Input needed from RRAC

A. Possible system selection strategies: Awaiting RRAC's Approval

1. Random Sampling based on all systems that have sufficient information to be located (addresses)
   Pros: this will give an overview of systems in general,
   Cons: limits comparisons between attributes. By getting many samples from common systems and counties with many installations but few of less common systems, differences between management approaches between systems or counties will be hard to detect.
2. Stratified Sampling by Manufacturer (based on all systems that have sufficient information to be located (addresses) and have manufacturer information
   Pros: By getting a minimum sample size of all manufacturers that exceed a minimum number of installations (e.g. 20), it will be possible to compare treatment technologies
   Cons: manufacturer information is not available for all records, so this approach would have to be either supplemented by additional random sampling, or risk losing information on systems with the management attribute "no manufacturer recorded"
3. Stratified Sampling by type of permit (ATU, PBTS, innovative, commercial vs. residential)
   Pros: The permit stands as a proxy for the type of management. Overall the management level is similar, though, with the exception of old experimental systems (no OP and ME) and commercial systems (no ME)
   Cons: little difference between ATU and PBTS expected because code is similar (requirement of ME). Commercial vs residential may be more interesting
4. Stratified Sampling by County (e.g. counties with few, many systems, or same number of samples per county)
   Pros: can gather comparative information on counties, even those with few systems
   Con: some counties have very few systems, so stratification could result in lots of information on a random small county, not better than random sampling. Approach also assumes that number of systems (rather than e.g. fraction of systems that have current operating permit) is a predictor of management
5. Stratification by Maintenance entity: Contact the Maintenance Entity and have them Identify systems that are in need of annual inspection or that is in need of frequently visits.

Pros: The Maintenance Entities are familiar with the systems and location of each sampling point (effluent or influent tanks)
Cons: We might be limited to only properly functioning systems. Information on maintenance entities is very limited in database, would need to be supplemented by random sampling

6. Contact County Health department and have them assist in the selection process.
Pros: Like the ME they should be familiar with the systems and would be able to provide additional information on the system.
Cons: They may not have the man power to devote to this project.

7. Visit all 67 counties and collect 9 samples per county.
Pros: This would be a true random sampling but, we would not have a parameter to judge or compare systems.
Cons: This would result in a time management discrepancy instead of 30 weeks it would take 67 weeks to complete this sampling event.

8. Select sites base on geographic location.
Pros: A representative group of systems would be selected with the same temperature and soil profiles. This could be used for further comparison through out the state.
Cons: While this may provide insights into temperature, it would provide no clear information on management, except by whatever locations happened to be picked. This would have a significant economic, as well as, time management disadvantage.

Draft Quality Assurance Project Plan For Assessment of Water Quality Protection by Advanced Onsite Sewage Treatment and Disposal Systems (OSTDS): Performance, Management, Monitoring

DEP Agreement No. G0239

Draft 2
Dec 2, 2009

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FDOH Contract Manager

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FDOH Engineer

Table of Contents

1.0 Overview

1.1 Project Purpose

To evaluate the performance of advanced systems throughout the State of Florida and identify best management practices with regards to compliance.

1.2 Background information

Onsite Sewage Treatment and Disposal Systems (OSTDS) are one of the nutrient sources in nutrient impaired watersheds. Estimates of the extent of their contribution to nitrogen loadings for different watersheds in Florida have ranged between less than five and 20%. Conventional OSTDS (septic tank-drainfields) have limited capacity to reduce nitrogen concentrations in water discharged to the drainfields. Because of this, residential density limitations have been used as one approach to meet the nitrate drinking water standard of 10 mg/L, which is not necessarily protective of ecological health. The phosphorus loading from OSTDS has been of most concern in the Florida Keys, where small lots, poor soils, and building practices increase the risks of impacts on surface water.

To achieve higher reductions of nutrient concentrations, additional treatment steps in OSTDS are necessary. Advanced OSTDS can utilize various approaches to improve treatment before discharge to a drainfield, or the drainfield itself can be modified. On occasion, engineers have included the drainfield as part of the treatment process, usually as means to achieve fecal coliform removal. In such cases, the engineer is required to include shallow groundwater monitoring wells in the monitoring plan.

The emphasis of this study will be on assessing the effectiveness of pretreatment before discharge to the drainfield. There are two large permitting categories in Florida onsite regulations that qualify as advanced treatment: Aerobic Treatment Units (ATUs) (Florida Administrative Code 64E-6.012), which are generally permitted based on certification by the National Sanitation Foundation; and performance-based treatment systems (PBTS) (Florida Administrative Code 64E-6, part IV), which are permitted based on design by an engineer experienced in wastewater. A third permitting category, rarely used, consists of engineer-designed alternative systems, such as sand filters.

Advanced systems have been required by local regulations, at least in part, with the objective to reduce nitrogen loading to sensitive areas (Florida Keys, St. George Island, Aucilla and Suwannee River floodplains, and Volusia County). In addition, Florida Administrative Code (FAC) 64E-6 requires advanced treatment, sometimes including nitrogen and fecal coliform removal, for lots where the usually required setback or authorized lot flow restrictions cannot be met.

Advanced systems differ in three aspects from conventional treatment systems that consist of a septic tank with drainfield. The design of advanced systems is more variable than the prescriptive approach for conventional systems. They need more frequent checkups and maintenance, which has been the reason for requiring operating permits for them. The performance expectations are more specific than absence of sewage on the ground surface, while failure definitions for advanced systems are vaguer. The first two issues have been challenges for the permitting process. Site specific performance specifications are not captured completely in the three databases that are used statewide for tracking permits, two that were developed for conventional system permitting for the state, and one that was developed for inspection tracking by Carmody, Inc. The third issue has made it hard to determine how well this aspect of Florida's onsite program is working. Until early 2001, operating permit fees allowed County Health Departments to perform limited sampling. In 2001, the legislature decided to limit operating permit fees. Since then, there has been no systematic statewide assessment of the management and performance of these systems. The proposed project aims to perform such a statewide assessment and develop improvements in the management of advanced systems where indicated.

1.3 Sampling locations

The project is to be performed statewide. The specific sampling locations will be selected based upon one or more of the following criteria: system type, system age, geographic location, random sampling, and density of advanced systems. The systems will be selected based on the Task 2 project database. If manufacturer information and system type are available initially for at least half of the systems, the sampling will be stratified to assure proportional representation of manufacturers and system types. The final subgroup categories and sizes will be determined with input from the DOH Research Review and Advisory Committee (RRAC) and consideration of the results of Task 1.

Due to the wide range of sampling locations associated with this project, it is anticipated that several NELAP certified laboratories will be utilized. NELAP-certified laboratory services will be provided by DOH-labs, procured in a set of purchase orders with local labs, or by contract with regional labs.

