

**QUALITY ASSURANCE PROJECT PLAN
FOR
EVALUATION OF WATER QUALITY AROUND
THE TOWN OF SUWANNEE, FLORIDA, AND
COMPARISON WITH HISTORIC DATA**

Prepared for:



**FLORIDA DEPARTMENT OF HEALTH
Bureau of Onsite Sewage Programs
Contract COQOT**

Prepared by:



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1.0 INTRODUCTION

The town of Suwannee, Florida, previously was serviced for residential and commercial sewage disposal by individual onsite sewage treatment and disposal systems (OSTDS) more commonly known as septic tank systems. In 1991 it was determined that a total of 850 OSTDS were in use, and that most were inadequate or failing¹. Due to the proximity of the OSTDS to local shellfish harvesting grounds in the Suwannee River Sound, the failing OSTDS were considered potential sources of bacterial contamination found in oysters harvested from that area in 1989 to 1990.

To address the contamination problem, plans were approved to construct a central wastewater treatment plant (WWTP) and purge and abandon all OSTDS. The WWTP became operational in 1997, and most OSTDS were closed by late 1997. To evaluate the impact in local surface and ground water quality by operating a central WWTP as opposed to the OSTDS, a pre- and early postconstruction sampling study was conducted by Environmental Consulting & Technology, Inc. (ECT), in late 1996 and 1997¹.

The purpose of the current project is to reevaluate water quality characteristics around the town of Suwannee 10 years after startup of the WWTP, essentially by duplicating the previous sampling efforts. This quality assurance project plan (QAPP) will present the methodologies to be employed for water quality sampling, data collection, and data quality evaluation and reporting. The primary guidance sources used to develop the QAPP and execute the project will be the Florida Department of Environmental Protection (FDEP) Quality Assurance Rule (Chapter 62-160, Florida Administrative Code [F.A.C.]) and the applicable FDEP-developed Standard Operating Protocols (SOPs) (DEP-SOP-001/01), which are incorporated by reference in Section 62-160.800, F.A.C. Additional reference documents will be the U.S. Environmental Protection Agency (EPA) Requirements for

¹ Environmental Consulting & Technology, Inc. (ECT). 1998. Evaluation of the Potential for Restoring Commercially Viable Oyster Harvesting in Suwannee Sound. Prepared for Florida Department of Health. ECT No. 96396-0400.

Quality Assurance Project Plans², and the quality assurance requirements in FDEP's Agreement No. CZ924, Attachment G, which is included in Appendix C.

Figure 1 presents an organizational chart of the participants and their roles for the project.

² U.S. Environmental Protection Agency (EPA). 2001. EPA Requirements for Quality Assurance Project Plans. EPA QA/R-5. EPA/240/B-01/003.

