SDCK FIELD SOP

SDCK Lab/ Field collection and Analysis of Water Samples / Standard Operating Procedure

The following pages contain ...

APPLICATION OF PROTOCOL

Proper adherence and conformity with the following field sample collection and analysis procedure is essential to ensure that data collected by San Diego Coastkeeper's Water Quality Monitoring Program meets all quality assurance and quality control standards, and is scientifically defensible and acceptable. The specific techniques are described in order to collect and analyze water samples in the field in a way that neither contaminates, loses, or changes the chemical form of the analytes of interest.

SUMMARY OF METHOD

Appropriate sampling equipment, containers and field measurement devices are transported to the site where samples are collected according to each sample's protocol (collection of 1 L bottle for lab analysis vs. filtered sample). Samples are stored on ice. Water velocity, water and air temperature, pH, conductivity, dissolved oxygen as well as other field data are measured and recorded using the appropriate equipment and data forms. Observational data is recorded and team promptly returns to SDCK's Lab once the team has visited all assigned sub-watershed sites.

CLEAN HANDS DIRTY HANDS

Clean Hands/Dirty Hands technique require two or more people working together.At the field site, one person is designated as Clean Hands (*CH*) and a second person as Dirty Hands (*DH*). Although specific tasks are assigned at the start to *CH* or *DH*, some tasks overlap and can be handled by either, as long as the prescribed care is taken to prevent contaminating the sample.

- Both *CH* and *DH* wear appropriate disposable, powderless gloves during the entire sampling operation and change gloves frequently, usually with each change in task. (Wearing multiple layers of gloves allows rapid glove changes.)
- Both *CH* and *DH* should start with a fresh pair of gloves when beginning the next site.

CLEAN HANDS (*CH*) gives and receives sampling containers, but otherwise minimizes contact with sampling equipment to reduce risk of cross contamination. In general, the tasks of the *CH* person are:

- Gives the empty sample container to the DH sampler
- Receives the full sample container from the DH sampler and transfers sample to inner storage bag
- Inserts a clean filter into the filter mechanism
- Prepares a clean work space (inside vehicle)
- Records Field Data after samples have been collected

DIRTY HANDS (*DH*) operates all sampling equipment and is involved with all operations involving contact with potential sources of contamination. In general, the tasks of the *DH* person are:

- Handling of sampling containers at the cooler and outer storage bag levels
- Collects sample with pole
- Operates filter pump and sampling probes
- Handles single or multi-parameter instruments for field measurements
- Places samples in cooler, after *CH* places containers in inner storage bags
- Handles water-flow equipment
- Cleans field equipment

UNIVERSAL GUIDELINES AND PRECAUTIONS

- Wear Gloves at all times!
- Verify that samples are being collected in the exact location as indicated by field notebook, GPS, or communication with field leader or returning volunteer familiar with the correct site
- Because communication of all collection times and data between team members and the data recorder is important it makes sense for one person to serve exclusively as data recorder at all watershed sites. This person also assumes responsibility of completely filling out the Chain of Custody for each sample, and relinquishing samples to SDCK.
- Only collect a sample if the site has adequate water flow. During some seasons, flow in some locations may be too low or none – mark as such on the data sheet. Do not search for an alternate sampling site
- Water samples are to be collected before any other activity is performed at the site
- Sampler should always be positioned downstream from sample collection point
- Collect water quality samples from the center of the stream, or collect as close to the center as the sampling pole and sampler's physical ability will allow
- Avoid disturbing bottom sediment during sample collection; and avoid collection of any residue from water surface
- Collect sample 3 -5 inches below water surface
- When using a sampling pole and bottle: plunge upside down container into the water and rotate 90 degrees upstream and sweep through water to collect sample
- When using measurement device probes: insert probes in smaller orange clamp on sampling pole so the clamp fits at the probe collar. Immerse probes so the orange pole clamp is just below the surface (probes should be 3 – 5 below surface)
- Take care when sealing the sample bag to remove most of the air from the bag so that the sample bottle is not insulated from the ice by excessive air being trapped inside the bag.