1.4 Overview of project sampling plan

During phase 4 an estimated total of 600 systems will be tested for three of the five analytes (TSS,TN and CBOD) The samples will be collected from the effluent ports. Then 300 systems out of the 600 systems will be sampled from the effluent tank and tested for two of the five analytes (Fecal coliform and TP).

In additionally to the 600 systems selected 100 systems will be sampled from the influent tank and tested for all five analytes (TSS, TP, TN, CBOD and fecal Coliform)..

Upon completion of phase 4, a quarter sampling event (phase 5) requires the continuation of sampling for 70 systems; of which 35 systems shall be tested for TSS, TN, CBOD and remaining 35 systems shall be tested for TP and Fecal coliform.

The use of a single Laboratory or several different laboratories will be determined after input from the RRAC committee. To ensure holding requirement of 6 hours for the fecal coliform samples some local labs should be considered.

1.5 Project objectives

The objectives of the overall project are to quantify the reduced loading of contaminants from advanced Onsite Sewage Treatment and Disposal Systems (OSTDS) to the environment; assess the operational status of systems under the current management framework; survey perceptions of user groups regarding the management of such systems; validate elements of a monitoring protocol for consistent assessment of systems; document good management practices.

This Quality Assurance Project Plan (QAPP) lays out the methodologies, procedures and other requirements necessary for collecting data adequate to support the goals of the project. Subsequently, the water quality data gathered through the sampling will be used to assess the overall performance of these systems. The data will be used to recommend best management plans which will help ensure that advanced systems are performing as designed.

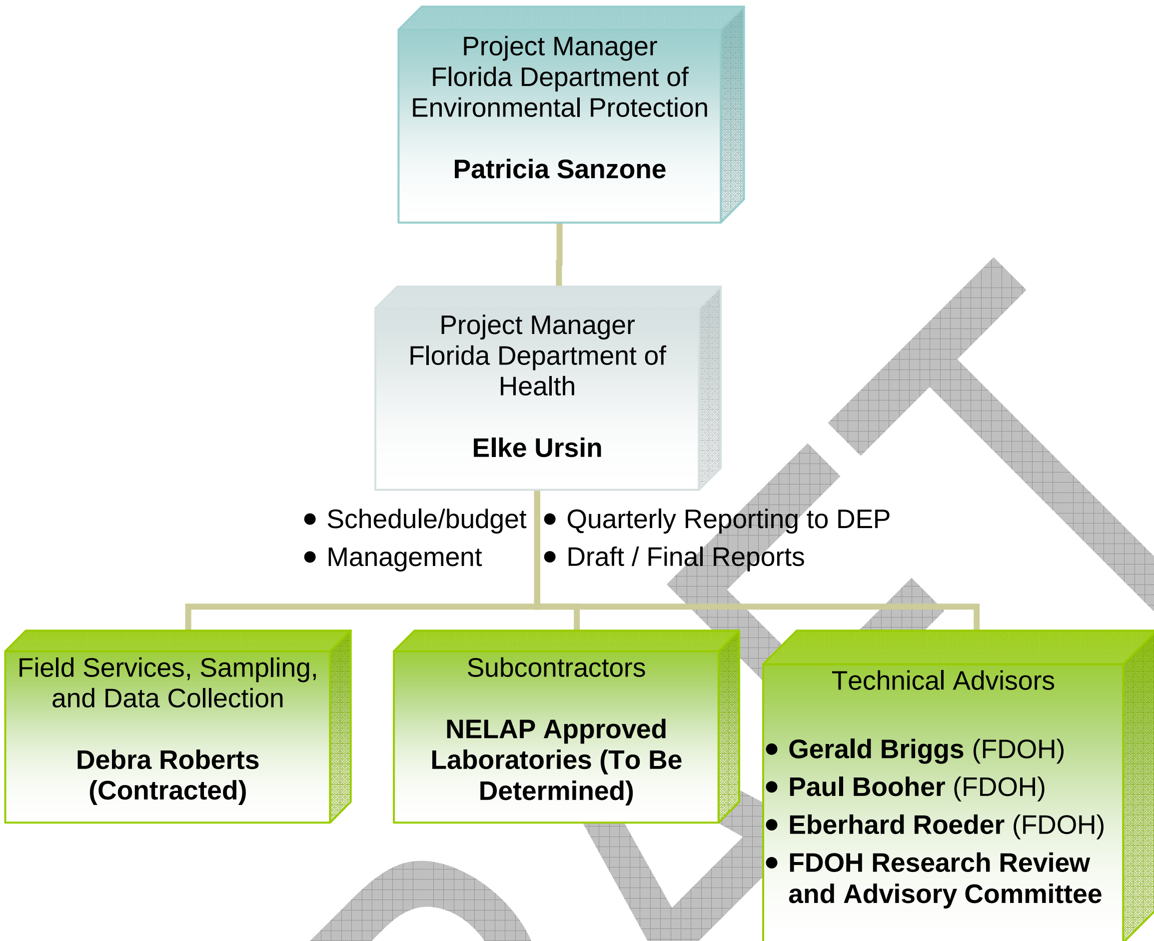
1.6 Definitions:

A. **Advanced system:** Includes aerobic treatment units (ATUs), performance-based treatment systems (PBTS), innovative systems, and sand or gravel filters.
B. **Carbonaceous Biochemical oxygen demand (CBOD5)**: The concentration of oxygen (expressed as mg/l) utilized by microorganisms in the oxidation of organic matter during a five day period at a temperature of 20 Degrees Celsius or 68 degrees Fahrenheit.
C. **Data quality indicators:** Quantitative and qualitative measures of principal quality attributes, including precision, accuracy, representative-ness, comparability, completeness, and sensitivity employed as a means of specifying criteria which, if achieved, will provide an indication that the resulting data are expected to meet the data quality objectives of the standard.

D. **Manufacturer:** The entity that develops, designs, and produces residential or commercial wastewater treatment systems.
E. **NELAP:** National Environmental Laboratory Accreditation Program
F. **Quality Assurance Project Plan (QAPP):** a written document that describes the implementation of quality assurance and quality control (QA/QC) activities during the life of the project.
G. **RRAC:** Research Review and Advisory Committee, Department of Health committee formed under F.S. 381.0065(4)(o).
H. **Total nitrogen:** The sum of the total Kjeldahl nitrogen (TKN), Nitrite (NO2), and Nitrate (NO3) in a sample, expressed as mg/L as N.
I. **Total suspended solids:** The quantity of solids (expressed as mg/L) readily removed from a well mixed sample with standard laboratory filtering procedures.
J. **Total Phosphorus:** are essential nutrient for plant growth.
K. **Fecal Coliform**: are bacteria mainly associated with the colon of animals (including humans) and which are excreted in feces.

