Florida Department of Health
Bureau of Environmental Health
Onsite Sewage Programs
Research Review and Advisory Committee Meeting

DATE AND TIME: **November 14, 2012 at 10:00 a.m. ET**

PLACE: Florida Department of Health Southwood Complex
4042 Bald Cypress Way, Room #240P
Tallahassee, FL 32399

Or via conference call / web conference:
Toll free call in number: 1-888-670-3525
Conference pass code: 8605907413
Website: http://connectpro22543231.na5.acrobat.com/rrac_new/

This meeting is open to the public

AGENDA: FINAL

10:00 – 10:05	Introductions and Housekeeping
10:05 – 10:15	Review Minutes of Meeting June 21, 2012
10:15 – 11:15	Nitrogen Study Update 1. October 2012 Legislative Status Report 2. Project Update
11:15 – 11:45	Overview of Total Maximum Daily Load Program at the Florida Department of Environmental Protection and How It Relates to Onsite Sewage Treatment and Disposal Systems – Rick Hicks
11:45 – 12:45	Discussion on Draft Report on EPA Non-Point Source Pollution Grant On The Performance and Management of Advanced Onsite Sewage Treatment and Disposal Systems in Florida
12:45 – 1:15	Updates on Other Projects 1. Florida Inventory of Onsite Sewage Treatment and Disposal Systems 2. Correlations Between Water Quality, OSTDS, and Health Effects
1:15 – 1:30	Other Business
1:30 – 1:45	Public Comment
1:45 – 2:00	Closing Comments, Next Meeting, and Adjournment

NOTE: Time slots are approximate and may be subject to change.

Florida Department of Health Research Review and Advisory Committee
Division of Disease Control and Health Protection
Bureau of Environmental Health - Onsite Sewage Programs Section

Approved Minutes of the Meeting held at the Southwood Office Complex, Tallahassee, FL
November 14, 2012

In attendance:

- **Committee Members and Alternates:**
  - **In person:**
    - Carl Ludecke (vice-chairman, member, Home Building Industry)
    - Bill Melton (member, Consumer)
  - **Via teleconference:**
    - Quentin (Bob) Beitel (alternate, Real Estate Profession)
    - Taylor Brown (alternate, Division of Environmental Health)
    - Tom Higginbotham (alternate, Division of Environmental Health)
    - Bob Himschoot (alternate, Septic Tank Industry)
    - Eanix Poole (alternate, Consumer)
    - David Richardson (alternate, Local Government)
    - John Schert (member, State University System)
    - Clay Tappan (chairman, member, Professional Engineer)
  - **Absent members and alternates:**
    - Wayne Crotty (member, Septic Tank Industry)
    - Paul Davis (member, Division of Environmental Health)
    - Craig Diamond (member, Environmental Interest Group)
    - John Dryden (alternate, State University System)
    - Kriss Kaye (alternate, Home Building Industry)
    - Geoff Luebkemann (member, Restaurant Industry)
    - Susan McKinley (alternate, Restaurant Industry)
    - Tom Miller (member, Local Government)
    - Jim Peters (alternate, Professional Engineer)
- **Visitors:**
  - **In person:**
    - Anthony Gaudio (Sustainable Tallahassee)
    - Richard Hicks (DEP)
    - Keith Parmer (Wakulla Springs Alliance)
    - Dan Pennington (1000 Friends of Florida)
    - Jim Stephenson (Wakulla Springs Alliance)
  - **Via teleconference:**
    - Damann Anderson (Hazen and Sawyer)
    - Josefin Hirst (Hazen and Sawyer)
    - Steve Meints
    - Don Orr
    - Andrea Samson
    - Sarah
    - Lee Smith
    - Shanin Speas-Frost
    - Pam Tucker
- **Department of Health (DOH), Onsite Sewage Program Section:**
  - **In person:**
    - Eberhard Roeder, Professional Engineer
    - Elke Ursin, Environmental Health Program Consultant
  - **Via teleconference:**
    None

1. **Introductions** – Eight out of ten groups were present, representing a quorum. The groups that were not represented were the Environmental Interest Group and the Restaurant Industry. Chairman Tappan called the meeting to order at 10:05 a.m. The agenda was outlined, introductions were made, and some housekeeping issues were discussed. Since the last meeting Tom Miller, the Local Government member, resigned due to relocating out of state. Proposed replacements have been named and staff is working on gathering all information required to appoint these people. Groups on the RRAC that have terms expiring in January of 2013 are the Real Estate Professionals, the Professional Engineers, and the Home Building Industry. Letters will be sent to the appointing agencies requesting nominations. A brief overview was given of the DOH restructuring as it relates to the onsite sewage section. The old structure had a Division of Environmental Health and a Bureau of Onsite Sewage Programs. The new structure has a Division of Disease Control and Health Protection, a Bureau of Environmental Health, and a combined Water and Onsite Sewage Section.

2. **Review of previous meeting minutes** – The minutes of the June 21, 2012 meeting were reviewed.

   Motion by Quentin Beitel, seconded by Bill Melton, to approve the minutes as presented. All were in favor and none opposed and the motion passed unanimously.

3. **Nitrogen Study Update** – Elke Ursin presented on the nitrogen reduction strategies study. On July 1, 2012 the project received $1.5-million in budget and cash for continuation of the study. These funds must be expended this fiscal year or they go away. In the past the funds come from a DEP trust fund and were deposited into an account that carried over between fiscal years. Staff members are working closely with Damann Anderson and his group to find ways to ensure these funds will be spent. Staff, in coordination with the provider, authorized work to begin on additional tasks. The October 2012 Legislative Status Report was discussed. Bill Melton stated that the next report should re-emphasize maintenance component so that there is an understanding that maintenance is important for these systems and will occur. Bob Himschoot asked if the results of the monitoring will be included in the report and Elke Ursin, with confirmation from Damann Anderson, stated that the results are preliminary at this point and would better be discussed after the sampling has been completed so that there is continuity and context. The Task A final report on the test facility work is close to being complete and a summary of those results would be included in the legislative status report due after that deliverable is complete. There was a discussion regarding the funding for the project: what the total funding for the project is, what has been appropriated as cash, and what has been spent. Elke Ursin also stated that she believed that the annual Legislative Budget Request that is sent out from the department is in line with what is being asked for in the report. The next legislative status report is due in February 2013 and will include clarification regarding some of the questions brought up during the meeting. Elke Ursin stated that the contract is now available on the Florida Accountability Contract Tracking System (FACTS) which is online (https://facts.fldfs.com/Search/ContractSearch.aspx). This system allows for public transparency on state contracts. A contract monitoring event was conducted on 8/31/12 at the research facility. A request from Quentin Beitel at the last RRAC meeting to have all the deliverables for this project available for viewing on the webpage is ongoing. The interim raw data regarding the field work will not be included on this site until the final reports have been written, but the other reports can be placed here to make it easier to find information.

Motion by Quentin Beitel, seconded by Bill Melton, to provide a consensus vote to concur with the work done on the report and that staff did a great job. All were in favor and none opposed and the motion passed unanimously.

Elke Ursin stated that Josefin Hirst presented a paper on the Task A PNRS II pilot study results at the annual Florida Environmental Health Association conference in September. This presentation will be emailed out to the email distribution list and posted on the website. A brief overview of the project was given to provide background information to people that are not familiar with the study. Elke Ursin presented an update on some of the tasks. Three additional sample events have been conducted at the first installed Task B home system. The second Task B home system design was completed, and the system was constructed. Start-up occurred in late September. Design has begun on three Task B home systems in Seminole County. Three additional sample events have been conducted at the Soil and Groundwater Test Facility (at GCREC). The fourth and final sample event was conducted at the second Task C home site. The third Task C groundwater monitoring home site was established in Polk County and instrumentation of the site for monitoring was completed. The first sample event was conducted at the third home site. The fourth Task C system, which is at the same location as the second Task B home system, had groundwater monitoring initiated. The site was partially instrumented and one sample event was conducted prior to installation of the second Task B system. This site will provide a before and after case study for improved treatment performance. Staff participated in a conference call with Hazen and Sawyer and the Colorado School of Mines on 7/18/2012 and 10/3/12. The approach was discussed for a simple soil tool that can be used to illustrate the subsurface behavior of wastewater. The scope and approach were refined and the deliverables were clearly specified and agreed to by all parties. There were discussions on the number of pumps required for the installed systems and the possibility of methyl mercury being created from the sulfur discharge.

4. **Overview of Total Maximum Daily Load (TMDL) Program and the TMDL Development Process and how it relates to Septic Tanks –** Rick Hicks with the Florida Department of Environmental Protection (DEP) presented an overview of the TMDL program. The program assesses the water quality of various surface water bodies on a 5-year rotation cycle. The assessment identifies impaired waters and what pollutants are causing the impairment and then develops targets for these waters on a prioritized schedule. The sources of the pollutant are identified and a basin management action plan (BMAP) is developed. A BMAP is developed collaboratively with local stakeholders and includes projects, initiatives, and activities aimed at water quality restoration. A septic tank inspection program could be an example of a non-structural best management plan. Several example projects initiated by the stakeholders were given. Bob Himschoot discussed his disappointment in the Silver Springs and Rainbow Springs BMAPs. He did not see any support for a maintenance program for septic systems. The industry feels that this would extend the life of the septic system and identify failing systems. There has been a collaborative effort between the Florida Home Builders Association, the Florida Association of Realtors, and the Florida Onsite Wastewater Association to implement an inspection program. He said that he would like to see DEP and DOH come together and support a managed onsite sewage program that starts addressing these issues now before the systems installed from the 1980s to today start to go into failure in the future. He does not see funding going toward onsite sewage system management; instead it is all related to extending sewer lines.

5. **Discussion on Draft Report on EPA Non-Point Source Pollution Grant on the Performance and Management of Advanced OSTDS –** Elke Ursin gave an overview of the EPA 319 project on the performance and management of advanced onsite systems. This project is to assess water quality protection by advanced (ATU, PBTS, etc.) systems throughout Florida and has been ongoing for approximately five years. The draft report, which is to tie all of the project components together, was submitted for review by the committee. The submitted report has some sections incomplete, which will be written over the following few weeks. Elke Ursin stated that the data entry and quality control were completed on 10/30/2012 and the report was sent to the committee on 11/8/2012. Elke Ursin went through each section of the report providing an overview and some of the results. Eberhard Roeder went over the sample data analysis and quality control information. She made a request for the committee and the public to send here any comments or ideas for things to analyze. Several discussions occurred during the presentation. Elke Ursin and Eberhard Roeder mentored two Florida Agricultural and Mechanical University Masters in Public Health students during the summer. These students worked on comparing various survey results with sample results and field operational assessments. After the presentation and discussion, Elke Ursin asked the RRAC what their preference would be regarding the final report: whether they would like to meet again to discuss the final report prior to submitting or whether staff could submit the final report without another RRAC meeting. The due date of the report is November 30, 2012. RRAC would like to review the executive summary and conclusions of the report and have another meeting on November 28, 2012 in the morning. Any questions can be directed to staff. Bill Melton commended Elke Ursin and Eberhard Roeder on this tremendous project and how they have overcome setbacks.

6. **Updates on Other Projects –**

   a) **Inventory of OSTDS in Florida –** Elke Ursin presented the progress on this project since the last meeting. Elke Ursin collaborated internally to begin developing both public and DOH interfaces to will allow for accessing and editing data. A process flow chart was shown showing the steps for the public view website. A demonstration of the draft website was given, which allows the user to find a parcel of interest, see what the wastewater method is, and provide an option for someone to update the information by sending DOH an email. The DOH view will come next after resolving and updating some ArcGIS software. The process on how to proceed is still being developed.

   b) **Relationship between Wastewater Disposal and the Incidence of Salmonella and Campylobacter in the State of Florida –** Elke Ursin presented the progress on this prioritized project. She has been mentoring Nicole Pritchard, a volunteer intern working on her MPH at Nova Southeastern University, since August 2012. The project started with collaboration between OSTDS staff and DOH epidemiology staff to determine what disease data was available. The goal was to discover the risks associated with living in an area with sewer versus living in an area with septic systems and becoming ill with Salmonella or Campylobacter. GIS was used to geocode disease data and overlay with the OSTDS inventory data. Two by two tables and risk ratios were then calculated. The methods used were discussed, as well as the data limitations. Despite limitations in the methodology and data, the results suggested that there was an increased risk in specific counties for cases of Salmonella and Campylobacter in individuals served by a septic system. The combined risk ratios were calculated for all eleven counties that had the best inventory data; indicating that the greatest risk is associated with acquiring Salmonella while strictly being served on a known septic system. Today Nicole Pritchard will present a poster with the data results for the 2012 Seven Hills Regional User Group (SHRUG). A project report will be drafted in the near future. There was a discussion of whether any statewide drinking water data exists, with Shanin Speas-Frost indicating that there is a project working on this and that contact information would be forwarded to Elke Ursin for follow-up.

c) **Other Research Program Activities –** Presentations on the research program were given at the FOWA 2012 Convention and Trade Show Educational Program, the Gulf Coast District of the Florida Environmental Health Association at their annual OSTDS continuing education course, and an online training for certified environmental health professionals. Staff have been working on an update for the research program public website and this update is nearing completion. This update will provide a much easier to navigate user interface. Staff also participated in a conference call with a Water Environment Research Foundation (WERF) project team for a project titled "Applicability Analysis of Existing Models for Site-Specific Water Quality Criteria to Protect Designated Uses from Nutrient Impacts". The discussion focused on the development of a nutrient impact modeling toolbox that could be used by regulatory agencies to assist with setting site-specific nutrient goals. Staff have also reviewed and provided comments for several DEP reports.

7. **Other Business** – There was no discussion on other business.

8. **Public Comment** – The public were allowed to comment throughout the meeting. Pam Tucker said that she was thankful that the public can comment throughout the meeting. She also said that the work that has been done is fantastic and she was impressed to see the results of work that started many years ago. There was no additional public comment.

9. **Closing Comments, Next Meeting, and Adjournment** – The next RRAC meeting will be on November 28, 2012 to discuss the advanced systems project executive summary and conclusions section. The next meeting after this will need to be in mid-December to discuss the draft legislative status report for the nitrogen study. The meeting adjourned at 2:08 p.m.

Motion to adjourn by Bill Melton, seconded by Carl Ludecke. All were in favor and none opposed and the motion passed unanimously.

Florida Department of
Environmental Protection

Overview of Florida's TMDL Program and the TMDL Development Process (and how it applies to septic tanks)

November 14 RRAC meeting

Water Quality Process Overview

Develop & Adopt Water Quality Standards to protect Florida waters

Use WQS to assess Florida waters & determine if meeting Designated Uses

If determined impaired, develop Total Maximum Daily Load (target to restore water)

Develop & implement Basin Management Action Plan to implement restoration

303(d) Listing Requirements

- **Section 303(d) of the Federal CWA requires states to:**
  - **submit lists of waters that do not meet their water quality standards (“impaired waters”),**
  - **identify pollutant causing or expected to cause impairment**
  - **establish/implement TMDLs for these waters on a prioritized schedule**
  - **new list and schedule required every 2 years**

What Does TMDL Stand For?

<u>T</u>otal

<u>M</u>aximum

<u>D</u>aily

<u>L</u>oad

- **Establishes maximum amount of a pollutant that a water body can <u>assimilate</u> without causing exceedances of water quality standards (water quality criteria & designated uses)**

TMDL Process: Overall Objective

- **Identify and quantify all point and nonpoint source (NPS) loadings to a water to determine the assimilative capacity of that waterbody for each pollutant impairing water quality**
- **Use data analysis and sometimes models to estimate and establish assimilative capacity**
- **TMDL:**
  - **May include allocations sources, and**
  - **Includes a Margin of Safety (MOS).**

TMDL components

- **They include the target (as a load or concentration) and the percent reduction needed to meet the target**
- **They include general allocation of the reductions needed between categories of sources**
- **<u>Wasteload Allocation</u> for direct discharges**
- **<u>Load Allocation</u> for nonpoint sources**

Implementation Steps

- Once a TMDL is Adopted the Department is authorized to develop and implement a Basin Management Action Plan.
- BMAPs include projects, initiatives, and activities aimed at water quality restoration.
  - Can include recognition of previous or on-going activities to provide credit toward achieving the goal.

Regulatory Framework

- The process for preparing BMAPs is found in:
  - Section 403.067, Florida Statutes (F.S.), known as the Florida Watershed Restoration Act (FWRA).
  - Spells out issues that are addressed within a BMAP.

FLORIDA

BMAP Process

- After a TMDL is adopted, the BMAP will be developed collaboratively with local stakeholders.
  - Through open meetings with public involvement.
  - Joint decision making with local partners.
  - Addressing impaired water through "structural" and "non-structural" best management practices and other activities.

Key BMAP Components

- TMDLs being addressed.
- Defines area addressed by BMAP.
- Future growth impacts.
- Projects to meet the TMDL including:
  - Implementation timeline;
  - Commitment to project; and
  - Expected water quality improvement.

BMAP projects

- Example projects initiated by the stakeholders:
  - Waterbody restoration projects
  - Stormwater treatment projects
  - Wastewater projects
  - Public education/outreach
  - Lawn fertilizer BMPs
  - Agricultural BMPs

Key BMAP Components (cont)

- Process to assess progress towards achieving the TMDL, and includes:
  - Monitoring plan;
  - Project reporting; and
  - Periodic follow-up meetings.

Agriculture Implementation

- Agricultural producers are required to implement appropriate best management practices (BMPs) for their commodities or implement FDEP designed water quality monitoring to show they are not having an impact.
  - BMPs developed for commercial agriculture.

Funding Opportunities for Restoration Activities

- TMDL program funding
- Federal 319 grant funding
- <u>Both require 50% match from recipients</u>

Septic Tanks

- So…. How does this apply to septic tanks?

Septic Tanks

- Local governments may propose septic tank-related projects to address waters impaired by bacteria or nutrients.
- Projects in some of the BMAPs include neighborhood-scale assessments to identify failed tanks or illicit connections
- Projects in some BMAPs include hooking up neighborhoods to central sewer

Septic Tanks

- No local government has yet instituted a septic tank inspection program as part of their BMAP, but one county has proposed it (Lee County)
- No local government has required PBTS as part of a BMAP (Wakulla County's activities could be included under the Wakulla Springs BMAP)

Septic Tanks

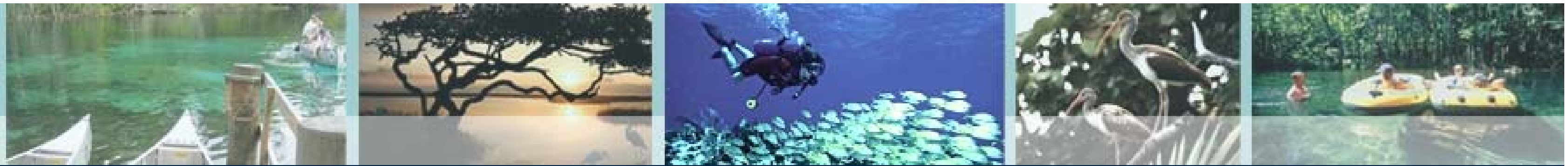
- For the Lower St Johns River BMAP (nutrients), City of Jacksonville proposed a septic tank retrofit program that would remove 125,000 kg/yr of nitrogen, 37 neighborhoods (22,000 connections)
- For the Bayou Chico BMAP (bacteria), ECUA proposed to hook up 4 neighborhoods (369 connections)

Septic Tanks

- For the St. Lucie River BMAP (nutrients), Martin County and City of Port St. Lucie are asking for credit for a massive sewer expansion program that nets 45,000 connections
- The Silver Springs BMAP, which will be coming soon, will also probably include some septic tank projects

ArcNLET Modeling and BMAPs

- ArcNLET was developed as a better alternative for providing estimates of nitrate loading from septic tanks to nearby surface waters
- It is being used as a tool to predict the amount of nitrogen removed by septic tank hookups, currently for the COJ project
- Will be used for the St. Lucie project next



Septic Tanks in future BMAPs

- Could include benefits for county septic tank inspection programs and maintenance entities
- Could include credits for retrofitting to passive nitrogen removal systems

Florida Department of Health Assessment of Water Quality Protection by Advanced Onsite Sewage Treatment and Disposal Systems: Performance, Management, Monitoring

DRAFT Final Report

for

DEP agreement G0239

By Eberhard Roeder and Elke Ursin

DRAFT November 8, 2012

Executive Summary

[This section will be written once the data analysis has been completed and reviewed]

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1 Introduction

1.1 Problem Definition/Background

Onsite Sewage Treatment and Disposal Systems (OSTDS) serve approximately one-third of all households in Florida. OSTDS are one source of nutrients in nutrient impaired watersheds. Estimates of the extent of their contribution to nitrogen loadings for different watersheds in Florida have ranged from between less than 5% to more than 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.

While most OSTDS are conventional OSTDS, or septic systems, there are some other systems that provide additional or advanced pretreatment before disposal. 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 a means to achieve fecal coliform reduction. In such cases, the engineer is required to include shallow groundwater monitoring wells in the monitoring plan.

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, innovative, is rarely used and 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 reduction, for lots where the required setback or authorized lot flow restrictions cannot be met. A property owner may also want an advanced system for protection of the environment with cleaner wastewater.

Advanced systems differ in three aspects from conventional treatment systems that consist of a septic tank with drainfield. First, the design of advanced systems is more variable than the prescriptive approach for conventional systems. Second, they need more frequent checkups and maintenance, which is the reason they require operating permits. Third, the performance expectations are more specific than absence of sewage on the ground surface, while failure definitions for advanced systems are more vague. 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.

Proper management of advanced onsite systems is a key to their success. Management of onsite systems has many facets. Each of the groups of people dealing with onsite systems in some way manages a part of the life-cycle of them, be it the design, permitting, selling, installation, operation, maintenance, use, repair, control, and eventual abandonment. Few are involved in all phases of a system's life, with the possible exceptions of regulators and installing maintenance entities. Anecdotally, there appears to be some variety of management approaches even within the comparatively uniform regulatory requirements (operating permit, maintenance contract, CHD inspection) in Florida. The approaches taken may depend on the work load, qualifications and interests of the people involved. With this variability a question arises: Is there set of good or "best" management practices that delivers superior results in terms of treatment results and in terms of the satisfaction of the people involved? How could other people learn about such a set of practices? Good data to base an answer to such questions on are hard to come by. Since 2001, when a change in Florida Statutes decreased operating permit fees and resulted in the discontinuation of a sampling program implemented by the county health departments, there had been no systematic assessment of effluent quality of advanced systems in Florida. A review of aerobic treatment unit sampling results gathered previously in one county, showed high variability of effluent quality that was at least in part related to differences in sample locations (Roeder and Brookman, 2006). The project aims to perform such a statewide assessment on a limited scale and develop improvements in the management of advanced systems where needed.