SEQUENCE OF SAMPLE COLLECTION AND ANALYSES: *Refer to page 6 for start of detailed procedures*

1. Collect first one liter (1L) bottle using sampling pole. Store in cooler immedately.

2. Collect second 1 L bottle as above, filter 250mL into glass bottle and store in cooler immediately. Remove spent filter and rinse filter mechanism.

3. Perform pH test on remaining volume in second 1 L bottle. Record Data. Discard remaining volume. Rinse pH meter.

4. Perform measurement of air temperature. Record data.

5. Use Hach meter probes attached to sampling pole to analyze dissolved oxygen, conductivity and water temperature. Record data. Rinse probes.

6. Record habitat data, get estimates of flow, and make observations of potential illegal discharge.

7. Perform required QA/QC procedures if instructed to do so (ex. transfer of field blank)

8. Review data sheet for completeness and make certain not to leave any equipment or litter at site.

SAMPLE CONTAINER LABELING

Label each container (sampling bottle or storage bags) with:

- the site name,
- site ID,
- sampler ID
- date and time of collection

In most cases, containers will be pre-labeled with site ID and and site name. Clean Hands is responsible for labeling the sample bottle with a waterproof sharpie prior to sampling. These labels need to correlate with the similar fields on the site data collection sheet. If for some reason the label is deteriorating or unclear, just write directly(clearly)on the sampling bottle with sharpie.

COLLECTING SAMPLES

You will be collecting two (2) 1L sample bottles. The first will be used for lab analyses, the second of these two will be filtered in the field and used to get pH readings. (the pH meter cannot be placed directly in the water body, it is water resistant not water proof)

1. Prepare to sample.

   The laboratory pre-cleaned HDPE 1L sample bottles are taken from the double-wrapped plastic bags using Clean Hands/Dirty Hands technique. The dirty hands person opens the first bag, and the clean hands person opens the inner bag around the bottle. The clean hands person then removes the bottle from the inner bag. The CH person holds the bottle while the DH person secures the clamp around the bottle. CH then removes the cap from the bottle so that DH may collect sample. Take note which way the bottle opening needs to be facing to ensure that when you push bottle into flow, the second small clamp is out of the water and not pointed down where it will scrape the bottom and disturb sediment.

2. Collection

   Sample Bottle in cuff is placed into water opening down, push down until you can rotate bottle 90 degrees towards flow and then push into flow until sample bottle is full. This ensures that no surface water enters the bottle. Scoop out of the water column and bring toward self without spilling. CH will immediately cap and hold bottle while DH removes the cuff. This is repeated for the second collection bottle for filtering and pH measurements. This second bottle is not stored, but used for filtering and pH analysis immediately. Sample is discarded after use.

3. Storage

   The lid is secured and the bottle is put back into the inner clean bag and sealed by the clean collector. The dirty hands collector then seals the outer bag and places the sample into the cooler. Make certain to carefully remove most air when sealing bags (both CH inner bag and DH outer bag) so that sample makes contact with ice and is not insulated by excessive air trapped in bags.

SAMPLE SHORT TERM STORAGE AND PRESERVATION

Properly store and preserve samples as soon as possible. This is done immediately after collection by placing the containers on ice in the cooler (make sure samples are surrounded in ice, not just sitting on top of. Sufficient ice will be needed to lower the sample temperature to at least 4°C within 45 minutes after time of collection. Sample temperature will be maintained at 4°C until delivered to the laboratory. Care is taken at all times during sample collection, handling and transport to prevent exposure of the sample to direct sunlight.

FIELD SAFETY ISSUES

Proper gloves must be worn to prevent contamination of the sample and to protect the sampler from environmental hazards (disposable polyethylene, nitrile, or non-talc latex gloves are recommended). Never do anything to jeopardize your own or others safety

FIELD SITE DATA SHEETS

Each visited field site requires a completed Field Data Sheet (even if no samples are collected (i.e. at a site which is found to be dry).