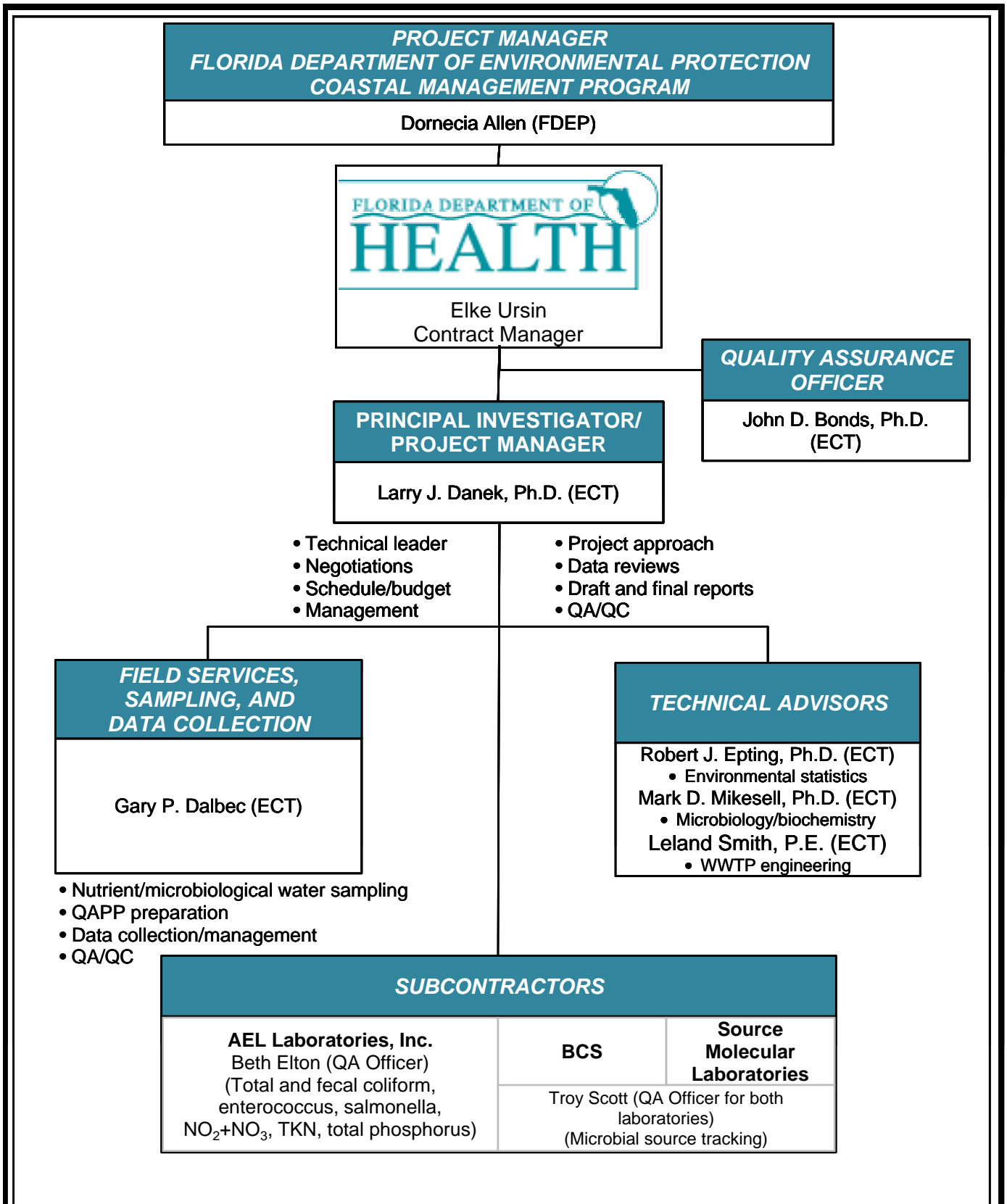


FIGURE 1.
ORGANIZATIONAL CHART OF PROJECT TEAM

Source: ECT, 2008.



2.0 PROJECT WORK SCOPE

2.1 SUPPLEMENTAL DATA

ECT will acquire, compile, and summarize available databases of recent and/or ongoing water quality sampling programs in the vicinity of the project's study area. Three sources of potential data include programs being conducted by the Suwannee River Water Management District (SRWMD), the Florida Department of Agriculture and Consumer Services, formerly collected by FDEP, and a recently completed study by FDEP. Supplemental data may also include precipitation and river flow data as available. To assess the quality of the data retrieved, contacts will be made to the respective agencies to inquire about the quality review status of the data (e.g., provisional or final), as well as any other issues concerning data validity and sample collection protocols.

Data requests will be made for existing electronic files/spreadsheets to avoid typographical errors associated with manual data entry and to obtain data in a more efficient format that can be readily used for the purpose of this project. Any data qualifier codes accompanying agency data submissions will be included and explained in the project report. Any suspected data outliers or anomalies will be discussed with appropriate agency personnel for resolution.

2.2 SAMPLING STATION LOCATIONS

Ten water quality sampling locations consisting of nine surface water stations and one ground water station will be monitored during each of the eight weekly surveys. Figure 2 illustrates the locations of these stations. The ground water station will be a shallow temporary well located near the previous study location on Leon Drive and will be situated downgradient from an abandoned OSTDS. The surface water stations include one control station (Station 10) located approximately 2 miles upstream of the town of Suwannee. The rest of the stations will be located in the canals within the town (Stations 2, 3, 4, 5, and 6) and in the major passes of the Suwannee River delta, specifically East Pass (Station 9), Alligator Pass (Station 8), and Wadley Pass (Station 7). Appendix A contains photographs of the current site conditions based on a site visit in December 2008.

