MWQI Copy

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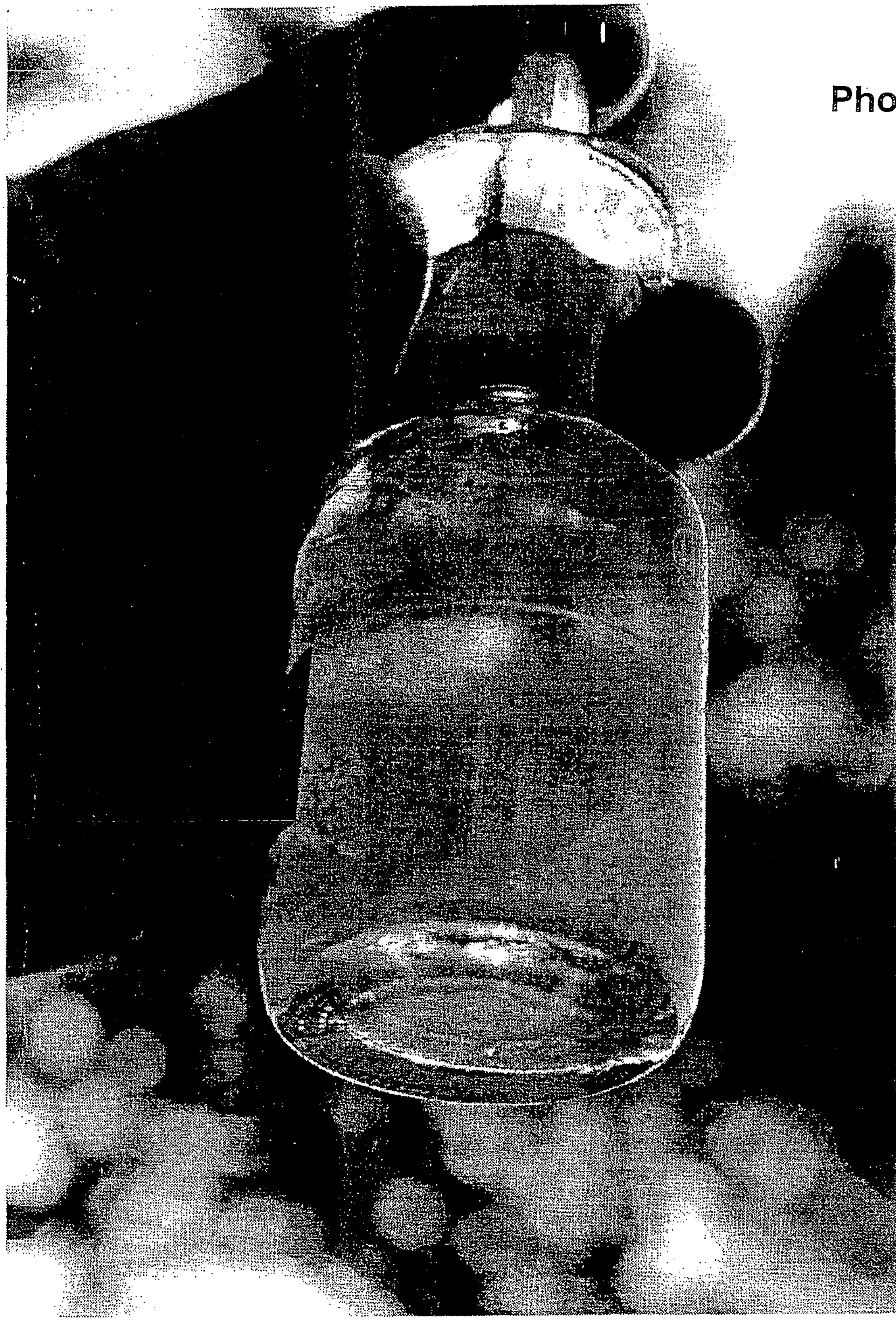

Municipal Water Quality Investigations Program Field Manual

August 1995

State of California • The Resources Agency • Department of Water Resources

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Introduction

The objective of the Department of Water Resources' Municipal Water Quality Investigations Program is to monitor and assess water quality of the Sacramento-San Joaquin Delta as related to drinking water supply. Included in the study area are the Bay-Delta estuary, river inflows, drainage from land surfaces, and Delta channels. The data are used to:

- Alert municipal water agencies about potential contaminant sources to Delta water supplies.
- Document water quality under a variety of hydrologic conditions for studying water transfer alternatives.
- Determine the influence of sea water intrusion, local and external sources of farm drainage, river inflows, in-channel processes, weather, and State Water Project and Central Valley Project operations on Delta drinking water quality. Selenium, bromide, and other inorganic constituents are monitored to trace the movement and mixing of water from different sources.
- Assist water agencies in planning, protecting, and improving drinking water facilities.
- Document causes of reduced water quality, both in and outside of the Delta, for use in regulatory processes.
- Develop and verify DWR's Delta transport model which is used to explore alternative SWP operations scenarios in the Delta.

The purpose of this manual is to document and standardize procedures used in the field monitoring activities of the MWQI Program, which is part of a comprehensive Quality Assurance/Quality Control program.

If you have questions or comments about this manual or the Municipal Water Quality Investigations Program, please contact Judith Heath, Division of Local Assistance, Department of Water Resources, 1020 9th Street, Sacramento, CA 95814; 916/327-1672.

Chapter 1—Field Preparation Procedures

Checklist

One of the most important ways to ensure quality and reduce errors is to develop and use a detailed checklist. Use the following checklist for MWQI field runs; copies of this checklist are available at the field trailer. See Chapter 4 for a specific checklist for autosampler runs.

Table 1—Equipment and Supplies Checklist for Field Runs

- ❑ Sampler (bucket, kemmerer, etc.)
- ❑ Cable or rope for sampler
- ❑ Ice chest (normally kept in van)
- ❑ Ice for cooling (blue ice, white ice holders, etc.). At least one 7 lb. bag or the equivalent.
- ❑ Labeled sample container (plastic pints, quarts, 250 mL bottles, VOA vials, etc.) and extra containers
- ❑ Pump, filter holder, and filters
- ❑ Acid for preservation (nitric acid supplied by Bryte Chemical Laboratory)
- ❑ Safety gloves
- ❑ Safety goggles or glasses, first aid kit eye wash, acid neutralizer
- ❑ Field testing equipment (EC meter, DO meter, pH meter, turbidity meter, ammonia kit). Record equipment taken in "Equipment Signout Sheet."
- ❑ Back-up Hellige Color Comparator kit for pH
- ❑ Safety rope, safety harness
- ❑ Field book (field sheets, chain of custody forms, laboratory analysis sheets, site maps, telephone numbers)
- ❑ Orange reflective safety vests (for heavy traffic areas)
- ❑ Rotating yellow light
- ❑ Full tank of gas in sampling vehicle
- ❑ Flashlights or lanterns with fresh batteries
- ❑ Inclement weather clothing (if necessary)
- ❑ Deionized rinse water for filter (make sure reservoir is full)
- ❑ Appropriate keys (should be on turn signal arm in van)
- ❑ Spare fuses and other small parts
- ❑ Tool box with appropriate tools
- ❑ Double distilled water (for metals and nutrients field blanks)
- ❑ Field sampling manual

Checked By: ____________________

Date: ____________________

The checklist should be completed before each field run and signed by the crew leader. All checklists will be kept in a binder for periodic QA/QC audits.

Equipment Condition

All equipment, including boats, laboratory vans, pumps, etc., should be carefully checked for proper operation prior to the sampling run. Some conditions to look for are broken or cracked components, leaky seals, cracked or worn tubing, frayed ropes, loose bolts or screws, blown fuses, inoperative readout devices, batteries with insufficient power, and corroded or dirty electric terminals.

Equipment Calibration

Calibrate instruments to comply with manufacturer's or laboratory specifications before and after the sampling run. All calibrations should be recorded on the top of the field sheet. If calibration is simple, as with the Yellowsprings® DO meter, calibration checks should be repeated during the sampling run. Calibration procedures for field measurement equipment, along with methodologies for measurement, are described in Chapter 2. Any calibration done in the field should be noted on the field sheets provided for the sampling run. All entries should be made in indelible ink.

Equipment Cleanliness

Chemical cleanliness of field sampling equipment and laboratory glassware is important. Generally, chemical cleanliness requires rigorous cleaning with hot water and strong detergents such as Alconox or Alcojet, and three or more rinses.

Labeling Sampling Containers

Prior to the run, sample containers should be labeled with waterproof ink. The label must accompany the sample container. It can either be gummed and placed directly on the container or placed on an attached sample tag. Applied labels must be made of material which can withstand immersion in water and with adhesive which will not contaminate the sample or cause the label to peel in hot, cold, or wet conditions. Avery manufactures a label that is suitable. The label information should include:

- Laboratory number
- Sample type, either by name or code number (e.g., standard mineral, chlorinated organic pesticides, Code 7, etc.)
- Date sample collected
- Sampling station name or code
- Filtered or unfiltered
- Preservative (acid, Lugol's Solution, Rose Bengal stain, etc.)

An example of a container label used by DWR follows:

COO858	11/13/93
JOHNSONSL	
VOA CODES	
40 ML-FILTERED	

Field Books

A three-ring binder containing field sheets, laboratory submittal and chain of custody forms, maps, material safety data sheets, and notes should be carried. The binder should be water resistant. Extra copies of the field sheets, laboratory submittal, and chain of custody forms should also be available.

Entries to the binder are made using indelible ink. Field notes should include the sampling site name or description, applicable weather conditions, whether pumps are running, and any other conditions which may affect the interpretation of the monitoring data. The field notes must contain sample times recorded as 24-hour Pacific Standard Time.

Useful notes for field sheets:
✓ bottle switched
✓ pump on
✓ raining
✓ fog

As necessary, notes can be transferred from the field binder for other uses. However, the field binder remains the Book of Original Entry for any legal purposes.

Laboratory Forms

The following DWR laboratory forms are presented in the appendices. In general, the forms used by the MWQI Program are:

- Chain of Custody Report
- Chemical Laboratory Test Request (DWR 1263)
- Laboratory & County Codes for Laboratory Submittal Forms
- Water Analysis—Mineral (DWR 2241 A)
- Water Analysis—Minor Elements (DWR 2241 D)
- Water Analysis—Miscellaneous (DWR 2241 B)
- Water Analysis—Miscellaneous Pesticides
- Water Analysis—Nutrient (DWR 2241 C)
- Water Analysis—Supplemental Minor Elements (DWR Form 2241 E)

Other laboratory forms included in the appendices are:

- Water Analysis—Chlorinated Organic Pesticides
- Water Analysis—Code and Price List (DWR 846)
- Water Analysis—Herbicides-Chlorinated Phenoxy Acid
- Water Analysis—Phosphorous/Nitrogen Pesticides
- Water Analysis—Purgeable Organics
- Water Quality Assessment Field Data Collection Sheet

Chapter 2—Water Quality Field Measurements

Purpose

Field analyses are performed when immediate results are necessary or for those parameters that can significantly change in a sample, such as temperature, pH, dissolved oxygen, and turbidity. Make field observations of cloud cover, wind speed and direction, unusual odors, air temperature, etc., to enhance data interpretation. Field analyses conducted for the MWQI Program include temperature, pH, dissolved oxygen, specific conductance, nitrate, and turbidity. Some of these parameters, such as pH and specific conductance, are often measured again in the laboratory for comparison purposes, but good field measurements are very important because parameters such as pH change and do not reflect field conditions when taken in the laboratory.

Necessary Equipment

The type of instrument, support equipment, and reagents used for analyses will depend on the parameter to be analyzed and the objectives of the study.

Equipment used for field analyses should be maintained and calibrated on a routine basis. Before going to the field, check equipment, restock chemicals, test, replace or recharge batteries, calibrate equipment and record results, and set up field books according to the sampling trip(s) planned. Also carry extra batteries, fuses, sample cuvettes, and other glassware.

For the purpose of measurement consistency, everyone should use the same type of equipment within the project. Different types of equipment give readings which may not be comparable.

Field Analysis Procedures

■ Temperature

Purpose:
Temperature is related to many of the physical, biological, and chemical characteristics of a water body. For instance, temperature affects the

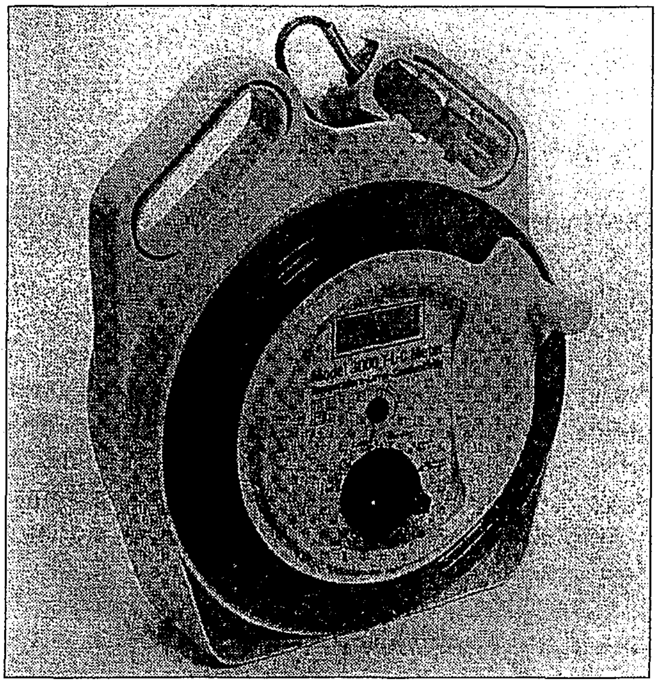


Photo 1— Multiparameter Instrument with Electrical Conductivity and Temperature Probes (from YSI Inc.).

solubility of oxygen in water and the rate of chemical reactions.

The temperature is measured using the YSI Model T.L.C. Meter which measures both temperature and specific conductance (Photo 1).

Equipment:
- YSI Model T.L.C. Meter
- Pint bottle
- Demineralized water

Measurement Procedure:
1. Completely submerge probe in pint bottle of water.
2. Set switch to "°C" position. Let probe sit in water for approximately one to two minutes to stabilize.
3. Take temperature reading and report the data to the nearest tenth (0.1) of a degree Celsius.

Cleaning and Maintenance:
In general, the temperature probe should be stored in a pint bottle of demineralized water in order to avoid buildup of deposits.

■ Specific Conductance (EC)

Purpose:
Specific conductance is a parameter which is used as a screening device. It can be correlated with the TDS and ionic strength of a solution, and is a good general indicator of the salinity of the water.

The specific conductance is measured using the YSI Model T.L.C. Meter which measures temperature in addition to conductivity.

Equipment:
- YSI Model T.L.C. Meter with probe
- Pint bottle
- Demineralized water

Measurement Procedure:
1. Completely submerge probe in pint bottle of water. A probe that is not completely covered with water will give low readings.

