



## PRE-FILTERING / CHL. CALIBRATION

Salton Sea water is very high in both organic and inorganic particulate matter. In order to accurately measure dissolved nutrients, it is necessary to pre-filter our samples to prevent contamination. We use a 0.7 $\mu$ m filter which will remove all but the smallest particulates.

## REAGENTS AND EQUIPMENT

50ml tubes, Glass Fiber Filter (GF/F), filter cassette, syringe

### *IF SAVING SAMPLES FOR A CHLOROPHYLL CALIBRATION*

Cooler, Dry ice, Aluminum foil, Tweezer/Forceps

## INSTRUCTIONS

1. Label a 50 ml tube with the sample number and “undiluted”
2. Put a filter Glass Fiber Filter (GF/F) in the cassette.
3. Put the filter cassette on the end of a syringe.
4. Holding the syringe over the labeled tube, press the plunger into the syringe.
5. Continue adding water to the syringe and filtering until it is difficult to push water through the filter.
6. Once the filter becomes clogged, open the cassette, and change the filter.

### *IF SAVING SAMPLES FOR A CHLOROPHYLL CALIBRATION*

1. Filter only one syringe and ensure that you record the exact volume filtered.
2. Remove the filter carefully without touching it (use tweezers/forceps) and fold it over so that the side with the material that has been filtered out is on the inside.
3. Place the filter on a piece of aluminum foil and fold the foil in an envelope around the filter.
4. Keep the filter on ice (preferably dry ice).



## AMMONIA (PHOT 4)

Ammonia is an important nitrogenous compound (ie: ammonia, nitrate, nitrite) utilized by algae. Similar to nitrate, high levels of runoff can lead to harmful algal blooms and deoxygenation at depth.

### METHOD

The YSI Ammonia test is based on an indophenol method. Ammonia reacts with alkaline salicylate in the presence of chlorine to form a green-blue indophenol complex. Catalysts are incorporated to ensure complete and rapid color development. The reagents are provided in the form of two tablets for maximum convenience. The test is simply carried out by adding one of each tablet to a sample of the water. The intensity of the color produced in the test is proportional to the ammonia concentration and is measured using a YSI Photometer.

### REAGENTS AND EQUIPMENT

YSI Photometer, YSI Ammonia No 1 Tablets, YSI Ammonia No 2 Tablets, YSI Ammonia Conditioning Reagent, Round Test Tubes, Pipette

### TEST INSTRUCTIONS \*(ADD CONDITIONER TO SALTON SEA SAMPLES)

1. Using a pipette, fill a test tube with 10 ml of pre-filtered sample.
  - a. To prevent contamination, ensure to use a clean pipette or one that has been designated and labeled for the sample.
  - b. If sample is from the Salton Sea, add Ammonia Conditioning Reagent.**
2. Add one Ammonia No. 1 tablet and one Ammonia No. 2 tablet, crush and mix to dissolve.
3. Stand for 10 minutes to allow color development.
4. Select Phot 4 on photometer to measure Ammonia mg/l N.
5. Wipe tube and take photometer sample with blank of the same dilution.
  - a. Use same type of tube for blank and sample.
  - b. If outside range of detection, dilute the sample.

RANGE OF DETECTION: 0 - 10 (mg/L N)



## NITRATE (PHOT 23)

Nitrate is the main nitrogenous compound (ie: ammonia, nitrate, nitrite) utilized by algae and is often the limiting nutrient for algal growth in the ocean. Nitrate run off into the Salton Sea can lead to eutrophication, overstimulate algal growth, create harmful algal blooms, and deoxygenation at depth.