To ensure the same station locations are occupied on each survey, the station latitude and longitude coordinates will initially be determined using mapping software and programmed into a global positioning system (GPS) receiver. The coordinates were refined/confirmed during the presampling reconnaissance trip. The receiver will then be used to navigate the survey boat to the surface water stations. Table 1 provides a hard copy list of coordinates that will be included in the field survey preparation packet for each trip in case the preprogrammed coordinates in the GPS receiver are inadvertently deleted or lost due to an instrument/software malfunction. Visual location reference points will be noted during the reconnaissance survey for boat positioning assistance should the GPS encounter operational problems. GPS receiver power source replacement or back up will be included in the field accessory kit. The status of the receiver's primary power source will be checked prior to each survey mobilization.

2.3 IN SITU PARAMETERS MEASUREMENTS

Water temperature, specific conductance, pH, and dissolved oxygen will be measured at all stations on each survey. These parameters will be measured at surface water station at three points in the water column: 1 foot (ft) below the surface, mid-depth, and 1 ft above the bottom. The shallow well will be purged per FDEP protocol, then the in situ measurements will be made prior to sample collection. A peristaltic pump and tubing system will be used to purge and sample the well. In situ measurements will be made with a Yellow Springs Instrument® (YSI) Model 556 multiparameter system or equivalent instrument. The instrument will be calibrated for all parameters on the day of each survey. The calibration will be documented on a field instrument calibration record Form FD 9000-8 (see Appendix B).

All required sampling ancillary information/data will be recorded. Form S-1 and FD 9000-24 (see Appendix B) are examples of the standardized forms that will be used to record the in situ and ancillary data for the surface water and ground water monitoring/sampling, respectively. The FDEP SOPs that will be referenced for instrument calibration and collection of in situ data are FD 1000, FT 1100, FT 1200, FT 1400, and FT 1500. Appendix C contains all SOPs referenced in this document.

Table 1. Town of Suwannee Water Quality Station Coordinates

Station	Latitude	Longitude
1	29 19 55.40	83 08 21.16
2	29 19 15.78	83 08 43.64
3	29 19 16.18	83 08 48.74
4	29 19 57.32	83 08 20.76
5	29 19 23.90	83 08 37.19
6	29 19 33.47	83 08 22.08
7	29 18 28.90	83 09 50.03
8	29 18 11.89	83 09 25.43
9	29 18 55.55	83 07 09.68
10	29 19 29.18	83 06 42.70

Source: ECT, 2009.

2.4 WATER QUALITY SAMPLE COLLECTION

Per the previous study, given the geometry and flows of the canals and river channel, it is expected that the water will be well mixed vertically, including the freshwater layer above the saltwater wedge of the Suwannee Estuary. Therefore, a surface grab sample from the top of the water column will be collected for laboratory analyses of the project parameters. The individual station sample containers will serve as the sampling device, eliminating the need for an intermediate sampling device that would require in-field decontamination between stations and events. Also this eliminates the potential of cross-contamination of samples between stations from the use of a common sampling device. Table 2 provides a listing of the water quality parameters for laboratory analyses to be sampled at each station, along with the analytical method, preservation requirements, and sample holding times.

AEL and BCS will provide all required sample collection containers with preservatives as necessary. Sample containers will be delivered to ECT by the laboratories and hand-delivered to the laboratories by ECT following sampling within the required shortest holding time. All sample collection will be documented on respective chain-of-custody forms (see Appendix B) with sampling information consisting of:

- Sample identification numbers.
- Sample collection dates and times.
- The number of containers per sample.
- The preservation used for each container.
- The samplers name and affiliation.
- Project name and location.
- Analyses requested.
- The material type and size of the sample containers.
- The temperature of the samples at delivery.
- The time of delivery and the sampler's signature.