The emphasis of this study is to assess the effectiveness of pretreatment in advanced OSTDS before discharge to the drainfields. The objectives of the overall project are to:

1. Quantify the reduced loading of contaminants from advanced Onsite Sewage Treatment and Disposal Systems (OSTDS) to the environment;

2. Assess the operational status of systems under the current management framework, including a comparison of system functioning to expected permit levels of performance;

3. Survey perceptions of user groups regarding the management of such systems;

4. Validate elements of a monitoring protocol for consistent assessment of systems; and

5. Document best management practices.

There are six major tasks associated with this project. These are described below with references to sections in this report that discuss these tasks:

1. Monroe County detailed study of variability of performance of advanced systems (Keys study) (Section 2.1.1.1, Section 3.3)
2. Statewide database inventory of advanced systems based on permit records (Section 1.3)
3. Survey of the perceived strengths and weaknesses of the current management of advanced onsite systems (Section 2.2.2, Section 3.2)
4. Statewide assessment of operating condition and performance of advanced systems (random sample of 700 systems) (Section 2.1, Section 3.4)
5. Periodic influent and effluent sampling for a sample of systems (approximately 70 systems) (Section 3.4.1.4)
6. Booklet with case studies outlining both strengths and weaknesses of the current program and best practices in advanced onsite management (Section 2.2, Section 3.5)

1.2 Glossary of Terms

Term	**Meaning**
ATU	Aerobic Treatment Unit. Type of advanced system that introduces oxygen to the wastewater. Generally permitted based on certification by the National Sanitation Foundation
CHD	County health department. The State of Florida Department of Health has 67 county health departments that administer health programs.
EHD	Environmental Health Database. Statewide permitting database that DOH uses to keep track of permits issued.
FAC	Florida Administrative Code. The part of the code that references OSTDS is Chapter 64E-6.
ME	Maintenance Entity. Company that does the inspections of the advanced system, making sure it is functioning properly.
OP	Operating permit. Required for advanced systems.
OSTDS	Onsite sewage treatment and disposal systems. Includes both conventional

	septic systems and advanced systems.
PBTS	Performance-Based Treatment System. Type of advanced system that is designed to meet a specific performance level. Permitted based on design by an engineer experienced in wastewater.
QAPP	Quality Assurance Project Plan. Document created to outline the methodologies, procedures, and other requirements necessary for collecting field data.

1.3 Statewide Statistics on Advanced Systems

A database was created as part of this project, containing a total of 16,595 systems from four main sources: the Department of Health's Environmental Health Database (EHD), the Carmody system, various county health department databases, and innovative permit files. The information came from two aspects of the permitting process: construction permitting for the initial construction or the repair of a system, and operating permitting for the continued operation and maintenance of a system.

1.3.1 Data Sources

The environmental health database (EHD), is the successor to a previous central permitting data system of the Department of Health (Centrax). It contains both data on permits issued since EHD has been implemented and legacy data from permits issued through the previous system since the mid- to late 1990s. Depending on the county, EHD was implemented between 2007 and 2008. The legacy data tend to contain fewer data fields. This data source contains information on all systems, not just advanced systems. Data from this source were made available to the project in the form of query results by a distributed computer systems consultant in the Bureau. The bulk of the data has a nominal date of September 2009.

Carmody is a web-based maintenance and inspection tracking system. Carmody Data Systems, Inc. is under contract with the Florida Department of Environmental Protection to offer this service to maintenance entities and health departments, as a tool to report maintenance and inspection events electronically. Carmody administers access to this tracking system. A related, publicly accessible, tool is "Septic Search ™" (http://septicsearch.com), which allows viewing of documents that Carmody Data Systems makes available for each system. In addition to maintenance and inspection reports, this may include other permit files, usually available for counties in which Carmody Data Systems, Inc. has performed a project to scan and electronically organize such files.

Preliminary surveys and telephone inquiries were made to the County Health Departments to determine their methods for recording operating permit data. Several counties (Miami-Dade, Duval, Escambia, Flagler, Madison, and Palm Beach) provided the Excel-spreadsheets that they use to track operating permits.

Additional innovative system records stemmed from files in the Florida Department of Health's Onsite Sewage Section that pertained to the permitting of innovative systems. These provided generally some information on the location, and sometimes permitting information, of systems that were installed under an experimental or innovative program.

1.3.2 Distribution of Systems

Table 1 shows the frequency of advanced systems by county and is sorted alphabetically. Table 2 shows the frequency of advanced systems by county and is sorted by highest frequency to lowest frequency. Over 60% of the advanced systems in Florida are contained in these five counties: Monroe, Charlotte, Brevard, Franklin, and Lee.

Table 1. Frequency of Advanced Systems by County (Alphabetical)

	Frequency	Percent
Alachua	19	0.11
Baker	3	0.02
Bay	17	0.10
Bradford	7	0.04
Brevard	2446	14.74
Broward	179	1.08
Calhoun	15	0.09
Charlotte	2454	14.79
Citrus	246	1.48
Clay	52	0.31
Collier	430	2.59
Columbia	23	0.14
Desoto	22	0.13
Dixie	18	0.11
Duval	464	2.80
Escambia	150	0.90
Flagler	80	0.48
Franklin	1104	6.65
Gadsden	12	0.07
Gilchrist	22	0.13
Glades	10	0.06
Gulf	60	0.36
Hamilton	16	0.10
Hardee	9	0.05
Hendry	86	0.52
Hernando	35	0.21
Highlands	28	0.17
Hillsborough	159	0.96
Holmes	8	0.05
Indian River	38	0.23
Jackson	29	0.17
Jefferson	15	0.09
Lafayette	21	0.13
Lake	125	0.75
Lee	706	4.25
Leon	111	0.67
Levy	42	0.25
Liberty	5	0.03
Madison	23	0.14
Manatee	20	0.12
Marion	331	1.99
Martin	88	0.53
Miami-Dade	299	1.80
Monroe	3436	20.71
Nassau	54	0.33
Okaloosa	25	0.15
Okeechobee	12	0.07
Orange	561	3.38
Osceola	121	0.73
Palm Beach	286	1.72
Pasco	30	0.18
Pinellas	33	0.20
Polk	228	1.37
Putnam	77	0.46
Santa Rosa	110	0.66
Sarasota	404	2.43
Seminole	142	0.86
St. Johns	100	0.60
St. Lucie	125	0.75
Sumter	40	0.24
Suwannee	77	0.46
Taylor	46	0.28
Union	1	0.01
Volusia	413	2.49
Wakulla	164	0.99
Walton	78	0.47
Washington	5	0.03
Total	**16595**	**100.00**

Table 2. Frequency of Advanced Systems by County (Highest to Lowest)

	Frequency	Percent
Monroe	3436	20.71
Charlotte	2454	14.79
Brevard	2446	14.74
Franklin	1104	6.65
Lee	706	4.25
Orange	561	3.38
Duval	464	2.80
Collier	430	2.59
Volusia	413	2.49
Sarasota	404	2.43
Marion	331	1.99
Miami-Dade	299	1.80
Palm Beach	286	1.72
Citrus	246	1.48
Polk	228	1.37
Broward	179	1.08
Wakulla	164	0.99
Hillsborough	159	0.96
Escambia	150	0.90
Seminole	142	0.86
Lake	125	0.75
St. Lucie	125	0.75
Osceola	121	0.73
Leon	111	0.67
Santa Rosa	110	0.66
St. Johns	100	0.60
Martin	88	0.53
Hendry	86	0.52
Flagler	80	0.48
Walton	78	0.47
Putnam	77	0.46
Suwannee	77	0.46
Gulf	60	0.36
Nassau	54	0.33
Clay	52	0.31
Taylor	46	0.28
Levy	42	0.25
Sumter	40	0.24
Indian River	38	0.23
Hernando	35	0.21
Pinellas	33	0.20
Pasco	30	0.18
Jackson	29	0.17
Highlands	28	0.17
Okaloosa	25	0.15
Columbia	23	0.14
Madison	23	0.14
Desoto	22	0.13
Gilchrist	22	0.13
Lafayette	21	0.13
Manatee	20	0.12
Alachua	19	0.11
Dixie	18	0.11
Bay	17	0.10
Hamilton	16	0.10
Calhoun	15	0.09
Jefferson	15	0.09
Gadsden	12	0.07
Okeechobee	12	0.07
Glades	10	0.06
Hardee	9	0.05
Holmes	8	0.05
Bradford	7	0.04
Liberty	5	0.03
Washington	5	0.03
Baker	3	0.02
Union	1	0.01
Total	**16595**	**100.00**

1.3.3 System Information

Table 3 illustrates the frequency of the type of advanced system in the database. Seventy-six percent of the systems are for ATU's and eight percent are for PBTS. Relatively few systems, about 15%, are recorded as unknown, indicating a limited potential of having included conventional systems.

Table 3 Frequency of Type of Advanced System (ATU, PBTS, Innovative, Unknown)

	Frequency	Percent
ATU	12660	76.3
Innovative	183	1.1
PBTS Non Innovative	1189	7.2
Unknown	2563	15.4
Total	**16595**	**100.0**

Table 4 illustrates the age of the advanced system from January 1, 2010, which is about six months after the data gathering for the database started, and the approximate date of when the data were imported into the database. The system installation date is entered on the construction permit and the operating permit application and was part of some CHD and innovative records. The high occurrence of unknown ages could be a result of there being fewer EHD permits in the database as well as this being a field that is not consistently completed in EHD. Of the systems with no final system approval date 8,248 (88%) did not have construction permit information. A total of 7,173 systems in the database had a final system approval date. Of these systems, 75% were installed within 2-5 years of January 1, 2010.

Table 4. Age of System From January 1, 2010

	Frequency	Percent
Unknown	9422	56.8
<2	431	2.6
2 - 5	5372	32.4
6 - 10	1313	7.9
11-15	47	.3
16-20	5	.0
>20	5	.0
Total	**16595**	**100.0**

Table 6 outlines the different technology approaches, manufacturers, products, and aeration subtypes for all of the systems for which data were available. These data likely reflect what has been installed over the years under a variety of approval conditions. Out of a total of 16,595 systems, 9,206 (56%) had this type of information. There were three main types of treatment technology approaches considered: extended aeration, fixed media, and combined (aeration and fixed media) (Figure 1). Sand and gravel filters would fall into the fixed media category, and several experimental or innovative treatment and disposal systems that involve effluent passage through a drainfield were included in this category. While interim aggregate filters are fixed film systems, they were not included in further consideration because they are generally located after an aerobic treatment step. The "other" category captures largely systems with injection wells and evapotranspiration in Monroe County.

One of the limitations of the source data that became apparent at this stage is the designation of a treatment technology based on the tank approval number. The distributors of one innovative treatment technology, Bionest, had obtained approval to fit the technology into several tanks that can also be used as septic or other tanks. Finding the tank approval numbers in the construction records of advanced systems lead to 35 systems designated as Bionest systems, even though the distributor confirmed that no system had been installed.

The main technology approach used in Florida is extended aeration, with 88% of the systems that had product information. Over half of the systems in the database used extended aeration in the treatment process. 42% use a diffuser and 10% use an aspirator to aerate (Table 5). Systems that use a combined technology approach only accounted for 7% of the population, while fixed media had only a share of 3%.

Table 5. Use of Aeration in the Treatment Process

	Frequency	Percent
Aspirator	1724	10.4
Diffuser	7028	42.4
Unknown	7843	47.3
Total	16595	100.0

Figure 2 illustrates the different manufacturers for the systems that had information. Fourteen manufacturers had less than 100 systems each and these were totaled together and combined under the "Other" category in Figure 3. The top five manufacturers used in Florida are Consolidated, Aqua-Klear, Hoot, Norweco, and Clearstream.

Figure 3 illustrates the different products for the systems that had information. In many but not all cases the product carries the same name as the manufacture. Nineteen products had less than 100 systems each and these were totaled together and combined under the "Other" category in Figure 3. The top five products used in Florida are Nyadic, Aqua-Klear, Hoot, Singulair, and Clearstream, which corresponds to the distribution of the respective manufacturers.

Table 6. Technology of Components with Sample Selection Information

Technology Approach	Manufacturer	Product	Aeration Subtype	Number of Systems	Product Sample	Subtype Sample	Approach Sample
Combined	Bio-Microbics	FAST	Diffuser	394	35	35	70
	Bionest	Bionest	Diffuser	35[1]	0		
	Jet	Jet	Aspirator	188	35	35	
Extended Aeration	Acquired Wastewater Technologies	Alliance	Diffuser	76	2	35	70
	Ecological Tanks, Inc.	Aqua Aire	Diffuser	73	2		
	Ecological Tanks, Inc.	Aqua Safe	Diffuser	56	2		
	Aqua-Klear	Aqua-Klear	Diffuser	1353	4		
	American Wastewater	B.E.S.T. 1	Diffuser	130	3		
	Acquired Wastewater Technologies	Cajun Aire	Diffuser	132	3		
	Clearstream	Clearstream	Diffuser	861	3		
	Delta	DF or UC	Diffuser	257	3		
	Delta	N/D	Diffuser	507	0		
	Hoot	Hoot	Diffuser	975	4		
	Hydro-Action	Hydro-Action	Diffuser	89	2		
	H.E. McGrew	Mighty Mac	Diffuser	357	3		
	Consolidated	Nayadic	Diffuser	1733	4		
	Consolidated	Multi-Flo	Aspirator	583	15	35	
	Consolidated	Enviro-Guard	Aspirator	3	3		
	Norweco	Singulair	Aspirator	949	17		
Fixed Media	Orenco	AdvanTex		8	6		70
	Quanics	Aerocell		5	4		
	Quanics	Biocoir		5	4		
	Carroll Environmental Technologies	Carroll Filter		1			
	Premier Tech	EcoFlo		30	9		

[1] Result of non-unique tank use, no systems actually installed. See text.

Technology Approach	Manufacturer	Product	Aeration Subtype	Number of Systems	Product Sample	Subtype Sample	Approach Sample
	EcoPure	EcoPure		19	8		
	Earthtek	EnviroFilter		149	14		
	Klargester	Klargester		2	2		
Fixed Media (cont.)	Rotodisk	Rotodisk		3	3		
	Ruck	Ruck		11	7		
	NoMound	NoMound		21	8		
	Sandfilter	Sandfilter		6	5		
Other	Injection Well	Interim filter		173	0		0
		Cromaglass		1	0		
		P-removal		19	0		
	Evapotranspiration			2	0		
			Total	**9206**			**210**

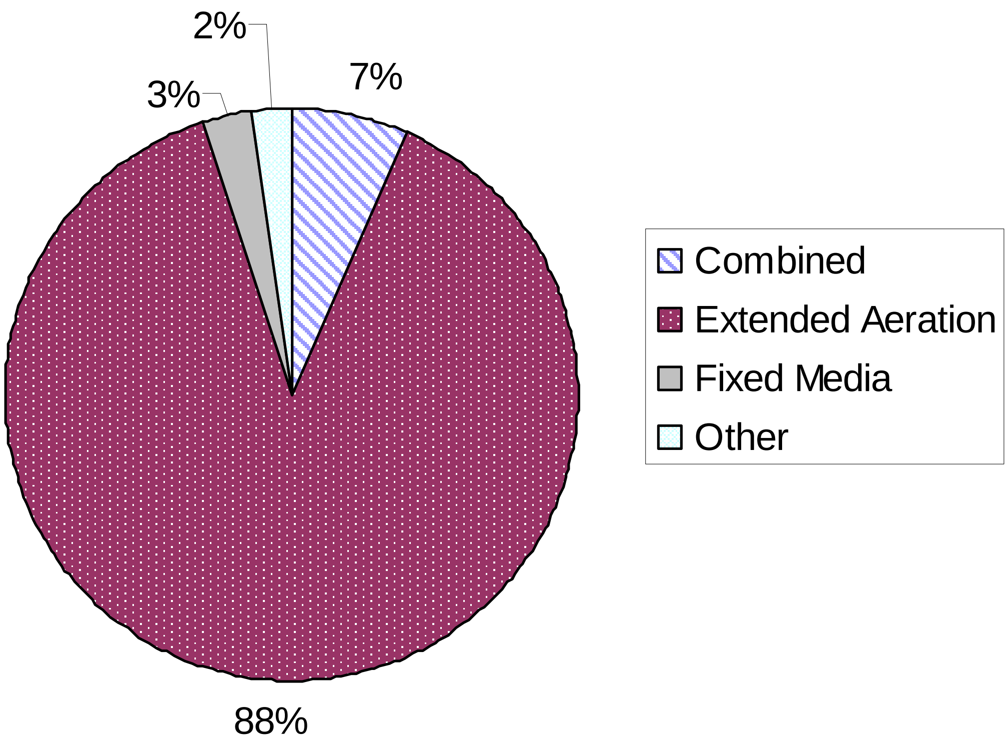


Figure 1. Technology Approach Information

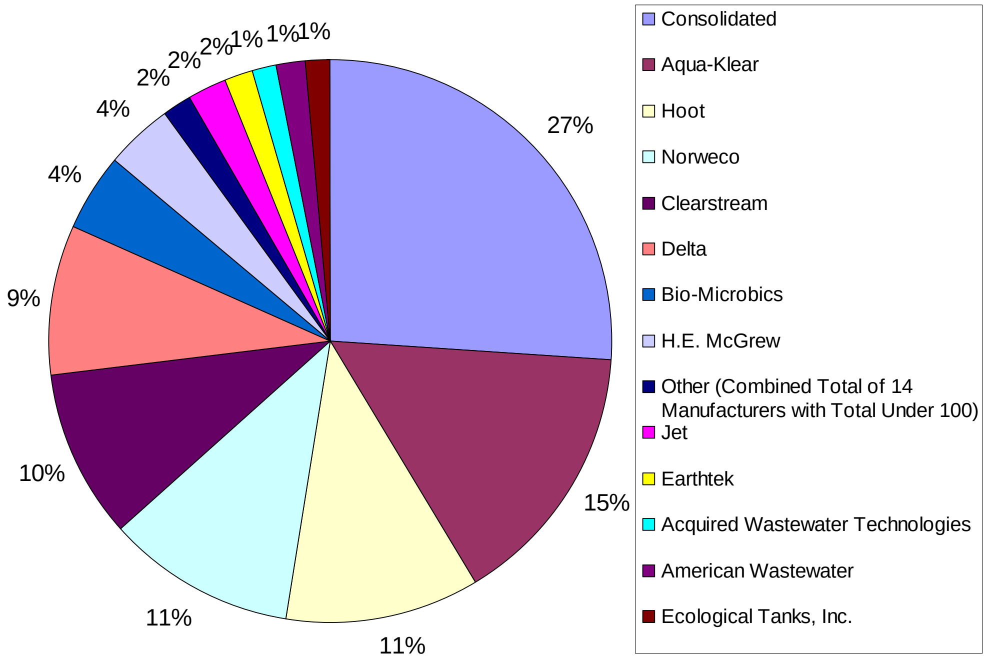


Figure 2. Manufacturer Information

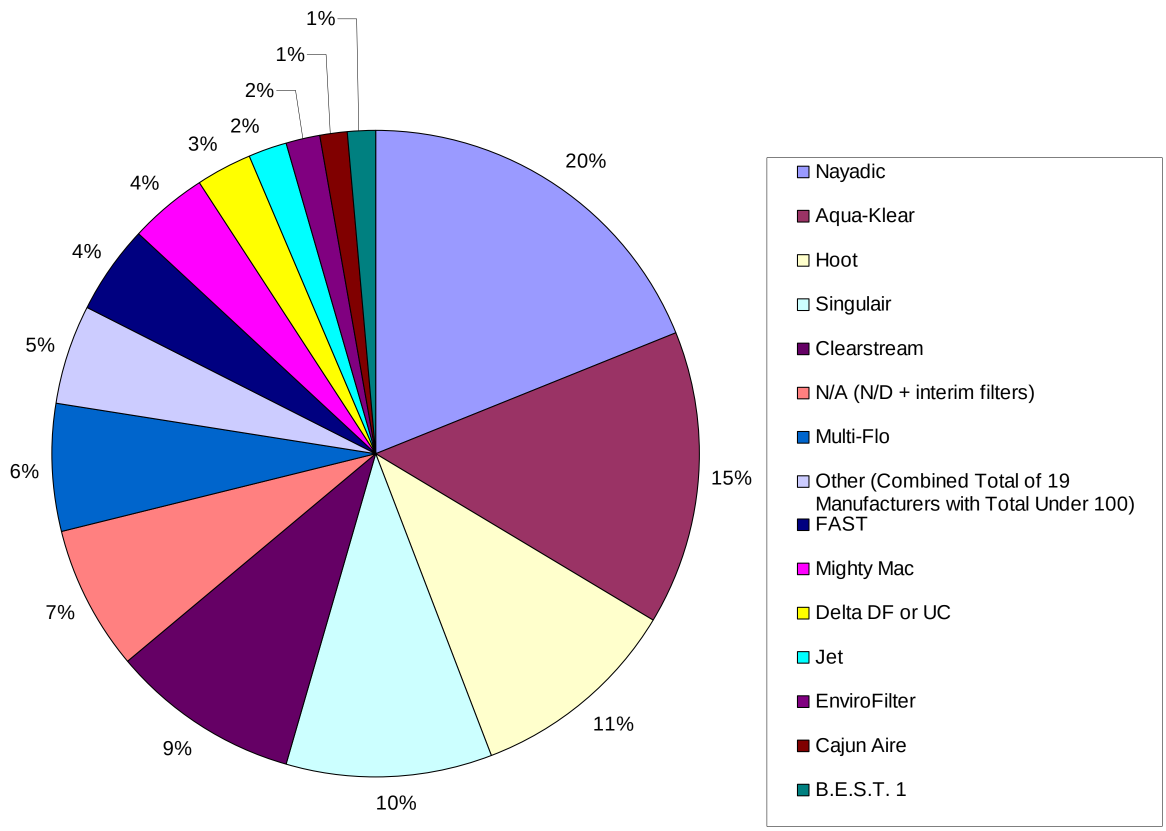


Figure 3. Product Technology Information

2 Methods

2.1 Sampling

2.1.1 Sampling Process Design (Experimental Design)

2.1.1.1 Validation of Sampling Protocol

One goal of the project is to validate elements of a monitoring protocol for consistent assessment of systems. Two issues are of particular concern here: one is the suggestion that effluent quality might vary so much over the course of a day that one sample is not representative. The other is to work toward an assessment method or check list that could be used uniformly to minimize differences due to the way different people assess different systems. Samples were taken from aerated OSTDS in the Florida Keys between February 2007 and June 2009. Both grab and composite samples were taken from 40 treatment systems at different frequencies and were analyzed for carbonaceous biochemical oxygen demand (cBOD5), total suspended solids (TSS), total nitrogen (TN), total phosphorus (TP), less frequently for total alkalinity, and occasionally for fecal coliforms and by some screening tests. The objectives of this task were to validate the sampling protocol for statewide sampling of advanced systems by characterizing the variability of grab samples over the course of a day, to compare grab sample results to time-composite sample results, and to assess longer term or seasonal variability. A sampling protocol was written (Roeder et. al. 2009) documenting protocols to provide consistent and representative wastewater samples. Results from this sampling effort are summarized in Section 3.3 and helped shape the structure for the sampling process for the statewide sample plan. Some of the findings from the final task report (Roeder 2011) were:

• Occasional spurious high concentrations were reported, in many cases for one analyte but not for others in the same sample. While this may influence means, median concentration results are less impacted by this and appear generally reliable. Review of sample results on the background of typical results and communication with the laboratory appear to be a way to resolve some of these. The conditions for such interaction were much improved for Task 4.

