Southwest Florida Water Management District

Data Collection Bureau
Water Quality Monitoring Program

STANDARD OPERATING PROCEDURES FOR THE COLLECTION OF WATER QUALITY & BIOLOGICAL SAMPLES

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STATEMENT OF INTENT

It is the intent of the Water Quality Monitoring Program (WQMP) at the Southwest Florida Water Management District (District) to collect water quality and biological samples in a manner consistent with Florida Department of Environmental Protection (FDEP) Standard Operating Procedure (SOP) FDEP-SOP–001/01, Rule 62-160.800 Florida Administrative Code (F.A.C.) and/or with procedures described in this manual.

INTRODUCTION

The WQMP is a program within the Data Collection Bureau (DCB) at the District. The Data Collection Bureau is responsible for the collection, management, and analysis of water resource, geographic information, and land surveying data. The principal function of the WQMP is water quality sampling, data analysis, and reporting for ground and surface water monitoring efforts designed to assess the District's water resource quality (see Detail 1 for WQMP Personnel Organization Chart). This SOP manual is intended to describe in detail the procedures used by the WQMP to collect water quality samples for the various monitoring projects currently funded. This manual will be the guidance document for the collection of water quality data within the WQMP. Updates will be made on an annual basis to document the evolution of sampling procedures and new monitoring projects.

WATER QUALITY MONITORING PROJECTS

The WQMP is currently involved in 17 water quality monitoring projects. Table 1 is a listing of the period of record, funding source, project coordinator, and data manager for each of the current water quality monitoring projects.

The projects listed in Table 1 are funded by the District and do not have specific Quality Assurance Project Plans. Instead, these projects follow the District Comprehensive Quality Assurance Plan that is created by the District Laboratory and approved by FDEP. This type of plan is generally very broad in scope and does not list detailed sampling methods, so there is a need for the WQMP to document detailed sampling methods for each project.

This manual will be used in two ways. First, it will be used to list specific procedures for the collection of water quality samples thereby eliminating variability between field sampling techniques. Secondly, this document will be used as a reference source for field technicians as well as a training manual for new field staff and District cooperators.

Table 1. Period of Record, Funding Source, and Project Coordinator for Current Water Quality Monitoring Projects

Project	Period of Record	Funding Source	Project Manager / Data Manager
Coastal Groundwater Quality Monitoring Network and Water Use Permit Water Quality Monitoring Network	1991-present	District	Kristina Mallams
Springs Water Quality Network	1992-present	District	Kristina Mallams
Ambient Lakes Water Quality Monitoring Network	1999-present	District	Trevor Fagan
Lake Panasoffkee Water Quality Monitoring Network	2000-present	District	Trevor Fagan
Stream Water Quality Monitoring Network (as of October, 2013, this project includes Rainbow River, Coastal Rivers, Kings Bay)	1997-present	District	Trevor Fagan
Shell, Prairie & Joshua Creek Watersheds Water Quality Monitoring Network	2001-present	District	Chris Zajac Trevor Fagan
Upper Floridan Aquifer Nutrient Monitoring Network	2004-present	District	Kristina Mallams
Upper Peace River Groundwater Quality Monitoring Network	2006-present	District	Kristina Mallams
Lake Tsala Apopka Water Quality Monitoring Network	2006-present	Withlacoochee Basin	Trevor Fagan
Rainbow River MFL	2013-present	District	Trevor Fagan
Lower Hillsborough River MFL Recovery	2012-present	District	Sean King Trevor Fagan
Chassahowitzka River MFL	2014-present	District	Mike Heyl Trevor Fagan
Myakka River Watershed Initiative (Flatford)	2001-present	District	Lisann Morris Trevor Fagan
Lake Hancock Outfall Treatment	2013-present	District	Janie Hagberg Trevor Fagan
Shell Creek Freshwater MFL	2012-present	District	Trevor Fagan
Kings Bay/Crystal River MFL	2014-present	District	Xinjian Chen Trevor Fagan
Springs Coast Offshore WQ Monitoring	2015-present	District	Sky Notestein Trevor Fagan

DATA MANAGEMENT

The management of water quality data collected by the WQMP is performed both internally by staff within the WQMP section as well as by the ADAPT/EDMS system maintained by the District Laboratory. Strict protocols have been established to ensure that all data are thoroughly reviewed and Quality Assurance (QA)/control checks are completed prior to release of the data files. The following sections explain the QA protocols utilized for the management of data collected by the WQMP.

Field Data

Data are collected by field technicians throughout the workweek using field computers, or by manually recording data on handwritten field sheets. Each field computer data file is downloaded on a bi-weekly schedule, and placed in a database compatible format. Handwritten field data are entered on an office personal computer in a database compatible format. Field data files are then sorted into discrete files by project name. A manual check is performed to ensure that the correct stations have been entered into the field data file and that typographical errors have not been made. This check also includes a comparison of paper copy field sheet entries versus database entries. At this time any pertinent field comments or data qualifier codes are also added to the database. An automated QA check is then performed to validate sample collection attributes against those logged within the District's laboratory information management system. These attributes include but are not limited to such things as sample collection date, sample collection time, sample identification (ID), shipping batch ID, and site ID. Any inconsistencies found are then researched, documented, and corrected. The data are then exported in an Environmental Data Management System (EDMS) deliverable format to the District's Laboratory staff for merging with laboratory data within EDMS. The EDMS field data deliverables compatible format is given in Table 2.

Laboratory Data

Laboratory sample tracking and data analysis entry for District analyzed projects occurs within the laboratory information management system. Once the laboratory has completed water quality analyses for a particular event the data are exported from the laboratory information management system to be held within the Automated Data Management Processing Tool (ADaPT). Within ADaPT, data value qualifier codes are assigned and Method Detection Limit (MDL) values for all parameters that fall below detection limits are attached to the data set. A description of value qualifier codes used is given in Table 3. Laboratory data can now be exported to EDMS for merging with field data provided by the WQMP.

Once the data are merged, and any necessary results have been qualified, QA checks are performed within EDMS. The EDMS program runs event checks for equipment blank values that exceed the MDL for any parameter. The program also compares duplicate parameter values to the original sample values and identifies value comparisons that exceed a 20 percent relative percent difference.

Table 2. Field Data Deliverable Format

Data Element Name	Data Type	Required	Description
LOCATION CODE	TEXT (80)	Yes	Location where the sample was taken
CLIENT SAMPLE ID	TEXT (35)	Yes	Client's identifier for a sample
SAMPLE DEPTH	TEXT (15)	No	Sample collection depth
DEPTH UNITS	TEXT (15)	No	Depth units
PROJECT NUMBER	TEXT (30)	Yes	Number assigned by the client to associate a sample to a project
PROJECT NAME	TEXT (90)	Yes	Project name assigned by the client
PROGRAM TYPE	TEXT (20)	Yes	Type of program, e.g., experimental or monitoring
SAMPLING METHOD	TEXT (80)	Yes	Use FDEP Field SOP number
SAMPLE COLLECTION TYPE	TEXT (SVL)	Yes	Sample collection type (grab, composite, etc.)
MATRIX ID	TEXT (20)	Yes	Sample matrix as listed in SVL
FIELD MEASUREMENT METHOD	TEXT (75)	No	Method used in measuring field parameter
FIELD PARAMETER NAME	TEXT (60)	No	Name of field parameter
RESULT	TEXT (10)	No	Result for the field parameter measured
RESULT UNITS	TEXT (10)	No	Units for field parameter result
FIELD PARAMETER QUALIFIER CODE	TEXT (7)	Conditional	Qualifier for field parameter result
FIELD PARAMETER COMMENTS	TEXT (200)	If Applicable	Information about a specific line of field data
FIELD COMMENTS	TEXT (200)	If Applicable	Information about the field sample for which no specific field data has been designated
FLOW	REAL	No	Water flow measurements at the time of sampling
FLOW UNITS	TEXT (7)	No	Flow units
WEATHER	TEXT	No	Weather conditions at time of sampling
SAMPLING PERSONNEL	TEXT (40)	Yes	Person collecting the sample
COLLECTION AGENCY	TEXT (20)	Conditional	Agency collecting the sample
BEGIN DATE COLLECTED	DATE/TIME	Yes	Date and time sample collection began. This field is optional for grab samples
END DATE COLLECTED	DATE/TIME	Yes	Date and time sample collection ended
SHIPPING BATCH ID	TEXT (25)	Yes	Unique identifier assigned to a cooler or group of coolers or shipping containers that link samples together
LATITUDE DEGREES	NUMBER (2)	Optional	The degrees portion of the angular distance on a meridian north or south of the equator
LATITUDE MINUTES	NUMBER (2)	Conditional	The minutes portion of the angular distance on a meridian north or south of the equator
LATITUDE SECONDS	REAL	Conditional	The seconds portion of the angular distance on a meridian north or south of the equator
LONG DEGREES	NUMBER (2)	Conditional	The degrees portion of the angular distance on a meridian east or west of the prime meridian
LONG MINUTES	REAL	Conditional	The minutes portion of the angular distance on a meridian east or west of the prime meridian

Table 2. Field Data Deliverable Format Continued

Data Element Name	Data Type	Required	Description
LONG SECONDS	REAL	Conditional	The seconds portion of the angular distance on a meridian east or west of the prime meridian
LOCATIONAL COLLECTION METHOD	TEXT (4)	Conditional	The method or mechanism used to derive the measurements
MAP SOURCE SCALE	NUMBER (8)	Optional	If the measurement was derived from a map, the scale of the map series used
LOCATIONAL DATA COLLECTOR	TEXT (30)	Conditional	Name of the person taking the locational measurement
LOCATIONAL DATA COLLECTION DATE	DATE/TIME	Conditional	Date and time on which the locational measurement was taken
COORDINATE ACCURACY LEVEL	NUMBER (1)	Optional	The measured, estimated, or deduced degree of correctness of the measurement
DATUM	TEXT (10)	Conditional	The horizontal reference for measuring locations on the earth's surface
OBJECT OF INTEREST	TEXT (25)	Conditional	The entity of interest (the thing regulated, permitted, or tracked)
RELATION POINT TO OBJECT OF INTEREST	TEXT (5)	Conditional	What the point defined by the latitude and longitude coordinates represents relative to the object of interest (exact location, center of the lake/facility, etc.)
VERIFIER NAME	TEXT (30)	Conditional	The name of the person verifying the measurement, if available
VERIFIER DATE	DATE/TIME	Conditional	Date and time on which the verification was performed
UPPER INTERVAL MEASUREMENT	NUMBER(5)	Conditional	Upper interval depth of the sample. Case depth when sampling a well.
LOWER INTERVAL MEASUREMENT	NUMBER(5)	Conditional	Lower interval depth of the sample. Total depth when sampling a well.
UPPER LOWER DEPTH UNITS	TEXT(15)	Conditional	Units for the upper and lower depth measurements.

Table 3. Data Value Qualifier Codes and Descriptions

Values	Description
A	Value reported is the average of two or more determinations.
B	Results based upon colony counts outside acceptable range.
D	*Test results are reported on samples without distillation.*
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
J	Estimated value, value not accurate 1. Surrogate recovery limits have been exceeded. 2. No known quality control exists for the component. 3. The reported value failed to meet the established quality control criteria for either precision or accuracy. 4. The sample matrix interfered with the ability to make an accurate determination. 5. The data is questionable because of improper laboratory or field protocols. 6. The total measurement for a component is exceeded by another component. The error limits for each measurement overlap.
L	Actual value is known to be greater than the value given.
N	*This test is not NELAC certified by this laboratory.* *1. Certification not requested/required by client.* *2. Certification not available through NELAC.* 3. *An E.P.A. Region IV variance is on file for the use of this method.*
O	Sampled but analysis lost or not performed. Reported value shall be 0.
Q	Sample held beyond the accepted holding time.
T	Value reported is less than the laboratory method detection limit. The value is reported for informational purposes only and shall not be used in statistical analysis.
U	Indicates that the compound was analyzed for but not detected. The reported value shall be the method detection limit.
V	Indicates that the analyte was detected in both the sample and any of the associated blanks, at similar concentrations.
Y	The laboratory analysis was from an unpreserved or improperly preserved sample.
Z	Too many colonies were present (TNTC)

Note: Italicized descriptions deviate from EPA and/or FDEP QAS descriptions

Quality Assurance Reports

Quality Assurance Reports are generated by the project manager on a quarterly basis. This report summarizes any QA actions and checks that were performed for the event. This includes the results of equipment blanks, duplicates, significant problems, corrective actions, and any additional comments that are pertinent to the quality of the data. These reports are kept with the project files.

Data Storage

Qualified data files are held in EDMS. Data will also be exported to the Water Management Information System (WMIS) and reformatted and exported to FDEP's Storage and Retrieval Database (STORET). The use of multiple storage venues ensures that the data is easily accessible for data requests by District and outside agency staff as well as the public.

WQMP GROUNDWATER PROJECT DESCRIPTIONS

Coastal Groundwater Quality Monitoring Network
Project Number: P078

PURPOSE

The Coastal Groundwater Quality Monitoring Network (CGWQMN) was developed to determine the quality of groundwater in coastal regions of the District. Primary use of the data is to track any apparent landward movement of salt-water resulting from major agricultural, industrial, and municipal groundwater withdrawals. The network is also designed to monitor up-coning of sulfate rich waters in coastal areas and limited inland areas.

PROJECT DESCRIPTION

Approximately 205 wells in the CGWQMN are sampled once each year between the months of December and March. A sub-network of 75 wells (chosen from the original list of 205 wells) are sampled two additional times in May and September. Wells are placed in discrete sample "runs" based on geographical location. The project beginning and ending dates will be determined by the section manager or project coordinator and will be posted on the sampling schedule board.

Table 4 lists field and laboratory parameters collected for the CGWQMN projects, as well as field filtration and acidification protocols.

Table 4. CGWQMN/WUPNET - Field, Laboratory Parameters and Bottle Types

Field Parameters	Lab Parameters	Kit Composition
Temperature (C) pH (SU) Specific Conductance (uS/cm)	SO_4, Cl, SiO_2, Alkalinity, TDS - analyzed for CGWQMN only, Fe, Sr, Na, Mg, Ca, K, Fluoride	500mL, plastic, not filtered, no preservation 250mL, plastic, filtered, preserved w/HNO_3 to < 2 250mL, plastic, filtered, no preservation

Water Use Permitting Groundwater Quality Monitoring Network
Project Number: P078 (incorporated into CGWQMN as of Fiscal Year 12)

PURPOSE

The Water Use Permitting Groundwater Quality Monitoring Network (WUPNET), located in the Southern Water Use Caution Area (SWUCA), was developed to upgrade the quality of data obtained from permitted irrigation and public supply wells. Well permit conditions require that permittees provide water quality information about their wells to the District. Historically, data received for some of the permitted wells have not been reliable. This network provides a continuous, reliable data collection effort which will assist with water resource management decisions. In fiscal year (FY) 2012 the WUPNET was fully incorporated under the CGWQMN due to the similar scopes/purposes of both networks.

PROJECT DESCRIPTION

Wells which are sampled for the WUPNET have been chosen using statistical techniques to determine distance between wells and sampling frequency. Monitoring of WUPNET is done concurrently with the CGWQMN and is performed by the WQMP with analyses done by the District Laboratory. Approximately 166 wells in the WUPNET are sampled once each year during the months of January, May, or September.

Table 4 lists field and laboratory parameters collected for the WUPNET project, as well as field filtration and acidification protocols.

Springs Water Quality Network
Project: P889

PURPOSE

Increasing nitrate levels in both inland and coastal-area springs within the District are of great concern because these springs contribute large quantities of water to local spring runs and rivers that drain into the Gulf of Mexico. Increased nitrate levels have the potential to affect aquatic ecosystems by stimulating the growth of nuisance aquatic vegetation. In addition, increasing nitrates in springs are indicative of increasing nitrate levels in the groundwater of inland areas where the spring water originates. The primary goal of the Springs Water Quality Network is to track nitrate concentrations with the long-term goal of establishing a nitrate management plan in the spring recharge areas.

PROJECT DESCRIPTION

Approximately 54 springs located throughout the District are sampled on a quarterly basis in the months of January, April, July, and October. An additional 12 springs are included with each July sampling event and 3 were added to the January event. Water quality analyses for this project are performed by the District Laboratory.

An attempt is made to sample tidally influenced springs during the low-tide cycle. The schedule of estimated beginning and end sample project dates will be determined by the field technician supervisor or project coordinator and posted on the sampling schedule board.

Table 5 lists field and laboratory parameters collected for this project, as well as field filtration and acidification protocols.

Table 5. Springs Water Quality Network - Field, Laboratory Parameters and Bottle Types

Field Parameters	Lab Parameters	Kit Composition
Temperature (C) pH (SU) Specific Conductance (uS/cm) Dissolved Oxygen (mg/L)	NH3, OPO4, NO2, NO3, SO4, K, Na, F, TDS, Cl, Mg, Ca, Fe, Alkalinity, Turbidity, Color, Total N, TPO4, TOC	500mL, plastic, not filtered, no preservation 250mL, plastic, filtered, preserved w/HNO3 to < 2 500mL, plastic, filtered, no preservation 250mL, plastic, filtered, preserved w/H2SO4 to < 2 40mL, amber glass, not filtered, preserved w/H2SO4 to < 2

Upper Floridan Aquifer Nutrient Monitoring Network
Project: P087

The Upper Floridan Aquifer Nutrient Monitoring Network (UFANMN) will be used to track regional trends of nitrates in the Upper Floridan Aquifer system, within the highly vulnerable areas of the Coastal Springs recharge basins. Data from this network may also assist with assessing the overall effectiveness of Best Management Practices (BMPs). Selection of the monitoring wells is based on a spatial analysis of historical nitrate data. Once expansion is complete, the network will consist of approximately 120 wells and include all of the major spring group recharge basins.

PROJECT DESCRIPTION

The well network currently consists of 96 monitoring wells in the Homosassa, Chassahowitzka, Rainbow, Weeki Wachee, Kings Bay and Aripeka spring recharge basins with open intervals in the Upper Floridan Aquifer system. The wells are each sampled once a year. The District Laboratory performs all the chemical water quality analyses for the UFANMN.

Table 6 lists the field and laboratory parameters collected for the UFANMN. as well as field filtration and acidification protocols.

Table 6. Upper Floridan Aquifer Nutrient Monitoring Network – Field and Laboratory Parameters

Field Parameters	Lab Parameters	Kit Composition
Temperature (C) pH (SU) Specific Conductance (uS/cm) Dissolved Oxygen (mg/L) Turbidity, Field (NTU)	NH3, OPO4, NO2, NO3, SO4, K, Na, F, TDS, Cl, Mg, Ca, Fe, Alkalinity, Turbidity, Color, Total N, TPO4, TOC	500mL, plastic, not filtered, no preservation 250mL, plastic, filtered, preserved w/HNO3 to < 2 500mL, plastic, filtered, no preservation 250mL, plastic, filtered, preserved w/H2SO4 to < 2 40mL, amber glass, not filtered, preserved w/H2SO4 to < 2

Upper Peace River Groundwater Quality Monitoring Network
Project: P545

PURPOSE

The Upper Peace River Groundwater Quality Monitoring Network was developed to examine if the influx of surface water from the Peace River into the Upper Floridan Aquifer (UFA) is bringing in excessive amounts of bacteria. This project is also examining if the influx of surface water into the UFA is liberating arsenic from pyrite found within limestone, which may be a result from the injection of surface water during aquifer storage and recovery.

The wells selected for this project are also a part of the Upper Peace River Karst Investigation. This project consists of nine monitor wells at three separate sites along the Peace River near Bartow, Florida.

PROJECT DESCRIPTION
The full network includes wells that are sampled semi-annually while two of the wells are sampled quarterly for the Upper Peace River Groundwater Quality Monitoring Network. Chemical water quality analyses are performed by ALS Environmental (Jacksonville, Florida).

Table 7 lists the field and laboratory parameters collected for the Upper Peace River Groundwater Quality Monitoring Network.

Table 7. Upper Peace River Groundwater Quality Monitoring Network – Field and Laboratory Parameters

Field Parameters	Lab Parameters	Kit Composition
Temperature (C) pH (SU) Specific Conductance (uS/cm) Dissolved Oxygen (mg/L) Turbidity, Field (NTU)	NH3, OPO4, NO2, NO3, SO4, K, Na, F, TDS, Cl, Mg, Ca, Fe, Alkalinity, Color, Total N, TPO4, TOC, NO2+NO3, Sulfide, Strontium, Arsenic, Total Coliforms, Fecal Coliforms	Sample bottles provided by ALS Environmental

Shell, Prairie & Joshua Creek Watersheds Water Quality Monitoring Network

For information on the groundwater component of the Shell, Prairie & Joshua Creek (SPJC) Watersheds Water Quality Monitoring Network refer to the SPJC section of the Resource Data / WQMP Surface Water Project Descriptions.

GROUNDWATER PROJECTS - FIELD SAMPLING PROTOCOLS

COASTAL GROUNDWATER QUALITY MONITORING NETWORK and WATER USE PERMIT WATER QUALITY MONITORING NETWORK
SPRINGS WATER QUALITY NETWORK
UPPER FLORIDAN AQUIFER NUTRIENT MONITORING NETWORK
UPPER PEACE RIVER GROUNDWATER QUALITY MONITORING NETWORK
SHELL, PRAIRIE & JOSHUA CREEK WATERSHEDS WATER QUALITY MONITORING NETWORK

Project Initiation
Approximately two weeks prior to the beginning of any groundwater quality sampling event, a well list is posted in the technician area. This list is comprised of the following information for all wells scheduled to be sampled for that event: run number, station name, District Site Identifier (SID), and county the well is located in. This list also includes a column to record the date of sample collection for each well, the initials of the technicians performing the sample collection, and the depth to water value collected prior to the well purge. For some projects, the same list will also be produced for addition into the site characterization books. Field staff will check wells off both lists immediately after sampling has been completed at the end of each work day (lists contained in the characterization books should be updated immediately after the well(s) has been sampled).

Sample Kits

Depending on the project, sample kits/bottles are obtained by the WQMP either directly from a vendor or from the contracted laboratory. Bottles for District kits will be ordered in bulk and stored in the clean equipment room until kits are to be made. Upon delivery to the WQMP, sample kits/bottles are inspected for cleanliness and the appropriate number of bottles and bottle types. Once assembled, sample kits are stored in the WQMP technician room in kit bins which have the designated project names displayed on the outside; field staff obtain sample kits/bottles from these bins.

Sample Equipment

The necessary equipment, paper work, and miscellaneous supplies needed for groundwater sample collection are listed below. This can be used by field staff as a general check-off list to insure that all required items are taken to the field each work day. A complete listing and pictorial description of sample collection and field equipment used by the WQMP can be found in Details 2 and 3.

1. Well characterization books and pre-printed sample bottle labels (if labels are missing, see field technician supervisor and/or project manager)
2. Field computer (including power cords and adaptors) for the recording of field measurements and relative comments and for checking historical results
3. Clipboard which includes the following:
    a. Water level instrumentation forms
    b. Groundwater field sheets (for use if field PC is inoperable or site is new)
    c. Calculator, writing pens, indelible labeling pens and markers
    d. Custody sheets (if needed)
    e. Federal Express bills (if needed)
    f. Spare bottle labels
4. Truck bin which includes the following:
    a. 1,000mL LDPE Nalgene containers each of pH 4,7, and 10 standards
    b. 1,000mL LDPE Nalgene containers each of at least two conductivity standad solutions (standards should bracket historical conductivity values for the wells to be sampled)
    c. 142mm/0.45um filter papers for tripod filter
    d. Multiprobe calibration cup (for mid-day check and/or field reference samples)
    e. Acid (HNO_3, H_2SO_4,) and pH litmus paper
    f. Freezer packs or ice may be placed in the bin during summer months
5. Acid waste container
6. Sample bottles (include at least one extra set)
7. Cooler(s) with temperature control bottle(s)
8. YSI multiprobe meter (in-house or field calibrated) with display unit and back-up
9. YSI user's manual
10. Turbidity meter (turbidimeter)
11. Five-gallon bucket (to measure discharge rates of pumps and flowing wells)
12. Field reference samples (if assigned)
13. Sample pump(s) and hoses - based upon wells to be sampled
14. Pump head – if sampling springs
15. Purge pump(s) and hoses - based upon wells to be sampled
16. Five gallons of de-ionized water (an extra 20 gallons if an equipment blank will be performed) **with all carboy spigots covered with protective bags**
17. Equipment blank cylinder (if a blank will be performed)
18. YSI meter flow cell and clear flow tubing
19. Tripod filter apparatus
20. Citrus canker de-con spray and supplies (for site access involving travel through citrus groves)
21. Generator(s)

22. Electronic water level indicator tape
23. Non-powdered latex gloves
24. Digital camera
25. Well fittings (T-valves, Y-valves)
26. Zip-lock plastic bags
27. Gas can(s)
28. Tool box
29. Duct tape
30. Phone/radio (must be turned on prior to leaving office)
31. Stop watch
32. Liquinox, scrub brushes
33. First aid kit
34. Trash bags
35. Garmin
36. Rope
37. Copy of the WQMP SOP Manual

Sample-Run Initiation

Field technicians are scheduled to perform tasks based upon the WQMP weekly schedule prepared by the field technician supervisor. When a specific project is assigned, field technicians pick an "active" sample run or, if no runs are active, choose which run they would like to start. This is done the night prior to the scheduled sampling day, the morning of the sampling day, or a combination of both. The sampling run selection is based upon:

1) Active runs which need to be completed
2) Equipment availability (purge pumps, etc.)
3) Status of call-ahead wells (i.e. property access permission)
4) Number of technicians needed to complete well sampling (i.e. one person wells versus two person wells) as noted on site characterizations)
5) Date well was last sampled (60-day separation preferred for CGW/WUPNET)

Once the sampling run for the day has been established, field staff load the necessary equipment (see sample equipment list) in their pre-assigned vehicle.

Site Arrival

If possible, the sampling vehicle should be parked at the well site in a location that will not be influenced by accumulated purge water. If the site is located on a roadside, extra care should be taken to park in a safe location. When possible, park the truck behind a guard rail or as far off the road as possible. The vehicle should also be oriented so that the field computer, field meters, and flow cell are not in direct sunlight. Finally, the sampling vehicle should be parked with care so that landscaping/personal property is not damaged.

Note: If sampling site is located within or accessed through a citrus grove, staff must follow the District's citrus canker sanitation protocol prior to entering property (see Detail 12).

The first step in sampling procedures once field staff arrive at a well-site is the identification of the well(s). Most wells sampled by the WQMP are labeled inside the shelter; this should be used as the primary means of identification. Wells can also be identified based upon descriptions and maps located in the project characterization books. Regardless of the method employed, both members of the sampling crew need to verify that the proper well has been located prior to the start of sampling procedures. In the event the well is to be sampled by a single person, the well identification needs to be double checked by that person. **Proper identification of the well is a critical step in the sampling process.**

Multiple wells at a site will be sampled from shallowest to the deepest, with the purge water directed away from the site. This is done to prevent the influence of purge water from a deeper well to a shallower well (especially important when sampling unconfined, shallow wells).

Once a visual verification of the wells to be sampled has taken place, the field computer is turned on and the program "ELB.Net" is selected. "Ground Water Sampling" is chosen from the main menu and the site is looked up in the computer and selected. Site identifiers should be double checked against the information on the well or within the well shelter, characterization sheets, and bottle labels to make sure all correspond and the correct site has been chosen in the field computer. General information such as weather is also entered in the field computer. See the well purge section for further details on how to begin a well purge, enter field data and sample collection information within ELB.Net.

If the field computer is not available, all site information and readings should be recorded on a paper copy field sheet (see Detail 14 for example form). Any corrections made to documentation should not obliterate the original entry. To make a correction, draw a line through the item to be corrected, write in the correct value next to the lined-out item, and initial and date the change.

Site Set-Up

The next steps in the sampling procedure are recording of the water level, set-up of the purge pump and set-up of the field meters. These steps are generally done simultaneously by a two-person sample crew.

Note: For springs, it is necessary to take a depth to vent reading (when possible) in meters, to be entered in the site description screen of the ELB.Net. When it is not possible to see the vent, the depth at which the pump head is set for sampling should be entered.

Depth to Water Measurement

The depth to water measurement is usually done with an electronic water level tape. Readings are measured to the nearest 100^{th} of a foot (two decimal places). Readings are to be taken from a known measurement point at the top of the well casing. This point should be identified by a notch in the casing or markings on the well shelter floor. If no measuring point is identifiable, note the point from which the water level was obtained (i.e. north edge of casing) in the field computer and on the characterization.

Two water levels will be taken, the values averaged, and the average value recorded in the field computer. If there is a difference between the readings of more than .02 feet, at least two additional readings need to be taken to determine an accurate water level. The tape should be raised above the water level in the well and then slowly lowered into the water for each reading. Readings and equipment information (i.e. agency owner and condition) will be recorded on a Water Level Instrumentation Log (see Detail 14 for example form) and the site characterization will be updated with the most current water level recorder information if necessary.

Note: Flowing wells, wells with in-place pumps, and springs assume a depth to water of zero feet for the purposes of calculating purge volumes.

Once the depth to water measurement has been obtained, any water level recording instrumentation will need to be removed to access the well bore. See Detail 4 for detailed instructions on the removal of this equipment.

Purge Pump Set-up

A description of each purge pump used by the WQMP can be found in Details 2 and 3. Based upon the depth to water, the total depth of the well, and the diameter of the well, the purge volume is automatically calculated in the field computer. The proper purge pump based on the purge amount, as well as the expected yield (often based on the aquifer the well penetrates) is chosen. This decision is also based upon what purge pump has been used historically at the well. **It is important to attempt to use the same purge pump at a similar pumping rate as what has been used historically. Check the site characterization for the pump normally used.**

Note: If the field computer is not available during the purge pump set-up, please see Detail 5 for instructions on manually calculating the total well volume and purge time.

The first and most important protocol is to insure that all equipment which goes down the well is properly secured. All reasonable precautions should be made to prevent loss of equipment down the well bore. When using submersible pumps the hose, power supply line and safety line should be secured together in 20-30 foot increments with duct tape.

