Mission Bay
Water Quality Monitoring Program

Volunteer Handbook and Field Manual

Welcome

Congratulations on joining the Mission Bay Water Quality Monitoring Program, San Diego Coastkeeper's bilingual volunteer program that collects data in the field monthly at ten locations throughout Mission Bay, located in Los Peñasquitos Watershed.

This program creates a pathway for interested community members to

- Learn the scientific tools they need to understand their local watersheds.
- Become engaged with Mission Bay and the local community.
- Directly influence local resource management by collecting data used to inform regulatory decisions about the protection and management of San Diego's rivers and streams.

Volunteers are in the field once a month to perform water quality sampling at ten different sites in Mission Bay for approximately three hours. They also engage in community events, meetings, and advocacy efforts. The duration of this program is one year.

Volunteer Stipends

We acknowledge the valuable time and effort needed for this program to achieve its goals. This program provides a stipend to the first ten volunteers who confirm and attend each monthly field day to reduce financial barriers and provide equitable access to this opportunity that would otherwise make it difficult for one to participate. Anyone interested is welcome to apply. Spanish speakers or community members with limited English are highly encouraged to participate.

Program Background

The goal of this monitoring program is to determine and understand the current state of Mission Bay's water quality in order to push for better policies that protect public and environmental health.

Mission Bay and its surrounding environment are at serious risk of degradation. Development and urbanization in Los Peñasquitos Watershed, along with aging stormwater and wastewater infrastructure, have created conditions where pollution plagues our communities, along with poor water quality, failing water infrastructure, and lack of habitat restoration, which in turn cause illness, urban flooding, erosion, and habitat degradation.

Sampling Parameters in Mission Bay

What Are We Testing?

- Temperature
- pH
- Conductivity
- Total dissolved solids
- Salinity
- Turbidity
- Dissolved oxygen
- Phosphorus
- Total suspended solids
- Nitrate and Nitrite
- Total coliform
- Enterococcus
- E. coli
- Zinc
- Copper
- Lead
- Qualitative observations

Definitions

Salinity is a measure of the content of salts in soil or water. The most common way to record salinity is to measure the amount of salt in 1,000 g of water, so it is referred to as 'parts per thousand' or ppt. Most of the ocean has a salinity of between 34 ppt and 36 ppt.

Turbidity is the measure of the relative clarity of a liquid. It is an optical characteristic of water and measures the amount of light scattered by material in the water when a light is shined through the water sample. Measured in nephelometric turbidity units (NTU). High turbidity = cloudy, low turbidity = clearer, opaque.

pH is a measure of how acidic/basic water is. The range goes from 0 to 14, with 7 being neutral. pHs less than 7 indicate acidity, whereas a pH greater than 7 indicates a base. pH measures the relative amount of free hydrogen and hydroxyl ions in the water.

Conductivity is a measure of the ability of water to pass an electrical current. Because dissolved salts and other inorganic chemicals conduct electrical current, conductivity increases as salinity increases. Higher amounts of dissolved substances, chemicals, and minerals in the water will lead to higher conductivity.

Dissolved oxygen (DO) measures how much oxygen is dissolved in the water - the amount of oxygen available to living aquatic organisms. While each organism has its DO tolerance range, generally, DO levels less than 5mg/L are considered stressful for fish, and levels less than 3mg/L are too low to support fish. DO levels below 1mg/L are considered hypoxic and usually devoid of life.

Lead is one of the heavy metals of greatest water-quality concern in urban areas and highway stormwater runoff. Its former use as an additive in gasoline has caused widespread contamination of soils near highways and streets and drainage ways for stormwater runoff from these areas.

Zinc comes from galvanized surfaces (roofs, gutters, flashing, fencing, guard rail, downspouts, drainage systems/pipes, etc.) and debris from vehicle tires. When high zinc levels are present in soils, such as at a hazardous waste site, the metal can seep into the groundwater. Industries also can release dust containing higher levels of zinc into the air we breathe. Eventually, the zinc dust will settle out onto the soil and surface waters.

Copper (Cu) pollution occurs due to natural and anthropogenic sources, mainly the factories that make or use Cu metal or related compounds, Cu mining, combustion of fossil fuels and wastes, domestic wastewater, waste dumps, phosphate fertilizer production, and wood production.