2. Let probe sit in water for approximately one to two minutes to stabilize. Then rapidly lift and lower probe to flush measurement compartment.

3. Turn knob to "**2 m℧/cm TC to 25°C.**"

4. Take reading in millimhos/cm. Multiply this reading by 1000 to get results in µS/cm or equivalent.

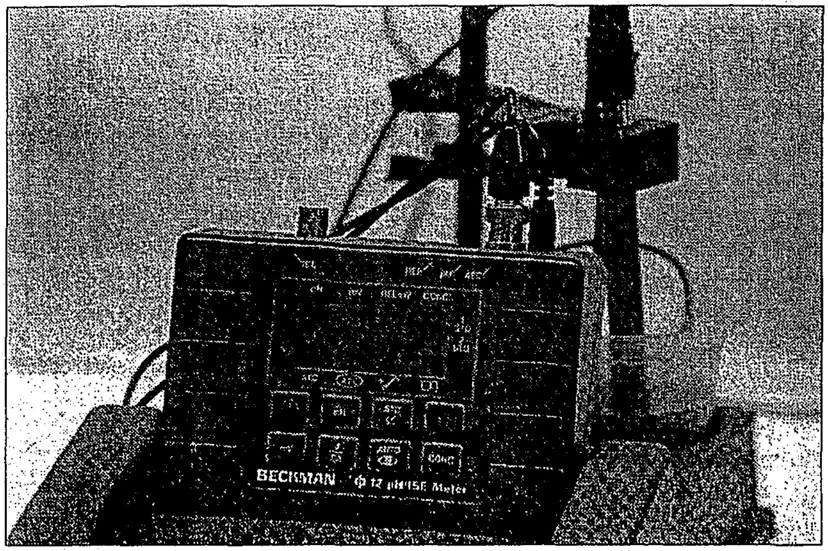
5. If the overrange signal is displayed (1.____), turn knob to right to "**20 m℧/cm TC to 25°C**" and record result.

Cleaning and Maintenance:
Rinse the probe with demineralized water between uses. Store in demineralized water.

■ pH

Purpose:
The pH value is a measure of the hydrogen ion (H+) concentration. pH is measured on a scale of 0 to 14, where a value of 7 is neutral.

Photo 2— Beckman pH Meter.



The pH is determined using a Beckman model 10 portable pH meter (Photo 2).

Equipment:
- Beckman model 10 pH meter with electrode and temperature probe
- pH 4 and 10 buffer solution
- Electrode storage solution
- Electrode storage bottle

Calibration:
The pH meter should be calibrated during preparation for the field trip on each sampling day. The meter is calibrated against two standard buffers which bracket the expected pH of the waters to be sampled (e.g., pH 4 and 10).

1. Thoroughly rinse electrode with a previously used portion of buffer before placing it in the fresh buffer.

2. Turn on the instrument. Clear meter by pressing "**C**."

3. Put probes in 1st Standard (pH 4) and press "**pH**" and then "**STD**."

4. Wait until auto "**eye**" in bottom right corner of the screen stops blinking.

5. Place probes in 2nd Standard (pH 10) Rinse Bottle; then remove and place in 2nd Standard Read Bottle.

6. Press "**STD.**"

7. Wait for auto "**eye**" to stop blinking.

8. Rinse probes thoroughly; then place in demineralized water until you arrive at the first site.

Measurement Procedure:
Care should be taken not to immerse the probe completely in the sample water, since this will cause cross contamination of the sample water and the electrode filling solution.

1. Put about 2 inches of sample water in measurement glass and rinse probes by swirling them in water. Discard rinse water and repeat.

2. Refill glass with sample water and place probes in glass. Let stabilize for 1 to 2 minutes.

   NOTE: Do NOT use the water that was used for rinsing.

   CAUTION: Do not cover the breather hole in the probe with sample water. This will cause contamination of the electrolyte solution.

3. Turn on the instrument and press "**pH.**"

4. For best results, leave probes in sample and work on other analyses (5 to 10 minutes) to ensure sample is stabilized.

5. After the auto read indicator "**eye**" stops flashing, record the pH reading to tenths of a pH unit.

6. Leave the probes in the sample water and make sure the clamp on the buret stand is lowered to hold the glass steady between stations.

Cleaning and Maintenance:
After use, the electrode should be thoroughly rinsed by swirling it in a cup

of demineralized water. The swirling rinse should last 1 to 2 minutes. Check level of electrolyte solution in probe. Solution level should be slightly below breather hole. If solution is low, fill to proper level. The probe can be temporarily stored in pH 4 buffer. For long-term storage, the probe should be stored in a special solution for electrodes. Store the electrode in a small bottle with an O-ring in the cap to prevent evaporation of the storage solution.

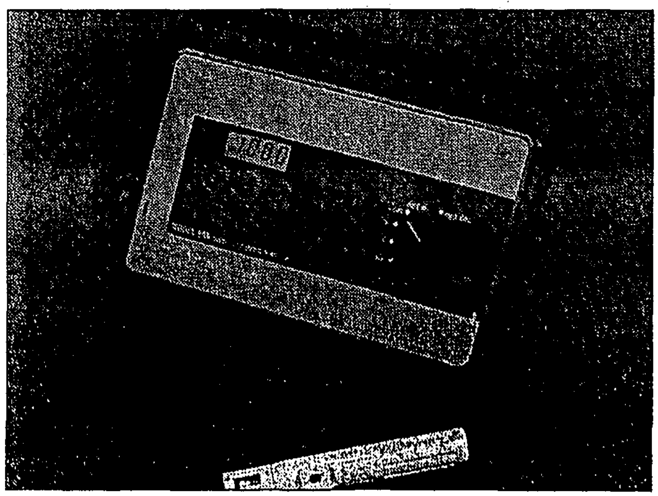
■ Dissolved Oxygen

Purpose:
Dissolved oxygen is essential for the maintenance of healthy water bodies. Most aquatic plants and animals need oxygen dissolved in the water for survival. Depletions of dissolved oxygen can cause major shifts in both the kinds and the diversity of aquatic organisms, and can create noxious odors.

Dissolved oxygen is measured by the YSI Model 50A or 50B dissolved oxygen meter (Photo 3).

Equipment:
- YSI Model 50A or 50B DO meter with probe
- 500 mL Erlenmeyer flask
- Magnetic stirrer with stirring bar
- Paper towels

Calibration:
1. Turn on the DO meter and allow to stabilize for 5 to 10 minutes before calibration. This can be done by setting the



*Photo—3
Dissolved Oxygen
Meter (from YSI Inc.).*

control knob to "**TEMP °C.**" It is recommended that the DO meter be turned on before leaving the trailer.

2. Set the function switch to "**mg/L CAL.**"

3. Place the probe in calibration bottle with a moist sponge or paper towel.

4. Press the "**CAL**" button once. The message "**SEt**" will appear on the display. This indicates that the mg/L reading will automatically correspond to the percentage of oxygen in the sample.

5. Turn the function switch to "**mg/L.**" "**CAL**" will appear on the display, followed in a few seconds by one or two audible tones.

Next, the appropriate calibration value in mg/L (± 0.02 mg/L) will be displayed. Observe the reading for stability for 2 or 3 minutes. Drift in the reading of more than two digits may mean that insufficient time was allowed for instrument stabilization.

There is a table listing "oxygen solubility vs. temperature in saturated air" on the back of the instrument. This table can be used to verify the calibration value.

Measurement Procedure:

1. Pour sample into flask, filling it about two-thirds full. Drop in the magnetic stir bar.

2. Place the probe in the flask and set the flask on the magnetic stirrer. The oxygen concentration at the membrane surface is continuously being depleted, and must be stirred to resupply fresh sample water.

3. Adjust the speed of the stirrer so that the bar magnet creates a small vortex in the water. Do **NOT** agitate the water. If the stirrer is inoperative, manually swirl the water in the flask.

4. Switch the function key to the "**mg/L**" position. Allow a few minutes for the probe to come to the temperature of the sample.

5. The sample should be stirred until the display has stabilized. Record the stabilized reading.

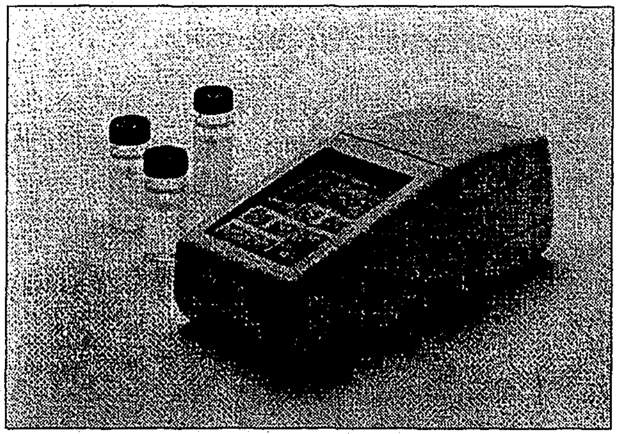
Cleaning and Maintenance:
The oxygen probe should be stored in a container supplied by the manufacturer. A small piece of moist paper towel or sponge should be placed in the container to prevent the electrode from drying out.

■ Turbidity

Purpose:
Turbidity is a measurement of the clarity of the water. The analysis is frequently done in the laboratory, but can also be done satisfactorily in the field with the proper equipment.

The type of field turbidimeter used in the MWQI Program is the Hach® 2100P (Photo 4).

Photo 4—Hach® Nephelometer Model 2100P



Equipment:
- Hach® 2100P Turbidity meter
- Sample cell and cap
- Demineralized water
- Kimwipes

Measurement Procedure:
1. Fill the measuring cell to the line. If air bubbles can be seen in the cell, tap the cell lightly to allow the bubbles to loosen and float to the surface.

2. Put cap on cell and wipe the outside with a Kimwipe to remove any fingerprints or water drops.

3. Press the "**I/O**" button. Be sure to place the instrument on a flat, sturdy surface. Do not hold instrument while making measurements.

4. Place the cell in the turbidimeter so that the diamond or orientation mark aligns with the raised orientation mark in front of the cell compartment. Close the cover.

5. Press "**READ.**"

6. Record the turbidity value.

7. Empty and rinse the cell with demineralized water. Fill the cell with demineralized water, recap it and place it in the instrument.

Cleaning and Maintenance:
The sample cells used in a turbidimeter require almost constant cleaning. Wash with detergent and rinse thoroughly. Avoid scratching the cells.

■ Ammonia

Purpose:
Ammonia (NH_3) is a form of nitrogen. Nitrogen is a nutrient that can cause large "blooms" of algae in the water.

Equipment:
- Hach Ammonia Nitrogen Test Kit
- Nessler Reagent
- Ammonia Nitrogen Color Disc
- Color Comparator
- Color Viewing Tubes (2)
- Stopper for color viewing tube

Measurement Procedure:
1. Fill the two glass sample tubes to the 5-mL mark with the sample water.

2. Add three drops (0.5 mL) of Nessler Reagent to one of the tubes, and swirl to mix. Allow at least 10 but not more than 25 minutes for color development. If ammonia nitrogen is present in the sample, a yellow color will develop.

3. Insert the tube of prepared sample into the right top opening of the color comparator.

4. Insert the glass sample tube containing the untreated sample into the left top opening of the comparator.

5. Hold the comparator up to a light source, such as the sky, a window or lamp, and look through the two openings in the front. Rotate the disc to obtain a color match.

6. Read the mg/L ammonia nitrogen through the scale window. Record on field sheets.

Cleaning and Maintenance:
After the sampling run, clean color viewing tubes thoroughly with a mild detergent. Rinse with demineralized water and dry.

Chapter 3—Water Quality Samples Collection & Processing

Purpose

Under the MWQI Program, samples of fresh water, brackish water, bay water, and agricultural drainage are collected throughout the Delta and monitored to evaluate the water quality in the Delta. The samples provide important information about the concentrations of several water quality parameters including trihalomethane formation potential, minerals, metals, pesticides, turbidity, specific conductance, pH, and dissolved oxygen.

Sample Collection Equipment

Sampling devices must be made of chemical resistant materials that will not change the quality of the water being sampled. The best sampling devices are usually constructed from one of three materials: Teflon®, glass, or stainless steel. These materials have been shown to be the most inert in terms of adsorption or desorption of organic and inorganic compounds.

In evaluating a sampling device, consider all of its parts, such as butyl rubber seals which may be small but could contaminate samples for organic analyses.

Container and Sample Volume Requirements

It is important to use the appropriate sample container for the parameter to be measured. Improper containers can introduce contaminants and cause other errors which make the data useless.

Appropriate volumes of samples must be collected to ensure that the required detection limits can be met and that any necessary sample re-analysis can be performed. Required volumes of samples are listed in Tables 2 through 4.

Unless otherwise specified, sample containers should be filled only to the neck. Leaving headspace in unchilled samples is necessary to avoid rupture from thermal expansion of the water. Even more head space is needed if a sample is to be frozen. Samples to be frozen cannot be placed in glass containers.

Sample Preservation

The purpose of preservation is to help retard chemical and biological changes that occur after the sample is taken. Some changes that may occur are volatilization of the constituent, adsorption of metal onto the surfaces of the containers, chemical reactions, and decomposition of organic material. The requirements for preservatives and preservation methods are listed in Tables 2 through 4.

Holding Times for Samples

The holding time is the maximum time a sample can be stored after collection before analysis is begun without significantly affecting the results. Holding times vary depending on the parameter, preservation technique, and analytical methodology. Maximum holding times are usually specified by the Environmental Protection Agency, and must be considered when scheduling sampling trips. Delivery times should be coordinated with the laboratory. Maximum holding times are listed in Tables 2 through 4.

Transporting, Shipping, and Storing Samples

For many samples, transportation to the laboratory must begin as soon as possible to avoid degradation of the constituents to be analyzed. Samples to be shipped which must remain cold should be thoroughly chilled prior to packing. Blue ice in nonleaking containers is convenient for keeping samples cooled during shipment, but has limited chilling capacity. Dry ice should not be used with samples that would be altered by freezing (e.g., precipitation of solids) and with samples in containers which could rupture (especially glass).

Samples should not be stored near agents that could contaminate the samples. For instance, samples for volatile organics analyses should not be stored near solvents. In most instances, samples should be stored in an ice chest or a refrigerator. This not only keeps them chilled, it also protects them from constituent changes which may occur in the presence of light. Samples should not be exposed to direct sunlight, and they should be delivered to the laboratory with a minimum of agitation.