• Relative to target concentrations, results from analysis of blanks indicated that the approach to sampling using peristaltic pumps was successful. For Task 4, flushing volumes were increased in an attempt to further reduce TN in equipment blanks, which had been detected most frequently.

• TSS appeared to be the most variable parameter in replicate samples from an intermediate container with a median relative standard deviation of 12%, but for cBOD5, TN, and TP this measure was 3% and less. Concerns about samples obtained from intermediate containers are thus less warranted for nutrient analyses than for TSS analyses.

• Detailed characterization of the treatment systems and sampling locations are very important. Particularly in treatment systems with multiple treatment steps, “influent” and “effluent” need further qualification, and may be ambiguous to a sampler encountering the treatment system or to a data analyst. In the present study this required some reclassification during data analysis from “influent” to “intermediate”. For Task 4, data fields for sample location description were more extensive, and a screen for the validity of “influent” samples was developed.

• The operational and maintenance conditions of a treatment system need to be better characterized if one wants to distinguish between technical limitations of treatment and shortcomings due to operator error or lack of maintenance. The assessment protocol for Task 4 included a more detailed assessment, including characterization if the power was on, observation of problems and the dissolved oxygen concentration as a measure of aeration.

• Assessments of variability between grab samples during each event showed that TSS had the highest variability, while TP and total alkalinity had the least, followed by TN. The first grab sample of a sampling event tended to be about 20% higher in TSS and 10% in cBOD5 than subsequent grab samples. This difference did not exist for nutrient species. Given that the emphasis of the project is on nutrient treatment effectiveness, grab sampling appeared appropriate for Task 4.

- There was no overall bias found between the effluent composite and average of grab samples during the same event, even though for any event there could be differences. These differences were the least for total alkalinity, TP, TN and nitrate, with more than 50% of events showing a relative difference of less that 10%.

- The between event variability as expressed by relative standard deviations, is at least twice as large as the within event variability for all parameters, except for TSS.

- Analysis for differences by weekday showed no consistent results. Flow measurements for a subset of systems, but not for all measurements, appeared to decrease from Monday through Thursday. Grab but not composite effluent sample results for TSS and cBOD5 indicated a decrease from Sunday through Thursday, but this was at least partly due to differences in the occurrence of first grab samples on each day.

- Differences in concentrations between the wet/hot and dry/cold seasons were not significant.

- Visual/olfactory assessments appeared to be able to discriminate a threshold-value of TSS (visual) and possibly TSS, ammonia, and TKN (olfactory). During Task 4, the assessment protocol was refined to use more standardized terminology.

- The Hach DR/890 colorimeter showed good agreement with laboratory nitrate and ammonia measurements and less so for ortho-phosphate compared to total phosphorus. In all cases there was an indication of between study-phase variability. To address these issues the recording forms for Task 4 were revised to better capture dilution and conversion factors.

- Taylor kits provided good agreement with laboratory measurements for total alkalinity. Task 4 relied largely on Taylor kits for this measurement, with some additional laboratory measurements for confirmation. Chlorine measurements by Taylor kit could not be independently assessed. They were utilized occasionally during the implementation of Task 4 to assess the effectiveness of chlorination devices.

2.1.1.2 Quality Assurance Project Plan

A Quality Assurance Project Plan (QAPP) was approved for this project which lays out the methodologies, procedures, and other requirements necessary for collecting field data adequate to support the assessments of operational status and reduction of contaminant loads (Florida Department of Health 2011). This QAPP provided a clear method to obtain data to help quantify the reduction of pollution from different types of advanced onsite systems to the environment and to assess the operational status of systems under the current management system.

2.1.1.3 Site Selection

2.1.1.3.1 General Site Selection

The database of advanced systems described in Section 1.3 provided an inventory of systems to select from for further permit review, site assessment, and sampling. Most sites were selected as a random sample from the inventory, while others were chosen to ensure that a variety of technologies were part of the sample population. The distribution of these sites generally aligned with the distribution of advanced systems in the state, with counties that have the most advanced systems having the highest representation in the random sample.

A total of 1,014 systems were selected for sampling (

Table 7). These are broken up into six sample groups. Five hundred eighty six systems were selected based purely on a random sample taken from all of the systems (Figure 4). For those records where sufficient information existed, treatment component technologies have been categorized and this information linked to the system record based on the type of technology installed (Table 6). The treatment technologies have been grouped as either: unsaturated fixed media, combined media, and extended aeration. Additionally, aeration technology for combined media and extended aeration was subcategorized into diffuser and aspirator approaches. Records were selected to represent each of the different technology approaches. Numbers of samples for each manufacturer were proportional to the logarithm of the number of systems in the same category. The record selection used a similar approach as the overall random sample, by selecting the records with the lowest n random numbers that fulfilled the criteria. A total of 210 systems (70 from each of three technology approaches: unsaturated fixed media, combined media, and extended aeration) were selected based on technology, with 112 systems coming from the initially selected random sample, and 98 systems selected based on their technology type. Two hundred and four additional systems were selected based in a second round of random sampling. These additional systems were necessary after performing detailed permit reviews which revealed that a large number of systems (~60%) were not an active advanced system (i.e. they were either abandoned, a conventional system, connected to sewer, etc.) A few additional systems were assessed to gather data on monitoring points beneath the drainfield, account for misidentifications, and assess a couple of conveniently located additional innovative systems.

Table 7. Systems Selected for Sampling

	Frequency
N	**15,581**
Y	**1,014**
Y-initial random sample	586
Y1-additional technology sample	98
Y2-sample for initial random sample and technology	112
Y3-second round of random samples	204
Y4-additional systems	7
Y6-drainfield monitoring samples	7
Total	**16,595**

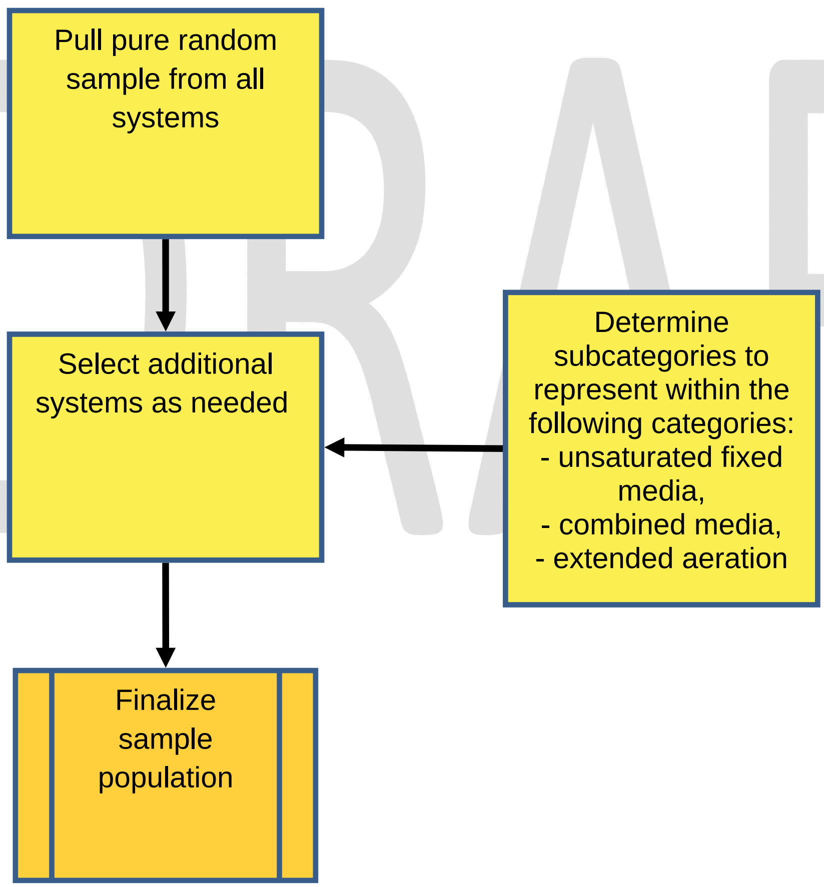


Figure 4. Site Selection Flowchart

The project target of about 600 effluent samples allowed for 95% confidence that the median is between the 46th and 54th percentile of measured effluent concentrations. About 600 samples also will allow estimation of the 10th and 90th percentile within 2.5%. Additionally, approximately 100 additional systems are targeted to evaluate differences in treatment technologies, resulting in a total target of 700 effluent samples. Information on the random system selection augmented by a stratified random sample for treatment technologies is shown in Table 6.

2.1.1.3.2 Selection of Sites for Assessment of Variability of Performance

Variability of effluent and influent quality was assessed for a selection of volunteer systems for which access to the system was available for both influent and effluent. These systems were solicited from the general sample population (Section 2.1.1.3.1). During the start of the general sampling efforts, homeowners were given a survey to complete and return regarding their use of the system (Appendix C of the project's Quality Assurance Project Plan). One of the survey questions asked if the owner would like to volunteer the system to be sampled periodically throughout the year. Those that answered yes to this question and met the requirements for having access to the influent and effluent were selected. Utilizing systems that had already been sampled under the general sampling effort made the sampling to assess variability of performance more efficient due to the overlap. This overlap streamlined this task as additional file reviews were not necessary. Systems that were located in close proximity to each other which had easy access for sample collection were also selected to be sampled.

2.1.1.4 Permit File Review

2.1.1.4.1 Obtaining Permit Files

System information was gathered for each of the selected site locations. This information came mainly from county health department permit files, the Department's Environmental Health Database, and the online SepticSearch website. The following documents about the construction and operating permitting history were collected to provide information on the system, and information was entered into the database associated with this project:

1. Construction Permit Application (DH 4015 p1)
2. Site Evaluation (DH 4015 p3)
3. Construction Permit (DH 4016 p1)
4. Final Inspection Documents (DH 4016 p2)
5. Site Plan
6. Engineer Design Drawing (if applicable)

7. As-Built
8. Operating Permit
9. Operating Permit Application (DH 4081)
10. Maintenance Entity Contract
11. Checklist used while conducting CHD inspections (if applicable)
12. Checklist of all activities associated with file (if applicable)
13. CHD Inspection Reports
14. ME Inspection Reports
15. Enforcement Action (if applicable)

For PBTS and Innovative Systems Only:

1. System Design Calculations
2. System Design Criteria
3. Whether soil was used as part of the treatment system
4. Contingency Plan
5. Certification of Design
6. An Operation and Maintenance Manual
7. A cover letter addressed to CHD stating the applicant’s intent to apply for a performance-based treatment system

An email was sent to the environmental health director for each county health department requesting this information. Follow-up emails were sent if some of the documents were omitted or if no initial response from the data request was sent. This information was documented in the database. Some counties (i.e. Brevard, Charlotte, Monroe) had scanned permit information available online. This allowed for easy access to the files, but at times the data request became limited to the information that was scanned (i.e. current maintenance contracts, operating permits, etc. were not added to the online system).

2.1.1.4.2 Data Organization

Once the files were received, they were scanned electronically and organized alphabetically by county and then numerically by the unique system ID number assigned for each system.

2.1.1.4.3 Data Entry

Initially, an assessment was done to see if all requested permit files were received. Files that were sent as incomplete were noted in the database and were evaluated as a part of the assessment of the county management practices in Section 2.2.

The database forms (Appendix D) were constructed to show basic identifying information about each property at the top (i.e. address, permit number, system ID). Then there are six tabs that can be clicked on to go to different data entry screens: record inquiry status, construction permit review, operating permit review, PBTS review, treatment train, and file review status. The tables that contain the data shown in the form were originally populated with information gathered from EHD and Carmody when available.

Below are instructions regarding data entry for each of the tabbed data entry forms:

1. Record Inquiry Status Data Entry
    a. Check to see that the address and permit numbers are correct. If not, fix it and fill out the box with the “Permit number change?” checkbox in it.
    b. In the Record Inquiry section, complete the information regarding how many attempts were made to obtain data.
    c. Click to check the red “Record Inquiry Complete?” box once the permit files have been obtained.
    d. Fill out the status, system treatment category, and any comments.
    e. For the “List of Requested Documents Received” section, if there is any “construction permit information available” or “operating permit information available” check the appropriate boxes. The Required Documents will become checked as data is filled out in other tabs.
    f. Check any of the other boxes on the right side of the “Comments on file search” box when appropriate.
2. Construction Permit Review
    a. Most of this is fairly self-explanatory; each section corresponds to one of the DOH standard forms.
    b. In the final inspection box:
        i. Check “Changes to final system approval” if there was data in the fields originally and any of the information was incorrect or missing.

ii. "Drainfield dosing" will be a yes or no answer

iii. "# of Dosing Pumps" will be 0 if there is not there. Leave it blank if a determination cannot be made.

iv. There are two places on this form where calculators have been inserted to assist in data entry. One is in the Final inspection box if the CHD just put DF dimensions and it needs to be calculated to square feet, and another is in the Site Evaluation box to convert to inches if the CHD entered the elevations in feet. Data in these calculation boxes are not stored.

3. Operating Permit Review
    a. Most of this is fairly self-explanatory.
    b. In the Operating Permit box, make sure to check the box "Operating permit current?" only if the permit has an expiration date that is AFTER 6/30/10 AND the permit was issued BEFORE 9/30/11.
    c. In the Maintenance / Inspections box, check to see that the "Effective date…" is the same as the "Calculated number". If not, change the "Effective date" to match what is in "Calculated number".
    d. Check the appropriate boxes on what inspections were done within 1 year of the date in the "Effective date of previous OP permit year completed" field (i.e. if the calculated number is 8/2/2009, the number of CHD and ME inspections that were done between 8/2/2008 – 8/2/2009 would be entered).
    e. Enter the most recent ME inspection date in the "Last ME Inspection" date field.
4. PBTS Review
    a. If this permit is for a PBTS, you will hear a ding and a red PBTS will appear in the top right of the form, viewable from all pages. This is to remind you to fill out this form. This is pretty self-explanatory, just remember to fill it out if appropriate.
5. Treatment Train
    a. Enter in any of the information that is known for this unit based on the information at hand. ONLY enter data in the YELLOW highlighted fields.
6. File Review Status:
    a. When all available data for this record have been reviewed, go to the "File Review Status" tab, type in the name of the reviewer in the "Final File Review by" field, the date the review was done, and any comments.

If a permit file review revealed that the system should not be included in this project, e.g., because it is not an advanced system or because it has been abandoned, then this was noted in the project database. Similarly, it was noted in the database if the permit file could not be located.

2.1.1.4.4 Data Quality Control

Each record underwent a quality control review. This review was mostly done by someone other than the data enterer, and was someone with extensive knowledge of the project database and project goals. Comments could be made by the quality control reviewers on each of the sub forms if necessary. An assessment of the results of the quality control was done indicating whether the data entry agreed with records, missed some fields, had data entry errors, or both missed fields and had errors.

2.1.1.5 Selection of Samplers

Samplers were solicited from various county health departments based on interest and density of advanced systems. Samplers were selected from Monroe, Charlotte, Lee, Volusia, and Wakulla counties. The Volusia County samplers sampled both Volusia and Brevard counties. The Wakulla County sampler was to handle sampling all the systems that were not within the county boundaries of Monroe, Charlotte, Lee, Volusia, and Brevard. All samplers were trained by the Quality Control Officer or by someone trained by the QC Officer. A Schedule C State Funding Increase was developed for each of the counties involved, outlining the tasks and funding amount. Funding was provided to conduct inspections and samplings of onsite sewage treatment and disposal systems in accordance with the QAPP. This was a cost reimbursement agreement based on actual salaries, fringe benefits, and other/supplies costs. It was anticipated that it would take a sampler approximately 2-3 hours per system, which was reassessed as needed based on actual numbers. Monitoring results were forwarded on an ongoing basis.

2.1.1.6 Selection of Labs

Table 8 shows a summary of the different laboratories used, which area of the state the samples came from, and how many samples were analyzed by type.

Table 8. Laboratories Used and Number of Samples Analyzed By Type

Lab Name	Sample Origin	Number of Samples					
		TP	CBOD5	TSS	Total alkalinity	TN	Fecal Coliform
Xenco / Florida Testing Services	Statewide	1130	1775	1775	30	1775	90
Ackuritlab	Tallahassee Area	0	0	0	0	0	26
Benchmark	Charlotte County	0	0	0	0	0	110
CH2M Hill - OMI, Inc.	Monroe County	0	0	0	0	0	15
Volusia County Health Department Environmental Health Laboratory	Volusia County and Brevard County	6	6	6	0	6	101

2.1.1.6.1 Xenco / Florida Testing Services LLC

The process for selecting a lab to conduct the main sample analysis portion of this project involved advertisement of an Invitation to Bid (ITB). The number assigned to the ITB was DOH 09-054 which was publicly advertised in the State of Florida Vendor Bid System.

The ITB required the successful lab to provide NELAP-certified analytical laboratory services to the Florida Department of Health for carbonaceous biochemical oxygen demand (CBOD5); total suspended solids (TSS), total nitrogen (TN), total phosphorous (TP), occasionally at the option of the department, fecal coliform and total alkalinity. It was anticipated that the number of TP analyzes were approximately half of the number of CBOD5, TSS and TN analyses, and that fecal coliform and total alkalinity analyses would rarely be requested.

Fifteen responses were received to the advertised ITB, and the lab that matched all of the criteria that also provided the lowest price was selected (Xenco / Florida Testing Services LLC). A blanket purchase order was created outlining the required services.

2.1.1.6.2 Fecal Labs

The process for selecting labs to conduct the fecal sample analysis involved contacting various labs within “hotspot” areas (i.e. Charlotte, Lee, Volusia, Tallahassee, and three regions in Monroe) and selecting the most affordable one within the area. A purchase order was issued outlining that the laboratory must comply with all NELAP accreditation requirements, analyze samples for fecal coliform per SM 9222 D, and provide sample bags. DOH was to deliver samples to the lab based on feasibility of sampling and delivery within the six-hour holding time.

2.1.1.6.3 Other Labs

The Volusia County Health Department Environmental Health lab also provided quality control check for the Xenco / Florida Testing Services lab. A limited number of samples were sent to both labs and were sampled utilizing the same methods to quantify consistency.

2.1.2 Sampling Process

2.1.2.1 General Field Work Procedures

The general field work procedures are outlined in the QAPP associated with this project (Florida Department of Health 2011) and are in line with FDEP's standard operating procedures (SOPs). Standardization for each sampler was performed during joint site visits with the quality assurance officer or a previously trained staff.

2.1.2.2 Activities Prior to Site Visit

Prior to the site visit, the sampler made necessary preparations regarding planning trip routes, determining the appropriate receiving lab(s), obtaining sample containers and chain-of-custody forms, etc. Specifically the following activities were conducted:

General

- Print assessment forms for the site as listed in Appendix B, C, and D of the QAPP
- Print calibration forms for field measurements as listed in Appendix E of the QAPP
- Obtain site plan with system information if available
- Obtain treatment system manufacturer's manual
- Determine shipping locations and times for laboratory samples
- Determine availability of laboratory for fecal coliform analysis
- Obtain sampling containers from respective labs. Florida Testing Services, LLC, dba Xenco Laboratories, will provide intermediate sample containers and all required sample containers with preservatives as necessary, and deliver to FDOH. Suitable local labs will supply sampling containers for fecal coliforms.
- Obtain supplies for field screening and cleaning and ensure equipment is clean
- Plan trip

Within one week of anticipated site visit:

- Contact County Health Department if applicable
- Coordinate with County Health Department on customary notification of owner/maintenance entity if applicable
- Review system information
- Obtain status of operating permit and maintenance contract and confirm dates of last two maintenance inspections and last county health department inspection for the site
- Coordinate with CHD if CHD-inspector will participate in site visit if applicable

On the day of the site visit

- Calibrate or verify continuing calibration of field measuring devices according to applicable FDEP SOPs (FT 1000-FT 1500) and procedures outlined in the QAPP (can occur at the site).

Monroe and Volusia Counties sent out notification letters to all of the selected sites to help streamline the sampling. These notification letters outlined that the system was randomly selected for assessment and sampling along with some background information about the onsite sewage program. The system owner or user was directed to contact the county health department if they did not wish to participate in the sampling project. Generally, there were very few that did not want to be a part of the sampling effort.

2.1.2.3 Equipment Cleaning

Details regarding the specifics of equipment cleaning are outlined in the QAPP (Florida Department of Health 2011). Two levels of cleaning are distinguished for this project:

1. Cleaning at the temporary base of operations (e.g., a county health department, hotel, or other accommodation). These cleanings will be documented in the field notebook, including the documentation requirements in FC 1000.
2. Field cleaning at a site and traveling from site to site.

2.1.2.4 Site Visit and Initial System Assessment

The core element of this project is the assessment of system functioning by visiting the sites and evaluating their operation both qualitatively and quantitatively. Upon arrival at a site location, an assessment of the system was made using the initial system evaluation form (Appendix C). The information on this form was gathered based on observation, without accessing the sewage or opening of tanks. In this way the information is comparable to what is obtainable using the procedures of many county health departments. The initial system evaluation form incorporates elements of checklists developed by the Consortium of Institutes of Decentralized Wastewater Treatment (http://www.onsiteconsortium.org/omspchecklists.html), and guidance given by the Onsite Sewage Programs Section for the Florida County Health Departments.

