Inland Surface Water Monitoring Plan and Field Manual

County of San Diego, Department of Public Works

Watershed Protection Program

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I. PURPOSE AND SCOPE

This document describes the process and procedures for field site visits and the collection of surface water samples for the Inland Surface Water Monitoring Program. As several water quality limited segments (WQLS) located within the County of San Diego's jurisdiction are on the 2008 Clean Water Act (CWA) Section 303(d) List of Impaired Water Bodies, the purpose of this program is to provide data that could be used to determine whether selected WQLS - pollutant combinations may potentially qualify for removal from the List.

According to the *Water Quality Control Policy For Developing California's Clean Water Act Section 303(d) List* (2004) "all listings of water segments shall be removed from the section 303(d) list if the listing was based on faulty data, and it is demonstrated that the listing would not have occurred in the absence of such faulty data."

According to the policy (California SWRCB, 2004), for toxicants (including priority pollutants, metals, chlorine, and nutrients), the pollutant/ water segment combinations should be removed from the CWA section 303(d) list if the numeric water quality objectives (WQOs) (including maximum contaminant levels where applicable) or California/National Toxics Rule water quality criteria are not exceeded as follows:

- Using the binomial distribution, waters shall be removed from the section 303(d) list if the number of measured exceedances supports rejection of the null hypothesis as presented in Table 4.1.

- The binomial distribution cannot be used to support a delisting with sample sizes less than 28.

For conventional pollutants (that include dissolved oxygen, pH, and temperature), numeric water quality objectives are not exceeded as follows:

- Using the binomial distribution, waters shall be removed from the section 303(d) list if the number of measured exceedances supports rejection of the null hypothesis as presented in Table 4.2.

- The binomial distribution cannot be used to support a delisting with sample sizes less than 26.

TABLE 4.1: MAXIMUM NUMBER OF MEASURED EXCEEDANCES ALLOWED TO REMOVE A WATER SEGMENT FROM THE SECTION 303(D) LIST FOR TOXICANTS.

Null Hypothesis: Actual exceedance proportion ≥ 18 percent.
Alternate Hypothesis: Actual proportion < 3 percent of the samples
The minimum effect size is 15 percent.

Sample Size	Delist if the number of exceedances equal or is less than
28 – 36	2
37 – 47	3
48 – 59	4
60 – 71	5
72 – 82	6
83 – 94	7
95 – 106	8
107 – 117	9
118 – 129	10

For sample sizes greater than 129, the maximum number of measured exceedances allowed is established where α and β ≤ 0.10 and where |α - β| is minimized.

α = Excel® Function BINOMDIST(k, n, 0.18, TRUE)
β = Excel® Function BINOMDIST(n-k-1, n, 1 – 0.03, TRUE)
where n = the number of samples,
k = maximum number of measured exceedances allowed,
0.03 = acceptable exceedance proportion, and
0.18 = unacceptable exceedance proportion.

TABLE 4.2: MAXIMUM NUMBER OF MEASURED EXCEEDANCES ALLOWED TO REMOVE A WATER SEGMENT FROM THE SECTION 303(D) LIST FOR CONVENTIONAL OR OTHER POLLUTANTS.

Null Hypothesis: Actual exceedance proportion ≥ 25 percent.
Alternate Hypothesis: Actual exceedance proportion < 10 percent.
The minimum effect size is 15 percent.

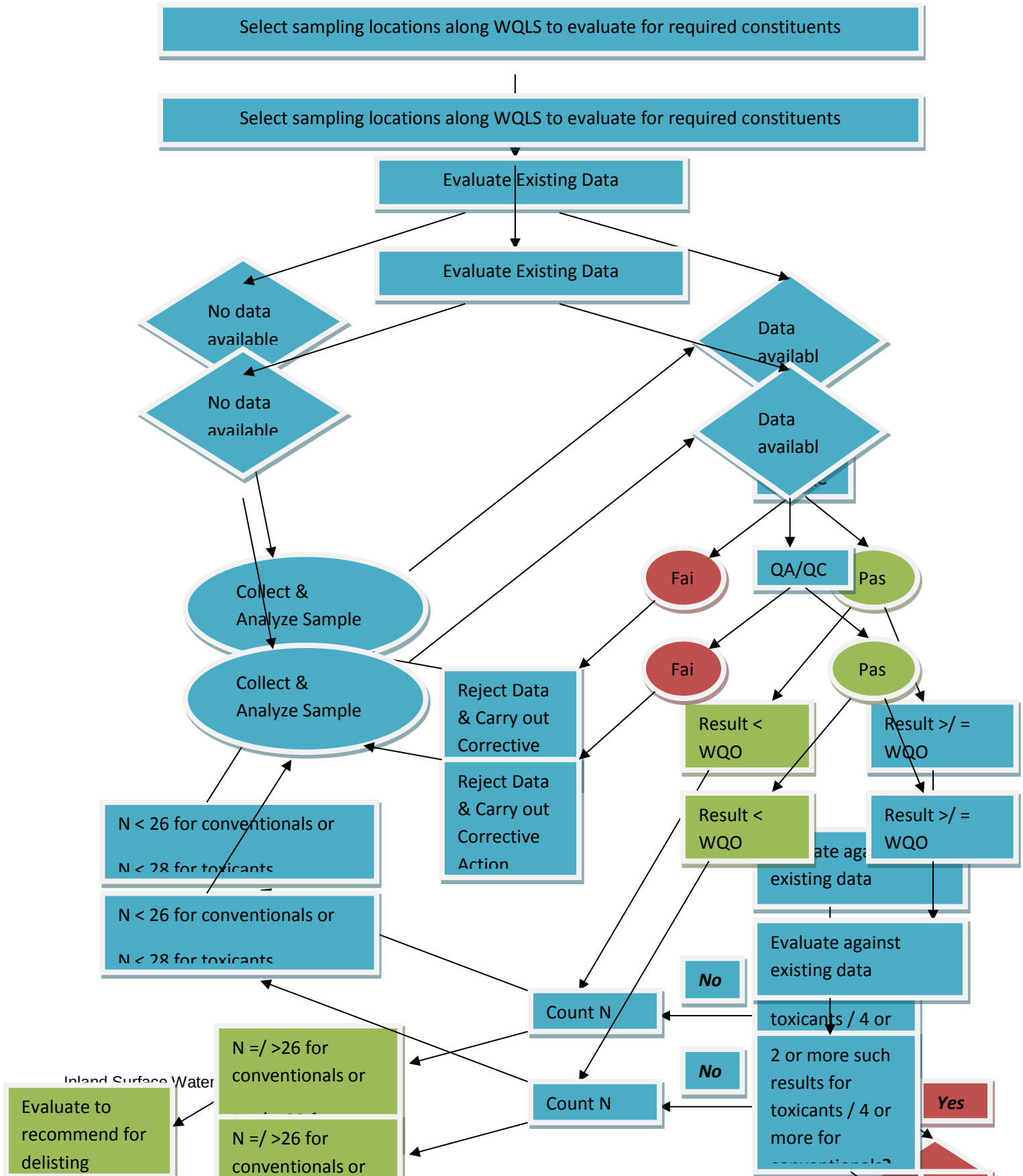
Sample Size	Delist if the number of exceedances equal or is less than
26 – 30	4
31 – 36	5
37 – 42	6
43 – 48	7
49 – 54	8
55 – 60	9
61 – 66	10
67 – 72	11
73 – 78	12
79 – 84	13
85 – 91	14
92 – 97	15
98 – 103	16
104 – 109	17
110 – 115	18
116 – 121	19

For sample sizes greater than 121, the maximum number of exceedances allowed is established at α and β ≤ 0.2 and where |α - β| is minimized.

α = Excel® Function BINOMDIST(k, n, 0.25, TRUE)
β = Excel® Function BINOMDIST(n-k-1, n, 1 – 0.1, TRUE)
where n = the number of samples,
k = maximum number of measured exceedances allowed,
0.10 = acceptable exceedance proportion, and
0.25 = unacceptable exceedance proportion.

Figure 1. Tables 4.1 and 4.2 From the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List.

Figure 2 illustrates the decision process for this project. Using this reiterative procedure, existing data collected by the County as part of the Dry Weather Monitoring program and several special monitoring projects together with data collected as part of this program are continuously reviewed and evaluated. Potential WQLS-pollutant combinations are considered for sampling and, after an appropriate QA/QC review and approval, available data are considered for use in the de-listing process.