Table 2—Containers, Preservation Techniques, and Holding Times for Organics in Water Samples

Parameter	Container	Volume Required (mL)	Preservation	Maximum Holding Time
Pesticides	1.3 L glass jug	1000	4°C	Extraction w/in 7 days; analyzed w/in 40 days
Volatile Organic Compounds	Amber glass vial w/ Teflon-silicone septa & screw cap	40 (no air space)	4°C, 2 drops HCL (1:1)	14 days
Trihalo-methane Formation Potential (THMFP)	Amber glass vial w/ Teflon-silicone septa & screw cap	250 (no air space)	0.45 µ filtered 4°C	14 days after quenching
Oil and Grease	Wide mouth glass jar, teflon lined cap	1000	H_2SO_4, pH<2, 4°C	28 days
Total Organic Carbon	glass vial w/Teflon-silicone septa & screw cap	40	H_3PO_4, pH<2, 4°C	28 days

Note: Check with laboratory; may need more than one container for quality control samples.

Source: 40 Code of Federal Regulations part 136 (7/90); Methods for Chemical Analysis of Water and Wastes, EPA- 600/4-79-020 (Revised March 1983).

Table 3—Containers, Preservation Techniques, and Holding Times for Inorganics in Water Samples

Parameter	Container[1]	Volume Required (mL)	Preservation[2]	Maximum Holding Time[3]
Bromide	poly or glass	50 (Bryte) 100 (EPA)	None required	28 days
Chloride	poly or glass	50	None required	28 days
Fluoride	16 oz poly	100 (Bryte) 300 (EPA)	None required	28 days
Iodide	poly or glass	100	Cool to 4°C	24 hours
Cyanide	poly	500	Cool to 4°C NaOH to pH>12 0.6 g ascorbic acid	14 days
Silica	8 oz poly	50	Cool to 4°C	28 days
Sulfate	poly or glass	50	Cool to 4°C	28 days
Boron	poly	100	None required	6 months
Ammonia[4]	poly or glass	400	Cool to 4°C H_2SO_4 to pH<2	28 days
Nitrite[4]	poly or glass	50	Cool to 4°C	48 hours
Nitrate[4]	poly or glass	100	Cool to 4°C	48 hours
Nitrate-Nitrite[4]	poly or glass	100	Cool to 4°C H_2SO_4 to pH<2	28 days
Organic Nitrogen[4]	poly or glass	500	Cool to 4°C H_2SO_4 to pH<2	28 days
Orthophosphate, dissolved[4]	poly or glass	50	Filter on site Cool to 4°C	48 hours
Hydrolyzable Phosphate[4]	poly or glass	50	Cool to 4°C H_2SO_4 to pH<2	28 days
Total Phosphate[4]	poly or glass	50	Cool to 4°C H_2SO_4 to pH<2	28 days

Table 3—Containers, Preservation Techniques, and Holding Times for Inorganics in Water Samples *(continued)*

Parameter	Container[1]	Volume Required (mL)	Preservation[2]	Maximum Holding Time[3]
Total Dissolved Phosphate[4]	poly or glass	50	Filter on site Cool to 4°C H_2SO_4 to pH<2	24 hours
Standard Mineral	qt poly 8 oz poly	960 100	0.45 u filtered 0.45 u filtered HNO_3, pH<2	[1]See note 6 mos
Standard Nutrient	8 oz poly 8 oz poly	100 100	4°C unfiltered freeze unfiltered	48 hours 3 mos
Total Metals	16 oz poly	480	HNO_3 to pH<2	6 mos
Dissolved Metals	16 oz poly	480	HNO_3 to pH<2 0.45 μ m filtered	6 mos
Suspended Metals	poly	200	filter on site	6 mos
Chromium VI	glass or poly	200	Cool, 4°C	24 hours
Total Mercury	16 oz poly	480	HNO_3 to pH<2	28 days
Dissolved Mercury	16 oz poly	480	filter; HNO_3 to pH<2	28 days

poly = polyethylene;
glass = borosilicate clear glass (amber glass will be specially noted)
Bryte = DWR's Bryte Chemical Laboratory

[1] Often a common container may be used to collect water for several different analyses. Discuss container sizes with your laboratory before collecting new analyses.

[2] Do not freeze agricultural waste or highly saline waters for dissolved samples.

[3] Unstable samples such as municipal and industrial wastes, hot springs, etc. require immediate attention.

[4] DWR's Bryte Chemical Laboratory can freeze these samples within 48 hours and extend the holding time to 3 months.

Source: 40 Code of Federal Regulations part 136 (7/90); Methods for Chemical Analysis of Water and Wastes, EPA- 600/4-79-020 (Revised March 1983).

Table 4—Containers, Preservation Techniques, and Holding Times for Miscellaneous Parameters in Water Samples

Parameter	Container	Volume Required (mL)	Preservation	Maximum Holding Time
Color	16 oz poly	480	4°C	48 hrs
Suspended Solids	16 oz poly	480	4°C	14 days
Volatile Suspended Solids	16 oz poly	480	4°C	14 days
Turbidity	100 ml poly or glass	1000	4°C	48 hours
Ultraviolet Absorption	poly or glass	50	4°C	48 hours

Source: 40 Code of Federal Regulations part 136 (7/90); Methods for Chemical Analysis of Water and Wastes, EPA- 600/4-79-020 (Revised March 1983).

Sample Collection Techniques

■ Surface Water Collection

Surface water samples are collected in a stainless steel bucket (Photo 5).

Equipment:
- Stainless steel sample bucket
- Steel cable

Sampling Procedure:

1. Start out with properly cleaned sample collection equipment. Pick an area which will give a representative sample. Take a sample where the water is well mixed. The best sampling points are those below a source of turbulence.

   NOTE: Be sure of the source of the sample water. Do NOT assume the source water from taps at permanent monitoring sites is the same as the water at the sample point.

2. Lower bucket below the water surface. Bring bucket back above surface and repeat procedure several times to thoroughly rinse it.

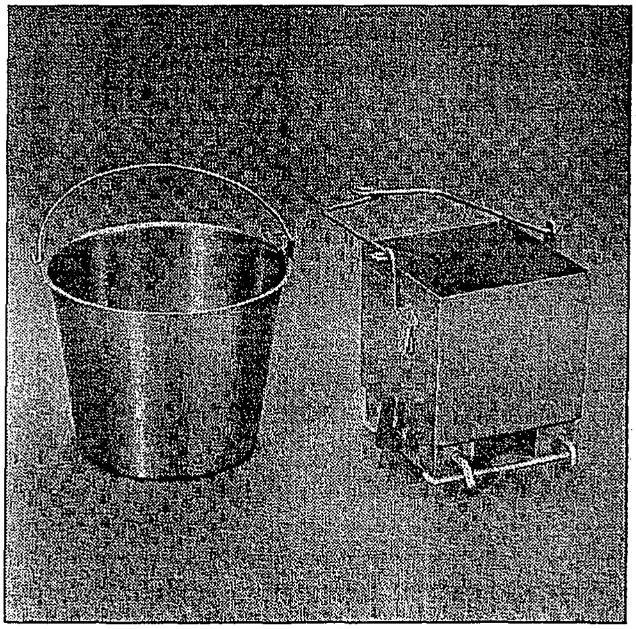


Photo 5—DWR Surface Water Samplers.

3. Take a sample approximately one meter below the surface in a stream or channel, or where turbulence is sufficient to keep the water body well mixed. Avoid collecting floating material to the extent possible.

■ Standard Minerals

DWR's Bryte Chemical Laboratory has grouped the analysis of a number of common minerals into a class designated as "Standard Mineral." Included in this group are calcium (Ca), magnesium (Mg), total hardness (as $CaCO_3$), sodium (Na), potassium (K), total alkalinity (as $CaCO_3$), chloride (Cl), sulfate (SO_4), nitrate (NO_3), boron (B), total dissolved solids (TDS), and electrical conductivity at 25°C.

The sample for the cations in the "Standard Mineral" are filtered and acidified and collected in an 8-ounce polyethylene bottle. A quart bottle of filtered water is collected for the analysis of the anions.

1. Anions

Equipment:
- Field filtering apparatus with 0.45 µm membrane
- Quart polyethylene bottle

Collection Procedure:
Filter sample water through a 0.45 µm membrane filter into a quart bottle (see "Field Filtration Technique" on page 3-15).

2. Cations

Equipment:
- Field filtering apparatus with 0.45 µm membrane
- 8-ounce polyethylene bottles
- Acid ampules
- Goggles
- Disposable gloves

Collection Procedure:

a. Filter sample water through a 0.45 µm membrane filter into an 8-ounce polyethylene bottle (see "Field Filtration Technique" on page 3-15). Leave space in the neck of the bottle for the addition of nitric acid from one ampule.

b. Wear goggles and disposable gloves when acidifying samples. Carefully break off the top of an ampule of nitric acid and empty contents into sample bottle. Do not dip the tip of the acid vial into the sample to dispense the acid. This could cause contamination.

■ Trace Metals and Minor Elements

1. Total Metals

Samples for total metals are collected without filtration in acid washed polyethylene bottles. After collection, the samples are acidified with nitric acid.

Equipment:
- 16-ounce polyethylene acid washed bottle
- Acid ampules
- Goggles
- Disposable gloves

Collection Procedure:

a. Samples for total metals should be collected without filtration in an acid-washed polyethylene pint bottle. Enough space should be left in the bottle for acidification.
(DO NOT RINSE BOTTLE)

b. Wear goggles and disposable gloves when acidifying samples. Carefully break off the top of an ampule of nitric acid and empty the contents into the sample bottle. Do not dip the tip of the acid vial into the sample to dispense the acid. This could cause contamination.

NOTE: In addition to wearing gloves and protective eye gear, carry an eyewash device and an acid neutralizing kit on field runs where acidification is scheduled.

Use caution when handling acids.

2. Dissolved Metals

Samples are filtered with a 0.45-µm filter into polyethylene bottles and acidified with nitric acid.

Equipment:
- Field filtration apparatus
- 16-ounce polyethylene acid washed bottles
- Acid ampules
- Goggles
- Disposable gloves

Collection Procedure:

a. Dissolved metal samples should be filtered through a membrane filter with a 0.45-µm pore size (see "Field Filtration Technique" on page 3-15).

b. Dissolved metal samples are collected in the same containers and acidified in the same way as total metal samples.

■ Volatile Organic Analysis

Samples taken from sampling equipment are placed in specially cleaned 40-milliliter Volatile Organic Analysis containers. The VOAs are screw-top borosilicate glass containers with plastic caps that have a hole in the center (Figure 1). Inside the cap is a removable plastic septum, one side of which is lined with Teflon®. The Teflon®-lined side should be in contact with the sample. This cap allows sample containers to be filled to the top with no headspace since the septum permits thermal expansion and, thus, prevents the container from bursting. Appropriate VOAs are provided in ready-to-use condition by the laboratory.

Equipment:
- Water sampler
- Unpowdered disposable gloves
- 40-mL VOA containers (see Figure 1)
- Plastic bags
- Ice/ice chest

Figure 1—VOA Glass Vial (from *EPA 600/4-82-029*, 1982).

Collection Procedures:

1. Do not touch the Teflon® liner or lip of the vial. Wear unpowdered, disposable gloves during the sampling to protect the sample.

2. If possible, fill the VOAs with the water from a sampler equipped with a release valve to control flow. Turn on the valve and release the water onto the inner sides of the VOA bottle being careful not to cause any bubbles. Fill the VOA until it is overtopped with a convex meniscus. Carefully place the cap and septum over the mouth of the vial, being careful to avoid trapping bubbles in the sample. Only one side of the plastic septum is Teflon® coated, and that side should be in contact with the water. Do not touch the Teflon® side of the septum. The lid should be screwed on firmly.

3. Check for bubbles by inverting the vial and tapping it lightly; then hold the vial up to the light and look for bubbles. If any bubbles appear, the sample must be discarded and the container refilled repeating the above procedure.

4. Inspect the samples thoroughly for particulate matter. This matter may contain bacteria which will rapidly degrade volatile organics. If visible matter cannot be avoided, shorten the

holding times to a minimum, and inform the laboratory that you have particulate matter in the sample, requesting expedited analysis.

5. Isolate samples from potential sources of contamination (including other samples and the necessary travel blanks) by placing them in individual plastic bags. The samples should be placed in an ice chest and padded to prevent breakage. Cube ice should be used to cool the samples to 4°C, but the VOAs should be kept separate from the melt water. Dry ice should not be used because of its capacity to freeze and burst sample containers. Samples for volatile analyses should be transported to the laboratory immediately.

   Solid or sediment samples for analysis of volatiles are collected in specially cleaned wide-mouthed glass jars with adhesive-free Teflon®-lined caps. A commonly used jar size is a half-pint (235 mL). The jars should be packed tightly to reduce air space.

■ Trihalomethane Formation Potential

Samples are filtered with a 0.45-µm filter into amber glass bottles. The bottle is capped with a Teflon®-lined cap.

Equipment:
- Water sampler
- Unpowdered disposable gloves
- 250-mL glass amber bottles
- Ice/ice chest

Collection Procedures:
1. Do not touch the Teflon® liner or lip of the vial. Unpowdered, disposable gloves should be worn during the sampling to protect the sample.

2. Filter sample into the 250-mL bottle (see "Field Filtration Technique" on page 3-15). Fill bottle until it is overtopped with a convex meniscus. Carefully place the cap over the mouth of the bottle, being careful to avoid trapping bubbles in the sample. Do not touch the Teflon® side of the cap. The lid should be screwed on firmly.

3. Check for bubbles by inverting the bottle and tapping it lightly; then hold the vial up to the light and look for bubbles. If any bubbles appear, the sample must be discarded and the container refilled repeating the above procedure.

4. Place the sample in an ice chest at 4°C.

■ Ultraviolet Absorbance (UVA)/Bromide

Samples are filtered with a 0.45-µm filter into polyethylene bottles and chilled to 4°C.

Equipment:
- 8-ounce polyethylene bottles
- Stainless steel bucket
- Field filtration apparatus
- Ice/ice chest

Collection Procedure:
1. Use a stainless steel bucket to collect the sample water.

2. Filter samples into the 8-ounce bottle (see "Field Filtration Technique" on page 3-15.)

3. Label containers and store them in an ice chest at 4°C. The UVA samples should be transported to the laboratory within 24 hours.

■ Organic Carbon

Samples should be collected in specially cleaned 40-milliliter vials which can be obtained from the laboratory. The vials contain 1 milliliter of phosphoric acid as a preservative. Care must be take to avoid loss of the preservative, and the vials should not be filled to overflowing.

1. <u>Total Organic Carbon</u>

Equipment:
- 40-mL pre-acidified vials
- Ice/ice chest

Collection Procedure:

1. Total organic carbon samples are collected from a water sampler.

2. Fill 40-mL vial. DO NOT FILL VIAL TO OVERFLOWING!

3. Chill the samples at <4°C and protect from sunlight. Deliver to the laboratory within 24 hours of collection.

2. Dissolved Organic Carbon

The MWQI program prepares dissolved organic carbon samples in a non-standard way. If standard dissolved organic carbon samples are required, follow the steps for total organic carbon. The MWQI dissolved organic carbon collection methodology is as follows.