The location of the tanks were determined by referencing site plans obtained during the permit review. A visual assessment was done to locate all components shown on the site plans. If the system does not appear to exist then the sampler documented this and proceeded to the next site. If the system appeared to be temporarily inaccessible, the sampler may have returned at a later time if this was feasible based on work in the area.

During this assessment, the sampler made a determination if the sewage was accessible. This determination will depend on the construction of the system and may depend on the presence of a maintenance entity that can assist with opening locked access covers.

2.1.2.5 System Use Survey

A survey was distributed as samplers visited sites. A cover letter provided the system owner/user with some basic information about the project, a copy of the survey, and an envelope for them to mail the survey back to the project staff. The survey was to be handed to the system owner/user at the time of sampling, or left on the door. A total of thirty-eight questions were included in the survey and gave DOH various aspects of how an advanced system owner uses their system (see 0 for a copy of the survey and cover letter). The survey was developed to give a better understanding of the use of the system and how that may affect the quality/quantity of the effluent leaving the system.

2.1.2.6 Operational Assessment

Where sewage and/or the interior of tanks are accessible, the sampler performed a more detailed assessment and took samples. The assessment was done using the system operation evaluation form (Appendix C). This operational assessment form incorporated elements of checklists developed by the Consortium of Institutes of Decentralized Wastewater Treatment (http://www.onsiteconsortium.org/omspchecklists.html), and experiences gained during the sampling in the Keys performed during the validation phase of this project (Section 2.1.1.1).

The general order of accessing sewage with sampling or measuring equipment will be from the effluent to the influent to minimize potential for cross contamination. Exceptions to this may occur when a sampling port is empty and water addition to the influent is needed to establish flow to the sampling port. Such an addition introduces the potential for diluting the influent. In such a case the influent, if accessible, may be characterized first, the equipment rinsed and the effluent characterized subsequently.

The operational assessment elements are described in the following subsections.

2.1.2.6.1 Visual Assessment of the Interior of the Tank or Compartment

After the access was opened, the sampler visually observed the interior of the tank, primarily to see if there is evidence for operational problems, the tank being damaged, and signs of leaking or of non-sewage water being added. The results are recorded on the operational assessment form (Appendix D of the QAPP).

2.1.2.6.2 In-situ Measurements

All in-situ data measurements of temperature, pH, dissolved oxygen (DO), specific conductance (SC), and redox potential (ORP) was achieved with a YSI model multi-parameter device. This instrument (one for each sampling region) included probes for dissolved oxygen, pH, specific conductance, and oxygen reduction potential, and provided related measures for salinity and dissolved oxygen saturation. To obtain measurements, the sampler slowly lowered the probe into the water so that the top of the instrument was between two and eight inches below the water level, which resulted in measurements taken between approximately six and twelve inches below the surface. However, if there was a scum and/or sludge layer thicker than about an inch, the sampler targeted the instrument to take measurements in the clear zone. The direction of measurement points was generally from effluent to influent. Additional details on these in-situ measurements, including equipment calibration procedures, are described in the QAPP. Results were recorded on the operational assessment form in Appendix D of the QAPP.

2.1.2.6.3 Sampling

Systems that were accessible, had an adequate volume of wastewater, and were powered on were sampled in accordance with FDEP SOP’s (FS 1000 and 2400). Samples were analyzed for cBOD5, TSS, TKN, NOx, TN, TP, and sometimes fecal coliform. Wastewater sample collection is described in Section 2.1.2.7. Where sewage was accessible, the sampler took samples for on-site or laboratory analysis. The samples were for:

- Effluent analysis

- Influent analysis
- Aeration chamber assessment
- Tap water analysis

The effluent and influent analysis and sampling requirements are described in more detail in Section 2.1.2.7. Effluent sampling was generally performed before any sludge judging (Section 2.1.2.6.4) to avoid stirring up of sludge. Systems that were powered off were also sampled to establish effluent concentrations from non-operating systems.

Influent sampling was generally performed after sludge judging (Section 2.1.2.6.4) established where the clear zone is.

The aeration chamber assessment consisted of taking a sample, assessing the color of the biomass, and observing the settled sludge volume of the mixed liquor.

Tap water samples were taken to characterize specific conductance, alkalinity and nutrient content in the water that is carrying the wastewater for several sites at which influent samples were obtained.

2.1.2.6.4 Sludge Judge

Depending on access, the sampler measured the thickness of scum, clear, and sludge layers in the water column. This measurement was performed in all accessible compartments, unless visual inspections indicated that there are no scum and sludge layers, or the sampler was concerned that the measurement might interfere with treatment components. Sludge judge equipment was used to assess the thickness of the scum and sludge layer.

2.1.2.7 Wastewater Sample Collection

The FDEP SOPs FS 1000 “General Sampling” and FS 2400 “Wastewater Sampling” guided the sampling efforts. About two liters of sample were needed for all analyses. All samples collected during this project consisted of only grab samples. A grab sample reflects performance only at the point in time that the sample was collected. The QAPP outlines the specific requirements for sample container preparation, determination of the sampling point, collection of the sample, preparation of the sample for shipment to the lab, and sample handling and custody.

2.1.3 Analytical Methods

2.1.3.1 Laboratory Analytical Methods

Table 9 provides a listing of the water quality parameters to be sampled for laboratory analysis along with the analytical methods, preservation requirements, and sample holding times. Fecal coliform samples may be analyzed either by the same lab or by another NELAC-certified lab, depending on the feasibility of getting samples there within the holding time. The fecal coliform samples will be hand delivered to NELAC certified Laboratories throughout the state.

Table 9. Laboratory Sample Analysis Parameters

Parameter	Method	Method Detection Limit	Laboratory	Holding time	Preservative
$CBOD_5$	SM 5210B	2.0 mg/L	FTS	48 hrs	Cool, 4^oC
TSS	SM 2540D	3.5 mg/L	FTS	7 days	Cool, 4^oC
TKN	EPA 351.2† or SM4500-NH3C (TKN)	0.0867 mg/L	FTS	28 days	H_2SO_4
NOx-N	EPA 353.2† or EPA300	0.05 mg/L	FTS	28 days	H_2SO_4
TP	EPA365.1 or EPA365.3	0.055 mg/L	FTS	28 days	H_2SO_4
Fecal Coliform	SM 9222D	1cfu/100 mL	Various	6 hrs	$Na_2S_2O_3$
Total Alkalinity	SM2320B	2.2 mg/L	FTS	14 days	Cool, 4^oC

FTS = Florida Testing Services, LLC

†Revision 2.0, 1993, will be used.

2.1.3.2 Field Screening Analytical Procedures

The QAPP outlines various procedures associated with conducting field screening activities such as the settled sludge volume test, protocols for obtaining visual/olfactory information, collection of titration measurements, colorimetric methods using the Hach DR/890 unit, test strip use, and any other evaluations that were used.

2.1.4 Quality Control

2.1.4.1 Laboratory Quality Control

Table 3 of the QAPP presented the data quality objectives of the laboratory chemical analysis. The laboratory quality control resulted in assessments if data needed to be qualified. The laboratories provided the results both in electronic report and electronic tabular form.

The electronic tabular data did facilitate data processing. Imported results were checked for accuracy and completeness. Occasionally fields did not align and were manually adjusted. On occasion reports included a result of 0 for samples that were below the detection limit (“U”). These results were manually changed to the provided detection limit (reporting limit for cBOD5). The qualifiers reported by the lab allowed an assessment of how many samples did not meet quality control standards of the lab.

For cBOD5, the project operating procedures did not call for the analysis of blanks, and so only a small number of blanks were analyzed. We distinguished between samples that did not have any problems, “J” codes that indicated that the laboratory had encountered problems that led to a qualification of results, a few samples with “Q” codes indicating exceedance of holding times, and “MDL_increases” where under-depletions compared to the expectations of the laboratory based on chemical oxygen demand analyses resulted in an increased detection and reporting limit.

2.1.4.2 Field QA/QC Samples

QA/QC for laboratory chemical analyses consisted of two parts: assessments of the quality of the lab, and assessments of the quality of the field work (see sections of the QAPP). Blank samples (field blanks, field equipment blanks, and pre-cleaned equipment blanks) provided controls for cross contamination in the field and lab. For an overall assessment, we followed two approaches:

We determined for the different types of blanks how frequently the detection limits were exceeded. If the detection limit was exceeded, we looked further if the exceedance was large relative to typical values of concentrations. As a substitute for a comparison with 10% of individual sample results, we used fixed values for each parameter (0.5 mg/L for TP, 1 mg/L for nitrogen species, and 5 mg/L for TSS), and if the result did not exceed that value, we qualified it as “H”.

While more than 5% of chemical analyses consisted of various blanks, not every sampling event included a blank. Building on the analysis of blanks we assessed for each sample if it was bracketed by acceptable blank results. For this purpose, all samples were grouped into regions, based on groups of samplers and sampling equipment. For each sample result in a region we assigned a quality based on surrounding blanks: “pass” if the current event or both surrounding blank quality control samples did not exceed the method detection limit, “H” if at least on of the blanks exceeded the MDL but was within acceptance limits, and “fail” when at least one of the surrounding blanks exceeded acceptance limits. A secondary qualifier introduced was the result qualifier, such as “J” for the particular analytical result itself, and if the sample result showed lower concentrations than the MDL or the acceptance limit. We also looked for patterns of when blank results were high.

Few cBOD5 blanks were analyzed because the QAPP did not call for that. Results indicating non-detection at elevated detection limits were frequent, and other data qualifiers occurred as well. For this parameter, we are reporting results of evaluations of individual sample results.

In addition to blanks, we took field duplicate samples for analytes other than total alkalinity. The objective was that at least 75% of duplicates for each analyte would have a relative deviation of less than 20%.

2.1.4.3 Field Procedures Quality Control

All field work by samplers was performed in accordance with the procedures outlined in the QAPP or referenced as FDEP SOPs. For field screening methods, between-analyst precision will be assessed by comparing concurrent results by two different samplers on the same samples for at least five samples and five sites.

2.2 Evaluation of Management Practices

One objective of this project is to assess management practices in order to find successful examples. The following data was collected as part of this project: past county program evaluations; the permitting, inspection, and maintenance records from systems selected for sampling; results from a survey that was sent as a part of this overall project to gather information from different stakeholder groups; and any information regarding the procedures that the county health departments use.

2.2.1 County Program Evaluations

Past county program evaluations and permit records were electronically stored to facilitate a quantitative means of assessing management practices.

A system of program evaluations was developed by the Department of Health to ensure consistency between county health departments in implementing the onsite sewage program and to identify additional staff training opportunities. The evaluation is performed generally every three years by Onsite Sewage Program staff. Program evaluation tools are recorded in an Excel spreadsheet and generate an overall score and component scores based on findings. This project looked at the overall score and at the scores for ATU operating permits, PBTS operating permits, and maintenance entity service permits.

The program evaluation tool is periodically revised to incorporate rule or other changes. For advanced systems, the tool currently focuses on documentation of permitting processes. Since the dropping of an ATU sampling requirement in 2001, the criteria have remained fairly consistent, with only a recent addition to assess PBTS operating permits separately.

A summary of evaluations completed during 2000 to 2010 provided historical data which was used as a baseline to identify common trends within a particular county and determine if there was a systematic trend. Capturing this information played a critical role in determining the strengths and weakness within the local county health department management practices. These data allow for an evaluation of which counties manage this program “best” in regard to consistency and completeness of documentation requirements. This later becomes an input to identify best management practice recommendations in Section 4.1.1.

2.2.1.1 Permit File Review Relative to Program Evaluation Criteria

The review of system files collected as described in Section 2.1.1.4 included a collection of certain data fields that were also included in the program evaluation tool to evaluate documented management practices. The particular components of the 2009-2011 program evaluation tool that were used with this project are those relating to ATU operating permits and PBTS operating permits. This will allow the scoring of project records to be standardized for comparison with historical records. Questions that are answered with this data review are:

- Is the current operating permit on file?
- Is the original operating permit application on file?
- Is there an inspection report completed by the CHD for a completed permit year?
- Is there an initial inspection report completed by the ME for a completed permit year?
- Is there a second inspection report completed by the ME for a completed permit year?
- Is the current ME contract on file?
- Are there monitoring requirements? [Only applicable to PBTS permits]

2.2.1.2 Procedures of County Health Departments

More qualitative observations on the inspection protocols used by counties and on enforcement steps taken, if applicable, were obtained. The permit file review will allow gathering of information on the forms used during County Health Department inspections and on documented enforcement. Additionally, during the site visits, project staff had the opportunity to gather data to allow comparison of CHD-staff protocols relative to the procedures used during this project.

2.2.2 User Group Surveys

A series of surveys were created by FDOH personnel and distributed and analyzed by Florida State University's Survey Research Lab (FSU-SRL) to various user groups as one of the tasks in the overall project. The objective of the user group surveys was to allow a representative sample of several user groups to voice their views and opinions as well as to measure the practices and perceptions of these user groups about the management of advanced onsite systems. These user groups consisted of system owners and users, system manufacturers, maintenance entities, system engineers, septic tank contractors, and department of health regulators Survey questions included both some that were targeted to specific user groups as well as some overlapping questions, where appropriate, to gauge differences between the groups on specific issues. Systems that were selected for sampling included a notation in the database on whether the system owner was sent a survey and whether a completed survey was sent back. About 1,000 of these surveys were returned as undeliverable. This was mainly because the address was sent to the property that had the advanced system to capture as many users as possible. Many systems are not owner-occupied residences, are vacant, or do not have a mail receptacle at the physical address. The survey letters were re-addressed to the actual property owner after querying various county property appraiser databases.

FSU-SRL sent a total of 3,793 surveys to a stratified random sample of system owners/users and 660 completed surveys (17.4%) were returned. The sample was based on the type of system (ATU, PBTS, or Innovative) and the use of the system (Residential, Commercial, or Unknown). The addresses stemmed from an intermediate development stage of the inventory database that allowed stratification according to if the system was an ATU or a PBTS and if the facility served was residential or commercial.

FSU-SRL sent surveys to all county health departments, and all installers (septic tank contractors), maintenance entities, and engineers for which the department had contact information from licensing or permitting files. Results (Completeness and QC results)

3 Analysis

3.1 Permit File Review

3.1.1 Summary Statistics

Permit file review showed many converted to sewer (almost 50% for Monroe) or was not an advanced system.

[THIS SECTION STILL NEEDS TO BE EVALUATED]

3.1.2 Quality Assurance Results

3.2 User Group Survey Results

Table 10 shows the results of the total population of surveys, the number that were sent, the number of surveys that were completed, and how many of those surveys were applicable to the project (i.e. they indicated that they had something to do with advanced OSTDS).

Table 10. User Group Survey Response Numbers

Sent to:	Population	# Sent	# Complete	# Applicable
System owners and users	16,802	3,793	660	660
Regulators	67	67	67	56
Installers	709	709	61	26
Maintenance Entities	226	226	33	33
Manufacturers	118	118	16	11
Engineers	164	164	19	13

3.2.1 System Owner and User Survey Results

Table 11 shows the overall distribution of the system owner and user population. Most of the surveys returned were by full-time residents that owned the home with the advanced system and for systems serving less than 4 people. Fifty-one percent of the people that returned a survey were located in the following counties: Monroe (17%), Brevard (13%), Charlotte (12%), and Lee (9%). Sixty percent of the responders had a college degree or higher, and 17% have a high school degree or less. Fifty percent reported a total household income of over $85,000.

Table 11. System Owner and User Population

	# Sent	% of Total Population	% Completed
All types of systems	**3793**	**27.9%**	**17.4%**
ATU's	**2378**	**19.6%**	**18.9%**
ATU Residential	1279	14.8%	18.5%
ATU Commercial	549	100.0%	18.2%
ATU Unknown	550	18.6%	20.5%
PBTS	**1231**	**100.0%**	**15.8%**
PBTS Residential	1044	100.0%	18.2%
PBTS Commercial	31	100.0%	12.9%
PBTS Unknown	156	100.0%	0.6%
Innovative	**184**	**100.0%**	**8.2%**
Innovative Residential	175	100.0%	8.6%
Innovative Commercial	9	100.0%	0.0%

Seventy-nine percent stated that they had an ATU, 8% had a PBTS, 1% had an innovative system, and 7% did not know what type of system they had. Fifty percent of the responders knew their system manufacturer. Fifty-eight percent of systems were installed within the last five years.

Fifty-five percent reported never experiencing problems, thirty-three percent reported experiencing problems once or twice within last year, and eleven percent experienced problems several times. The major sources of problems were system malfunctions such as pump failures, electrical malfunctions, faulty alarms, and bad motors. Almost half of the responders used septic tank contractors or plumbers to fix problems, 35% relied on maintenance entities, while 10% report fixing the problems themselves.

Figure 5 shows how satisfied system owners/users were with their systems, with 79% being either very satisfied or satisfied. Table 12 shows a comparison between owner/user satisfaction and their reported annual income. Many of the responders did not fill in any information for annual income. In looking at differences in satisfaction based on income, there appears to be a fairly even distribution which indicates that income level may not influence satisfaction. Fifty-nine percent of the system owners and users would prefer to hookup to a municipal/county sewer system if the cost were equal. Figure 6 shows the breakdown of what the greatest advantages are for having an onsite system. The breakdown was pretty even among the categories, and most of the answers provided in the “other” category were those stating that there is no advantage to having an advanced system.

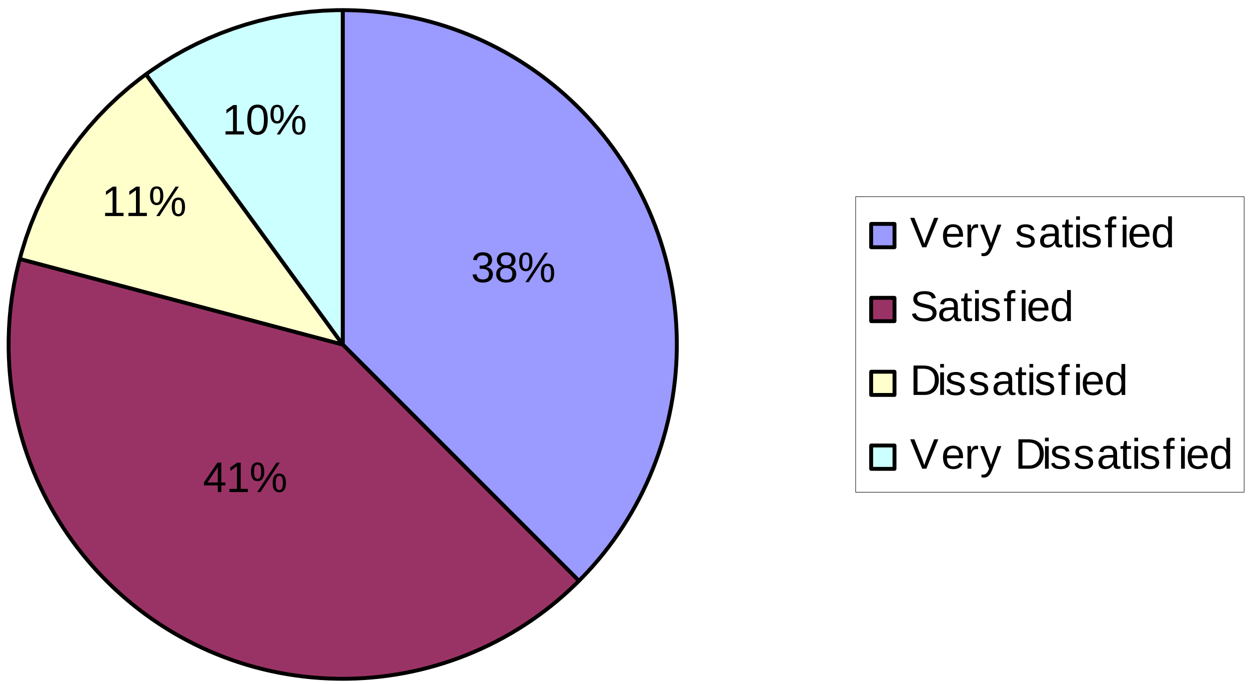


Figure 5. System owner/user satisfaction (Question: How would you describe your overall satisfaction with your advanced onsite sewage system (septic system)?)

Table 12. Comparison of system owner/user satisfaction with annual income

	Under $15,000	$15,000 to $25,000	$25,001 to $45,000	$45,001 to $65,000	$65,001 to $85,000	$85,001 to $100,000	Over $100,000	Blank	**Total**
Very Satisfied	4	3	24	29	18	27	78	51	**234**
Satisfied	7	14	23	41	20	13	79	60	**257**
Dissatisfied	1	3	5	10	7	4	22	14	**66**
Very Dissatisfied	4	4	4	9	0	6	15	18	**60**
Blank	1	0	3	1	1	2	3	4	**15**
Total	**17**	**24**	**59**	**90**	**46**	**52**	**197**	**147**	**632**

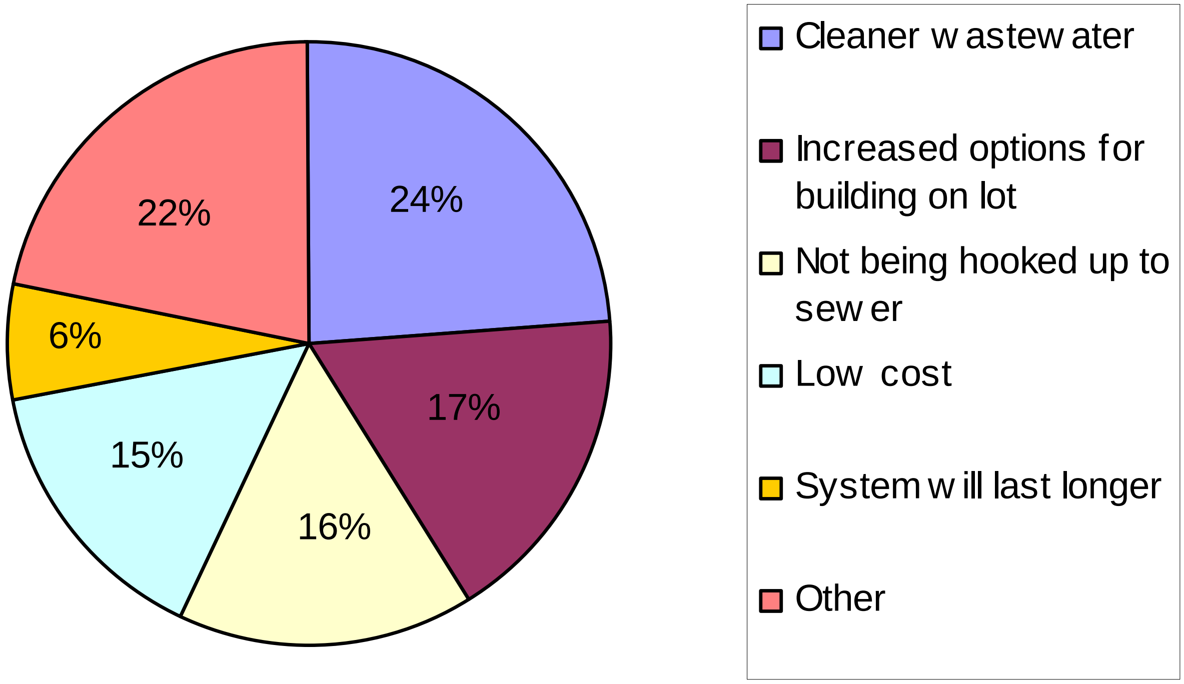


Figure 6. Greatest advantage of having an advanced system according to system owners and users

Forty-two percent of owners and users inspect their own system every few months and 25% do not inspect their system at all. Fifty-five percent reported that their maintenance entity inspects their system twice a year. Eighty-six percent reported that their maintenance entity informed them of the results of the inspection. Forty-three percent reported that they were informed of inspection results from the county health departments.