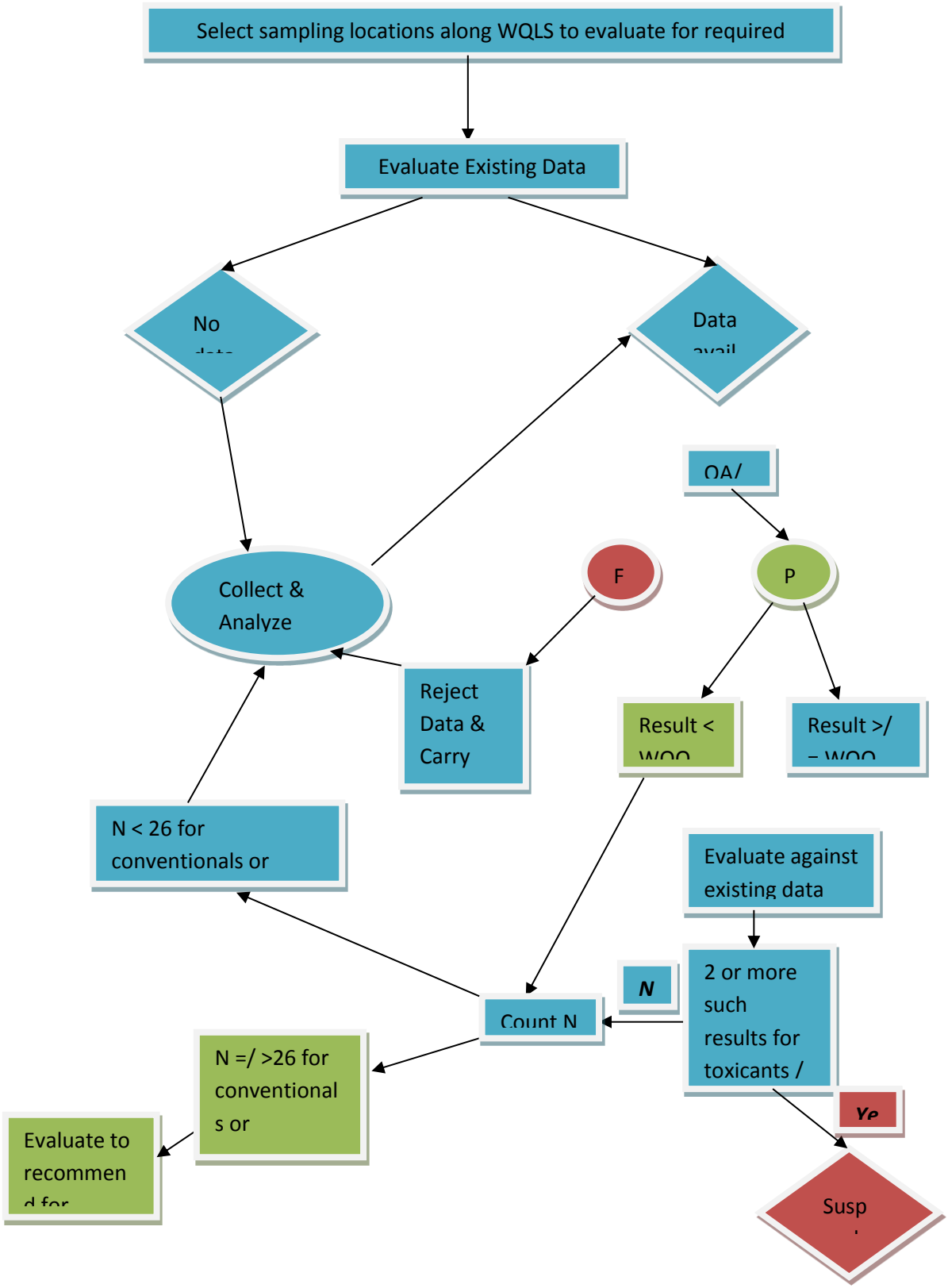


Figure 2. Decision Process for Data Review and Sample Collection

II. TRAINING

All staff conducting activities directly related to the implementation of the Surface Inland Water Monitoring Program, and the related activities described in this Monitoring Plan, must receive training prior to their involvement in such activities. Training will consist of: review of safety procedures, use of field sheet including field observations, flow estimation, and field sampling, and calibration of field instruments.

III. DEFINITIONS

Blank Solution - Solution that is free of the analyte(s) of interest. Such a solution would be obtained from the laboratory.

Clean Water Act (CWA) - Federal law enacted to regulate/reduce water pollution. CWA is administered by the US Environmental Protection Agency (EPA).

Clean Water Act Section 303(d) - Report to Congress from EPA that identifies those waters for which existing controls are not sufficiently stringent to achieve applicable water quality standards.

Duplicate Sample - Two discrete aliquots collected from the same sample location at the same time.

Field Blank - Laboratory sterilized water (blank solution) that is subjected to all aspects of sample collection, field processing, preservation, transportation, and laboratory handling as an environmental sample.

Grab Samples - A specific location at a given time is represented by a discrete aliquot. The sample is collected all at once and at only one particular point in the sample medium.

Matrix Interference - Also referred to as matrix effects. Matrix interference is a chemical and/or physical interference that impedes the analytical instrumentation in detecting the true value concentration of a target analyte within a sample. One possible source of matrix interference may be caused by contaminants that are co-extracted from the sample and result in a positive or negative bias. The extent of matrix interferences will vary considerably from source to source, depending upon the nature and diversity of the sample matrix.

Outlier - A datum that appears to deviate markedly from that of other members of the sample in which it occurs.

Quality Assurance (QA) - All those planned or systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality.

Split Sample - The collection of one discrete aliquot split into two discrete sample aliquots. Each sample is analyzed for the same parameters.

Water quality limited segment (WQLS) - Any segment where it is known that water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards, even after the application of the technology-based effluent limitations required by sections 301(b) and 306 of the Clean Water Act.

V. BACKGROUND AND SAFETY PRECAUTIONS

Field sampling/ measurements will not be conducted when the sampling environment and/or discharges create hazardous conditions (e.g. diesel spill to a creek). Use the following safety precautions at all times when conducting monitoring activities and be sure to heed all warnings and precautionary statements.

- Do not sample during dangerous conditions such as high winds, lightning storms, or flooding conditions.
- Do not remain in open areas or stand under trees if lightning is occurring in the vicinity.
- If adverse conditions develop while in the field, return to the vehicle and if necessary return to DPW Headquarters.
- Do not enter confined spaces.
- Do not open any manhole without consulting DPW, Roads Division (Stormwater Strike Team Supervisor for Div. 1 is Tony Stanley (619-660-5831) and for Div. 2 Tony Ariosta (760-510-2389).
- Wear appropriate attire (i.e. hat, safety boots, gloves, and long pants).
- Be aware of your environment! Watch for: snakes, ticks, bees, poison oak, and stinging nettle (see Appendix 1 for photos).
- Be familiar with Material Safety Data Sheets (MSDS) for all chemicals used in the field and when calibrating instruments. Know the health hazards and emergency medical treatments, and follow proper disposal instructions.
- Keep a first aid kit and fire extinguisher in the vehicle.
- Make sure accident reporting packet with film camera is in the vehicle.
- Park vehicle off road if possible, turn hazard light on, and place orange safety cones out if you are parking near traffic lanes.
- Watch out for traffic along the access road when sampling or making observations.

- Watch your step; the ground may be wet and slippery, steep, or unstable. Rocks may be loose. Do not attempt to climb down unsafe slopes. Return another day.
- Always wear clean disposable gloves when sampling.
- Protect eyes and skin against contact with acids and other preservatives.
- Use a backpack when transporting sample bottles from the sample location back to the ice chest in the vehicle.

Safety Equipment

The following safety equipment is required during monitoring activities:

- First aid kit
- Safety glasses
- Disposable gloves
- Proper safety boots
- Snake guards
- Safety vests
- Orange traffic cones
- Sun screen
- Insect repellent containing DEET
- Cell phone
- Drinking Water

VI. RESPONSIBLE PERSONNEL

Field Staff

- Calibrate and maintain equipment
- Follow sample collection procedures
- Follow record keeping procedures
- Enter data from datasheets and laboratory reports into the database

Monitoring Coordinator

- Coordinate dates and locations for sampling events
- Maintain all electronic and hard copy data received from the laboratory
- Maintain field datasheets in the appropriate binder

Quality Assurance Officer

- Conduct routine QA/QC on analytical data
- Conduct routine QA/QC on field data
- Verify database entries
- Verify instrument calibrations, and upkeep of all required log sheets
- Conduct field and laboratory audits (annually or as needed)
- Prepare annual QA/QC reports
- Prepare annual data reports

VII. EQUIPMENT

The Inland Surface Water Monitoring Plan is required to perform monitoring while in the field. All applicable equipment and supplies needed to implement this program are listed in Appendix 2. The field screening analyses are performed using the following equipment:

- Horiba U-10, 5-parameter probe
- Global Flow Probe, Model FP101 or FP201 (arrow points downstream with the current).