Equipment:

- 40-mL pre-acidified vials
- Field filter apparatus
- 0.45 µm Millipore membrane filter
- Demineralized water
- Ice/ice chest

Collection Procedure:

1. Filter samples through a 0.45 µm Millipore membrane filter (see "Field Filtration Technique" next on page).

> **When using membrane filters, special care should be taken to thoroughly rinse the filter with a quart of demineralized water and at least a half-pint of the sample water before collecting the DOC sample. Fill organic carbon vials after all other sample bottles have been filled. The 40-milliliter vial should be filled from the filter apparatus discharge tubing.**
>
> **DO NOT FILL VIAL TO OVERFLOWING!**

2. Chill the samples at <4°C and protect from sunlight. Deliver to the laboratory within 24 hours of collection.

Field Filtration Technique

Purpose:
In many instances it is desirable to know the concentration of a substance which is dissolved in water as well as the amount of the substance which is suspended. By filtering the water, the suspended matter is removed, but the dissolved material passes through the filter and can be collected as a sample.

The equipment that is commonly used by the MWQI Program is a filter stand that supports a 142 mm diameter filter (Photo 6). Water is supplied to the stand by a peristaltic pump equipped with surgical grade silicon tubing.

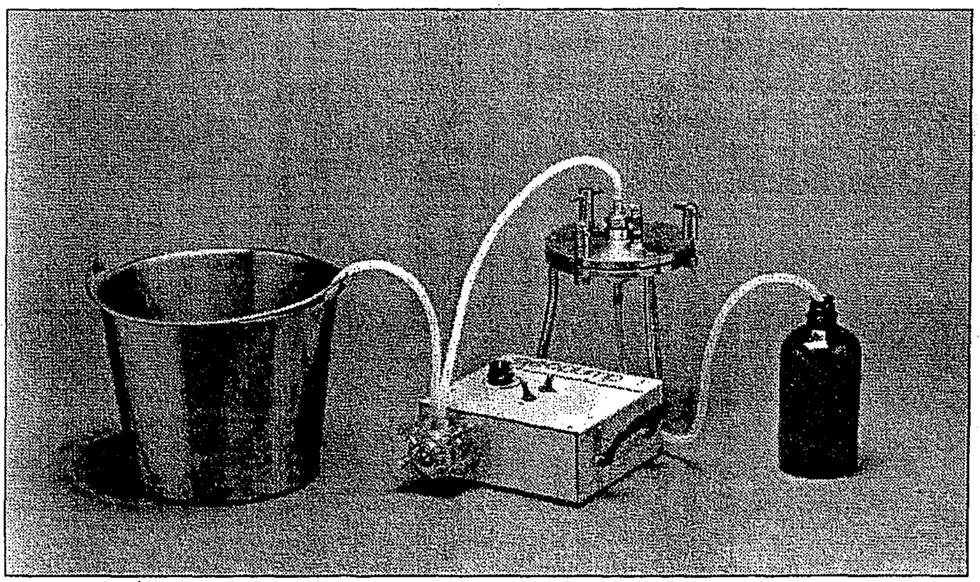


Photo 6—Filtering Apparatus.

Equipment:
- Filter stand
- Peristaltic pump
- 0.45 µm membrane filter
- Prefilters (if needed)
- Silicon tubing
- Power adapter
- Forceps (tweezers)
- Demineralized water

Filtration Procedure:

1. Using clean forceps (tweezers) place the supporting screen on the base of the filtering device. If there is a difference in the two sides of the screen, be sure the side facing upward is in agreement with the manufacturing instructions.

2. Using the forceps, place a membrane filter (0.45 µm pore size) on top of the screen. If a second screen is on the filtering device, that screen should be placed on top of the filter. An alternative to using forceps would be using protective or separating papers from the filter container. Either way, be careful not to touch and contaminate the filter paper.

   NOTE: Highly turbid samples may be filtered with a prefilter to extend the life of the membrane filter. Use only prefilters tested and approved by the lab.

3. Place the top plate of the filtering device in the proper position and firmly fasten the screw clamps.

4. Place the intake tube in a bottle of demineralized water, turn on the pump and open the air vent valve. Lift the air valve side of the device to let the internal air escape. Close the valve when the device has filled with water.

5. After a quart or more of the demineralized water has been flushed through the system, remove the intake tube from the bottle and pump as much water as possible out of the system.

6. Shake any remaining water from the intake tube; place the tube in the sample water. Pump a half pint or more of the sample through the system discarding the water that is discharged.

7. Sample containers which have not been specially cleaned by the laboratory or by the manufacturer and which do not contain any preservative should be rinsed thoroughly with the filtered water using about 10 percent of the total volume of each container.

8. After rinsing the appropriate containers for the samples scheduled to be collected, the containers should be filled with the filtered sample. Air space should be included or excluded in

accordance with the instructions for collecting each type of sample.

NOTE: Fill the sampling container(s) for inorganic analyses first. After they are full, fill the containers for organic analyses.

If the filter needs to be changed during the sampling process, steps 4 through 6 must be repeated. Pay particular attention to rinsing the filters with demineralized water (Steps 5 and 6) if samples for organic analyses (DOC, TTHMFP, UVA, etc.) are being collected.

9. When finished with a site, disassemble the filter holder, rinse it completely, and reassemble it with the new filters (Steps 1 through 3).

10. To prevent tubing from contacting the floor during travel between stations, insert both ends of the silicone tubing in a half gallon bottle containing demineralized water.

11. When next site is reached, repeat procedures 4 through 9.

Cleaning and Maintenance:
Between field trips, the filter assembly should be cleaned by circulating a hot solution of a strong detergent (Alconox or Alcojet) through the system. This can be done by placing both the intake and discharge tubes in a container of the solution and operating the peristaltic pump for at least 10 minutes.

The assembly should then be thoroughly flushed with tap water followed by a thorough flush with demineralized water. If preferred, the assembly can be washed using the laboratory dishwasher in the trailer. The apparatus should be allowed to dry and then be stored in a plastic bag.

Chapter 4—Autosamplers

The ISCO Autosampler is a programmable liquid sampler that collects sequential or composite samples based on either time, flow rate, or storm events. Collected samples are placed in glass or plastic bottles which are housed in an "environmentally sealed" and insulated compartment (Photos 7 and 8). Field personnel can then retrieve samples for analysis once the program has been executed. The MWQI Program uses the Autosampler to perform sample collection on occasions when grab samples cannot be feasibly collected by the field personnel (e.g., hourly or daily sampling).

Table 5—Equipment and Supplies Checklist for Autosampler Runs

- ❑ Nicad or gel cell batteries
- ❑ ISCO Automated sampler bottles (to replace used bottles)
- ❑ Ice chest (normally kept in van)
- ❑ Ice for cooling (blue ice, white ice holders, etc.)
- ❑ Labeled sample containers (plastic 1/2 pints, 250 mL bottles, VOA vials, etc.) and extra containers
- ❑ Pump, Filter apparatus, and filters
- ❑ Acid for preservation, if required (nitric acid supplied by Bryte Chemical Laboratory)
- ❑ Safety gloves
- ❑ Safety goggles or glasses, first aid kit, eye wash, acid neutralizer.
- ❑ Field testing equipment (EC meter)
- ❑ Safety rope
- ❑ Field book (field sheets, chain-of-custody, laboratory analysis sheets, site maps, telephone numbers)
- ❑ Orange reflective safety vests (for heavy traffic areas)
- ❑ Rotating yellow light
- ❑ Full tank of gas in van
- ❑ Flashlights or lanterns
- ❑ Inclement weather clothing (if necessary)
- ❑ Deionized rinse water for filter (make sure reservoir is full)
- ❑ Appropriate keys (should be on turn signal arm in van, check against keys listed on the field sheet)
- ❑ Tool box with appropriate tools
- ❑ Double distilled water
- ❑ Field sampling manual

Checked By: ____________________

Date: ____________________

A checklist (see page 4-1) should be completed before each field run and signed by the crew leader. Copies of this checklist are available at the field trailer. All checklists will be kept in a binder for periodic QA/QC audits.

Procedure:

1. Loosen the rubber attachments which fasten the lid of the Autosampler. This will allow access to the computer control pad. For refrigerated sampler, open cover on top of autosampler.

2. At the computer control pad, press "**STOP**" to end the current sampling program.

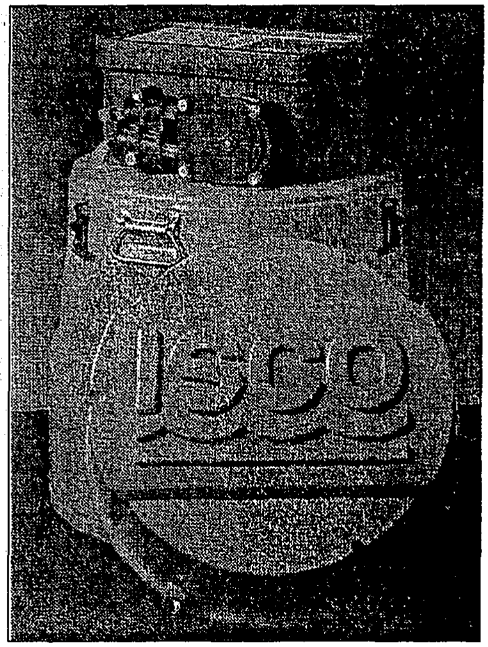


*Photo 7—
ISCO Protective
Enclosure (from ISCO).*

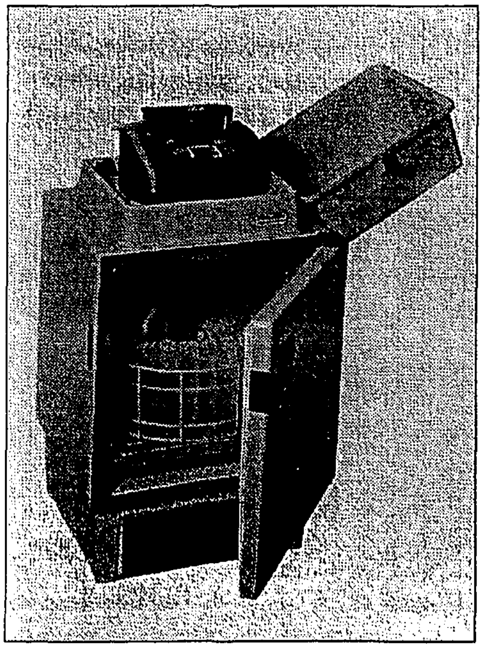


*Photo 8—
ISCO Refrigerated
Autosampler*

3. Always review the Autosampler's sampling schedule before removing any sample from the unit. Do this by pressing the "**DISPLAY STATUS**" button. Then select (with the arrow keys) "**REVIEW.**" This will provide information on each sample taken which includes date, time taken, volume, and number of bottles. Press the "**ENTER**" button to advance to the next information screen which will display information on the next sample sequence.

4. Once the sampling schedule has been reviewed, press the "**OFF**" button. This will turn off the Autosampler.

5. Disconnect the battery from the unit by unscrewing it counter-clockwise. Do not mix up the used and fresh batteries. At some locations, the Autosampler may use an adaptor connected to a 110-volt electrical outlet. These adapters, which look similar to the batteries, to not need to be replaced.

6. Detach the three metallic locking clamps which hold the top half of the unit to the bottom half. The sample bottles are contained in the lower half. This half should be brought back to the field vehicle with the assistance of another person. Once in the vehicle, any sample processing and field measurements can be done. For the refrigerated sampler, open the front door of the sampler. The bottles are contained here, in the refrigerated part of the autosampler. The bottles are kept in a metal rack which slides out of the autosampler. Carry this rack to the field vehicle for sample processing.

7. When done with the sample processing and field measurements, the sample bottles need to be replaced by fresh ones. The old bottles should be returned to the field trailer for cleaning. For the refrigerated autosampler, slide the bottle rack back into the unit with sample bottle number 1 in front.

8. Reassemble the Autosampler unit, making sure that the unit is on a level spot, and that the delivery tube is not folded or crushed. Install a fresh battery. Once a new battery is in place, there will be some noise from the motor. The unit is simply rotating the sample delivery arm to the first sample bottle.

9. To reactivate the existing program, simply press the "**ENTER**" button repetitively until the unit makes a long beeping noise. Then, press the "**START SAMPLING**" button. The sampling program must not be altered without permission and instruction from the Field Supervisor.

10. Secure the unit.

Maintenance:
NOTE: The Field Supervisor should be notified and consulted before any maintenance work is done.

Peristaltic Pump Tubing:
The peristaltic pump tubing should be replaced periodically due to wear and/or biological growth in the tube.

1. Visually inspect the tubing. If algae or other material is present, the tubing should be replaced.

2. Check the Autosampler Display. When sufficient wear has occurred, the Autosampler will display "**WARNING! REPLACE PUMP TUBING.**"

Intake Screen:
Occasionally the suction screen at the tube intake becomes clogged. The screen should be periodically checked for debris, and any debris should be cleaned off.

If you have problems with the Autosampler in the field, try to reach the Field Supervisor. If the problem is serious enough, he or she may decide to have the unit removed from the sampling location.

Chapter 5—Post Run Procedures

Table 6—Post Run Procedures

- ❑ Take all samples except THMs and the Metropolitan Water District of Southern California water samples to Bryte Chemical Laboratory.
- ❑ Check in with laboratory. Make sure that a copy of the chain-of-custody is provided.
- ❑ Refuel vehicle and check all other fluid levels; return to trailer.
- ❑ Put remaining samples in refrigerator.
- ❑ Put ice packs back into freezer and wipe or wash out ice chest.
- ❑ Take sampler(s), cable(s), and bucket, etc. into trailer and place on top of dishwasher.
- ❑ Put sampling container boxes under workbench.
- ❑ Empty van's trash container.
- ❑ Remove field equipment (pH, EC, D.O., Turbidity Meters, and Ammonia kit) and take into kitchen area.
- ❑ Wipe off all field equipment (clean off the dust and dirt).
- ❑ Follow these procedures for each piece of equipment:
  - ❑ EC Meter—Refill pint bottle with fresh demineralized water. Place probe into bottle. Place meter in cupboard marked "EC Meters."
  - ❑ pH Meter—Disconnect all wires and probes. Gently wrap temperature probe conductor wire and place in container with other probes. Fill pH electrode with

Table 6—Post Run Procedures *(continued)*

electrolyte solution found in cupboard marked "pH Chemicals." Cover hole in probe with plug. Fill tip bottle with pH storage solution. Place electrode in tip bottle, screw on cap with o-ring, and place in electrode storage rack in cupboard marked "pH Meters." Place meter with others.