When asked about what preference they would have for receiving information from the county health department regarding OSTDS, 69% indicated their preference would be through mailed brochures. Topics of interest related to advanced systems that system owners and users would like to learn about include:

- Owner maintenance
- System performance
- Cost
- Sewer hook-up
- Environmental issues
- Permitting/regulation
- Contractors/maintenance entities
- Operating instructions

Seventy-three percent had no difficulty in finding a Maintenance Entity for their system. Fifty-five percent pay between $200 and $500 per year for operating permits and a maintenance contract. The average repair cost for the previous year was $474 and the median cost was $200 with 28% having no expenses for repairs. The system owners and users satisfaction with their maintenance entity was very high, with 32% “Very Satisfied” and 51% “Satisfied”. Sixty-seven percent of owners and users stated that they will renew their agreement with the same maintenance entity. Only 15% reported that if there were an alternative they would switch maintenance entities.

Figure 7 shows a breakdown of the US EPA Management Model (FIND REFERENCE) which goes from homeowner awareness, to a maintenance contract, to an operating permit, to having a responsible maintenance entity (RME) operating and maintenance model, to having an RME ownership model. The majority of people would rather do it or have a maintenance entity charge for maintenance in a lump sum, which are two of the lowest tiers on the management model.

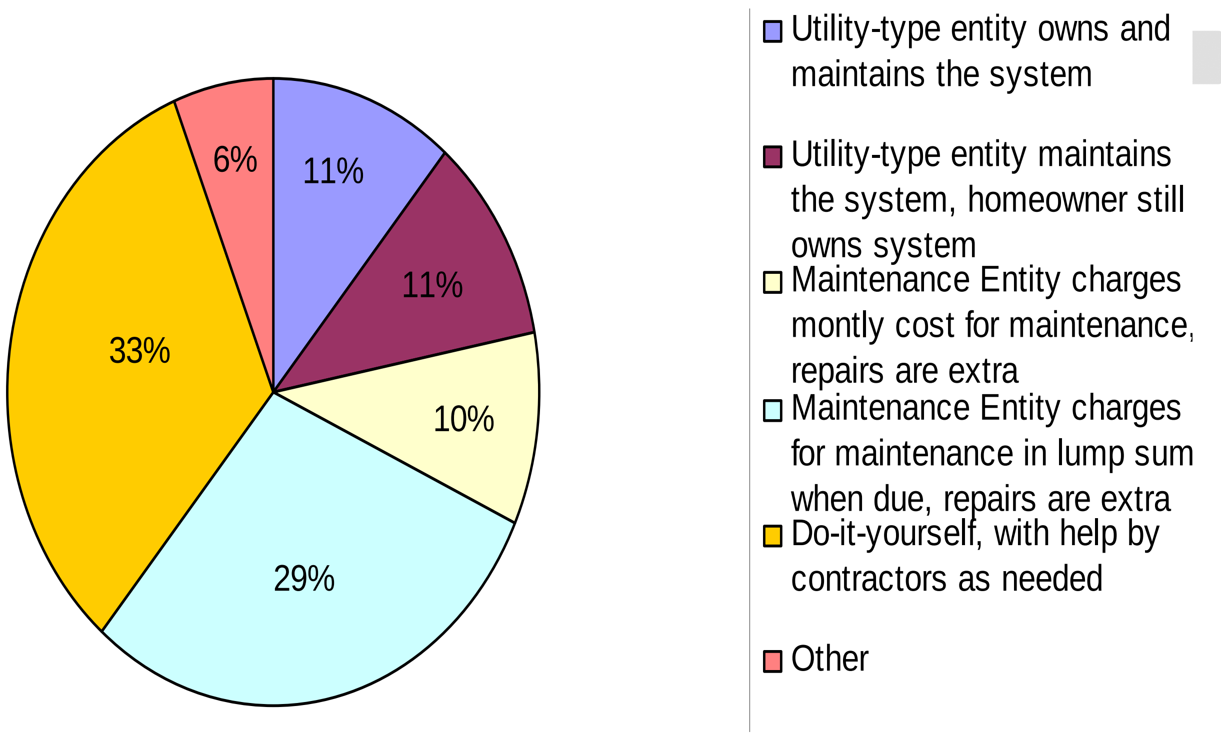


Figure 7. Who do system owners and users prefer to deal with regarding permitting and maintenance of advanced systems?

Some other results included:

- System owners and users of advanced systems in counties with the most advanced systems (Monroe, Brevard, Charlotte) reported less frequent system problems over the past year

- System owners and users who "never" experienced problems over the past year are "very satisfied" at twice the rate of those who experienced problems "once or twice"
- System owners and users who fix problems themselves are less satisfied than those who rely on others
- Cost of yearly operation and maintenance was not a factor in determining overall system satisfaction
- Fewer people using the system equals less frequent problems

Some of the suggested changes or improvements given by the system owners and users included:

- Reduce cost of system
- Fee for Maintenance Entities are too high and often times they do not come out for repairs
- Inspections should consist of more than just a visual inspection given the cost
- Consumers need more choices for maintenance entities to help drive lower costs
- Operating permits should be done annually instead of bi-annually

3.2.2 Regulator Survey Results

Figure 8 illustrates the number of advanced systems that were reported in the survey as being regulated by county health departments. The majority of counties do not have very many advanced systems.

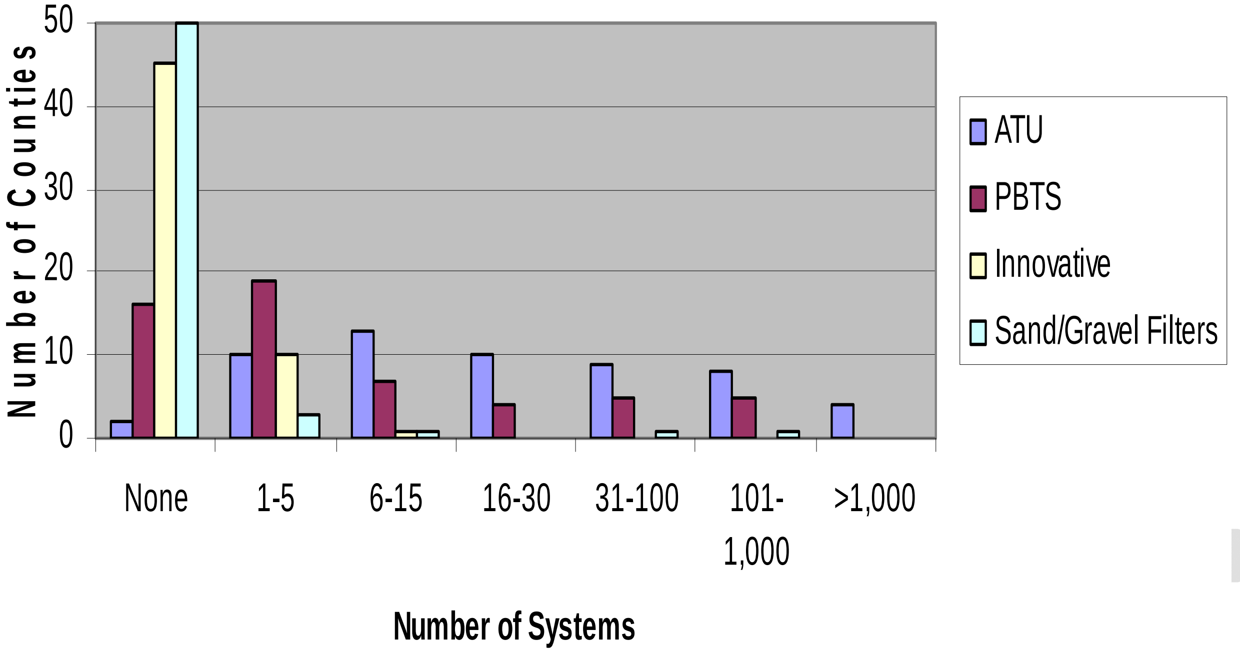


Figure 8. Number of Reported ATU, PBTS, Innovative, and Sand/Gravel Filter Systems Regulated by County Health Departments

Twenty-eight of fifty-six counties have less than one full time employee (FTE) assigned to conduct ATU/PBTS inspections, 21 counties have 1-2 FTEs, and 4 have 3-5 FTEs. Monroe County has the most with 14 FTEs for the inspection function as of the time of the survey. Thirty-nine of fifty-six counties report that turnover of inspector personnel is not a problem in their county at this time.

Thirty-three counties have between 1 and 5 contractors installing systems. Charlotte County reported the most contractors with 23. Fifty-one counties feel that the number of contractors is adequate for their county's needs. Thirty-three counties have between 1 and 5 licensed maintenance entities providing services. Sixteen counties felt that the number of licensed maintenance entities is inadequate to meet their county's needs.

Nearly all of the counties used the Environmental Health Database (EHD) for construction permit records and operating permit records. Less than ten counties indicated that they use the Carmody database to enter and maintain information. Most counties look at paper files to keep track of monitoring requirements and inspection results.

Forty-five of fifty-six counties reported that they infrequently conducted sampling on advanced systems. The reasons for this limited sampling included: sampling is not required (27 of 45), limited resources (10 of 45), limited staff (7 of 45), and visual inspections sufficient to ensure compliance (10 of 45). Thirty-eight of fifty-six counties have developed checklists to use when conducting inspections. Nearly all of the counties performed the following activities during county inspections of advanced systems:

- Check the general overall system appearance
- Check that the power is on
- Look for changes in the site conditions
- Check for any smells and/or sounds from the system
- Check for any wetness in the drainfield

Counties “rarely” found substantial changes to the permitted design during construction inspections. Most counties evaluate their own applications for ATUs and PBTS. Thirty-one of forty-four counties send innovative system permits to the State Onsite Sewage Program Engineer for evaluation. Nine counties reported having passed ordinances that require standards for advanced systems that are more stringent than those required by the state: Brevard, Charlotte, Citrus, Collier, Franklin, Manatee, Orange, Volusia, and Wakulla counties.

Twenty-one of fifty-six counties reported having had no advanced systems that required compliance enforcement action over the past year. Monroe, Brevard, Lee, Franklin, and Charlotte counties had the largest number of advanced systems that required compliance enforcement action. Paperwork issues were the most prevalent reason requiring enforcement. The most successful strategies in achieving compliance for systems needing enforcement were sending the “notice to correct” letter and by issuing citation and/or fines. Approximately 70% of all counties reported that systems in violation needed multiple enforcement actions to correct the problem.

Forty-five counties indicated that 75% to 100% of maintenance entities submit reports by paper. The majority of counties rated overall quality of maintenance entity reports as “good”. The cost of the maintenance contract and not being able to choose between several maintenance entities were the most frequent complaints received from system owners and users.

3.2.3 Installer Survey Results

The main reasons for installing advanced systems according to system installers were because of lot size restraints, environmental issues, or because the systems work well. The main reasons for NOT installing advanced systems were because of low demand, having questions about how well the work, limited profit margin, and that they like working with conventional systems.

Ninety-two percent of installers that responded to the survey reported they were a maintenance entity as well. They reported that it generally took two weeks to a month to get a construction permit from the county health department. About half of the installers that responded use the Carmody system. When asked how they keep track of customer satisfaction, the result was pretty evenly split among whether they do not keep track at all, they leave a card for customer comments, the track customer complaints that they receive, of handle it with verbal communication.

3.2.4 Maintenance Entity Survey Results

The maintenance entities that responded to the survey reported that they worked about equally on ATUs and PBTS. About 60% said customers received a copy of the inspection report. There is about an even mix between those maintenance entities that use Carmody and those that use other methods to maintain their records.

Regarding maintenance contracts, the maintenance entities stated that an annual fee of between $100-$300 is typically charged. This fee covers all required inspections and routine maintenance, with 42% of the maintenance entities stating that this fee includes sampling of the system as well.

Most common tasks maintenance entities reported performing during routine inspections were to:

- Work through a checklist
- Open covers to aerobic treatment chamber, trash compartment, and clarifier/dosing tank
- Trigger alarms and pumps
- Check air supply running
- Inspect/clean filters (effluent and air)
- Check for odors
- Check water clarity in tank and observation port
- Measure sludge accumulation
- 73% pump the tank about every 3 years
- Over 50% take effluent samples

3.2.5 Manufacturer Survey Results

Over 70% of manufacturers that responded to the survey did not sell any ATUs or PBTS during the past year. Criteria and qualifications they required for maintenance contractors were to be state certified and trained by manufacturer. The manufacturer stated that asks the maintenance contractor should do during inspection are to work through the product's checklist, open up the tanks, check for odors, and replace any non-functioning parts.

3.2.6 Engineer Survey Results

Eighty-five percent of the engineers that responded to the survey designed fewer than 5 ATUs over the last year. Ninety-two percent designed fewer than 5 PBTS over the last year. Over 90% of engineers reported that they "rarely" have to re-engineer a design. About 70% of the engineers require sampling on the systems they design.

3.2.7 Combined Group Survey Results

The response rates for installers (9%), maintenance entities (15%), and engineers (12%) were lower than for the owner/user group. More than half of the responding installers and about a third of the responding engineers indicated that they are not involved in the installation of advanced systems. This is likely a reflection of the small share that they constitute of the overall onsite sewage market as is the fact that eleven (of sixty-seven) county health departments reported not having a single advanced system installed in their county. Figure 9 shows the reported revenue that various user groups received from advanced systems. This figure shows how small of a proportion advanced systems are to these groups regular revenue stream.

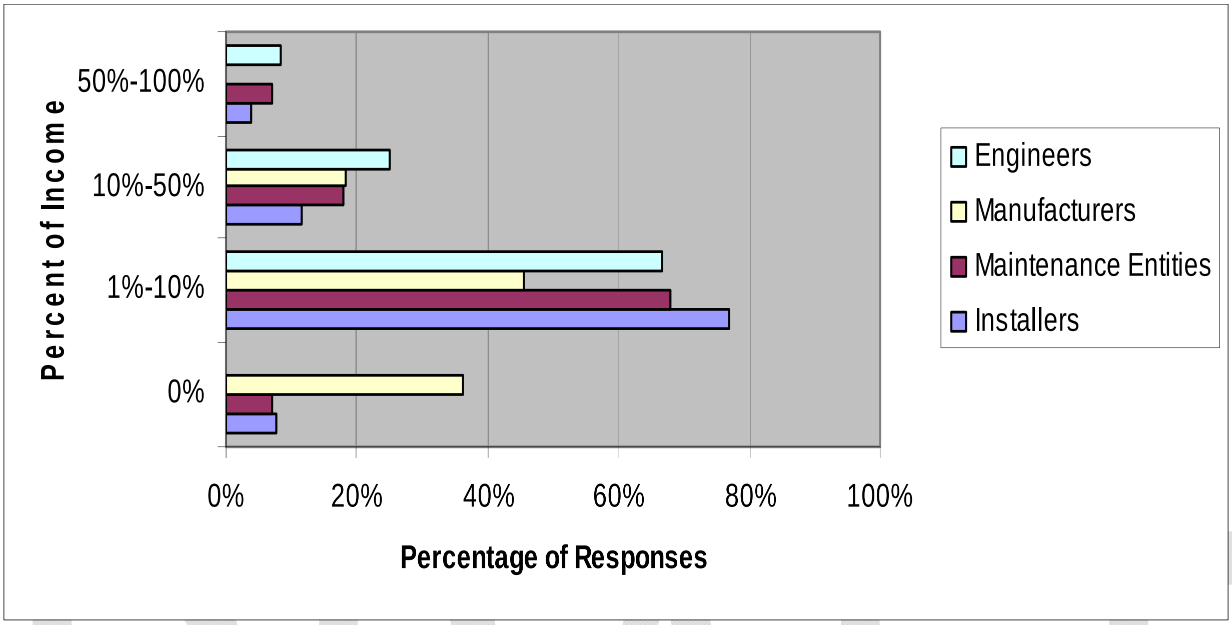


Figure 9. Revenue from advanced systems as reported by engineers, manufacturers, maintenance entities, and installers

The highest rated cause for failure between the installer, maintenance entity, and engineer groups came from malfunctioning treatment system parts, homeowner misuse, and the power being turned off. The lowest rated causes for failure from these groups was engineer design or installation issues.

There were some distinct relationships shown between the different user groups. The manufacturers of advanced systems mainly interacted with installers. Engineers mainly interacted with the county health department and installers. Installers and maintenance entities mainly interacted with owners and the county health department.

Figure 10 compares the responses from engineers, maintenance entities, installers, and regulators regarding their overall perception of treatment performance. All of these groups predominantly indicated that both ATU and PBTS performance is either good or excellent. When comparing this result with how satisfied homeowners are (Figure 5) this seems to indicate that advanced systems are fairly well accepted among the different user groups.

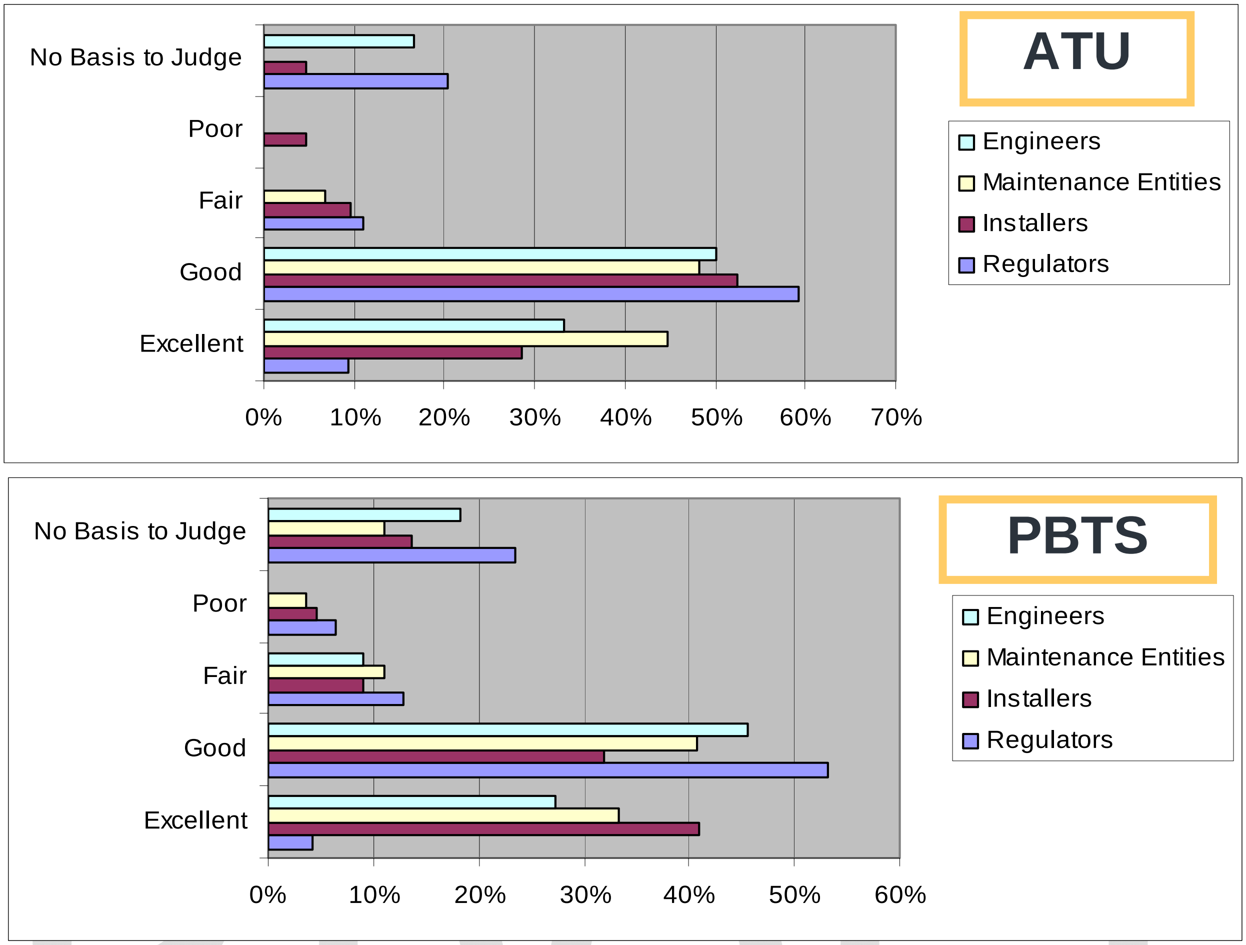


Figure 10. Comparison of the perceptions of overall treatment performance of advanced systems between groups (Question: How would you rate the OVERALL TREATMENT PERFORMANCE of the advanced systems you are involved with?)

When these groups were asked for some general comments and suggestions about advanced systems, there were two main points that came up: the importance of consistency between county health departments and that advanced systems are expensive to install and maintain.

3.3 Preliminary Assessment of Treatment Systems

The sampling of advanced systems in the Florida Keys, which was conducted to help validate the sampling protocol described in Section 2.1.1.1 was analyzed to provide a preliminary assessment of treatment systems. Detailed reporting on this is provided in the final task report (Roeder 2011). Some of the highlights are:

- Maintenance and operation of treatment systems appear to be important variables that were not systematically characterized in this study. Both the sampling results of processes that require replenishment of materials and anecdotes by the samplers indicated that this is an important, but not quantified, element of performance variability.