## METHOD

In the YSI Nitratest method nitrate is first reduced to nitrite, the resulting nitrite is then determined by a diazonium reaction to form a reddish dye. The reduction stage is carried out using the unique zinc-based Nitratest Powder, and Nitratest Tablet which aids rapid flocculation after the one minute contact period. The test is conducted in a special Nitratest Tube - a graduated sample container with hopper bottom to facilitate settlement and decanting of the sample. The nitrite resulting from the reduction stage, is determined by reaction with sulphanilic acid in the presence of N-(1-naphthyl)-ethylene diamine to form a reddish dye. The reagents are provided in a single Nitricol tablet which is simply added to the test solution. The intensity of the color produced in the test is proportional to the nitrate concentration and is measured using a YSI Photometer.

## REAGENTS AND EQUIPMENT

YSI Photometer, YSI Nitratest Powder, YSI Nitratest Tablets, YSI Nitricol Tablets, YSI Nitratest Tube (20 ml), Round Test Tubes, Pipette

## TEST INSTRUCTIONS

1. Using a pipette, fill Nitratest Tube with 20 ml of pre-filtered sample.
  - a. To prevent contamination, ensure to use a clean pipette or one that has been designated and labeled for the sample.
2. Add one level spoonful of Nitratest Powder and one Nitratest tablet. **Do not crush the tablet.** Replace screw cap and shake tube well for one minute.
3. Allow tube to stand for about one minute then gently invert three or four times to aid flocculation. Allow tube to stand for two minutes or longer to allow the precipitate to settle until at least half the liquid is clear.
4. Remove screw cap and wipe around the top of the tube with a clean tissue. Carefully decant the clear solution into a round test tube, filling to the 10 ml mark.
5. Add one Nitricol tablet, crush and mix to dissolve.
6. Stand for 10 minutes to allow color development.
7. Select Phot 23 on photometer to measure Nitrate mg/l N.
8. Wipe tube and take photometer sample with blank of the same dilution.
  - a. Use same type of tube for blank and sample.
  - b. If outside range of detection, dilute the sample.

RANGE OF DETECTION: 0 - 1 (mg/L N)



## NITRITE (PHOT 24)

Nitrites are found in natural waters as an intermediate product in the nitrogen cycle. Nitrite is harmful to fish and other forms of aquatic life and the nitrite level must be carefully controlled in water used for fish farms and aquariums.

### METHOD

Nitrites in acid solution react with sulphanilic acid. The resulting diazo compound couples with N-(1-naphthyl)-ethylene diamine to form a reddish dye. The YSI Nitricol method features a single tablet reagent containing both of these reagents in an acidic formulation. The test is simply carried out by adding a tablet to a sample of the water under test. The intensity of the color produced in the test is proportional to the nitrite concentration and is measured using a YSI Photometer.

### REAGENTS AND EQUIPMENT

YSI Photometer, YSI Nitricol Tablets, Round Test Tubes, Pipette

### TEST INSTRUCTIONS

1. Using a pipette, fill a test tube with 10 ml of pre-filtered sample.
  - a. To prevent contamination, ensure to use a clean pipette or one that has been designated and labeled for the sample.
1. Add one Nitricol tablet, crush and mix to dissolve.
2. Stand for 10 minutes to allow color development.
3. Select Phot 24 on photometer to measure Nitrite mg/l N.
4. Wipe tube and take photometer sample with blank of the same dilution.
  - a. Use same type of tube for blank and sample.
  - b. If outside range of detection, dilute the sample.

**RANGE OF DETECTION: 0 - 0.5 (mg/L N)**



## PHOSPHATE LR (PHOT 70)

Phosphate is an important nutrient for algal growth in inland lakes and can often be the limiting nutrient for algal growth. Phosphate runoff from fertilizers is often the primary cause of algae blooms in lakes.

### METHOD

In the YSI Phosphate LR method, the phosphate reacts under acid conditions with ammonium molybdate to form phospho-molybdic acid. This compound is reduced by ascorbic acid to form the intensely colored 'molybdenum blue' complex. A catalyst is incorporated to ensure complete and rapid color development, and an inhibitor is used to prevent interference from silica. The reagents are provided in the form of two tablets for maximum convenience. The test is simply carried out by adding one of each tablet to a sample of the water. The intensity of the color produced in the test is proportional to the phosphate concentration and is measured using a YSI Photometer.