- ❑ DO Meter—Wrap cable around handle of meter. Make sure that the DO probe has been placed back into probe storage bottle with a moistened towel. Place meter in cupboard marked "DO Meters."
- ❑ Turbidity Meter—Rinse out sample bottle with demineralized water. Fill bottle with demineralized water and replace cap. Place bottle and meter back into storage container and place in cupboard marked "Turbidity Meters."
- ❑ Ammonia Testing Kit—Wipe off all excess moisture from kit. Place kit in cupboard marked "Testing Kits."

❑ Complete "Equipment Sign-out Sheet" indicating date equipment was returned and noting any equipment problems.

❑ Wipe down counter and sweep the van's floor with the short broom marked "van broom" in the shed. The yard blower may also be used.

❑ If the vans are extremely dirty on the outside, notify the field supervisor so that he/she can have them taken to the carwash.

❑ Before leaving the trailer site, lock the vans, turn on the trailer alarm, and lock all storage shed doors and padlocks.

Checked by: ______________________

Date: ______________________

Chapter 6—Quality Assurance/Quality Control

The quality of analytical data is critically dependent on the way the sampling is conducted, the manner in which the sample is handled and analyzed and, finally, how the data are handled.

Contamination Avoidance

Samples should be safeguarded from analyte loss, tampering, or contamination. Every possible precaution should be taken to prevent contamination and ensure reliable data. Contamination may be introduced during sample collection, handling, storage, or transport to the laboratory.

Common sources of potential sample contamination during sample collection include unclean equipment and apparatus, improper handling of samples (e.g., filtration), improper preservation protocols, an unclean work environment (e.g., roadside dust, smoking), and unclean sample containers. Common sources of contamination from sample transport and storage include use of unclean storage containers, cross-contamination between samples (e.g., volatile organic samples becoming contaminated because of the proximity of other samples), and improper cooling temperatures.

Sample Misidentification

One of the largest sources of error is misidentification of sample bottles. The following procedures should be followed to help avoid misidentification:

- Pull out <u>all</u> bottles for the station when you arrive. Both members of the sampling team should independently check for correct bottles.
- Check bottle numbers against field sheets.
- Accurately detail any sample bottle mix-ups on the field sheet so results can be correctly identified.

QA/QC Samples

Analytical field control is performed by incorporating duplicates, blanks, spikes, and known reference standard samples into the collection effort. A description follows.

■ Field Duplicates

Field duplicates are second samples collected at the same location, time, and in the same manner as the original sample. Field duplicates are used to assess precision of the laboratory and the field collection process. (Precision is a measure of the ability to get the same answer through repeated analyses of a sample.) It is recommended that one field duplicate be taken for every ten samples taken, or one field duplicate be taken for each sampling run.

Field duplicates are often presented to a laboratory "blind," i.e., the laboratory is not made aware that the batch contains replicate samples. This procedure is recommended.

■ Field Blanks

Field blanks are samples of purified water brought to the field, then either filtered or not, before being transported back to the laboratory with the samples. Filtered blanks help to check possible contamination from hoses, housing, filters, and technique. Unfiltered blanks help to check possible contamination from sample containers and preservatives. The travel blank helps to check diffusion of contaminants into samples which might occur in the process of collecting and transporting samples from the field. Travel blanks are particularly important when volatile chemical analyses are planned.

Samples submitted to the DWR Bryte Chemical Laboratory for nutrients and trace metals analysis should be accompanied with filtered and unfiltered blank samples. The recommended frequency is one set for each field crew run. Preparation is as follows:

Nutrient Blanks:
Unfiltered—one 8-ounce plastic bottle filled with blank water (laboratory supplied).

Filtered—one 8-ounce plastic bottle filled with blank water supplied by the laboratory, which has been filtered in the field using the normal filtration equipment.

NOTE: If only total nutrient is requested, only the unfiltered blank is necessary.

Trace Metal Blanks:
Unfiltered—one 16-ounce acid washed plastic bottle filled with blank water supplied by the laboratory and one milliliter of nitric acid (ampule provided by laboratory).

Filtered—one 16-ounce acid-washed plastic bottle filled with blank water supplied by the laboratory which has been filtered through the field apparatus, plus one milliliter of nitric acid (ampule provided by laboratory).

NOTE: If only total trace metal analysis is requested, only unfiltered blanks are necessary. Both unfiltered and filtered blanks should be used for dissolved trace metals.

Volatile Blanks:
For volatile analysis samples, a pair of travel blanks prepared by the laboratory from organic-free water should accompany each batch of sample vials to the field and back again. These blanks are required to prove that containers were properly cleaned and that no contamination occurred during handling and transportation.

Standard Minerals:
Blanks are normally not required for standard minerals, since mineral contamination is not usually significant. However, for very low-level detection work, such as mineral analysis for rain water, blanks may be necessary. Consult with the QA Officer if you are planning special low-level analyses.

■ Spikes

Spikes are samples "spiked" with a known amount of analyte and analyzed using standard techniques. This analysis produces data on analytical accuracy. Accuracy is a measure of the ability to correctly quantify a known quantity of analyte in a sample, or in other words, to get the correct answer.

■ Standard Reference Materials

Standard Reference Materials are samples specially prepared by agencies, such as the National Institute of Standards and Testing; they contain known concentrations of a substance. These samples are submitted by the Program Manager to the laboratory blind; that is, the sample does not look any different from the samples collected in the field. They are submitted as a check on performance. The QA Officer can help to obtain these samples for the Program Manager's use. The Standard Reference Materials are used to provide the Program Manager and the laboratory with valuable accuracy data.

Chapter 7—Water Quality Sampling Safety Procedures

This discussion highlights safety procedures for field sampling activities. In general, it is advisable to have a partner on all sampling runs. A partner can help in the event of an emergency.

In case of an emergency in the Sacramento-San Joaquin Delta, radio Delta Field Division (Delta Control) and explain the emergency. At this time, request that State Police monitor the frequency. Communicate with the State Police (radio unit 408 or 409) and answer all questions.

Safety Equipment

The type of safety equipment to be taken on the run depends on the type of samples to be collected and the forecasted weather conditions. In general, the sampling team should be equipped and trained in the use of:

- Fire extinguishers
- Eye wash equipment
- Eye protection devices
- First-aid kit, poison oak preventative solution
- Life jackets for boat and offshore sampling
- Tethering ropes for personnel to anchor themselves while sampling over water
- Two-way radios
- Hard hats (if necessary)
- Fluorescent colored vests for bridge sampling
- Road markers for warning oncoming traffic
- Rotating yellow light for vehicle roof when vehicle is stopped on or near traveled roadways (check with DWR's Mobile Equipment Office for latest regulations)
- Protective clothing (gloves, hard hats, rain gear, boots, etc.)
- Sunscreen lotion (be sure to wash hands thoroughly after application to prevent contamination of samples)
- Snake bite kit

Bridge and Shore Sampling

■ Often samples will be taken from places where there is a danger of falling into water. For this reason, life jackets should always be worn when working near water.

■ The person sampling should be tethered with a line fastened to a stable object, such as a vehicle and/or an anchored ladder. For bridge sampling, tethers should not be long enough to allow the sampler to fall over the edge. Perlon and other types of rock-climbing ropes with a minimum diameter of 9 millimeters are recommended. Tethers must not be tied to belts.

■ Escape routes should be planned ahead of time. Do not wade into streams where the water is fast and deep, even with a tether.

■ When sampling on private property, access must be obtained from the owner. The owner should be asked to point out any possible safety hazards.

■ Beware of farm animals, especially cattle and dogs.

■ Be cautious of oncoming traffic when sampling from bridges, levees, and other traveled roads. If parked on the shoulder of the road, place an orange cone about 20 feet from the rear of the vehicle as a warning to oncoming motorists. All safety equipment must be visible and accessible. Acquire and use a flashing yellow warning light on the top of the vehicle. It is a good idea to have a permanent warning light mounted on vehicles which are continually used for sampling. If the sampling vehicle has no warning light, portable ones are available. Wear highly visible fluorescent vests on the roads and bridges. At least two persons should do this work; one should watch for traffic as the other performs the sampling.

■ Drive slowly on rough or narrow roadways. Equipment and chemicals in the sampling van or truck should be secure so no damage occurs to them while traveling on rough roads.

Boat Sampling

Boats are often used to sample lakes, reservoirs, rivers, and channels.

DWR regulations require the presence of at least two persons in the boat at all times. Moreover, each boat should have a marine radio for use in case of an emergency.

LIFE VESTS SHALL BE WORN AT ALL TIMES!

Extra flotation devices should also be carried. A fully charged fire extinguisher must be carried in all power boats. Other legal requirements are taught in the DWR Boat Safety class, which is required for all personnel involved in this type of field work. Instructors of this class can be consulted to determine current legal requirements for boat safety equipment.

Agricultural Drainage Water

Agricultural drainage water could (but rarely does) contain high concentrations of pesticides and other synthetic organic toxins. Agricultural drains can often be hazardous:

- Beware of poorly constructed or broken-down walkways and pump platforms (e.g., rotten or missing wood).

- Pumps can turn on automatically, so stay away from areas near moving parts and electrical currents.

- Wear disposable plastic gloves when sampling agricultural water, and avoid skin contact with water, sediment, and vegetation. Wash hands thoroughly after sampling.

- Take precautions when in slippery areas, deep mud, or along steep accesses.

- Obtain permission to access locked gates and private property. Relock gates after access. When relocking gates with more than one lock, be sure that none of the locks are locked off and made unusable.

- Beware of hunters, farm animals, spiders, wasps, and snakes. Be wary of areas where crop-dusting is occurring or has occurred. Low-flying planes and posted fields are signs which suggest pesticide use. Also look for notices of field reentry times.

Chapter 8—Mobile Radio Operation

DWR's Mobile Radio System is capable of providing two-way communications between various field locations throughout the State. This system is very useful when questions or problems arise in the field.

Guidelines

The radio system is to be used only for official business, or communications involving the imminent safety of life or property. The Federal Communications Commission periodically monitors the frequencies for illegal, fraudulent or otherwise improper signals. Persons found to be responsible for these signals will be subject to disciplinary action. The following guidelines should be followed.

- Radio use is restricted to official business or communications involving the imminent safety of life or property.
- Transmission of false, deceptive, unidentified, or music signals is strictly prohibited.
- Use of obscene or profane language is illegal.
- Never stay on the air for an extended length of time without a break.
- Do not break into the transmission of others except in an emergency.
- Use the 10-code and the phonetic alphabet whenever possible (see Tables 8 and 9).
- Use radio call numbers whenever possible to identify persons. See Table 10 for a list of call numbers for DWR staff.
- At the end of each transmission, or exchange of transmissions, transmit DWR's identification call sign "**KD9257.**"

Basic Functions

The following basic functions apply to the Syntech Mobile Radio. The functions may be slightly different on different models.

Power On/Off:
To turn the radio on, rotate the "**Off-Volume**" knob clockwise until a click is heard. To turn off the radio, rotate the "**Off-Volume**" knob fully counter-clockwise until a click is heard.

Volume/Squelch:
To adjust the volume, rotate the "**Squelch**" knob fully counterclockwise. The "**TX/Busy**" indicator should glow green. Rotate the "**Off-Volume**" knob for a comfortable listening level. Noise should be heard coming out of the speaker. Now turn the "**Squelch**" knob clockwise until the noise stops abruptly, then continue turning clockwise a little farther.

Channel Selection:
To select or change a channel setting, rotate the channel selector "**Up/ Down**" knob on the radio. The channel number will be displayed in the display window. Use the channel listing (see Table 7) to determine the desired channel and tone.

Tone Selection:
To select a tone use the SSC tone encoder. Select a tone number based on the channel and relay station (see Table 7). Rotate the tone encoder dial to the desired tone number.

Microphone PTT (Push-to-Talk):
The PTT switch is located on the side of the hand microphone. Remove the microphone from its clip and depress to transmit. The "**TX/Busy**" light will glow red when the PPT is pressed. The microphone is active and the radio is radiating a signal when the PTT is pressed. Release the PTT to receive. When the PTT switch is released, a half second burst of noise is usually heard. This is called a "squelch tail" and is an indication the radio is successfully transmitting.

Monitoring (MON):
When a coded squelch system is used by two or more entities sharing the same frequency, the MON button disables the squelch coding protection

and allows the shared frequency to be monitored. Be sure the MON button is pushed in when using the radio.

Basic Operation

<u>To Receive</u>:
Turn the radio on. Adjust volume and squelch. Check to see if the MON button is pushed in. Select the desired channel.

<u>To Transmit</u>:
Select the desired channel. Press the PTT switch on the microphone. The "**TX/Busy**" light will glow red when the transmitter is on. Speak slowly, clearly, and at normal volume into the speaker, holding it one to two inches from your lips. Inexperienced radio operators often speak with the microphone too close to the mouth and/or speak too loudly. This causes "overmodulation" which blurs the voice making it very difficult to understand. Ask people who have heard your radio technique to comment on how well you were understood.

Safety

Do not operate the transmitter in close proximity to blasting caps or in an explosive atmosphere (petroleum fuels, solvents, dust, etc). Radio frequencies can, in some cases, detonate explosive charges. Do not operate the transmitter of a mobile radio when someone outside the vehicle is within 2 feet of the antenna. There is a hazard of harmful radiation.

To avoid damage to the equipment, do not operate the transmitter unless all antenna connectors are securely fastened.

Table 7—Channel Listing

Channel	Tone	Sites	Areas Used
1	—	State Car/Car	Statewide
5	—	Local Car/Car	Statewide
3	—	Beckwourth	Oroville Field Division
8	—	Bloomer	Oroville Field Division
2	—	Zion	Delta Field Division
2	1	Cobb	Delta Field Division
2	2	Sunol	Delta Field Division
3	—	Diablo	Delta Field Division
8	*	Black 1	Delta Field Division
7	—	Black 2	San Luis Field Division
6	—	Blue Ridge	San Luis/San Joaquin FDs
4	2	Shirley	San Joaquin Field Division
4	5	Edmonston	San Joaquin Field Division
6	1	Los Pinetos	Southern Field Division
6	4	Quartzite	Southern Field Division
7	1	Tejon	Southern Field Division
7	4	Strawberry	Southern Field Division
8	1	Box Springs	Southern Field Division
8	4	Hauser	Southern Field Division

* Tone not assigned

Table 8—10-Code

10-1	Receiving poorly
10-2	Receiving well
10-4	OK, message received
10-7	Out of service
10-8	In service
10-9	Repeat transmission
10-13	Weather and road
10-19	Return to office/base
10-20	What is your location
10-21	Call by land-line/phone
10-22	Disregard last call
10-23	Stand by
10-30	Traffic
10-36	Correct time
10-99	All secure
10-100	Nature calls

Table 9—Phonetic Alphabet

A	Adam	N	Nora
B	Baker	O	Oscar
C	Charlie	P	Paul
D	David	Q	Quebec
E	Edward	R	Robert
F	Frank	S	Sam
G	George	T	Tom
H	Henry	U	Union
I	Ida	V	Victor
J	John	W	William
K	King	X	X-Ray
L	Lincoln	Y	Yankee
M	Mary	Z	Zebra

Table 10—Radio Call Numbers

D300	Raymond Hart
D301	Bruce Agee
D302	Cassandra Enos
D303	David Gonzalez
D304	Judith Heath
D305	Walt Lambert
D306	Paul Marshall
D307	Marc Commandatore
D308	Raymond Tom
D309	Diana Stoliker
D310	Mike Sutliff
D311	Lori Weisser
D312	Rick Woodard
D313	Collette Zemitis
D314	Richard Sapudar
D315	Murage Ngatia
D316	Derrick Adachi
D317	Tina Turner
D318	Student Position
D319	Marian McCarter
D320	Carrie Stephens

Chapter 9—Vehicle Breakdown Emergency Procedures

This chapter discusses the procedures to be used in the event of a vehicle breakdown during or after working hours.