- ✓ Refer to data sheet or to monitor progress throughout the field procedure.
- ✓ Make sure to check all appropriate boxes and fill all blank fields paying special attention to the measurement units.
- ✓ Record any and all results, when processing and reading and make note of any change from procedure or results that seem unusual.
- ✓ Clean all equipment after use and between sites.
- ✓ Remember to process one sub-watershed batch at a time as they come in from field with priority to keep under holding time.

FILTERING SAMPLE

- ✓ Using "Clean Hands (CH)/Dirty Hands (DH)" techniques, proceed to filter 250ml of sample from the second 1L sample bottle prior to obtaining a pH reading.
- ✓ Teamwork is required to properly attach and remove sample bottle from filtering mechanism. Don't put your hands where they don't belong ;)

Instructions:

1. DH removes the filtering mechanism from the ziplock bag. Be sure that all gaskets are in place to ensure proper seal and vacuum.
2. DH unscrews the white collar and removes the top vessel from the bottom unit.
3. CH removes new filter from source cup and places the filter on the perforated surface without touching the mechanism.
4. DH puts the top vessel back onto the unit, being careful to tighten by screwing the white collar only and not twisting the unit, which will tear or move the filter.
5. CH will now remove the clean labeled glass sample bottle from the internal bag after DH opens the outer bag. Be careful to set the orange aside so it will not be contaminated. CH and DH need to work together to screw the bottle to the filtering mechanism.
6. CH is responsible to pour the collected sample into the mechanism while DH pumps the water through the filter.
7. Once 200-250 ml (50ml minimum for extremely turbid samples that clog filter)have passed into the glass, CH should recap the 1L sample bottle and remove the glass sample bottle from the filter mechanism and re-cap with the orange lid and place into clean internal sample bag.
8. DH will close the external sample bag and then place sample into cooler.
9. DH is responsible for the cleaning of the sample vessel with de-ionized water between sites.

COLLECTING AMBIENT DATA

- ✓ Conduct monitor / field analysis in the shade if possible, or shade sample with your body from the sun
- ✓ It's important to filter and obtain pH measurements quickly after collecting sample prior to taking measurements of dissolved oxygen, conductivity and water temp.
- ✓ Make sure that all data fields are completed in full with proper units recorded and all blanks filled and boxes checked.
- ✓ Clean Hands/Dirty Hands Technique is only necessary for collecting water samples, it is not necessary for collecting ambient field data. You must still be gloved at all times. Gloves need to be changed when ever soiled and between sites. Do not reuse gloves. It is a good idea for CH to wear multiple sets of gloves so changing soiled gloves is as easy as removing outer pair.
- ✓ Any Instrument that comes in contact with water sample must be rinsed thoroughly between uses to avoid site cross-contamination. De-ionized water is used on all equipment except for the pH meter; Use tap water to rinse the pH meter.

AIR TEMP: LAMOTTE ENVIRO-SAFE AIR THERMOMETER

1. Record instrument ID # onto data sheet.
2. Find a shaded area in open space (under a tree, under an overhand, etc.). You can create shade by turning your back to the sun if no shade is available.
3. Place thermometer into air. Hold the thermometer at an arms length away from your body and record the temperature.
4. Allow the thermometer reading to stabilize for at least **1 minute** and record temperature.
5. Allow an additional **30 seconds** between readings.
6. Obtain a total of **3** measurements. Return air thermometer to bag dry.

pH: OAKTON INSTRUMENT pHTESTR 3 or 30

Instructions:

CH/DH technique is no longer necessary for obtaining field measurements

1. Record instrument ID # on data sheet.
2. Remove cap.
3. Press ***ON/OFF*** button to switch pH meter ON.
4. Place probe 0.5-1.0 inches into water sample in the 1L sample bottle, only the probe needs to be immersed. Stir gently a few times and wait **1 minute** to let the reading stabilize.
5. Allow an additional **30 seconds** between readings.
6. Obtain a total of **3** measurements.
7. Press ***ON/OFF*** to turn pH meter OFF. If you do not press a button for about 8 minutes, the pH meter will automatically shut off to conserve battery power.
8. Rinse the electrode with **TAP WATER** and replace cover. You do not need to dry the instrument; store the probe wet.
9. Discard the remaining sample water from the 1L sample bottle.