The pump can then be lowered down the well bore. The pumphead should typically be set five feet below the water level. However, on wells that historically have had drawdown problems, the pump can be set to the depth where the drawdown problem is alleviated. This depth is based upon historical notes which are added to the well characterizations. All electrical connections between pumps and generators need to be kept dry and away from main walking areas. When a generator is used it should be kept as far away from the well and sample area as possible. **Submersible pumps which are powered by a generator will never be lowered down a well while the generator is running.**

Purge equipment needs to be clean; this includes being free of dirt and grass. Groundwater pumps used to collect samples for volatile organic compounds, pesticides, herbicides, bacteria, etc. require strict decontamination cleaning procedures. Strict field equipment/pump cleaning is not required for the majority of WQMP groundwater projects. A thorough rinse of internal and external pump parts (as well as flushing the internal parts of the pump with purge water) is a sufficient cleaning regime. **Field staff are required to visually inspect the equipment to ensure that proper securing and cleaning procedures have been performed.**

The WQMP has a day each month designated solely to the cleaning of all sampling equipment and sampling vehicles. Protocols which are followed on cleaning day can be found in Detail 6.

Note: Protocols for purge pump set-up and depth to water measurements are eliminated on wells with in- place pumps, flowing wells, and springs.

Field Meter Calibration

The YSI multiprobe to be used will be calibrated prior to leaving the office or prior to use in the field. A mid-day check on pH, conductance and DO (mg/L) will also be performed. Detailed procedures and example screenshots for the calibration of these multiprobes can be found in Details 7 and 14. Detailed procedures for interface with the ELB.Net can be found in Detail 8.

Note: If for any reason a meter fails calibration or does not perform accurately in the field, a maintenance request form explaining the nature of the failure will be turned in along with the failed meter to the meter maintenance technician at the end of the workday. A copy of this maintenance request form will also be turned into the field technician supervisor's mail bin. The WQMP has a designated field technician who is responsible for the maintenance, repair, and ordering of replacement parts for YSI multiprobes. In addition, this technician also has the responsibility of performing all monthly calibration checks on the various probes. A complete list of these responsibilities can be found in Detail 7.

A complete listing of all WQMP field meters and field measurement equipment is given in Detail 9. If a meter fails calibration or is suspect in any way, it must be replaced with the backup meter and noted in the field computer. A Meter Failure Report should be completed and given to the meter maintenance technician. Meters used are chosen in the field computer using the make, model, and WQMP meter ID number (i.e. YSI XLM004).

Note: All multiprobes should be transported in the cab of the sampling vehicle, and secured in a manner that will reduce vibration of the probes.

Field Reference Samples (FRS) for pH and specific conductance will be analyzed periodically. These are “blind” standards with an unknown value, supplied by the United States Geological Survey (USGS) or the District Laboratory. Following meter calibration, measurements of the FRS are taken in the field and the results submitted to the field technician supervisor. If any meter has results from a FRS returned as unsatisfactory, the meter will be immediately pulled from field use and not returned until maintenance or repair has been performed. A copy of the failing reference sample sheet will also be turned into the field technician supervisor’s mail bin.

Well Purge

The well purge begins once the purge discharge is relatively constant and has been measured. The discharge measurement is calculated in gallons per minute (gpm) using a five gallon bucket by measuring the amount of time it takes to fill the bucket (or by using a flow measuring device). For low volume wells where a low-discharge pump will be used, it is not necessary to fill the entire five gallons. Instead, the amount purged over a one-minute period can be estimated. For fixed rate pumps, such as the peristaltic (0.25 gpm), the purge does not need to be measured, it can be listed as the discharge which is expected from these pumps.

Once the purge rate has been established it is entered into the field computer and the field computer calculates the purge volume. If a field computer is unavailable, the purge rate should be entered into the hard copy field sheet and the purge volume calculated using the instructions in Detail 5. The discharge end of the purge line must be fitted with a “Y” to divert a portion of the discharge to the flow cell using flow-thru tubing. This “Y” needs to be equipped with a valve to regulate flow between the two lines. Flow into the flow cell should be approximately one to one and a half gallons per minute.

At this point the start pump option should be selected in the field computer. Field readings are taken based upon the volume of water in 0.5 well volumes, which is calculated by the field computer or can be manually calculated using the instructions in Detail 5. For well stabilization a minimum of three and maximum of five well volumes, and stabilization of pH, temperature, and specific conductance readings are required. A minimum of six sets of readings (at 0.5 well volume intervals) will be taken. The final three readings are used to determine stabilization of the field parameters and will be indicated by the field computer. In order to determine stabilization if a field computer is unavailable, the final three readings for pH, temperature and specific conductance all must fall within the stabilization ranges listed in Table 8, and the readings must also agree with those field values that were recorded during the well purge. For verification of values, historical field readings are available for reference in the field computer by selecting “Site Info / History” from the ELB.Net menu or by selecting the History button from within the selected site. Table 8 lists the required limits for well stabilization based on the field parameters.

Table 8. Field Parameter Stabilization Limits

Parameter	Range
Temperature	± 0.2 C
Specific Conductance	5% uS/cm
pH	± 0.1 SU

Field readings are taken and recorded in the field computer at the designated times (determined by the field computer) once the field meter displays a stable reading. If a field computer is unavailable, the readings along with the reading time are written on a groundwater field sheet. The water color, water odor, and water clarity are observed and noted in the field computer or groundwater field sheet. Any other items of note during the purge are recorded in the comments section of the field computer or groundwater field sheet.

Care should be taken to prevent over purging of the well. When stabilization of the field parameters has not occurred and five well volumes have been withdrawn, the decision to continue or stop the purge is made on a well by well basis. Wells that fall into this category are usually redeveloped or removed from the network.

There are several deep wells sampled by the WQMP that have relatively large diameters but very low yields. These wells can take over five hours to purge. When a purge is projected to take over five hours, the WQMP has adopted a “five-hour purge rule”. This rule states that readings can be taken at 0.25 well volumes instead of 0.5 well volumes, and a total of one and a half well volumes are all that is needed to evacuate the well. Thus, a minimum of 1.5 well volumes will be withdrawn and stabilization of field parameters will be achieved. If the five-hour purge rule is used, the 0.25 well volume option should be selected in the field computer.

A second condition can occur when the well is purged dry. When this occurs, the well is allowed to recover to within ten percent of its original water level and then purged dry again. The well can be sampled once it has recovered sufficiently enough to provide water for the sampling procedure. If this occurs, it is crucial that you “stop pump” in the field computer, while waiting for the well to recover and then start pump when you resume purging the well. A comment should be made in the field computer or on the handwritten field sheet if this procedure has been used.

Purge water from the well must be discharged as far off-site as possible. Purge water should not be allowed to flood the immediate well site, especially when a shallow unconfined well is located at the site. The best alternative is to discharge purge water to an adjacent ditch, storm sewer, or low lying area off-site.

Once the purge is complete (typically three well volumes evacuated and stabilization of field parameters) the purge pump can be removed from the well to be followed by a sample pump, or the purge pump now becomes the sample pump. The flow rate for sampling should be no greater than one gpm, if possible. If the purge pump is a submersible, it can be used as the sample pump. If a centrifugal pump is used for purging the well, it must be removed and replaced with a low-flow submersible pump (e.g. peristaltic, or Redi-Flo) for sampling. When removing a centrifugal pump, the pump must be removed from the well while it is still running and pumping water. This is done to remove any stagnant water in the well casing above the pump that has not been evacuated during the purge. This is especially important when the pump is not equipped with a check valve. Stagnant water exists above the pump because it is assumed that the pump removes water from the well below the pump’s set-depth (i.e. water above the pump will not be evacuated from the well casing). Therefore, the removal of the pump while it is running assists in removing this stagnant water.

Once the pump is removed, the equipment will be rinsed with clean water, tap or deionized (DI), if it has become significantly fouled from the well. This especially applies to purge water that has remained in the pump tubing or hose.

In-Place Pumps, Flowing Wells, and Springs
Sampling of wells with in-place pumps, flowing wells, and springs are done in a very similar manner. For wells with in-place pumps, a point along the plumbing from which the purge and sampling will occur must be determined. This point must be located before any filtration or water treatment systems that may have been installed on the well. It should also occur before the pressure tank, if so equipped, and if possible. The purge rate is measured using a bucket. Polyvinyl chloride (PVC) or steel fittings are used to direct a portion of the purge water into the flow cell. If purging and sampling occur after the pressure tank, this must be noted in the field computer for the sampling of these types of wells and springs. The sample access point must also be indicated in the field computer in the designated areas.

An additional scenario associated with some in-place pumps (such as large turbine pumps on agricultural wells) is the lack of an easily accessible sample point. Sample points for all wells with in-place pumps must be identified on the characterization form so consistency can be maintained. In the case of an in-place pump, flowing well, or spring the purge volume is based upon a depth to water of zero. Purge volumes for in-place pumps are usually less than wells which require the use of a sampling pump because in many instances the pump has been used routinely (for irrigation, public supply, etc.). The frequency of use on these types of pumps should be verified prior to calculating the necessary purge volume to evacuate from the well. Purging procedures for wells with in-place pumps should be performed as follows:

1) If the pump on the well to be sampled is continuously running and the sample can be collected prior to a tank, the valve should simply be opened and allowed to flush at maximum velocity for at least 15 minutes before field readings are collected.
2) If the pump is continuously running and a tank is located ahead of the sample location, the purge must include the entire storage tank volume.
3) If the pump is running intermittently, it is necessary to determine, if possible, the volume to be purged, including storage/pressure tanks prior to the sampling point. The pump should then be run continuously at maximum velocity until the required volume has been purged.

Once the correct purge procedure is completed, stabilization of field readings must be confirmed. The well should be purged at one gpm for 15 minutes with field parameter readings (pH, temp, sp. cond.) taken at 5 minute intervals.

For springs, low flow pumps such as a peristaltic are used. The intake tubing is attached to the YSI sonde and the sonde is placed directly in the spring vent. Purge volumes for springs are also less (usually 15 minutes) because in most cases springs are a constantly flowing feature.

Note: Once the purge is complete, it may not be possible to lower the flow rate to one gpm prior to collecting the sample. When this occurs, comment the situation in the field computer.

Sample Preparation
When a different low-flow sample pump is used following the removal of a purge pump, stabilization of field readings must be confirmed. This is done by purging the well at one gallon per minute with the low-flow pump for an additional 15 minutes and taking field parameter readings at five minute intervals. The three field stabilization parameters (pH, temp., sp. cond.) all must fall within the stabilization ranges listed in Table 8, and the readings must also agree with those field values that were recorded during the well purge.

The additional field readings collected from the sample purge are entered into the field computer in a separate area from the main purge. If a sample purge does not need to be performed (i.e. the well purge has been performed with a low-flow pump) this area is left blank. The area in the field computer that contains information regarding where the sample is collected (sample pump purge, artesian flow, etc.) also needs to be completed.

Prior to completion of the well purge the sample bottles will be prepared. Latex powder-free gloves should be worn to prevent contamination of the bottles. The bottles that comprise the sample kit need to be visually inspected for cleanliness. If any bottle appears dirty, discard and replace with another. Pre-printed labels will be placed in the characterization “sleeve” for each well to be sampled prior to the sample event. Record the date in YYYYMMDD format (i.e. 20010424 for April 24, 2001), the time in HHMMSS (military time) and the sampler initials on each label. The labels should be affixed to the sample container with the barcode running vertically, ensuring that the correct label is put on the right bottle.

A tripod filter apparatus and 142mm - 0.45um cellulose-acetate filter paper are used for filtration of samples for most groundwater projects. Prior to filtration the entire filter apparatus must be rinsed thoroughly with DI water. The sample technician must wear gloves for this cleaning. Also, care should be taken to prevent sweat from dripping onto the filter. Unscrew the nylon bolts and take the filter apparatus apart on a clean, flat surface (cooler top, etc.). Begin by rinsing the filter base in deionized water from a five gallon Nalgene carboy. Next, rinse the bottom plate, bottom screen, and O- ring, and place on the base of the filter apparatus. A new filter paper is then placed on the bottom screen. Each filter is packaged with two blue protective papers on either side; make sure that both of these protective papers are removed prior to placing the filter on the filter screens. Next, rinse the top screen and top plate and place each on top of the filter paper. Tighten the nylon bolts and set aside in a clean, shaded area until use. It is important that the O-ring be seated correctly to prevent leakage of water along seams.

Sample Collection
Flow from the sample pump, in-place pump, or artesian well discharge will be reduced to one gallon per minute. The flow will be routed from the pump, in-place pump plumbing, or flowing well plumbing via clear-flow PVC tubing. This tubing must be visually clean and unstained (iron discoloration, bacteria and algal growth, surface area dirt, and grass are the most common problems). Refer to Tables 4 through 7 for bottle types and parameters collected for each groundwater project. Samplers will wear gloves during the collection of all samples. If possible, sample collection will be done in an area located out of direct sunlight, wind and rain. Collect all unfiltered bottles first from the discharge line using 50-100mLs of sample water as an initial rinse. Replace the cap and gently shake the bottle and then discard the water. Fill the sample bottle with source sample water leaving a slight head space.

Filtered samples are collected next. Connect the discharge sample line to the tripod filter and allow water to flow through the filter for approximately 30 seconds to remove any DI water or unwanted residue from the filter. If leakage occurs around the seams of the filter tighten the nylon bolts. If this does not stop the leakage, follow the steps in cleaning the filter again and be sure the O-ring is seated correctly. Place the first bottle to be filtered beneath the tripod filter and add 50-100mLs of sample water to the bottle as a rinse. Gently shake this water in the bottle with the cap on and then discard the water. Place the bottle beneath the filter and fill (leave a slight head space). Repeat this procedure for any additional filtered bottles. Care should be taken to not touch the mouth or inner edge of the sample bottles. Following sample collection keep the sample bottles out of direct sunlight. Bottles that do not require acidification can be immediately placed in ice.

Sample Acidification

Powder-free latex gloves must be worn throughout the sample acidification process. All acids can cause burns and will damage clothing. **Gloves and eye protection must be used. Do not breathe acid fumes.** A detailed explanation of storage and disposal protocols for acids, buffers, and other standards used by the WQMP can be found in Detail 10. If possible, keep all acids and sample bottles out of direct sunlight. Identify the sample bottle(s) (red dot on lid) to be preserved with sulfuric acid (H_2SO_4). This acid is kept in a teflon dropper bottle that has red banding. Note the final field measured pH reading as this may affect the amount of acid needed (e.g. pre-acidified samples with lower pH values will require less acid to reach a pH of <2). The objective with acidification is to add the least amount of H2SO4 to bring the sample down to a pH <2. Start by adding a few drops of H_2SO_4 to the bottle (approximately one drop for a 40mL bottle, three drops (or less) for a 250mL bottle, and six drops (or less) for a 500mL bottle). Recap and invert the bottle several times to mix the acid with the sample water. Pour a small amount of the sample water directly over a strip of pH litmus paper. Compare the results of the litmus paper to the pH range shown on the litmus paper container. The pH test strip paper should NEVER be dipped in the sample bottle, this may contaminate the sample. Add more acid and repeat this procedure as needed until a pH of less than 2.0 is achieved. Once the pH is acceptable, place bottle(s) in ice. **It is very important to not over acidify or nutrient results will be jeopardized.**

Gloves are now discarded and a new pair put on prior to following the next step: The pre-cleaned bottle which has a solid blue lid or a blue dot on lid will now be preserved with nitric acid (HNO_3). This acid is contained in glass “snap-off” ampoules. Snap off top portion of ampoule away from your body being careful to avoid the broken edge. Add the entire contents of one HNO_3 acid ampoule to the appropriately marked bottle by lightly tapping on the bottom of the ampoule until all the acid has been delivered. Discard all used glass vials in a HNO_3 acid waste container. These waste containers are carried at all times in each field vehicle. Invert the bottle several times to mix the acid with the sample water. Pour a small amount of the sample directly over a strip of pH litmus paper. The pH test strip paper should NEVER be dipped in the sample bottle, this may contaminate the sample. Compare the results of the litmus paper to the pH range shown on the litmus paper container. The pH must be less than 2.0. Adding more HNO_3 acid should not be necessary. Ensure that the caps on all sample bottles are screwed on tightly and re-inspect the labels for accuracy. Place the bottles in ice immediately following sample collection and acidification.

Field Quality Control Sample Collection

The number of field quality control samples collected will be ten percent of total samples collected for the entire event (e.g. if 100 primary samples will be collected, five duplicates and five equipment blanks will be collected). For groundwater projects, these QC samples will usually be assigned to a particular well site or well run and are noted on the project event check-off list. QC samples will be collected at an even frequency throughout the sampling event.

Duplicate Samples

Duplicate sample labels will be in the "sleeve" of the appropriate characterization with the original set of labels. The duplicate sample is intended as a check of "repeatability" for laboratory analyses and field sampling protocols. A duplicate sample is obtained at a site by duplicating, in rapid succession, the entire sample collection procedure that was used to obtain the first sample. For groundwater duplicates, one kit of containers will be filled with sample water from the pump and preserved appropriately. Then a second kit will be filled from the pump and preserved filling the bottles in the same order as the original sample kit.

The duplicate should be recorded in the field computer's QA section. Duplicate samples are assigned a different sample time and sample ID (if using pre-printed labels) than the original sample so the samples can be distinguished from each other. The sample time should be corrected in the field computer to match the time written on the duplicate bottle labels.

Equipment Blank Samples

Equipment blanks will be taken from pre-cleaned and/or field cleaned equipment. Data from equipment blank results reflect how thoroughly equipment is cleaned and also ensure that contamination is not carried over between well sites. Equipment blanks are usually pre-assigned to specific runs but can be done at any well in that run. Make sure that a low-flow sample pump will be used at the well site where the equipment blank sample will be collected. For example, a well that is purged and sampled with a two-inch Grundfos is not a reasonable site for an equipment blank sample. The same holds true for flowing wells and wells with in-place pumps. The equipment blank is collected by running DI water through all equipment that has been used to collect the primary sample at that site. The following procedure should be used:

1) Thoroughly rinse and clean outside areas of pump heads and pump tubing/hoses with DI water. Repeat this process with the tripod filter apparatus if filtered samples will be collected.
2) Fill a Teflon "equipment blank tube" with DI water and one to two drops of Liquinox.
3) Put the sample pump head into the tube and run DI water through the pump using the following protocol for each specific pump used (continue to replace water in the tube as the pump draws down the water level):
    a) Redi-flo and whale pumps – flush 15 gallons through pump prior to collecting equipment blank sample.
    b) Peristaltic pumps – flush two and a half gallons through pump prior to collecting equipment blank sample.
4) Five gallons of DI water will be reserved for collection of the equipment blank sample. To fill blank sample bottles, follow sample collection protocols given for each project. Filter and acidify as specified for the project.

Sample bottles used for equipment blank sample collection should be labeled with the appropriate labels assigned to that run. The sample labels also need to contain the date, time and samplers' initials. The equipment blank should be recorded in the field computer's Quality Assurance (QA) section.

Split Samples
A split sample is a type of QA sample that is collected in the field. It is collected similarly to field duplicate and replicate samples, except that it is sent to an alternate laboratory for analysis. The purpose of a split sample is to use an alternate laboratory to verify the accuracy of the primary laboratory's analysis. Note should be made in the comments portion of the field sheet that a split sample was collected. Because the split sample will be shipped to an alternate laboratory, sample custody record procedures may vary.

Post Sampling Procedures
Following completion of sample collection procedures, the pump used will be rinsed and/or flushed with DI water if sampling has resulted in the pump becoming fouled or filled with discolored purge water. All meters will be rinsed with DI water and stored properly. Water level instrumentation, if removed, will be replaced and a final depth to water will be measured and recorded on the water level instrumentation log (see Detail 4). The well site area will be left clean, including the removal of all trash (even if it is not yours). Any small maintenance items that need to be done at the well site should now be performed (e.g. lubrication of locks, etc). Any major maintenance that needs to be performed at the site will be recorded on a "request for well maintenance form" and given to the field supervisor. Take pictures and record comments as needed to assist in identifying any problem(s).

If water level instrumentation devices were disassembled prior to sampling of the well, these devices will need to be reassembled (see Detail 4 for instructions). Any changes at the well site since the last time it was visited will be updated in the characterization book (including new locks, access routes, directions to site, contact persons, etc.). If necessary, new pictures of the site should be taken to be added to the characterization book.

Final Paperwork and Sample Shipment
Upon returning to the office at the end of the day, the samples need to be prepared for shipment and the appropriate paperwork printed and stored. Plug the field computer into the docking station so the computer does not shut off during printing. Also, confirm that the field computer is attached to the network and that the correct printer is selected as the default in your printer settings. Once in the ELB software, "output options" should be selected from the main menu. Next select "Groundwater Data Sheets"; the sites sampled for that day should be chosen from the list and then "print selected datasheets" should be selected. At this point the field sheets will begin printing. Once the field sheets have printed select "output options" from the main menu again and choose "Sample Custody Report" and "continue – print report". Sample Custody Reports for the day's sampling will now begin printing. If a field computer was not used for data collection, a hand written Sample Custody Report should be filled out with information for the sites sampled that day (see Detail 14 for example form).

When you have confirmed all field sheets and custody reports have printed, the field computer will prompt you to save data for the session. At this point you will choose yes to save data for the session. A back-up copy of the field data collected each day will still exist on the field computer and will be downloaded biweekly.

Table 9 lists the shipping methods used for each groundwater project.

Table 9. Groundwater Project Shipping Methods

Project	Shipping Method
CGWQMN & WUPNET	District Courier
Coastal Springs	District Courier
Shell/Prairie/ Joshua Creeks	District Courier
Upper Floridan Aquifer Nutrients Network	District Courier
Upper Peace River Groundwater	Federal Express (FedEx)

For all District Laboratory analyzed samples a Shipping Batch Identifier must be included on every page of the custody report shipped or hand delivered to the laboratory. The shipping batch identifier will consist of the Date / Time shipped; the format will be mmddyyhhmm (ex. A date and time of 6/11/2012 4:33 PM will read 0611121633). This information is included on every page of the custody logs printed from the field computer, but it needs to be hand entered on the handwritten Sample Custody Records if a field computer is unavailable. Verify that all copies of custody logs contain the same shipping batch identifier. If a correction needs to be made to the shipping batch identifier, strike through the original shipping batch identifier and write the correct identifier on all custody log pages. When assigning coolers, all samples shipped in one cooler must have the same shipping batch identifier. You may not put samples with different shipping batch identifiers in the same cooler. Samples with the same shipping batch identifier may be split up into two or more coolers, though. Shipped by and shipping date will also be handwritten on the bottom of **all** custody report pages by the technician shipping the samples.

When shipping via District Courier, a District cooler without a drain will be used. This is to protect other documents shipped via courier from water damage. If shipping to outside laboratories use coolers with drains that have been plugged.

Prior to sample shipment, two plastic garbage bags (one placed inside the other), or one extra thick contractor garbage bag, will be put in a cooler to prevent leaks outside the cooler. Samples and a temperature control bottle will also be placed in the bag (use the same temperature control bottle which was used in the cooler during the day's activities). Fill the plastic bag with ice leaving enough room so the bag can be tied shut. Put the custody report(s) in a zip-lock plastic bag and tape it to the inside lid of the cooler.

Note: Custody reports should reflect only those sites which are contained in the cooler. If more than one cooler will be used, a copy of the custody report will be made. Use a marker or pen to cross out the samples on the custody report which are not contained in the additional cooler(s). Initial and date any corrections.

Place a mailing label on the cooler for shipment to "Matt Jablonski - Brooksville Laboratory" if the samples are being analyzed by the District Laboratory. Tape the lid shut with packing tape and place the cooler at the end of the sidewalk located at the southeast corner of Tampa Service Office, Building 6.

If samples are being shipped via FedEx, fill out a FedEx shipping bill with the correct address and shipping information (examples can be obtained from the project coordinator) and place behind Tampa Service Office Building 6. Call FedEx to schedule cooler pick-up. The District coolers without a drain are not to be used when shipping to outside laboratories via FedEx (or any shipping method other than District Courier).

Custody reports, field sheets (electronic **and** hand-written), equipment blank, duplicate sheets, and reference sample sheets will be checked for accuracy by the sampling personnel. Any corrections made to documentation should not obliterate the original entry. To make a correction, draw a line through the item to be corrected, write in the correct value and initial and date the change. Once the sheets are checked they should be signed and dated by all samplers involved and put in the field technician supervisor's mail bin. Reference sample results should be turned in with the associated field paperwork. After the review by the field technician supervisor, the project coordinator will review the sheets to ensure completion, and then file the sheets appropriately. The check-off list posted in the equipment room needs to reflect which wells were sampled that day and if any QA samples were done. Confirm that the check-off list in each characterization book is also updated. File any water level forms as instructed in Detail 4.

Post Field-Use Equipment Maintenance
DI water containers should be checked for cleanliness and re-filled after returning to the office. The Whirlpak bag covering the container spigot should be checked for wear and replaced as needed.

All acids and standards will be removed from each sampling vehicle and placed in the clean equipment room at the end of each week. Vehicles should be swept out and all trash thrown away. All multiprobes will be removed from the sampling vehicle and post checked following each sampling day and the electronic log sheet filled out. If for any reason the multiprobe does not pass the post check, an incident report must be filled out. The sonde and report should be given to the meter maintenance technician.

Any problems associated with the day's activities (equipment, a well purge, a well site, field computer, vehicle, etc.) should be reported immediately to the field sampling supervisor or project coordinator.

Planning for the next day’s activities can now begin.

WQMP SURFACE WATER PROJECT DESCRIPTIONS

Stream Water Quality Monitoring Network
Project: P108

PURPOSE
The Stream Water Quality surface water monitoring network was developed to support resource management decisions through the collection of monthly water quality samples at selected stream gaging stations at various basins throughout the District. This project is the integration of six networks that were originally independent projects. As of FY12, the Peace River water quality network and the Myakka River water quality network were incorporated into this network. In FY13 the Coastal Rivers, Rainbow River, and Kings Bay networks became part of this network. These data are used to determine pollutant loads, characterize water quality conditions, and monitor changes or trends in water quality over time.

PROJECT DESCRIPTION
Samples are currently collected at 73 stations on a bimonthly basis with the exception of 5 stations located on the Peace River which are collected monthly. The stations are located in Sarasota, Polk, Citrus, Hernando, Hillsborough, Marion, Pinellas, Pasco, Lake, Manatee, Desoto, Hardee, and Sumter counties.

Monitoring for the Stream Water Quality project occurs during the same time period - usually the first week of every other month. The monitoring sites are split into "runs" based on the geographical location of the sites. Northern runs and southern runs are sampled during alternating months in keeping with the bimonthly schedule. Water quality analyses for this project are performed by the District Laboratory.

Table 10 lists field and laboratory parameters collected for the Stream Water Quality project, as well as field filtration and acidification protocols.

Table 10. Field and Laboratory Parameters Collected for the Stream Water Quality Project

Field Parameters	Lab Parameters	Kit Composition
Temperature (C) pH (SU) Specific Conductance (uS/cm) Dissolved Oxygen (mg/L) Total Depth of Station (M) Sample Depth (M) Secchi Depth (M) Stage Height - if present (ft.)	Cl, SO4, F, TDS, TSS, Ca, Mg, K, Na, TOC, OPO4, Chl a, b, c, NH3, TPO4, NO2, NO3, Total N, Turbidity, Color, Alkalinity	500mL, plastic, not filtered, no preservation, 1000 mL, plastic, not filtered, no preservation, 250mL, plastic, filtered, preserved w/ HNO3 to < 2, 40mL, amber glass, not filtered, preserved w/H2SO4 to < 2, 250mL, plastic, filtered, no preservation, 1000mL, brown plastic, not filtered, no preservation, 250mL, plastic, not filtered, preserved w/H2SO4 to < 2, 250mL, plastic, not filtered, no preservation

Lake Panasoffkee Water Quality Monitoring Network
Project: W476

PURPOSE
A restoration and monitoring project for Lake Panasoffkee, which is funded through the Surface Water Improvement & Management (SWIM) Program, has involved dredging the lake bottom and littoral zone areas to remove areas of accumulated sediment. This water quality monitoring effort was initiated to monitor water quality prior to, during, and following dredging activities.

PROJECT DESCRIPTION
Field parameters and water quality samples are collected at four stations on Lake Panasoffkee on a quarterly basis. The stations are located at the north, central, south, and outlet canal areas of the lake.

Quarterly monitoring for the Lake Panasoffkee Network occurs during the same time period as the Stream Water Quality project. Water quality analyses for this project are performed by the District Laboratory.

Table 11 lists field and laboratory parameters collected for the Lake Panasoffkee Network, as well as field filtration and acidification protocols.

Table 11. Field and Laboratory Parameters Collected for the Lake Panasoffkee Network

Field Parameters	Lab Parameters	Kit Composition
Temperature (C) pH (SU) Specific Conductance (uS/cm) Dissolved Oxygen (mg/L) Total Depth of Station (M) Sample Depth (M) Secchi Depth (M) Stage Height - if present (ft.)	Cl, SO4, F, TDS, TSS, TOC, OPO4, Chl a, b, c, NH3, TPO4, NO2, NO3, Total N, Turbidity, Color, Alkalinity, , , NO3+NO3	500mL, plastic, not filtered, no preservation, 1000mL, plastic, not filtered, no preservation, 40mL, amber glass, not filtered, preserved w/H2SO4 to < 2, 250mL, plastic, filtered, no preservation, 1000mL, brown plastic, not filtered, no preservation, 250mL, plastic, not filtered, preserved w/H2SO4 to < 2, 250mL, plastic, not filtered, no preservation

Ambient Lakes Water Quality Monitoring Network
Project: P250

PURPOSE
The Ambient Lakes Water Quality Monitoring Network (ALWQMN) was originally developed to monitor changes in surface water quality at approximately 287 lakes located within District boundaries. Water quality data are used to track impacts from land use changes and/or improvements from BMP efforts.

PROJECT DESCRIPTION
The 287 lakes originally sampled as part of this network were sampled twice in one year (dry and wet seasons) on a three-year rotating basis. A subset of approximately 42 lakes were sampled biannually (twice a year) rather than twice every three years. This subset consisted of impacted lakes (lakes that have shown upward trends in Trophic State Indices) as well as lakes of increasing interest (e.g. reference lakes).