To match the sampling approach of the previous study, sampling will begin approximately 2 hours before the predicted low slack tide and be completed within 2 hours following

Table 2. Town of Suwannee Water Quality Sample Information

Parameter	Analytical Method	Preservation	Holding Time
Total coliform	SM 9222 B	Cool 4° Celsius	6 hours
Fecal coliform	SM 9222 D	Cool 4° Celsius	6 hours
Enterococci	EPA 1600	Cool 4° Celsius	6 hours
Salmonella	SM 9260 B	Cool 4° Celsius	6 hours
Nitrate + nitrite	EPA 353.2†	Cool 4° Celsius H ₂ SO ₄ to pH <2	28 days
Total Kjeldahl nitrogen	EPA 351.2†	Cool 4° Celsius H ₂ SO ₄ to pH <2	28 days
Total phosphorus	EPA 365.3	Cool 4° Celsius H ₂ SO ₄ to pH <2	28 days
Microbial source testing*	Human enterococcus ID	Cool 4° Celsius	12 hours

*The number of samples to be analyzed and sample locations to be determined following evaluation of enterococcus results from the first three rounds of sampling.

†Revision 2.0, 1993, will be used.

Note: SM = standard methods.
H₂SO₄ = sulfuric acid.

Source: ECT, 2008.

low slack tide. An online tide prediction Web site will be referenced to identify the appropriate sampling time window.

The FDEP SOPs that will be referenced for surface water and ground water sample collection are FS 2100 and FS 2200, respectively.

Per the surface water sampling SOP, Section 2110.1, general surface water sampling protocols to be followed will include:

- Collect samples from the bow of the boat away from outboard motor.
- Collect samples manually using the samples containers from the top 12 inches of the water column and avoid skimming the water surface.
- Cap and shake sample containers containing chemical preservatives to mix the preservative evenly with the sample volume.
- Segregate individual station sample container sets in sealable plastic bags (e.g., Zip-Loc®) to avoid station cross-contamination during transport.
- Immediately place all samples requiring preservation by chilling into coolers in ice upon completion of sampling at each station.
- Wear powder-free Latex gloves at all times during sample container handling. New gloves will be worn at each station and changed if objects other than containers are handled.

Periodic checks for adequate sample chemical preservative will be done per FDEP SOP FS 2100, particularly during initial sampling.

Consistent with the earlier study, the sample from Station 4 will be collected from the dock located on the property where the Station 1 well is located. If access to the water requires a sampler device because of low water level beyond arms reach, a polyethylene dipper will be used. The device will be cleaned and decontaminated between sampling events following FDEP SOP protocol. The device will be wrapped with aluminum foil and stored in a plastic bag between surveys. If the dipper is used, an equipment blank

sample will be collected as part of the quality assurance/quality control (QA/QC) sample collection program.

A peristaltic pump and tubing system will be used to purge and sample the project well (Station 1).

Per the ground water sampling SOP, general purging and sampling protocols to be followed will include:

- Wear powder-free Latex gloves at all times when handling sample tubing and containers.
- Use new tubing on each sampling event.
- During sampling, purge at a minimum flow rate to maintain constant water level in the well if possible.
- Collect samples as soon as possible following purging, dependent on the recharge rate of the well.
- Place a piece of rolled plastic on the ground around the well to prevent pump tubing from contacting the soil around the well.

Please note that new gloves will be worn at each station and changed at each station if objects other than sample containers or sampling equipment are handled.

Ten percent of all laboratory samples will have QA/QC samples taken consisting of either field blank, equipment blank, and duplicate samples. Considering a project total of 80 samples are anticipated (8 events \times 10 stations), at least eight QA/QC samples will be collected. Acceptable field and laboratory duplicate and laboratory spike sample results acceptance criteria, as well as calibration information, is presented in Table 3. Per Agreement CZ924, Attachment G, Item 3(d)(ii), one set of matrix spike and matrix spike duplicate or laboratory duplicate samples using project samples will be generated as follows:

- The first time a sample is collected.
- One in each additional 20 samples, after the first 20 samples.
- The last time a sample is collected.

In addition to the sampling forms referenced, a standard ECT form to log all activities during a sampling day will be recorded on Form N-2 in Appendix B.