### REAGENTS AND EQUIPMENT

YSI Photometer, YSI Phosphate No 1 LR Tablets, YSI Phosphate No 2 LR Tablets, Round Test Tubes, Pipette

### TEST INSTRUCTIONS

1. Using a pipette, fill a test tube with 10 ml of pre-filtered sample.
  - a. To prevent contamination, ensure to use a clean pipette or one that has been designated and labeled for the sample.
1. Add one Phosphate No 1 LR tablet, crush and mix to dissolve.
2. Add one Phosphate No 2 LR tablet, crush and mix to dissolve.
3. Stand for 10 minutes to allow color development.
4. Select Phot 70 on photometer to measure Phosphate mg/l P.
5. Wipe tube and take photometer sample with blank of the same dilution.
  - a. Use same type of tube for blank and sample.
  - b. If outside range of detection, dilute the sample.

**RANGE OF DETECTION: 0 - 1.3 (mg/L P)**



## SULFATE (PHOT 32)

Sulfate is another sulfuric salt, but the oxidized form. The sulfate concentration at the Salton Sea is about 10 times that of the modern ocean and has continued to increase annually as a result of agricultural runoff and internal cleaning efforts to curb eutrophication. Such human-induced elevated levels of sulfate in the lake implies imbalance of the water chemistry, which drives the oversaturation of sulfate leading to spontaneous gypsum crystal precipitation on surface waters, rapid crust formation on the lakeshore, and most importantly, favorable supply for microbial sulfate reduction leading to sulfide accumulation and subsequent atmospheric release in the summer.

## METHOD

The YSI Sulfate test is based on a single tablet reagent containing barium chloride in a slightly acidic formulation. Barium salts react with sulphates to form insoluble barium sulphate. At the sulfate levels encountered in the test, this is observed as turbidity in the test sample. The degree of turbidity is proportional to the sulfate concentration and is measured using a YSI Photometer.

## REAGENTS AND EQUIPMENT

YSI Photometer, YSI Sulfate Turb Tablets, Round Test Tubes, Pipette

## TEST INSTRUCTIONS

2. Using a pipette, fill a test tube with 10 ml of pre-filtered sample.
  - a. To prevent contamination, ensure to use a clean pipette or one that has been designated and labeled for the sample.
3. Add one Sulfate Turb tablet, crush and mix to dissolve. A cloudy solution indicates the presence of sulphate.
4. Stand for five minutes then mix again to ensure uniformity.
5. Select Phot 32 on photometer to measure Sulfate mg/l SO<sub>4</sub>.
6. Wipe tube and take photometer sample with blank of the same dilution.
  - a. Use same type of tube for blank and sample.
  - b. If outside range of detection, dilute the sample.

**RANGE OF DETECTION: 0 - 200 (mg/L S)**



## SULFIDE (PHOT 33)

Sulfide is a sulfuric salt in the reduced form, which means it is unstable in environments with oxygen. Sulfide is the product of anaerobic (without oxygen) microbial reaction that occurs in the Salton Sea water column when there is no dissolved oxygen available due to eutrophication in the summer. When sulfide is accumulated in the water column, daily and seasonal water mixing induces sulfidic gas emission. This sulfidic gas emission is what creates the rotten egg yolk smell on the Salton Sea shoreline, specifically prolific in the summer months. The South Coast Air Quality Monitoring District is actively monitoring the release of this odor (more information on forecast can be found on [saltonseaodor.org](http://saltonseaodor.org)).