2.0 Project Organization and Management:

2.1 Organization Chart of Key Personnel



2.2 Training Requirements and Certification

In accordance to the grant agreement individual performing sampling should obtain an OSTDS certification. An accelerated Training class will begin on December 7 thru December 11 of 2009. . Debra Roberts is enrolled and plans to obtain this certification.

The Department of Health licensed professional engineer, certified environmental health professionals, the Research Review and Advisory Committee, and other interested parties will be conducting draft and final report review.

Debra received her Bachelor of Science in 2001 from Florida A&M University major in Biology and minor in Chemistry. In addition she has worked as a QA Chemistry and Environmental Lab technician for General Dynamics, Chemist for Total Home Care Solutions and Quality Assurance Supervisor for Talecris Plasma Resources. The culmination of aforementationed employers has exposed her to an extensive knowledge of standard operating procedures with respects to handling samples, collection, preservation, transport and storage, documentation, chain of custody record completion, and communication with event coordinators and laboratory staff.

The selected laboratory will be NELAP certified according to EPA standards methods. Equipment probe numerical values will be obtained in accordance with manufacturers instructions.

3.0 Experimental Approach

3.1 General approach and testing conditions

The samples shall be collected and analyzed by a NELAP certified laboratory.

3.2 Experimental Design And Sampling Strategy

This experiment is designed to measure the overall performance of advanced systems. The sampling parameters include system type, system age, geographic location, random sampling, and density of advanced systems.

3.3 Sampling / Monitoring Points

A total of 600 sites will be selected for the sampling of effluent ports. Each site will be tested for TSS, TN and CBOD which will result in 1800 analytes tested from the effluent tanks. In addition to the 1800 analytes tested 600 will be collected from the effluent tank and tested for fecal coliform and TP. This will result in a net total of 2400 analytes tested from the effluent tanks.

While at the aforementioned sampling sites 100 will be selected for sample collection and tested for TSS, TN, TP, CBOD and Fecal coliform. This will result in a net total of 500 analytes tested from the influent tanks.

Additionally, 35 systems will be selected and tested on a quarterly basis for TSS, TN, CBOD and 35 systems will be tested for TP and Fecal coliform. This will result in the net total of 1400 analytes tested per year.

Field duplicates of both influent and effluent samples will be collected one duplicate for every twentieth samples.

An alternative 100 systems will be selected as a precautionary measure in the event that the original system does not produce an adequate amount of sample.

Depended on the laboratory selection an audit will be perform prior to sampling and then quarterly thereafter.

3.4 Frequency Of Sampling

The initial sampling timeline requires that 600 systems are sampled within the project period. An estimated amount between 5 to 10 systems will be sampled daily. Subsequently, a select number of 70 systems will be sampled on a quarterly basis thereafter.

3.5 Measurement and parameters of interest

Obtaining access to property will serve as a limiting factor, however if a relationship with the associated system maintenance entity is developed this might aid in the process of gathering a larger number of samples. The basic project design is to sample a total of 700 ports which would serve as a representative population

4.0 Sample and audit plans

A total of 600 systems shall be selected for the sampling of effluent ports. Each system will be tested for TSS, TN and CBOD5 which will result in 1800 analytes tested from the effluent tanks. In addition to the 1800 analytes tested 600 will be collected from the effluent tank and tested for fecal coliform and TP. This will result in a net total of 2400 analytes tested from the effluent tanks.

While at the aforementioned sampling sites, 100 influent tanks will be selected for sample collection and tested for TSS, TN, TP, CBOD5, fecal coliform. This will result in a net total of 500 analytes tested from the influent tanks.

Depended on the laboratory selection an audit will be perform prior to sampling and then quarterly thereafter. If the laboratories are within driving range an initial audit of the facility will be conducted prior to first sample submission.

4.1 Significance of measuring analytes

4.1.1 Rationales for analytes to assess performance and operational status

The performance and operational status of a treatment system will be characterized by effluent concentration of several analytes. These will be indicators of a) how complete aerobic stabilization is; b) what the nutrient concentrations leaving the system are; c) the extent of treatment of a pathogen indicator; d) operational variables that are expected to be related to system functioning

A. CBOD5 test measures the oxygen utilized to oxidize organic material, inorganic material, and reduce forms of nitrogen in the sample. A change in levels away from acceptable ranges may interfere with aerobic processes, as well as, the decomposition of organic matter generates cell growth.

B. Total suspended Solids (TSS) measures the non filterable materials contained in the wastewater sample. The solids contained in a wastewater sample will accumulate over time thereby reducing the clear layer. If the clear layer is reduced, it causes the solids and liquid retention time to decreases. This will lead to an increase in the organic and solid matter leaving the tank.

C. Total Nitrogen measures dissolved inorganic nitrogen such as nitrites, nitrates and ammonia, as well as organic nitrogen. Excessive nitrogen in wastewater effluent can lead to eutrophication of receiving waters. Within wastewater treatment systems, nitrogen exists in a variety of forms; following nitrogen species through the wastewater treatment system can help to identify biological transformations. Different types of biological transformations occur under aerobic and anoxic conditions:

<u>Aerobic conditions</u>:

***1. Hydrolysis*: Conversion of organic nitrogen into soluble ammonium**

***2. Nitrification*: Conversion of ammonium to nitrite and nitrate**

***3. Nitrogen assimilation*: Incorporation of nitrogen into biomass - cells are composed of approximately 12.4% nitrogen**

<u>Anoxic conditions:</u>

The main transformation is denitrification, where nitrite and nitrate are reduced to nitrogen gas, which evolves to the atmosphere.

Denitrification and nitrogen assimilation are the only ways to remove nitrogen from the system. All other processes are only transforming nitrogen from one dissolved species to another.

D. Total Phosphorus is a key nutrient for living organisms, and a key component of cell macromolecules such as RNA, phospholipids (cell membranes), and ATP. In aqueous solution, phosphorus is typically found as orthophosphate, polyphosphate, and organic phosphate.

1. Orthophosphates: (H_3PO_4) are readily available as nutrients.

2. Polyphosphates: which are chains of phosphorus-based molecules, must be converted to orthophosphates via hydrolysis prior to utilization as a nutrient.

3. Organic phosphates: must be converted to orthophosphate to be available as a nutrient. Cells are composed of approximately 2.5% phosphorus.

E. Fecal coliform are a good indicator of contamination from human or other animal waste products and they indicate greater risk of exposure to pathogenic organisms. Each person discharges from 100 to 400 billion fecal coliform organisms per day.

Total alkalinity is a measure of how much acid it can neutralize.