The initiation of sample collection and sampling location(s) for microbial source tracking will be contingent on the results of enterococcus sample analyses from the initial three rounds of sampling. These data will be evaluated to identify the sampling stations that exhibit microbial counts or concentrations that indicate potential fecal contamination. Source tracking samples will be collected in the same manner as all other parameters. Based on this approach, source tracking sample collection will be conducted at some or all stations during the fourth (or later) round of sampling. Additional source tracking sampling may be done dependent on the initial source tracking results and/or subsequent enterococcus data. The cost for the source tracking analyses will come either from additional funding or deletion of other parameters from the sampling list (Table 2) to be approved by DOH.

2.5 LABORATORY SAMPLE ANALYSES

All sample analyses for the parameters listed in Table 2, with the exception of microbial source tracking, will be performed by Advanced Environmental Laboratories, Inc. (AEL), in Gainesville, Florida. AEL holds accreditation with the Florida Department of Health, Bureau of Laboratories, and the National Environmental Laboratory Accreditation Program (NELAP) in all project parameters. Appendix D includes a copy of the AEL general accreditation certificate and scope of accreditation certificate with individual parameters/methods.

If microbial source tracking analyses is performed for presence/absence determination of human fecal contamination, the analyses will be performed as a collaborative effort by BCS and Source Molecular Laboratories. A brief description of sample processing will include:

Table 3. Chemistry Laboratory Operations and Data Review Information and Criteria

Parameter	Number of Calibration Standards	Calibration Acceptance Criteria (%)	Calibration Blank Criteria	QC Check Sample Recovery Criteria (%)	Matrix Spike Recovery Criteria (%)	Laboratory and Field Duplicate Samples Acceptance Criteria (% RPD)	Practical Quantitation Limit (mg/L)	Method Detection Limit (mg/L)
Total Kjeldahl nitrogen	6 + blank	90 to 110	< MDL	90 to 110	90 to 110	10	0.10	0.08
Total phosphorus	9 + blank	80 to 120	< MDL	80 to 120	80 to 120	20	0.006	0.006
Nitrate + nitrite	9 + blank	90 to 110	< MDL	90 to 110	90 to 110	10	0.004	0.003

Note: RPD = relative percent difference.

MDL = method detection limit.

Typical matrix spike concentrations for total phosphorus range from 0.1 to 0.3 mg/L, 1 to 2 mg/L for TKN, and 0.4 to 1 for nitrate+nitrite

Sources: AEL, 2009.

ECT, 2009.

- Filtration of a 100-milliliter (mL) water sample.
- Placement of sample filter in enterococcus growth media to enriched enterococcus per EPA Method 1600.
- Extract deoxyribonucleic acid (DNA) from enriched enterococcus colonies using a Qiagen USA® extraction kit following manufacturer's protocol for source identification.

The complete sampling processing and analyses SOP is found in Appendix E.

General QA/QC procedures for source tracking include initial performance recovery (IPR), ongoing performance recovery (OPR), matrix spikes (MS), negative and positive control analysis, method blanks, and media sterility checks and are performed as necessary for quality control. IPR is performed before the method is used in analysis of samples. OPR analysis occurs after every 20 field and matrix spike samples or one per week that samples are analyzed. IPR and OPR analyses require preparation of a 100-milliliter (mL) sample of water and seeding it with approximately 20 colony-forming units (cfu) of ESP gene containing *Enterococcus faecium* (C68) and then processing the samples as outlined in the procedure. IPR is performed with four samples. The method performance is based on a positive PCR signal for all *Enterococcus faecium* (C68) seeded samples. Negative controls are run using sterile reagent water, non-ESP *Enterococcus faecium*, or autoclaved field samples. All negative control samples should result in a negative PCR signal. Analysis of positive and negative controls is conducted whenever new media or reagent is used. Method blanks are tested to see the sterility of equipment used, and a media sterility check is incubated at 36.5 degrees Celsius (°C) + 1.0°C for 24 + 2 hours and analyzed for growth.

2.5.1 MICROBIOLOGY QA/QC PROCEDURES

Microbiology QA/QC procedures for coliforms, enterococcus, and salmonella will include the following:

- Blanks—Pre-, post-, and mid- (after every 10 samples) sample analyses. The source of any positive results in a blank sample will be investigated to in-

clude reagent water, media, instruments, and general housekeeping adequacy.