As of fiscal year (FY) 2013, the ALWQMN underwent a major reevaluation. As of FY 2013 approximately 30 lakes will be sampled quarterly for two years. These include the lakes with the poorest water quality and those with declining water quality. At the end of the two years the lakes with the poorest water quality will be sampled monthly for one year. This will provide sufficient data for District project manager to determine lakes which need additional attention. In addition, this data collection frequency will allow the Florida Department of Environmental Protection to evaluate these water bodies for impairments. Once the three-year cycle is complete, another set of approximately 30 lakes, based on water quality and project importance, will be selected for monitoring. Water quality analyses for this project are performed by the District Laboratory.

Table 12 lists field and laboratory parameters collected for the ALWQMN, as well as field filtration and acidification protocols.

Table 12. Field and Laboratory Parameters Collected for the Ambient Lakes Network

Field Parameters	Lab Parameters	Kit Composition
Temperature (C) pH (SU) Specific Conductance (uS/cm) Dissolved Oxygen (mg/L) Total Depth of Station (M) Sample Depth (M) Secchi Depth (M) Stage Height - if present (ft.)	Cl, SO4, F, TDS, TSS, Ca, Mg, K, Na, TOC, OPO4, Chl a, b, c, NH3, NH4, TPO4, NO2, NO3, Total N, Turbidity, Color, Alkalinity, Cu, Fe, Pb, Mn, Zn, NO3+NO3, Hardness	500mL, plastic, not filtered, no preservation, 1000mL, plastic, not filtered, no preservation, 250 mL, plastic, filtered, preserved w/ HNO3 to < 2, 250mL, plastic, filtered, no preservation, 1000mL, brown plastic, not filtered, no preservation, 250mL, plastic, not filtered, preserved w/H2SO4 to < 2, 40mL amber glass, not filtered, preserved w/H2SO4 to <2

Lake Tsala Apopka Water Quality Monitoring Network
Project: B218

PURPOSE
Generally, the Tsala-Apopka Chain of Lakes, which is an expansive marsh and open water system, has good water quality, with distinct differences between the different pool systems. The purpose of the water quality monitoring project is to establish the baseline conditions to support restoration projects and to serve as the basis to evaluate the success of various restoration efforts. Data for this network will be used along with existing information to help focus restoration efforts.

PROJECT DESCRIPTION
Nineteen lakes are monitored on a quarterly frequency for the Lake Tsala Apopka Water Quality Monitoring Network. Water quality analyses for this project are performed by the District Laboratory.

Table 13 lists field and laboratory parameters collected for the Lake Tsala Apopka Water Quality Monitoring Network as well as field filtration and acidification protocols.

Table 13. Field and Laboratory Parameters Collected for the Lake Tsala Apopka Water Quality Monitoring Network

Field Parameters	Lab Parameters	Kit Composition
Temperature (C) pH (SU) Specific Conductance (uS/cm) Dissolved Oxygen (mg/L) Total Depth of Station (M) Sample Depth (M) Secchi Depth (M) Stage Height – if present (ft.)	SO4, TSS, TPO4, NH3, NO2+NO3, Turbidity, Color, NO2, NO3, Alkalinity, Chl a, b, c, OPO4, Total N, NH4	500ml, plastic, not filtered, no preservation, 1000mL, plastic, not filtered, no preservation, 250ml, plastic, filtered, no preservation, 1000mL, brown plastic, not filtered, no preservation, 250mL, plastic, not filtered, preserved w/H2SO4 to <2

Shell, Prairie & Joshua Creek Watersheds Water Quality Monitoring Network
Project: H017

PURPOSE

During the drought years of 1999, 2000, and 2001, declining trends in water quality in Shell and Prairie Creeks resulted in decreasing trends in water quality in the City of Punta Gorda's Shell Creek Reservoir. The source of the poor water reaching the reservoir is groundwater pumped from the deep, highly productive portion of the Floridan aquifer. Agricultural wells utilize this poor water quality zone to obtain the yields necessary to meet their irrigation demands and to provide frost/freeze protection

Two programs were developed to improve surface water quality within the region. The first program is a well back-plugging program. Back-plugging to a recommended well depth will help sustain surface water resources for public supplies and assist in maintaining groundwater resources for the agricultural community. Qualified property owners are eligible for some or all reimbursement costs to have deep artesian wells back- plugged, and for costs to have their pumps pulled and reset. The amount reimbursed is determined by the well's diameter and back plug amount. This reimbursement program is a 50/50 match between the Peace Basin and Governing Board. The second program is the Facilitating Agricultural Resource Management Systems (FARMS) Program. This program is an agricultural Best Management Practice (BMP) cost-share reimbursement program that involves both water quantity and water quality aspects. It is intended to expedite the implementation of production-scale, field demonstration agricultural BMPs that will provide water resource benefits. The FARMS Program is a public/private partnership program developed by the District and the Florida Department of Agriculture and Consumer Services. The purpose of the FARMS initiative is to implement agricultural BMPs that will provide resource benefits that include water quality improvement; reduced Upper Floridian Aquifer withdrawals; and/or conserve, restore, or augment the area's water resources and ecology.

Water quality monitoring in the SPJC has been initiated for four reasons:

1) Water quality data collected from agricultural water-use-permit wells allows project managers to determine which wells in the SPJC watersheds exhibit poor water quality (e.g. elevated levels of specific conductivity, chloride, and total dissolved solids). These wells, if proven to have poor water quality, are then scheduled for back-plugging.
2) Following back-plugging activities, water quality data are collected to determine if the well back-plugs have resulted in an improvement in water quality.
3) Monitoring of specific conductivity in surface water systems (rivers, streams and canals) throughout the SPJC watersheds is performed by continuous In-situ YSI® 600XLM data sondes and manual spot-checks. Review of these data assists project managers in determining which agricultural areas should be investigated for poor water-quality wells and for potential FARMS projects. Following well back-plugging activities or the completion of a FARMS project, these data will help determine if poor water quality from agricultural run-off is improving as a result of the implementation of these management actions.
4) Water quality data are collected as a key element of performance monitoring for the Shell and Prairie Creek Watersheds Reasonable Assurance Plan which was created to address Total Maximum Daily Load (TMDL) listed water bodies within the basins.

PROJECT DESCRIPTION

Wells in the SPJC watersheds that are potential candidates for back-plugging are sampled on an "as needed" basis which is dependent on what areas have been selected for further investigation. Surface water stations that are associated with potential FARMS projects are also sampled on an "as needed" basis. Water quality analyses for this project are performed by the District Laboratory.

Table 14 lists field and laboratory parameters collected for the SPJC Watersheds Network, as well as field filtration and acidification protocols.

Table 14. Field and Laboratory Parameters Collected for the SPJC Watersheds Network

Field Parameters	Lab Parameters	Kit Composition
Temperature (C) pH (SU) Specific Conductance (uS/cm)	SO_4, CL, SiO_2, TDS, Conductance, Fe, Sr, Na, Mg, Ca, K, Fluoride, Alkalinity,	500mL, plastic, not filtered, no preservation, 250mL, plastic, filtered, no preservation, 250mL, plastic, filtered, preserved w/HNO_3 to < 2

During the dry season (October thru May), data sondes are currently deployed by the District at two surface water stations. These sondes are downloaded, cleaned, calibrated, and re-deployed on a monthly frequency. During the rainy season (June thru September) these data sondes are removed. Three sondes are maintained throughout the year under contract with the USGS.

Detail 11 lists instructions for the maintenance, calibration, logging set-up, and download of the YSI data sondes.

Lower Hillsborough River MFL Recovery Network
Project: H400

PURPOSE
The purpose of this monitoring is to determine if the adopted MFL Recovery Strategy is effective. Samples are collected at the direction of the project manager, because sampling is flow dependent.

PROJECT DESCRIPTION
Data collection consists of collecting profile data at 13 stations with YSI multiprobes and water quality samples at 4 additional sites. Sampling is flow dependent with samples only being collected when flow is coming over the Hillsborough River Dam.

Table 15 Field and laboratory parameters collected for the Lower Hillsborough River MFL Recovery Network, as well as field filtration and preservation protocols.

Table 15. Field and Laboratory Parameters Collected for the Lower Hillsborough River MFL Recovery Network

Field Parameters	Lab Parameters	Kit Composition
Temperature (C) pH (SU) Specific Conductance (uS/cm) Dissolved Oxygen (mg/L) Total Depth of Station (M) Sample Depth (M) Secchi Depth (M)	Cl, SO4, TSS, Ca, Mg, K, Na, PO4, NH3, TP, TKN, NO2+NO3, Turbidity, Color, Alkalinity, Chl a, b, c	500mL, plastic, not filtered, no preservation, 1000L, plastic, not filtered, no preservation, 250mL, plastic, filtered, HNO3 preserved to < 2, 250mL, plastic, filtered, no preservation, 1000mL, brown plastic, not filtered, no preservation, 250mL, plastic, not filtered, H2SO4 preserved to < 2, 40mL amber glass, not filtered, H2SO4 preserved to < 2

WMP – Myakka River Watershed Initiative (Flatford)
Project: H089

PURPOSE

This initiative is a comprehensive project that will illustrate the effects of land use conversions and alterations and evaluate best management practices (BMPs) for restoration alternatives. The objectives are to restore water quality, natural system, and floodplain impacts in the watershed in ways that can also provide a benefit to water supplies in the Southern Water Use Caution Area (SWUCA). The purpose of the water quality monitoring project is to establish the quality of the water in Flatford Swamp. Data from this network will be used along with existing information to assist the District in determining if this water can be used as an alternative water supply.

PROJECT DESCRIPTION

Six streams are monitored on a quarterly frequency for the Flatford network. Water quality analyses for this project are performed by the District Laboratory.

Table 16 lists field and laboratory parameters collected for the Myakka River Watershed Initiative, as well as field filtration and acidification protocols.

Table 16. Field and Laboratory Parameters Collected for the Myakka River Watershed Initiative

Field Parameters	Lab Parameters	Kit Composition
Temperature (C) pH (SU) Specific Conductance (uS/cm) Dissolved Oxygen (mg/L) Total Depth of Station (M) Sample Depth (M) Secchi Depth (M) Stage Height - if present (ft.)	Alkalinity, Ca, Cl, Color, Fluoride, Mg, NO3-NO2, N, TOC, DOC, OPO4, P, K, TDS, TSS, Na, SO4, Turbidity	500mL, plastic, not filtered, no preservation, 1000mL, plastic, not filtered, no preservation, 250mL, plastic, filtered, no preservation, 250mL, plastic, not filtered, preserved w/H2SO4 to < 2 40mL, glass, not filtered, preserved w/H2SO4 to < 2 40mL, glass, filtered, preserved w/H2SO4 to < 2

Lake Hancock Outfall Treatment Project
Project: H014

PURPOSE
A monitoring project that involves observing the quality of the water discharging from Lake Hancock into the treatment wetlands. The water is being treated by the wetlands prior to being discharged into Saddle Creek. This project was initiated to monitor the water quality prior to, during and after the discharge of water through the structure on Lake Hancock.

PROJECT DESCRIPTION Autosamplers were installed on the five structures present on Lake Hancock and the treatment wetlands to collect 24-hour composite samples. The samples are collected at frequencies varying from weekly to monthly. For instructions on autosampler set-up refer to Detail 16. Water quality analyses for this project are performed by the District Laboratory.

Table 17 lists field and laboratory parameters collected for the Lake Hancock Outfall treatment Project, as well as field filtration and acidification protocols.

Table 17. Field and Laboratory Parameters Collected for the Lake Hancock Outfall Treatment Project.

Field Parameters	Lab Parameters	Kit Composition
Temperature (C) pH (SU) Specific Conductance (uS/cm) Dissolved Oxygen (mg/L) Total Depth of Station (M) Sample Depth (M) Secchi Depth (M) Stage Height - if present (ft.)	Cl, SO4, F, TDS, TSS, TOC, OPO4, Chl a, b, c, NH3, TPO4, NO2, NO3, Total N, Turbidity, Color, Alkalinity, Ammonia, Ca, NO3+NO3, Magnesium, Phaeophytin	500mL, plastic, not filtered, no preservation, 1000mL, plastic, not filtered, no preservation, 250mL, plastic, filtered, preserved w/ HNO3 t o < 2, 40mL, amber glass, not filtered, preserved w/H2SO4 to < 2, 250mL, plastic, filtered, no preservation, 1000mL, brown plastic, not filtered, no preservation, 250mL, plastic, not filtered, preserved w/H2SO4 to < 2, 1,000mL, brown plastic, not filtered, no preservation

Rainbow River MFL
Project: B208

PURPOSE
To establish minimum flows and levels on the Rainbow River.

PROJECT DESCRIPTION
Collect water surface elevation measurements at 11 stations and flow measurements at 5 stations along the Rainbow River. For flow measurement methodology refer to Detail 17. For elevation collection using survey equipment refer to the Land Survey SOP.

Chassahowitzka River MFL
Project: B209

PURPOSE
To establish minimum flows and levels on the Chassahowitzka River.

PROJECT DESCRIPTION
Download loggers and collect water surface elevation measurements at three stations along the Chassahowitzka River. For OTT logger protocols refer to Detail 15.

Shell Creek Freshwater MFL Project
Project: B810

PURPOSE
Beginning in FY12, the WQMP took over data collection for this project. Data from this system will be utilized in the establishment of MFLs.

PROJECT DESCRIPTION
Data collection consists of downloading data from a single depth logger and collecting discharge measurements at one site. Data collection is conducted quarterly. On each visit, water surface elevation is determined by staff gauge reading, discharge data are collected with either the Sontek Flowtracker or S5, and data is downloaded from a depth logger. For flow measurement procedures refer to Detail 17 and 18. For HOBO logging protocols refer to Detail 15.

Kings Bay/Crystal River MFL Project
Project: B807

PURPOSE
To establish minimum flows and levels in Kings Bay/Crystal River.

PROJECT DESCRIPTION
Data is collected from two loggers (deployed at top and bottom of water column) at a single station in Kings Bay. Data from this system will be utilized in the establishment of MFLs. For OTT logging protocols refer to Detail 15. For YSI data sonde logging protocols refer to Detail 11

Springs Coast Offshore WQ Monitoring
Project: P529

PURPOSE

Project COAST is a critical piece of maintaining situational awareness for the entire Spring Coast and reinforces the "Springshed to Sea" approach to managing the natural resources in the Spring Coast region. These data are crucial to assessing the status and trends in surface water quality along the Springs Coast, home to the second largest sea grass area in the United States. These data are used in conjunction with the District's Springs Coast Seagrass Mapping project (B107) to investigate the effects of water quality on sea grass coverage and vice versa.

PROJECT DESCRIPTION
Samples are collected at 60 stations quarterly to match the schedule currently employed for Quarterly Springs and Coastal Rivers sampling. Water quality analyses for this project are performed by the District Laboratory.

Table 18 lists field and laboratory parameters collected for the Springs Coast Offshore WQ Monitoring Project, as well as field filtration and acidification protocols.

Table 18. Field and Laboratory Parameters Collected for the Springs Coast Offshore WQ Monitoring

Field Parameters	Lab Parameters	Kit Composition
Temperature (C) pH (SU) Specific Conductance (uS/cm) Dissolved Oxygen (mg/L) Total Depth of Station (M) Sample Depth (M) Secchi Depth (M) Stage Height - if present (ft.)	Cl, SO4, F, TDS, TSS, Ca, Mg, K, Na, TOC, OPO4, Chl a, b, c, NH3, TPO4, NO2, NO3, Total N, Turbidity, Color, Alkalinity	500mL, plastic, not filtered, no preservation, 1000 mL, plastic, not filtered, no preservation, 250mL, plastic, filtered, preserved w/ HNO3 to < 2, 40mL, amber glass, not filtered, preserved w/H2SO4 to < 2, 250mL, plastic, filtered, no preservation, 1000mL, brown plastic, not filtered, no preservation, 250mL, plastic, not filtered, preserved w/H2SO4 to < 2, 250mL, plastic, not filtered, no preservation

SURFACE WATER PROJECTS - FIELD SAMPLING PROTOCOLS

STREAM WATER QUALITY MONITORING NETWORK
LOWER HILLSBOROUGH MFL RECOVERY NETWORK
LAKE PANASOFFKEE WATER QUALITY MONITORING PROJECT
AMBIENT LAKES WATER QUALITY MONITORING NETWORK
LAKE TSALA APOPKA WATER QUALITY MONITORING PROJECT
SHELL, PRAIRIE & JOSHUA CREEK WATERSHEDS WQ MONITORING NETWORK
MYAKKA RIVER WATERSHED INITIATIVE (FLATFORD)
LAKE HANCOCK OUTFALL TREATMENT PROJECT
SPRINGS COAST OFFSHORE WQ MONITORING

Project Initiation

Approximately two weeks prior to any project begin date a site list will be posted in the technician area. This list is comprised of the following information for all surface water sites scheduled to be sampled for that event: run number, station name, District Site Identifier (SID), and county the site is located in. This list also includes a column to record the date of sample collection for each site. Field staff will check sites off these lists immediately after sampling has been completed at the end of each workday. Habitat assessments and Stream Condition Indexes (SCIs) will also be performed routinely on qualified surface water sites. See Detail 13 for more information.

Sample Kits

Depending on the project, sample kits/bottles are obtained by the WQMP either directly from the vendor or from a contract laboratory. Bottles for District kits will be ordered in bulk and stored in the clean equipment room until kits are to be made. Upon delivery to the WQMP, sample kits/bottles are inspected for cleanliness and the appropriate number of bottles and bottle types. Once assembled, sample kits are stored in the WQMP technician room in kit bins which have the designated project names displayed on the outside; field staff obtain sample kits/bottles from these bins.

Sample Equipment

The necessary equipment for surface water sample collection is listed below. This can be used by field staff as a general check-off list to insure that all needed items are taken to the field each work day. A complete listing and pictorial description of sample collection and field equipment used by the WQMP can be found in Details 2 and 3.

1. Surface water site characterization books and pre-printed sample bottle labels (if labels are missing see project coordinator) or field technician supervisor
2. Field computer for the recording of field measurements and relative comments and for checking historical results
3. YSI multiprobe (in-house or field calibrated) with display unit
4. YSI multiprobe calibration log and user's manual
5. Truck bin which includes the following:
   a. 1,000mL LDPE Nalgene containers each of pH 4,7 and 10 standards
   b. 1,000mL LDPE Nalgene containers each of at least low conductivity standard solutions (standards should bracket historical conductivity values for the sites to be sampled)
   c. 142mm/0.45um filter papers for tripod filter
   d. Multiprobe calibration cup (for mid-day check and/or field reference samples)
   e. Acid (HNO_3, H_2SO_4) and pH litmus paper.
6. Acid waste container
7. Sample bottles (include at least one extra set)
8. Cooler(s) of ice with temperature control bottle(s)
9. Clipboard with the following:
   a. Calculator, writing pens, indelible labeling pens and marker
   b. Surface water field sheets (for use if field PC in inoperable or site is new)
   c. Plant ID cards
   d. Custody sheets (if needed)
   e. FedEx bill (if needed)
   f. Spare bottle labels
10. Field reference samples (if assigned)
11. Secchi disk (pole mounted for Rainbow River, Kings Bay and Coastal Rivers sites)
12. 30 or 60mL barrel syringes and 0.45um filter disks
13. Five gallons of DI water (an extra five gallons if an equipment blank will be performed) **with all carboy spigots covered with protective bags**
14. Zip-lock plastic bags
15. Canoe, gheenoe, or boat; include boat keys, boat/canoe anchor, life vests, flotation cushions, paddles, emergency flares, emergency air-horn, rope and whistle
16. Alpha bottle and alpha bottle repair kit
17. Non-powdered latex gloves
18. Tripod filter apparatus (for Ambient Lakes, Rainbow River, Coastal Rivers and Kings Bay sites and other designated "turbid" sites)
19. Peristaltic pump with pump head and clear-flow tubing (if using tripod filter)
20. Citrus canker de-con spray and supplies (for site access involving travel through citrus groves)
21. Garmin
22. Digital camera
23. LiCor equipment (if collecting light attenuation data)
24. Flow meter and wading rod or S5 River Surveyor (if collecting flow measurements)
25. If collecting macroinvertebrates:
   a. Habitat Assessment and Stream Condition Index paperwork (Physical/Chemical Characterization Sheet, Stream River Habitat Sketch Sheet and Stream/River Habitat Assessment Field Sheet)
   b. D-Frame net
   c. Wide-mouth Nalgene bottles
   d. 100-meter tape measure
   e. Survey tape and/or flags
   f. 10 percent buffered formalin
   g. Brush

26. Chest or hip waders/rubber boots
27. First aid kit
28. Trash bags
29. Phone/radio (must be turned on prior to leaving office)
30. Rope
31. Copy of WQMP SOP Manual
32. 300-foot tape measure

Sample Run Initiation
Field technicians are scheduled to perform tasks based upon the WQMP weekly schedule prepared by the field technician supervisor. When a specific project is assigned, field technicians pick an "active" sample run or, if no runs are active, choose which run they would like to start. This is done the night prior to the scheduled sampling day, the morning prior to the sampling day, or a combination of both. The sampling run is based upon:

1) Runs which are active or runs which have not yet been started
2) Equipment availability (canoe/gheenoe/boat,multiprobes)
3) Status of call-ahead stations (i.e. property access permission)

Once the sampling run for the day has been established, field staff load the necessary equipment (see equipment list) in their pre-assigned vehicle.

Field Multiprobe Calibration
The YSI multiprobe equipment to be used will be calibrated either prior to leaving the office or prior to use in the field. A mid-day check on pH, conductance, and DO (mg/L) will also be performed.
Detailed procedures and example forms for the calibration of these multiprobes can be found in Details 7 and 14 as well as in the log book assigned to each multiprobe.

Note: If for any reason a meter fails calibration or does not perform accurately in the field, a maintenance request form explaining the nature of the failure will be turned in along with the failed meter to the meter maintenance technician at the end of the work day. A copy of this maintenance request form will also be turned into the field technician supervisor's mail bin.

The WQMP has a designated field technician who is responsible for the maintenance, repair, and ordering of replacement parts for YSI multiprobes. In addition, this technician also has the responsibility of performing all monthly calibration checks on the various probes. A complete list of these responsibilities can be found in Detail 7.

Site Arrival
Note: If sampling site is located within or accessed through a citrus grove, staff must follow the District's citrus canker sanitation protocol (see Detail 12).

The first step in sampling procedures once the samplers have arrived at the site is the identification of the site. The sites are identified based upon written descriptions, photographs, and maps located in the characterization books, or by Garmin GPS location. Both samplers need to verify that the proper site (bridge, structure, lake, etc.) is located prior to the start of sampling procedures. In the event the site is to be sampled by a single person, the site identification needs to be double checked by that sampler. **The proper identification of the site is a critical step in the sampling process.**

The sampling vehicle should be parked as close to the site as possible. If the site is located at a bridge or roadside, extra care should be taken to park in a safe location. When possible, park the truck behind a guard rail or as far off the road as possible. **When parking on a bridge turn on**

the strobes which are located on the front and rear of every field vehicle and place orange caution cones around the sampling vehicle. Caution vests are also available and should be worn at all times.

The field computer is turned on and the program "ELB.Net" is selected. "Surface Water Sampling" is chosen from the main menu and the site is looked up in the computer and selected. Site ID's should be double checked against characterization sheets and bottle labels to make sure the correct site has been chosen in the field computer.

If the field computer is not available, all site information and readings should be recorded on a paper copy field sheet (see Detail 14 for example form). Any corrections made to documentation should not obliterate the original entry. To make a correction, draw a line through the item to be corrected, write in the correct value next to the lined-out item, and initial and date the change.

Sample Collection Initiation

A description of sampling equipment and field measurement equipment used by the WQMP for surface water projects can be found in Details 2 and 3.

All field parameter data and water quality samples should be collected upstream of bridges or other permanent structures. Sediments and other types of debris can accumulate around bridge abutments and influence the data being collected. Samples which are collected for long-term projects at "fixed" monitoring sites should be taken at the same general location every time the site is visited.

Sample collection at lakes which are < 10 hectares (approximately 28 acres) in size should occur in the center of the lake in an area free of any submerged or emergent vegetation. Lakes which are > 10 hectares should be sampled in an area away from the littoral zone which is free of any submerged or emergent vegetation.

Note: If after speaking with the field technician supervisor and/or the project coordinator, it is determined that it is not possible to follow the above procedures, record the deviation from standard protocols in the comments section of the field computer

Note: If upon site arrival, it is noted that the system is dry (no water at sample collection point) or pooling (water is non-continuous within the system) then the site should not be sampled. Upon returning to the office, the pre-printed labels for the non-sampled site and the reason for the exclusion should be turned into the field technician supervisor along with the remainder of the day's paperwork. If pre-printed labels are not available a note including the site name, SID, and reason for exclusion should be turned into the field technician supervisor along with the remainder of the day's paperwork.

Field Data Collection

First, record general information such as weather, stream flow, submerged and emergent aquatic vegetation present, major/micro land use, staff gage measurement (if present), equipment used (e.g. multiprobe, alpha bottle), and samplers initials in the field computer or on the surface water field sheet.

Next, collect field parameter readings; a detailed description of entering this information into ELB.Net is provided in Detail 8. Lower the YSI multiprobe to the bottom of the surface water body, read the total depth of station off the display, and record into the "total depth" field. At this time the secchi depth value should be recorded and entered into the appropriate place in the field computer or on the surface water field sheet. Lower the secchi disk into the water column and note the depth at which the disk disappears and the depth at which it re-appears. The average of these two numbers should be determined and the average value entered in the field PC or surface water field sheet. **Polarized sun glasses should be removed prior to taking this measurement.** If collecting samples from a boat, canoe, or gheenoe, this procedure should be done on the shady side of the vessel. If the secchi disk is visible to the bottom of the water body, enter the total depth of the site in the "secchi depth" field. During sampling of the Rainbow River, Kings Bay, or Coastal Rivers sites a horizontal secchi reading will also be taken. This will be collected after sampling is complete in order to prevent disturbing bottom sediments. One technician enters the water wearing a dive mask and swims away from the boat while carrying the zero end of the 300-foot measure tape. A second technician remains on the boat waving the pole mounted secchi disk below the surface and holding the spool end of the measure tape. As the first technician swims away and loses sight of the secchi disk they will raise their hand to signal the technician on the boat. The technician on the boat then records the distance as the "disappear" value. The swimmer then returns toward the boat and signals the "reappear" distance of the secchi. Both values are recorded and averaged for horizontal secchi distance.

Raise the multiprobe to the depth at which samples will be collected. For most surface water projects, field parameter readings and water quality samples are taken at 0.5 meters from the surface or mid-depth, whichever is shallowest (i.e. total depth of site is 0.3 meters, so field parameters and samples will be collected at 0.15 meters; or total depth of site is 1.2 meters so field parameters and samples will be collected at 0.5 meters). Samples and field readings will not be collected if the total depth at the collection point is less than 10cm (0.1 meters).

Note: Some projects such as Ambient Lakes or deeper flowing systems require that field parameters be collected throughout the water column (e.g. top, mid, and bottom). Profile readings are usually collected if the total depth is greater than 1.5 meters. When field parameters are collected at bottom depths, the multiprobe should be raised slightly above the bottom (at least 0.2 meters) so the probes are not influenced by bottom sediments and plant material. Water quality samples will be collected only at the top depth of 0.5 meters (unless otherwise specified) raise the multiprobe to the correct depth, allow to equilibrate for two to three minutes until all readings have stabilized, and enter the field parameters into the appropriate locations in the field computer or surface water field sheet. Specific conductance, pH, salinity, dissolved oxygen (in mg/l), and temperature should all be recorded. For verification of values, historical field readings are available for reference in the field computer by selecting "Site Info / History" from the ELB.Net menu or by selecting the History button from within your selected site. If a second set of field parameters is to be recorded at a different depth, choose "another" in the field computer and record second depth and field parameter values. Continue with this procedure if a third parameter set is to be recorded.

Following field parameter data collection, the multiprobe can now be retrieved, turned off (to save battery power) and stored in the protective sleeve or calibration cup.

Note: If possible, all multiprobes should be transported in the cab of the sampling vehicle, and secured in a manner to reduce vibration of the probes.

Field Reference Samples (FRS) for pH and specific conductance will be analyzed periodically. These are "blind" standards with an unknown pH or specific conductance concentration which are supplied by the USGS or District Laboratory. Following meter calibration, measurements of the FRS are taken in the field and the results submitted to the field technician supervisor. If any meter has results from a FRS returned as unsatisfactory, the meter will be immediately pulled from field use and will not be returned until maintenance or repair has been performed. A copy of the failing reference sample sheet will also be turned into the field technician supervisor's mail bin.

Sample Preparation
Either prior to, or following field parameter data collection, sample bottles will be prepared. Latex powder-free gloves should be worn to prevent contamination of the bottles. The bottles that comprise the sample kit need to be visually inspected for cleanliness. If any bottle appears dirty, discard and replace with another. Pre-printed labels will be placed in the characterization "sleeve" for each site to be sampled prior to the sample event initiation. Record the date in YYYYMMDD format (i.e. 20010424 for April 24, 2001), the time in HHMMSS (military time) and the sampler initials on each label. The labels will then be affixed to the sample container with the bar code running vertically, ensuring that the correct label is put on the right bottle. The sample bottles are now ready to be filled, paying close attention to the filtration and acidification protocols (which are stated on the bottle label). If possible, after labeling the bottles, place them in a clean area out of the sun.

Sample Collection
Refer to Tables 10 through 18 for bottle types and parameters collected for each surface water project.