Alkalinity is significant in the treatment of wastewater, because it will influence treatment processes such as anaerobic digestion

Chlorine (only for systems with chlorination) is used as a disinfectant because it destroys targeted organisms by oxidizing cellular materials

4.2 Preparations prior to sampling

4.2.1 Permit file review and coordination

Prior to sampling, the sampler will coordinate with the county health department for the respective systems. This will include review of the permitting files.
The following forms will be collected and maintained in a separate file: Engineer Schematics, Original permit, original soil evaluation, site plans, As built, latest Operating permit, latest ME inspection and latest CHD inspection.

The selected onsite systems will be tentatively sampled on Monday thru Thursday according to the following plan. Preparation for the following week sampling event shall occur on Friday.

A two hour window in between sites will allow for breakdown, transport and setup at the next location. This will vary based on the location of sample sites selected.

This will result in a yield of 5 systems sampled daily for approximately 30 weeks depending upon the weather and access to systems.

Fridays will designated to contacting system owners, ME and CHD to finalize the sampling time and date. Also this would be an opportunity to answer any questions that might arise.

The maintenance entity can assist identifying the component tanks and uncovering obstructed tanks.
The maintenance entity if possible could coordinate their inspection with the sampling events. While in the various counties, the local county health department shall be notified and can coordinate annually inspections accordingly. This would provide insight of their inspection process and best management practices.

4.3 Equipment preparations prior to sampling

4.3.1 Packing list

There are several tools and equipments required to complete a sampling event. An automatic sampler with sample container, crowbar, 500ml beaker, tubing, battery, coolers, Taylor test kit, 0.5 and 1.0 disposable pipette caps, 50 ml graduated cylinder , NIST-traceable thermometer, small table, YSI and sample bottles.

The supplies needed are as followed: powder free latex gloves, hand sanitizer, eye protection, plastic bags, garbage bags, liquinox detergent, hand lotion and ice.

Disposable powder free gloves are mandatory for sample collection to protect personnel who collect the samples and to assure the integrity of the samples. Disposable gloves will be changed and discarded at each sampling location.
Expose the sample points by removing any obstructions.

4.3.2 Equipment cleaning

When automatic sampler is deployed for extended time periods, clean the sampler using the following procedures when routine maintenance is performed. Inspect deployed samplers prior to each use. At a minimum, change the tubing if it has become discolored or has lost elasticity.

Clean the automatic sampler after each sampling event as followed: Wash the exterior and accessible interior portions of the automatic samplers (excluding the waterproof timing mechanisms) with laboratory detergent and rinse with de-ionized water. Next, clean the face of the timing case mechanisms with a clean, damp cloth. Then, check all tubing (sample intake and pump tubing). Change the tubing every six months or if it has become discolored (i.e., affected by mold and algae) or if it has lost its elasticity.

Disposable powder free gloves shall be mandatory for sample collection to protect personnel who collect the sample and to ensure the integrity of the samples. Disposable gloves will be changed and discarded at each sampling location.

4.4 Calibration of YSI devices

The YSI will be calibrated daily prior to sampling event. Then a verification calibration will be completed daily after the final sample collection.

Ph calibration will be completed by use of three buffers solutions. Prior to use and after opening buffer solution the date open will be annotated on the container. The expiration date of the buffers should not exceed one year after open date.

An air calibration will be completed on the dissolved oxygen probe and compared to the oxygen solubility table FT 1500-1 in FDEP's SOP FT 1500.

The temperature sensor will check against an NIST-traceable thermometer on bi-weekly intervals.

Table 1. Field Parameter

Parameter	Acceptable criteria	Units
Temperature	+/- 0.2	Celsius
Conductivity	+/- 5 % of solution value	mS/cm
Dissolved Oxygen (DO)	+/- 0.3 mg/L	DO%
Power of hydrogen (pH)	+/- 0.2	pH

If acceptable calibration standards are not meet a second attempt will be made to calibrate the YSI 556 instrument. After the second attempt to calibrate device proves to be unsuccessful a complete diagnosis by field personnel per manufacture instruction will be completed to ensure accuracy. A probe's reading will be qualified if calibrations are not within acceptable ranges.

4.5 Field testing equipment and calibration

In general electronic instruments for pH, DO and Turbidity are used to measure the properties of water or wastewater. As such, they are indirect methods of measurement, and must be calibrated. To calibrate probes/instruments, it is extremely important that the technology manufacturers SOP are carefully followed and documented. The operator, by complying with instructions will ensure that the equipment is operating as designed by the supplier and there is quality control of field data. Accurate field data is necessary in order to meet sampling protocol requirements Non-compliance with calibration and testing instruction will result in a lack of calibration and inaccurate measurements which will mask both treatment and effluent water quality problems and by violating sampling protocols will invalidate all data collected.

4.5.1 Temperature

The temperature will be measured using pH and dissolved oxygen meter, or thermometer.

4.5.2 PH

Measures the "acidity" of the water, measured using a pH meter.
This meter is used to measure the acidity of the water by comparing readings from a reference electrode and a sample electrode. To determine pH the output of these electrodes must be temperature-compensated, most pH meters also measure temperature.

4.5.3 DO

The DO meter will measure dissolved oxygen, electrical conductivity, and salinity. DO is measured by the rate of consumption of oxygen at the tip of the probe, so it requires continual movement of water past the tip (an up-and-down motion seems to work best, keep the probe tip submerged). Stable readings are not possible while the temperature of the sample is changing.

4.6 Sample labeling

Sample container from the Laboratory are marked: influent grab CBOD5, influent grab TSS, influent grab TN, Influent grab TP, influent grab fecal coliform, effluent grab CBOD5 effluent grab TSS, effluent grab TN, effluent grab TP, effluent grab fecal coliform. The nomenclature of the sample will be.

The County coded+ unique Id from database will be annotated on the appropriate sample bottles label. If the sample collected is a blank the same county coded, unique Id and word blanks or equipment blanks will be used to identify the systems.
To ensure accuracy of the sample, label bottles with just prior to field uses.