Equipment Maintenance

- Field staff will maintain clean and properly functioning equipment at all times.
- The Horiba U-10 Meter is to be calibrated before each day of use using the AutoCal solution provided by the manufacturer following the procedure in Appendix 3. All calibration results will be documented in the calibration log sheet. Care should be taken to keep calibration solution uncontaminated. Solutions should be changed weekly, and should not be used after the expiration date. Keep waste solutions contained!
- Field meters and cameras must be in proper working order. Make sure that batteries have sufficient voltage to power the equipment for the entire field trip.

- Recharge or replace batteries as necessary. Keep extra batteries in the instrument case. Probes should be inspected, cleaned and reconditioned regularly.
- Clean and rinse all other sampling equipment after returning from the field.
- Sample containers used in the field (e.g. graduated cylinders for sample dilutions, test kit flasks and / or beakers) should be cleaned immediately after use. Rinse three to four times with deionized water. Rinsewater from test kit cleaning must be poured into the waste container.
- Supply of containers used for analytical laboratory analysis should be checked and restocked as needed.

VIII. PROCEDURES

FIELD SITE VISITS

1. Introduction

Sample locations should be identified and located each day prior to leaving the DPW facility. Appendix 14 lists all County of San Diego sample locations so far identified for 2011.

Monitoring will be conducted on a biweekly schedule, depending on staff availability, during dry weather conditions as well as after rain events. For safety, weather conditions should be verified prior to departure to sampling locations using the following sources:

- Department of Public Works Flood Control Section at (619) 495-5557 (7:00 am - 4:00 pm weekdays).

National Weather Service weather forecasts 24-hour recorded message at (619) 289-1212 or http://www.wrh.noaa.gov/sgx/

Field measurements and/or grab samples will be collected at each location as indicated for that location based on the specific CWA Section 303(d) listings. At each location, flow will be measured quantitatively using standard USGS protocols (Rantz, 1982). If the discharge flows are too small to measure with instrumentation, the indirect methods described by USGS may be used to estimate flow (e.g., float method, Manning formula). For each site sampled, physical and biological characteristics will be recorded on the "General Site Description," "Water Flow," "General Condition," "Observations," and "Flow Measurement" sections will be filled out on the corresponding field sheets.

3. Field Sheets/ Documentation

An Inland Surface Water Monitoring Datasheet (Appendix 4) must be filled out for each site visit at the time of the visit and a unique sample event ID number from the Sample Event ID log sheet (kept in the vehicle or field backpack) must be assigned to each site visit/ datasheet. All information fields (observations and measurements) on the sheet should be filled in. Special care must be taken to insure

that each sample event or site visit has a unique number assigned to it. This Sample Event ID Number is the primary reference number in the database for each unique sample and should be recorded on all related documents pertaining to that sample (i.e. Chain of Custody). All documentation should be filled out accurately and neatly.

If a parameter was not measured "N/A" should be placed in the applicable cell. This ensures that the parameter was not overlooked. If a measurement was recorded inaccurately, a line should be drawn through the error, correct result noted, and the person responsible for documenting the results should initial and date the correction. This is good practice for correcting any written errors on any documents.

4. Field Observations

Qualitative field observations may be made during site visits when ponded or flowing water is observed. These observations are intended to provide a general assessment of the site and include variables like weather, odor, water clarity, presence of floatable matter, visible deposits / stains, vegetative coverage and biological status (detailed discussion in Appendix 5). If a location is dry, a datasheet must be filled out noting the lack of water and current weather condition. Each field screening location should be photographed at least once a year to provide additional information and documentation of site conditions. In addition to providing important descriptive information, photos serve as an official record of the site visits, a visual record of the condition of the pipes, structures and the surrounding environment, and can assist other staff in locating the site in subsequent visits. If a site is new, one photograph looking upstream and one looking downstream should be taken.

5. Flow Measurement Procedures

A flow measurement should be made during each site visit where flowing water is observed. Flow measurements can be used to estimate pollutant mass loading. Since a majority of sample locations lack a permanent flow measurement installation, several field methods may be employed to estimate flow rate. If water is ponded, take width, length, and depth and record velocity as zero (0).

Velocity-area method - The most practical method for measuring the discharge of a stream is the velocity-area method. This method requires the physical measurement of the cross-sectional area and the velocity of the flowing water. Discharge is determined as the product of the area times the velocity.

$$\text{Discharge } (ft^3/sec) = \text{Velocity } (ft/sec) \times \text{Depth } (ft) \times \text{Width } (ft)$$

Using the Global Flow Probe, measure the velocity of the water flow (see flow probe instruction in Appendix 6). Use the measurement marks on the probe to measure the stream width and depth. Note: The probe markings are in tenths of a foot, therefore, you read directly from the markings and do not need to make any conversions. Record results on the datasheet.

Fill a bottle method - If monitoring an outfall, staff should record information on the diameter of an outfall for the determination of the discharge flow. The rate can be determined by measuring the length of time it takes to fill a 1-Liter bottle. This method is very helpful for low-flow situations.

Partially filled pipe method - Another method for measuring flow is the partially filled pipe method. This method is helpful when you have a substantial flow coming from an outfall. For this method all measurements must be converted to a common unit before calculation (ft, in, or cm). Measure the

water depth and inside pipe diameter and apply the following formula using the partially filled pipe formula chart in Table 1.

D = water depth.

d = *inside* pipe diameter

Calculate D/d.

Find the tabulated (Ta) value on the partially filled pipe formula chart below using the D/d value. (i.e. if D/d = 0.263 then Ta =0.1623).

Find the area using the formula

$a = Ta*d^2$.

Multiply area (a) by the water velocity.

Convert to desired value.

Table 1: Partially Filled Pipe Formula Chart.

Calculating the Area (a) of the Cross Section of a Circular Pipe Flowing Partially Full										
D = Depth of water			a = area of water in partially filled pipe							
d = diameter of the pipe			Ta = Tabulated Value				Then a = Ta*d2			
D/d	**0.00**	**0.01**	**0.02**	**0.03**	**0.04**	**0.05**	**0.06**	**0.07**	**0.08**	**0.09**
0.0	0.0000	0.0013	0.0037	0.0069	0.0105	0.0147	0.0192	0.0242	0.0294	0.0350
0.1	0.0409	0.0470	0.0534	0.0600	0.0668	0.0739	0.0817	0.0885	0.0951	0.1039
0.2	0.1118	0.1199	0.1281	0.1365	0.1440	0.1535	0.1623	0.1711	0.1800	0.1890
0.3	0.1982	0.2074	0.2187	0.2280	0.2355	0.2450	0.2540	0.2642	0.2780	0.2836
0.4	0.2934	0.3032	0.3130	0.3220	0.3328	0.3428	0.3527	0.3627	0.3727	0.3827
0.5	0.3980	0.4030	0.4130	0.4230	0.4330	0.4430	0.4520	0.4620	0.4720	0.4820
0.6	0.4920	0.5020	0.5120	0.5210	0.5310	0.5400	0.5500	0.5590	0.5690	0.5780
0.7	0.5870	0.5960	0.6050	0.6140	0.6230	0.6320	0.6400	0.6490	0.6570	0.6660
0.8	0.6740	0.6810	0.6890	0.6970	0.7040	0.7120	0.7190	0.7250	0.7320	0.7360
0.9	0.7450	0.7500	0.7560	0.7610	0.7660	0.7710	0.7750	0.7790	0.7820	0.7840

6. Sampling Procedures

Depending on the parameters that are to be measured at a specific site, field screening may include making qualitative observations, collecting at least one grab sample (if analytical laboratory parameters are being screened for), and/or conducting *in-situ* water quality measurements (if pH or turbidity measurements are required). Also, at each location, site description, instantaneous flow estimates, and visual observations are recorded on the Inland Surface Water Monitoring Datasheet.