- Typical influent concentrations of cBOD5 and TSS were consistent with domestic sewage, and total phosphorus slightly elevated. TN concentrations were about twice as high as concentrations during a study that established the feasibility of current treatment standards and as the septic tank effluent concentrations provided in Florida performance-based treatment system regulations as point of comparison. Overall, 50% of influent composite samples showed a TN concentration between 47 and 94 mg/L, compared to 15 and 43 mg/L for the effluent.

- Overall, the addition of a phosphorus reduction treatment step, usually a media filter, improved treatment for TSS, cBOD5, nitrite-nitrogen, and total phosphorus. Systems without that treatment step had median concentration results similar to an earlier survey of ATUs in the Keys.

- Among the phosphorus treatment approaches sampled there were significant differences in effluent concentrations. While overall, total phosphorus was significantly reduced, the Keys treatment standard was not met in most cases, even for the better performing approaches.

- Within the treatment systems sampled, nitrification appeared to be a limiting step to nitrogen reduction. The sampling events with the most nitrified effluent achieved typically about a 75% reduction compared to their influents, while the events with the least nitrified effluent only achieved a typical TN-reduction of about 28% and did not eliminate cBOD5. Events with intermediate nitrification showed intermediate TN-reduction and some indications of occasional alkalinity limitation.

- 25% of the obtained fecal coliform samples exceeded the secondary grab sample standard of 400 cfu/100 mL. Nearly half of the obtained chlorine measurements did not meet the system-required chlorine residual. Such observations confirm that aerobic treatment alone is not sufficient to meet secondary fecal coliform standards. The chlorine measurements also point to the need for monitoring the effectiveness of chlorination units.

- Compared grab samples to time-composite samples and found that there was no big difference.

- Found that a detailed field evaluation of existing site conditions is important to go along with sample results to provide context.

3.4 Statewide Assessment of Operational Status and Performance

3.4.1 Statewide Assessment (All Samples)

550 total systems visited. 350 systems sampled. 5% of the visited sites were vacant. Logistical challenges and time constraints prevented sampling in about ten southern Florida counties (with a total of 87 selected sites) and kept the completion rate in Monroe at about 62% of the 119 active systems.

Figure 11 shows how many systems each regional sample group assessed.

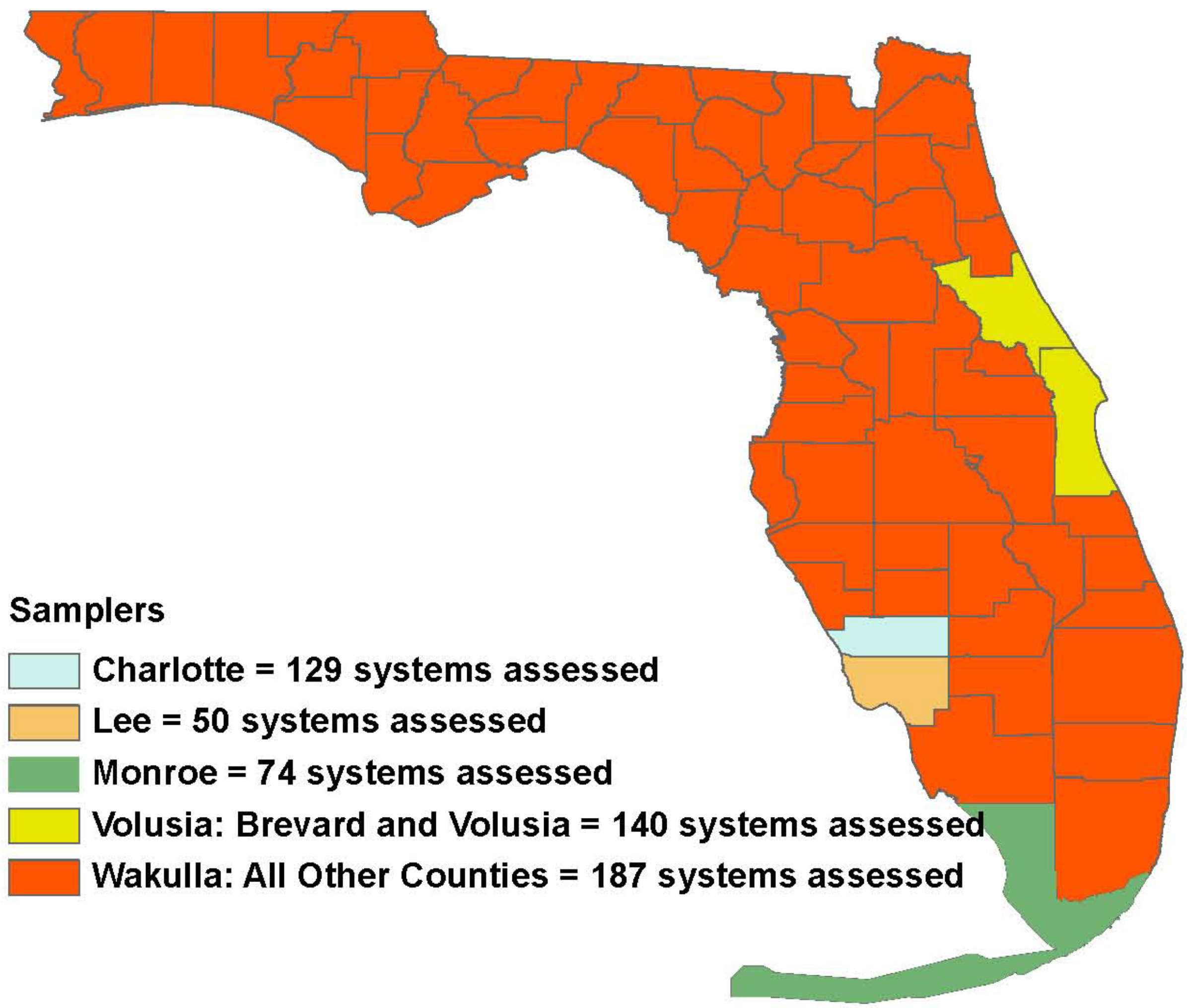


Figure 11. Map of Sampler Locations and Systems Assessed

3.4.1.1 Quality Control Analysis

3.4.1.1.1 Usability Assessment

For cBOD5, samples that were prepared and analyzed more than a day outside of their holding time were designated as unusable. For samples that had elevated reporting limits, we deemed results initially usable if the reporting limit did not exceed about two-thirds of other results.

The qualifier of most concern is “J”, which indicates an estimated value due to not meeting one or more of the quality objectives of the method.

For each field or equipment blank QC sample we looked at the results and assigned the appropriate code:

a. Analyte Flag = U or undetect, assign code “Pass” (all Alkalinity will have a “Pass” code

b. Analyte Result is in the following ranges, assign code “H” (The AC data for this sample was reported above undetect but below quality threshold. Data were determined to be valid for reporting.”

i. TSS < 5 mg/L and does not have a U flag

ii. CBOD5 < 5 mg/L and does not have a U flag

iii. TKN < 1 mg/L and does not have a U flag

iv. Nitrate Nitrite < 1 mg/L and does not have a U flag

v. TN < 1 mg/L and does not have a U flag or <10% of sample

vi. TP < 0.5 mg/L and does not have a U flag or <10% of sample

vii. Fecal < 150 CFU/100 mL

c. Analyte Result is greater than the thresholds for an H code, assign the code “Fail”

2. Sort the data by Region, then Date.

3. Copy the more restrictive results up and down between the QC samples.

Table 13. Data Quality Objectives for Laboratory Analyses

Parameter	CBOD5	TSS	TKN	NOx-N	TN	TP	Total Alkalinity
Method	SM 5210B	SM 2540D	EPA 351.2 † or SM4500-NH3C (TKN)	EPA 353.2 † or EPA300		EPA365.1 or EPA365.3	SM2320B
Number of Calibration Standards	N/A	N/A	6 (n/a for SM4500)	6		6	N/A
Calibration Acceptance Criteria (correlation)	N/A	N/A	Corr >0.995 (n/a for SM4500)	Corr >0.995		Corr >0.995	N/A
Calibration Blank Criteria	N/A	N/A	<0.3	<0.2		<0.03	N/A
QC Check Sample Recovery Criteria (%)	70-120	80-120	90-110 (77-161 for SM4500)	90-110 (80-120 for EPA300)		90-110 (80-120 for EPA365.3)	80-120
Matrix Spike Recovery Criteria (%)	N/A	N/A	90-110 (77-161 for SM4500)	90-110 (80-120 for EPA300)		90-110 (80-120 for EPA365.3)	N/A
Laboratory and Field Duplicate Samples Acceptance Criteria (%RPD)	25 (20 starting Jul. '11)	20	20	25 (20 for EPA300)		20	20
Practical Quantitation Limit (mg/L)	2.0	4.0	0.30 (0.5 for SM4500)	0.20 (0.05 for EPA300)		0.03	4.0
Method Detection Limit (mg/L)	2.0	3.5	0.09 (0.28 for SM4500)	0.1 (0.008 for EPA300)		0.055 (0.007 for EPA 365.3)	2.2
Blank screening Method Detection Limit (mg/L)		3.5	0.28	0.1	0.1	0.055	2.2
Acceptability limit ("H")		5	1	1	1	0.5	2.2

†Revision 2.0, 1993, will be used.

3.4.1.1.2 Sampling Quality Control Chemical Analysis

Up to 620 chemical analyses of samples were completed. The number of completed sample analyses varied by parameter, due largely to lower numbers of QC and tap water samples for cBOD5 and TSS. Using total nitrogen results as the most complete set, of the 620 samples, 386 consisted of effluent samples and 83 were influent samples. Table 14 shows the composition of the sample results. 386 effluent samples included some instances of multiple samples at one site, due to repeat visits, parallel treatment trains or several locations along a treatment train. This represents about a 50% completion of the project target. The number of influent samples is between the 10% of effluent samples and about 100 samples aimed for in the QAPP, and represents roughly the number of accessible pretreatment compartments or tanks encountered over the course of the study. 60 tap water samples exceeded the target of 10% of effluent samples, and is close to the number of influent samples as intended.

34 duplicate samples were analyzed, about 7% of effluent and influent sample results, and 49 blanks, about 10%. This exceeded the requirement of about 10% of total, and provided more than anticipated data to data quality assessment. In addition, six replicate samples were analyzed by a second lab, and in two cases samples were obtained that compared the instantaneous concentrations in an effluent stream to the concentration in a pump tank.

Table 14. Distribution of TN-sample results between sample types and quality control samples

		Original/Duplicate				
		Original	Duplicate	2nd lab	Stream	Total
Sample Type	EFF	386	30	6	2	424
	INF	83	4	0	0	87
	QC-blanks	49	0	0	0	49
	TAP	60	0	0	0	60
Total		578	34	6	2	620

Number of samples, QC results, representativeness based on sampling location

Overall, about 10% of systems (or about 100) were sampled for influent.

Table 15 summarizes the overall data results for the chemical analysis results. All samples were received at acceptable temperatures. Nearly all samples were received and analyzed within holding times. Only two batches of cBOD5 samples were prepared outside of holding times, resulting in a “Q” qualifier. One of these batches exceeded the holding time by three days and the results tended to be very untypically low, this batch was deemed unusable.

Table 15. Data quality of chemical analysis results

Parameter	Total Alkalinity	CBOD5	TSS	TKN	NOx-N	TN	TP
Method	SM2320B	SM 5210B	SM 2540D	EPA 351.2 † or SM4500-NH3C (TKN)	EPA 353.2 † or EPA300	Calculated	EPA365.1 or EPA365.3
Method Detection Limit (mg/L)	2.2	2	3.5	0.09 (0.28 for SM4500)	0.1 (0.008 for EPA300)		0.055 (0.007 for EPA 365.3)
Result Screening Method Detection Limit (mg/L)	2.2	2	3.5	0.28	0.1	0.1	0.055
Acceptability limit (“H”)	2.2	n/a	5	1	1	1	0.5
Number of sample results	43	519[1]	538	620	620	620	617
Samples with elevated MDL	0	93[1]	0	0	0	0	0
Samples with Qualifiers ("Q")	0	13[1]	0	0	0	n/a	0
Samples with Qualifiers ("J", “V” or exceeding result)	0	85[1]	0	16	18	n/a	9
percent of samples meeting laboratory objectives	100%	63%	100%	97%	97%	100%	99%
Samples not bracketed by blanks	n/a	n/a	75	64	65	66	63
Samples with worst nearest blank result "H"	n/a	n/a	44	207	57	262	53
Samples with worst nearest blank result "fail"	n/a	n/a	0	9	87	100	37

[1]Note: cBOD5 results that fell into multiple groups were counted only once in the highest row.

†Revision 2.0, 1993, will be used.

For nutrients, between 97 and 99% of data reported by the lab did not require qualification other than “U” for below detection limit. For cBOD5, only about two thirds of data were unqualified. For about 15% of samples each, the reporting limit was increased or the results were qualified. The reason for either case was generally an under depletion of oxygen, in the sample or in the control.

The bracketing analysis was only performed for TSS and nutrients. It resulted in about 10% of samples not bracketed by blank samples. For TSS about 10% of samples were bracketed by at least one blank result that exceeded 3.5 mg/L but did not exceed 5 mg/L, and none exceeded 5 mg/L. For other parameters, the fraction of samples bracketed by at least one blank sample that exceeded the acceptance limits ranged from less than 2% (TKN) to about 16% (TN). Many of these samples themselves had concentrations below method detection or acceptability limits. This indicated that a detection in a bracketing blank was not a systematic indicator for contamination problems in samples in temporal vicinity.

A more detailed look at the blank results is provided by Table 16. It distinguishes blank sample results by field blank (FBL), pre-cleaned equipment blank (PEB) and field-cleaned equipment blank (FEB). Not shown here is a comparison by sampling group or region, which did not show appreciable differences in results between groups.

Table 16. Results of analyses of blanks

Parameter	Total Alkalinity	CBOD5	TSS	TKN	NOx-N	TN	TP
Number of QC-blank samples	3	14	32	49	49	49	48
FBL-total	0	0	2	12	12	12	11
FBL pass	n/a	n/a	2	8	9	8	10
FBL H	n/a	n/a	0	4	3	4	1
FBL fail	n/a	n/a	0	0	0	0	0
PEB-total	2	6	8	10	10	10	10
PEB pass	2	6	8	8	9	5	8
PEB H	0	0	0	1	1	4	2
PEB fail	0	0	0	1	0	1	0
FEB-total	1	8	22	27	27	27	27
FEB pass	1	5	20	17	23	13	24
FEB H	0	(2 MDL_ increase)	2	10	2	12	1
FEB fail	0	1	0	0	2	2	2

FBL=field blank; PEB=precleaned equipment blank; FEB=field-cleaned equipment blank

Field blank results present information on how likely it is to detect a chemical even though it should not be there. The source for this could be either in the laboratory equipment, the quality of the distilled water used for the blank, or contamination during the filling of the sampling bottles. Field blanks were not analyzed for total alkalinity and cBOD5, and only two analyses for TSS were completed. Eleven distilled water and one phosphorus calibration standard were used as field blanks for nutrients. The phosphorus calibration standard results were within 2% of the labeled phosphorus concentration. None of the blanks exceeded the acceptance criteria, two third of the nitrogen results and 90% of the phosphorus results were below detection limits.

Pre-cleaned equipment blanks represent conditions after the equipment had been field cleaned. In addition to the sources of contamination for field blanks, residual concentrations from samples or from the cleaning are possible sources. None of the blanks analyzed for cBOD5 or TSS showed detectable levels of concentrations. 80% of the ten blanks for TKN and TP and 90% of the NOx analyses did not show concentrations beyond the detection limit. One blank exceeded the acceptability limit for TKN and thus also for TN. This result occurred during the first sampling event, and we speculated that some tap water could have contaminated the sample. In response, we changed the QAPP to require more rinsing before taking the sample.

Field cleaned equipment blanks we obtained after other samples had already been collected on a day by treating a container with distilled water as if it was a sample. These samples assess the effectiveness of rinsing between samples and the significance of carry-over between samples.

Of the 27 nutrient field equipment blank samples, no TKN and fewer than 10% of NOx and TP samples exceeded the acceptability limit. TKN appeared to be the parameter with most contamination issued with ten of 27 samples exceeding method detection limits to a limited extent. Between 10 and 20% of NOx and TP samples detected some presence, but these were generally not in the same samples for both parameters.

cBOD5 results were mainly (five of eight) below detection limit, and two additional samples were below an increased detection limit that stemmed from higher dilution. Only one sample exceeded acceptability limits.

Over 90% of field equipment blanks resulted in no detectable TSS concentrations, with two samples showing low concentrations.

In summary, over 95% of analytical results for all parameters, except cBOD5, met laboratory quality objectives and were unqualified other than for low concentrations (“U”, “I”). For most parameters (nutrients and TSS), the exceedances of acceptability criteria in blank samples were rare and sporadic, less than 10%. These consistent results indicate bracketing is not useful for identifying poor quality samples. Bracketing, which emphasizes temporally closer blank samples over further removed one, would have resulted in eliminating a sizeable fraction of results, up to one quarter, without apparent increases in the quality of the remaining results. All results were deemed usable.

cBOD5 results appeared less reliable, partly because the laboratory added qualifiers to sample results, partly because of the increase in detection limit for about 20% of samples. In most of these cases, the laboratory had expected higher BOD based on a screening test of chemical oxygen demand. It is unclear what the reason for these underdepletions is, a characteristic of sewage samples or an issue with the laboratory procedures.

For cBOD5 , eight samples that were prepared four days instead of two days after sampling and resulted frequently in non-detects were excluded. For effluent samples, the median was about 5 mg/L and 90% of samples did not exceed about 60 mg/L. Two non-detect samples with a reporting limit above the secondary grab sample standard of 40 mg/L were deemed unusable. Influent samples showed a median sample of about 70 mg/L and 90% of samples did not exceed 160 mg/L. All results had reporting limits below 160 mg/L and were used. One sample had a concentration about eight times the concentration of the next highest, and was excluded. This resulted in a total of 11 exclusions.

Sampling and analysis of duplicates resulted in 34 valid pairs for nutrients, 31 for cBOD4, 30 for TSS, and 2 for total alkalinity. The relative deviation was used to quantify agreement between the two samples. Table 17 summarizes the results. For cBOD5 (84%), TN (79%) and TP (88%), the project exceeded the goal of 75% of duplicates remaining within a relative deviation of 20%. For TSS (70%), TKN (71%), NOx (74%), the objective was not met, but the target was missed not by much. Over 90% of cBOD5 and TP duplicates and over 80% of TKN, NOx and TN duplicates agreed within 30%. The two total alkalinity duplicates agreed within 10%.

Table 17. Differences between samples of the same sampling point: relative percent deviations between duplicates and analyses by two different laboratories

Parameter	Total Alkalinity	CBOD5	TSS	TKN	NOx-N	TN	TP
Comparison between duplicates							
Number of sample pairs	2	31	30	34	34	34	34
Fraction meeting 20% RPD	100%	84%	70%	71%	74%	79%	88%
Fraction meeting 30% RPD	100%	94%	70%	85%	82%	85%	91%
Average	1%	-3%	-2%	-2%	-7%	-7%	-6%
Median	1%	0%	0%	0%	1%	0%	0%
Comparison between labs							
Number of sample pairs	0	6	6	6	6	6	6
Fraction meeting 20% RPD		17%	33%	17%	83%	33%	83%
Average		-74%	51%	70%	-20%	36%	16%
Median		-92%	61%	71%	-5%	12%	-6%

The median relative deviation was zero or close to it, while the average relative deviation was slightly negative. This stemmed from more duplicate samples having much lower concentrations than the original rather than much higher concentrations. A comparison of relative deviations and absolute relative deviations by regions using the Kruskal-Wallis test or the Median test did not result in any significant differences at the 5% level. There also did not appear to be a consistent pattern between analytes of which region tended to have more or less variable duplicates. Overall, this suggests that the QAPP and training on common procedures were successful in establishing uniform data quality.

Samples from six sampling locations taken during two sample events were sent to two different laboratories and analyzed. Because the detection limits were somewhat different between the laboratories, we counted it as no difference if both laboratories provided a "U" result below their respective detection limits. Only for NOx and TP was the agreement in five out of six (83%) within the quality objective of 20%. For NOx this was partly due to the fact that three samples were below the respective detection limits. For TSS and TN a third of the samples agreed within 20%, but for cBOD5 and TKN, only one of the six samples did. Median and averages suggest that the second laboratory measured typically lower results for cBOD5, and higher results for TSS and TKN. Both laboratories were NELAP-certified and we do not have independent data that would allow determination if one measured more accurately than the other. The limited comparison indicates that between-lab variability can be important.

Two sets of samples provided an impression of the differences between the concentrations seen in sample obtained from the flow into a chamber (recirculating splitting box, and pump tank, respectively) and the concentrations of a sample from the chamber itself. The comparison suggested some additional reduction of TSS in the chamber and lesser differences for nutrients. But one of the systems appeared to not have been operating properly recently, and the other system did not achieve any measurable nitrification.

3.4.1.1.3 Representativeness of Sampling Location

During the project samplers attempted to obtain samples as clean as site conditions allowed. Florida regulations require installation of a sampling port for aerobic treatment unit. While sampling ports in the form of cleanouts in the line between treatment units and drainfield have the advantage of sampling the flow after the treatment, they also have disadvantages. One disadvantage is that no flow may occur at the time of sampling and if there is no basin, no water may be available for sampling. Another concern is that flows are generally not high enough in gravity installations to scour the lines, so that some solids accumulation may occur that could impact samples. For these reasons, the project preferred pump chambers for sampling, and included flushing of sampling ports before sampling. A potential additional confounding element is that there could be treatment effects in every compartment after the aeration chamber. Aeration chambers were only rarely sampled, generally in integrated fixed activated sludge treatment units that did not have a clarifier.

To assess the impact of sampling location on results overall, we performed a Kruskall-Wallis analysis for the effluent samples from aeration chambers, clarifiers, pump chambers and sampling ports. A first analysis indicated that there were significant differences (<5%) for cBOD5, TSS, TKN, and fecal coliforms between these groups, but not for total nitrogen, total phosphorus, alkalinity and odor intensity. Nitrate-nitrogen differences were nearly significant (5.4%). Inspections of rankings indicated that sampling ports showed higher TKN (and lower nitrate), higher cBOD5 and TSS concentrations. A second Kruskall-Wallis analysis between aeration chambers, clarifiers and pump chambers indicated that only TSS concentration had significant differences between the three locations, with pump chambers tending to have lower concentrations.