Example of sample name:

01- Unique Id
01-Unique Id “blank”

Table 3. County and associated codes

County	Code	County	Code	County	Code	County	Code
Alachua	**01**	**Flagler**	**18**	**Lake**	35	**Pinellas**	**52**
Baker	**02**	**Franklin**	**19**	**Lee**	36	**Polk**	**53**
Bay	**03**	**Gadsden**	**20**	**Leon**	37	**Putnam**	**54**
Bradford	**04**	**Gilchrist**	**21**	**Levy**	38	**Santa Rosa**	**55**
Brevard	**05**	**Glades**	**22**	**Liberty**	39	**Sarasota**	**56**
Broward	**06**	**Gulf**	**23**	**Madison**	40	**Seminole**	**57**
Calhoun	**07**	**Hamilton**	**24**	**Manatee**	41	**St. Johns**	**58**
Charlotte	**08**	**Hardee**	**25**	**Marion**	42	**St. Lucie**	**59**
Citrus	**09**	**Hendry**	**26**	**Martin**	43	**Sumter**	**60**
Clay	**10**	**Hernando**	**27**	**Monroe**	44	**Suwannee**	**61**
Collier	**11**	**Highlands**	**28**	**Nassau**	45	**Taylor**	**62**
Columbia	**12**	**Hillsborough**	**29**	**Okaloosa**	46	**Union**	**63**
Dade	**13**	**Holmes**	**30**	**Okeechobee**	47	**Volusia**	**64**
Desoto	**14**	**Indian Rivers**	**31**	**Orange**	48	**Wakulla**	**65**
Dixie	**15**	**Jackson**	**32**	**Osceola**	49	**Walton**	**66**
Duval	**16**	**Jefferson**	**33**	**Palm Beach**	50	**Washington**	**67**
Escambia	**17**	**Lafayette**	**34**	**Pasco**	51		

4.7 Notification

4.7.1 Initial system observation

One day prior to the field sampling, a telephone call will be made to the homeowner. At this time if there are any questions, comments or concern the homeowner will have an opportunity to ask prior to staff arrival. During this phase the homeowner should be informed that there will be no retaliatory action or disruption to property upon arrival.

Upon arrival to the site location, knock on the door so that the homeowner is aware of your presents. Evaluate the property for dangers that may impede your ability to collect samples.

4.7.2 Sampler setup

Prepare the site by removing the sampling equipment. Ensure that the effluent and influent tanks are easily differentiated by using the schematics provided by the local County Health Department. Place an automatic sampler near the effluent sampling point and a different automatic sampler near the influent sampling point when applicable. Ensure that all wires and tubing connections are properly connected and the battery is fully charged.

4.7.3 Preparing the site for sampling

4.7.3.1 Turbidity

The clarity of the water, measured using a portable turbid meter.
The turbid meter measures the light transmittance of a sample in NTU's (Nephelometric Turbidity Units, a standard measure). It needs no field calibration. Handle the sample vials only by their ends (preferably the lid) so as not to affect the transmittance; wipe any fingerprints, spots, etc. from the outside of the vial; and be sure to close the vial compartment lid when taking a measurement.

4.7.3.2 Collecting samples with auto-samplers

The sampler should be placed in an upright (it will not work if placed on its back or side. Open the sampler and remove the battery charge from the unit.
To secure the sample jug, screw the jug cap/float, place jug into the sampler enclosure, insert end of the peristaltic pump hose into the hole in jug cap and plug the float switch lead into the control panel. (Located under control panel enclosure).

If possible, secure the auto-sampler to a fixed point, such as a tree or fence post to prevent theft. The sampling unit is water resistant, not water proof. Avoid submerging the unit.
Insert the hose into the sample port and submerge the strainer under water but avoid the water surface or tank bottom. The samples should be collected at depth between 40% and 60% of the total depth where the turbulence is maximized.
Set the collection volume to appropriate volume and start collection process. Note: If the unit does not start the sample cycle press the pump test button to initiate a sample.
Label bottles with time and date of sample collection and note time on the chain of custody form.
The global Water WS700 wastewater sampler will function only if the battery plug is securely fastened into the battery socket on the control panel and the floater sensor plug is inserted into its socket.
Cap and invert the sample collecting jug 5 times to obtain a homogenous mixture then pour to contents into the respective sample bottle.

The remaining wastewater shall be used to determine visual/olfactory and Taylor chlorination test for chlorinated systems only.

Example of Automatic Sampler:
Composite and Discrete Samplers.

FEATURES:
Ideal for wastewater, industrial and environmental sampling
CE Certified
Does composite, or discrete sampling
Simple to operate – no programming required
Output provided for use with optional data logger
Lightweight and easy to carry
Rugged construction for harsh environments
Meets federal, state and local wastewater regulations
Timed and external flow pulsed samples
Adjustable and repeatable sample volume
Peristaltic pump prevents sample contamination
Automatic back flush clears pickup strainer and hose
Rechargeable battery or AC powered
Refrigerated/cooler options available
The easiest and most reliable method for collecting water quality samples

4.8 Duplicates, fields and equipment blanks

Field duplicates of both influent and effluent samples shall be collected at a frequency of one duplicate after the twentieth samples.

Field blanks will be collected with the use of tap water and equipment blanks with distilled water after the twentieth sample collection.

Additionally, the laboratory will provide a sample bottle designated QC lab bottles. The chain of custody form will be annotated whether the field blank was tap water or distilled water.

4.8.1 Duplicates

A duplicate sample will be collected and tested for all five analytes after every twentieth sample collection.
4.8.1.1 Collect enough wastewater to fill 2 sets of sample bottles.
4.8.1.2 Fill the sample bottles
4.8.1.3 Label the bottles with time of sample collection and annotate “Duplicate” on appropriate sample bottles.

4.8.2 Field blanks

The field blank will be obtained by pouring clean water taken from distilled water container. The frequencies of field blank collection will occur after every twenty samples. If an analyte is detected in a blank at greater than the detection limit and/or 10 percent of a quantified project sample, a reanalysis will be required.

4.8.3 Equipment blanks

The equipment blanks will be collected by pouring distilled water into a 500 ml beaker. Then the autosampler hose will be inserted into the 500 ml beaker and cycle through the equipment. A sample collecting bottle will be placed in the autosampler to collect the equipment blank.

4.9 Field assessments and testing

4.9.1 Visual/Olfactory protocols

It is important that the sample collector conduct a visual examination of the wastewater. In most cases this visual examination will immediately provide the sample collector with an understanding of the status of treatment. The sample collector's field inspection should include an evaluation of the color of the wastewater in the treatment unit, odors from the unit and finally the solid content of the effluent. The following are the items that need inspections:

1. Wastewater Color: no color __ brown___ clear___ turbid ____ other________________
2. Wastewater Odor: musty____ earthy ____ moldy ___offensive____
3. Effluent Solids: no___ some___ turbid_____

This information shall be recorded on the chain of custody form.

4.9.2 Alkalinity (use Taylor test kit)

1. Rinse and fill large comparator tube to 25 ml make with water to be tested.
2. Add 2 drops R-0007. Swirl to mix
3. Add 5 drops R-0008. Swirl to mix. Sample should turn green
4. Add R-0009 dropwise. After each drop, count and swirl to mix until color changes from green to red.
5. Multiple drops in step 4 by 10.Then, record as part per million (ppm) total alkalinity as calcium carbonate.