Analytical laboratory samples should be transported on ice (at 4°C). Table 3 provides a summary of all field measurements and analytical laboratory analysis parameters available for the Inland Surface Water Monitoring Program.

Physical Water Quality Properties Collection – Use the Horiba U-10, 5-parameter probe to collect pH, conductivity, turbidity, dissolved oxygen, temperature, and salinity. The Horiba U-10 sensor body must be fully submerged in the water so that all sensors are covered. The sensors should be pointed upstream so that the water flows through and around them. Place sensor in a representative portion of the creek and turn the Horiba on. Wait approximately one (1) minute for the sensors to equilibrate. If you are at the first site of the day, you may need to wait up to five minutes with the "Turbidity" mode selected for the turbidity reading to stabilize, especially if the water is cold. This warm-up period is necessary to avoid erroneously high turbidity readings at the first site of the day. Start with the conductive measurement and work on through the parameters, taking care to let the values stabilize at each parameter. If the flow velocity of the creek is slow (i.e. less that 0.50 feet/second), it will be required that the sensor be agitated in the water for approximately 30 seconds, taking care not to lift the sensor out of the water while agitating, in order to obtain a proper D.O. reading (only D.O. is affected by a slow flow velocity). It is recommended that the D.O. be done last if you are at a site with slow flow velocity. If the level of the water is to low and will not cover the sensor, the Horiba measurements can be made in a clean, triple-rinsed, beaker. The water can be collected with a syringe or clean sample cup (triple-rinsed). Note on the field sheet how the water was collected if the measurements were done in a beaker.

Analytical Laboratory Sample Collection - Samples for analytical laboratory analysis need to be collected in the appropriate containers (see Table 2 for container type, holding time and necessary preservative for each analyte). The contracting laboratory will provide the appropriate pre-cleaned sample containers with preservative added (see Appendix 7). Samples are to be collected by standing downstream and at the horizontal and vertical center of the stream/creek flow for a more representative sample of the whole stream. When sampling, make sure the container opening faces upstream. For shallow water (i.e. less than 6-inches deep), it will suffice to fill the bottle from the surface of the stream rather than sample mid-depth. For deeper water, sample mid-depth by leaving the lid on the sample bottle and lowering the bottle to the mid-depth position, then removing the lid and allowing the container to fill. Be sure to firmly screw cap on the container to prevent leakage. If water level is very low, collect the water sample using a clean syringe and fill appropriate sample container. Note on the field sheet if a syringe was used for sample collection. Avoid sampling the slowly flowing water near the edge of stream, unless intended. Store all samples in an ice chest with ice at approximately 4^{o} C until custody is transferred to the analytical laboratory directly or via courier.

Table 2: Summary of Field and Laboratory Sampling and Analysis Requirements

Physical and Inorganic Non-Metals	**Analytical or Field Method**	Container[1]	Volume (mL)	Holding Time	Target Reporting Limit(s) mg/L	Units
Field Screening Parameters						
Turbidity	Horiba Multiparameter Water Quality Instrument	in situ field measurement		N/A	N/A	N/A
pH		in situ field measurement		N/A	N/A	N/A
Laboratory Analytical Parameters						
Ammonia	SM4500 NH3 B,C	P	500	28 D	0.01	
TDS	SM 2540C	P	500	7 D	20	mg/l
Iron	'EPA 200.7/ EPA 6010	P	500	6 M	0.15	ug/L
Manganese	EPA 200.7	P	500	6 M	.025	mg/l
Sulfates	EPA 300.0/ SM4500 SO4 E	P	500	28 D	5.0	mg/l
Chlorides	SM4500 Cl C	P	500	28 D	1.00	mg/l
Selenium	EPA 200.8	P	500	6 M	0.002	mg/l
Aluminum	EPA 200.7	P	500	6 M	0.1	mg/l
Total Hardness	SM 2340C	P	500	6 M	10	mg/l

7. QA /QC for Field Analysis

Field Staff should refer to the Inland Surface Water Monitoring Program Quality Assurance Project Plan (QAPP) for QA/QC procedures and schedules. **Field duplicate samples** should be collected for every ten samples or monthly whichever comes first. Collected data should include Horiba data, and laboratory grab samples, on a new field sheet and with a time of five minutes apart from the original sample collection time. When collecting a grab sample for duplicate analysis use two sample containers to collect two discrete aliquots. When collecting a grab sample for split analysis, use one large sample container and split this into two separate aliquots at the field station. To collect a duplicate set of physical parameter readings using the Horiba multi-sensor probe, the sensor should be left in place in the stream and **not moved** once the first set of readings is recorded. The Horiba should be turned off for about 30 seconds and then switched back on to take the second set of readings. One **laboratory reagent water blind blank sample** should be submitted to the laboratory for every 20 samples. A new field sheet should be filled out for the blank with a time of five minutes apart from the original sample collection time.

ANALYTICAL LABORATORY ANALYSIS

1. Introduction

At locations where analytical samples are to be collected, samples must be collected in the appropriate containers provided by the laboratory (Appendix 7). If sample contains a preservative be sure to handle the container appropriately and avoid contaminating sample or spilling preservative. Staff should contact receiving personnel at the laboratory to arrange for the pick-up of sample containers for each week sampling needs (via e-mail, or see FAX order form in Appendix 9). Staff should give the laboratory one-week notice to prepare the required containers.

Samples collected for laboratory analysis should be submitted to the laboratory as soon as possible after collection. The following procedures must be followed for analytical laboratory samples:

1. Fill out the chain of custody (COC) form making sure that all sample containers are correctly labeled (see sample COC in metal clip board.). Do a bottle count to make sure none are missing.

2. Carefully pack sample containers in the cooler with ice, making sure samples stay cold. Laboratory staff will check the temperature of samples upon arrival at the lab.

3. Ensure that the samples are transported to the laboratory within the appropriate holding times.

4. Complete the chain of custody form at the laboratory. Be sure and obtain a photocopy of the completed, signed and time/date-stamped COC from laboratory staff.

Note: <u>Do not</u> store food or drinks in the ice chest.

2. Chain of Custody

The chain of custody (COC) forms (Appendix 10) are an integral part of the Inland Surface Water Monitoring Program. It is essential that they are filled out accurately. A chain of custody form must be filled out when a sample is transferred to another individual or laboratory personnel. Field staff must follow strict sampling and chain of custody protocols when conducting monitoring.

The completed copy of the COC should remain at DPW Headquarters and filed chronologically in a binder at the desk of the Monitoring Coordinator. The COC is a good reference document when reviewing analytical hard copy data and should be reviewed to ensure that the requested analyses were conducted.

3. QA/QC for laboratory Analysis

Field staff should refer to the Inland Surface Water Monitoring Program Quality Assurance Project Plan for laboratory QA/QC protocols and schedules. Laboratory data will be submitted electronically to the Monitoring Coordinator and Quality Assurance Officer from the contract laboratory. The Quality Assurance Officer should become familiar with the QA/QC procedures of the lab and review QA/QC results to ensure that there are no issues regarding the quality of data submitted.

IX. DATA MANAGEMENT

A. HARD COPY DATA

There are two forms that need to be managed. The first form is the field datasheet, which contains data collected in the field at each sample site. The second form is the report received from the contract laboratory with the analytical results and chain of custody forms. Both sets of hard copy data need to be placed in the appropriate binders and stored at the Monitoring Coordinator's desk.

Field Datasheets

When field staff return to the office, all data from the field datasheets should be entered into the Database (refer to Database Instructions, Appendix 11). If field staff are unable to enter data for that day, staff should set aside one day during the week to enter data. Field sheets must be entered in a sequential order into the database.

The Quality Assurance Officer should perform routine QA/QC of the data periodically.

Analytical Laboratory Data Reports

After samples have been submitted to and analyzed by the contract laboratory, the County of San Diego will receive a hard copy report of the data and a copy of the original Chain of Custody. It may take up to three weeks to receive hard copies of laboratory data after samples are submitted.

The Monitoring Coordinator should create a folder to file the hard copy data. The folder should be labeled with the following information.

1. Season/ Year

2. Site ID
3. Sample Event ID Number
4. Date
5. Log Number used by the Contract Laboratory.

B. ELECTRONIC DATA

The contract analytical laboratory will send an electronic copy of the data to the County of San Diego. This data will be in an Excel spreadsheet in the format specified as well in a PDF file. The Monitoring Coordinator will place a hard copy printout in the appropriate binder and maintain the electronic data in the appropriate computer folder.