## METHOD

This simplified method for the determination of sulfide is based on a reagent containing diethyl-p-phenylene diamine (DPD) and potassium dichromate. Sulfide reacts with this reagent in acid solution to produce a blue colored complex. In the absence of sulfide the reagent produces a pink color. Chlorine, and other oxidizing agents which normally react with DPD, do not interfere with the test. The reagents are provided in the form of two tablets and the test is simply carried out by adding one of each tablet to a sample of the water. The color produced is indicative of the sulfide concentration and is measured using a YSI Photometer.

## REAGENTS AND EQUIPMENT

YSI Photometer, YSI Sulfide No 1 Tablets, YSI Sulfide No 2 Tablets, Round Test Tubes, Pipette

## TEST INSTRUCTIONS

1. Using a pipette, fill a test tube with 10 ml of pre-filtered sample.
  - a. To prevent contamination, ensure to use a clean pipette or one that has been designated and labeled for the sample.
2. Add one Sulfide No 1 tablet and one Sulfide No 2 tablet. Crush and mix gently to dissolve the tablets. **Gentle mixing is essential to avoid loss of sulfide.**
3. Stand for 10 minutes to allow color development.
4. Select Phot 33 on photometer to measure Sulfide mg/l S.
5. Wipe tube and take photometer sample with blank of the same dilution.
  - a. Use same type of tube for blank and sample.
  - b. If outside range of detection, dilute the sample.

RANGE OF DETECTION: 0 - 0.5 (mg/L S)



## DILUTIONS

Dilution is the process of decreasing the concentration of a solute in a solution, in our case this is done by adding more deionized (DI) water to the sample solution. The resulting solution should be thoroughly mixed so as to ensure that all parts of the solution are identical. Mathematically this relationship can be shown as:

$$c_1 V_1 = c_2 V_2$$

Where  $C_1$  is the initial concentration,  $V_1$  is the initial volume,  $C_2$  is the final concentration, and  $V_2$  is the final volume.

## REAGENTS AND EQUIPMENT

50ml Falcon tube, Pipette

## TEST INSTRUCTIONS (EXAMPLES)

1:5 Dilution: Measure out 10 ml of **pre-filtered sample** with pipette and add to 50ml falcon tube. Top up the falcon tube to the 50ml line with DI water.

1:10 Dilution: Measure out 5 ml of **pre-filtered sample** with pipette and add to 50ml falcon tube. Top up the falcon tube to the 50ml line with DI water.

1:100 Dilution: Measure out 5 ml of **1:10 dilution sample** with pipette and add to 50ml falcon tube. Top up the falcon tube to the 50ml line with DI water.

**Ensure that all dilutions are labeled with the dilution factor and their respective sample ID's.**





## TURBIDITY METER




Turbidity is a measure of the relative clarity of water. Higher turbidity indicates less scattered sunlight and is often caused by suspended sediment in the water, which can have negative impacts on aquatic life.

The TN400 turbidity meter operates on the nephelometric principle of turbidity measurement. When light is passed through a sample of water, part of the radiation is dissipated by absorption, reflection, and reaction. The turbidity meter measures the degree of attenuation of light shown through the sample which is a function of turbidity.


## REAGENTS AND EQUIPMENT

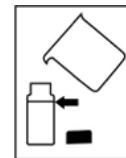
TN400, Silicon Oil, Standard Solutions (0.02, 20.0, 100, 800 NTU), TN400 Vials (x3)

## CALIBRATION (BEFORE RUNNING SAMPLES)

- All calibrations should be conducted in a dark area on a level surface.**
- Apply a small dab of silicone oil on each calibration vial and wipe with a cloth to ensure even distribution.
  - Turn the vial of 20.0, 100, 800 NTU upside down several times and set it still for 2 mins. (0.02 NTU doesn't need to be overturned)
- Open the flip cover and put in 0.02NTU calibration vial. **Align the mark on the vial with the mark on the sample well** and then close the cover.
- Power on instrument  , initiate calibration mode  , select 0.02, and press 
  - Repeat for 20.0, 100, and 800 when indicated.
  - Once completed, the meter will enter measuring mode.