Samplers should wear gloves during the collection of all samples. Sample collection should be done in an area located out of direct sunlight and wind (where possible). Depending on site access and site depth, sample collection for surface water projects is performed either by using an alpha bottle or by dip- grab methods. An alpha bottle will be used at sites which are sampled from bridges or cannot be accessed by wading. The alpha bottle is lowered to the same point that the top field parameter reading was taken (normally 0.5 meters or mid-depth whichever is shallowest). Use the black and red tag marks on the lowering line to determine depth; normally red marks tag the one meter increments, and black marks tag the 0.5 meter increments. Allow the alpha bottle to equilibrate with the source sample water for approximately 30 seconds. At this time the sample can be "captured" in the alpha bottle by sending the messenger down the line. Raise the alpha bottle back up and set it on a level surface to prevent leaking (i.e. truck tailgate or bridge railing). Unfiltered samples are collected first. Prior to collecting unfiltered samples, fill each bottle partially with 10-20mLs of sample source water directly from the alpha bottle spigot, replace lid, and shake gently to rinse. Pour out rinse water and fill all unfiltered bottles directly from the spigot located at the bottom of the alpha bottle, leaving a slight head space in each bottle.

Note: If collecting samples from a surface water system with high flow, dive weights should be attached to the alpha bottle and the multiprobe to keep equipment stable.

Dip-grab samples are collected by submersing a bottle neck-first into the water to the appropriate depth (normally this will be elbow depth for a 0.5 meter sample collection). The sampler will stand in the center of the stream, downstream of where the sample will be collected (i.e. stand with flow coming toward you and dip bottles ahead of where you are standing). This will reduce the probability of introducing suspended sediments to the sample bottles. Only unfiltered bottles will be collected using this method. First, invert the sample bottle to the correct sample depth such that the neck is down (pointing into the water flow) and allow bottle to fill partially (10-20mLs) with water. Bring the bottle back to the surface, replace the cap, shake bottle gently to rinse, and pour water downstream or away from sample location. Repeat the previous step to collect all unfiltered bottles, leaving a slight head space in each bottle. Whether collecting samples using an alpha bottle or by dip-grab methods, the brown-opaque chlorophyll bottles should be filled first. Try to shade the sample as you fill the bottles. Fill all remaining non-filtered bottles. Immediately place the filled sample bottles in ice. Filtered samples will be collected last.

Filtration of a surface water sample is achieved by using a 30 or 60mL disposable barrel syringe and 0.45-micron disk filter. If collecting the sample from an alpha bottle, remove the plunger, cover the tip of the syringe and fill the syringe directly from the alpha bottle spigot with source sample water. Replace the plunger and attach a filter disk to the syringe. Flush a full syringe (30 or 60mLs) of sample water through the filter before filling the sample bottle. Filter a small amount of sample water (10-20mLs) into the bottle as an initial rinse. Discard the rinse water and continue this procedure until the sample bottle is full.

If samples are being collected using the dip-grab method, follow the same protocol as listed above and invert the syringe to correct sample depth such that the opening is down (pointing into the water flow) and allow syringe to fill with sample water.

Note: The filter disk must be removed from the syringe prior to removing the plunger and refilling the syringe. Pulling back on the plunger with the filter attached may damage the filter

Note: For all lakes, Rainbow River, Kings Bay, and Coastal Rivers sites, filtered samples are collected using a peristaltic pump equipped with clear flow tubing and pump head, a tripod filter apparatus, and 142mm / 0.45um filter papers. Prior to filtration the entire filter apparatus must be rinsed thoroughly with DI water. The sample technician must wear gloves for this cleaning. Also, care should be taken to prevent sweat from dripping onto the filter. Unscrew the nylon bolts and take the filter apparatus apart on a clean, flat surface (cooler top, etc.). Begin by rinsing the filter base in deionized water. Next, rinse the bottom plate, bottom screen, and O-ring and place on the base of the filter apparatus. A new filter paper is then placed on the bottom screen. Each filter is packaged with two protective papers on either side; make sure that both of these protective papers are removed prior to placing the filter on the filter screens. Next, rinse the top screen and top plate and place each on top of the filter paper. Tighten the nylon bolts and set aside in a clean, shaded area until use. It is important that the O-ring be seated correctly to prevent leakage of water along seams. When using the peristaltic pump to collect filtered samples, lower the pump head to the desired sample depth (0.5 meters) and use the pump to drive the sample water through the filter apparatus. Allow water to flow through the filter for approximately 30 seconds to flush any deionized water or unwanted residue from the filter. If leakage occurs around the seams of the filter tighten the nylon bolts. If this does not stop the leakage, follow the steps in cleaning the filter again and be sure the O-ring is seated correctly. Place the bottle to be filtered beneath the tripod filter and add approximately 50mLs of water to the bottle as a rinse. Shake the bottle with the cap on and then discard the water away from the sample site. Place the bottle beneath the filter and fill (leave a slight head space). Care should be taken to not touch the mouth or inner edge of the sample bottles. Following sample collection keep the sample bottles out of direct sunlight. Bottles that do not require acidification can be immediately placed in ice.

Note: The bottle with a blue cap or a blue dot on lid (pre-cleaned) may only be filled halfway but will contain no less than 125mL of sample water.

Sample Acidification

Powder-free latex gloves must be worn throughout the sample acidification process. All acids can cause burns and will damage clothing. Gloves and eye protection must be used. A detailed explanation of storage and disposal protocols for acids, buffers, and other standards used by the WQMP can be found in Detail 10. If possible, keep sample bottles out of direct sunlight. Identify the sample bottle(s) (red dot on lid) to be preserved with sulfuric acid (H_2SO_4). This acid is kept in a teflon dropper bottle that has red banding. Note the final pH reading as this may affect the amount of acid needed (e.g. pre-acidified samples with lower pH values will require less acid to reach a pH of <2). Start by adding a few drops of H_2SO_4 to the bottle (approximately one drop for a 40mL bottle, 3 drops for a 250mL bottle, and 6 drops for a 500mL bottle). Invert the bottle several times to mix the acid with the sample water. Pour a small amount of the sample directly over a strip of pH litmus paper. The pH test strip paper should NEVER be dipped in the sample bottle, this may contaminate the sample. Compare the results of the litmus paper to the pH range shown on the litmus paper container. Add more acid and repeat this procedure as needed until a pH < 2.0 is achieved. Once the pH is acceptable, place bottle(s) in ice. **It is very important to not over acidify or nutrient results will be jeopardized.**

Gloves are now discarded and a new pair put on prior to following the next step: The pre-cleaned bottle which has a solid blue lid or a blue dot on lid will now be preserved with nitric acid (HNO_3). This acid is contained in glass "snap-off" ampoules. Snap off top portion of ampoule away from your body being careful to avoid the broken edge. Add the entire contents of one HNO_3 acid ampoule to the appropriately marked bottle by lightly tapping on the bottom of the ampoule until all the acid has been delivered. Discard all used glass vials in a HNO_3 acid waste container. These waste containers are carried at all times in each field vehicle. Invert the bottle gently several times to mix the acid with the sample water. Pour a small amount of the sample directly over a strip of pH litmus paper. The pH test strip paper should NEVER be dipped in the sample bottle, this may contaminate the sample. Compare the results of the litmus paper to the pH range shown on the litmus paper container. The pH must be <2.0. Adding more HNO_3 acid should not be necessary.

Ensure that the caps on all sample bottles are screwed on tightly and re-inspect the labels for accuracy. Place the bottles on ice immediately following sample collection and acidification.

Field Quality Control Sample Collection

The number of field quality control samples required to be collected is ten percent of the total samples collected for an entire project (e.g. if 100 primary samples will be collected, five replicate and five equipment blank samples will be collected). For surface water projects these QC samples will usually be assigned to a particular site or site run and are described on the project event check-off list. The QC samples need to be collected at an even frequency throughout the sampling event.

Replicate Samples

The replicate sample is intended as a check of "repeatability" for laboratory analyses and field sampling protocols. Replicate samples, rather than duplicate samples, are collected for surface water projects because of how quickly water quality can change in a flowing surface water system. Whether collecting these samples using dip-grab or alpha bottle methods, a replicate sample is collected by filling the same bottle from the replicate kit immediately after filling that same bottle from the original sample kit. All unfiltered bottles should be collected first followed by filtered samples. Preserve appropriate bottle(s) immediately after filling.

Sites or runs at which replicate samples will be collected are pre-established. The extra set of labels will be in the "sleeve" with the original set of labels of the appropriate characterization. The replicate should be recorded in the field computer's QA section (choose "duplicate"). Replicate samples are assigned a different sample time than the original sample so the samples can be distinguished from each other. The sample time should be corrected in the field computer to match the time written on the replicate bottle labels.

Equipment Blank Samples

Equipment blanks are collected in the field to test the cleanliness of pre-cleaned or field cleaned sample equipment. Data from equipment blank results reflect how thoroughly equipment is cleaned in the field and also ensures that contamination is not carried over between sites. Equipment blanks are pre-assigned to specific runs but can be done at any site in that run.

The equipment blank is collected by running DI through all equipment that has been used to collect the original sample at a particular site. The following procedure should be used:

1) Thoroughly rinse and clean (using one drop of Liquinox) the inside and outside areas of alpha bottles. If collecting an equipment blank sample for a lakes project, rinse tripod filter, peristaltic pump head, and pump tubing with DI water. Flush the inside of tubing by running approximately two and a half gallons of DI water through the pump.
2) Completely fill the alpha bottle with DI water. Collect the equipment blank following sample collection protocols for that specific project (see "sample collection" section). First, collect all unfiltered bottles directly from the spigot on the alpha bottle. Lastly, collect filtered samples and acidify as specified for the project.
3) If samples are collected using dip-grab methods, simply fill all unfiltered bottles with deionized water directly from the spigot on the five gallon Nalgene carboy. Allow deionized water to run for approximately 30 seconds before collecting samples to flush the spigot. Collect the filtered sample by also filling the barrel syringe directly from the carboy.
4) Acidify as specified (see "sample collection" section).

Sample bottles used for equipment blank sample collection should be labeled with the blank labels assigned to that run. The sample labels also need to contain the date, time and samplers' initials. The equipment blank should be recorded in the field computer's QA section with the time corrected to match the bottles.

Split Samples

A split sample is a type of QC sample that is collected in the field. It is collected similarly to field duplicate and replicate samples, except that it is sent to an alternate laboratory for analysis. The purpose of a split sample is to use an alternate laboratory to verify the accuracy of the primary laboratory's analysis. Note should be made in the comments portion of the field sheet that a split sample was collected. Because the split sample will be shipped to an alternate laboratory, sample custody record procedures may vary.

Post Sampling Procedures

Following the completion of the sampling procedure the alpha bottle will be thoroughly rinsed with DI water. If used, the tripod filter paper will be removed and the filter apparatus thoroughly rinsed with DI water. The site needs to be picked-up including the removal of all trash (even if it is not yours). Make notes in the characterization as needed (i.e. new bridge being built, directions to site have changed, problems at site). Take pictures as needed to assist in identifying the sample location.

Final Paperwork and Sample Shipment

Upon returning to the office at the end of the day, the samples need to be prepared for shipment and the appropriate paperwork printed and stored. Plug the field computer into the docking station so the computer does not shut off during printing. Also, confirm that the field computer is attached to the network and that the correct printer is selected as the default in your printer settings. Once in the ELB software "output options" should be selected from the main menu. Next "Surface Water Data Sheets" should be selected; the sites sampled for that day should be chosen from the list and then "print selected datasheets" should be selected. At this point the field sheets will begin printing. Once the field sheets have printed select "output options" from the main menu again and choose "Sample Custody Record" and "continue – print report". Sample Custody Records for the day's sampling will now begin printing. If a field computer was not used for data collection, a hand written custody record should be filled out with information for the sites sampled that day (see Detail 14 for example form).

When you have confirmed that all field sheets and custody logs have printed, the field computer will prompt you to save data for the session. At this point you will choose yes to save data for this session. A back-up copy of the field data collected each sampling day will still exist on the field computer and will be downloaded on a biweekly basis.

For all District Laboratory analyzed samples a Shipping Batch Identifier must be included on every custody record shipped or hand delivered to the laboratory. The shipping batch identifier will consist of the Date / Time shipped; the format will be mmddyyhhmm (ex. A date and time of 6/11/2012 4:33 PM will read 0611121633)

This information is included on every page of the custody logs printed from the field computer, but it needs to be hand entered on the handwritten Sample Custody Records if a field computer is unavailable. Verify that all copies of custody record contain the same shipping batch identifier. If a correction needs to be made to the shipping batch identifier, strike through the original shipping batch identifier and write the correct identifier on all custody record pages and date and initial corrections. When assigning coolers, all samples shipped in one cooler must have the same shipping batch identifier. You may not put samples with different shipping batch identifiers in the same cooler. Samples with the same sample batch identifier may be split up into two or more coolers, though. Shipped by and shipping date will also be handwritten on the bottom of all custody record pages by the technician shipping the samples. When shipping via District Courier, a District cooler without a drain will be used. This is to protect other documents shipped via courier from water damage. If shipping to outside laboratories use coolers with drains that have been plugged.

Prior to sample shipment, two plastic garbage bags (one placed inside the other) or one extra thick contractor garbage bag will be put in a cooler to prevent leaks. Samples and a temperature control bottle will also be placed in the bag (use the same temperature control bottle which was used in the cooler during the day’s activities). Fill the plastic bag with ice leaving enough room so the bag can be tied shut. Put the custody record(s) in a zip-lock plastic bag and tape it to the inside lid of the cooler.

Place a mailing label on the cooler for shipment to “Matt Jablonski - Brooksville Laboratory” if the samples are being analyzed by the District Laboratory. Tape the lid shut with packing tape and place the cooler at the end of the sidewalk located at the southeast corner of Tampa Service Office, Building 6.

If samples are being shipped via FedEx, fill out a FedEx shipping bill with the correct address and shipping information (examples are located in the office) and place behind Tampa Service Office Building 6. Call FedEx to schedule cooler pick-up. The District coolers without a drain are not to be used when shipping to outside labs via FedEx (or any shipping method other than District Courier).

Note: Custody records should reflect only those sites which are contained in the cooler. If more than one cooler will be used, a copy of the custody record will be made. Use a marker or pen to draw a line through samples on the custody record which are not contained in the additional cooler(s). Initial and date any corrections. Custody records, field sheets (electronic **and** hand-written), equipment blank, duplicate sheets, and reference samples sheets will be checked for accuracy. Any corrections made to documentation should not obliterate the original entry. To make a correction, draw a line through the item to be corrected, write in the correct value next to the lined-out item, and initial and date the change. Once the sheets are checked they should be signed and dated by all samplers involved and put in the field technician supervisor's mail bin. The project coordinator will review the sheets to ensure completion, and then file the sheets appropriately. The check-off list posted in the equipment room needs to reflect which sites were sampled that day and if any QA samples were done**.**

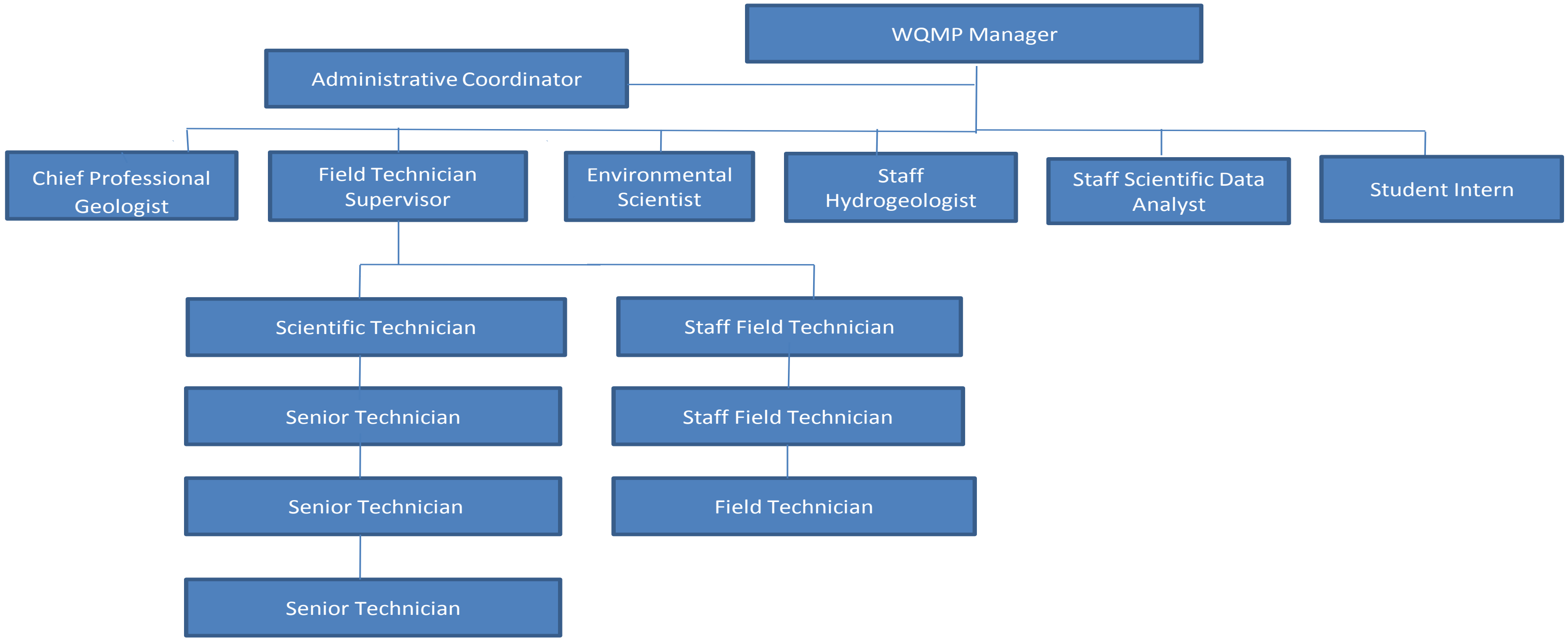
Final Equipment Maintenance
DI water containers should be checked for cleanliness and re-filled after returning to the office. The Whirlpak bag covering the container spigot should be checked for wear and replaced as needed.

All acids and standards will be removed from each sampling vehicle and placed in the clean equipment room at the end of each week. Vehicles should be swept out and all trash thrown away. All multiprobes will be removed from the sampling vehicle and post checked following each sampling day and the electronic log sheet filled out. If for any reason the multiprobe does not pass the post check, an incident report must be filled out. The sonde and report should be given to the meter maintenance technician. Any problems associated with the day's activities (equipment, a sampling site, field computer, vehicle, etc.) should be reported immediately to the sampling supervisor or project coordinator.

Planning for the next day's activities can now begin.

Detail 1
WQMP Personnel Organization Chart

DETAIL 1. DATA COLLECTION BUREAU / WQMP PERSONNEL ORGANIZATION CHART



Detail 2
Ground and Surface Water
Sample Collection Equipment

WQMP GROUND AND SURFACE WATER SAMPLE COLLECTION EQUIPMENT

Brand Name	Model Number	Serial Number	FA Number	WQMP Number	Construction Details
Sample Gloves	NA	NA	NA	NA	Disposable-powder-free latex
Teflon Tubing	NA	NA	NA	NA	Disposable-1/16" & 3/8"
.45 um barrel syringe filter	NA	NA	NA	NA	Cellulose Acetate
60 ml barrel syringe	NA	NA	NA	NA	Plastic
Tripod filter	NA	NA	NA	NA	Polycarbonate
Various sample/discharge hoses	NA	NA	NA	NA	Teflon, PVC, polypropylene, polyethylene
Grab Sample	NA	NA	NA	NA	Plastic/Glass
Peristaltic Pump	07571-00	J00000011	NA	P002	Silicone, PVC, stainless steel pump head
Peristaltic Pump	07571-00	D00003291	NA	P004	Silicone, PVC, stainless steel pump head
Peristaltic Pump	07571-00	J08006240	10-19781	P007	Silicone, PVC, stainless steel pump head
Peristaltic Pump	07571-00	J08001175	10-19782	P008	Silicone, PVC, stainless steel pump head
Peristaltic Pump	07571-00	J08001172	10-19783	P009	Silicone, PVC, stainless steel pump head
Peristaltic Pump	07571-00	J08001174	10-19784	P010	Silicone, PVC, stainless steel pump head
Peristaltic Pump	07571-00	C09000087	10-19791	P011	Silicone, PVC, stainless steel pump head
Peristaltic Pump	07571-00	F14002690	10-21275	P013	Silicone, PVC, stainless steel pump head
Peristaltic Pump	07571-00	F14002691	10-21276	P014	Silicone, PVC, stainless steel pump head
JETSUB Submersible Pump	A PL 9950	96030135	NA	J007	Stainless steel pump head
JETSUB Submersible Pump	A PL 0248	96511017	NA	J008	Stainless steel pump head
JETSUB Submersible Pump	22 SQ-190	96397386	NA	J013	Stainless steel pump head
JETSUB Submersible Pump	P1 1118	96511017	NA	J071	Stainless steel pump head
JETSUB Submersible Pump	22 SQ-190	96160157	NA	J012	Stainless steel pump head

WQMP GROUND AND SURFACE WATER SAMPLE COLLECTION EQUIPMENT

Brand Name	Model Number	Serial Number	FA Number	WQMP Number	Construction Details
Rediflo Submersible Pump	NA	021413153	10-16128	R011	316 & 329 stainless steel pump head
Rediflo Submersible Pump	A1A106003	P111450015	10-19497	R069	316 & 329 stainless steel pump head
Rediflo Submersible Pump	200	00102250	NA	R014	316 & 329 stainless steel pump head
Rediflo Submersible Pump	A 1A106003	1511950	10-17562	R066	316 & 329 stainless steel pump head
Proactive Typhoon	P-10200	NA	NA	NA	Plastic submersible pump
Proactive Tornado	P-10330	1415	NA	NA	Plastic submersible pump
SS GeoSub Submersible Pump	81400103	NA	10-19780	R068	316 stainless steel pump head
Grundfos 1.5" Submersible Pump	MS-402	L90 02-2738	NA	S019	304 SS stainless steel pump head
Grundfos 1.5" Submersible Pump	MS-402	O1D18 11-2291	NA	S020	304 SS stainless steel pump head
Grundfos 2" Submersible Pump	2243019204	O3D18 28-1875	NA	S021	304 SS stainless steel pump head
Grundfos 2" Ette Submersible Pump	2243009204	07D18 28-1875	NA	S022	304 SS stainless steel pump head
Mini Honda Centrifugal Pump	WX10	GCAG-1930905	NA	M023	
Mini Honda Centrifugal Pump	WX10	GCAG-1931038	NA	M024	
Mini Honda Centrifugal Pump	WX10	GCAG-1451061	NA	M025	
Mini Honda Centrifugal Pump	WX10	GCAG-1930951	NA	M026	
Mini Honda Centrifugal Pump	WX10	GCAG-206602	NA	M027	
Mini Honda Centrifugal Pump	WX10	GCAG-2025157	NA	M028	
Mini Honda Centrifugal Pump	WX10	GCAG-2166806	NA	M061	
Mini Honda Centrifugal Pump	WX10	GCAG-2200935	NA	M064	
Big Honda Centrifugal Pump	WH20X	GC02-3296413	NA	B029	

WQMP GROUND AND SURFACE WATER SAMPLE COLLECTION EQUIPMENT

Brand Name	Model Number	Serial Number	FA Number	WQMP Number	Construction Details
Big Honda Centrifugal Pump	WH20X	GC02-7127507	NA	B031	
Big Honda Centrifugal Pump	WH20X	GC02-3110254	NA	B033	
Big Honda Centrifugal Pump	WH20X	GCAAK1572110	NA	B036	
Big Honda Centrifugal Pump	WH20X	GCAAK1572222	NA	B034	
Big Honda Centrifugal Pump	WH20X	GCAAK1572233	NA	B035	
PD Yellow	7200WTTS	WH190F06044403	NA	G070	
Honda Generator	EB5000	GC05-2796907	10-13855	G037	
Honda Generator	EM5000S	GC05-3683739	10-17376	G039	
Honda Generator	EM5000S	GC05-3858918	NA	G041	
Honda Generator	EG5000	EBEC-1000567	10-	G071	
Honda Generator	EG5000CL	EBEC-1011804	10-21270	G072	
ONAN Generator	5500	K06E008617	NA	G043	
Alpha Bottle	6.2 L	NA	NA	A040	Acrylic
Alpha Bottle	6.2 L	NA	NA	A042	Acrylic
Alpha Bottle	6.2 L	NA	NA	A043	Acrylic
Alpha Bottle	6.2 L	NA	NA	A044	Acrylic
Alpha Bottle	6.2 L	NA	NA	A045	Acrylic
Electronic Water Level Tape	Solinst 101	202927	NA	W060	
Electronic Water Level Tape	Solinst 101	38367	NA	W053	
Electronic Water Level Tape	Heron Watermark	27015	NA	W061	
Electronic Water Level Tape	Solinst 101	61207	NA	W062	
Electronic Water Level Tape	Solinst 101	35417	NA	W059	

Detail 3

Sample Equipment Descriptions

WQMP Deionized (DI) System

Located in a climate controlled clean equipment room at the Tampa Service Office. There is also a system located in the WQMP Service Bay at the Sarasota Service Office.

Electronic Water Level Tape

Equipment is used to measure water levels in wells.

SonTek FlowTracker

Equipment is used for the collection of flow measurements in streams, rivers, canals, and creeks.

Alpha Bottle and Secchi Disk

Alpha bottle is used from bridges and boats for the collection of surface water samples.
The Secchi Disk is used to measure water clarity.

YSI ProDSS Multiprobe

In-Situ field data collection at ground and surface water sites.

YSI Multiprobe with 650 Hand Held Display, Cable, & Flow Cell

In-Situ field data collection at ground and surface water sites and unattended data logging.

Acid and Formalin Storage Cabinets

Located in a climate controlled clean equipment room.

Typhoon Submersible Pumps

Max depth pump can be set = 30'
Discharge rate = 3 GPM
Powered by 12VDC

<u>Tripod Filter Apparatus and Barrel Syringe</u>

Filtration of ground and surface water samples.

<u>WAAS Corrected Handheld GPS Unit (Garmin)</u>

Navigation to sites and recording of site coordinates.

WQMP Kit Storage Bins

Located in a climate controlled, clean equipment room.

Tornado Submersible Pump

Max depth pump can be set = 85‘
Discharge rate = 4 GPM
Powered by 12VDC

Jetsub Submersible Pump

Max depth pump can be set = 200’
Discharge rate = 30 GPM Powered by generator

2HP Submersible Pump

Max depth pump can be set = 200’
Discharge rate = 45-70 GPM Powered by generator

RediFlo Submersible Pump

Max depth pump can be set = 200’
Discharge rate = 1-6 GPM Powered by generator

<u>SONTEK RiverSurveyor S5</u>

Equipment used for the collection of flow measurements in rivers and streams.

Big and Mini Centrifugal Pumps

Max depth pumps can be set = 25‘
Big centrifugal discharge rate = 50 – 150 GPM
Mini centrifugal discharge rate = 5 – 30 GPM
They are gas powered.

HONDA® Generator

Generator is used to power Grundfos®,
Redi-Flo® and Jet-Sub submersible pumps
They are gas powered.

Peristaltic Pumps

Discharge range from 0.00–0.25 GPM variable speed
Max depth pump can be set = 25‘
Powered by 12VDC

WQMP Field Computer and Network Printer

Field sheets and custody logs may also be printed at the Brooksville Chemistry Laboratory.

WQMP Canoes

Located in the pump room.

WQMP WELDBILT Boat

18 ft. V-Hull Tunnel boat with 50 HP HONDA, 4 stroke motor.

Carolina Skiff

17’ Skiff with 80 HP Suzuki 4 Stroke Motor

<u>HACH Turbidimeter</u>

The collection of turbidity readings for groundwater projects.

WQMP Gheenoe

16 ft. with 2 HP HONDA,
4 Stroke motor

ONSET OTT Logger

Loggers used for unattended surface water data collection.

Detail 4 Water Level Instrumentation Instructions

WATER LEVEL INSTRUMENTATION INSTRUCTIONS

Disassembling Water Level Recorder (WLR)

Removing the steel tape or PT (Pressure Transducer) prior to sampling is mandatory. Care is needed in taking apart the water level recorder (WLR).

1) Complete top portion of the water level instrumentation log (see Detail 14 for example form): SID, well name, technician name, date and instrument type (e.g. float and tape, PT, etc.). Note on the water level log the time and depth to water reading before disassembly.
2) Using two small pieces of duct tape mark a spot on the wheel and tape that correspond.
3) Using another longer piece of duct tape, remove the steel tape from the wheel without spinning it and place the duct tape on the wheel and box to keep the wheel from spinning. Take care not to tape over the tape already on the wheel.
4) If necessary, remove the WLR by unscrewing the mounting screws located on the feet of the sensor wheel.
   Note: Make note of any washers being used to keep the WLR level. Make sure these get replaced when you put the water level recorder back together.
5) Use only one hand to remove the guard over the well, while holding the steel tape with the other.
6) Once the guard is removed, you may remove the steel tape, float, and weight.
   Note: Be careful to notice what side the float and weight are on if it is not marked in the well shelter. Placing the float on the wrong side will make the readings run backwards. If not marked, note with sharpie on shelter which side float was on for future reference.
7) Place the tape in a safe out of the way place, free from persons walking on it or bending it. Do not coil tape on ground, it should be walked out straight back away from well.
8) You now may begin sampling protocols.

Reconnecting the WLR after Sampling

1) Place the float on the correct side of the ―guard‖. You may let it go down into the well, just be sure the well has recovered the point where the float hits water and there is still a considerable amount of tape out of the well.
2) Replace the ―guard‖ so that the float and weight will be on the correct sides. You may go ahead and put the weight in the well, take care to rest the tape on the guard so it does not fall in, or hold onto tape with free hand.
3) Replace the WLR by moving it back to its correct spot and remounting it with its screws. **Note:** Be sure to place any washers back in their original positions before replacing the WLR.
4) After remounting the WLR, place the steel tape back on the sensor wheel by lining up the taped areas on each. Carefully remove the tape on both sides so that the holes line up correctly.
5) You may then carefully remove the large piece of tape that is keeping the sensor wheel from turning.
   Note: The well may draw down or recover considerably; therefore you may need to control the turning of the sensor wheel while it comes into equilibrium with the new water level.

6) After the sensor wheel stops turning, you are finished putting the WLR back together.
7) Note the ending time and depth to water reading on the water level instrumentation log. Include any necessary additional comments regarding the water level instrument (e.g. float on incorrect side, kinks in tape, etc.) on the water level log.
8) If the well is a USGS site, record reading at pointer onto water level log.
9) Turn in the water level log to the WQMP Field Technician Supervisor upon completion.