- Duplicates—Duplicate analyses will be performed weekly, and the precision will be calculated.
- Positive and Negative Controls:
 - Coliforms—10 positive colonies plus atypical colonies incubated in lauryl tryptose broth/brilliant green lactose bile broth/escherichia coli (LTB/BGB/EC) medias.
 - Enterococcus—10 typical and atypical colonies verified on brain-heart infusion broth (BHIB) + 6.5 percent sodium chloride (NaCl), BHIB at 44.5°C, bile esculin azide (BEA) agar, biochemically with calalase and gram stain.
 - Salmonella—For positive controls, salmonella organisms are inoculated with urea reagent and incubated. The salmonella colonies should urease negative and remain orange in color. Negative controls are done with *S. aureus*. The *S. aureus* culture should urease positive and turn pink in color.

Additional QC measures will include temperature monitoring of incubators at the beginning and completion of an incubation period, chlorine residual check of all samples, and a monthly double-count check by a second analyst.

2.5.2 DATA ASSESSMENT AND ACCEPTANCE CRITERIA

Briefly, for DNA extraction and PCR reactions, a set of positive and negative controls are conducted in each run. System performance is acceptable if the PCR detection of the positive control *Enterococcus faecium* (C68) meets the acceptable criteria of presence (+) in the positive control reactions and absence (-) in the blank reaction (sterile water sample). If the results fall outside the required indicated, system performance is deemed questionable and the PCR run is thrown out. The problem is identified by evaluating each step of the analysis, media, reagents, and controls. Once the problem is identified and corrected, the PCR must be repeated, and the results of the controls must be acceptable.

Data assessment for chemical analyses will be based on results of method/equipment blanks, precision based on duplicate analyses, and accuracy based on matrix spike samples. Table 3 provides acceptance criteria for chemical analyses. If an analyte is detected in a blank at greater than the detection limit and 10 percent of a quantified project sample, a reanalysis will be required. The source of the blank contamination will be investigated to attempt resolution. If the detection persists, the data from that sample round will be deemed questionable and may be omitted from project data analyses. Data will be “J” flagged if used.

Data assessment for microbiological analyses will consist of an evaluation of the performance of blanks, positive and negative controls, and duplicates together with the sampling results. This evaluation will indicate how sample results data need to be qualified and what corrective actions are indicated. No fixed numerical acceptance criteria are used in this evaluation, and reanalysis of samples is not feasible due to the limited holding time of samples.

2.5.3 CORRECTIVE ACTIONS

The results of the positive and negative controls must be acceptable for the results to be valid. If the results for *Enterococcus faecium* (C68) and the negative PCR control meets the acceptable criteria, system performance is acceptable, and analysis is valid. If the performance is not acceptable, a laboratory director must be immediately informed, and the system performance must be evaluated and corrected. DNA extracted from all delivered samples is held at -20°C, and PCR will be rerun on all sample parts of a reaction that resulted in questionable control results. Should the overall system performance be deemed unacceptable even following the evaluation of all samples, the client whose samples are run during the time of “out-of-range” must be notified. An analysis must be repeated at the client’s request on fresh samples after the problem is identified and fixed. Problems are typically identified by evaluating each step of the analysis, media, reagents, and controls. Once the problem is identified and corrected, the PCR reactions are to be repeated, and the results must be acceptable.

For chemistry, calibrations using the multiple primary calibration standards must pass prior to running any samples. Additionally, a second source calibration check standard must be measured and must provide an acceptable result. Should calibration verifications fail, the run is stopped, the problem fixed, and any samples run since the last passing calibration verification are repeated. For matrix spike or duplicate failures (values outside acceptance criteria), the specific samples are reanalyzed. If the QC failures are confirmed and are due to matrix effects with the samples, appropriate data qualifiers are included with the results.

For microbiology, any blank failures or extremes in duplicate values are assessed for possible causes, and appropriate action is taken to correct the problem. These could be data such as too numerous to count, and subsequent samples would be run at a higher dilution; or contamination of a blank may indicate the need for some decontamination in the laboratory. All data would be qualified as appropriate with any notes included on unusual occurrences.