* When high TA is anticipated, this procedure may be used: Use 10ml sample, 1 drops R-0007, 3 drops R-0008 and multiply drops in step 4 by 25.

4.9.3 Chlorine test (Use Taylor test kit) (only for systems including chlorination)

1. Rinse and fill large comparator to desired mark with water to be tested.
Note: for 1 drop=0.2ppm, use 25 mls sample. For 1 drop=0.5ppm, use 10 mls sample.
2. Add 2 dipper R-0870. Swirl until dissolved. Sample will turn pink if chlorine is present.
Note: If pink color disappears, add R-0870 until color turns pink.
3. Add R-0871 dropwise, swirling and counting after each drop, until color change from pink to colorless.
4. Multiply drops in step 3 by drop equivalence (Step1). Record as part per million free chlorine (FC).
5. Add 5 drops R-0003. Swirl to mix. Sample will turn pink if combined chlorine is present.
6. Add R-0871 dropwise, swirling and counting after each drop, until color change from pink to colorless.
7. Multiply drops in step 6 by drop equivalent (Step 1). Record as ppm combined chlorine (CC).

4.9.4 Ph Test (if pH meter is not calibrated and occasional to check consistency)

1. Rinse and fill large comparator tube to 44mls mark with water to be tested.
2. Add 5 drops R-0004. Cap and invert to mix.
3. Match color with color standard. Then, record as pH units and save sample if pH needs adjustment. If sample color is between two values, pH is average of the two. To lower pH: go to acid demand test. To raise pH: Go to base demand test.

Acid Demand Test:
Use treated sample from pH test.
Add R-0005 dropwise. After each drop, count, mix and compare with pH color standards unit desired pH is matched. See treatment table to continue.
Base Demand Test:
Use treated sample form pH test.
Add R-0006 dropwise. After each drop, count, mix and compare with color standard until desired pH is matched. See treatment tables to continue.

5.0 Data management

5.1 Chain of Custody Forms

The appropriate chain of custody form shall be used for all sample collections. Samplers shall sign when the cooler is relinquished to the shipper. The laboratory attendant shall sign when the cooler is delivered by the shipping agent. The Chain of Custody Form insures accountability for sample integrity. Copies of the chain of custody forms shall be retained during the period of sampling and analysis.

The approved laboratory shall provide a chain of custody form which includes the name of analytes, time of sample collection, time of receipt at lab, laboratory address, sample type, temperature upon arrival to the lab ect…

5.2 Laboratory methods

This grant agreement requires that the selected laboratory is NELAP certified. To verify that selected laboratory meets these requirements a current certification number will be obtained from each lab and documented on appropriate chain of custody.

The laboratory methodology numbers will be determined by selected lab and identified on the chain of custody form.

Depending on laboratory analyses results an alkalinity sample may be collected and tested. If an analyte is detected at greater than the detection limit and/or 10 percent of a quantified project sample, a reanalysis will be required.

This will not be a routine test and will be subjected to approval from DEP and the RRAC committee.

5.2.1 Transport *samples to the Laboratory*

Prior to collecting sample ice will be purchased and periodically throughout the day to ensure adequate cooling temperature is maintained.

The influent and effluent grab sample shall be sent to be analyzed for the following analytes: CBOD5, TSS, TN, TP, and Fecal Coliform.

If contract lab is within 30-50 miles, all samples will be transported to there. If a lab for fecal coliform is readily accessible (e.g. within 20 miles), fecal coliform samples will be transported to there to ensure holding time requirement of 6 hours for the fecal coliform. Other samples will be shipped to the contract lab.

The laboratories will provide a cooler kit which includes the following: sample bottles with affixed labels, approved additives, chain of custody and appropriate ice cooler.

Additionally, the affixed label from the lab should include the following annotation:
Influent/ effluent
Grab sample
Duplicate
Field blank
Sampling date and time

Table 2. Laboratory Parameters

Parameter	Method	Method Detection Limit	Laboratory	Holding time	Preservative
CBOD5	SM 5210B	2.0 mg/L	Various	48 hours	none
TSS	EPA 160.2	2.0 mg/L	Various	7 days	none
TN	Calculated	1.0 mg/L	Various	28 days	H_2SO_4
TP	EPA 365.4	0.15 mg/L	Various	28 days	H_2SO_4
Fecal Coliform	SM 9222D	10CFU/100mL	Various	6 hours	$Na_2S_2O_3$

5.2.2 Laboratory Submissions

The influent and effluent grab sample shall be sent to be analyzed for CBOD5, TSS, TN, TP, and Fecal Coliform. Additional samples of alkalinity shall be submitted to the laboratory for analyses base on the discretions of the RRAC committee. The chain of custody forms will be annotated with the machines serial number.

6.0 Data Quality Objectives and Criteria for Measurement Data

Data Quality Objectives (DQOs) are the quantitative and qualitative terms used to describe how well the data need to be in order to meet the project's objectives. DQOs for measurement data (also known as data quality indicators) are precision, accuracy, representativeness, completeness and comparability. The overall QA objective for analytical data is to ensure that data of known and acceptable quality are provided. These are necessary attributes to ensure that analytical data are reliable, scientifically sound and defensible.

6.1 Precision

Analytical precision is a measurement of how far an individual measurement may deviate from a mean of replicate measurements. Precision is evaluated from analysis of field and laboratory duplicates and spiked duplicates. The standard deviation (SD), relative standard deviation (RSD), and/or relative percent difference (RPD) recorded from sample analyses are methods used to quantify precision. RPD should be <20% or better. RPD is calculated by the following formula:

$$RPD= [(C1-C2])/ (C1+C2)/ 2] \times 100\%$$

Where: C1= concentration of compound or element in the sample
C2= concentration of compound or element in the duplicate

Field duplicates of both influent and effluent samples will be collected one duplicate for every ten samples. The laboratory will run duplicate samples as part of the laboratory QA program.

6.2 Accuracy

Accuracy is the degree of agreement of measured value with the true or expected value of the quantity of concern. To ensure field accuracy instruments will be calibrated in accordance to manufacture suggestion, chemical used will be checked for expiration date, completion of chain of custody.

During the verification test, the laboratory will run matrix spike samples at a frequency of one spiked sample from every 10 samples analyzed. The laboratory will run an analysis on the laboratory control prior to testing samples.

6.3 Comparability

Comparability is a qualitative term that expresses the measure of confidence that one data set can be compared to another and can be combined for the decisions to be made. Comparability shall be ensured by using standard sample collection, preparation and handling procedures. EPA-approved analytical methods and holding time, and by following QA/QC protocols. The data will be compared to determine the degree of differences in data being collected at these selected sites.