This suggests that for total nutrient analysis the sampling location does not make a significant difference. This confirms findings from the Task 1 Keys study that found that the presence of an aggregate filter and pump chamber did not make a difference in total nutrient concentrations. TSS is, as was seen in the Task 1 Keys study most variable, with high concentrations in sampling ports and lower concentrations in pump chambers.

3.4.1.2 Sampling Microbiological Analysis

Overall, 252 analyses for fecal coliforms were performed for the project by four laboratories. Temperature criteria for samples at arrival at the laboratories were always reported as met, several samples for one of the laboratories did exceed holding times by less than 24 hours. One of the laboratories did provide qualifiers as “>” or “<”, but not in the standard format. For this laboratory, inspection of the lab sheets indicated that “>” represented a “z” qualifier for “too numerous to count” and “<” represented a “U”. Further, several other results appeared to require a “B” qualifier for measurements outside the ideal range of 20-60 colony forming units. Of the 252 analyses only 32% were qualified by nothing other than a “U”.

The increased detection limits ranged from 5 up to 100 cfu/100mL. Compared to most of the values found in other, non-QC, samples this represents still a very low number. Due to the several orders of magnitude spanned by sampling results we used the decadic logarithm of usable results to perform the calculations for the relative percent deviations.

Quality control samples were analyzed by three laboratories for three sampling groups. These samples were predominantly field equipment blanks. Two precleaned equipment blanks and three tap water samples resulted in no detectable colony forming units, but a field blank resulted in low concentrations (15 cfu/100 mL). Among field equipment blanks without duplicates, six resulted in no detectable colonies at detection limits up to 100 cfu/100 mL, and four resulted in detections of not greater than 100 cfu/100 mL. Three results were between 200 and 500, one was 1440 cfu/100 mL, and one sample showed confluent growth with evidence of presence of fecal coliform (“N”). These results indicate some cross contamination in about half of the cases, but due to varying detection limit this may be an underestimate. About a quarter of field equipment blanks exceeded 200 cfu/100 mL, but only rarely (one each) were 800 cfu/100 mL exceeded or confluent growth observed. A Kruskal-Wallis test did not show significant differences for QC-results between the three laboratories, or groups of samplers.

The frequency of “B” and “Q” qualifiers indicates that the numerical values of fecal coliform in about half of the samples should be understood as estimates. The results span several orders of magnitudeThe cross contamination between samples, when it was detected, was mostly limited to less than 100 cfu/100 mL. For data analysis purposes, results of less than 100 cfu/100 mL cannot be distinguished from non-detects, and we used this value as a cut-off for low values. This value is also well below the regulatory standard of 200 cfu/100 mL. On the higher end, while three of ten “Z”-qualified samples exceeded 2,000,000 cfu/100 mL, six samples only indicated that 3000 cfu/100 mL were exceeded. Because 3000 cfu/100 mL is well above secondary treatment standards, these values are still considered useable.

Overall, 12 sets of duplicate samples were analyzed. Eight of the 12 pairs meet a relative percent deviation of 20% using the logarithmic value of the result. Introduction of the cut-off value of 100 cfu/100 mL brings two additional pairs into this range. Eight of the raw data pairs and eleven of the cut-off pairs met a relative deviation of 30%. There appears to be a tendency of the duplicate showing higher concentrations than the original, this occurred in nine cases, while the inverse occurs only in two.

In looking at the relative percent deviations as a function of concentration it appears that average fecal concentration beyond about 1500 cfu/100 mL show smaller deviations than lower concentrations. This would suggest that one can be fairly certain that high concentrations are high, but less certain that low concentrations are low are precisely above or below treatment standards such as secondary treatment standards (200 cfu/100 mL annual average, 800 cfu/100mL grab sample).

3.4.1.3 Field Screening Assessments

Four-hundred and ninety-two samples were screened using qualitative screening methods (color, clarity, odor intensity and odor quality), and 491 samples were also screened using a Hach instrument for apparent color and turbidity. These samples included influent, effluent and tap water samples, and thus covered a wide range of concentrations.

Figure 12 illustrates the relationship between the field instrument measurements of turbidity and apparent color of the samples taken. Apparent is a linear relationship that is limited by the upper measurement limit of apparent color in the instrument that was used in four of the five groups. The instrument used in Charlotte County had a larger measurement range.

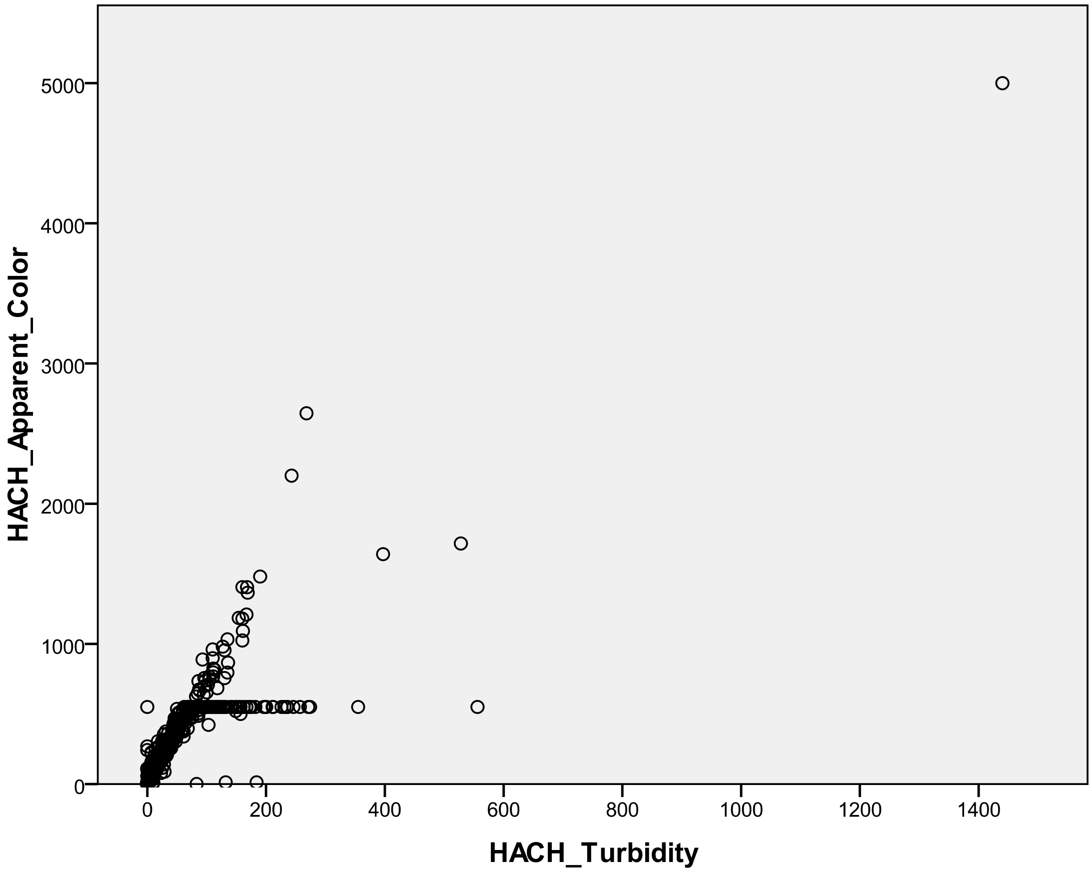


Figure 12. Relationship between turbidity and apparent color measured by Hach instruments during the study

The more qualitative descriptions of clarity and color were expected to be related to the measured turbidity and color. In assessing this correspondence we compared the two measurements (visual and field instrument) of color and turbidity.

Table 18 compares average odor intensity descriptions (0-4 scale) with descriptions of color and clarity. While there was a general trend that dirtier looking samples smell stronger, there is also a standard deviation of about one intensity unit, indicating overlap.

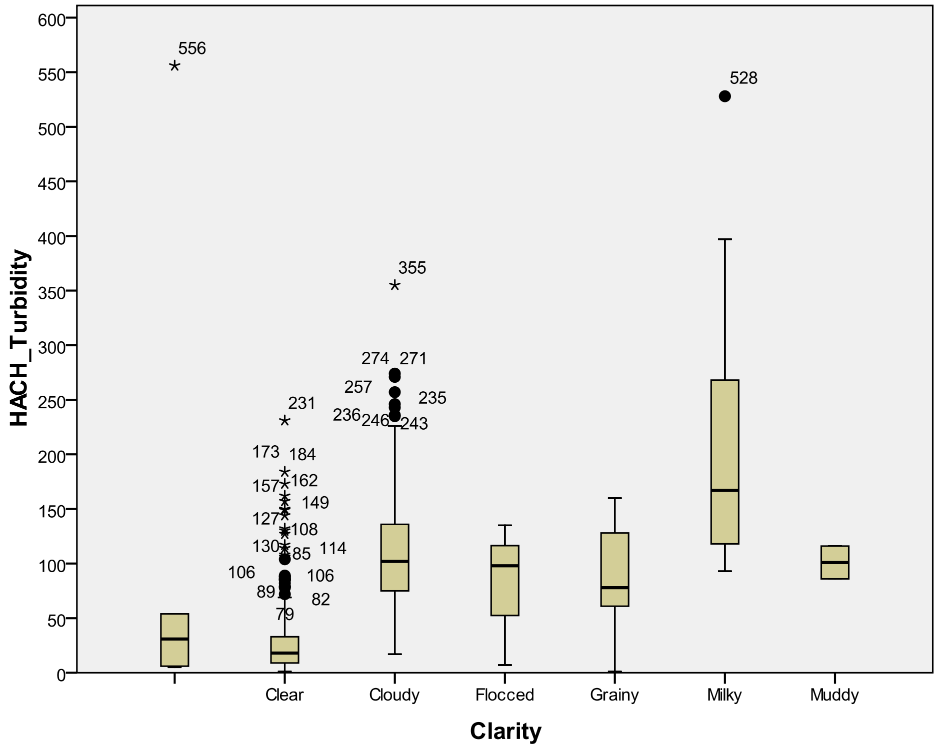
Table 18. Average odor intensity assessments based on color and clarity assessments.

Color	Mean	N	Std. Deviation
NONE	.50	135	.771
	1.00	6	1.095
OTHER	1.00	10	.943
WHITE	1.50	4	1.732
MUSTARD	1.63	24	1.279
TAN	1.80	219	1.287
GRAY	1.94	35	1.083
BROWN	2.00	41	1.204
BLACK	2.67	3	1.528
Clarity	**Mean**	**N**	**Std. Deviation**
	.67	6	1.033
Clear	1.00	307	1.077
Grainy	1.90	10	1.370
Cloudy	2.22	134	1.241
Flocked	2.25	4	.957
Muddy	2.33	3	1.155
Milky	2.92	13	1.115
Total	1.43	477	1.282

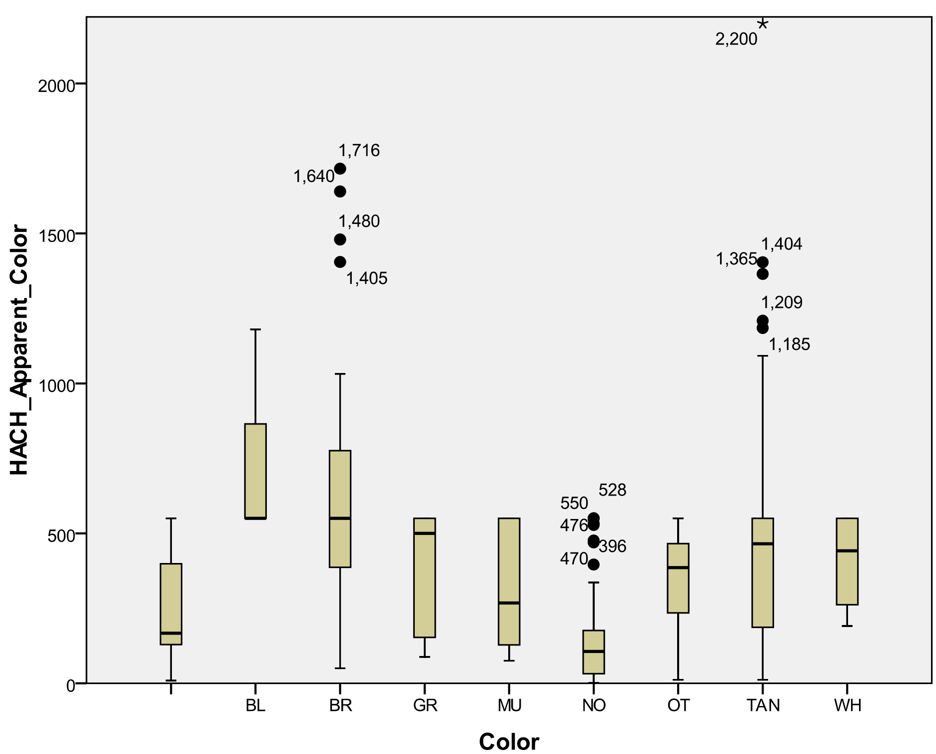
For a comparison of HACH measurements with other measures, we selected only records with measurements that were distinct from zero to address a database issue that made it difficult to distinguish between absent values and true zero measurements.

Figure 13 a) is a box plot of the measured turbidity for the various turbidity descriptions. The groupings of most turbidity measurements suggest that a sample can be seen as either clear or not clear. The turbidity values for cloudy, flocked, grainy, and muddy samples cluster around 100, while the few milky samples are higher. By contrast, clear samples cluster around 20.

Figure 13 b) compares the apparent color measurements with the color descriptions of the samplers. Here, the transitions are somewhat more gradual, but again, no color observed is usually associated with very little color measured, while brown and black are associated with high color measurements. These results show the potential for visual assessments of water, further investigation is needed to address if observations are related to the quality as expressed by treatment standards.



a)



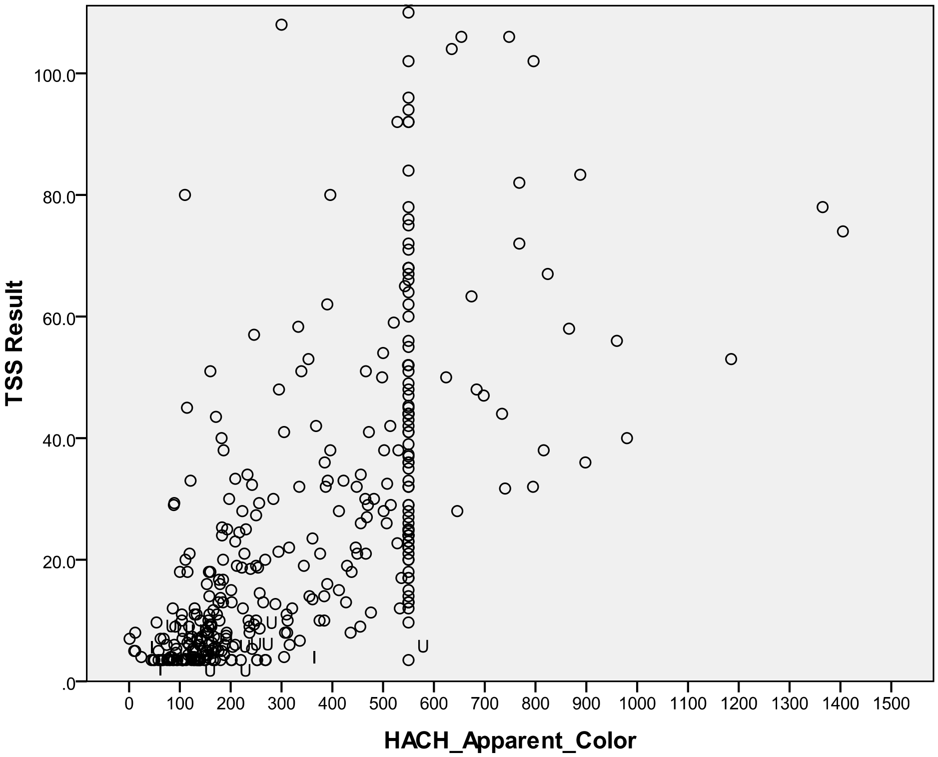
b)

Figure 13. Comparison of visual observation and field instrument measurements of clarity and color. a) measurements of clarify; b) measurements of color

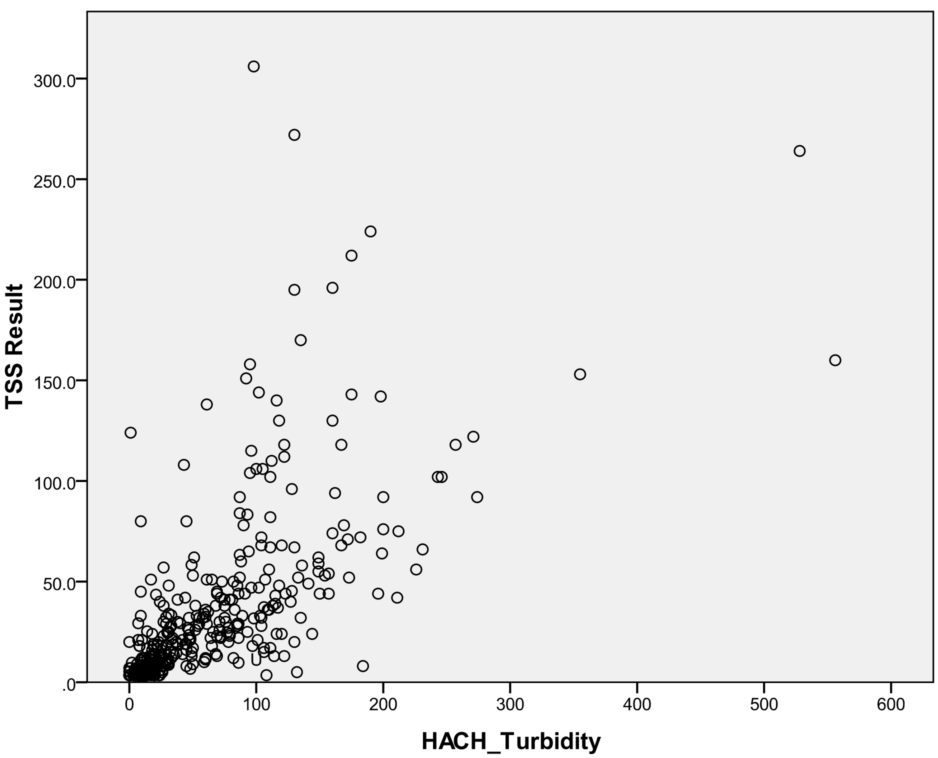
3.4.1.3.1 Comparison of Hach Field Kit Measurements and Laboratory Analyses

We linked data to match Hach field kit measurements with the results of chemical analyses. Of the 630 samples for which chemical or microbiological results were available, about 390 had information on field measurements of apparent color and turbidity. 79 for ammonia, 88 for nitrate, 54 for phosphate, and 368 for total alkalinity.

We compared graphically apparent color to cBOD5, TSS and TKN. For cBOD5 and TKN, no linear relationship was apparent. For TSS a very broad pattern of increased concentrations with increased apparent color measurement and turbidity existed. The tendency was that color measurements below 100 corresponded with TSS values below 10 mg/L, and color measurements above 500 tended largely to be associated with TSS values above 20 mg/L. Figure 14 shows the lower ranges of measured TSS concentrations in comparison to field measurements. While not always visibly apparent, rank order correlations (Spearman's rho) provided a correlation coefficient between 0.7 and 0.8 between apparent color and cBOD5 and TSS and between measured turbidity and cBOD5 and TSS, and between 0.6 and 0.7 between apparent color and turbidity, and TKN.



a)



b)

Figure 14. Concentrations of TSS compared to field instrument measurements of a) apparent color and b)turbidity. TSS-scale is not fully shown for better identification of points.

3.4.1.3.2 Field Test Kits for Nutrients

We paired measured concentrations for TKN (lab) and ammonia-nitrogen (field), NOx (lab) and nitrate-nitrogen (field), and TP (lab) and orthophosphorus (field). The field tests measure only parts of what the laboratory measures, so it would be expected that the field test results would be below the laboratory measurements. The extent depends to how important organic ammonia (TKN), nitrite-nitrogen (NOx), and non-orthophosphorus (TP) are. Figure 15 shows the comparisons. There were general tendencies to move in the same direction, which were also indicated by correlation coefficients (Spearman's rho) of 0.83 for NOx, 0.80 for TKN, and 0.48 for TP. Each measure encountered some specific issues that, while surmountable, indicate that very close quality oversight is needed to make these screening tests routinely useful. For TKN, the overall impression (and correlation) is impacted by the outlying largest TKN concentration measured. The other pairs show a general pattern of ammonia accounting for 80-90% of TKN. For NOx, it appears that a group of samples is systematically overestimated laboratory measured concentrations, which could be associated with an error in reporting units. For most samples, nitrate appears to be the dominant species. For high concentrations, the field measurement limit of 33 mg/L for undiluted samples results in a flattening out of the relationship. Phosphorus samples show a core of very nicely corresponding pairs, surrounded by considerable scatter. On the low side, the measurement limit for undiluted samples of 0.9 mg/L resulted in several low values. For the remainder of the scatter further work would be needed to assess if it stems from limitations of the method or from implementation issues.