X. WASTE MANAGEMENT

Field Staff will store all spent reagents used for instrument calibration and standardization in an appropriate hazardous waste container. Field staff are to conduct routine calibrations in the laboratory. Staff will use the leased laboratory space located at 5252 Kearny Villa Way, San Diego, CA 92123. Waste containers must be label with the follow information:

- Date of Storage
- Waste Accumulation Date (Date waste first accumulate)
- Waste Organics
- Waste Metals
- Oil & Water
- Mixed Solvents
- Glass
- Name of Program Responsible for waste storage
- Point of Contact

When the waste container is full, contact Nancy Stalnaker (858-495-5645) to arrange for removal of waste.

XI. ADMINISTRATIVE / FISCAL

The Analytical Laboratory Coordinator will receive mailings from the contract laboratory periodically. Each mailing will contain a copy of the chain of custody form for the set of analyses performed, hard copies of data and matching invoices. The Analytical Laboratory Coordinator is to review the invoices to ensure that the data for the analysis stated on each invoice has been received and is correct. After this review is performed, the Analytical Laboratory Coordinator will sign each invoice and write the following on each copy:

date it was received and verified

their signature and printed name

BPA code (normally 531748)

Sci. + Mon. Gen.

P 1013959

O 50855

E 52370

T 010.001

A 100496

The same information should be written on the monthly invoice when it is received from the contract laboratory. All invoices should be approved for payment and signed by Nancy Stalnaker. The set of invoices for a given month along with the monthly invoice should be scanned and the resulting PDF file renamed according to the following nomenclature: "531748Jan2014MonthlyInvoiceEnviromatrix". The file then should be entered into Sharepoint. The original copy of each invoice should be placed in the ISWM project binder. The Invoice Tracking spreadsheet in the computer should be updated accordingly. The PDF file should be e-mailed to Lourdes Barnes with CCs to Nancy Stalnaker and Theresa Brownyard along with the updated Invoice Tracking Spreadsheet.

XII. CHECK-OUT & CHECK-IN PROCEDURES

All staff must let the supervisor know that they are heading out to the field and must check-in upon their return from the field. If you are still in the field by 4:00 pm, staff must phone the supervisor to update your status and estimate time back to the office.

Reference

California State Water Resources Control Board Regional Water Quality Control Board. 2004. *Water Quality Control Policy For Developing California's Clean Water Act Section 303(d) List*. http://www.swrcb.ca.gov/water_issues/programs/tmdl/docs/ffed_303d_listingpolicy093004.pdf

Appendix I

Field Sampling Safety

Things to watch out for (clockwise from top left: poison oak, stinging nettle, rattlesnake, tick):

Appendix II

Equipment and Supplies List

- Clipboard, pens, pencils, Sharpie, or other waterproof pens
- Thomas Guide, MS4 maps, and land use maps
- Digital camera
- Latex gloves, protective eyeglasses or goggles, rubber boots
- Snake guards
- Safety traffic cones and safety vests
- Cooler and ice (if collecting laboratory samples)
- Paper towels, KimWipes, plastic bags
- Sample bottles with preservatives
- Cell phone
- GPS unit
- Multi-parameter probe (Horiba)
- Extra batteries for all meters
- Flow measurement equipment (required equipment will depend on method used)
    - Current meter or wristwatch
    - Measuring tape for measuring stream width
    - Folding scale for measuring stream depth
- De-ionized or ultra pure water in squeeze bottles for rinsing, dilutions, etc. (depending on methods used)
- Waste disposal bottles (keep in truck)
- Backpack
- Calculator for determining discharge using the area/velocity method
- Trash bags/bin

- Plastic syringes
- 0.45 micron filters
- Plastic sample cups
- Graduated cylinder
- Sample Event ID log
- List of phone numbers
- County Road Station map and addresses
- Field data sheets
- Pole dipper stick for sampling
- Manhole cover opening tool
- Machete
- Drinking Water

Appendix III

Horiba U-10 Calibration Procedure and Log Sheet

Instrument Calibration and Frequency

The Horiba U-10 Meter is to be calibrated using the Auto-Calibration procedure described below prior to use in the field each day. Upon return to the lab from the field (post-deployment), the Horiba pH 7 and pH 10 solutions will be checked and results recorded. All measurements will be checked against the data quality objectives (DQOs) listed in Table 1. If results are out of the DQO range then probe must be calibrated using the manual two-point calibration methods. Manual two-point calibrations for dissolved oxygen, pH, conductivity and turbidity will be conducted quarterly. Following manual calibration the probe will be checked using the Horiba pH 4 (Autocal) solution and probe condition will be noted. All data will be recorded in the calibration data sheet.

Auto-calibration Procedure (performed daily prior to departure):

1. ***Fill each Horiba calibration cup with the proper pH solution, according to its label. The pH 4 cup should be filled slightly** over **the fill line.***

2. ***Triple-rinse probe with deionized water and blot dry with a clean cloth or Kimwipe.***

3. ***Place probe in Horiba calibration cup containing Horiba pH 4 solution. Allow a** few **minutes for equilibration.***

4. ***Using the MODE key put in MAINT mode then toggle to "S.SET". Using the ↑↓ keys select "A" for Auto-salinity. Press ENT to complete salinity setting.***

5. ***Horiba pH 4 (Autocal) solution. Using the MODE key put in MAINT mode then toggle to AUTO sub-mode. Press ENT to initiate auto-***

calibration. Readout will automatically return to MEAS mode when completed.

6. ***Record readouts for all parameters (pH, conductivity, turbidity, dissolved oxygen, temperature, and salinity) in the Daily Calibration Logsheet.***

7. ***Remove the probe from the Horiba pH 4 solution, triple-rinse with deionized water, dry and place in the pH 7 solution. Record the pH and temperature values on Daily Calibration Logsheet. Repeat this step with pH 10 solution.***

8. ***Follow the directions below for Zero and Span calibration should the pH values fall outside accepted ranges.***

9. ***Upon return from the field, check the probe using the Horiba pH 7 and pH 10 solutions, record pH and temperature values in the Daily Calibration Logsheet, then triple-rinse probe with deionized water and place in a beaker of tap water for short-term storage.***

Manual Two-point Calibrations (performed quarterly):

pH Calibration:

pH calibration is done using two standard solutions of different pH values, one for the ZERO calibration, the other for the SPAN calibration. Water Quality objectives for pH in surface waters for the San Diego region are 6.5 to 9.0, therefore it is recommended to use pH 7 and pH10 solutions.

Zero Calibration:

- ***Use the pH 7 solution (Must use pH7 solution), check temperature of standard.***

- ***Press MODE, select MAINT mode.***

- ***Press MODE again to move the lower cursor to ZERO.***

- ***Press SELECT to move the upper cursor to pH***

- ***Select the appropriate pH value after the readout has stabilized (e.g. enter pH = 6.86 if temp. is 25 ℃; note that different brands of standard pH solutions may have different pH values at a given temperature; Table 3) using the ↑↓ keys.***

To complete pH zero calibration, press ENT. Record this value in the calibration data sheet.

Span Calibration:

- ***Rinse and dry probe and place in second standard solution (e.g. pH 10).***

- ***Use the MODE key to move the lower cursor to SPAN.***

- ***Check the temperature of the standard solution and select the appropriate pH value after the readout has stabilized using the ↑↓ keys.***

- ***To complete pH span calibration, press ENT. Record this value in calibration data sheet.***

Record all data into the logsheet.

Conductivity Calibration:

The Horiba U-10 automatically selects the proper range to measure conductivity. Therefore, manual calibration must be done for all three ranges used by the probe.

Zero calibration:

- ***Triple rinse probe in DI or distilled water. Shake off excess water and allow to air dry.***
- ***Press MODE and move lower cursor to ZERO.***
- ***Press SELECT and move upper cursor to COND***
- ***Press the ↑↓ keys to set the readout to zero.***
- ***To complete the zero COND calibration, press ENT. Record this value in the calibration data sheet.***

Span calibration:

- ***Triple-rinse and immerse probe in 0.718 mS/cm solution.***
- ***Press MODE and move lower cursor to SPAN***
- ***Use the ↑↓ keys to select 0.718 once readout has stabilized.***

- ***Press ENT to complete the 0.718 mS/cm conductivity calibration. Record this value in the calibration data sheet.***

- ***Repeat the above procedure using the 6.67 mS/cm and 58.7 mS/cm standard solutions.***

Note: Shelf life of conductivity solutions is six months. Keep solutions tightly capped. Conductivity standards are "one-shot" solutions – do not reuse the standard (from SWAMP guidelines).