2.5.4 CONTINGENCIES FOR HANDLING UNACCEPTABLE DATA

The percent recovery is compared to the acceptable range. If the percent recovery meets the acceptable criteria, system performance is acceptable, and analysis is valid. If the percent recovery is outside the acceptable range for recoveries, a laboratory director must be immediately informed, and the system performance must be evaluated. Should the system performance be deemed unacceptable, the client whose samples are run during the time of “out-of-range” must be notified. An analysis must be repeated on fresh samples after the problem is identified and fixed. Problems are typically identified by evaluating each step of the analysis, media, reagents, and controls. Once the problem is identified and corrected, the IPR must be repeated and the results must be acceptable.

The laboratory reports will include all project sample results and ancillary data in the format specified by the NELAP accreditation. Additionally, all NELAP required in-house laboratory QA/QC sample results associated with the project sample batch will be part of the data report. These sample types will include method blanks, matrix spike, matrix

spike duplicates, and duplicates. The results from the QA/QC will be used to assess the validity of the project sample analytical data.

2.6 DATA REVIEW AND VALIDATION

2.6.1 *IN SITU* DATA

As reported, all *in situ* data measurements will be achieved with a YSI Model 556 multi-parameter system. The YSI will be calibrated at the start of each sampling day, followed by an initial calibration check to confirm instrument reliability. A postcalibration will be done after each survey.

The dissolved oxygen probe will be air calibrated with results compared to the oxygen solubility table FT 1500-1 in FDEP's SOP FT 1500. If dissolved oxygen calibration data do not meet the +/- 0.3-mg/L acceptance criteria specified on the form FD9000-8 calibration log, the probe will be serviced (e.g., dried or membrane replaced) to meet acceptable criteria.

Specific conductance calibration will be done with two potassium chloride standards expected to bracket the anticipated range of field measurements. For example, 100 and 700 microSiemens per centimeter. The Model 556 automatically compensates for standard solutions temperatures; therefore, data will not require manual temperature compensation. The acceptance criteria for this calibration will be +/- 5 percent of the calibration solution value.

pH calibration will be done using three buffers that will bracket the field measurements. The calibration verification acceptance criteria will be readings with +/- 0.2 standard units of the calibration solution values.

As part of the data verification process used before *in situ* data are transferred from field records to computer files, the initial calibration and continuing calibration results will be compared with the acceptance criteria. If calibration results failed to meet these criteria, the data will be flagged in the compiled data table for further consideration during final data analyses and reporting.

2.6.2 LABORATORY ANALYTICAL DATA

A combination of sampling equipment blanks (for monitor well sampling), field blanks, and duplicates will be used as part of the laboratory data verification process.

For the monitoring well pump sampling system equipment blank, reagent-grade water will be provided by the analytical laboratory and processed through the sample tubing to assess the potential of positive bias/analyte contribution to the project sample results. Well results will be deemed acceptable as long as any blank result concentrations are less than or equal to 10 percent of the project sample concentration.

As the sample containers will be used as the sampling apparatus for surface water samples, a field blank consisting of a sample set filled in the field with reagent-grade water and transported to the laboratory to assess the potential for sample contamination during transport and handling will be employed. Similar to the ground water sample equipment blank, project results associated with field blank samples will be considered valid if the blank concentration is less than 10 percent of any field sample result. Surface water duplicate samples will be collected to assess the precision of laboratory analyses. The relative percent difference will be calculated and compared to the laboratory's established relative percent difference criteria for each parameter as listed in Table 3 to ascertain acceptable analytical precision.

In addition to field-generated QA/QC sample results to establish data validity, the laboratory-generated quality control samples consisting of method blanks, laboratory control samples, matrix spikes, and duplicates will be reviewed in each laboratory report for data acceptability. Any laboratory QA/QC results that do not meet established acceptance criteria may result in reanalysis of the project sample batch associated with the QA/QC samples. QA/QC issues pertaining to field and/or laboratory data will be communicated by the ECT QA officer to the project manager. The decision on data use in the project report will be made by the project manager and based on the extent of the excursion outside acceptable criteria.

2.6.3 DATA TRANSCRIPTION AND VERIFICATION

ECT will transfer all validated data into a computer spreadsheet. All data qualifiers will be entered as part of this process into a separate column to show the qualifications of each data point in tables.