6.4 Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic population, parameter at a sampling point, a process condition, or an environmental condition. The sampling location for the samples will be designed for easy access to help ensure that a representative sample of flow is obtained in each grab sample bottle. The laboratory will follow the set procedures in accordance to the good laboratory practices for homogenous mixing of grab container contents prior to sub-sampling in order to ensure a homogenous mix.

and observation of the sample collection and review of operating logs maintained at the site

6.5 Completeness

Completeness is the percentage of valid results obtained compared to the total number of samples taken for a parameter. Completeness will be measured by tracking the number of valid data results against the specific requirements in the test plan. The anticipated number for valid result from analyses should be equal to or better than 85%.

7.0 DATA MANAGEMENT

7.1 Documentation and Records

Required documentation will include:
Registration of sample site in *approved* Access database
Chain of custody records for sample
Lab analysis report as filed by contracted laboratory manager

Copies of chain of custody records, laboratory reports, and other documentation will be submitted to the FDOH project manager for archiving. Upon completion of the review, a final report, including lab reports and chain of custody records will be archived at 4052 Bald Cypress Way Bin# A-08, Tallahassee, FL 32399 and submitted to the FDEP project manager.

7.2 Data Entry into MS-Access Database

A newly created statewide MS-Access database was created for this project. This database will be maintained on a server accessible to the Bureau of Onsite Sewage Programs. The database will be made available to the FDEP project manager at the end of the project, or as requested.

Information needed for data entry will be gathered from the laboratory results and field notes. Data entry for each sample event will be doubled checked by the project Technical Advisors or their assignees for accuracy and comparison. Any changes done during the quality check will be noted in the database.

Additionally, notes will be taken for each location and documented in a field notebook titled “319 Project”. A schematic of actual system installation will be drawn and a copy will be placed in the folder created for each system sampled. If unusual events are noted at a location they will be documented in the comment section of the database.

8.0 Testing and Measurement Protocols

8.1 Data Review

All data collected by this project is subject to review. This will allow for individuals or groups to determine if the data meet the Quality Assurance Project Plan (QAPP) objectives.

8.2 Data Integrity

Sampling chain of custody sheet must be filled at the time prior to delivery to the lab. Upon receipt, the lab will document the arrival time. This will ensure compliance with holding time requirements.

8.3 Data Entry

Data is then entered into the database described in section 5.2 which is designed to flag any values which fall outside of the expected range for each parameter.

9.0 Assessment/Oversight

9.1 Schedule of Audits

The Research Review and Advisory Committee will review this QAPP and overall project design and may suggest procedural refinements or additional testing procedures. Any such change will be subjected to approval by the FDEP Project Manager and FDOH Project Manager. At least one lab audit will be performed during the testing by the FDOH representative.

9.2 Corrective Action

After initial review by the FDOH and the RRAC, a preliminary draft report will be provided to FDEP Project Manager. Any corrections to sampling locations, sample results, or collection information will be made to update the report. The corrected report shall be submitted to the RRAC and posted on the FDOH website.

Electronic copies of the lab reports, chain of custody records, field reports, and the final report from the sampling event shall be stored on FDOH data servers.

10.0 References

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Appendix 1
Form 1-2 Operational Checklists: System evaluation (SE)

(This form is used for identification of the system design flow and to gather the operational checklists needed for conducting an O&M service visit.)

A. Client Contact Information

Name of owner:____ System ref. #:_______________Site address/County:___________________________________

B. System Evaluation

2. Observation and assessment of the site (on lot and in neighborhood)
a. Evaluate presence of odor within 10 ft of perimeter of system:
☐ None ☐ Mild ☐ Strong ☐ Chemical ☐ Sour
i) Source of odor, if present: ____
b. Any surfacing or breakouts. Yes ___ No____
c. Any construction, utility work, or changes in drainage patterns. Yes ___ No____
d. Are all components present and not modified? Yes ___ No____
e. Are all lids at grade or on risers present and secure? Yes ___ No____
f. Traffic on onsite wastewater system. Yes ___ No____

3. Site status at conclusion of O&M service visit:
☐ Verify that controls are set on the appropriate mode.
☐ Power is on to all components.
☐ Revisit all components to verify lids are secure.
☐ Gather all tools for removal from the site.
☐ Verify that no sewage is on the ground surface.
☐ Service notification.

5.Alarm(s)
a. Alarm(s) present. Yes____No_____
b. Audio alarm operational. N.A.____Yes____No_____
c. Visual alarm operational. N.A.____Yes____No_____
d. Remote telemetry operational. N.A.____Yes____No_____
e. Electronic monitoring operational. N.A.____Yes____No_____

4. Comments:

5. Overall system condition:
☐ Acceptable ☐ Maintenance needed
☐ Unacceptable ☐ Maintenance performed
☐ Mitigation required

Company name: ____
Agreement period from: ______________________________to __________________________________

This report indicates the condition of the above onsite wastewater treatment system at the time of the O&M service visit. It does not guarantee that it will continue to function satisfactorily.

Appendix 2

Form D-1 Residential evaluation survey (RES)

Name: ________________________________ Date: ____________ Time:_______________

Address: ______________________________ Phone: _________________________________

Parcel #: ______________________________ PM phone: _____________________________

Designer: ______________________________ Installer: ______________________________

Home/Residents

1. Is this your first home with an on-site wastewater treatment system? YES / NO
2. Did you receive any septic system user information? YES / NO
3. Did you receive the as-built drawing for the system? YES / NO
4. Type of use: Permanent / Seasonal If seasonal, number of months used ____________
   a. Number of people living in the home: Adults: ____ M ____ F
   b. Children: ____ M ____ F Teenagers: ____ M ____ F

c. Number of bedrooms: __________ Number of bathrooms: ____________

5. Water supply: Private well / centralized system / other supply
6. Do you have an in-home business? YES / NO

f "yes", what type? ____

7. Is any resident using long term prescription drugs or antibiotics? YES / NO

ype __________

____

____

8. Do you use bath/skin oil/moisturizer? YES / NO

Use: ____________________times/week.

Do you use septic system additives?

YES / NO

If "yes", what products? _________________

Appliances and cleaning products

10.Home equipped with water conserving fixtures/appliances? YES / NO

11.Garbage disposal? YES / NO Use: ________ times/day ________ times/week

12. Dishwasher used? YES / NO Use: _______ times/day ________ times/week

13.Laundry: Maximum _____ loads per day consecutive loads: YES / NO

Total _____ loads/week

a. Brand of laundry detergents used? _____________________________ powder / liquid

b. Bleach used? YES / NO powder / liquid Use: ______ cups/load _______ loads/week

c. Hot or cold water used? ______________

14.Whirlpool tub? YES / NO Use: ________ times/day ________ times/week

15.Is a drain cleaner used? YES / NO

Type: ____________________

Frequency of use: __________

16.Hand-washing soap brand? __________________

Antibacterial? YES / NO

17.Number of rolls of toilet paper used per week? _______________

18.Toilet cleaning product brand? ________________________

Cleanings/month __________________

Continuous cleaner used in toilet tank?

