35 feet of water Northeast of Pelican Point.

b. Operator: Grant Susner

c. Instruments and Sensors:
-Sea-Bird 37-SIP conductivity cell, and thermistor. Wetlabs ECO-FLNTU (combination chlorophyll fluorescence and turbidity meter). Nortek Aquadopp - 400 kHz (acoustic doppler current profiler (ADCP)).

d. Sampling Protocols:

Optimally, CT and ECO sampling every ten minutes with current data taken every 15. Due to limitations of solar power, sampling times and sensor activity is highly variable.

e. Maintenance
The CT is pulled annually for factory calibration. It is removed for cleaning every few months.

f. Reference sampling:
Typically conducted monthly, but additionally as opportunities occur.

g. Telecommunications:
Data are sent via Wi-Fi radio antenna to shore based internet where they are collected and stored to a BML database.

h. References:
boon.ucdavis.edu/tomales_bay_buoy.html

a. Sites:
Fort Point SF (37° 48' 23.8674 N/ 122° 27' 58.32 W)
Sensors mounted in a lightweight cage, cage attached to a wooden piling/pier located adjacent to the GFNMS SF tide pier. The CTD intake is approx. 1.5'off bottom in about 10-16+'(low/high of tide). Shore power/comms. cable runs from sensor cage along the sandy substrate over to the GFNMS tide pier.

b. Operator: David Dann

c. Instruments and Sensors:
Sea-Bird Electronics SBE 16+ CTD, WETLabs C-Star Transmissometer, Seapoint Chlorophyll Fluorometer.

d. Sampling Protocols:
-Sensors are set to sample data every 5 minutes.

e. Maintenance
-Array serviced /6-8 weeks (diving is required to remove & recover cage from piling). Cleaning & backup data upload is performed topside on GFNMS tide pier.
- Fresh water, bleach solution & Triton X are used for CTD cleaning (as outlined in the Seabird manual and cleaning protocol), freshwater and vinegar solution for the optics of the fluorometer and Transmissometer.
-CTD & pump are sent in for annual calibration/servicing. Transmissometer and Fluorometer typically calibrated & serviced /2 years or as needed.

f. Reference sampling:
-Comparative CTD profiling cast (with comparable sensors+ YSI castaway CTD) is taken pre/ post cleaning.

g. Telecommunications:
-Data are sent via serial connection to a terminal server transferred to BML over the internet and stored to a BML database.

h. References:
http://boon.ucdavis.edu/fort_point.html

a. Sites:
Inverness mooring (38.118N/-122.867W)
Mooring in approx. 15' of water. SeaFET and SBE 37 are mounted on a steel plate shackled inline to the chain mooring 1m below the surface. SBE 39 thermistor mounted on chain 1m off bottom

b. Operator: David Dann & Jason Sadowski

c. Instruments and Sensors:
- Satlantic SeaFET, SBE 37-SMP-OD, Seabird SBE 39 thermistor

d. Sampling Protocols:
SeaFET set to sample hourly, one average (made up of 30 sub-samples taken every ~3 seconds), SBE 37 set to sample /15 minutes. SBE 39 thermistor /5 minutes.

e. Maintenance-
-Top sensors are cleaned/uploaded topside via vessel /4-6 weeks. 39 thermistor swap out typically /3-4 months (requires diving).

-Combination of freshwater, bleach solution & Triton X solution are used for 37 cleaning (as outlined in the Seabird manual and cleaning protocol), fresh & seawater for the SeaFET.

c. Sensors sent in for calibration typically annually or as needed.

f. Reference sampling:
-Comparative CTD profiling cast (with SBE 19+ profiler and SBE 43 DO) is taken pre and post servicing, bottle sampling for PH.

g. Telecommunications:
-No data telemetry currently exists for mooring. Data is uploaded manually.

h. References:
None

<u>San Jose State University, Moss Landing Marine Labs</u>

a. Site: MLML Seawater Intake (36.8025° N, 121.7915° W)