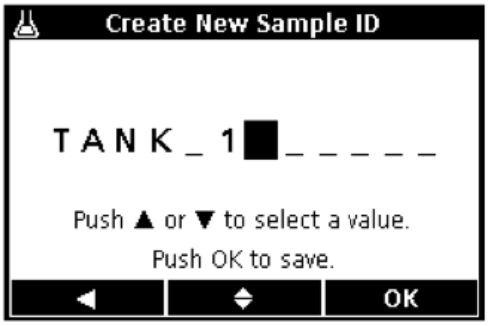
DISSOLVED OXYGEN, CONDUCTIVITY & WATERTEMPERTURE: HACH HQ40D

Instructions:

- ✓ CH/DH technique is not necessary for collecting ambient field data
- ✓ See pg 13 for description of displays and buttons and for directions to change user ID and site ID

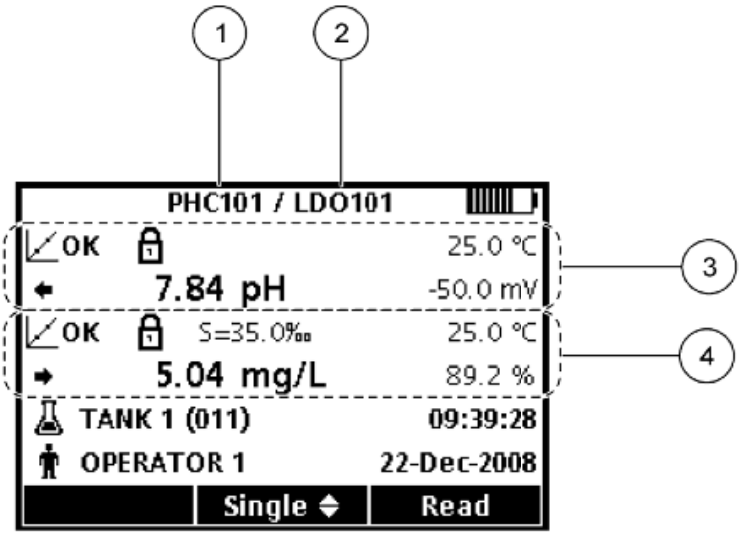
1. Turn meter on, check that meter recognizes both probes. Reading at top of screen will display CDC401/LDO101, and there will be two lines of units associated with the probes.
2. Remember to verify the correct site location setting on the meter before monitoring.
3. Attach probes to sampling pole (small clamp) if you cannot reach center of stream from bank.
4. Probes can be placed directly in the water body at 3 – 5 inches depth. Ensure that both are submerged just enough and proceed to take measurements simultaneously.
5. Press the green button to get reading.
6. Wait for reading to stabilize and lock before recording readings on data sheet, this may take time depending on your site. CH records measurements on data sheet when lock icon appears.
7. Wait **30 seconds** between measurements, press green button again to initialize reading.
8. Obtain a total of **3** measurements.
9. Pay close attention to the units. The Conductivity meter tends to change units from µS to mS between sampling sites depending on conductivity levels. Dissolved oxygen is measured in mg/L. Read and record the correct units. (see pg 13 for ex.)
10. After use, rinse the probe thoroughly with de-ionized water. Set the location on the meter for the next monitoring site. Push Power off.

CHANGING SAMPLE/USER ID



- Select either  Sample or User Icon
- Select Current ID for a list of previously entered names, then select the appropriate site/user ID
- Select Create new if your name or site does not exist, use up and down arrows to change to either alpha or numeric symbol and select ok (green button) when done.