YES / NO

19.Please list commonly used cleaning supplies:

Shower ___________________________ Kitchen ________________________________

Floors ____________________________ Other: ________________________________

20. Please list any antibacterial products:____

21. Water treatment device:
YES / NO
a. Is a water softener used? YES / NO
Back flushes to: ___________________________
b. Reverse osmosis? YES / NO
Discharges to: ____________________________

22. Air conditioner unit(s)? YES / NO
Condensate drains to: ___________________________
23.Commercial ice machine? YES / NO
Condensate drains to: ___________________________
24. Footing drains or basement sump pumps connected into the system? YES / NO
25. Is the pump working?
YES / NO
26.Chain of custody completed? YES / NO

Site Sketch (Sketch the system or attach record of construction (as-built)

Scale 1” = ________ feet

Appendix 3
Form 5-2 Operational Checklist: Septic, trash and processing tanks (STPT)

Service provided on: Date:________ Time:_____________ Reference #:_______________________
Service provided by: Company: ________________________ Employee:________________________
Date of last service: ___________________________________ By: ☐ You ☐ Other:_______________
Date of last inspection: ________________________________

1. Type:
   - ☐ Septic tank ☐ Trash tank
   - ☐ Processing tank ☐ Pump vault present
2. Conditions at the tank
   - a. Evaluate presence of odor within 10 ft of perimeter of system:
     ☐ None ☐ Mild ☐ Strong ☐ Chemical ☐ Sour
   - b. Source of odor, if present: _________________________________
3. Tank description
   - a. Material: ☐ Concrete ☐ Fiberglass ☐ Plastic
   - b. Capacity: _____________gal
   - c. Compartmented. Yes ____No_____
   - d. Capacities for compartmented system: 1)______ gal 2) ______ gal
4. Tank access
   - a. Access location: ☐ Inlet ☐ Outlet ☐ Center
   - b. Located at grade. Yes____No_____
   - c. If 'No', how deep is lid buried. ______________
   - d. Risers on tank. Yes____No_____
   - e. Evidence of infiltration in risers. Yes____No_____
   - f. Lids securely fastened. Yes____No_____
   - g. Lid in operable condition. Yes____No_____
5. Current tank operating conditions
   - a. Liquid level relative to outlet: _____________in
     ☐ At ☐ Above ☐ Below
   - b. Maximum liquid level of tank (invert of inlet pipe):___________in
   - c. Height at which alarm is activated as measured from invert of inlet: _____________in
   - d. Evidence liquid level has been higher. Yes____No_____
   - e. Evidence liquid level dropped without pumping. Yes____No_____
   - f. Evidence of continuous inflow. Yes____No_____
   - g. Date of last pump out:_______________________________________
   - h. Presence of flocculants in clear zone. Yes____No____
   - i. Evaluation of layers in tank:

Compartment Number	Scum (in)		Clear Zone (in)		Sludge (in)		Odor	Other
	Depth	Color*	Depth	Color	Depth	Color		
1								
2								

*Color Choices: ☐ Clear ☐ Flocced ☐ Milky ☐ Muddy ☐ Grainy
☐ Black ☐ Brown ☐ Mustard ☐ Gray ☐ White

6. Tank pumping recommended. Yes____No_____
Reference #:____

7. Baffles currently structurally sound. Yes____No_____
   - a. Inlet baffle in place. Yes____No_____
   - b. Outlet baffle in place. Yes____No_____
   - c. Compartment baffle in place. N.A. ______ Yes____No_____
   - d. Effluent screen. Yes____No_____

NOTES

2. ☐ Acceptable
   ☐ Unacceptable

4. ☐ Acceptable
   ☐ Unacceptable

5. ☐ Acceptable
   ☐ Unacceptable

Manufacturer:___________________Model:______________

e. Is screen accessible from ground surface? Yes____No_____

f. If screened, percent plugged: _____________%

g. Was screen cleaned? Yes____No_____

8. Tank structural condition (evaluate if tank pumped): N.A.___________

a. Appears to be watertight (no visual leaks). Yes____No_____

b. Rebar exposed. Yes____No_____

c. Corrosion present. Yes____No_____

d. Sapling present. Yes____No_____

e. Cracks present. Yes____No_____

f. Root intrusion. Yes____No_____

g. Deflection noted. N.A.___Yes____No_____

9. Contractor responsible for pumping: _______________

a. Gal removed: _______________ Date:_____________________

10. Lab samples collected for monitoring. Yes____No_____

Types of analysis:____

____

____

f. Recirculation changed to:___________________

*If dam configuration, recirculation device cannot be inspected or cleaned

11. Additional tasks for trickling filters

11.1 Clarification chamber

a. Solids blanket below recirculation pump inlet. Yes____No_____*

*If no, was system pumped out. Yes____No_____

b. If screened inlet, was screen cleaned. Yes____No_____

11.2 Sludge return

a. Solids blanket slightly above return pump. Yes____No_____

b. Changed solids return rate. Yes____No_____

i) Pump: □ Off □ On

ii) Changed from ____ min to ____min

12. Manufacturer's required maintenance performed. Yes____No_____

(If 'Yes', attach Manufacturer Inspection form to this report, if supplied)

13. Lab samples collected for monitoring. Yes____No_____

Types of analysis:____

____

____

Appendix 4

Form FD9000-8 **CALIBRATION LOG (FDEP SOP FT 1000-FT 1500, FD 1000-FD 40**

Project/Site: ____

Temperature (Quarterly)	*For Date of Last Temperature Verification see ______________ in log book ________*					
Dissolved Oxygen	**DEP SOP FT 1500**	Initials	Date	Time	Probe Charge	Probe Gain
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
Specific Conductance	**DEP SOP FT 1200**	Initials	Date	Time	Standard *µmhos/cm*	Exp. Date
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
pH	**DEP SOP FT 1100**	Initials	Date	Time	Standard SU	Exp. Date
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						
CAL ICV CCV						

Maintenance: Weekly pH Slope: ______________ Specific Conductance Probe Cleaned? Yes No Dissolved Oxygen

Notes:

Perform only in Calibrate Mode: **CAL** - Calibrate -

Perform only in **CCV** - Continuing

		Run Mode:	Calibration Verification
Perform only in Run Mode:	**ICV** - Initial Calibration Verification		