Removing PT

1) Complete top portion of the water level instrumentation log (see Detail 14 for example form): SID, well name, technician name, date and instrument type (e.g. float and tape, PT, etc.). Note on the water level log the time and depth to water reading before disassembly.
2) Gently raise the PT out of the well taking care not to knock it on the well casing or shelter floor. As the PT is raised the cord should be coiled. At no time should the cord be kinked.
3) Once the PT has been removed and coiled it should be place to the rear of the shelter or on the ground and out of the way of activity, whichever is safest.

Replacing the PT after Sampling

1) Slowly lower the PT into the water without knocking the PT or kinking the cord.
2) After the PT is submerged it should be gently raised and lowered a few inches in order to free any air bubbles which may have become trapped inside.
3) Note the ending time and depth to water reading on the water level instrumentation log. Include any necessary additional comments on the water level log.
4) Turn in the water level log to the WQMP Field Technician Supervisor upon completion.

Issues

Issues with the water level recording equipment (e.g. cannot be reassembled due to drawdown, weight and float on wrong, the tape and/or float are in bad condition, etc.), will be directed to the appropriate personnel (preferably by e-mail if possible) as listed below, as well as to the technician supervisor and project manager.

If the well has USGS equipment on it contact the following USGS personnel:

Kevin Grimsley
Tampa Data Chief
Email: kjgrims@usgs.gov
813-498-5064

Mickey Messer
Field Operations Supervisor
Email: mmesser@usgs.gov
813-498-5060

Dusty McDevitt
Records Processing Supervisor
Email: mcdevitt@usgs.gov
813-498-5068
Cell 813-918-8784

Note: If the well has USGS equipment, make note of any USGS identification that may be assigned to the well as it may differ from District assigned identification.

If the well has District equipment on it, contact the following District personnel:

Steven Saxon
Field Technician Supervisor
Email: steven.saxon@swfwmd.state.fl.us
352-796-7211, extension 4290

Detail 5
Well Volume
and Purge Rate/Time
Calculation Instructions

WELL VOLUME AND PURGE RATE/TIME CALCULATION

Well Volume Calculation

1) Determine Water Column Height **(h)**
   i. Retrieve the total depth of the well from the characterization. Total depth given in the characterization is from **land surface**; in order to correctly characterize the water column height, any stick up above land surface must be added to the total depth given in the characterization. For example – If the total depth value given in the characterization for a well is 100 feet from land surface and there is an additional three feet of ‗stick up' above land surface then the total depth from top of casing **(TOC)** would be 103 feet. Measure the distance from the TOC to the top of the water column and record this as the depth to water value **(d)**.
   ii. Subtract the Depth to water **(d)** from the total depth as referenced to the top of the casing **(TOC)**. This is the water column height **(h)**.

Water Column Height = h = TOC – d

If depth to water **(d)** = 25ft and the total depth of the well from the top of casing **(TOC)** = 103 ft, then the water column height **(h)** = 78 ft.

Water Column Height = 78 ft = 103 ft – 25 ft

2) Determine Well Volume
   i. Obtain the casing diameter of the well from the characterization. Casing diameters are given in inches.
   ii. Using the table containing well volume factors below, obtain the gallons per linear foot using the casing diameter as the reference. For example, if the casing diameter in the characterization is listed as four in., then the gallons per linear foot for a four inch well would be 0.6528 gal/ft.
   iii. To determine the volume of water currently present in the well to be sampled, multiply the water column height **(h)** by the well volume factor to obtain the gallons of water contained in one well volume for the given well.

1 Well Volume = h x well volume factor

If the water column height **(h)** = 78 ft and the **well volume factor** is = 0.6528 gal/ft, then the volume of water in the well = 50.9 gallons. Multiplying the result by three gives the volume of water needing to be evacuated in order to purge three well volumes (three well volumes = 152.7 gal).

1 Well Volume = 50.9 gal = 78 ft x 0.6528 gal/ft

3 Well Volumes = 152.7 gal = 50.9 gal x 3

FACTORS USED TO CALCULATE WELL VOLUME

Diameter of hole In.	Gallons Per Lin. Ft.
2	0.1632
1/8	0.1842
1/4	0.2065
3/8	0.2301
1/2	0.2550
5/8	0.2811
3/4	0.3085
7/8	0.3372
3	0.3672
1/8	0.3984
1/4	0.4309
3/8	0.4647
1/2	0.4998
5/8	0.5361
3/4	0.5737
7/8	0.6126
4	0.6528
1/8	0.6942
1/4	0.7369
3/8	0.7809
1/2	0.8262
5/8	0.8727
3/4	0.9205
7/8	0.9696
5	1.0200
1/8	1.0716
1/4	1.1245
3/8	1.1787
1/2	1.2342
5/8	1.2909
3/4	1.3489
7/8	1.4082
6	1.4688
1/8	1.5306
1/4	1.5937
3/8	1.6581
1/2	1.7238
5/8	1.7907
3/4	1.8589
7/8	1.9284
7	1.9992
1/8	2.0712
1/4	2.1445
3/8	2.2191
1/2	2.2950
5/8	2.3721
3/4	2.4505
7/8	2.5302

Diameter of hole In.	Gallons Per Lin. Ft.
8	2.6112
1/8	2.6934
1/4	2.7769
3/8	2.8617
1/2	2.9478
5/8	3.0351
3/4	3.1237
7/8	3.2136
9	3.3048
1/8	3.3972
1/4	3.4909
3/8	3.5859
1/2	3.6822
5/8	3.7797
3/4	3.8785
7/8	3.9786
10	4.0800
1/8	4.1826
1/4	4.2865
3/8	4.3917
1/2	4.4982
5/8	4.6059
3/4	4.7149
7/8	4.8252
11	4.9368
1/8	5.0496
1/4	5.1637
3/8	5.2791
1/2	5.3958
5/8	5.5137
3/4	5.6329
7/8	5.7534
12	5.8752
1/8	5.9982
1/4	6.1225
3/8	6.2481
1/2	6.3750
5/8	6.5031
3/4	6.6325
7/8	6.7632
13	6.8952
1/8	7.0284
1/4	7.1629
3/8	7.2987
1/2	7.4358
5/8	7.5741
3/4	7.7137
7/8	7.8546

Diameter of hole In.	Gallons Per Lin. Ft.
14	7.9968
1/8	8.1402
1/4	8.2849
3/8	8.4309
1/2	8.5782
5/8	8.7267
3/4	8.8765
7/8	9.0276
15	9.1800
1/8	9.3336
1/4	9.4885
3/8	9.6447
1/2	9.8022
5/8	9.9609
3/4	10.1209
7/8	10.2822
16	10.4448
1/4	10.7737
1/2	11.1078
3/4	11.4469
17	11.7912
1/4	12.1405
1/2	12.4950
3/4	12.8545
18	13.2192
1/4	13.5889
1/2	13.9638
3/4	14.3437
19	14.7288
1/4	15.1189
1/2	15.5142
3/4	15.9145
20	16.3200
1/4	16.7305
1/2	17.1462
3/4	17.5669
21	17.9928
1/4	18.4237
1/2	18.8598
3/4	19.3009
22	19.7472
1/4	20.1985
1/2	20.6550
3/4	21.1165
23	21.5831
1/4	22.0549
1/2	22.5317
3/4	23.0137

Purge Rate/Time Calculation

1) Determine Purge Rate
   i. To determine the purge rate for the equipment being utilized to purge the well, use a five gallon bucket and a stopwatch. Record the total amount of time (in seconds) it takes to fill the five gallon bucket.
   ii. Divide the total amount of seconds into 300 sec (since five gallons per minute is equal to five gals per 300 sec). The result is the purge/flow rate (Q) in gallons per minute (gpm).

Purge Rate = Q gpm = 300 sec / amount of time to fill five gallon bucket (in seconds)

If it took 30 secs to fill up the five gallon bucket, then the rate at which the pump is purging would be 10 gpm.

Purge Rate = 10 gpm = 300 sec / 30 sec

2) Determine Purge Time
   i. Using the previously calculated purge volume for the well currently being sampled, divide by Q (which was obtained when calculating the purge rate). This gives the amount of time in minutes it would take to purge a specific volume from the well.

Purge Time = Purge Volume gal / Q gpm

If the previously calculated purge volume = 50.9 gal for one well volume and the purge rate **(Q)** = ten gpm, then the time it would take to purge one well volume = 5.9 minutes.

Purge Time for 1 Well Volume = 5.9 min = 50.9 gal / 10 gpm
Purge Time for 3 Well Volumes = 15.3 min = 152.7 gal / 10 gpm

3) Determine the Time at which to Collect Readings
   i. For wells, field readings are typically recorded after each half well volume has been purged. To determine the time at which each field reading should be recorded, divide the amount of time it would take to purge three well volumes by six. This value can also be obtained by dividing the amount of time it would take to purge one well volume by two.

Time Interval to Collect Field Readings for 0.5 Well Volume =
Purge Time for 3 Well Volumes / 6

If the purge time for three well volumes = 15.3 min, then the time at which it would take to purge 0.5 well volume = 2.55 min. So every 2.55 min field readings would need to be recorded.

Time Interval to Collect Field Readings for 0.5 Well Volume =
2.55 min = 15.3 min / 6

An example of how to record the well volume and purge rate/time information on the groundwater field sheet is provided below:

Example Groundwater Field Sampling Data Sheet

Southwest Florida Water Management District

Water Quality Monitoring Program
7601 HWY 301 N. Tampa, FL 33637 (813) 985-7481
FDEP SOP(s) FD1000, FS1000, FT1000

SID/UID ____________ COUNTY ____________ PROJECT ____________
SITE NAME ____________ SAMPLERS ____________

CASED DEPTH (from land surface) ____50____ CASING DIAMETER ____4____

TOTAL DEPTH (from land surface) ____100____

CASING MATERIAL: PVC/ STEEL/ IRON/ OTHER ____PVC____

AQUIFER: SURFICIAL/ INTERMEDIATE/ FLORIDAN/ OTHER ____Surficial____

LAB: DISTRICT/ USGS/ DEP/OTHER ____________

ON SITE (Date & Time) ____________

LAND SURFACE ELEV/ MEASURING POINT ELEV ____87/90____

METER CALIBRATION **OTHER METERS**

meter # ____________ meter # ____________

PURGE EQUIPMENT AND DISCHARGE **WATER ELEVATION (MPE-DTW)** 90 –25 = 65

Purge with ____Mini Centrifugal____ **TOTAL DEPTH (TOC)** ____103____

@________,Q=____10____GPM **DEPTH TO WATER** ____25____(d)

Purge time ____3 WV = 15.3 min____ **WATER COLUMN HEIGHT** ____78____(h)

Measurement interval for readings (min/ gal) ____2.55 min / 0.5 gal____

1 WELL VOLUME= ____78____ (h)X ____0.6528____(gal/lin.ft.)

Purge <3 volumes? Y/N If yes, why? = ____50.9____GALLONS

____________ 3 WELL VOLUMES= ____152.7____GALLONS

Detail 6
Cleaning Day Protocols for Sample Equipment and Sampling Vehicles

CLEANING DAY PROTOCOLS FOR SAMPLING EQUIPMENT & SAMPLING VEHICLES

Submersible and Centrifugal Pumps

Fill two large trash cans with water and add Liquinox to one of them. Place submersible pump in soapy water and scrub until clean. Place suction hose from centrifugal in soapy water. Run each pump for several minutes. Uncoil and clean wire and hose with soapy water. Rinse pumps, pump buckets, reels, hoses and wires with tap water. Neatly recoil wire back on reels and in buckets. Tag all clean pumps with survey tape. Any repairs or maintenance should be noted in the comments. Initial appropriate boxes.

Pump	Model #	Serial #	WQM	FA #	Cleaned	Not used
Rediflo	A 1A106003	P111300004	R011	10-16128		
Rediflo	A 1A106003	P110360035	R014	N/A		
Geosub	81400103	N/A	R068	10-19780		
Rediflo	A1A106003	P111450015	R069	10-19497		
Jetsub	A PI 9950	96030135	J007	N/A		
Jetsub	A PI 0248	96511017	J008	N/A		
Jetsub	22SQ-190	96160157	J012	N/A		
Jetsub	P1 1118	96511017	J071	N/A		
Grundfos	MS-402	01D18 11-2291	S020	N/A		
Grundfos 2"	2243019204	03D18 28-1875	S021	N/A		
Grundfos 2"	2243019204	07D18 28-1875	S022	N/A		
Honda Mini	WX10	GCAG-1930905	M023	N/A		
Honda Mini	WX10	GCAG-1931038	M024	N/A		
Honda Mini	WX10	GCAG-1451061	M025	N/A		
Honda Mini	WX10	GCAG-1930951	M026	N/A		
Honda Mini	WX10	GCAG-206602	M027	N/A		
Honda Mini	WX10	GCAG-2025157	M028	N/A		
Honda Mini	WX10	GCAG-2166806	M061	N/A		
Honda Mini	WX10	GCAG-2200935	M064	N/A		
Honda Big	WH20X	GC023296413	B029	N/A		
Honda Big	WH20X	GC027127507	B031	N/A		
Honda Big	WH20X	GC023110254	B033	N/A		
Honda Big	WH20X	GCAAK1572222	B034	N/A		
Honda Big	WH20X	GCAAK1572233	B035	N/A		
Honda Big	Wh20X	GCAAK1572110	B036	N/A		

Comments: ____

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Technicians: ______________________ ______________________

Sr. Technician: ______________________ **Date:** ______________________

CLEANING DAY PROTOCOLS FOR SAMPLING EQUIPMENT & SAMPLING VEHICLES

Peristaltic Pumps

For these pumps, the tubing is washed with Liquinox and rinsed with DI. Replace the tubing with a one foot piece of new masterflex tubing as needed. Wipe down inside and outside of pump with a damp cloth. Note any repairs or maintenance in the comments. Retrace WQMP# if faded.

Pump	Model	Serial #	WQMP	FA #	Tubing	Tubing
Masterflex	7571-00	J00000011	P002	N/A		
Masterflex	7571-00	D00003291	P004	N/A		
Masterflex	7571-00	J08006240	P007	10-19781		
Masterflex	7571-00	J08001175	P008	10-19782		
Masterflex	7571-00	J08001172	P009	10-19783		
Masterflex	7571-00	J08001174	P010	10-19784		
Masterflex	7571-00	F14002690	P013	10-21275		
Masterflex	7571-00	F14002691	P014	10-21276		
Masterflex	7571-00	C09000087	P011	10-19791		

Comments: ____

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Hoses

Hoses should be cleaned with a pressure washer. Any repairs or maintenance should be noted in the comments. All cleaned hoses should be tagged with survey tape indicating they are clean.

Hoses	# Not used	# Cleaned	Total
Mini			
Big			
Jetsub100‘			
Jetsub50‘			
2‖ X 100‘			
2‖ X 50‘			
2‖ X 25‘			

Comments: ____

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Technicians:______________________ ______________________

Sr. Technician:______________________ **Date:** ______________________

CLEANING DAY PROTOCOLS FOR SAMPLING EQUIPMENT & SAMPLING VEHICLES

Gas Engine Oil & Maintenance

All generators and gas pumps should have the oil level checked monthly and oil changed every other month as needed. A check in the appropriate box should indicate the maintenance performed. Any repairs or mechanical issues should be noted in the comments. They should be pressure washed or wiped down as needed then retrace WQMP# if fading.

Generators

Pump	Model #	Serial #	WQMP #	FA #	Level	Oil
Honda	EM 5000 S	GC05-2796907	G037	10-13855		
Honda	EM 5000 S	GC05-3683739	G039	10-17376		
Honda		GC05-3858918	G041	N/A		
Onan	5500	K06E008617	G043	N/A		
Honda	EG5000CL	EBEC-1011804	G072	10-21270		
B&S			G073	10-12192		
Honda	EG5000	EBEC-1000567	G071	10-21271		
PD yellow	7200 WTTS	WH190F06044403	G070	N/A		

Pumps

Pump	Model #	Serial #	WQMP #	Level check	Oil Changed
Honda Mini	WX10	GCAG-1930905	M023		
Honda Mini	WX10	GCAG-1931038	M024		
Honda Mini	WX10	GCAG-1451061	M025		
Honda Mini	WX10	GCAG-1930951	M026		
Honda Mini	WX10	GCAG-206602	M027		
Honda Mini	WX10	GCAG-2025157	M028		
Honda Mini	WX10	GCAG-2166806	M061		
Honda Mini	WX10	GCAG-2200935	M064		
Honda Big	WH20X	GC023296413	B029		
Honda Big	WH20X	GC027127507	B031		
Honda Big	WH20X	GC023110254	B033		
Honda Big	WH20X	GCAAK1572222	B034		
Honda Big	WH20X	GCAAK1572233	B035		
Honda Big	Wh20X	GCAAK1572110	B036		

Comments: ____

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Technicians: ____________________ ____________________

Sr. Technician: ____________________ **Date:** ____________________

CLEANING DAY PROTOCOLS FOR SAMPLING EQUIPMENT & SAMPLING VEHICLES

Backroom Cleaning Check List
Note: **WEAR GLOVES AND SAFETY GOGGLES WHEN HANDLING ACID. ALWAYS ADD THE ACID TO THE WATER, NEVER THE WATER TO THE ACID**.

Begin by filling a five-gallon bucket with tap water. Pour all acid waste containers (vials and baking soda) in the bucket then stir. Check the pH in the bucket. If needed, add baking soda until it reaches a pH of 7. Pour water into strainer. Remove and discard acid waste vials in trash.

Fill a clean trash can with tap water. Add HCL until pH is below 2. All tripod filters should be taken apart and soaked along with flow cells. After soaking, scrub flow cells and tripod filters with tap water and Liquinox, and then rinse with tap water. Add baking soda to trash can until pH reaches 7, and then empty.

Alpha bottles should be removed from trucks, scrubbed with Liquinox and rinsed with DI, then air dried.

Scrub YSI buckets and sonde tubes until clean. Replace sponge in sonde tube.

Rinse DI and buffer bottles with a mixture of DI and HCL. Remove HCL with three rinses of DI only. Allow bottles to air-dry then cover spout with clean whirl-pak. Refill bottles.

Refill pH buffer containers and acid dropper bottles to tape line only. Check pH strips and restock as needed. Check tripod filters and restock as needed.

Wipe down all tables, cabinets, desks, and shelving. Throw out all trash, recycled bottles, etc. Remove all items from floor; sweep and mop floor with hot soapy water. Let air-dry. Replace items. Remove any items that do not belong in the backroom and straighten out all items on shelves and desks. Restock any items that are running low. Defrost refrigerator. Clean inside and outside. Throw out any old food. Scrub and clean sinks.

RESTOCK		**CLEANING**	
Latex gloves	In-line filters	DI containers	Clean mats
Utility wipes	Syringes & filters	Buffer containers	Reorganize room
Kimwipes	Trash bags	Refrigerator	
Ziploc bags	Baking soda	Sink	
Tripod filter paper	WLR sheets	Tables, shelves	
Acids	Shipping Labels	Clutter removed	
Whirl-paks	Groundwater sheets	Remove trash	
pH/cond. buffers	Surface water sheets	Floor swept	
pH strips	Duct tape/Packing tape	Floor mopped	

Restock completed:_____________ **Cleaning completed:** ___________

Technician:____________________ **Date:** _________________________

List any low or needed supplies: ____

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Sr. Technician: ______________________________

CLEANING DAY PROTOCOLS FOR SAMPLING EQUIPMENT & SAMPLING VEHICLES

Boat/Trailer Cleaning Check List

All boats, trailers and canoes should be pressure washed inside and out. Check list should be gone through and checked off for each item. Any maintenance or item issues should be listed in the comments.

WeldBilt Boat

Item	Checked	Item	Checked
Check oil		Check rope	
Clean interior and compartments		Check safety items	
Clean exterior		Grease & lube motor	
Lube steering cables		Clean trailer	
Check horn		Check lights	
Check battery		Check tire pressure	
Check drain plugs		Grease & lube wheel bearings	
Check anchor		Check safety chains	

Gheenoe

Item	Checked	Item	Checked
Check oil		Check safety items	
Clean interior		Grease & lube motor	
Clean exterior		Clean trailer	
Check rope		Check lights	
Check horn		Check tire pressure	
Check drain plugs		Grease & lube wheel bearings	
Check anchor		Check safety chains	

Canoes

Canoe #	Serial #	Pressure cleaned	Not used
W01	ZPE05017A303		
W02	XTC01363J102		
W03	ZEP0360ZA303		

Comments: ____

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Technicians: ______________________ ______________________

Sr. Technician:______________________ **Date:** ______________________

Detail 7
Meter Calibration
and Maintenance Protocols

METER CALIBRATION AND MAINTENANCE PROTOCOLS

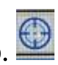
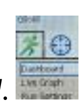
There are three YSI multiprobe sondes the WQMP currently uses: YSI EXO Series for continuous monitoring, Pro DSS Series for routine field readings, and YSI 6 Series for unattended logging. The YSI 6 Series also serves as an alternative for the Pro DSS in the event of unavailability.

Meter Calibration for YSI EXO Series

Calibrating Depth

1. Press the *Power* button.
2. Use arrows on handheld to scroll to the Calibration tab.  Press Enter.
3. Scroll down to *Dep NV 0-100m.* Press Enter. Press Enter again on *Depth m.*
4. Make sure depth sensor openings at the base of the meter are unobstructed.
5. Enter 0 for the Value under Point 1.
6. Press the top right button to *Start Cal.*
7. Wait for the *Red Unstable* light to turn *Green Stable.*
8. Note the pre-calibration readings for depth in meters, and record the value on the ELB calibration log.
9. Press *Apply* to accept the calibration. Then press the *Complete* Button.
10. The next screen shows your QC Score for the calibration. Press OK.

Calibrating pH

1. Use arrows on handheld to scroll to the Calibration tab.  Press Enter. 
2. Scroll down to the pH Calibration. Press Enter.
3. The EXO will only show a 2 Point Calibration. You will need to add the 3rd Point by Pressing .
4. The Order of Calibration will be pH 7.00 / pH 10.00 / pH 4.00.
5. Rinse pH probe with DI, and then with pH 7.00 standard.
6. Submerge pH probe in pH 7.00 standard.
7. Press *Start Cal.*
8. On the calibration screen allow time for the temperature, pH, and pH millivolt values to stabilize.
9. Wait for the *Red Unstable* light to turn *Green Stable.*
10. Once the readings are stable, note the temperature, pH, and pH millivolt values on the ELB calibration log.
11. Select *Apply* to Calibrate. Then Press *Next.*
12. Now you are ready for pH 10.00 Calibration.
13. Repeat steps 5-11 with pH 10.00 standard.
14. Now you are ready for pH 4.00 Calibration.
15. Repeat steps 5-11 with pH 4.00 standard.
16. The next screen will show the pH cal. QC Score. Press OK.
17. Now you can perform your pH QC Check.
18. Press *ESC* Button.
19. Scroll left to the "*Running Man"* and Scroll down to *Dashboard*.  Press Enter. 
20. Rinse the pH probe with DI water, and then with a pH buffer.
21. Submerge the pH probe in solution.

22. Wait for readings to stabilize. Then Record values on the ELB calibration log > pH Check.

Calibrating Specific Conductivity

1. Use arrows on handheld to scroll to the Calibration tab.  Press Enter. 
2. Rinse the conductivity probe with DI, and then with 6667 uS/cm standard.
3. Submerge the conductivity probe in 6667 uS/cm standard.
4. Select Conductivity Calibration.
5. The Exo automatically enters a conductivity buffer value of 10,000 uS/cm.
6. You will need to delete that number by Pressing .
7. Now you can enter the appropriate calibration buffer solution value. *(Usually 6667)* Press Ok.
8. Wait for the *Red Unstable* light to turn *Green Stable.*
9. Once the conductivity/temp. is stable record the pre/post values on the ELB calibration log.
10. Select *Apply* to Calibrate. Then Press *Next.*
11. Press *ESC* Button.
12. Scroll left to the "*Running Man"* and Scroll down to *Dashboard*.  Press Enter. 
13. Now you can perform your Cond. QC Check.
14. Rinse the conductivity probe with DI water, and then with a different buffer solution from what you calibrated with. (Usually you try to match with closest known field values for that day.)
15. Submerge the conductivity probe in solution.
16. Wait for readings to stabilize. Then Record values on the ELB calibration log > Cond. Check.

Calibrating Optical Dissolved Oxygen

1. Use arrows on handheld to scroll to the Calibration tab.  Press Enter. 
2. Scroll down to *Optical DO.* Press Enter.
3. Press Enter again while Highlighted on *ODO sat.*
4. Rinse the ODO probe with DI.
5. Pour DI into the calibration cup until it's about a ½ inch high on the bottom.
6. Use a Kimwipe to dry the top of the ODO probe.
7. Place the cap of the calibration cup on top of the meter but do not tighten it down.
8. The Value should say: *Air Sat* under Point 1.
9. Press *Start Cal.*
10. Allow for readings to Stabilize.
11. Wait for the *Red Unstable* light to turn *Green Stable.*
12. Note the pre-calibration value and temperature, and then record the values on the ELB calibration log.
13. Press *Apply* to Calibrate. Then press *Complete.*
14. The next screen will show the DO cal. QC Score. Press OK.

EXO Calibration Complete.

Meter Calibration for YSI Pro DSS Series

Calibrating Depth

1. Press the *Power* button.
2. Press the *Calibration* button.

3. Make sure depth sensor openings at the base of the meter are unobstructed.
4. Note the pre-calibration readings for depth in meters, and record the value on the ELB calibration log.
5. Press *Enter* to accept the calibration.

Calibrating pH

1. Press the *Calibration* button.
2. Rinse pH probe with DI, and then with pH 7.00 standard.
3. Submerge pH probe in pH 7.00 standard.
4. Select pH Calibration.
5. *Ready for cal point 1* should appear at the bottom of the next screen below the graph.
6. Make sure the *Calibration value* at the top of the calibration screen is 7.00. If it isn't, use the arrow keys to scroll up to that row and press *ENTER*. Use the arrow keys on the next screen to change the value to 7.00 and select the *ENTER* button.
7. On the calibration screen allow time for the temperature, pH, and pH millivolt values to stabilize. This may take a few minutes and the graph at the bottom of the screen will show how stable the pH values are.
8. Once the readings are satisfactory, note the temperature, pH, and pH millivolt values on the ELB calibration log.
9. Select the *Accept Calibration* option on the Calibration screen and press *ENTER*.
10. The first calibration point will be accepted and the screen will look the same, except now *Ready for cal point 2* will appear at the bottom of the screen.
11. Repeat steps 2-9 with pH 4.00 standard, entering the appropriate values as necessary.
12. The second calibration point will be accepted and the screen will look the same, except now *Ready for cal point 3* will appear at the bottom of the screen.
13. Repeat steps 2-9 with pH 10.00 standard, entering the appropriate values as necessary.
14. After all 3 calibration points are completed, *Calibration successful!* will appear at the bottom of the Calibration home screen.
15. On the *Run* screen, check the pH calibration with one of the pH standards.

Calibrating Specific Conductivity

1. Press the *Calibration* button.
2. Rinse the conductivity probe with DI, and then with 6667 standard.
3. Submerge the conductivity probe in 6667 standard.
4. Select Conductivity Calibration.
5. An approximate Conductivity value will appear at the top of the Calibration screen. Change the value to 6667 if it is not already showing 6667.
6. Allow the meter to stabilize for a couple of minutes and note the pre-calibration value and temperature from the bottom of the Calibration screen, and then record the values on the ELB calibration log.
7. Select the *Accept Calibration* option. *Calibration successful!* will appear at the bottom of the Calibration home screen.
8. On the *Run* screen, check the Specific Conductivity calibration with a different standard that will "bracket" the expected values for the day.

Calibrating Optical Dissolved Oxygen

1. Rinse the ODO probe with DI.
2. Use a Kimwipe to dry the top of the ODO probe.

3. Pour DI into the calibration cup until it's about a ½ inch high on the bottom.
4. Place the cap of the calibration cup on top of the meter but do not tighten it down.
5. Press the *Calibration* button.
6. Select ODO Calibration.
7. Allow the meter to stabilize for a couple of minutes and note the pre-calibration value and temperature from the bottom of the Calibration screen, and then record the values on the ELB calibration log.
8. Select the *Accept Calibration* option. *Calibration successful!* will appear at the bottom of the Calibration home screen.

Meter Calibration for YSI 600 Series

Begin by connecting the appropriate length field cable (25ft, 50ft or 100ft) to both the YSI 650 (hand-held display) and the YSI Multi-probe. Make sure all connections are secure and moisture-free.

Calibration will be recorded in ELB.Net under the Calibration selection. The calibration information can be recorded manually in ELB.net during the calibration or written in the logbook and transferred to ELB.Net at the end of the day. Each sonde has a logbook that is used for documentation of sonde calibrations and mid and post day checks. Select the correct logbook for the sonde you are calibrating and start a new calibration log sheet (see Detail 14 for example form). Begin by filling out the relevant information at the top of the form; sonde #, calibration date, initial calibration time, personnel, and event(s).

Initial Calibration:
Turn on the YSI 650 and scroll to Sonde Menu and hit ENTER.
Scroll to Calibrate and hit ENTER (◄)

Between and prior to all calibrations rinse the calibration cup well (at least three times with each standard and/or DI). Calibrate in this order: specific conductance, pH, pressure (depth), dissolved oxygen (D.O.). Prior to each calibration add enough standard to the calibration cup to submerse the probes.