Emergency Equipment

Since field activities occasionally occur after hours, you should carry a cellular phone, in addition to a mobile radio, so that emergency personnel can be reached after hours. Portable radios are available for loan at telecommunications. You should also carry a General Services Credit Card for emergency charges.

Before operating the vehicle, you should ensure that all emergency equipment in the vehicle is in working order. Make sure that the spare tire is inflated properly and the tire jack is in the vehicle. A preoperational checklist is located at the back of the Monthly Travel Log in each vehicle. Review this checklist before each field run.

Procedure for Field Vehicle Breakdown

■ Flat Tire

In the case of a flat tire, you should change the tire if you have been properly trained. If not, a Mobile Equipment Shop should be called (see following procedure); a mechanic will be dispatched. Unless the breakdown occurs locally, the MWQI Program will be charged for the service.

■ Operational Breakdown

The first step in the case of a vehicle breakdown is to contact the Mobile Equipment Shop closest to where the breakdown occurred. The Mobile Equipment Office is part of the Division of Management Services. Area shops and supervisors are listed on page 9-3. Mobile Equipment's normal operating hours are 0700 to 1500, Monday through Friday. It is DWR's policy for employees to call Mobile Equipment shop supervisors at their home if the breakdown occurs after normal working hours. Home phone and pager numbers of responsible supervisors are listed on page 9-4. (You should periodically request an updated list from the Mobile Equipment

Office, as shop supervisors change.) Contact the Mobile Equipment shop either by radio, cellular phone, or freeway call box, if available. Give the location of the breakdown, such as post mile on state highway, or any other information that will guide the mechanic to your location. Make sure that the time of departure of the mechanic and location of you and your vehicle is clearly explained.

If no one from Mobile Equipment can be reached, call the California Highway Patrol or a tow truck. This procedure is further described in Section 4125.1 in the Department Administrative Manual (DAM). The tow truck should take the vehicle to an approved vendor, if possible (Ford, Dodge, etc.). This service can be charged on a General Services Credit Card. Bill arrangements should be discussed over the phone before the tow truck is dispatched. Small repairs such as fan belts, flat tires, batteries, etc., can be charged on the State Fuel Credit Card. Permissible purchases are listed in the back of the Monthly Travel Log located in each vehicle (also see DAM Section 4124.3). If for some reason, the tow truck driver refuses to bill the State, then the operator can pay out of pocket and be fully reimbursed. **IT IS VERY IMPORTANT TO KEEP THIS RECEIPT IN ORDER TO GET REIMBURSED!** After the tow truck arrives at its destination, call your supervisor to arrange for transportation. If the supervisor is not available, then call the next available employee.

If the amount of the repairs exceeds $250, or if the repairs are not on the permissible list, then the repairs must be approved by a Mobile Equipment Supervisor. In this case, the vehicle may have to remain at the garage until a supervisor can examine it (DAM Section 4124.1 and State Administrative Manual Section 4161). If this occurs, be sure to remove all field equipment from the vehicle and return it to the field trailer.

Make sure that all repairs and services are documented in the Equipment Maintenance Record located in the Monthly Travel Log.

State Garage Vehicle

If a breakdown occurs while operating a vehicle from the State Garage, the first contact is the State Garage at (916) 657-2327. If you are unable to contact the State Garage, then follow the above guidelines.

Rental Vehicles

When using rental vehicles on State business, follow the guidelines set forth in the rental agreement with the rental company. At the time of rental, ask the company representative for a procedure for breakdown and the proper contacts for your area of operation.

Mobile Equipment Office Shop Locations

SACRAMENTO
3901 Commerce Drive
West Sacramento, CA 95691

Shop Supervisor: Al Garcia
(916) 373-0504

OROVILLE
460 Glen Drive
Oroville, CA 95965

Shop Supervisor: Mike Harhen
(916) 534-2342

SUTTER
6908 Colusa Highway
Sutter, CA 95982

Shop Supervisor: Mike Harhen
(916) 755-0321

DELTA
West Kelso Road
Byron, CA 95982

Shop Supervisor: Bud Jones
(209) 833-2090

SAN LUIS
31770 West Highway 152
Santa Nella, CA 95322

Shop Supervisor: Chris Carlotti
(209) 826-0718

COALINGA
Fresno Coalinga Highway
Coalinga, CA 93210

Shop Supervisor: Chris Carlotti
(209) 884-2405

BAKERSFIELD
Mettler Rural Branch
South End of Sabodan Street
Bakersfield, CA 93381

Shop Supervisor: Ed Beenau
(805) 858-2211

LOST HILLS
Highway 46 & Farnsworth
Lost Hills, CA 93249

Shop Supervisor: Ed Beenau
(805) 797-2391

CASTAIC
31849 North Lake Hughes Road
Castaic, CA 91310

Shop Supervisor: Gary Smith
(805) 257-3610

PEARBLOSSOM
34534—116th Street
Pearblossom, CA 93553

Shop Supervisor: Dave Burns
(805) 944-2517

Mobile Equipment Office Emergency Contact List

Sacramento—Headquarters
Glee Valine, Office Chief
Work: (916) 653-2950
Home: (916) 452-4936
Pager: (916) 592-4414
Cellular: (916) 834-7209

Sacramento—Headquarters
Tio Zasso, Engineering
Work: (916) 653-2952
Home: (916) 783-7273
Pager: (916) 948-8636

Sacramento
Al Garcia, Shop Supervisor
Work: (916) 373-0504
Home: (916) 682-2966
Pager: (916) 592-4416

Oroville
Mike Harhen, Shop Supervisor
Work: (916) 534-2342
Home: (916) 533-3552
Pager: (916) 592-4421
Cellular: (916) 798-1751

Sutter
Mike Harhen, Shop Supervisor
Work: (916) 755-0321
Home: (916) 533-3552
Pager: (916) 592-4421
Cellular: (916) 798-1751

Delta
Bud Jones, Shop Supervisor
Work: (209) 833-2090
Home: (209) 545-9235
Pager: (209) 472-4631

San Luis
Chris Carlotti, Shop Supervisor
Work: (209) 826-0718
Home: (209) 826-4160
Pager: (209) 573-9093

Coalinga
Chris Carlotti, Shop Supervisor
Work: (209) 884-2405
Home: (209) 826-4160
Pager: (209) 573-9093

Bakersfield
Ed Beenau, Shop Supervisor
Work: (805) 858-2211
Home: (805) 399-8644
Pager: (805) 334-6125

Lost Hills
Ed Beenau, Shop Supervisor
Work: (805) 797-2391
Home: (805) 399-8644
Pager: (805) 334-6125

Castaic
Gary Smith, Shop Supervisor
Work: (805) 257-3610
Home: (805) 942-4458
Pager: (805) 286-6433

Pearblossom
Dave Burns, Shop Supervisor
Work: (805) 944-2517
Home: (805) 944-9774
Pager: (805) 286-6781

Field Data Collection Sheet

DEPARTMENT OF WATER RESOURCES
WATER QUALITY ASSESSMENT
FIELD DATA COLLECTION SHEET

Run Name: Sampler(s): Sampling Date:

EC Meter # ____ Calibrated by ____	pH Meter #____ Probe #____ Calibrated by ____	DO Meter #____ Probe #____ Calibrated by ____

Station Name/Number Lab Codes Req.	Lab No.	Time (PST)	Field Temp	Field EC	Field pH	Field D.O.	Field Turb.	Fld NH3	Comments/Problems Locks
		Typical Range->					<-Hi <-Lo		
		Typical Range->					<-Hi <-Lo		
		Typical Range->					<-Hi <-Lo		
		Typical Range->					<-Hi <-Lo		
		Typical Range->					<-Hi <-Lo		
		Typical Range->					<-Hi <-Lo		
		Typical Range->					<-Hi <-Lo		
		Typical Range->					<-Hi <-Lo		

Chemical Laboratory Test Request

State of California — DEPARTMENT OF WATER RESOURCES — The Resources Agency

CHEMICAL LABORATORY TEST REQUEST

DATE SUBMITTED			COLLECTOR		PHONE
UNIT & WORK ORDER NUMBER			INVESTIGATION		
ANALYSIS BY	X	1. DWR CHEMICAL LABORATORY	APPROVED		
		2. DEPARTMENT OF HEALTH LABORATORY	RECEIVED (FOR LABORATORY)		DATE RECEIVED
		3. OTHER	BOTTLES RECEIVED		
SPECIAL INSTRUCTIONS			NUMBER	SIZE	TYPE
				QUART	POLY
				PINT	POLY
				1/2 PINT	POLY
				40 ML	GLASS

SAMPLER'S NUMBER	LABORATORY NUMBER	ANALYSES	DATE CHARGED: MINERAL	NUTRIENT	METAL	MISC.	PESTICIDE	BIO.
C								
C								
C								
C								
C								
C								
C								
C								
C								
C								
C								
C								
C								
C								
C								
C								
C								
C								
C								
C								
DWR 1263 (11/79)	PAGE TOTAL							

Water Analysis—Minor Elements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

D [7] T [S] LAB NO. [C]
1 2 3 8

WATER ANALYSIS (MINOR ELEMENTS)

BASIN 9–13 | STATE WELL NO./STATION NO. 14–25 | T 26 | YR MO DAY 27–32 | TIME(PST) 33–36 | CO. 37 38 | FIELD TEMP 39–42 | U 43

FIELD EC 44–49 | FIELD PH 50–52 | D.O. 53–55 | DISCHARGE (CFS) 56–62 | G.H. (FT) 63–66 | DEPTH (FT) 67–69 | SAMPLER [5,0,5,0] 70–73 | LK 78 | CARD [1] 79 | CODE [A] 80

TYPE OF ANALYSIS | W.O.

ARSENIC ____ ml	BARIUM ____ ml	CADMIUM ____ ml	CHROMIUM(all) ____ ml
A ____ C ____	A ____ C ____	A ____ C ____	A ____ C ____
Factor ____	Factor ____	Factor ____	Factor ____
A(sam) ____	A(sam) ____	A(sam) ____	A(sam) ____
As mg/L 9–15, D/T 16	Ba mg/L 17–23, D/T 24	Cd mg/L 25–31, D/T 32	Cr mg/L 33–39, D/T 40
CHROMIUM(+6) ____ ml	COPPER ____ ml	IRON ____ ml	LEAD ____ ml
A ____ C ____	A ____ C ____	A ____ C ____	A ____ C ____
Factor ____	Factor ____	Factor ____	Factor ____
A(sam) ____	A(sam) ____	A(sam) ____	A(sam) ____
Cr^{+6} mg/L 41–47, D/T 48	Cu mg/L 49–55, D/T 56	Fe mg/L 57–63, D/T 64	Pb mg/L 65–71, D/T 72 [2] 79
MANGANESE ____ ml	MERCURY ____ ml	SELENIUM ____ ml	SILVER ____ ml
A ____ C ____	A ____ C ____	A ____ C ____	A ____ C ____
Factor ____	Factor ____	Factor ____	Factor ____
A(sam) ____	A(sam) ____	A(sam) ____	A(sam) ____
Mn mg/L 9–15, D/T 16	Hg mg/L 17–23, D/T 24	Se mg/L 25–31, D/T 32	Ag mg/L 33–39, D/T 40

LAB [5,0,5,0] 49–52
[ ] 53 [ ] 54 [ ] 55 [ ] 79

Owner ____
Name Address COPY TO OWNER [ ]
City Zip Code
Detailed Location ____

ZINC ____ ml
A ____ C ____
Factor ____
A(sam) ____
Zn mg/L 41–47, D/T 48

DATE TO LAB. ____
DATE STARTED ____
DATE COMPLETED ____
CHEMIST ____
CHECKED ____

REMARKS ____

Sampler of DLA-MWQI

Water Analysis—Supplemental Minor Elements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

D [7] 1 T [S] 2 LAB NO. [C] 3–8

WATER ANALYSIS (SUPPLEMENTAL MINOR ELEMENTS)

BASIN (9–13) | STATE WELL NO./STATION NO. (14–25) | T (26) | YR MO DAY (27–32) | TIME(PST) (33–36) | CO. (37–38) | FIELD TEMP (39–42) | U (43)

FIELD EC (44–49) | FIELD PH (50–52) | D.O. (53–55) | DISCHARGE (CFS) (56–62) | G.H. (FT) (63–66) | DEPTH (FT) (67–69) | SAMPLER [5 0 5 0] (70–73) | LK (78) | CARD [1] (79) | CODE [A] (80)

TYPE OF ANALYSIS | W.O.

ALUMINUM ____ ml	ANTIMONY ____ ml	BERYLLIUM ____ ml	BISMUTH ____ ml
A ____ C ____	A ____ C ____	A ____ C ____	A ____ C ____
Factor ____	Factor ____	Factor ____	Factor ____
A(sam) ____	A(sam) ____	A(sam) ____	A(sam) ____
Al mg/L 9–15 D/T 16	Sb mg/L 17–23 D/T 24	Be mg/L 25–31 D/T 32	Bi mg/L 33–39 D/T 40
COBALT ____ ml	GALLIUM ____ ml	GERMANIUM ____ ml	LITHIUM ____ ml
A ____ C ____	A ____ C ____	A ____ C ____	A ____ C ____
Factor ____	Factor ____	Factor ____	Factor ____
A(sam) ____	A(sam) ____	A(sam) ____	A(sam) ____
Co mg/L 41–47 D/T 48	Ga mg/L 49–55 D/T 56	Ge mg/L 57–63 D/T 64	Li mg/L 65–71 D/T 72 [2] 79
MOLYBDENUM ____ ml	NICKEL ____ ml	STRONTIUM ____ ml	TITANIUM ____ ml
A ____ C ____	A ____ C ____	A ____ C ____	A ____ C ____
Factor ____	Factor ____	Factor ____	Factor ____
A(sam) ____	A(sam) ____	A(sam) ____	A(sam) ____
Mo mg/L 9–15 D/T 16	Ni mg/L 17–23 D/T 24	Sr mg/L 25–31 D/T 32	Ti mg/L 33–39 D/T 40

LAB [5 0 5 0] 49–52
[ ] 53 [ ] 54 [ ] 55 [ ] 79

Owner ____
Name ____ Address ____ COPY TO OWNER [ ]
City ____ Zip Code ____
Detailed Location ____

VANADIUM ____ ml
A ____ C ____
Factor ____
A(sam) ____
V mg/L 41–47 D/T 48

REMARKS ____

Sampler of DLA-MWQI

DATE TO LAB ____
DATE STARTED ____
DATE COMPLETED ____
CHEMIST ____
CHECKED ____

Water Analysis—Mineral

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

D 7 | T S | LAB NO. C
1 2 3 8

WATER ANALYSIS (MINERAL)

BASIN 9 13 | STATE WELL NO./STATION NO. 14 25 | T 26 | YR 27 | MO | DAY 32 | TIME(PST) 33 36 | CO. 37 38 | FIELD TEMP 39 42 | U 43

FIELD EC 44 49 | FIELD PH 50 52 | D.O. 53 55 | DISCHARGE (CFS) 56 62 | G.H. (FT) 63 66 | DEPTH (FT) 67 69 | SAMPLER 5,0,5,0 70 73 | LK 78 | CARD 1 79 | CODE A 80

TYPE OF ANALYSIS | W.O.