All validated *in situ* and laboratory data transcribed to computer spreadsheet will be peer-reviewed for possible transcription errors after each round of data entry to computer spreadsheets via comparison to laboratory records and field notes. Additionally, the full content of each project report will be in-house peer reviewed prior to distribution for agency review.

Any data reported with a “U” qualifier, for example, 5U, will not be represented (<) as less than 5 in the project report.

2.6.4 AUDITS

A planning audit as part of contract monitoring will be conducted by DOH between the second and fourth sampling event. The intent of the audit is to determine if the quality objectives are being met, which consist of laboratory report completeness, acceptability of results based on instrument calibrations, and analyses of blanks, duplicates, and matrix spike samples. Any deficiencies or areas for improvement will be documented and corrected/implemented. A summary report of the audit results will be forwarded to the FDEP contract manager.

An internal audit by the primary contractor’s QA officer will be performed within the first three sampling and analyses events to determine if proper preplanning/scheduling is being conducted to ensure the successful execution of the sampling event and adequate communications between the prime contractor and subcontractors are occurring.

2.6.5 USABILITY ASSESSMENT AND DATA QUALITY INDICATORS

The data analysis and presentation will rely heavily on graphs and charts to display the differences and/or similarities to ECT’s original report. All data that have numerical values associated with them will be considered usable for the initial phase of this analysis.

During this initial phase, ECT will assess data generally for the appearance of patterns that should be further investigated in more detail and eventually statistical analyses. Usability assessment for qualified data will generally consider applicable data quality indicators as discussed in FDEP's usability document (ftp://ftp.dep.state.fl.us/pub/labs/assessment/sopdoc/2008sops/usability_doc.pdf). In particular, both *in situ* and laboratory data quality indicators (DQI) will include comparison of the overall data set on individual sampling events to identify potential data outliers requiring additional verification effort. Data will also be compared with previous project sampling event data and any supplemental data for common parameters on other projects in the study area. The validation of *in situ* data will depend largely on the results of the *in situ* instrument calibration verification and postsurvey calibration checks.

DQI for laboratory analyses will include the results of a combination of QA/QC field and laboratory sample types, including:

- Laboratory control samples.
- Laboratory matrix spike and matrix duplicate samples.
- Laboratory method blank samples.
- Field blank samples.
- Equipment blank samples.
- Field duplicate samples.

The DQIs implemented will also include aspects of sample processing such as adequate preservation and adherence to sample holding time limits.

ECT will assess the usability of validated data for addressing the following issues:

- Comparisons between water quality at stations during the current project. Usable data will include all data that have no qualifiers associated with them. Additionally, if some stations or quality parameters include a few, up to approximately a quarter, samples with qualifiers indicating very high or low values, these data will be reviewed to assess if replacement of the qualified data with a fixed numerical value would be consistent with the distribu-

tion of data. This replacement would allow use in regressions, comparison of means and medians, and rank-order correlations and comparisons. Qualifiers indicating consistent biases during a sampling event could be used in assessing differences between stations comparisons.

- Comparison of historical data and data generated during the current project. Usable data will include all data that have no qualifiers associated with them. If there are differences in detection limits that influence any data points, a common reference detection limit, such as the highest limit, will be utilized in data analysis. Additionally, if some stations or quality parameters include a few, up to approximately a quarter, samples with qualifiers indicating very high or low values, these data will be reviewed to assess if replacement of the qualified data with a fixed numerical value would be consistent with the distribution of data. This replacement would allow use in regressions, comparison of means and medians, and rank order correlations and comparisons.

Based on this assessment of usability, ECT plans to use all usable data for additional statistical analysis.

The previous analyses were complicated by the effects of El Niño, making it difficult to compare the before and after data sets. Analyses to calculate the differences in means and confidence intervals will be completed to determine the statistical reliability of the data set comparisons. Correlations between various parameters such as nutrients versus coliforms or coliforms versus Salmonella will be completed, as practical. Determining statistically defensible correlations will be essential for inclusion in any journal article that might result. The statistical analyses will be completed by Dr. Robert Epting, ECT's biostatistician.

Appendices Available Upon Request