Turbidity calibration:

When doing zero calibration it is crucial that you clean the probe thoroughly.

Zero calibration:

- ***Triple-rinse probe and shake off excess water droplets immerse probe in DI or distilled water.***

- ***Press MODE and move the lower cursor to ZERO.***

- ***Press SELECT and move upper cursor to TURB.***

- ***Use the ↑↓ keys to select 0.0 once readout has stabilized.***

- ***Press ENT to complete the zero turbidity calibration. Record this value in the calibration data sheet.***

Span calibration:

- ***Triple-rinse and immerse probe in 100 NTU standard solution.***
- ***Press MODE and move lower cursor to SPAN.***
- ***Use the ↑↓ keys to select 100 NTU once the readout has stabilized.***
- ***Press ENT to complete the 100 NTU turbidity calibration. Record this value in the calibration data sheet.***

Note: Shelf life of turbidity solutions is six months.

DO calibration:

DO calibration solution for the span calibration must be prepared fresh just before it is used. Add 1L of DI water to the reagent bottle and shake vigorously until the white powder is completely dissolved.

Zero calibration:

- ***Triple-rinse probe in tap water and immerse it in zero DO standard solution. This solution must be prepared immediately before use.***
- ***Press MODE and move the lower cursor to ZERO.***
- ***Press SELECT and move the upper cursor to DO.***
- ***Use the ↑↓ keys to select 0.0 once the readout has stabilized.***

— ***Press ENT to complete the zero DO calibration.***

Span calibration:

Fill a container with tap water, close lid and bubble air through it with an aquarium pump to saturate it with dissolved oxygen.

Triple-rinse the probe and immerse it in the container of O2-saturated water.

Make sure the probe is set for freshwater by setting the S.SET Sub-Mode to 0.0%.

Press MODE to move the lower cursor to SPAN.

After the readout has stabilized, slowly move the probe up and down in the water and set the readout value to the appropriate DO value based on the temperature of the water (refer to Table 4: DO saturation at various temperatures).

Press ENT to complete the SPAN calibration for DO. Record in the calibration data sheet.

Table 1:Calibration solutions and values at 25^{o} C.

Parameter	pH 4 (Horiba)	pH7 (Horiba)	pH 7 (YSI)	pH 10 (YSI)
pH	4.01	6.86	7.00	10.00
Conductivity (mS/cm)	4.49		5.87	16.7
Turbidity (NTU)	0		0	0
DO (mg/L)	8.52		0.0 (Zero oxygen)	

Table 2: Data Quality Objectives for Accuracy and Precision

Parameter	Value	+/- ½ unit	+/- ½ unit
pH (± 0.5 units)	4.01*	3.51	4.51
	6.86*	6.36	7.36
	10.0	9.50	10.50
Conductivity	4.49	4.27	4.71
	5.87	5.58	6.16
Turbidity	100	95	105
DO	8.52	8.09	8.95

*Check manufacturers standard reference value.

Table 3: Standard pH values at different temperatures

Temperature (°C)	pH 4 (Horiba)	pH 4 (YSI)	pH 7 (Horiba)	pH 7 (YSI)	pH10 (Horiba)	pH 10 (YSI)
15	4.00	4.00	6.90	7.05		10.12
20	4.00		6.88		10.06	
22	4.00		7.00		10.03	
25	4.01		6.86		10.01	

Table 4: Dissolved Oxygen at Various Temperatures

Temperature (°C)	Dissolved Oxygen (mg/L)	+ 5%	- 5%
15	9.76	10.25	9.27
16	9.56	10.04	9.08
17	9.37	9.84	8.90
18	9.18	9.64	8.72
19	9.01	9.46	8.56
20	8.84	9.28	8.40
21	8.68	9.11	8.25
22	8.53	8.96	8.10
23	8.39	8.81	7.97
24	8.25	8.66	7.84
25	8.11	8.52	7.70
26	7.99	8.39	7.59
27	7.87	8.26	7.48
28	7.75	8.14	7.36
29	7.64	8.02	7.26
30	7.53	7.91	7.15

Horiba U-10 Daily Calibration Log Sheet

PRE-FIELD:

CALIBRATED: BY_____ DATE_____ TIME_____ METER_____

Calibration		pH*	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (^{o}C)	Salinity (%)
Auto-Cal Solution	Std. Value	4.00	4.49	0.0	8.52	@ 22	0.23
	Reading						
pH 7 Solution	Std. Value	6.86**					
	Reading						
pH 10 Solution	Std. Value	10.00					
	Reading						

POST-FIELD:

CHECKED: BY_____ DATE_____ TIME_____ METER_____

Calibration		pH*	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (^{o}C)	Salinity (%)
Auto-Cal Solution	Std. Value	4.00	4.49	0.0	8.52	@ 22	0.23
	Reading						
pH 7 Solution	Std. Value	6.86**					
	Reading						
pH 10 Solution	Std. Value	10.00					
	Reading						

***pH readings should fall within +/- 0.5 units; all other parameters should fall within +/- 5% of standard values.**

****Horiba pH 7 standard solution**

Horiba U-10 Quarterly Calibration Logsheet

CALIBRATED BY_____ DATE_____ TIME_____ METER_____

Calibration		**pH**	**Cond. (mS/cm)**	**Turbidity (NTU)**	**DO (mg/L)**	**Temp. (^{o}C)**	**Salinity (%)**
1st Solution	Std. Value	4.00	4.49	0.0	8.52	@ 22	0.23
	Reading						
2nd Solution	Std. Value	7.00	5.87	0			0.31
	Reading						
3rd Solution	Std. Value	10.00	16.7	0			0.99
	Reading						
DO*	0.0 mg/L	N/A	N/A	N/A		N/A	N/A

*Zero DO calibration only.

CHECKED BY_____ DATE_____ TIME_____ METER_____

Calibration		pH	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (^{o}C)	Salinity (%)
1st Solution	Std. Value	4.00	4.49	0.0	8.52	@ 22	0.23
	Reading						
2nd Solution	Std. Value	7.00	5.87	0			0.31
	Reading						
3rd Solution	Std. Value	10.00	16.7	0			0.99
	Reading						
DO*	0.0 mg/L	N/A	N/A	N/A		N/A	N/A

*Zero DO calibration only.

Parameter	Value	-5%	+5%
pH	4.00*	3.90	4.10
	7.00*	6.90	7.10
	10.00*	9.90	10.10
Conductivity	4.49	4.27	4.71
	5.87	5.58	6.16
Turbidity	100	95	105
DO	8.52	8.09	8.95

N/A

Appendix IV

Inland Surface Water Monitoring Datasheet

COUNTY OF SAN DIEGO
WATERSHED PROTECTION PROGRAM

DEPARTMENT OF PUBLIC WORKS
5510 OVERLAND AVE, SUITE 410
SAN DIEGO, CA 92123

Inland Surface Water Monitoring Datasheet

New Site? ☐ Yes ☐ No

GENERAL SITE DESCRIPTION

Site ID		**Site Type**		**Sample Event ID**		**Sample Event Type**	Field Screening
Location						**Watershed**	**Hydrologic Unit**
Date		**Time**		**Latitude**			**Hydrologic Area**
Field Staff		**Thomas Guide**		**Longitude**			**Hydrologic Subarea**

QC Sample	None	☐ Original	☐ Duplicate	☐ Blank	☐ Split	☐ Lab Standard	
Land Use (Primary) (Check one only)	☐ Residential	☐ Rural Resid.	☐ Commercial	☐ Industrial	Agriculture	☐ Parks	☐ Open
Land Use (Secondary) (Optional, >10%)	☐ Residential	Rural Resid.	☐ Commercial	☐ Industrial	Agr.	☐ Parks	Open ☐ None
Conveyance (Check one only)	☐ Concrete Channel	☐ Natural Creek	Earthen Channel	Manhole	Catch Basin	☐ Outlet	☐ Curb/Gutter

WATER FLOW ☐ Flowing ☐ Pooled ☐ Dry **REFERRED FOR**

GENERAL CONDITION

Weather ☐ Sunny ☐ Partly Cloudy ☐ Overcast ☐ Fog **Last Rain** ☐ > 72 hours ☐ < 72 hours
☐ none ☐ < 0.1 inches ☐ > 0.1 inches