DISSOLVED HARDNESS
___ ml
1 ml = ___ mg CaCO₃
as $CaCO_3$ mg/L 9 13

DISSOLVED CALCIUM
___ ml
1 ml = ___ mg Ca
Ca mg/L 14 19

DISSOLVED MAGNESIUM
meq/L Ha ___
meq/L Ca ___
meq.L Mg ___
Mg mg/L 20 25

DISSOLVED SODIUM
dil. ___
% A ___
Curve ___
Na mg/L 26 31

DISSOLVED POTASSIUM
dil. ___
% A ___
K mg/L 32 36

DISSOLVED TOTAL ALKALINITY
___ ml 1 ml = ___ mg $CaCO_3$
as $CaCO_3$ 37 40
pH 45 47

DISSOLVED SULFATE
___ ml
SO_4 mg/L 48 53

DISSOLVED CHLORIDE
___ ml
1 ml = ___ mg Cl
Cl mg/L 54 59

DISSOLVED NITRATE
___ ml
NO_3 mg/L 60 63 | 79

DISSOLVED FLUORIDE
___ ml
F mg/L 9 11

DISSOLVED BORON
___ ml
A ___ C ___
Factor ___
A (sam) ___
B mg/L 12 16

CALC. DIS. SOLIDS
TURBIDITY | CODE
Candle = C
Hach = A
Hellige = E
Hatch Color-imiter = B
Turb. 17 20 | CODE 21 | R 22

DISSOLVED SOLIDS
___ ml 180 C=B 105 C=5 | T
T.D.S. mg/L 23 28 | T 29

SPECIFIC CONDUCTANCE 25°C
R (Std) ___
R (sam) ___
Factor ___
Micromohs/cm 30 35

DISSOLVED SILICA
___ ml
A ___ C ___
Factor ___
A (sam) ___
SiO_2 mg/L 36 38

LAB. 5,0,5,0 39 42 | OV 3 43 79

Owner ___
Name | Address | COPY TO OWNER ☐
City | Zip Code
Detailed Location ___

___ Na | ___ Alk
___ Ca | ___ SO_4
___ Mg | ___ Cl
___ Na | ___ NO_3
___ K | ___ F
meq/L sum | meq/L sum

REMARKS ___

DATE TO LAB. ___
DATE STARTED ___
DATE COMPLETED ___
CHEMIST ___
CHECKED ___

Sampler ___ of DLA-MWQI

Water Analysis—Miscellaneous

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

D 7 | T S | LAB NO. C (1, 2, 3–8)

WATER ANALYSIS (MISCELLANEOUS)

BASIN (9–13) | STATE WELL NO./STATION NO. T (14–25, 26) | YR MO DAY (27–32) | TIME(PST) (33–36) | CO. (37, 38) | FIELD TEMP U (39–42, 43)

FIELD EC (44–49) | FIELD PH (50–52) | D.O. (53–55) | DISCHARGE (CFS) (56–62) | G.H. (FT) (63–66) | DEPTH (FT) (67–69) | SAMPLER 5 0 5 0 (70–73) | LK (78) | CARD 1 (79) | CODE A (80)

TYPE OF ANALYSIS

FIELD RESIDUAL CHLORINE
Cl mg/L (9–12)

SETTEABLE SOLIDS
CODE
ml
FIELD = F
LAB = L

METHYLENE BLUE ACTIVE SUBSTANCES
CODE
ABS = A
LAS = L
ml
A C
Factor
A(sam)
MBAS mg/L (13–16) CODE (17)

OIL AND GREASE
O&G mg/L (18–20)

CYANIDE
ml
CN mg/L (21–25)

W.O.
PHENOLS
ml
A C
Factor
A(sam.)
as Phenol mg/L (26–31)

CHEMICAL OXYGEN DEMAND
ml

ml/L (32–34) CODE (35)
mg/L (36–40)
COD mg/L (41–45)

BIOCHEMICAL OXYGEN DEMAND
Dil
Bat. No.
Orig
Orig.(c)
Bat. No.
Final
Final(c)
Diff.
Seed
Corr.
mg/L
% Dep.
Thio Factor(O) (F)
BOD mg/L (50–54) CODE (55)

SUSPENDED SOLIDS
CODE
ml
180°C = 8
105°C = 5

TANNIN AND LIGNIN
ml
as Tannic Acid mg/L (48–49)

SS mg/L (58–62) CODE (63)
VSS mg/L (64–68)

COLOR, TRUE
pH (69–71)
Color Units (72–74)

LAB. 5 0 5 0 (75–78) 2 (79)

Owner
Name Address COPY TO OWNER ☐
City Zip Code
Detailed Location

SET UP
Date
Time
TAKE OFF
Date
Time

DAY CODE
4 = A
5 = B
6 = C
7 = D
100 = E
OTHER = F

DATE TO LAB.
DATE STARTED
DATE COMPLETED
CHEMIST
CHECKED

REMARKS

TOC VIAL NUMBER(S)

Sampler of DLA-MWQI

Water Analysis—Miscellaneous *(continued)*

D 7 (1) T S (2) LAB NO. C (3–8)

TOTAL ORGANIC CARBON ______ ml C mg/L [9–12]	DISSOLVED ORGANIC CARBON ______ ml C mg/L [13–16]	UVA ______ ml Abs cm^{-1} [17–20]	BROMIDE ______ ml Br mg/L [21–26]	SULFITES ______ ml SO_3 mg/L [27–32]
TOTAL SULFIDES ______ ml S mg/L as $CaCO_3$ [33–37]	DISSOLVED SULFIDES ______ ml S mg/L [38–42]	ODOR at 60° C Threshold Odor Number [43–47]	CARBON CHLOROFORM EXTRACT ______ ml m-C CE mg/L [48–59]	CARBON ALCOHOL EXTRACT ______ ml m-C AE mg/L [53–57]
TURBIDITY-FILTERED WATER CODE Hach = A Other Neph. = N Helige = E Other = O Turb Units [58–60] Code [61]	OV [78] 3 [79]			

Water Analysis—Miscellaneous Pesticides

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

ORG. LAB NO.

WATER ANALYSIS MISCELLANEOUS PESTICIDES

STATE WELL NO./STATION NO. T | YR MO. DA | TIME | FIELD EC | FIELD PH | DEPTH (FT)

TYPE OF ANALYSIS: O & M Miscellaneous Pesticides | W.O.

Compound	Storet Code	CAS No.	ug/L
Glyphosate		1071-83-6	
AminomethylphosphonicAcid		1066-51-9	
Propargite		2312-35-8	
SAMPLER	OF		

DATE TO LAB ______	DATE ANALYZED ______	DATE COMPLETED ______
CHEMIST ______	QC NUMBER ______	CHECKED ______

1/95

Water Analysis—Chlorinated Organic Pesticides

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

ORG. LAB NO.

WATER ANALYSIS CHLORINATED ORGANIC PESTICIDES, Page 1

STATE WELL NO./ STATION NO. | T | YR. MO. DAY | TIME | FIELD EC | FIELD PH | DEPTH (FT)

TYPE OF ANALYSIS: Code 4 | W.O.

Compound	Storet Code	CAS No.	ug/L
Diuron	39650	330-54-1	
BHC, alpha	39337	319-84-6	
Chlorpropham	81322	101-21-3	
Dichloran	38447	90-30-9	
Simazine	39055	122-34-9	
BHC, gamma	39340	58-89-9	
BHC, beta	39338	319-85-7	
Atrazine	39033	1912-24-9	
PCNB	39029	82-68-8	
BHC, delta	34259	319-86-8	
Chlorothalonil	70314	1897-45-6	
Alachlor	77825	15972-60-8	
Heptachlor	39410	76-44-8	
Thiobencarb	34722	28249-77-6	
Chlorpyrifos	81403	2921-88-2	
Aldrin	39330	309-00-2	
DCPA	39770	1861-32-1	
Captan	39640	133-06-2	
Heptachlor Epoxide	39420	1024-57-3	
Chlordane	39350	57-74-9	
Endosulfan I	34361	959-98-8	
Dieldrin	39380	60-57-1	
DDE	39320	72-55-9	
Endrin	39390	72-20-8	
Endosulfan II	34356	33212-65-9	
Endrin Aldehyde	34366	7421-93-4	
DDD	39310	72-54-8	
Endosulfan Sulfate	34351	1031-07-8	
DDT	39300	50-29-3	
Methoxychlor	39480	72-43-5	
Dicofol	39780	115-32-2	
Toxaphene	39400	8001-35-2	
PCB-1016	39671	12674-11-2	
PCB-1221	39488	11104-28-2	

DATE TO LAB ______ DATE ANALYZED ______ DATE COMPLETED ______
CHEMIST ______ QC NUMBER ______ CHECKED ______

1/95

Water Analysis—Chlorinated Organic Pesticides *(continued)*

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

ORG. LAB NO.

WATER ANALYSIS CHLORINATED ORGANIC PESTICIDES, Page 2

STATE WELL NO./ STATION NO. | T | YR. MO. DAY | TIME | FIELD EC | FIELD PH | DEPTH (FT)

TYPE OF ANALYSIS: Code 4 W.O.

Compound	Storet Code	CAS No.	ug/L
PCB-1232	39492	11141-16-5	
PCB-1242	39496	53469-21-9	
PCB-1248	39500	12672-29-6	
PCB-1254	39504	11097-69-1	
PCB-1260	39508	11096-82-5	
Metolachlor		51218-45-2	
Oxyfluorfen		42874-03-3	

SAMPLER OF

DATE TO LAB ______ DATE ANALYZED ______ DATE COMPLETED ______
CHEMIST ______ QC NUMBER ______ CHECKED ______

1/95

Water Analysis—Purgeable Organics

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

ORG. LAB NO.

WATER ANALYSIS PURGEABLE ORGANICS, Page 1

STATE WELL NO./ STATION NO. T YR. MO. DAY TIME FIELD EC FIELD PH DEPTH (FT)

TYPE OF ANALYSIS: Code 7 W.O.

Compound	CAS No.	ug/L
Dichlorodifluoromethane	75-71-8	
Chloromethane	74-87-3	
Vinyl chloride	75-01-4	
Bromomethane	74-83-9	
Chloroethane	75-00-3	
Trichlorofluoromethane	75-69-4	
1,1-Dichloroethene	75-35-4	
Methylene chloride	75-09-2	
trans-1,2-Dichloroethene	156-60-5	
1,1-Dichloroethane	75-34-3	
2,2-Dichloropropane	590-20-7	
cis-1,2-Dichloroethene	156-59-4	
Chloroform	67-66-3	
Bromochloromethane	74-97-5	
1,1,1-Trichloroethane	71-55-6	
1,1-Dichloropropene	563-58-6	
Carbon tetrachloride	56-23-5	
Benzene	71-43-2	
1,2-Dichloroethane	107-06-2	
Trichloroethene	79-01-6	
1,2-Dichloropropane	78-87-5	
Bromodichloromethane	75-27-4	
Dibromomethane	74-95-3	
cis-1,3-Dichloropropene	10061-01-5	
Toluene	108-88-3	
trans-1,3-Dichloropropene	10061-02-6	
1,1,2-Trichloroethane	79-00-5	
1,3-Dichloropropane	142-28-9	
Tetrachloroethene	127-18-4	
Dibromochloromethane	124-48-1	
1,2-Dibromoethane	106-93-4	
Chlorobenzene	108-41-4	
Ethyl benzene	100-41-4	
1,1,1,2-Tetrachloroethane	630-20-6	

DATE TO LAB ______	DATE ANALYZED ______	DATE COMPLETED ______
CHEMIST ______	QC NUMBER ______	CHECKED ______

1/95

Water Analysis—Purgeable Organics *(continued)*

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

ORG. LAB NO.

WATER ANALYSIS PURGEABLE ORGANICS, Page 2

STATE WELL NO./ STATION NO. T | YR. MO. DAY | TIME | FIELD EC | FIELD PH | DEPTH (FT)

TYPE OF ANALYSIS: Code 7 | W.O.

Compound	CAS No.	ug/L
m-Xylene	108-38-3	
p-Xylene	106-42-3	
o-Xylene	95-47-6	
Styrene	100-42-5	
Isopropyl benzene	98-82-8	
Bromoform	75-25-2	
1,1,2,2-Tetrachloroethane	79-34-5	
1,2,3-Trichloropropane	96-18-4	
n-Propylbenzene	103-65-1	
Bromobenzene	108-86-1	
1,3,5-Trimethylbenzene	108-67-8	
2-Chlorotoluene	95-49-8	
4-Chlorotoluene	106-43-4	
tert-Butylbenzene	98-06-6	
1,2,4-Trimethylbenzene	95-63-6	
sec-Butylbenzene	135-98-8	
4-Isopropyltoluene	99-87-6	
1,3-Dichlorobenzene	541-73-1	
1,4-Dichlorobenzene	106-46-7	
n-Butylbenzene	104-51-8	
1,2-Dichlorobenzene	95-50-1	
1,2-Dibromo-3-chloropropane	96-12-8	
1,2,4-Trichlorobenzene	120-82-1	
Hexachlorobutadiene	87-68-3	
Napthalene	91-20-3	
1,2,3-Trichlorobenzene	87-61-6	
Surrogate (Fluorobenzene)		
% Recovery =		
SAMPLER OF		

DATE TO LAB	DATE ANALYZED	DATE COMPLETED
CHEMIST	QC NUMBER	CHECKED

1/95

Water Analysis—Phosphorus/Nitrogen Pesticides

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

ORG. LAB NO.