Nitrate/Nitrite includes lawn and garden fertilizers, pet waste, leaking septic tanks, and aerially-deposited nitrogen from powerplant emissions and vehicle exhaust.

Phosphorus in urban runoff includes plant and leaf litter, soil particles, pet waste, road salt, fertilizer, and atmospheric deposition of particles. Lawns and roads account for the greatest loading.

Total dissolved solids (TDS) are dissolved organic matter and inorganic salts, including sodium, potassium, calcium, magnesium, chloride, bicarbonates, and sulfates.

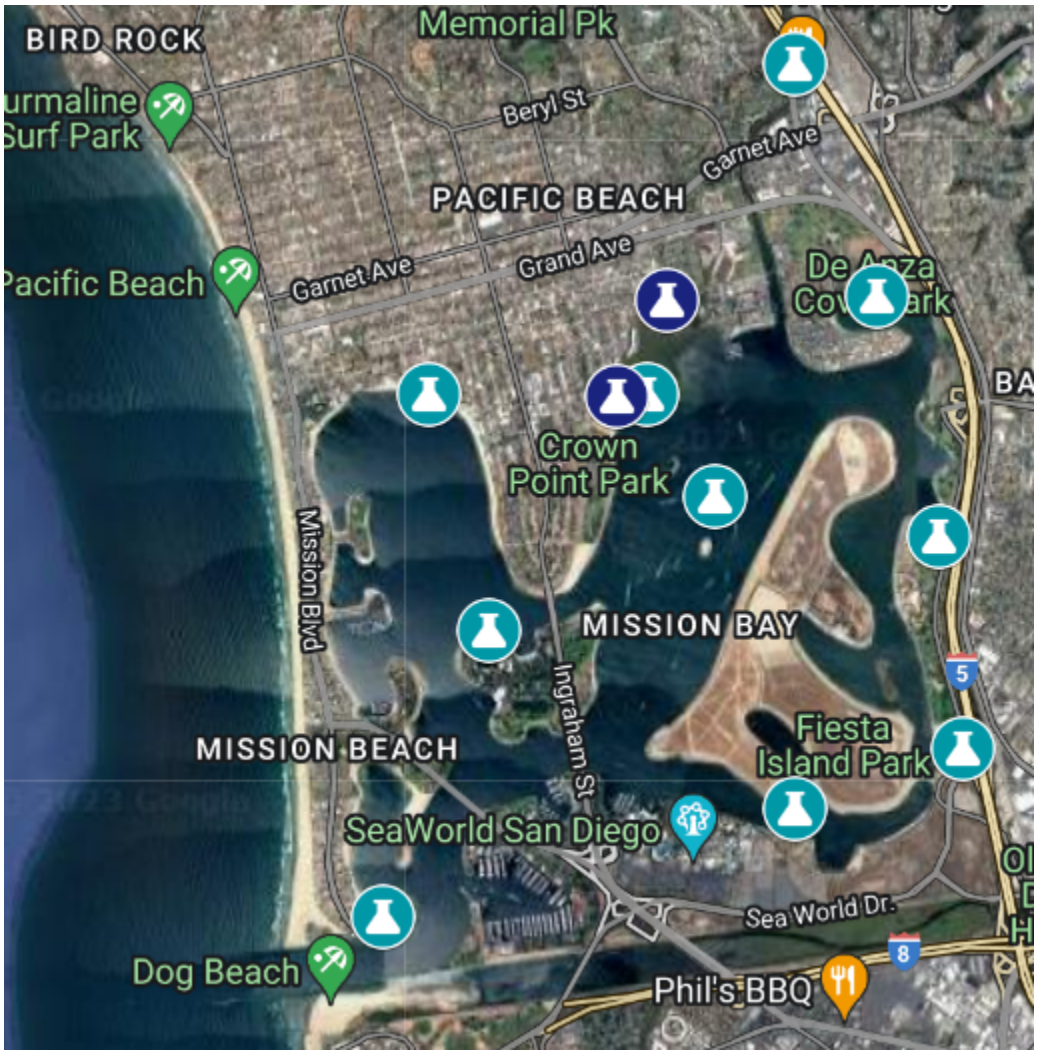
Total suspended solids (TSS) are the dry-weight of suspended particles not dissolved in a sample of water that can be trapped by a filter that is analyzed using a filtration apparatus known as sintered glass crucible. include pavement (from wear), vehicle exhaust emissions, vehicle parts, building and construction material, road salt, road paint and pedestrian debris, soil material, plant and leaf litter, and atmospheric deposition of particles.