SCREEN REFERENCE



NOTE:

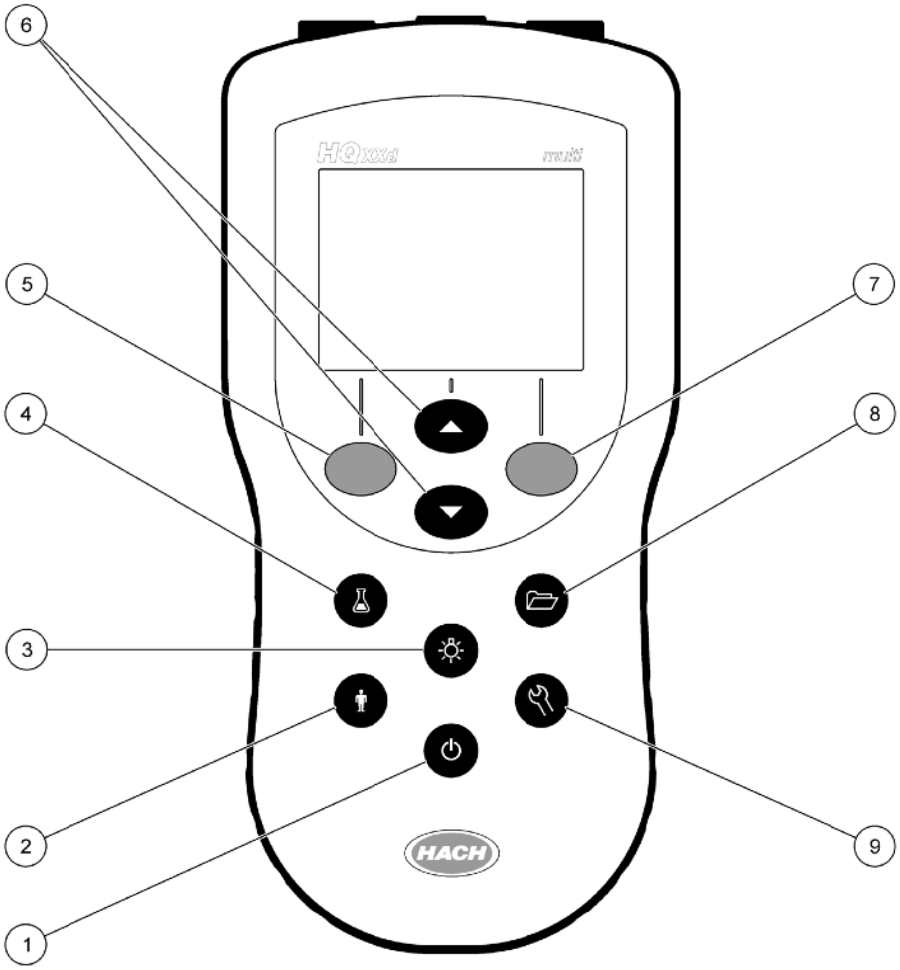
SCREEN SHOULD ALWAYS BE IN DUAL DISPLAY SHOWING BOTH CONDUCTIVITY AND DISSOLVED OXYGEN, SHOWN HERE WITH PH ON TOP AND DISSOLVED OXYGEN ON BOTTOM JUST AS AN EXAMPLE.

DISSOLVED OXYGEN RECORDS UNITS IN MG/L

CONDUCTIVITY RECORDS UNITS IN US/CM OR MS/CM

1	Probe that is connected to port on left	**3**	Measurement information for probe on left
2	Probe that is connected to port on right	**4**	Measurement information for probe on right

HQ40d METER REFERENCE



1	**ON/OFF**: power on or power off the meter	6	**UP** and **DOWN** keys: scroll through menus, enter numbers/letters or change the read view screen.
2	**OPERATOR ID**: associate data with an individual	7	**GREEN/RIGHT** key: select menu options
3	**BACKLIGHT**: illuminate the display screen	8	**DATA LOG**: recall or transfer stored data
4	**SAMPLE ID**: associate data with a sample location	9	**METER OPTIONS**: change settings, run check standards, view meter information
5	**BLUE/LEFT** key: select menu options		

MEASURING WATER FLOW

Instructions:

1. Equipment needed: sampling pole marked with 1-foot increments, stop watch, and an orange peel.

2. Set the sampling pole alongside (parallel to) the water source.

3. Drop the 'peel' just before the end of the sampling pole. Be sure to start the timer just as the 'peel' passes the end of the sample pole.