Sensors are located within the pumphouse at the MLML shorelab. Sensors are connected to raw seawater pipeline flowing with seawater drawn from an intake pipe situated at ~17m depth about 300m offshore, between two fingers of the Monterey Canyon head.

b. Operator: Jason Adelaars

c. Instruments and Sensors
Seabird SBE19 (temperature, conductivity), Honeywell Durafet III (pH), Turner C-Sense (pCO_2), Aanderra Optode 3835 (dissolved oxygen), Wetlabs C-Star (beam attenuation), Wetlabs WetStar (fluorescence)

d. Sample Protocol
All sensors are queried for a grab sample every 5 minutes continuously.

e. Maintenance
-On a once to twice weekly basis the optics of the C-Star and WetStar are cleaned with a Kimwipe or cotton swab along with a mild Methanol solution to remove accumulated algae biofouling.
-On a once-a-month basis the SBE19 is flushed with a 0.1% Bleach solution and a dilute distilled vinegar solution to remove any biofouling or crystallization. The SBE19 is sent to manufacturer for calibration every 1-2 years.
-On a once-a-month basis the oxygen optode is removed from its flow-cell and wiped clean of biofouling by freshwater and Kimwipes.
-On a once-a-month basis the pH probe is removed from the flowline and inspected. The reference solution (KCL gel) is checked and the probe tip is cleaned with Kimwipes and a mild Methanol solution. This probe has been replaced with a new probe (and calibrated by station operator) every ~12-18 months.

f. Reference sampling
Once or twice a year a grab sample is taken from the flowline and analyzed in a laboratory for pH. In the future, similar reference sampling will happen for pCO_2.

g. Telemetry
The data are telemetered using hard wired Ethernet collected on a Windows virtual server and are sent to Axiom for ingest into CeNCOOS data archives. Additionally, the data from these sensors are hosted on MLML's public data website.

h. References
http://pubdata.mlml.calstate.edu/seawater/index.php

a. Site:
-Monterey Wharf II Sonde (36.60508° N, 121.88943° W)
The sonde is located within Monterey Harbor, Monterey, CA beneath the municipal wharf and collocated with the Monterey Abalone Company's operations. The sonde is deployed within a perforated PVC pipe connected to a piling of the wharf approximately 2.5 m below water level.

b. Operator: Jason Smith

c. Instruments and Sensors
-YSI 6600V2-4 multi-parameter sonde. Parameters: temperature, salinity, depth, pH, dissolved oxygen, chlorophyll fluorescence, phycoerithrin fluorescence as proxy for marine cyanobacteria, and turbidity. All sensors manufactured by Xylem/YSI.

d. Sample Protocol
-The sonde collects and internally logs a sample every 7.5 minutes. In absence of telemetry most recent redeployment is utilizing a 5 min sampling interval. Telemetry had been transmitting only 15 min samples.

e. Maintenance
-On a monthly basis the sonde is visually inspected, fouling removed from all surfaces as needed. Optical and electrochemical sensor elements cleaned with dampened kimwipe and rinsed with DI. Data are downloaded, manually verified and transmitted to J. Adelaars for delivery to CeNCOOS data systems and local databases. Every 3 months or as needed the wiper sponges on the optical sensors are replaced.
-The conductivity and pH sensors are calibrated by station operator every 3 months utilizing certified reference seawater from SIO.

f. Reference sampling
Sensor readings prior to and post monthly maintenance are compared to guage fouling related signal attenuation. Temperature records are compared to adjacent NOAA tide station to identify drift or outliers. Weekly phytoplankton sampling ca 100 m shoreward of sonde are used to assess consistency of chlorophyll fluorescence measures by sonde.

g. Telemetry
-None currently. Data are downloaded monthly. New Storm logger system will allow real time telemetry.

h. References
ECONET web server has been decommissioned. All data archived locally.

END OF STANDARD OPERATING PLAN DOCUMENT