E. coli in water strongly indicates sewage or animal waste contamination. Sewage and animal waste can contain many types of disease-causing organisms.

Enterococcus indicates the presence of human fecal material in water and the possible presence of disease-causing bacteria, viruses, and protozoa. These pathogens can sicken swimmers and others who use rivers and streams for recreation or eat raw shellfish or fish.

Total coliform counts give a general indication of the sanitary condition of a water supply. Total coliform includes bacteria in the soil, in water influenced by surface water, and in human or animal waste.

Mission Bay Sampling Sites



Site (Google Map directions)	GPS Location	Parking Details
Mission Point	32.76095, -117.24783	There is a big parking lot, and you can possibly sample from the Dog Beach
Fanuel Street Park	32.79111, -117.24462	Small parking lot, accessible

Paradise Point	32.77749, -117.24039	Park at North Cove Beach and walk over to the site location
Kendall Frost Marsh	32.79115, -117.22953	Park at Crown Point Dr. and access the gate from there
Fiesta Sunset Beach Mid-Channel[+]	32.78532, -117.22497	Big area to park, very accessible
Rose Creek (Freshwater source)	32.81021, -117.21945	Parking in the cul-de-sac, sample from the bridge or sidewalk
DeAnza Cove	32.79676, -117.21378	Plenty of parking and accessible
Leisure Lagoon	32.78291, -117.20954	Small parking lot, but accessible
Tecolote Creek	32.77064, -117.20793	Small parking lot, take samples from the bridge
South Shores Mid-Channel[+]	32.76719, -117.21949	No parking. You need to park on Fiesta Island and kayak
Olney Street Outfall* (stormwater)	32.79644, -117.22823	TBD
Stribley Marsh Outfall* (stormwater)	32.791, -117.23175	TBD

*Only tested during or immediately after storm/rain events

[+]Samples collected with San Diego Coastkeeper staff

Sampling Teams

Team	Sites
Team 1	• Mission Point • Fanuel Street Park • Paradise Point
Team 2	• Rose Creek • Leisure Lagoon • Tecolote Creek

	• Kendall Frost Marsh (special access site)
Team 3 (with Coastkeeper Staff)	• De Anza Cove • Fiesta Sunset Beach (Mid-Channel) • South Shores (Mid-Channel)

Scientific Monitoring Equipment

Equipment	Parameters
YSI Pro1020 Meter	pH, dissolved oxygen, temperature
Marine Salinity Tester	Salinity
2100Q and 2100Qi Turbidimeter	Turbidity
Test bottles (to be taken to the lab for testing)	Total Coliform/E.coli Enterococcus Copper Lead Zinc Nitrate+Nitrite Phosphorus Total Suspended Solids Metals Preparation & Digest

Other Equipment and Supplies

- Gloves
- Plastic bottles (1L)
- Sampling pole(s)
- Aqua bailer (for Tecolote Creek site)
- Cooler (with reusable ice packs)
- Distilled water
- Sampling data sheet and pen

Instructions for Using Scientific Monitoring Equipment

YSI Pro1020 Meter - pH, Dissolved Oxygen, Temperature

1. Before taking measurements, be sure the instrument has been calibrated to ensure the most accurate readings.
2. Turn the instrument on and wait 5-15 minutes if using a polarographic sensor.
3. Install the sensor guard and insert the probe into the sample.
4. Ensure the conductivity sensor is completely submerged in the sample. The sample should cover the two holes near the cable for accurate conductivity readings.
5. Move the probe in the sample at a rate of at least 6 inches (16 cm) per second if using the yellow membrane and 3 inches (7.62 cm) per second if using the blue membrane.
6. While continuing to provide sample movement, wait for the readings to stabilize.
7. Once a reading is documented, remove the probe from the sample and wash it with distilled water.

Marine salinity tester

1. Press the ON/OFF button to turn the tester on.
2. At start-up, all the LCD segments are displayed for 1 second, then the percent indication of the remaining battery life is displayed for another second.
3. The tester then enters the normal measurement mode using the last selected unit, displayed on the secondary LCD for 3 seconds.
4. Insert the tester into the sample bottle to take the measurement.
5. Record measurement and remove the tester from the sample bottle.
6. Wash with distilled water.