1) Specific Conductance – Use a standard of 1000 uS/cm or greater (usually 2764 uS/cm). Write the value of your standard in the ‗Known Value' field for the Sp. Cond ‗Calibrate' line of the initial calibration section of your calibration log. Write in the lot # of the standard you are using in the appropriate field of your calibration log.
   i. Select **Conductivity** from the calibrate menu and hit **ENTER**.
   ii. Choose **SpCond** from the conductivity calibration menu and hit **ENTER**.
   iii. Input the concentration of your standard in **mS/cm (e.g 2764 uS/cm would be**

2.764 mS/cm) and hit **ENTER.** After you hit enter a real-time display will appear on the screen. Note the specific conductivity and temperature values on the display. Once these values have stabilized, record the specific conductivity value from the display in the ―Pre-Calibrated Value‖ field on your calibration log.

iv. After recording the pre-calibrated value, hit **ENTER** to calibrate for specific conductivity. The screen will then display the calibrated value. Enter the specific conductivity and temperature values from the display into the ‗Calibrated Value' and ‗Temp (ºC)' fields on your calibration log.

v. Hit **ENTER** to return to the conductivity calibration menu and then **ESCAPE (ESC)** to get back to the main calibration screen.

vi. Calculate the difference between the known and calibrated values from your calibration log. Then determine if the difference falls within the acceptable range for the parameter (see table below), and write Y or N in the ‗Within Range' field of the calibration log accordingly.

2) pH - Note the ‗Known Value' field of the calibration log for pH is pre-filled. Always begin by calibrating pH 7. 'Write in the lot # of the pH buffer standard you are using in the appropriate field of the pH ‗calibrate' line of the initial calibration section of your calibration log.

   i. Select **ISE1 pH** from the calibrate menu and hit **ENTER**.
   ii. Then choose **3-Point** and hit **ENTER**.
   iii. Input the value of your first buffer **(7)** at the prompt and hit **ENTER.** After you hit enter a real-time display will appear on the screen. Note the pH value on the display. Once the pH value has stabilized, record it in the ―Pre-Calibrated Value‖ field on your calibration log.
   iv. After recording the pre-calibrated value, hit **ENTER** to calibrate for pH 7. The screen will then display the calibrated value. Enter the pH and temperature values from the display into the ‗Calibrated Value' and ‗Temp (ºC)' fields on your calibration log. Also record the pH millivolts (mV) from the display on the ‗mV for pH 7.00' line of the pH mV check section of your calibration log.
   v. Hit **ENTER** to return to the calibrate menu.
   vi. Calculate the difference between the known and calibrated values from your calibration log. Then determine if the difference falls within the acceptable range for the parameter (see table below), and write Y or N in the ‗Within Range' field of the calibration log accordingly.
   vii. Repeat the above steps for pH 4 and pH 10. Once all three pH points are calibrated and the millivolts for each have been recorded appropriately, hit **ESC** to get back to the main calibration screen.
   viii. On your calibration log, calculate the difference for the two mV equations and write Y or N accordingly in the ‗Within Range' fields.

3) Pressure-Abs (Depth) **–** The pressure/depth sensor is the circular shaped indention just above the probes. Note the ‗Known Value' field of the calibration log for depth is pre-filled with 0 feet. It is not necessary to have standard in the calibration cup during the depth calibration.

   i. Select **Pressure-Abs** and input 0.00 ft as a known sensor offset, then hit **ENTER**. After you hit enter a real-time display will appear on the screen. Note the depth value on the display. Once this value has stabilized, record the depth value from the display in the ―Pre-Calibrated Value‖ field on your calibration log.
   ii. After recording the pre-calibrated value, hit **ENTER** to calibrate for depth. The screen will then display the calibrated value. Enter the depth value from the display into the ‗Calibrated Value' field on your calibration log.

iii. Calculate the difference between the known and calibrated values from your calibration log. Then determine if the difference falls within the acceptable range for the parameter (see table below), and write Y or N in the ‗Within Range' field of the calibration log accordingly.
iv. Hit **ENTER** to return to the calibrate menu.

4) Dissolved Oxygen (D.O.) – Note the ‗Known Value' field of the calibration log for dissolved oxygen is pre-filled with 100 percent oxygen saturation. Add a small amount (about 1/8 inch) of DI water in the calibration cup and gently blot probes, sides of calibration cup, and cap with Kimwipes and cotton swabs. Gently place cap on calibration cup (do not tighten).
   i. Press **ESC** until you are returned to the main menu.
   ii. Choose **Sonde Run** mode and monitor the D.O percent saturation on the display until it stabilizes (usually takes ~ ten minutes).
   iii. Once the value stabilizes, hit **ESC** and return to the main menu.
   iv. Select **Sonde Menu**, then **Calibrate**.
   v. Choose **Dissolved Oxy** and then **DO %**. Dissolved oxygen is calibrated with % saturation, but read as mg/L during sample collection.
   vi. Input 760 mm Hg into the barometric pressure screen and hit **ENTER**. After you hit enter a real-time display will appear on the screen. Note the dissolved oxygen percent saturation value on the display. Once this value has stabilized, record the dissolved oxygen percent saturation value from the display in the ―Pre-Calibrated Value‖ field on your calibration log.
   vii. After recording the pre-calibrated value, hit **ENTER** to calibrate for dissolved oxygen. The screen will then display the calibrated value. Enter the dissolved oxygen percent saturation and temperature values from the display into the ‗Calibrated Value' and ‗Temp (ºC)' fields on your calibration log.
   viii. Hit **ENTER** to return to the calibrate menu.
   ix. Calculate the difference between the known and calibrated values from your calibration log. Then determine if the difference falls within the acceptable range for the parameter (see table below), and write Y or N in the ‗Within Range' field of the calibration log accordingly.

After calibration is complete, press **ESC** until you return to the main menu.

Initial Check

A check on specific conductance and pH is completed after the initial calibration and prior to heading into the field to confirm the calibrations. Scroll to **SONDE RUN** from the main menu and press **ENTER**.

Check your specific conductivity in the sonde run mode by rinsing and filling the calibration cup with a standard representative of the surface or groundwater that you will be sampling during the day. Historical field sheets or the historical data in the field computers can be used to verify the expected specific conductance concentration ranges. Once the standard has been added to the calibration cup to submerse the probes note the specific conductivity and temperate values on the 650 display. Once the values have stabilized record them on the Sp. Cond ‗*Check*' line in the initial calibration section. Verify that the calibrated value is within the specifications given in the table below. Follow the same steps with a pH standard to check for pH.

Midday Check

Complete a midday check sometime during the day, preferably at or near a sample point that occurs in the middle of the day. The midday is performed (in run mode) by recording the depth, specific conductance, pH, and dissolved oxygen values on the Midday Check tab in ELB.Net and comparing against the acceptable ranges. If no mid-day check is performed, note on the comments section of the calibration log the reason (i.e. no mid-day, only one station sampled). If any parameter fails this check, the sonde will need to be recalibrated for the failed parameter. The recalibration section of the calibration log should be used to record the results of the recalibration. If the recalibration also fails, the technicians should switch to their back-up sonde and begin a new calibration log. Note on the calibration log of the failed sonde the sonde # of the back-up sonde that was used.

Post Check

At the end of every sample day complete a post-check on the sonde once samplers have arrived back at the office. The post check is performed (in **run** mode) by recording the specific conductance, pH, dissolved oxygen, and depth values from the display in the Post-Use Check tab in ELB.Net and comparing against the acceptable ranges.

Meter Failures

If any sonde fails the initial calibration/check, midday or post check for a parameter, a Post - Calibration Failure and Sonde Maintenance Report (see Detail 14 for example form) needs to be filled out and turned in to the Field Technician Supervisor along with the field paperwork from the day's sampling activities.

WQMP Meter Maintenance Protocols

The responsibility of the meter maintenance technician is to oversee the operation, maintenance, and repair of all the WQMP's meters. The meter maintenance technician is responsible for ensuring that all meters produce reliable and quality data. The meter maintenance technician needs to have a thorough working knowledge of all meters. This requires independent research into the operation of each type of multiprobe. Being familiar with the manuals, consulting knowledgeable District staff, speaking with representatives from the manufacturers, and reading journal articles and texts are all excellent sources of information. The meter maintenance technician must also be able to communicate proper operation and care of the meters as well as any other technical information that may be important to the rest of the WQMP staff. Occasional updates on the proper care and operation of the meters, either during staff meetings or in the form of a memo, are recommended.

Meter Maintenance

The data that the WQMP collects carries the important underlying assumption that the meters used to collect the data are in proper working order. Routine maintenance is a critical part of the meter maintenance technician's responsibilities; this includes cleaning, calibration and check-ups for all multiprobe meters. These sondes have the capability to monitor five major field parameters: temperature, pH, specific conductivity, dissolved oxygen, and depth.

Each sonde is maintained monthly by the meter maintenance technician in order to keep all aspects of the probes functioning properly. During this maintenance each probe is cleaned, reconditioned, and tested according to manufacturer specifications before being placed back into service.

Meter Repair

Once the meter maintenance technician is made aware of a problem, they must assess the situation and decide whether the meter is repairable in-house or if it needs to be returned to the manufacturer.

If the meter is to be returned for repair to the manufacturer, the company should be contacted to provide information on their return/repair process. The manufacturer will need to receive and assess the meter and provide a quote for the repair cost back to the WQMP. Once the quote has been approved by the WQMP Manager it will be determined if a purchase order (issued by the WQMP administrative assistant) or a District Procurement Card (P-Card) will be used for payment for the repairs. No repair work should be done to the meter prior to the manufacturer receiving the purchase order in the mail, or the P-card information over the phone.

Detail 8
Field Data Collection and ELB.Net

Groundwater Sampling Procedure with ELB.Net

1) Double click the ELB.Net icon, or select ELB.Net from the start menu.
2) Select **Groundwater Sampling** from the ELB.Net main menu.
3) The **Multiple Well Select Screen** will appear and will show any current groundwater sampling sessions. Click the **Create New Session** button.
4) Three drop down boxes will appear for selecting technicians on duty for the session. Select the staff member(s) from the list and click the **Continue** button.
5) The **Well Select Screen** will appear for choosing the well to be sampled. If the SID for the site is available, type it into the **Find Text** field (if the SID is unavailable, search by name or other criteria). Select SID in the **Search Column** field. Hit the Enter button on the keyboard. The selected well will appear highlighted in the site list. If it matches the keyboard. The selected well will appear highlighted in the site list. If it matches the name of the well to be sampled, click the **Select** button.
6) The **Well Details Screen** will appear which shows the well depth, casing diameter and other information. Compare the well characterization sheet with this screen to make sure the desired well has been selected. If it is correct click the **Continue** button.
7) The next screen shows the **Meters on File for this Shift**. Click the **Add Meter** button to select the meters to be used for the shift. Scroll through the drop down list to select the appropriate meter. Click on the desired meter and hit the **Add Selected Meter** button. Repeat as necessary until all meters that will be used on the shift have been added. Click the **Continue** button.
8) The **Site Description** screen will appear. First enter the **Depth to Water** and click the **Submit** button. The program will then calculate the casing volumes for purging. If the well has multiple casings, calculate one well volume based on the depth to water, then click the **Override Case Volume** button and enter that value so the proper amount of water can be purged.
9) Next click the **Weather** field. The **Weather Conditions** screen will appear. Select the desired weather information and click the **Save and Close** button.
10) Next select the desired project from the **Project Designator** drop down field.
11) Next enter the pump rate in the appropriate field and click the **Submit** button. The program will then calculate the total purge time based on that pump rate.
12) Next enter the desired pump from the **Purge Technique** drop down field. After completing all the required information on this screen, click the **Continue** button.
13) The **Well Purging Screen** will appear while the program waits for the purge to begin. At this point additional wells can be added if sampling a site with multiple wells to purge. This is done by clicking **Well Activities** at the top of the screen and selecting **Change Well**. Select **Yes** when prompted and repeat steps 3 through 12 as needed. Adjust the **Pump Rate** if necessary on this screen after turning on the pump and measuring the flow. Click the **Start Pump** button.
14) The program will then show all of the ―Read Times‖ and will count down to the next reading. If only purging 1 ½ volumes for a ―5 hour purge rule‖ well, select the ¼ volume interval option for taking readings. When it is time to take a reading click the **Take Next Readings** button.
15) The **Field Parameters Entry** screen will appear. Make sure the meter is in the correct flow cell if purging multiple wells. Click the **Take Reading** button. Enter the readings for the parameters required for the current project. Make any necessary adjustments or additions (such as odor, color etc.) and click the **Save** button.
16) Next the program will ask if you want to stop or continue the purge based on the readings obtained up to that point. Select **Continue to Purge** until the necessary volume and

stability requirements are met. Once the well is ready to be sampled, click the **Stop Purging** button. Then select **Yes** when prompted

17) On the next screen enter turbidity and/or odor information if needed and click the **Continue** button. The **ELB.Net Sampling Information** screen will appear. Select the appropriate sample device, sample point, filter apparatus, acidification, and pump rate. Click the **Sample** button.
18) On the next screen select the correct project from the choices given, and click the **Take Samples** button.
19) On the next screen, set or enter the sample time, enter the sample and submission id#'s, and select the shipping courier. Enter and save any QA information as needed by clicking the **QA/QC** button. If no QA is needed just skip that step and click the **Save** button. Then click the **Done** button and add/edit comments if needed.

Surface Water Sampling Procedure with ELB.Net using

1) Double click the ELB.Net icon, or select ELB.Net from the start menu.
2) Select **Surface Water Sampling** from the ELB.Net main menu.
3) Three drop down boxes will appear for selecting technicians on duty for the session. Select the staff member(s) from the list and click the **Continue** button.
4) The **Well Select Screen** will appear for choosing the site to be sampled. If the SID for the site is available, type it into the **Find Text** field (if the SID is unavailable, search by name or other criteria). Select SID in the **Search Column** field. Hit the **Enter** button on the keyboard. The selected site will appear highlighted in the site list. If it matches the name of the site to be sampled, click the **Select** button.
5) The **Well Details Screen** will appear which shows basic information about the site. Compare the site characterization sheet with this screen to make sure the desired site has been selected. If it is correct click the **Continue** button.
6) The next screen shows the **Meters On File For This Shift.** Click the **Add Meter** button to select the meters to be used for the shift. Scroll through the drop-down list to select the appropriate meter. Click on the desired meter and hit the **Add Selected Meter** button. Repeat as necessary until all meters that will be used on the shift have been added. Click the **Continue** button.
7) The **Site Description** screen will appear. First enter the weather information, and the **Water Body Type** and **Stream Flow** rate. Then enter the **Total Depth**, **Secchi Depth**, and **Staff Gauge** reading (if applicable). Finally, select the appropriate project from the **Project Designator** drop-down box. Click the **Continue** button.
8) The program will then attempt to connect to the sonde. When using the 650 and entering the information manually from a field sheet, click **OK** once the pop-up box appears. Enter the first **Depth From Surface** and click **Submit Depth**.
9) The **Field Parameters Entry** screen will appear. From the field sheet data, enter Temperature, Conductivity, Salinity, pH, and Dissolved Oxygen. To enter data from a mid and/or bottom depth reading, click the **Take Another Reading button**. Enter the next **Depth From Surface**, click **Submit Depth**, and enter the data the same way as above. After all the data from the various depths has been entered, click the **Done** button.

10) The next **Field Parameters Entry** screen will appear which shows a summary of the data that was just entered. On this screen the **Begin Date/Time**, and the **End Date/Time**, will need to be edited to reflect the actual reading and sampling times. The **End Date/Time** for the top (sample depth) reading will need to match the sample time written on the bottles. Click on the box twice to edit the value. Click **Yes** when prompted after moving from one box to another. The **Begin Date/Time** for the top depth, and both times for the other depths can usually just be approximations of the actual times, since they are not linked to the sample time. Click the **Close** button after all the times have been edited.
11) The **ELB.Net Sampling Information** screen will appear. Select the appropriate sample device, sample point, filter apparatus, and acidification. Click the **Continue** button.
12) On the next screen select the correct project from the choices given, and click the **Take Samples** button.
13) On the next screen, enter the sample and submission ID numbers, select the sample type, and select the shipping courier. Enter and save any QA information as needed by clicking the **QA/QC** button. If no QA is needed just skip that step and click the **Save** button. Then click the **Done** button and add/edit comments if needed.

Detail 9
Ground and Surface Water
Field Measurement Equipment

WQMP GROUND AND SURFACE WATER FIELD MEASUREMENT EQUIPMENT

Brand Name	Model Number	Serial Number	FA Number	WQMP ID #
YSI Multi-probe	600 XLM	03H0326 AA	10-16197	WQMP 05
YSI Multi-probe	600 XLM	03E1151 AD	10-16284	WQMP 09
YSI Multi-probe	600 XLM	05A1843AA	10-17568	WQMP 12
YSI Multi-probe	600 XLM	02A0578 AA	10-15555	Offshore Springs 1
YSI Multi-probe	600 XLM	03J0032AA	10-17420	Offshore Springs 2
YSI Multi-probe	600 XLM	01G0852 AB	10-15474	SPJC 01
YSI Multi-probe	600 XLM	02J0887 AE	10-16176	SPJC 04
YSI Multi-probe	600 XLM	02D1017 AB	NA	SPJC 06
YSI Multi-probe	600 XLM	02D0969 AA	NA	SPJC 07
YSI Multi-probe	600 XLM	02J0887 AC	10-16177	SPJC 08
YSI Multi-probe	600 XLM	02J0887 AD	10-16178	SPJC 09
YSI Multi-probe	600 XLM	02L0535 AA	20-00563	SPJC 12
YSI Multi-probe	600 XLM	02L0429 AA	20-00565	SPJC 13
YSI Multi-probe	600 XLM	03C0289 AA	10-16273	SPJC 14
YSI Multi-probe	600 XLM	03J0032 AA	NA	SPJC 16
YSI Multi-probe	600 XLM	03L0066 AA	10-17378	SPJC 17
YSI Multi-probe	600 XLM	03L0066 AB	10-17379	SPJC 18
YSI Multi-probe	600 XLM	03L0066 AE	10-17382	SPJC 21
YSI Multi-probe	ProDSS	15J103111	10-21335	DSS 01
YSI Multi-probe	ProDSS	15J103113	10-21336	DSS 02
YSI Multi-probe	ProDSS	15L101853	10-21337	DSS 03
YSI Multi-probe	ProDSS	15L101854	10-21338	DSS 04
YSI Multi-probe	ProDSS	15J103117	10-21339	DSS 05
YSI Multi-probe	ProDSS	15J103116	10-21340	DSS 06
YSI Multi-probe	ProDSS	15H102624	10-21341	DSS 07
YSI Multi-probe	ProDSS	15J103118	10-21342	DSS 08
Brand Name	**Model Number**	**Serial Number**	**FA Number**	**WQMP ID #**
YSI Multi-probe	ProDSS	15H102623	10-21343	DSS 09
YSI Multi-probe	ProDSS	15J103112	10-21344	DSS 10
YSI Multi-probe	600 XLM	05M1276 AB	10-18860	SPJC 22
YSI Multi-probe	600 XLM	05M1712 AD	10-18865	SPJC 24
YSI Multi-probe	600 XLM	05M1276 AA	10-18861	SPJC 25

YSI Multi-probe	600 XLM	05M1712 AC	10-18862	SPJC 26
YSI Multi-probe	600 XLM	05M1712 AB	10-18863	SPJC 27
YSI Display	ProDSS	15J103171	10-21324	HH 01
YSI Display	ProDSS	15J102519	10-21325	HH 02
YSI Display	ProDSS	15J103172	10-21326	HH 03
YSI Display	ProDSS	15J103170	10-21327	HH 04
YSI Display	ProDSS	15J102518	10-21328	HH 05
YSI Display	ProDSS	15J103173	10-21329	HH 06
YSI Display	ProDSS	15J103174	10-21330	HH 07
YSI Display	650	02J0458 AB	10-16159	WQMP 02
YSI Display	650	02L0276 AA	20-00566	WQMP 04
YSI Display	650	03C0393 AC	NA	WQMP 05
YSI Multi-probe	EXO1	13K101785	10-21259	EXO1-01
YSI Multi-probe	EXO1	13K102199	10-21260	EXO1-02
YSI Multi-probe	EXO2	16A102782	10-22104	EXO2-03
YSI Multi-probe	EXO2	16A104201	10-22106	EXO2-04
YSI Multi-probe	EXO2	16A104200	10-22103	EXO2-05
YSI Multi-probe	EXO2	16A102781	10-22105	EXO2-06
YSI Display	EXO	13L100913	10-21261	
YSI Display	EXO	13L100912	10-21262	
HACH Turbidimeter	2100P	950800008559	NA	AGW026
HACH Turbidimeter	2100P	010800023283	NA	AGW027
HACH Turbidimeter	2100P	010800023435	NA	AGW028
HACH Turbidimeter	2100P	021000028205	NA	AGW029
HACH Turbidimeter	2100Q	11090C012117	NA	AGW030
HACH Spectrophotometer	DR/2000	960100038542	10-12304	AGW032
Eight Inch Secchi Disc	NA	NA	NA	D046
Eight Inch Secchi Disc	NA	NA	NA	D047
Eight Inch Secchi Disc	NA	NA	NA	D048
Eight Inch Secchi Disc	NA	NA	NA	D049
Eight Inch Secchi Disc	NA	NA	NA	D050

Eight Inch Secchi Disc	NA	NA	NA	Pole
Electronic Water Level Tape	Solinst 101	202927	NA	W060
Electronic Water Level Tape	Solinst 101	38367	NA	W053
Electronic Water Level Tape	Heron Watermark	27015	NA	W061
Electronic Water Level Tape	Solinst 101	35417	NA	W059
Electronic Water Level Tape	Solinst 101			W062
Marsh McBirney Flow Meter	2010	2004609	NA	

Detail 10
Storage Protocols for
Acids, Buffers, and Other Standards

WQMP STORAGE PROTOCOLS FOR ACIDS, BUFFERS, AND OTHER STANDARDS
Backroom Storage of Acids, Buffers and other Standards
The WQMP uses acids and bases for the preservation of samples (Nitric acid - HNO3 and sulfuric acid - H2SO4) and for cleaning certain sampling equipment (Hydrochloric acid - HCl). Acids and bases are stored in approved acid cabinets in the WQMP backroom which is kept at a constant, cool temperature. Acids and bases are stored in separate cabinets for safety reasons.

Formalin (10 percent buffered), for biological sample preservation, is stored in a separate cabinet.

Specific conductance standards, pH buffers, and field reference standards are stored in the WQMP backroom on safe and secure shelves.

Gallex 900, a Galloway product used for the decontamination of Citrus Canker on trucks, is safely stored in the WQMP backroom on a lower, secure shelf. Anti-bacterial soap, typically used on clothing and foot wear in conjunction with projects requiring Gallex 900, is also stored on adjacent, lower, secure shelf in the WQMP backroom.

Isopropyl alcohol, used in small quantities for cleaning various sampling equipment (e.g. meters), is stored in the WQMP backroom in a secure shelving unit.

Vehicular Chemical Storage

The WQMP maintains a small fleet of trucks used for field acquisition of samples.
Meters are taken into the field with sampling crews. These meters are field checked requiring buffers and other standards to be transported. The following chemicals are used in the field and therefore are temporarily stored on trucks: pH buffers and specific conductivity standards. These items are stored on the truck in a dedicated compartment.

Acids and bases used for sample preservation are temporarily stored in field vehicles during the work day. They are stored on the truck in a dedicated compartment. The acids are removed from the trucks and re-stored in the acid storage cabinet over the weekend. H2SO4 is stored in 40ml Teflon dropper bottles (for District projects) and is securely placed in a screw top Teflon jar for transportation into the field. HNO3 is stored in snap-off glass vials which are kept in pre- packaged dual foam storage blocks.

Used acid vials are discarded and stored in discrete Nalgene containers which have been partially filled with sodium bicarbonate (baking soda) which serves as a neutralizing agent.

Gallex-900 and anti-bacterial soap, used for decontamination of Citrus Canker, are stored on trucks in a safe and stable location to be determined by field sampling crews.

Other chemicals stored on trucks include (but are not limited to): wasp and bug spray, 2-cycle and motor oil, Liquid Wrench lubricant spray, sun screen, Liquinox brand soap, PVC glue and cleaner.

Other WQMP Safety Issues

Eye-wash stations are set up in two locations within the WQMP. The first station is located in the clean equipment room in a clearly marked, easily accessed location. The second station is located on each sampling truck. The technician assigned to the truck determines the easily accessible eye-wash bottle location. Eye-wash bottles contain a mild saline solution and their contents are frequently checked by the WQMP safety representative and/or the District safety representative.

District first-aid kits are located in each truck, typically stored in the backseat area of the cab which is easily accessed in time of need. WQMP staff who are assigned vehicles communicate with the WQMP safety representative to report items which are needed to restock kits. A wall-mounted First-Aid kit is also maintained in the WQMP backroom. It should always be easy to locate.

Fire extinguishers are stored in all WQMP and District vehicles. These are checked and refilled annually (at minimum). They are located on floorboards beneath backseats.

Material Safety Data Sheets (MSDS)

The MSDS is stored in a highly visible, readily accessible location in the WQMP clean equipment room. Its contents include information regarding all chemicals stored in the backroom (acids, Gallex, etc.). Chemical contents, clean-up and emergency procedures, contact information, and potential safety hazards, etc., can typically be found within the MSDS for a given chemical. This information is available for all staff. The MSDS is always easy to locate and access, including accessibility by those outside the WQMP in time of fire or other emergency. In time of fire or other emergency, it should be easy to find by firemen or other emergency personnel without assistance by WQMP staff. Therefore, it must be kept visible!

Detail 11
YSI Data Sonde Logging Protocol

SPJC WATERSHEDS YSI DATA SONDE LOGGING PROTOCOLS
Field Equipment Checklist

Back-up data sonde in case replacement is necessary AA batteries (ample supply, each sonde uses four) Liquinox
Deionized Water
Scrub Brushes and Small YSI Conductivity Probe Brush YSI Field Cable (―Y‖ connector)
ToughBook
Lap Top Cigarette Lighter Adaptor/Charger Cable Conductivity Standards (>1000 uS/cm)
Paper Towels
YSI Logging Notebook and Paperwork YSI Calibration Cups
Silicone Sealant
Mini Centrifugal and Hoses if PVC Tubes to be Cleaned-out

1st Step
Conductance Checks, Sonde Cleaning and Battery Change

1) Remove sonde from monitoring site. Follow Multiprobe Logging Field Sheet to perform following procedures (see Detail 14 for example form):

    Using calibrated "daily use" data sonde, check conductance value inside PVC tube and conductance value outside of tube (in waterbody). Record values on field sheet.

    Proceed to **2nd step** (see below) and upload data from logging data sonde. Compare last recorded conductance value from log-run file to "daily use" sonde values and record on field sheet. If the difference in values exceeds five percent, contact Trevor.

    Prior to cleaning or re-calibration of logging sonde, check conductance value in conductivity standard. Record on field sheet. This step **MUST** be performed when sondes are removed upon project completion as it serves as a post check and validates collected data.

    Clean outside of sonde thoroughly with liquinox and a soft brush. Remove guard over probes and lightly brush probes with liqiunox. Use small bottle brush to thoroughly clean conductivity probe ―ports‖. Probe area and probes should be completely clean! Also clean the inside of probe guard.

2) Remove battery cap and replace with new batteries (four AA's). **Double check polarity on batteries!** Wipe dirt from around all threaded areas and O-rings. You may need to lightly brush threads to get all dirt out. O-rings should have no dirt or sand on them. Replace O-rings if they appear damaged or are too dirty to completely clean. Apply silicone sealant on O-rings (two) that are located at top and bottom of battery housing.

3) Remove bulkhead connector (cap where cable plugs in) and clean threads. **DO NOT GET WATER IN CONNECTOR.**

2nd Step
Data Upload (Downloading recent log data from sonde to the ToughBook)

1) Plug cigarette lighter adaptor cable to computer and cigarette lighter. Plug in ―Y‖ connector cable to bulkhead connector and to COM 1 port in back of lap top computer.
2) Turn on computer. On computer desktop double-click on ―EcoWatch‖ icon.
3) On top menu bar, click on sixth button from right. This is the ―connect to sonde‖ button.
4) At next window select ―COM 1" and click ―O.K.‖
5) At next window type ―menu‖ at ―# symbol‖ prompt. Hit enter.
6) In main menu window type ―3" for ―file‖. Hit enter.
7) In file window type ―2" for ―upload‖. Hit enter.
8) Choose file to upload. Should be only one file shown. Type ―1" and hit enter.
9) In time window type ―1" for ―proceed‖. Hit enter.
10) In file type window choose ―3" for ―ascii text‖. Hit enter. File transfer window will show bite count and block count values increasing – wait until completed.
11) When file transfer window closes, hit ―0" to return to main menu (at any time during the above procedures can hit ―0― to return to the main menu or go back to the screen you were at previously).
12) Downsize EcoWatch software (hit staple symbol (―) in upper right-hand corner of screen).
13) Go to My Computer and open drive C:/ecowin/data/current file name. Choose okay when file has been chosen.
14) View data quickly by paging down to see if sonde logged correctly (dates, etc.).
15) Fill out log field sheet with date, time, and name of uploaded log data set.

3rd Step
Calibrating YSI Sonde (Sonde only needs to be calibrated for specific conductance!)

1) Sonde should be plugged in computer. Re-open EcoWatch software by choosing icon on bottom menu bar.
2) Place calibraton cup on sonde and rise probes thoroughly three times with conductivity standard. Fill cup with standard so probes are covered.

3) At main menu choose ―2" for ―calibrate‖. Hit enter. If you are not at the main menu hit ―0" until you are back at main menu.
4) Choose ―1" for ―conductivity‖. Hit enter.
5) Choose ―1" for ―specific conductivity‖. Hit enter.
6) **Always use a conductance standard that is >1,000 uS/cm.** Enter specific conductance of the standard in mS/cm (example - standard is 1020 uS/cm so enter 1.020 in the computer...move decimal point three places to the left). When values stabilize record pre-calibrated value on field sheet. Hit enter. Enter post-calibrated value on field sheet. Hit enter if calibration value is good.

4th Step
Setting up sonde to log

1) Before setting up new log file, you must delete the file you just uploaded. If you don‘t do this, the sonde will want to continue logging the old file set-up.