4. Stop the timer at 20 seconds and record the distance the floatable traveled.

5. Note the distance on the section labeled **Flow** on the field data sheet. Repeat three times to obtain **3 speed measurements**.

6. Record estimate of water body width in appropriate space provided on data sheet.

OBSERVATIONS OF HABITAT AND ILLEGAL DISCHARGE

The data sheet has many fields dedicated to subjective environmental observations such as: observed rainfall, water sample color, vegetation and so on. Discuss you observation amongst team members before completing these fields to your best ability. A section is available for field noted for observations or descriptions that may seem pertinent to the conditions of the sampling site.

The data section dedicated to illegal discharges does not just pertain to the site in question but also to any observations made while in the field or traveling from site to site and back to the lab. Please make sure to record as many fields as possible and bring such observations to the attention of whoever is receiving your samples back at the San Diego Coastkeeper lab.

CHAIN OF CUSTODY FORMS (COC)

Every sample bottle that will be returned to the lab must have a complete Chain of Custody Form that correlates with it.
Samples should be traceable from collection or receipt in the laboratory through preparation and analysis to final archival or disposal. This process ensures the integrity of the samples from the time of collection through sample disposal. Custody is defined as having control of the sample in one or more of the following manners: physical possession, in person's view after taking possession, secured by a person in a manner that prevents tampering of sample, and/or secured by a person in an area restricted to authorized personnel. The sample custodian is the person assigned the responsibility for custody of the sample at a given field site, laboratory, or testing facility. Include region and trip information as well as any special instructions to the laboratory.

TRANSFERRING CUSTODY

Record is in permanent ink on a Chain-of-Custody Form for receiving samples from the field and/or sediment preparation laboratory to a biological laboratory. The Chain-of-Custody Forms travel with the samples during the transfer, and are filed in the laboratory project files. Upon arrival at the laboratory, the sample custodian examines the sample container(s) to ensure that the sample seals are intact and the sample containers have not been damaged. If any seals have been broken and/or any sample containers damaged, the sample custodian records the condition of the seals and containers on the Chain-of-Custody Form. The sample custodian takes custody of the samples by signing, dating, and noting the time in the on the Chain-of-Custody Form.

SUBDIVIDING SAMPLES

Once at the laboratory, if samples have to be subdivided and submitted to another laboratory, this information should be noted on the Chain-of-Custody Form. With each transaction, the sample custodian relinquishes custody to the sample recipient, who then becomes the next sample custodian.

FIELD QA/QC SAMPLES FOR LAB ANALYSIS

- Field duplicates are currently checked randomly for 10% of the total number of sites monitored.

- Trip blanks (1/event)will also be selected at random and tested in Lab. The trip blank is a sample bottle containing de-ionized water that should travel throughout the field and return to the lab for analyses. There should be no evidence of contamination.

- Field Blanks (1/event) will be randomly provided, and need to be transferred to a sample bottle for later testing. You will transfer this provided water to a container when the samples are collected. The field blank is a sample bottle containing DI water that should travel throughout the field and be transferred into container as if it was collected in field and returned to the lab for analyses. There should be no evidence of contamination.

REVIEW OF DATA

Everything on data sheet and COC form will be reviewed before we can receive the samples from a monitoring team, please review all data fields for completeness. The Quality Assurance Project Plan requires 90% completeness for all our projected data.

A field not filled out and a zero or not available (n/a) are not the same. No data entered equals incomplete. Completed data fields, clear results and units = ☺ ; Incomplete = ☹

At any time you cannot clearly determine how to correctly fill out the data sheet, make notes as to why do not guess (ex. Malfunctioning equipment). No data with a proper explanation is better than bad data.

CONTACTS

If you have any questions in the field please call the WQ Lab

(619) 758 7743 x115

or contact the Watershed Program Manager, Clay Cliffton's cell phone

(619) 964 1776