2100Q and 2100Qis - Turbidimeter

Turbidity measurement procedure
Note: Before a measurement is taken, always ensure the sample is homogeneous throughout.

1. Collect a representative sample in a clean container. Fill a sample cell to the line (about 15 mL). Take care to handle the sample cell by the top. Cap the cell.
2. Wipe the cell with a soft, lint-free cloth to remove water spots and fingerprints.
3. Apply a thin film of silicone oil. Wipe with a soft cloth to obtain an even film over the entire surface (Apply silicone oil to a sample cell on page 20).

4. Push the Power key to turn the meter on. Place the instrument on a flat, sturdy surface. Note: Do not hold the instrument while making measurements.
5. Gently invert and insert the sample cell in the instrument cell compartment so the diamond or orientation mark aligns with the raised orientation mark in front of the cell compartment. Close the lid.
6. Push Read. The display will show stabilizing and then the turbidity in NTU (FNU). The result is shown and stored automatically. Write down the reading on the data sampling sheet for each site.
7. Take the sample out and empty it. Place the used sample container upside down inside the box.

How to Collect a Water Quality Monitoring Sample

You will be responsible for collecting at least two (2) 1L sample bottles. The first will be used for lab analyses, and the second will be used to measure ambient parameters.

1. **Prepare for collecting a sample**
    - The laboratory pre-cleaned 1L sample bottles are taken from the bags using the Clean Hands/Dirty Hands technique. The dirty hands (DH) person opens the first bag, and the clean hands (CH) person opens the bag around the bottle. 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 the sample. Note how the bottle opening must be facing to ensure that when you push the

bottle into the flow, the second small clamp is out of the water and not pointed down, where it will scrape the bottom and disturb the sediment.

2. **Collect water quality sample(s)**
    - The sample Bottle in the cuff is placed into the water opening down; push down until you can rotate the bottle 90 degrees towards flow, and then push into flow until the sample bottle is full. This ensures that no surface water enters the bottle. Scoop out of the water column and bring it toward yourself without spilling. CH will immediately cap and hold the bottle while DH removes the cuff. This is repeated for the second collection bottle for ambient measurements. This second bottle is not stored but used for analysis immediately. The sample is discarded after use.
3. **Storing the water quality sample(s)**
    - The lid is secured, and the bottle is put back into the inner clean bag and sealed by Clean Hands. The Dirty Hands collector then seals the outer bag and places the sample into the cooler. Ensure to remove most air when sealing bags carefully (both CH inner bag and DH outer bag) so that the sample makes contact with ice and is not insulated by excessive air trapped in bags.

“Clean Hands/Dirty Hands”

The Clean Hands/Dirty Hands technique requires two or more people to work 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.)
- CH and DH should start with fresh gloves when beginning the following site.

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

- Retrieves sample bottle from the inner bottle storage bag
- Holds sample bottle while dirty hands close the sampling pole clasp
- Receives the full sample container from the DH sampler and transfers the sample to the test bottles that will be taken to the lab and places them in the inner storage bag

- Prepares a clean workspace (inside a vehicle or table)
- Records Field Data after samples have been collected (if there is no one designated as data collector)

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 the outer bottle storage bag.
- Collects samples with pole
- Operates sampling probes
- Handles single or multi-parameter instruments for field measurements
- Places samples that will be taken to the lab in the cooler after CH places containers in inner storage bags
- Handles water-flow equipment
- Cleans field equipment

Guidelines and Precautions

- Wear gloves at all times! Change into a new pair of gloves between sites.
- Verify that samples are being collected in the location indicated by field notebook, GPS, or communication with the 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 essential, it makes sense for one person to serve exclusively as data recorder at all watershed sites.
- Water samples must be collected before any other activity is performed at the site.
- The sampler should always be positioned downstream from the 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 the sampler's physical ability will allow.
- Avoid disturbing bottom sediment during sample collection, and avoid the collection of any residue from the water surface.
- Collect samples 3-5 inches below the water surface if possible.
- When using a sampling pole and bottle, plunge the upside-down container into the water, rotate 90 degrees upstream, and sweep through the water to collect the sample.
- When sealing the sample bag, 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.

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