WATER ANALYSIS PHOSPHORUS/ NITROGEN PESTICIDES

STATE WELL NO./ STATION NO.	T	YR.	MO.	DA.	TIME	FIELD EC	FIELD PH	DEPTH (FT)

TYPE OF ANALYSIS: Code 5 W.O.

Compound	Storet Code	CAS No.	ug/L
Mevinphos		7786-34-7	
Demeton	39560	8065-48-3	
Naled		300-76-5	
Phorate	39023	298-02-2	
Dimethoate	39009	60-51-5	
Diazinon	39570	333-41-5	
Disulfoton	39010	298-04-4	
Methyl Parathion	39600	298-00-0	
Malathion	39530	121-75-5	
Chlorpyrifos		2921-88-2	
Parathion	39540	56-38-2	
Methidathion		950-37-8	
Profenofos		41198-08-7	
s,s,s-Tributyl Phosphorotrithioate(DEF)	39040	78-48-8	
Ethion	39398	563-12-2	
Carbophenothion(Trithion)	39786	786-19-6	
Phosmet		732-11-6	
Phosalone		2310-17-0	
Azinphosmethyl	39580	86-50-0	
Bromacil		314-40-9	
Cyanazine		21725-46-2	
Naproamide		15299-99-7	
Norflurazon		27314-13-2	
Pendimethalin		40487-42-1	
Prometryn		7287-19-6	
Propetamphos		31218-83-4	
Trifluralin		1582-09-8	
Benfluralin		1861-40-1	
SAMPLER	OF		

DATE TO LAB ________	DATE ANALYZED ________	DATE COMPLETED ________
CHEMIST ________	QC NUMBER ________	CHECKED ________

1/95

Water Analysis—Nutrient

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER ANALYSIS (NUTRIENT)

D 1 | T 2 | LAB. NO. 3–8

CARD 1:

BASIN 9–13 | STATE WELL NO./STATION NO. 14–25 | T 26 | YR. 27 | MO. | DAY –32 | TIME (PST) 33–36 | CO. 37 38 | FIELD TEMP. 39–42 | U 43

FIELD EC 44–49 | FIELD PH 50–52 | DO 53–55 | DISCHARGE (CFS) 56–62 | G.H. (FT.) 63–66 | DEPTH (FT.) 67–69 | SAMPLER 70–73 | LK 78 | CARD CODE 1 79 | 80

TYPE OF ANALYSIS | W.O.

CARD – 2:

FIELD CARBON DIOXIDE
CO_2 mg/L 9–11

FIELD ALKALINITY as $CaCO_3$
Phen. mg/L 12–14 | Tot. mg/L 15–17

TURBIDITY
CODE
Candle = C
Hach = A
Hellige = E
Hach Colorimeter = B
Turb. 18–21 | CODE 22 | R 23

TOTAL AMMONIA ______ ml
as N mg/L 56–62

TOTAL ORGANIC NITROGEN ______ ml
as N mg/L 63–69

TOTAL AMMONIA AND ORGANIC NITROGEN ______ ml
as N mg/L 70–76

DISSOLVED NITRITE ______ ml
A ______ C ______
Factor ______
A (som) ______
as N mg/L 41–47

DISSOLVED NITRATE ______ ml
as N mg/L 48–55

DISSOLVED NITRATE AND NITRITE
______ ml
as N mg/L 24–31

DISSOLVED AMMONIA ______ ml
as N mg/L 34–40

CARD 2 79

CARD – 3:

DISSOLVED ORGANIC NITROGEN
______ ml
as N mg/L 41–47

DISSOLVED ORTHOPHOSPHATE
______ ml
A ______ C ______
Factor ______
A (som) ______
as P mg/L 9–16

DISSOLVED ACID HYDRO-LYZABLE PHOSPHATE
______ ml
A ______ C ______
Factor ______
A (som) ______
AP ______ – OP ______
as P mg/L 17–24

DISSOLVED TOTAL PHOSPHORUS
______ ml
A ______ C ______
Factor ______
A (som) ______
as P mg/L 25–32

TOTAL ORTHOPHOSPHATE
______ ml
A ______ C ______
Factor ______
A (som) ______
as P mg/L 48–55

TOTAL PHOSPHORUS
______ ml
A ______ C ______
Factor ______
A (som) ______
as P mg/L 33–40

LAB. 74–77 | OV 78 | 3 79

OWNER ______ NAME ______ ADDRESS
______ CITY ______ ZIP CODE ______ COPY TO OWNER ☐
DETAILED LOCATION ______
POINT OF COLLECTION ______ PPG ______
REF. POINT ______ Cl RESID. ______ COLOR ______
DEPTH TO WATER ______ FT. SECCHI ______ M ODOR ______
DEPTH OF WELL ______ FT. WIND ______ FOAM ______
USE ______ %CLOUD COVER ______
PERF. INTER ______ ALGAE ______ TURBID. ______
REMARKS ______

SAMPLER ______ OF ______

DATE TO LAB. ______
DATE STARTED ______
DATE COMPLETED ______
CHEMIST ______
CHECKED ______

DWR 2241 C (Rev. 8/78)

Water Analysis—Herbicides-Chlorinated Phenoxy Acid

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

ORG. LAB NO.

WATER ANALYSIS HERBICIDES-Chlorinated Phenoxy Acid

STATE WELL NO./STATION NO. | T | YR | MO. | DA | TIME | FIELD EC | FIELD | DEPTH (FT)

TYPE OF ANALYSIS: Code 6 | W.O.

Compound	Storet Code	CAS No.	ug/L
Dicamba		1918-00-9	
MCPP		93-65-2	
Pentachlorophenol(PCP)		87-65-2	
Dichlororop		120-36-5	
2,4 - D	39736	94-75-7	
MCPA		94-74-6	
2,4,5 - TP	39760	93-72-1	
2,4,5 - T	39740	93-76-5	
2,4 - DB		94-82-6	
Picloram		1918-02-1	
Triclopyr		55335-06-3	
SAMPLER	OF		

(above includes salts and esters)

DATE TO LAB	DATE ANALYZED	DATE COMPLETED
CHEMIST	QC NUMBER	CHECKED

1/95

Water Analysis

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

ORG. | LAB NO.

WATER ANALYSIS

STATE WELL NO./ STATION NO. | T | YR. | MO. | DAY | TIME | FIELD EC | FIELD PH | DEPTH (FT)

TYPE OF ANALYSIS: EDB, DBCP | W.O.

Compound	Storet Code	CAS No.	ug/L
1,2-Dibromoethane (EDB)		106-93-4	
1,2-Dibromo-3-chloropropane(DBCP)		96-12-8	
Chloropicrin		76-06-2	

DATE TO LAB ________	DATE ANALYZED ________	DATE COMPLETED ________
CHEMIST ________	QC NUMBER ________	CHECKED ________

1/95

Chain of Custody Report

Example

CHAIN OF CUSTODY REPORT

CLIENT:	REPORT TO:	TURNAROUND TIME: 8 HR. ☐
ADDRESS:	BILLING TO:	24 HR. ☐ 48 HR. ☐ 72 HR. ☐
PHONE:		5 DAY ☐ 10 DAY ☐ 15 DAY ☐
PROJECT NAME/SITE:	PO#/BILLING REFERENCE:	
SAMPLER: DATE:		

SAMPLE ID#/ STATION	SAMPLE DESCRIPTION	NUMBER OF CONT.	TYPE CONT.	SAMPLING TIME/DATE	ANALYSIS REQUESTED										REMARKS	SAMPLE NUMBER

RELINQUISHED BY	DATE	TIME:	RECEIVED BY:	TRAVEL TIME:
				ON SITE TIME:
RELINQUISHED BY:	DATE	TIME:	RECEIVED BY:	OTHER:
				WERE SAMPLES: YES / NO
RELINQUISHED BY:	DATE	TIME:	RECEIVED IN LAB BY:	PRESERVED ?
				IN GOOD CONDITION?

Water Analyses Code and Price List

State of California | DEPARTMENT OF WATER RESOURCES | The Resources Agency

Chemical Laboratory

WATER ANALYSES
Code and Price List
Fiscal Year 1993–94 –95

Total $ ______
Date ______
W.O. ______
Unit ______

CODE	TYPE OF ANALYSIS	NO. OF ANAL.	UNIT* PRICE $	CHARGES
	Special and Nonvolume Work	(hr.)	(/hr.)	
1.	Standard Mineral (27-30, 32-4, 39, 41, 54, 58)		135	
2.	Standard Nutrient (40, 43, 45, 46, 48)		95	
3.				
4.	Chlorinated Organic Pesticides		160	
5.	Organic Phosphorous Pesticides		160	
6.	Herbicides (chlorinated phenoxy acid)		240	
7.	Purgeable Organics		240	
8.	Trihalomethane Potential		200	
9.	Carbamates		175	
10.				
11.	Arsenic		43	
12.	Barium		23	
13.	Cadmium		23	
14.	Strontium		13	
15.	Chromium (all valences)		23	
16.	Copper		23	
17.	Iron		23	
18.	Aluminum		23	
19.	Lead		23	

* Volume basis, 12 or more
** Total metal samples are not filtered in the lab and therefore include dissolved, suspended and precipitated metals. Metals not designated Total are filtered in the field or lab and include only dissolved metals.
Total Metals Digestion, per sample. Extra charge for Al & Fe, no chg. for As, Hg & Se.

DWR 846 (Rev. 8/93) (1 of 3)

Water Analyses Code and Price List *(continued)*

CODE	TYPE OF ANALYSIS	NO. OF ANAL.	UNIT* PRICE $	CHARGES
20.	Manganese		23	
21.	Mercury		43	
22.	Nickel		23	
23.	Selenium		43	
24.	Silver		23	
25.	Zinc		23	
26.	Molybdenum		23	
27.	Calcium		12	
28.	Magnesium		12	
29.	Sodium		12	
30.	Potassium		10	
31.	Lithium		10	
32.	Alkalinity (Total as $CaCO_3$ and pH)		14	
33.	Sulfate		16	
34.	Chloride		11	
35.	Fluoride		18	
36.	Bromide		22	
37.	Iodide			
38.	Silica		11	
39.	Boron		11	
40.	Nitrate plus Nitrite		14	
41.	Nitrate		15	
42.	Nitrite		11	
43.	Ammonia		16	
44.	Organic Nitrogen (requires 43)		28	
45.	Ammonia and Organic Nitrogen		28	
46.	Dissolved Orthophosphate		16	
47.				
48.	Total Phosphorous (not filtered)		28	

DWR 846 (Rev. 8/93) (2 of 3)

Water Analyses Code and Price List *(continued)*

CODE	TYPE OF ANALYSIS	NO. OF ANAL.	UNIT* PRICE $	CHARGES
49.				
50.				
51.				
52.	Oil and Grease		41	
53.	Methylene Blue Active Substances (surfactant)		40	
54.	Dissolved Solids		14	
55.	Suspended Solids		36	
56.	Suspended and volatile Suspended Solids		40	
57.	Settleable Solids (settleable matter), mL/L		9	
58.	Specific Conductance		8	
59.	Turbidity		9	
60.				
61.	Color ("true")		12	
62.	pH		7	
63.	Chemical Oxygen Demand		38	
64.	Biochemical Oxygen Demand		40	
65.	Biochemical Oxygen Demand (wastewater)		115	
66.	Total Organic Carbon		35	
67.	Tannin and Lignin		14	
68.	Project Std. (11, 15, 16, 17, 19, 20, 23, 25, 27-9, 32-5, 39, 41, 54, 58)		367	
68a.	Project, Additional (12, 13, 18, 21, 24)		135	
69.	Project Partial (27-9, 32-4, 39, 54, 58)		107	
70.	Membrane filtration.		8	
71.	Total Metals Digestion (per sample) **		35	
72.	UVA		12	

DWR 846 (Rev. 8/93) (3 of 3)

Table 1
Laboratory Codes

Code	Analysis	Code	Analysis	Code	Analysis
1	Standard Mineral (27-30, 32-4, 39, 41, 54, 58)	25	Zinc	49	Phenol
2	Standard Nutrient (40, 43, 45, 46, 48)	26	Molybdenum	50	
3	Purgeable Organics	27	Calcium	51	
4	Chlorinated Organic Pesticides	28	Magnesium	52	Oil and Grease
5	Organic Phosphorous Pesticides	29	Sodium	53	Methylene Blue Active Substances
6	Herbicides	30	Potassium	54	Dissolved Solids
7	Purgeable Organics (GC-MS)	31	Lithium	55	Suspended Solids
8	THM Formation Potential	32	Alkalinity	56	Suspended and Volatile Suspended Solids
9	Phytoplankton	33	Sulfate	57	Settleable Solids
10		34	Chloride	58	Specific Conductance
11	Arsenic	35	Flouride	59	Turbidity
12	Barium	36	Bromide	60	
13	Cadmium	37	Iodide	61	Color
14	Strontium	38	Silica	62	pH
15	Chromium	39	Boron	63	Chemical Oxygen Demand
16	Copper	40	Nitrate plus Nitrite	64	Biochemical Oxygen Demand
17	Iron	41	Nitrate	65	Biochemical Oxygen Demand (Wastewater)
18	Aluminum	42	Nitrite	66	Total Organic Carbon
19	Lead	43	Ammonia	67	Tannin and Lignin
20	Manganese	44	Organic N (requires 43)	68	Project, Standard
21	Mercury	45	Ammonia & Organic N	68a	Project, Additional
22	Nickel	46	Dissolved Orthophosphate	69	Project, Partial
23	Selenium	47		70	Membrane Filtration
24	Silver	48	Total Phosphorous	71	Total Metals Digestion

Table 1
Laboratory Codes

CODE	COUNTY	CODE	COUNTY
1	ALAMEDA	30	ORANGE
2	ALPINE	31	PLACER
3	AMADOR	32	PLUMAS
4	BUTTE	33	RIVERSIDE
5	CALAVERAS	34	SACRAMENTO
6	COLUSA	35	SAN BENITO
7	CONTRA COSTA	36	SAN BERNARDINO
8	DEL NORTE	37	SAN DIEGO
9	EL DORADO	38	SAN FRANCISCO
10	FRESNO	39	SAN JOAQUIN
11	GLENN	40	SAN LUIS OBISPO
12	HUMBOLDT	41	SAN MATEO
13	IMPERIAL	42	SANTA BARBARA
14	INYO	43	SANTA CLARA
15	KERN	44	SANTA CRUZ
16	KINGS	45	SHASTA
17	LAKE	46	SIERRA
18	LASSEN	47	SISKIYOU
19	LOS ANGELES	48	SOLANO
20	MADERA	49	SONOMA
21	MARIN	50	STANISLAUS
22	MARIPOSA	51	SUTTER
23	MENDOCINO	52	TEHAMA
24	MERCED	53	TRINITY
25	MODOC	54	TULARE
26	MONO	55	TUOLUMNE
27	MONTEREY	56	VENTURA
28	NAPA	57	YOLO
29	NEVADA	58	