2) To erase old log file hit ―0" until you are back at main menu. Choose ―3" for ―file‖. Choose ―6" for ―delete files‖. File to erase should be #1 (REMEMBER, THIS IS THE FILE THAT YOU JUST UPLOADED AND SAVED). Choose ―1" to delete.
3) To set up log file hit ―0" until you are back at main menu.
4) Choose ―1" for ―run‖.
5) Choose ―2" for ―unattended sample‖.
6) You should not have to change any of the information on the logging list except the log file name and log site name (dates and times should be good, but double check them).
7) Choose ―5" for ―file‖.
8) Enter file name. This should be the next sequential number above the file you just uploaded. (Example: you just uploaded site0121 so the new file will be site0122, etc.)
9) Choose ―6" to enter ―site name‖.
10) Enter site where you are at (example: Hog Bay, Joshua Creek)
11) **CHOOSE "C" TO "START LOGGING", CHOOSE "1" TO CONFIRM. IF YOU DO NOT DO THIS THE SONDE WILL NOT LOG!**
12) Record times, dates, and log file name on logging field sheet. If logging file "start time" is different than actual deployment time, record actual deployment time on field sheet.
13) Choose ―0" until you are back to ―main menu‖. Choose ―file‖ and ―exit‖.
14) Deploy sonde at site.
15) Note important comments such as flow of system, PVC tube maintenance (sediment removal), problems at site, problems with data sonde, etc.

Detail 12
Citrus Canker
Sanitation Protocol

CITRUS CANKER SANITATION PROTOCOL

The following recommendations/procedures have been developed as a result of concerns about the potential for District employees/vehicles working within citrus groves to spread citrus canker. Groves in all areas of the District are susceptible to contamination.

Staff must make contact with grove owners or managers prior to any entry. Every District employee/vehicle shall be sanitized prior to entering and when exiting any citrus grove. Sanitation is required by Florida Department of Agriculture and Consumer Services rule upon entering or exiting groves within the quarantine areas. It is highly recommended by DACS and the Institute of Food and Agricultural Sciences outside the quarantine areas, which staff shall follow until further notice.

District employees should enter citrus groves only when necessary and contact with citrus trees and other vegetation should be minimized or avoided. Grove owners should be contacted prior to entering groves to determine what precautions the owner/manager is following and to let them know that we are sanitizing prior to entering his grove. Some groves have vehicles which are only used within the grove and access for other vehicles is restricted. If a grove owner's vehicle is used, employees must still sanitize their hands, arms, clothes, shoes and equipment.

Vehicle/Employee Sanitation

1) **Read and follow label directions on the sanitation product labels.**
2) Wear the required protective equipment (face shield and rubber gloves) when handling or mixing either of the concentrated products and when spraying vehicles with the Gallex 900 solution. Do not get either product in your eyes. If you do get it in your eyes, flush eyes with water for 15 minutes.
3) Mix 2.4 ounces of the GX 1027 antibacterial soap product per gallon of water. Use this mixture to wash your hands and arms for 20-30 seconds then rinse with water. Also, use the diluted mixture in a spray bottle to spray your sleeves if wearing a long sleeve shirt, pants, or legs if wearing shorts, shoes, especially the soles. No rinsing is necessary.
4) Mix one ounce of the Gallex 900 solution per gallon of water in a one or two gallon pump up sprayer. Make sure that you properly rinse the measuring cup by filling it with clean water and emptying it three times into the sprayer. Use this diluted mixture to spray the tires, axles, fenders, bumpers, sides and any other parts of the vehicle which may have contacted the ground or vegetation within the grove.
5) All field equipment must be sprayed with the Gallex 900 solution utilized for sanitizing vehicles

Vehicle Sanitation Kit

Each vehicle which will be used within a citrus grove should have the following supplies:

Face shield
Rubber gloves
Spray bottle (two)
Pump-up sprayer, one or two gallon
Small (one to four ounce) measuring cup
Plastic gallon jugs of water, three or more (save empty jugs and refill with tap water)
Paper towels
Eye wash bottle

Detail 13
Habitat Assessment
and Stream Condition Index
Information

HABITAT ASSESSMENT AND STREAM CONDITION INDEX INFORMATION
Methods and Site Selection Criteria

All habitat assessments and Stream Condition Indexes (SCIs) performed by the WQMP are completed in accordance with FDEP SOP FT 3001 and 3100 respectively. Please refer to these SOPs for specific methods and equipment/materials required for these procedures. Habitat assessments and SCIs are performed on qualified sites, selected from the WQMP surface water networks, with an emphasis on waterbodies or reaches of waterbodies not actively monitored by other agencies, in an effort to increase the coverage of sites monitored within a watershed. Habitat assessment and SCI data are stored by FDEP in their Statewide Biological Database (SBIO) and are used along with water chemistry results in support of TMDL assignment. FDEP SOPs and forms can be found at http://www.dep.state.fl.us/water/sas/sop/index.htm.

Habitat Assessment

During a habitat assessment, field staff record the availability and quality of habitat (e.g. snags, leaf pack/mats, aquatic vegetation, roots, and rocks) from a 100-meter stretch of a waterbody, with the 100 meter stretch selected ideally containing within its boundaries the regular monthly or quarterly water chemistry sample point. This information is then used to determine which habitats to sample, via the SCI method, in order to get a good representation of the macroinvertebrate community within the system. Access to productive habitat and the condition of surrounding land-use and buffer zone characteristics can impact macroinvertebrate colonization and recruitment.

Once all relevant information and observations are assembled by field staff, the 100-meter stretch is assigned a habitat assessment score, based on primary and secondary habitat components. Primary habitat components (i.e. substrate diversity, substrate availability, water velocity, and habitat smothering) are characteristics of the stream stretch and habitat that directly affect the macroinvertebrates ability to find and colonize suitable habitat. Secondary habitat components (i.e. artificial channelization, bank stability, riparian buffer zone width and buffer zone quality) are components that indirectly affect the macroinvertebrates by altering the in-stream environment and/or the system's ability to prevent the introduction of non-pointsource pollution. Each component is assigned a numerical value from one to twenty, with twenty being the best score, as well as a categorization of optimal, suboptimal, marginal or poor. The overall habitat assessment score, comprised of the sum of the component scores, is then used in conjunction with the SCI results to rank a site.

Stream Condition Index

Examination of the macroinvertebrate community within a waterbody provides a systematic and enduring look at the health of the system. Where water chemistry samples provide a snapshot of water quality at the time and location of sample collection, macroinvertebrate analysis is a more long-term indicator of quality, because some macroinvertebrates exhibit a tolerance or lack of tolerance to poor water quality.

This is especially true in flowing systems where significant events, both physical and chemical may occur within the system and have their chemical/physical signatures diluted or rapidly transported downstream. Certain macroinvertebrates, by their presence or absence in the area where the event occurred, may indicate a disturbance that may or may not be evident in water chemistry samples.

For the SCI macroinvertebrate sample collection method, field staff collect a total of 20 discrete

1.5 meter sweeps with a D-frame dipnet from within the 100-meter stream stretch. The number of sweeps from each habitat type is determined by the number of productive habitats available (as determined in the habitat assessment). Depending on the number of productive habitats, field staff will perform ten, seven, five, four, or three sweeps in each of the productive habitats and complete the remaining sweeps from the minor habitats (e.g. sand, silt, muck, and rock/shell rubble). During the SCI, care is taken to try to choose the optimum habitat available (e.g. habitat in the good flow versus habitat in areas with poor flow, or partially decayed leaves versus new fresh fallen leaves).

The 20 dip-net sweeps are transferred into a wide-mouth container and preserved with ten percent buffered formalin. The wide-mouth containers are then sent off to the analyzing lab for identification and inclusion in SBIO.

Detail 14
Field Related Forms and Documents

Southwest Florida Water Management District

SAMPLE CUSTODY RECORD

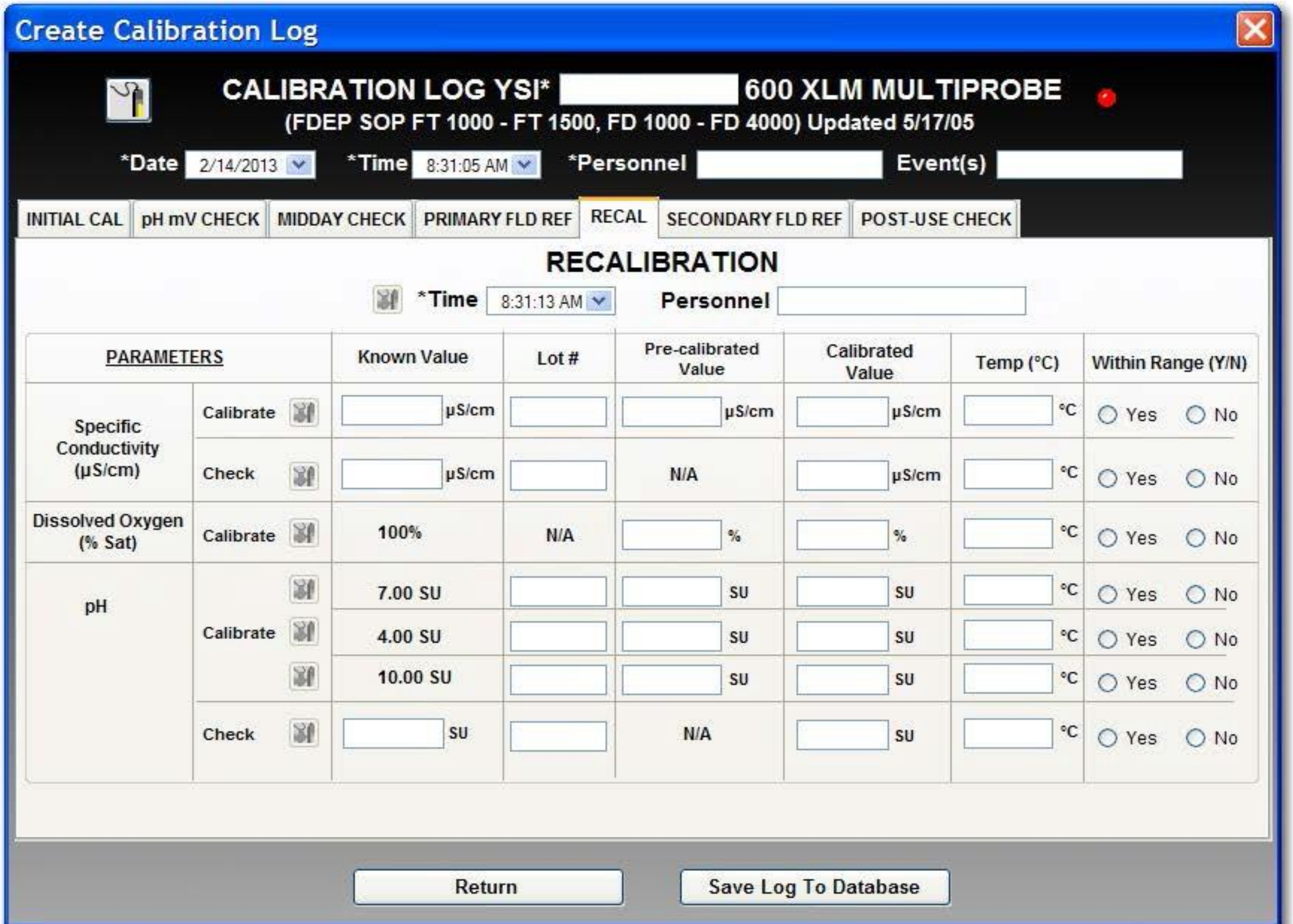
Page ______ of ______

Project Name: ______________________ **Section:** ____________________ **Department:** ____________________________

Date: _______________ **Shipping Batch ID:** __________________ (MM/DD/YYYY HH:MM) **Submission No.** ________________

DISTRICT UID (WEL; STA; FLO; RNF) e.g. WEL1234005678900	SAMPLE INFORMATION	LIMS SAMPLE ID (e.g. 200123456)
UID: ______________________ Number of Containers: _____	Site Name: ____________________ Sample Date: __________ Sample Time: __________ Depth: __________ m Temp: ________ °C pH: __________ Cond: ______________ uS/cm *Preservation Intact (Y/N) ______ Comments ______________________________	______________ (LIMS SAMPLE ID)
UID: ______________________ Number of Containers: _____	Site Name: ____________________ Sample Date: __________ Sample Time: __________ Depth: __________ m Temp: ________ °C pH: __________ Cond: ______________ uS/cm *Preservation Intact (Y/N) ______ Comments ______________________________	______________ (LIMS SAMPLE ID)
UID: ______________________ Number of Containers: _____	Site Name: ____________________ Sample Date: __________ Sample Time: __________ Depth: __________ m Temp: ________ °C pH: __________ Cond: ______________ uS/cm *Preservation Intact (Y/N) ______ Comments ______________________________	______________ (LIMS SAMPLE ID)
UID: ______________________ Number of Containers: _____	Site Name: ____________________ Sample Date: __________ Sample Time: __________ Depth: __________ m Temp: ________ °C pH: __________ Cond: ______________ uS/cm *Preservation Intact (Y/N) ______ Comments ______________________________	______________ (LIMS SAMPLE ID)
SAMPLES COLLECTED BY: FULL NAME: ______________________ FULL NAME: ______________________	SEND RESULTS TO: ______________________________ NAME EXTENSION MAIL CODE	TOTAL NUMBER OF CONTAINERS: _____
This space reserved for Lab use only: Samples Logged by: ______________________ Date/Time: ______________________	Received at lab by: ____________________ Date/Time: ______________ Sample temp: ________ °C Thermometer ID: __________ Initials/Date: __________ pH paper lot# ____________________ Initials/Date: ______________ pH paper lot# ____________________ Initials/Date: ______________	*DENOTES LAB USE ONLY

White – Lab Copy Yellow – Originator Copy



Create Calibration Log

CALIBRATION LOG YSI* 600 XLM MULTIPROBE

(FDEP SOP FT 1000 - FT 1500, FD 1000 - FD 4000) Updated 5/17/05

*Date 2/14/2013 *Time 8:31:05 AM *Personnel Event(s)

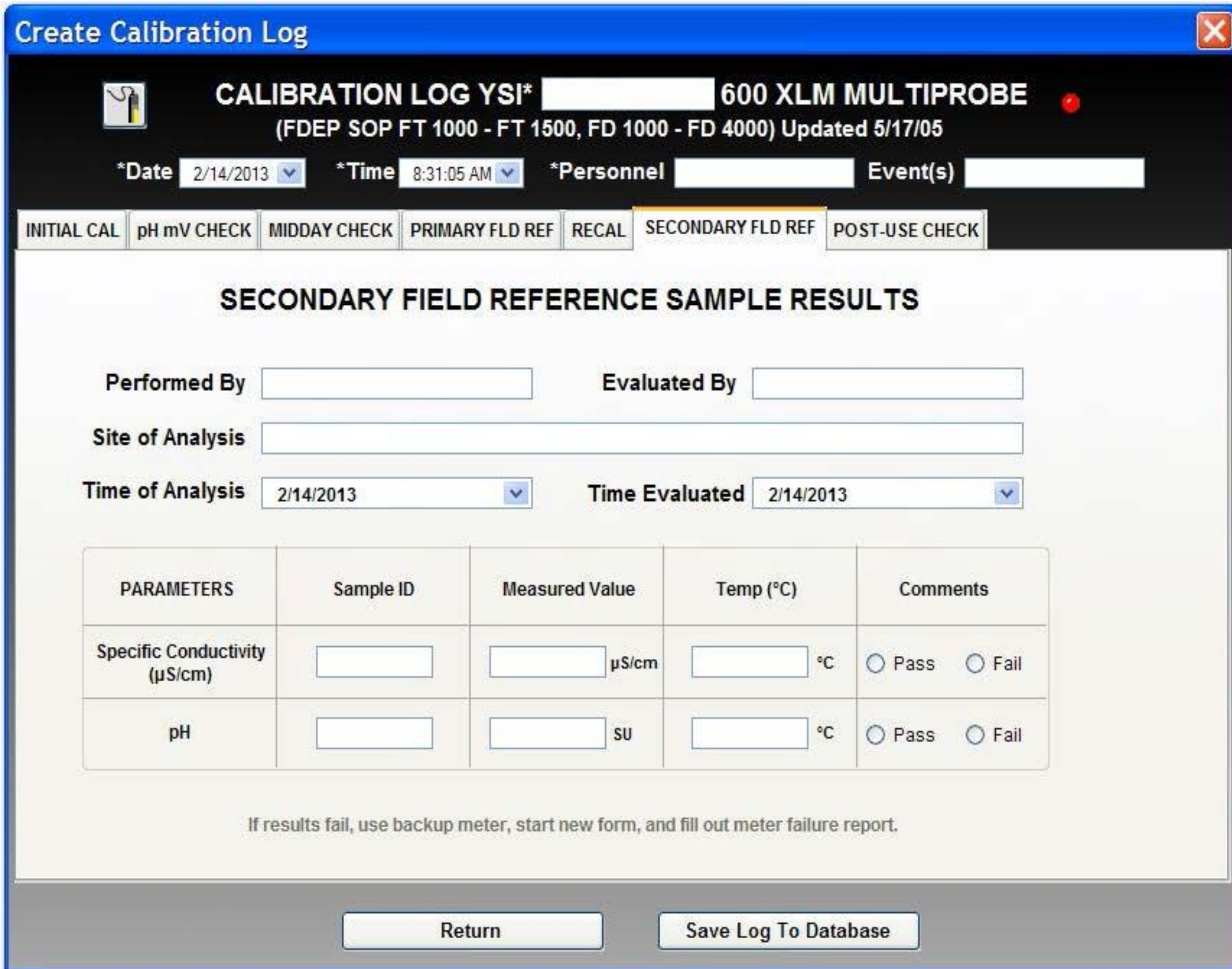
INITIAL CAL | pH mV CHECK | MIDDAY CHECK | PRIMARY FLD REF | RECAL | SECONDARY FLD REF | POST-USE CHECK

RECALIBRATION

*Time 8:31:13 AM Personnel

PARAMETERS		Known Value	Lot #	Pre-calibrated Value	Calibrated Value	Temp (°C)	Within Range (Y/N)
Specific Conductivity (µS/cm)	Calibrate	µS/cm		µS/cm	µS/cm	°C	Yes No
	Check	µS/cm		N/A	µS/cm	°C	Yes No
Dissolved Oxygen (% Sat)	Calibrate	100%	N/A	%	%	°C	Yes No
pH	Calibrate	7.00 SU		SU	SU	°C	Yes No
		4.00 SU		SU	SU	°C	Yes No
		10.00 SU		SU	SU	°C	Yes No
	Check	SU		N/A	SU	°C	Yes No

Return | Save Log To Database



Create Calibration Log

CALIBRATION LOG YSI* 600 XLM MULTIPROBE

(FDEP SOP FT 1000 - FT 1500, FD 1000 - FD 4000) Updated 5/17/05

*Date 2/14/2013 *Time 8:31:05 AM *Personnel Event(s)

INITIAL CAL | pH mV CHECK | MIDDAY CHECK | PRIMARY FLD REF | RECAL | SECONDARY FLD REF | POST-USE CHECK

SECONDARY FIELD REFERENCE SAMPLE RESULTS

Performed By Evaluated By

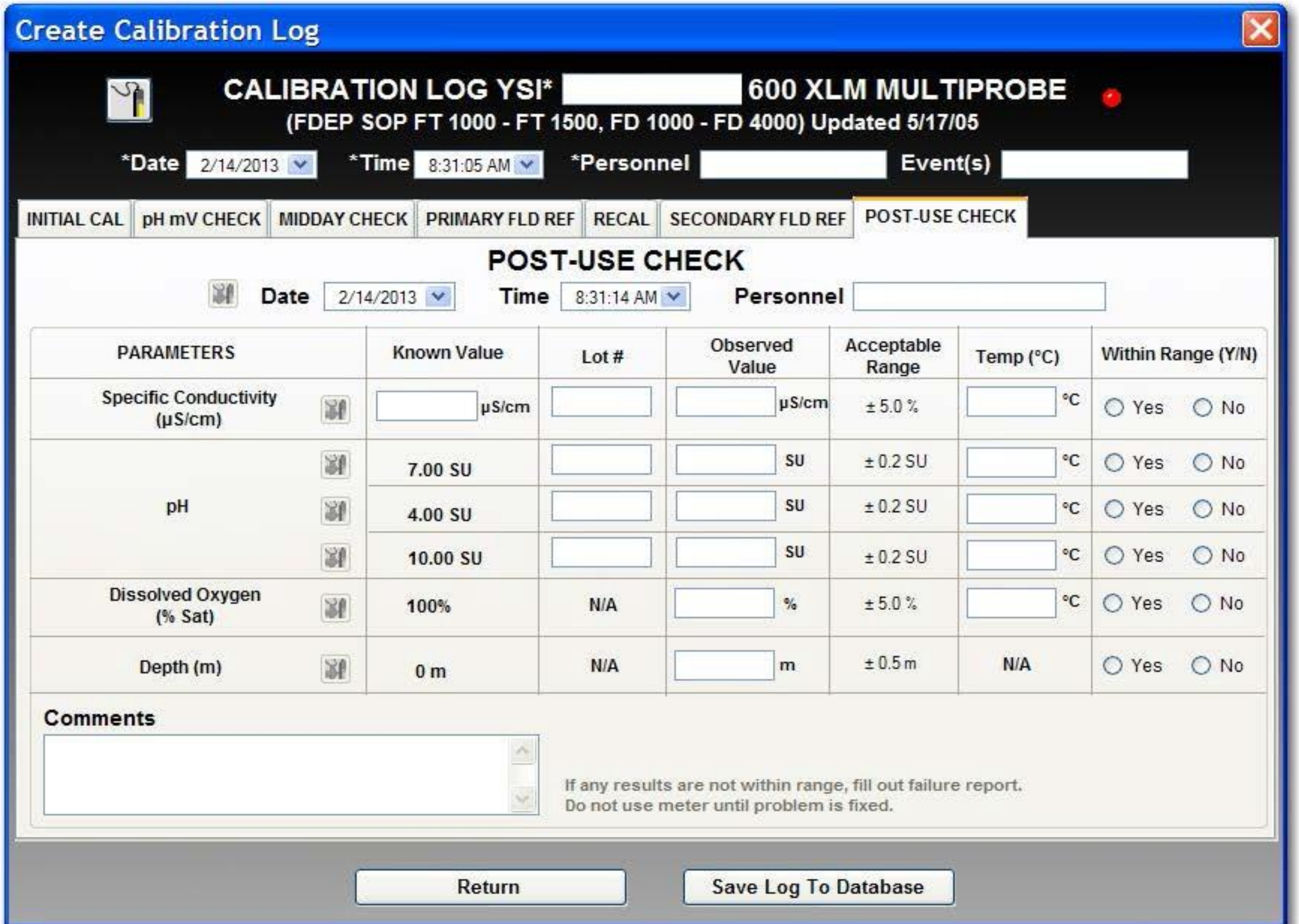
Site of Analysis

Time of Analysis 2/14/2013 Time Evaluated 2/14/2013

PARAMETERS	Sample ID	Measured Value	Temp (°C)	Comments
Specific Conductivity (µS/cm)		µS/cm	°C	Pass Fail
pH		SU	°C	Pass Fail

If results fail, use backup meter, start new form, and fill out meter failure report.

Return Save Log To Database



Create Calibration Log

CALIBRATION LOG YSI* 600 XLM MULTIPROBE
(FDEP SOP FT 1000 - FT 1500, FD 1000 - FD 4000) Updated 5/17/05

*Date 2/14/2013 *Time 8:31:05 AM *Personnel Event(s)

INITIAL CAL | pH mV CHECK | MIDDAY CHECK | PRIMARY FLD REF | RECAL | SECONDARY FLD REF | POST-USE CHECK

POST-USE CHECK

Date 2/14/2013 Time 8:31:14 AM Personnel

PARAMETERS	Known Value	Lot #	Observed Value	Acceptable Range	Temp (°C)	Within Range (Y/N)
Specific Conductivity (µS/cm)	µS/cm		µS/cm	± 5.0 %	°C	Yes No
pH	7.00 SU		SU	± 0.2 SU	°C	Yes No
	4.00 SU		SU	± 0.2 SU	°C	Yes No
	10.00 SU		SU	± 0.2 SU	°C	Yes No
Dissolved Oxygen (% Sat)	100%	N/A	%	± 5.0 %	°C	Yes No
Depth (m)	0 m	N/A	m	± 0.5 m	N/A	Yes No

Comments

If any results are not within range, fill out failure report.
Do not use meter until problem is fixed.

Return | Save Log To Database

CALIBRATION LOG YSI WQMP ________600XLM MULTIPROBE

Southwest Florida Water Management District

Water Quality Monitoring Program
7601 HWY 301 N. Tampa, FL 33637 (813) 985-7481
FDEP SOP(s) FD1000, FS1000, FT1000
Updated 9/10/09

Date: __________ **Time:** _____ **Personnel:** ________________ **Event(s):**__________

INITIAL CALIBRATION ***Calibrate Sp. Cond. with 1000uS/cm or greater and check with 2nd standard close to the expected range of sample water***

PARAMETERS		Known Value	Lot #	Pre-Calibrated Value	Calibrated Value	Temp (°C)	Within Range (Y/N)
Sp Cond (µS/cm)	*Calibrate*						
	Check			NA			
Dissolved Oxygen (% Sat)	*Calibrate*	100%	NA				
Depth (m)		0	NA			NA	
pH	*Calibrate*	7					
		4					
		10					
	Check			NA			

pH mV CHECK

mV for pH 4.00	
mV for pH 7.00	
Difference	
Within Range (Y/N)	

mV for pH 10.00	
mV for pH 7.00	
Difference	
Within Range (Y/N)	

Difference between pH7 to pH4 and pH7 to pH10 should be ± 165 to 180MV

MIDDAY CHECK Time: _________ Personnel: __________

PARAMETERS	Known Value	Lot #	Observed Value	Acceptable Range	Temp (°C)	Within Range (Y / N)
Sp Cond (µs/cm)				± 5.0 %		
pH	7			± 0.2 SU		
	4			± 0.2 SU		
	10			± 0.2 SU		
Dissolved Oxygen (% Sat)	100%	NA		± 5.0 %		

If results not within range, recalibrate on back of sheet. **Re-calibration needed (Y / N)?**

PRIMARY FIELD REFERENCE SAMPLE RESULTS

Performed by: ________________ **Evaluated by:** _______________ **Time Evaluated:** __________

Site of analysis: ____ **Time of analysis:** __________

PARAMETERS	Sample ID	Measured Value	Temp (°C)	Comments
pH				PASS / FAIL
Sp Cond				PASS / FAIL

If results fail, recalibrate on back of sheet, and perform secondary FRS. **Re-calibration needed (Y / N)?**

CALIBRATION LOG YSI WQMP ________600XLM MULTIPROBE (PAGE 2)

Southwest Florida
Water Management District

Water Quality Monitoring Program
7601 HWY 301 N. Tampa, FL 33637 (813) 985-7481
FDEP SOP(s) FD1000, FS1000, FT1000
Updated 9/10/09

RE-CALIBRATION Time: ________ Personnel: ________________

PARAMETERS		Known Value	Lot #	Pre-Calibrated Value	Calibrated Value	Temp (°C)	Within Range (Y / N)
Sp Cond (µS/cm)	***Calibrate***						
	Check			NA			
PH	***Calibrate***	7					
		4					
		10					
	Check			NA			
Dissolved Oxygen (% Sat)	***Calibrate***	100%	NA				

SECONDARY FIELD REFERENCE SAMPLE RESULTS *(If needed)*
Performed by: __________________ Evaluated by: ________________ Time Evaluated: __________
Site of analysis: ____ Time of analysis: ________

PARAMETERS	Sample ID	Measured Value	Temp (°C)	Comments
pH				PASS / FAIL
Sp Cond				PASS / FAIL

If results fail, use back-up meter, start new sheet, and fill out meter failure report.

POST-USE CHECK (To be performed at the end of the day)
Date: ___________ Time: _____ Personnel: _____________

PARAMETERS	Known Value	Lot #	Observed Value	Acceptable Range	Temp (°C)	Within Range (Y / N)
Sp Cond (µs/cm)				± 5.0 %		
pH	7			± 0.2 SU		
	4			± 0.2 SU		
	10			± 0.2 SU		
Dissolved Oxygen (% Sat)	100%	NA		± 5.0 %		
Depth (m)	0	NA		± 0.5 m	NA	

If any results are not within range, fill out failure report, do not use meter until problem is fixed.

Additional Comments:

____

____

____

METER FAILURE AND SONDE MAINTENANCE REPORT

Southwest Florida Water Management District

Water Quality Monitoring Program
7601 HWY 301 N. Tampa, FL 33637 (813) 985-7481
FDEP SOP(s) FD1000, FS1000, FT1000

Meter #: ________ Meter Serial #: ____________ Technician: ____________________

Project: ________________________ Date/Time Issue Occurred: ____________________

Site Issue Occurred at: ____

Problem: (describe issue – e.g. failed midday check, bubble in DO membrane):

This portion to be completed by meter technician

Action Taken:

Maintenance Technician: ___________________________________

Maintenance Date/Time: ___________________________________

Maintenance Date/Time Completed: _________________________

Surface Water Field Data Sheet

Southwest Florida Water Management District

Water Quality Monitoring Program
7601 HWY 301 N. Tampa, FL 33637 (813) 985-7481
FDEP SOP(s) FD1000, FS1000, FT1000

Project: ____________________ **Sampler Name(s):** ________________________

Station Information

Station Name: ____

UID/SID: ________________ **Date:** ____________ (YYYYMMDD) **Time:** __________ (Sample Time)

Waterbody Type (Circle one): Lake River/Stream Estuary Canal Other________

Weather Conditions (Circle one): Clear Partly Cloudy Cloudy Rain

Air Temperature: ______°F **Wind Speed:** ______mph **Wind Direction:** ________

***Water Sample Collection Device** (circle one):* *Van Dorn* *Direct Grab w Sample Bottle*

Water Quality Measurements

Total Water Depth :_______(meters) **Secchi Depth** :_______(meters) **Stage** (if applicable) :_______(Feet)

Stream Flow (Circle one): No Flow Low Moderate High Flood

Lake Level (Circle one): Low Normal High

Depth from which laboratory samples were collected: __________ (meters)

Sample meter used: ______________________

Field Measurements:

Depth Collected (meters)	**pH** (SU)	**D.O.** (mg/L)	**Temperature** (°C)	**Sp. Conductance** (uS/cm)	**Salinity** (ppth)

Comments:____

____

____

____ Revised 7/9/2009

QA/QC

Time Collected

Duplicate ____________

Blank ____________

Ref. Samp ____________

Groundwater Field Sampling Data Sheet

Southwest Florida Water Management District

Water Quality Monitoring Program
7601 HWY 301 N. Tampa, FL 33637 (813) 985-7481
FDEP SOP(s) FD1000, FS1000, FT1000

SID/UID ____________ COUNTY ____________ PROJECT ____________

SITE NAME ________________________ SAMPLERS ____________

CASED DEPTH (from land surface) ____________ CASING DIAMETER ____________

TOTAL DEPTH (from land surface) ____________

CASING MATERIAL: PVC/ STEEL/ IRON/ OTHER ____________

AQUIFER: SURFICIAL/ INTERMEDIATE/ FLORIDAN/ OTHER ____________

LAB: DISTRICT/ USGS/ DEP/OTHER ____________

ON SITE (Date & Time) ____________

LAND SURFACE ELEV/ MEASURING POINT ELEV ____________ / ____________

METER CALIBRATION

meter # ____________

OTHER METERS

meter # ____________

PURGE EQUIPMENT AND DISCHARGE

WATER ELEVATION (MPE-DTW) ____________

Purge with ____________

TOTAL DEPTH (TOC) ____________

@ ______ ,Q= ____________ GPM

DEPTH TO WATER ____________ (d)

Purge time ____________

WATER COLUMN HEIGHT ____________ (h)

Measurement interval for readings (min/ gal) ____________

1 WELL VOLUME= ________ (h)X ____________ (gal/lin.ft.)

Purge <3 volumes? Y/N If yes, why?