OBSERVATIONS **N/A**

Odor	☐ None	☐ Musty	☐ Rotten Eggs	☐ Chemical	☐ Sewage	☐ Other
Color	☐ None	Yellow	☐ Brown (Silty)	☐ White (Milky)	☐ Gray	Other
Clarity	☐ Clear	Slightly Cloudy	☐ Opaque			☐ Other
Floatables	☐ None	☐ Trash	☐ Bubbles/Foam	☐ Sheen	Algae	Fecal Matter ☐ Other
Deposit	☐ None	Course Particulate	☐ Fine Particulate	☐ Stain	Oily Deposit	☐ Other
Vegetation	☐ None	☐ Limited	☐ Normal	☐ Excessive		☐ Other
Biology	None	☐ Insects	☐ Algae	☐ Snails	☐ Fish ☐ Birds	☐ Cray Fish ☐ Other

FLOW MEASUREMENT **N/A**

Flowing Creek **Average**

Width	ft
Depth	ft
Velocity	ft/sec (enter 0 if water is ponded)
Length of Ponded Area	ft

Evidence of Overland Flow? ☐ Yes No Irrigation Runoff
☐ Other _____

Outlet Diameter _____ Liters/Second _____

Leaf Float Distance _____ ft Time _____ sec

FIELD MEASUREMENT **N/A**

Horiba Meter: In Stream ☐ In Bucket ☐ Agitated (DO) **Analytical Lab Sample Collected?** ☐ Yes ☐ No
Sample Filtered for Test Kits? ☐ Yes ☐ No

Parameter	Reading	Parameter	Reading
pH (Unit)		DO (mg/L)	
Cond. (mS/cm)		Temp (°C)	
Turb. (NTU)		Salinity (PS)	

COMMENTS: _____

Completed by: _____

Appendix V

Directions for filling out the
Inland Surface Water Monitoring Datasheet

Before Leaving the Office

1. Make sure that there is an updated list of constant information queried from the Database in the vehicle.

2. Make sure you have a list of Sample Event ID numbers, also kept in the vehicle.

Sampling Procedures

Location Information

When you get to a site, a field sheet should be completed whether or not flowing water is present. This includes dry sites and sites with ponded water.

[Is this a new site? Yes/No]. If yes be sure to turn the field sheet over and collect the GPS, location, report the land use, construction and conveyance type. If neither land use, construction or conveyance type information is collected this new site will not be identified in the constant information during future queries. Be sure to collect all information. If this is an old site, review the constant information found in the constant information folder to ensure that the GPS, land use, construction and conveyance information is correct. If anything needs changing, record this information on the back of the field sheet.

Flow Observed

[Is flow observed at the site?] Yes= flowing water, No=no flow or dry, Ponded=A pool of water, or water that does not appear to have any flow.

General Conditions

Use this section to report on the current weather conditions at the site. The **[Last Rain]** <72 hours should be filled out if rain occurred.

Observations

This section should be completed only where flowing or ponded water is observed. This section is referring to the in-stream habitat. This includes the vegetation and biology, since we are concerned with how the quality of the water is serving as an indicator for stream health, by either supporting excessive algal growth, or very little biology. For a complete description of each of the observations refer to the attached sheet.

Flow Observations

1. Flow observation should be collected at every site. If the flow is too low to measure using the flow probe (refer to flow probe directions below), use the floating leaf method to estimate the flow. If you have encountered a pipe which is discharging water, you can measure the width of the pipe and count how many liters of water are captured in how many seconds. Be sure that when you use this method, you can capture all the water coming from the pipe in your container.

2. It is also important to note if there is any form of overland flow. This means that flowing water has to be observed discharging to the channel where the samples were collected. If there was, or is any evidence that water may have entered the channel do not check yes. Water has to be observed physically flowing into the channel. You can note in the comments section that overland flow appears to have just occurred. **[Evidence of overland Flow?]** If you do see overland flow, check yes and check whether it is irrigation runoff or other.

Water Sampling (Flow Measurement)

Be sure that all the questions are completed fully in this section.

1. **[Flowing Creek]** Record the creeks' water flow characteristics using the hand-held stick flow meter (FP-101 or FP-201). Record the water's "Width", "Depth", and "Velocity" (see Appendix 6) in the appropriate box on the field sheet using the measurement scale on the side of the stick flow meter (note: the scale is shown in tenths of a foot and not in inches). If the water is ponded record "0" (zero) for the "Velocity" and estimate the "Length" of the pond and record in the appropriate box on the field sheet. If the flow is too slow or small to be measured with the stick flow meter, then a "Leaf Float" estimation can be used to determine the velocity. The leaf float method is conducted by floating a small leaf on top of the water and noting the drift; record "Distance" in feet and "Time" in seconds. The final alternate flow measurement technique is accomplished by recording the time need to fill a container with a known volume.

2. **[Field Measurement]** Measuring the following field screening water quality properties using the Horiba U-10 multimeter: pH, conductivity, turbidity, dissolved oxygen (see Appendix 15), temperature, and salinity. Let readings stabilize before recording all values in the appropriate box on the field sheet.

3. **[Is the sample filtered?]** Sample may be filtered at some sites because of its turbid nature or to remove color interferences. This can affect the field analysis and is important to note. **[Dilution and Parameter?]** If a dilution is run on any parameter you must record the dilution and the parameter on which it was conducted. If this information is not recorded, the value is assumed to be a non-exceedance in the database, except for any follow up sample(s) collected. This is critical for making sense of the data once it is queried from the database.

4. [**Analytical Lab Sample collected?**] Check yes or no, if a lab sample was collected, whether part of an IC/ID, regular field screening or QA/QC. This is the only relationship between what was

conducted in the field and the laboratory data submitted by the analytical laboratory. We should be able to query the database for all sites where lab samples were collected and this information should correlate with the lab data.

Comments

The comments section of the field sheet is designed to capture any other relevant information about the site that is not clearly outlined on the field sheet. It can also contain further explanation of sample locations, address information or distinguishing characteristics about a particular site. Observations are an important part to collecting field data and this section should be completed at every site visit. Examples of other comments might by if the water was collected via a syringe or if the Horiba measurements were conducted in a bucket versus in-situ. Also, note if birds or other animals are present or evidence exists that animals were present (manure or foot prints) at the site.

Appendix VI

Flow Probe User Instructions

1. The FP101 probe handle is a two-piece rod expandable from 3' to 6'. The FP201 probe handle is a three-piece rod expandable from 5' to 15'. To expand the rod for correct placement in flow, loosen the locking nut on the handle, pull out the top piece, and retighten the nut.

2. Make sure the Flow Probe's propeller turns freely by blowing strongly on the prop. Remove any accumulated debris (e.g.- magnetic sediment). If the propeller still does not turn freely, remove the screw holding the propeller and clear any debris present. Re-attach the propeller with the screw, taking care not to over-tighten the screw.

3. Scroll with the bottom button until the "AVGSPEED" for velocity appears on the bottom of the screen. Push the top button for three (3) seconds to reset the display. The display will read in feet/second units.

4. Point the propeller directly into the flow you wish to measure. Face the arrow inside the prop housing **downstream** (arrow points in the direction of flow). If there's no arrow the raised bump on the outside of the housing should be pointed **into** the flow.

5. For small streams, the probe can be moved **slowly** and smoothly throughout the flow during average velocity measurement. Move the probe smoothly and evenly back and forth from top to bottom of the flow so that the probe stays at each point in the flow for approximately the same amount of time. Keep moving the probe for 20-40 seconds to obtain an accurate average value that accounts for surging. (Move the probe as if you were spray painting and attempting to get an even coat of paint over the entire surface).

   The Flow Probe uses true velocity averaging. Reset "AVGSPEED" before starting a new measurement. One reading is taken per second, and a continuous average is displayed. For example, after 10 seconds, 10 readings are totaled and then divided by 10 and this average is displayed. Once the average reading becomes steady, the true average velocity of the stream is obtained. When you pull the probe from the water, this average value is frozen on the display until it is reset. Record this value in the proper cell on the field sheet.

6. Measure/calculate the cross-sectional area of your flow stream in square feet (Note: optional, the database will do this calculation). The average velocity (calculated with the Flow Probe in feet/second) times the cross-sectional area (square feet) equals flow in cubic feet per second (cfs), or $Q = V \times A$.