## TEST INSTRUCTIONS

- All measurements should be taken in a dark area on a level surface.**
- Ensure each sampling vial is thoroughly cleaned and the cap number matches that of the vial.
- Decant 18ml of **un-filtered sample** into sampling vial (approx. 4/5 of the vial, see image)
  - Ensure solution is uniform and no bubbles are present.
  - Apply a small dab of silicone oil on each calibration vial and wipe with a cloth to ensure even distribution.
  - Label or note which vial contains which sample. (Do not place labels on the glass vial)
- Open the flip cover and insert sample vial. **Align the mark on the vial with the mark on the sample well** and then close the cover.
- Press  to take sample (approx. 8 seconds) and record value.





## YSI PRODSS / SONDE

The YSI ProDSS (digital sampling system) is a portable water quality multiparameter instrument for the measurement of critical water parameters including:

- **pH:** How acidic or basic a body of water is with 0 being extremely acidic, 7 being neutral and 14 being extremely basic.
- **Dissolved Oxygen:** The amount of oxygen available in the water. Oxygen levels will typically be higher closer to the surface and often at the lowest at depth. There are also other factors that can impact oxygen levels, such as decomposition of dead phytoplankton.
- **Chlorophyll:** An indicator for the presence of photosynthetic phytoplankton (or algae) in the Salton Sea. High concentrations of chlorophyll in the water can indicate algal blooms.
- **Phycoerythrin:** An accessory pigment to the primary photosynthetic pigment, chlorophyll. Phycoerythrin is commonly found in harmful algal bloom forming cyanobacteria (blue-green algae) and is useful for monitoring algal blooms in the Salton Sea.
- **Salinity:** The concentration of salt in the water. High salinity levels make the Salton Sea uninhabitable to many fish and as their food source dwindles, an unreliable water source for many fish-eating birds.
- **Water Temperature:** Warmer temperatures can impact the levels of dissolved oxygen, rates of photosynthesis (the process used by plants and algae to "make food") and can generally make an aquatic habitat uninhabitable if temperatures are high enough.

## EQUIPMENT

YSI Sonde, YSI ProDSS, YSI Sonde Weight, Field journal

## TEST INSTRUCTIONS

1. **Remove plastic sleeve and attach weight to cage.**

### *SAMPLING FROM THE SHORE*

2. Power on multimeter and lower into water. **(If water is shallow, ensure that the entire cage is submerged. This may be accomplished by positioning the sonde horizontally).**
3. Allow numbers to stabilize and take sample by pressing enter. Record the date, time, and location of sample in the field journal.

### *SAMPLING FROM THE BOAT*

4. Once the station is reached record the date, time, and location in the field journal.
5. Lower to 0.5 meters (**1st mark**), allow numbers to stabilize, and record sample by hitting enter.
  - a. Lower an additional meter (**2 marks**) and record a second sample.
  - b. Continue sampling at one meter intervals until the lake bottom is reached.
  - c. Once the lake bottom is reached, record bottom depth, and take sample approx. 0.5 meters from the bottom.

**When sampling from the boat, record every time a sample is taken in the field journal.** When multiple samples are taken at one station; record location, date, and time for the station, then report the depths in order they were sampled by the ProDSS.



## SECCHI DISK

The Secchi disk is used to estimate water turbidity or clarity. Higher turbidity indicates less scattered sunlight and is often caused by suspended sediment in the water, which can have negative impacts on aquatic life.

The Secchi disk is a useful approximation of turbidity as it is easily measured and replicable.

## TEST INSTRUCTIONS (EXAMPLES)

1. Slowly lower Secchi disk into the water until it is no longer visible and note depth. **Each mark is 0.5 meters.**
2. Slowly raise Secchi disk until it becomes visible again and note depth.
3. Average the two depths to determine Secchi depth and record depth in the field journal along with station ID, date, and time.