= ____________ GALLONS

____

3 WELL VOLUMES= ____________ GALLONS

INITIAL PURGE READINGS AND FINAL STABILIZATION READINGS

TIME	pH	TEMP	DO	SP COND	TURB	COLOR	GAL	ODOR

FINAL STABILIZATION READINGS

Groundwater Field Sampling Data Sheet (Page 2)

Southwest Florida Water Management District

Water Quality Monitoring Program
7601 HWY 301 N. Tampa, FL 33637 (813) 985-7481
FDEP SOP(s) FD1000, FS1000, FT1000

SAMPLE TIME ______________________ **SAMPLE ID** ______________________

SAMPLE POINT AND PROCEDURES

Sample device(s): Redi-flo Jetsub 2" sub. 1 ½ " sub. Peristaltic Whale

If other, describe pump used ______________________

Discharge rate = ____________ GPM @ Time ______________________

Sample Point: Wellhead Spigot Other ______________________

Filter Apparatus: Tripod QED (inline) Other ______________________

QUALITY ASSURANCE SAMPLES

Were quality assurance samples collected? Y/N if yes, what type?

SPIKE TRIP BLANK EQ BLANK DUPLICATE FIELD REFERENCE: pH ID# ________ Cond ID # ________

WEATHER: CLEAR PARTLY CLOUDY MOSTLY CLOUDY LIGHT MEDIUM HEAVY FOG
RAIN VERY HOT WARM COOL COLD

WIND: LIGHT MODERATE STRONG NORTHERLY EASTERLY SOUTHERLY WESTERLY
BREEZE GUSTS NO WIND

AMBIENT AIR TEMPERATURE ________ °F / °C
OTHER WEATHER OBSERVATIONS ______________________

DATA REQUEST (INCLUDE NAME, ADDRESS & PHONE #) ______________________

ON SITE VISITORS ______________________
CONDITION OF WELL ______________________
CONDITION OF TAG ______________________
ADDITIONAL COMMENTS ______________________

SWFWMD FIELD REFERENCE SAMPLE

Southwest Florida
Water Management District

Water Quality Monitoring Program
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FDEP SOP(s) FD1000, FS1000, FT1000

Field Reference samples must be collected in the field.

ANALYST: ______________________

DATE OF ANALYSIS: ___/___/___

TIME OF ANALYSIS: ____________

SITE OF ANALYSIS: ______________________

PROJECT: ______________________

pH

FIELD REFERENCE BOTTLE ID: ______________________

INSTRUMENT: *make* ________ *model* ________ *ID#* ________

MEASURED VALUE: ____________

TEMPERATURE: ____________ °C

COMMENTS: ____

____

SPECIFIC CONDUCTANCE

FIELD REFERENCE BOTTLE ID: ______________________

INSTRUMENT: *make* ________ *model* ________ *ID #* ________

MEASURED VALUE: ____________

TEMPERATURE: ____________ °C

COMMENTS: ____

____

FOR OFFICIAL USE ONLY

pH (PASS / FAIL) **SpCond (PASS / FAIL)**

MULTIPROBE LOGGING FIELD SHEET

Southwest Florida Water Management District

Water Quality Monitoring Program
7601 HWY 301 N. Tampa, FL 33637 (813) 985-7481
FDEP SOP(s) FD1000, FS1000, FT1000

ONE SHEET SHOULD BE FILLED OUT FOR EACH LOG RUN- AT LOG START AND LOG FINISH

SITE NAME: ____________________

MULTIPROBE TYPE & ID: ____________________

POST-LOG CONDUCTIVITY CHECK

DATE/TIME OF CONDUCTIVITY CHECK: ____________________

INDEPENDENT COND. READING OUTSIDE PVC TUBE: ____________________

INDEPENDENT COND. READING INSIDE PVC TUBE: ____________________

LAST RECORDED COND. READING ON LOGGING SONDE: ____________________

COND. CHECK IN STANDARD: STANDARD VALUE ____________ SONDE VALUE ____________

PVC TUBE CHECK AND MAINTENANCE

CONDITION OF TUBE: ____________________

ACTIONS TAKEN: ____________________

MULTIPROBE CALIBRATION

CONDUCTIVITY STANDARD VALUE USED: ____________________

PRE-CALIBRATED CONDUCTIVITY VALUE: ____________________

PRE-CALIBRATED TEMPERATURE VALUE: ____________________

POST-CALIBRATED CONDUCTIVITY VALUE: ____________________

POST-CALIBRATED TEMPERATURE VALUE: ____________________

LOGGING SET-UP INFORMATION

LOG START DATE/TIME: ____________________

LOG STOP DATE/TIME: ____________________

LOG FILE NAME: ____________________

LOGGING UPLOAD INFORMATION

LOG UPLOAD DATE/TIME: ____________________

LOG UPLOAD FILE NAME: ____________________

COMMENTS: ____________________

Southwest Florida Water Management District

WATER LEVEL INSTRUMENTATION LOG

Water Quality Monitoring Program
7601 HWY 301 N. Tampa, FL 33637 (813) 985-7481
FDEP SOP(s) FD1000, FS1000, FT1000

SID ________________

Wellsite Name________________

Well Name ________________

County ________________

Technician(s) ________________

Date ________________

Instrument Type:

______Float & Tape

______P.T.

______Other____________

	BEGINNING READING	ENDING READING
Time	____________	____________
Depth to Water (DTW)	____________	____________

Tape and float in proper order upon arrival: ☐ Yes ☐ No
If no, please explain:____

____

Reassembled correctly: ☐ Yes ☐ No
If no, please explain: ____

____

Additional Comments:

____

____

____

USGS Steel Tape reading at pointer: ______________

Was Tape Indicator removed from shelter: ☐ Yes ☐ No

***Return completed forms to Jason Hust ***

White copy – Well Shelter Yellow copy – Dianna Brass

Detail 15
HOBO/OTT Logging Protocols

HOBO Data Logger Procedures

For various projects, the WQMP utilizes Onset “Hobo Logger” data loggers. The two types of loggers on hand are depth and conductivity/temperature. After deployment, these loggers are downloaded on a project specific schedule.

<u>Initial Deployment</u>

The initial deployment of a data logger will typically involve construction of a housing tube or modification of an existing site in order to suspend the logger at the desired elevation. These instructions will not cover this as it will vary from site to site. However, it should be noted that it is very important for the elevation of the logger(s) to be known and for the logger(s) to be secured in a fashion as to maintain that elevation. Also, if a depth logger will be used, an additional logger must be placed in the atmosphere (to log atmospheric pressure and later correct depth data) at or near the site.

1) Turn on field computer (must have Hoboware Software) and plug the Optical USB Base Station into a USB port on the computer.
2) Start Hoboware software,
3) Place correct coupler on base station (different for depth and conductivity).
4) Insert data logger into coupler with correct alignment (protective end cap must be removed on depth logger prior to insertion). Adjust until logger is recognized by Hoboware software.
5) Click the Launch  icon on the toolbar or choose LAUNCH from the device menu
6) Different messages may appear depending on the state of the logger. Answer each of the prompts as needed.
7) Configure the launch parameters in the launch logger window (i.e. log interval). NOTE: all loggers should be launch to record ON THE HOUR. For example, if you want 15 minute intervals and it is currently 1320, set the logger to begin logging at 1330.
8) Click the START button when you are finished setting the launch parameters.
9) Once back at the home screen in Hoboware, click on the Status icon. Record this information of the field sheet as verification that the launch process was successful.
10) If you are deploying a Conductivity logger, a conductivity, specific conductance, and temperature reading must be taken with a YSI and recorded on field sheet. This measurement should be taken very close to and at the same depth as the logger. This measurement also MUST be taken at a time (interval) when the logger will be taking a reading.
11) If you are deploying a Depth logger, a gage reading or WSE measurement must be taken and recorded on field sheet. This measurement also MUST be taken at a time (interval) when the logger will be taking a reading. If this measurement is to be obtained with survey equipment, see the Survey SOP.

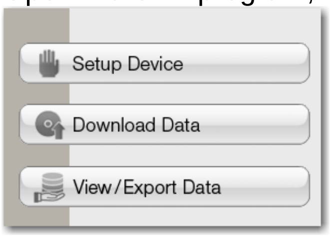
Data Download and/or Logger Retrieval

Each data logger will be downloaded on a set schedule based on the project.

1) Turn on field computer (must have Hoboware Software) and plug the Optical USB Base Station into a USB port on the computer.
2) Start Hoboware software,
3) Place correct coupler on base station (different for depth and conductivity).
4) Insert data logger into coupler with correct alignment (protective end cap must be removed on depth logger prior to insertion). Adjust until logger is recognized by Hoboware software.
5) Click the Readout  icon on the toolbar or choose READOUT from the device menu.
6) A message will ask if you want to stop the logger. If data collection for this site is complete or you will be changing out the logger due to battery or other issues, select YES. If this logger will remain active at this site, select NO.
7) You will be prompted to select a location and/or new filename. Ensure that the filename is correct for this site and save the file to the appropriate folder on your desktop.
8) Once back at the home screen in Hoboware, click on the Status icon. Record this information of the field sheet as verification that the logger will continue to log.
9) If you are downloading and/or retrieving a Conductivity logger, a conductivity, specific conductance, and temperature reading must be taken with a YSI and recorded on field sheet. This measurement should be taken very close to and at the same depth as the logger. This measurement also MUST be taken at a time (interval) when the logger will be taking a reading.
10) If you are downloading a Depth logger, a gage reading or WSE measurement must be taken and recorded on field sheet. This measurement also MUST be taken at a time (interval) when the logger will be taking a reading. If this measurement is to be obtained with survey equipment, see the Survey SOP.

Steps for deploying OTT data loggers

Open the OTT program, three options will be available from this window; they are:



Select setup device for the initial deployment. Next a window will appear, this window allows you to modify the operating parameters and specify criteria. For the initial deployment select the

button at the bottom of the window. All of the options that were previously blank will become populated once the logger is connected to the program.*

***If your PC will not connect to the OTT logger, refer to the troubleshooting documents.**

Set the date/time to the PC date and time by clicking the 

button, it is important to note that there is a small lag time between the two and you will get an error message when connecting from time to time.

Water level/ Pressure setup

The parameter number for Water Level/Pressure is 0001, leave this as is. Change the parameter name to “Water Surface Elevation”, next choose “Water Level” for Meas.type. And “Depth” for Meas. Range. Units should be “ft. (0.1)”. Storage interval and Sample interval should be adjusted to the required reading interval for the project the loggers will be used for.(00:15:00)

Temperature Setup

The parameter number for temperature is 0002, Change the parameter name to “Temperature”, make sure the units are “C(0.01)”, change he sample interval and storage interval to the reuired intervals for the project.

Specific Conductance Setup

The parameter number for conductivity is 0004, change the parameter name to “Specific Conductance”, change Meas.type/Meas.range to “0.001 … 2.000 mS/cm”, change units to “uS/cm”, Temperature compensation should be “Freshwater”, sample interval and storage interval should be set to desired reding interval. See Example below:

After all the required changes have been made click: 

at the bottom of the window to save the settings.

*****There is no need to launch the logger, once the batteries are connected the unit is logging until the batteries are removed.*****

Steps to download OTT logger files

1. Record Date/Time in "Data Logger" section on field sheet.
2. Circle download type.
3. Perform surrogate (side by side) readings.
4. Open stilling well and log onto Toughbook
5. Connect reader head to the top of the OTT sonde.

   *If connection fails, refer to the trouble shooting documents included in characterization book.
6. Open OTT software link and click on "Download Data"
7. Click "All sensors" button. (make sure all sensors are checked)
8. Select "All" next to date option drop down.
9. Click "Download Data" button.
10. Click "View/Export data" button.
11. On the View data screen there is a list of downloads. Hold down the "Ctrl" key and select each sensor to download and make sure you select the "TO-Date" rows of that current day.
12. After clicking each row to download (All sensors), release the "Ctrl" key and click on "Export Excel"

*If download fails, refer to the trouble shooting documents included in characterization book.

13. Expand date column (A) in Excel spreadsheet to show all dates. In sheet 2-5 note the date range on the field sheet in the comments area (Each sheet should start and end on the same Date/Time).
14. In Excel, click File_SaveAs_Computer_Desktop. Use file name format "Bullfrog41_20150120"..
15. Close Excel window and Minimize OTT window and make sure the Excel spreadsheet was saved to your desktop.

The data download is complete.

Steps to calibrate OTT logger

1. Remove sonde from stilling well, Clean stilling well and clean sonde.
2. Take instantaneous reading of standard.
3. Clean sonde and stilling well.
4. Remove bottom cap to clean depth probe.
5. Click "Setup Device" from the OTT main menu screen.
6. Click "Connect" in the setup window.

   *If connection fails, refer to the trouble shooting documents included in characterization book.
7. Record parameter units on the "OTT Setup" section of the field sheet.
8. Check Date/Time for accuracy. Reset if needed.
9. Record "Sample interval" in "Log interval" line on field sheet.
10. Click on "OTT CTD" tab on the top ribbon of the Setup screen.
11. Click "View Instantaneous Values"

12. Note battery volts on field sheet.
13. Dry sonde thoroughly.
14. Close “instantaneous Values window” and Click “OTT CTD” tab on top ribbon.
15. Select “Calibrate Conductance Sensor” in the dropdown options.
16. With sonde completely dry, click on “Start zero point” button.
17. Record Zero point value near calibration sections on your field sheet.
18. Click “stop zero point test”
19. Place sonde in 6667 standard.
20. Click “Start Calibration.
21. Allow sonde to equilibrate for a few moments. Click “Stop Calibration”. Record new “cell constant”.
22. Return to setup screen and click “OTT CTD” and click “instantaneous Values”. Record calibrated value in your “Post” box of the calibration section of the field sheet. Record temperature.
23. Remove sonde from standard. In setup screen, calibrate depth to 0.00 and click SAVE.

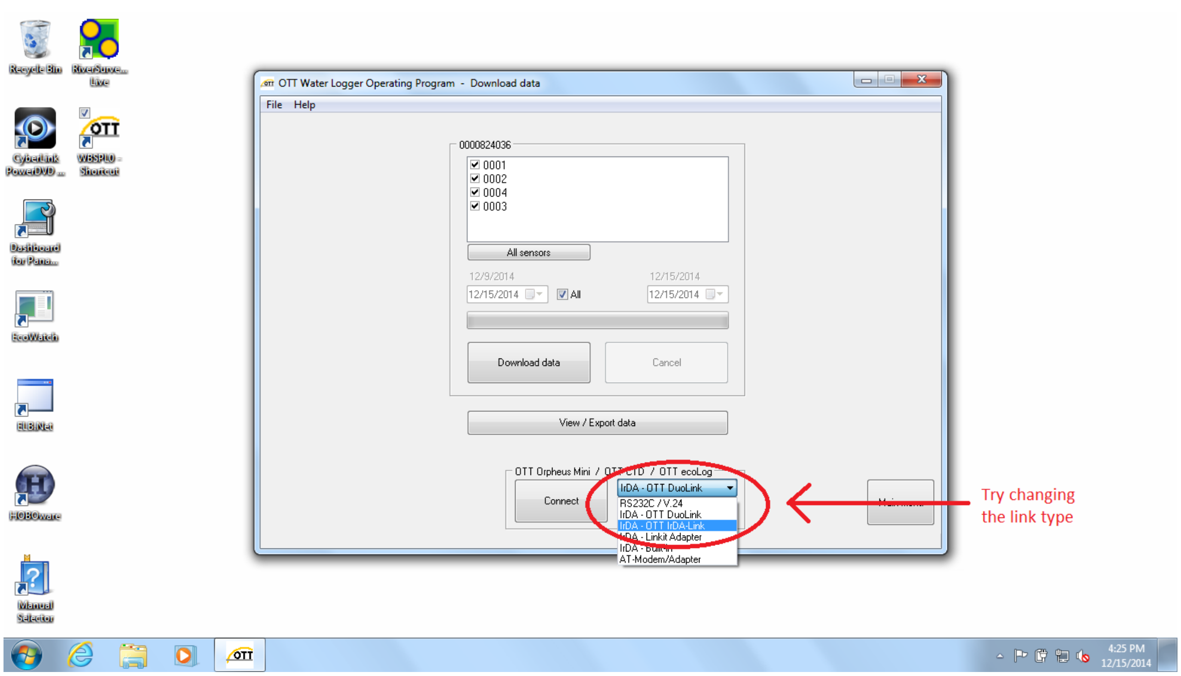
The sonde calibration is complete

The sonde is always logging when batteries are in. Replace sonde in stilling well and refasten lid.

Perform a Post-Download Side-by-Side and record the values on your field sheet.

OTT Troubleshooting

1. **If the OTT sonde will not connect during Setup or during Download**, click on the “Link option” drop down (Button next to “Connect”). Select other “IrDA” link option and click “Connect”



2. **While exporting Data to Excel, if error message appears**, select and export each sensor one by one. Save the Excel files for each sensor to the desktop, noting in the filename which sensor it is.

Checking & changing batteries

Check the battery voltage as follows

- Set up the PC/OTT CTD communication link (see Chapter 7.2).
- Select the "OTT CTD" menu, "View Instantaneous values" function [1] → the OTT CTD starts an instantaneous value measurement → the "Observer" window indicates the current battery voltage and the energy withdrawn from the batteries so far in Ah.
- If the battery voltage is ≤ 3.6 to 3.7 volts → replace the batteries.
- Click on the "Exit" button.
- Close the operating program.

[1] With suitable settings (Menu "File", Function "Options"), the operating program starts with the "Observer" window.

Replace dead batteries as follows

- Open the top cap/observation well cover.
- Pull the communication unit approximately 80 cm out of the observation well and hold (a second person would be useful).
- Slide the pipe casing of the communication unit approximately 30 cm in the direction of the pressure probe cable. (The rubber stop located on the pressure probe cable (see Fig. 1) prevents the pipe casing from falling. Do not move the rubber stop!)
- Remove dead batteries.
- Insert 3 new batteries (LR6/FR6 · AA) into the battery compartment as shown in Figure 2 within 10 minutes. Ensure that the polarity is correct!
- Slide the pipe casing of the communication unit back on until it stops.
- Slowly and carefully place the communication unit back into the observation well.
- Close the top cap/observation well cover.

Detail 16
ISCO Autosampler Protocols for Lake Hancock

Items needed:

1. 5 coolers of ice (1 per sampler)
2. 35 sample bottles
3. 5 auto-sampler batteries
4. Auto-sampler tubing (5 sections, pre-labeled)

Procedure:

1) Clean the PVC stilling well with the PVC cleaning rod (except at the pump station, which does not have a stilling well installed).
2) Unlock auto-sampler from the structure.
3) Remove the cover of the auto-sampler.
4) Select the appropriate section of auto-sampler tubing for the site that you are at and place the pump head into the PVC stilling well next to the structure. At the pump station, the tubing is placed inside a large aluminum pipe with a hole in the side that will accommodate the tubing.
5) Set the pump head so that a sampling depth of approximately ½ meter is achieved. If needed, use a measuring tape and make a small mark on the tubing to set the position. Wrap the tubing around the handrail to keep it in place. Before attaching the other end of the tubing to the pump, twist it several times to the left so it will be less twisted after turning it to the right when threading it onto the pump nozzle.
6) Unlatch the center section of the auto-sampler and lift it up to gain access to sample bottle compartment.
7) Place seven clean sampling bottles into positions #1 through #7.
8) Wrap a rubber band around the top of the sampling bottles to hold them in place.
9) Place the three additional sampling bottles (will already be inside the sampler) into the pre-designated spots in the base where the metal brackets are mounted.
10) Install the plastic retaining ring between the bottles, and secure it with the bungee cords, making sure that the bottles remain straight and in the correct alignment.
11) Fill the empty space between the bottles with ice, just over the top of the retaining ring. Do not overfill the compartment with ice, as this may cause the sampling arm to get hung up as it moves to the different bottle positions.
12) Remove the caps from under the seven sample bottles.
13) Re-install the center section of the sampler and secure the three latches. Once of the latches is wider to prevent misalignment when reassembling the sampler.
14) Plug in and secure the battery with the rubber straps.
15) Turn the power on.
16) Press **Enter** (left arrow-bottom right button) on the first screen for “extended programming”.
17) Press **Enter** when the option to run the “Extended 1” program appears.
18) Press **Enter** on the next screen, which says: “program name: “extended 1”, site description: “pump station…etc.”
19) Press **Enter** on the “units selected: length: ft” screen.
20) Press **Enter** to skip the “1 minute data interval” screen.
21) Press **Enter** to skip the summary screen because the information should be saved from the previous event by the internal memory in the auto sampler. **However, make sure it still looks correct** – (24 1000mL bottles, (x) ft suction line, auto suction head, 1 rinse, 1 retries).
22) Press **Enter** on the “one-part program” screen.

23) Press **Enter** on the “pacing: time, every 1 hours, 0 minutes” screen.
24) Press **Enter** on the “distribution: 7 bottles/sample, 24 samples/bottle, run continuously” screen.
25) Press **Enter** on the “volume: 40mL samples” screen.
26) Press **Enter** to skip the “enable: none programmed” screen.
27) Press **Enter** to skip the “enable: repeatable enable, no sample at disable, no sample at enable” screen.
28) Press **Enter** to skip the “enable: countdown continues while disabled” screen.
29) Press **Enter** to skip the “enable: 0 pause & resumes” screen.
30) On the next screen the start date and time will need to be programmed. Press the **back/up** button (bottom left button) to edit this information. The screen should start flashing. Press **Enter** to select the appropriate date and start time.
31) On the next screen the “clock time” option (3rd line down) should be flashing. Press **Enter** to edit the start time program.
32) On the next screen that says: “start “extended 1” at: xx:xx”, select the desired hour (using the number buttons) that you wish to start the program, and press **Enter**. The cursor should then move to the minute position. Select the desired minute to start the program and press **Enter**. Select a start time within 5 or 10 minutes of the current time so you can confirm that the sampler functioning properly before leaving the site.
33) The next screen is the “select days” screen. If the desired start day of the week (current day) is not already flashing, use the **back/up** button, and the **forward/down** button to move the cursor to the appropriate day. To remove an undesired day that is flashing, press **Enter** when the cursor is on that day. To add a desired day that is not flashing, press **Enter** when the cursor is on that day. Once this is complete, use the **forward/down** button to move the cursor off the days of the week and press **Enter**.
34) The next screen will say: “first valid day is: xx-month”. The correct date should already be there at this point because of the internal memory of the sampler. If it’s not, use the **back/up** button, and the **forward/down** button to make changes before going to the next screen. Once the date is correct, press **Enter**.
35) The next screen will show a summary of the start time, day of the week, and start date. For example: “start: 09:20 TU not before: 4-Feb”. If everything is still correct, press **Enter**.
36) The next screen will say: “programming complete, run this program now? The “Yes” option should already be flashing. Press **Enter.**
37) At this point the programming is complete, and the next screen will show the start time, day of the week, and start date. On the same screen the current time, day of the week, and current date will also be displayed on the bottom line.
38) Observe the sampler as it runs through the first sampling cycle. If everything goes fine, after the first cycle (it takes about 4 minutes), the following screen will appear: “2, 24 btls 1-7 in 00:56:00” – (the exact countdown time will vary). This is simply showing that the 2nd sampling cycle will start in 56 minutes.
39) If there are no issues with the first sampling cycle, replace the lid of the sampler, lock the sampler and the cables with the padlocks, and move on to the next site.

Sampling and Data-Collection Procedure, Day 2

1) Take profile readings at each site according to Ambient Lakes protocols (.5 meters from the top, mid-depth, .2 meters from the bottom, etc.) Label sample kit with the current time.
2) Unlock auto-sampler from the structure.
3) Remove the cover of the auto-sampler.
4) Unlatch the center section of the auto-sampler and lift it up to gain access to sample bottle compartment.
5) Install the caps onto the seven sample bottles so that no water is lost on the way to the work truck. Remove the rubber bands from the top of the sample bottles and place them aside to be used the next time.
6) Remove the seven sample bottles from the auto-sampler.
7) Remove the three place-holding bottles and the plastic retaining ring from the auto-sampler.
8) Dump out the ice from the auto-sampler and angle it towards the sun to help it to dry out while preparing the samples.
9) Take the seven sample bottles to the work truck and pour them into a clean DI container (with a spout) for dispensing into the sample kit. This will be the 24-hour composite sample. For the filtered bottles, use a peristaltic pump with a tripod filter. More than one filter may be necessary at some of the sites.
10) After filling, filtering and acidifying the appropriate bottles, place the sample kit on ice.
11) Rinse the DI container (the one that you used for the composite sample) between sites with clean DI water.
12) Remove the battery from the auto-sampler and take it back with you so it can be charged up again at the office.
13) Use the drying cloth to remove any remaining water from the sample bottle compartment of the auto-sampler. Place the plastic retaining ring and the 3 place-holding bottles back inside the sample bottle compartment (dry as necessary).
14) Disconnect the sample tubing from the auto-sampler and remove the other end from the stilling well. Label the tubing before placing it in the truck so that it can be used at the correct site the next time.
15) Reassemble the auto-sampler and lock it to the structure.
16) Bring the used auto-sampler bottles back to the office and ship them to the lab in Brooksville (in coolers) so they can be cleaned and used again.
17) Connect the auto-sampler batteries to the chargers in the office and remember to unplug them the next morning so that a charging time of approximately 16 hours is achieved.

Detail 17
Flow Measurement Using RiverSurveyor Equipment

COLLECTING DISCHARGE WITH SONTEK/YSI RIVERSURVEYOR S5 MOUNTED ACOUSTIC DOPPLER CURRENT PROFILER (ADCP)

1) Assemble boat/radio/ADCP connecting wires (instructions are in the case with the S5).

2) Make sure the batteries are installed.

3) Turn the boat on. The power button should turn green.

4) Make sure the Bluetooth radio antenna with the USB is connected to the laptop.

5) Select **RIVERSURVEYOR LIVE** on the laptop and connect to the S5.

6) Complete systems test. This verifies battery voltage, compass calibration and checks the temperature sensor.

7) Scroll to **COMPASS CALIBRATION** and select **START**. Rotate the ADCP through two compete revolutions while varying pitch and roll angles as much as possible. It is important to complete the compass calibration as close to the measurement location as possible.

8) Verify the **SYSTEM SETTINGS** has a transducer depth of 0.2 feet.

9) Verify the units are in English and not metric.

10) Complete **EDGE SETTINGS** prior to starting measurements if possible.

11) Begin discharge measurements.

12) Adjust edge settings if they change during measurements and verify the correct bank is noted (right or left bank facing downstream).

13) Record the time of measurement along with weather conditions or any conditions which could affect the discharge measurements.

14) Continue discharge measurements until three measurements are within five percent of each other and a fourth measurement is within ten percent of the accepted three.

Detail 18
Flow Measurement Using FlowTracker Equipment

INSTRUCTIONS FOR COLLECTING DISCHARGE WITH SONTEK/YSI FLOWTRACKER ACOUSTIC DOPPLER VELOCIMETER (ADV)

1) Put up tag line and determine interval necessary to complete at least 20 measurements.

2) Hold power button until Flowtracker turns on.

3) Press ***ENTER*** for main menu.

4) Press **3** to start data run.

5) Press **1** to name.

6) Enter random set of numbers (we will not be storing so the name is not important) and press **ENTER.**

7) Press **9** to accept name.

8) When at first station, press **NEXT STATION** (written yellow on 2 button).

9) Press **NEXT STATION** again.

10) Use wading rod to measure depth of water and record on field sheet.

11) Adjust wading rod for measured depth and press **MEASURE**.

12) After measurement is complete (30 seconds), record velocity on field sheet.

13) Press **1** to accept (or 2 if the measurement needs to be repeated).

14) Move to next station.

15) Repeat instructions starting back at Step 10.

Detail 19
FlowTracker
Depth Calculator

DISCHARGE MEASUREMENTS WITH FLOWTRACKER IN WATER > 3' REQUIRE MEASUREMENTS AT 20% & 80% OF THE TOTAL DEPTH		
Total Depth (ft)	Bottom Reading (.2)	Top Reading (.8)
3.1	0.6	2.5
3.2	0.6	2.6
3.3	0.7	2.6
3.4	0.7	2.7
3.5	0.7	2.8
3.6	0.7	2.9
3.7	0.7	3.0
3.8	0.8	3.0
3.9	0.8	3.1
4.0	0.8	3.2
4.1	0.8	3.3
4.2	0.8	3.4
4.3	0.9	3.4
4.4	0.9	3.5
4.5	0.9	3.6
4.6	0.9	3.7
4.7	0.9	3.8
4.8	1.0	3.8
4.9	1.0	3.9
5.0	1.0	4.0