7. If the propeller gets fouled while measuring flow, clean it until the prop turns freely and start over.

Appendix VII

Laboratory Containers (note: size and type of containers may vary from lab to lab)

Analyte	Method	Container	Sample Volume	Preservative	Maximum Holding Time
Aluminum, total	EPA 200.8	Plastic	500 ml	Acidify to pH <2 with HNO3	6 months
Aluminum, dissolved	EPA 200.8	Plastic	500 ml	None, 4' C	6 months
Ammonia	EPA 350.2	Plastic	500 ml	Acidify to pH <2 with H2SO4	28 days
Chloride	SM 4500 Cl C	Plastic	500 ml	None, 4' C	28 days
Hardness	EPA 130.2/EPA 200.7; SM2340 B	Plastic	500 ml	None, 4' C	6 months
Iron, total	EPA 200.8	Plastic	500 ml	Acidify to pH <2 with HNO3	6 months
Manganese, dissolved	EPA 200.8	Plastic	500 ml	None, 4' C	6 months
Manganese, total	EPA 200.8	Plastic	500 ml	Acidify to pH <2 with HNO3	6 months
Selenium, dissolved	EPA 200.8			None, 4' C	6 months
Selenium, total	EPA 200.8	Plastic	500 ml	Acidify to pH <2 with HNO3	6 months
Sulfate	SM 4500 SO4 E; EPA 300	Plastic	500 ml	None, 4' C	28 days
TDS	SM 2540 C	Plastic	500 ml	None, 4' C	7 days

Appendix VIII

Sample Container Request Form

Container Request Form

Today's Date: 2/3/2014
Project Manager: Dan Verdon
Sample Matrix: SW **Pickup Date:** 2/10/2014
Client: SAN DIEGO COUNTY
Address: 5510 Overland Ave., Suite 410 San Diego, CA 92123
Contact: Kenneth Liddell **PO#:**
Phone No: 858-694-2335 **Fax No:** 858-495-5263

Qty	Type of container	Description	Preservative
4	Plastic	Sulfate	4° C, None
4	Plastic	Manganese (total and dissolved)	Acidify to pH<2 with HNO3
30	Plastic	Selenium (total and dissolved)	Acidify to pH<2 with HNO3
4	Plastic	Aluminum (total and dissolved)	Acidify to pH<2 with HNO3
4	Plastic	Iron (total only)	Acidify to pH<2 with HNO3
40	Plastic	Hardness	Acidify to pH<2 with HNO3

Notes: ISWM sampling project; please include coolers

Appendix IX

Sample Chain of Custody Form

CHAIN-OF-CUSTODY RECORD

– EnviroMatrix Analytical, Inc. –

[illegible] San Diego, CA [illegible] • Phone [illegible] • Fax [illegible]

EMA LOG #:

Client: County of San Diego

Attn: Kenneth Liddell

Sampler(s):

Address: 5510 Overland Ave., Suite 1[illegible]

San Diego, CA 92123

Phone: [illegible] Fax: [illegible]

Email: Kenneth.Liddell@sdcounty.ca.gov

Billing Address: same as above

Project ID: Inland Surface Water Monitoring

Project #: Contract #:

Requested Analysis

ID #	Client Sample ID	Sample Event ID	Sample Date	Sample Time	Sample Matrix	Container # / Type	Selenium, total and dissolved	Iron, total only	Manganese, total and dissolved	Sulfate	Aluminum, total only																	
1					SW	2P																						
2					SW	2P																						
3					SW	2P																						
4					SW	2P																						
5					SW	2P																						
6					SW	2P																						
7					SW	2P																						
8					SW	2P																						
9					SW	2P																						
10					SW	2P																						

Matrix: [illegible]

WW = Wastewater, [illegible]

Shipped By: [illegible]

Turnaround Time: Same Day [illegible]

Reporting Requirements: [illegible]

Sample Disposal: [illegible]

Sample Integrity

Correct Containers: Yes No N/A	Containers Properly Preserved: Yes No N/A
Custody Seals Intact: Yes No N/A	Temp @ Receipt:
COC/Labels Agree: Yes No N/A	Sampled By: Client EMA [illegible]

Project/Sample Comments:

RELINQUISHED BY	DATE/TIME	RECEIVED BY
Signature		Signature
Print		Print
Company		Company
Signature		Signature
Print		Print
Company		Company
Signature		Signature
Print		Print
Company		Company

[illegible]

[illegible]

[illegible]

Appendix X

Step By Step Guide To Entering Field Data Sheets into Database

Before Starting

1. Organize the field sheets by sample event ID number.
2. Review each field sheet for accuracy and understanding of the chain of events.

Database Entry Procedures

1. Open the Special Projects Database
2. Click on [Enter field screening data for a sampling event]
3. Check that your keyboard has **"numbers lock" ON**!!!! (very important)
4. Begin entering data. If a field is not completed on the field sheet leave it blank in the database. Once you have completed entering the data for that record, click on "Site ID" to scroll to next page (click on arrow at bottom of page).
5. Initial and date the top right hand corner of all entered field data sheets and place them in the Inland Surface Water Monitoring field data sheet binder.

Appendix XI

Department of Public Works Road Service Request form (to be filled out online)

Roads Service Request

San Diego County Department of Public Works

If this is an emergency, and it is after hours or on a weekend or holiday, call the San Diego County Sheriff Dispatcher at 858.565.5262

Where is the problem? Choose an Unincorporated Community

Exact Problem Location (Address/ Cross streets):

The problem is with:

Streets–Choose One **If Other:**
(If Street Lights selected, please indicate type of pole: wood, metal concrete in box above)

Drainage--Choose One **If Other:**

Signs--Choose One Type of Sign--Choose One **If Other:**

Roadside–Choose One **If Other:**
(If Street Lights selected, please indicate type of pole: wood, metal concrete in box above)

Enter your comments in the space provided below:

Tell us how to get in touch with you:

Name*
E-mail*
Tel*
FAX
Address*

Appendix XII

Potential Inland Surface Water Monitoring Sample Site Locations

Station ID	Location Description	Watershed	HSA	Latitude	Longitude	TB Page	TB Grid
CAR02	Escondido Creek @ East County Club Drive	Carlsbad	904.62	33.09901	-117.13047	1129	C6
CAR04	San Marcos Creek @ Discovery Street	Carlsbad	904.52	33.13046	-117.20045	1128	D2
CAR16	Agua Hedionda Creek @ Oleander Ave.	Carlsbad	904.32	33.15629	-117.21513		
SDG05	San Dieguito River @ El Apajo (end)	San Dieguito River	905.11	32.99948	-117.20550	1168	D6
SDG08	Green Valley Creek @ Rancho Bernardo Road	San Dieguito River	905.11	33.01962	-117.11974	1169	E3
SDG09	Felicita Creek @ Quiet Hills Farm Road	San Dieguito River	905.23	33.07326	-117.08373	1149	J2
SDR07	Forrester Creek @ Greenfield Drive	San Diego River	907.13	32.80826	-116.91151	1252	C3
SDR08	Los Coches Creek @ I-8 Business Route	San Diego River	907.14	32.83599	-116.90040	1232	D7
SDR10	San Diego River @ Riverford Road	San Diego River	907.12	32.85653	-116.94730	1231	H4
SDR20	San Vicente Creek @ Wildcat Canyon Road	San Diego River	907.23	32.99628	-116.84387	1173	A5
SLR17	Keyes Creek @ Dunlin Road	San Luis Rey River	903.12	33.32384	-117.15723	1048	H3
SMG07	Sandia Creek @ Sandia Creek Drive (at USGS station)	Santa Margarita River	902.22	33.42460	-117.24904	997	F3
SMG08	De Luz Creek @ De Luz Road (Mile Marker 8 @ private driveway)	Santa Margarita River	902.21	33.42184	-117.32179	996	G4
SMG09	Santa Margarita River @ SDSU Ecological Reserve Entrance	Santa Margarita River	902.22	33.42839	-117.19561	998	C3
SWT03	Sweetwater River @ Plaza Bonita Road	Sweetwater River	909.12	32.65069	-117.06374	1310	D4

Station ID	Location Description	Watershed	HSA	Latitude	Longitude	TB Page	TB Grid
TIJ01	Cottonwood Creek @ Old Highway 80 (Bridge Crossing)	Tijuana River	911.61	32.78844	-116.49732	430	A6
TIJ02	Pine Valley Creek @ Old Highway 80 and Pine Valley Road	Tijuana River	911.41	32.83776	-116.53725	1237	A5
TIJ07	Cottonwood Creek @ Marron Valley Road	Tijuana River	911.82	32.57288	-116.75798	429	J10
TIJ09	Tecate Creek @ Mexican Border Fence	Tijuana River	911	32.57737	-116.61643	429	K10