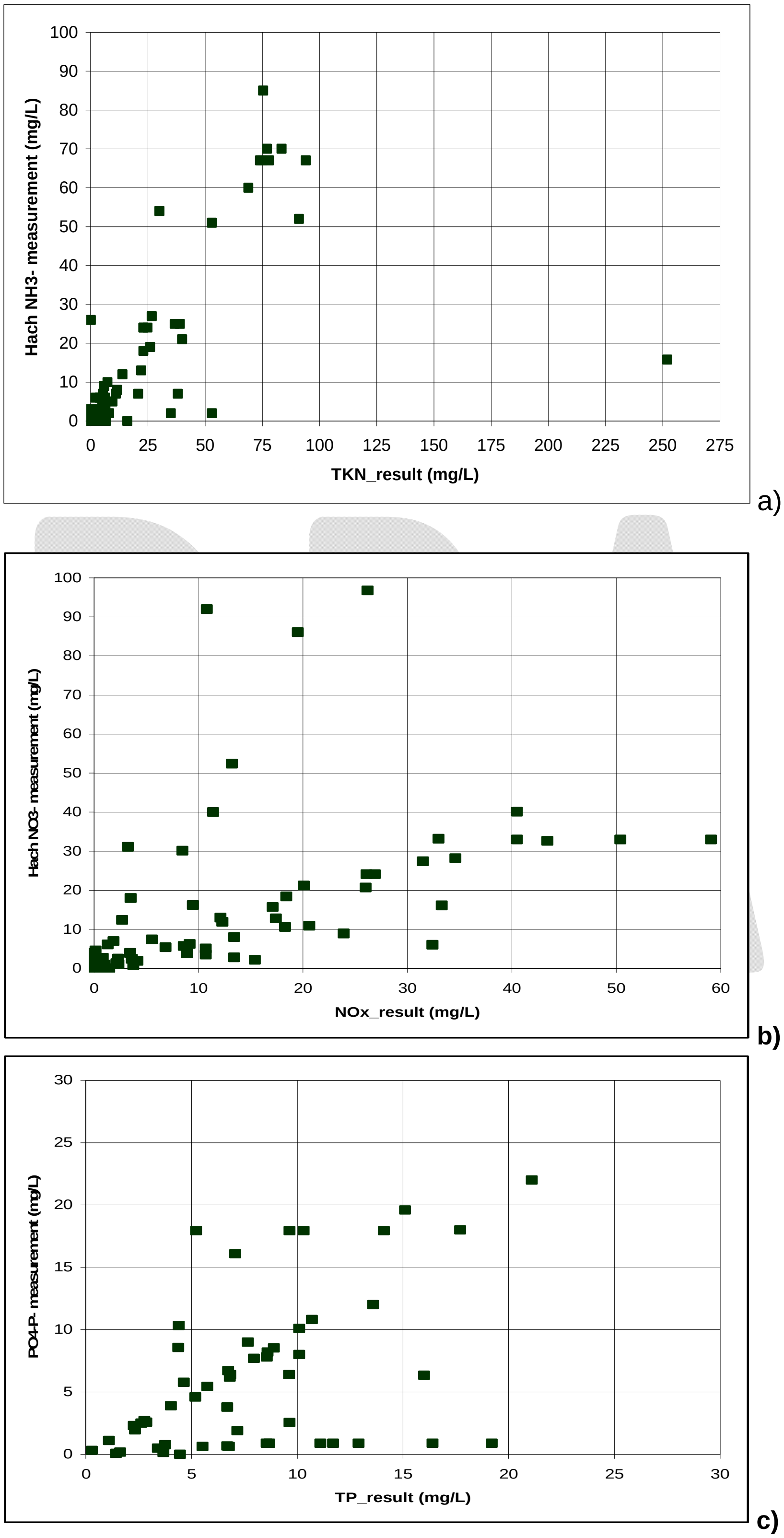


Figure 15. Comparison of laboratory and field screening tests: a) TKN (lab) and ammonia-nitrogen, b) NOx (lab) and nitrate-nitrogen, c) TP (lab) and orthophosphorus.

3.4.1.4 Variability of Performance Assessment

To assess the variability of performance of treatment systems and influent strength, samplers repeated visits to 25 sites. For most sites only two samples were obtained, but at two sites, a third effluent samples was obtained, and at one site, two sampling locations were sampled at each of the two times. The measure of variability is the percent relative deviation for concentration measurements between one sampling event and the following sampling event. If both sampling results were below detection limits, a value of zero was assigned to the relative percent deviation of zero was assigned and the average concentration of the pair.

The result is shown in

Table 19. They indicate a variability that far exceeds the variability of the sampling methodology as indicated by duplicate and blanks samples for all parameters except fecal coliform. By looking at the interquartile range one can see that fewer than 50% of effluent pairs remain within a relative deviation of 30% for all measurements except TP, for which 54% meet this threshold. Expressed differently, this indicates that concentrations vary frequently by a factor of two between visits, which corresponds to a relative percent deviation of 67%. The influent concentrations are similarly variable as indicated by average deviations and their standard deviations. This similarity is surprising relative to an expectation that influent should be more variable than effluents given the averaging and mixing that occurs in the treatment plant. This could suggest that on the time-scale of repeat visits, months, variations in the loading occur that influence both influent and effluent. Interestingly, median and average effluent deviations would indicate a tendency that TSS, TKN and NOx increased at later visits, while TP decreased. On the other hand, influent deviations suggest a decrease in most parameters except NOx, which increased. Relative to the large range of deviations, this appears to be not a pattern that can be further investigated with the data of this study.

Table 19. Relative percent deviations between sampling results of subsequent visits at a site.

Effluent	cBOD5	TSS	TKN	Nox	TN	TP	log fecal
count	26	26	27	27	27	26	8
average	-16%	25%	41%	25%	-9%	-36%	-21%
stdev	115%	100%	132%	123%	77%	59%	33%
25-percentile	-107%	-50%	-22%	-77%	-77%	-55%	-28%
median	0%	46%	25%	22%	2%	-18%	-11%
75-percentile	59%	78%	191%	126%	30%	-4%	3%
Influent	**cBOD5**	**TSS**	**TKN**	**Nox**	**TN**	**TP**	**log fecal**
count	22	22	22	22	22	21	3
average	-26%	-26%	-16%	27%	-22%	-28%	-1%
stdev	116%	85%	88%	117%	78%	51%	2%
25-percentile	-119%	-75%	-68%	-9%	-67%	-68%	-2%
median	-29%	-48%	-30%	0%	-26%	-24%	0%
75-percentile	35%	22%	23%	118%	23%	3%	0%
TAP	**cBOD5**	**TSS**	**TKN**	**Nox**	**TN**	**TP**	**log fecal**
count	0	1	15	15	15	14	0
average	n/a	0%	60%	48%	61%	-9%	n/a
stdev	n/a	n/a	73%	86%	98%	64%	n/a
25-percentile	n/a	0%	18%	0%	-35%	-4%	n/a
median	n/a	0%	87%	0%	77%	0%	n/a
75-percentile	n/a	0%	122%	137%	158%	0%	n/a

To provide further context,

Table 20 shows information on the absolute concentration values of the assessment pairs. Looking at tap water samples first, it becomes apparent that the variability, while large, is relative to low absolute concentrations of nutrients, generally below 1 mg/L. The few influent and effluent concentrations of fecal coliform are consistent with a reduction in concentrations of around two log units during the course of aerobic treatment. Average influent concentrations of TN and TP are 53 mg/L and 8 mg/L, respectively. The average effluent concentrations are 37mg/L and 8 mg/L, indicating some consistency in a removal of about a quarter to a third for total nitrogen and less than 10% for total phosphorus. Influent and effluent concentration vary noticeably both between sites and between visits. For cBOD5 and TSS, the difference between average and median effluent concentration indicate the influence of a relatively few samples with higher concentrations. Estimated removal effectiveness would therefore vary depending on whether medians or averages are used in the assessment between 75% and 90% for cBOD5 and between 57% and 72% for TSS.

Table 20. Average concentrations of sampling pairs during subsequent visits at a site.

Effluent	cBOD5	TSS	TKN	Nox	TN	TP	log fecal
count	26	26	27	27	27	26	8
average	36.1	37.0	16.8	20.2	37.0	7.8	4.0
stdev	62.9	52.3	23.7	19.5	23.3	2.3	1.1
25-percentile	3.0	6.9	2.5	4.9	20.7	6.6	3.4
median	8.6	16.5	5.2	17.2	34.6	7.8	3.8
75-percentile	24.9	47.6	24.7	27.5	52.3	8.6	5.1
Influent	cBOD5	TSS	TKN	Nox	TN	TP	log fecal
count	22	22	22	22	22	21	3
average	145.9	86.1	50.2	2.7	52.9	8.2	6.2
stdev	116.4	131.3	31.7	7.3	30.4	3.2	0.2
25-percentile	49.1	23.2	22.4	0.0	24.8	5.8	6.2
median	117.5	59.5	40.9	0.2	49.8	8.3	6.3
75-percentile	242.3	83.3	76.2	1.5	76.6	9.6	6.3
TAP	cBOD5	TSS	TKN	Nox	TN	TP	log fecal
count	0	1	15	15	15	14	0
average	n/a	0.0	0.4	0.5	0.9	0.7	n/a
stdev	n/a	n/a	0.3	0.6	0.7	2.2	n/a
25-percentile	n/a	0.0	0.3	0.0	0.4	0.0	n/a
median	n/a	0.0	0.4	0.1	0.8	0.0	n/a
75-percentile	n/a	0.0	0.6	0.8	1.1	0.2	n/a

3.4.2 Assessment for Random Samples[2]

Project staff performed field assessments, usually combined with sampling, of over 550 systems throughout Florida. Logistical challenges and time constraints prevented sampling in about ten southern Florida counties (with a total of 87 selected sites) and kept the completion rate in Monroe at about 25% of the 260 selected systems. Of the systems that had a field assessment, 480 were from the purely random selection and only these will be discussed further. The detailed field assessments encompassed an initial assessment, similar to inspections that county health departments perform and, where feasible, field measurements and sampling. Lab samples were packed in ice and sent overnight to a NELAP certified lab.

The field assessment included a check to see if the system was operational (power was on, no sanitary nuisance existed, aeration resulted in bubbles and mixing of sewage, and alarms were not on). Since the site visits were largely unannounced, these operational assessments can provide a general indication that could be applied to the larger population of advanced systems. Approximately five percent of the visited sites were vacant. Thirty percent of the sites visited were considered to be not operating properly (143 out of 480 systems). The main cause for a

[2] For purposes of this section, only those that were selected as a purely random sample are included in the subsequent discussions and calculations (901 systems of 1014).

system to be non-operational was that the power indicator was off, followed by the aeration not working (Table 21). The most common combination of non-functional conditions was that the power was switched off, the power indicator was not on, and the aeration was not working. Since all three of these are a direct result of the power being off, this is not surprising, but it is interesting to note that the most common reason a system was not operational (20%) had to do with the power being off. If all power related operational status indicators are grouped together, we are left with three meta-groups: power related issues, sanitary nuisance related issues, and alarm issues. Power related issues consist of 70% of all operational problems followed by sanitary nuisance issues (9%), alarm issues (8%), power and alarm issues (8%), and finally power and sanitary nuisance issues (6%).

Table 21. Distribution of issues leading to a non-operational status for non-vacant systems

Reason For Non-Operational Status (non-vacant systems)		
	# Not OK	% Not OK
Power switched off	54	43%
Power indicator off	79	62%
Aeration not working	73	57%
Sanitary nuisance	20	16%
Alarm issue	19	15%

One means to provide an assessment of treatment performance was the comparison of effluent to “influent” data. Samplers obtained these samples by drawing from the clear zone of a pretreatment compartment or trash tank of systems. These samples represent then not raw sewage, but sewage that already has undergone some settling and anaerobic treatment. In this way these samples are more comparable to septic tank effluent, although septic tanks tend to be typically larger by a factor of about three.

In reviewing the influent data, several samples showed high nitrate/nitrite nitrogen values. Samples with values above 5 mg/L nitrate/nitrite were excluded as inconsistent with an anaerobic pretreatment step (six of forty-seven samples). Possible causes are a misidentification of compartments in the field, or interaction between aeration treatment and pretreatment compartments. Table 22 summarizes the results of the pretreatment effluent sampling. The data show considerable and somewhat skewed variability with an interquartile range that is larger than the median value. The median value for cBOD5 (76mg/L) is much lower than the median for septic tank effluent reported by Lowe et al. (2009) (216 mg/L) while the median values for TSS (68 mg/L) were similar to the 61 mg/L reported by Lowe et al. (2009). The median values for TN (46 mg/L) and TP (8.3 mg/L) in this study were both somewhat lower than the 60 mg/L and 9.8 mg/L, respectively reported by Lowe et al. The concentrations can also be compared to results from a pilot study for this project (Roeder, 2011). There, influent concentrations of advanced treatment systems that appeared to be most representative for pretreatment tank effluent showed median concentrations of 99 mg/L, 64 mg/L, 76mg/L and 10 mg/L for cBOD5, TSS, TN and TP, respectively. Again, the current study showed lower nutrient concentrations, which could be related to differences in water usage.

Table 22. Pretreatment effluent or influent data summary

"Influent" Pretreatment Effluent (mg/L)		cBOD5	TSS	TKN	NOx	TN	TP
N	Valid	39	41	41	41	41	40
	Missing	2	0	0	0	0	1
Mean		115.2	92.0	51.9	0.3	52.3	9.0
Std. Deviation		100.0	111.4	37.6	0.7	37.3	5.6
Minimum		.0	7.0	.118	.019	2.970	.670
Maximum		393	630	181	3	181	34
Percentiles	10	14.0	20.0	11.8	0.0	12.0	3.3
	25	43.5	28.0	22.8	0.0	24.0	6.0
	50	76.4	68.0	45.8	0.1	45.9	8.3
	75	174.0	115.0	74.6	0.2	74.8	10.5
	90	259.0	147.2	103.5	1.3	103.5	14.3

The effluent concentrations are shown in

Table 23. For the purposes of this analysis, the last sampling point of a treatment unit before dispersal in a drainfield, or borehole in Monroe County was used as representative of the overall treatment unit performance in cases when more than one sampling point had been sampled. The median concentrations for cBOD5 (5.4 mg/L) and TSS (19 mg/L) show substantial removal as compared to the influent concentrations. TN concentrations have been reduced. The TKN and nitrate-nitrite concentrations indicate that there is a wide variability occurring among systems in the extent of nitrification. TP concentrations are only about 1 mg/L lower than before the aeration step. Based on the median effluent concentrations relative to influent concentrations, the typical removal effectiveness of the advanced treatment units are 93% for cBOD5, 72% for TSS, 34% for TN, and 10% for TP. The removal effectiveness for cBOD5, TN, and TP is consistent with expectations for such treatment systems. The removal effectiveness of TSS is somewhat lower than expected, and suggests entrapment of inert solids during the sampling process.

Table 23. Effluent concentration summary for the random sample of systems

Effluent (mg/L)		cBOD5	TSS	TKN	NOx	TN	TP
N	Valid	308	308	308	305	307	307
	Missing	1	1	1	4	2	2
Mean		25.5	36.7	21.5	16.2	37.6	8.0
Std. Deviation		53.5	56.5	32.2	21.1	32.6	4.4
Minimum		2.000	3.500	0.087	0.008	0.517	0.007
Maximum		450	484	252	108	290	29
Percentiles	10	2.0	3.5	0.1	0.0	7.4	2.9
	25	2.2	6.8	1.5	0.2	16.2	5.3
	50	5.4	19.0	7.7	6.0	30.3	7.5
	75	23.7	42.0	27.9	26.2	51.5	10.0
	90	63.9	92.0	69.1	47.3	77.0	13.0

Two comparisons of effluent concentrations were performed, using the Kruskall-Wallis test. First, effluent concentrations from systems with an unsatisfactory operational status (about 20%) were compared to effluent concentrations from systems with a satisfactory operational status. Secondly, effluent concentrations from sampled systems that had been found with power switched off, with power indicator off, or where aeration did not appear to occur (about 15%) were compared to all other effluent samples. In both cases, the systems that appeared operational performed significantly (level of significance <5%) better than the non-operational ones for cBOD5 and TN but not significantly different for TSS and TP. The operational systems under each definition did increase the removal effectiveness based on median concentrations for TN by about 4% to nearly 40% but did not do so for cBOD5. The apparent lack of aeration power for treatment systems resulted in samples with median concentrations that indicated lack of nitrification, no nitrogen removal, and reduced cBOD5 removal (from 93% to 57%). The substantial fraction of low cBOD5 effluent concentrations in samples from non-operational treatment systems and the measurement of high nitrite/nitrate concentrations in some of these samples indicate that the power operational status at the time of the visit is not completely predictive of effluent concentrations at the same time, for example, because of the hydraulic residence time in the treatment unit.

3.4.3 Analysis of Sample Results for Sites that Completed System Use/User Surveys

Out of the 550 total systems visited, sixteen of the sites had also completed a system owner and user survey that was sent by Florida State University's Survey Research Lab (Section 2.2.2). Also, 29 system use surveys were completed and returned, with 26 of these having been sampled. Five of these also completed a system owner and user survey from Section 3.2.

An analysis was performed looking at the sample results for those systems that completed a system use or a system owner and user survey (Sections 3.2 and 2.1.2.5). Information completed by the system owner or user was compared to the information in the permit file and information on the sampling results to assess whether there is a correlation between user knowledge about their system and system performance.

1. One of four secondary PBTS systems was out of compliance for Carbonaceous Biochemical Oxygen Demand (CBOD5)
2. One advanced secondary PBTS system was out of compliance for Total Nitrogen (TN)
3. One of four PBTS systems was out of compliance for Total Suspended Solids (TSS)

Next an analysis was done comparing a question from the FSU-SRL system owner and user perceptions survey which asked *"How many times have you experienced problems with your sewage system over the PAST YEAR?"* with the results of the operational assessment indicating whether the operational status was OK or Not OK. There was a small sample size (n=15) of users that responded to this question.

1. Of the 15 respondents, three users with an operational status that was OK, indicated they never had problems with their OSTDS over the past year
2. Two users with an operational status that was Not OK, and seven users with an operational status that was OK, indicated they had problems once or twice with their OSTDS over the past year
3. Two users with an operational status that was Not OK, and one user with an operational status that was OK, indicated they had problems several times over the past year with their OSTDS

Additional data analysis was performed to determine if the number of times a user experienced problems with their system in the past year is related to having indicated that they have encountered problems with their system. The survey question specifically asked *"Within the LAST 5 YEARS, have you had any of the following problems?"* with the options being sewage on the ground, plumbing backup, drainfield damaged, tank damaged, parts broken / system stopped working, D-box / header damaged, or other. The sum of the total number of boxes checked was used to compare to the question asking *"How many times have you experienced problems with your sewage system over the PAST YEAR?"* A small sample size (n=16) of users responded. The data results displayed below indicated the following:

1. Of the 16 respondents, six users (five with an operation stats that was OK and one with an operation status of Not OK) indicated that they have had no problems in the last five years

2. Five users (two with an operational status that was Not OK and three users with an operational status that was OK) indicated they responded to at least one of the listed problems within the last 5 years

3. Three users with an operational status that was OK, indicated they responded to at least two of the listed problems within the last 5 years

4. One user with an operational status that was OK, indicated they responded to at least three of the listed problems within the last 5 years

5. One user with an operational status that was Not OK, indicated they responded to at least four of the listed problems within the last 5 years

The overall review and analysis of the survey results from users of OSTDS, along with their corresponding wastewater sample results and system evaluations provided a limited assessment of the owner/user's perceptions regarding the management of their systems. Further evaluation of the secondary treatment standards and advanced secondary treatment systems did indicate an association between OSTDS with mechanical and/or operational issues and the systems that were also out of compliance (had results that exceeded performance standards) for various pollutants including CBOD5, TSS, and TN. Additionally, the data analysis indicated the user's perceptions of the OSTDS issues were related to operational status of the system.

3.5 Assessment of Management Practices

As part of this project, data was collected to help assess management practices. These data included: past county program evaluations; the permitting, inspection, and maintenance records from systems selected for sampling (discussed in Section 2.1.1.4 and analyzed in Section 3.1); and results from a survey that was sent as a part of this overall project to gather information from different user groups (discussed in Section 2.2.2 and analyzed in Section 3.2). Day to day operations at the county health departments were also evaluated when available to help identify any best management practices that are already in place. This section discusses how past county program evaluations and the permit records mentioned above were assessed. A database was created which facilitated a quantitative means of assessing management practices (Appendix B). A further assessment was done for a select group of counties to develop case studies.

It is important to define what is meant by "Best" when discussing Best Management Practices. For the purposes of this analysis, some of the items used to evaluate "Best" Management Practices include, but are not limited to:

1. Completeness of documentation
2. Fraction of systems with current permits
3. User group satisfaction
4. Operating conditions of systems
5. Sampling results

3.5.1 Programmatic Evaluations and Management Practices

A review of previous year evaluations from 2000 - 2010 provided historical data which was used as a baseline to identify common trends within a particular county and determine if there were any systematic trends. Capturing this information played a critical role in determining the strengths and weakness within the local county health department.

The database table developed to store information on the program evaluations had several data fields that were analyzed against various statistics from the advanced systems inventory database. These fields included: the total average score over the years, average ATU score, average ATU maintenance entity permit files score, average other operating permits (including PBTS) score. Each data field had a score for each county that was evaluated during 2000 – 2010. In addition, a separate analysis was done for the previous completed program evaluation cycle in 2006 – 2008. This was done to see if there was any difference between the overall averages and the immediately preceding score. For example, a county may average low because they did poorly during two program evaluations in the early 2000's, but did a major reorganization of the program and scored very well during the last cycle.

There were no correlations between any of the scores when looking at the total number of advanced systems in a county. This would seem to show that there is no tendency for scores to get better or worse the more advanced systems a county has.

The following counties have the highest and lowest total average program evaluation scores over the years.

Top 5:

1. Volusia (98%)
2. Lake (95%)
3. Indian River (95%)
4. Osceola (93%)
5. Alachua (93%)

Bottom 5:

1. Taylor (57%)
2. Franklin (58%)
3. Santa Rosa (65%)
4. Wakulla (65%)
5. Broward (67%)

The following counties have the highest and lowest average ATU scores over the years.

Tied for First (all 100%):

1. Broward
2. Hendry
3. Lake
4. Levy
5. Miami-Dade
6. Pinellas
7. Sumter

Bottom 5:

1. Wakulla (36%)
2. Okeechobee (40%)
3. Pasco (42%)
4. St. Johns (44%)
5. Taylor (46%)

The following counties have the highest and lowest average ATU maintenance entity permit file scores over the years.

Top 5:

1. Highlands (83%)
2. St. Lucie (80%)
3. Sarasota (80%)
4. Flagler (80%)
5. Monroe (78%)

Bottom 5:

1. Taylor (0%)
2. Santa Rosa (13%)
3. Okeechobee (25%)
4. Putnam (25%)
5. Columbia (25%)

The following counties have the highest and lowest average other operating permit's (including PBTS) scores over the years.

Tied for First (all 100%):

1. Highlands
2. St. Lucie
3. Flagler
4. Sumter
5. Citrus
6. Suwannee
7. Dixie
8. Hendry
9. Gulf
10. Lafayette
11. Gilchrist
12. Baker
13. Manatee
14. Union

Bottom 5:

1. Hamilton (50%)
2. Nassau (50%)
3. Gadsden (51%)
4. Franklin (55%)
5. Palm Beach (56%)

The total overall score was ranked from highest score to lowest score, then the other scores were ranked similarly and were all compared individually to the total overall score. There did not appear to be any correlation between any of them. This would seem to show that it was not likely that you would have a high score on any of the advanced system program evaluation questions if you had a high overall average score for the county.

Next an several evaluations of consistency were done to see which counties were consistent when comparing the ranked total overall average score with the various other scores. Lake County showed up as being consistently high scoring when comparing the overall score to the ATU score (ranked second in the overall average score and first in the ATU average score). Counties like Broward and Miami-Dade did not have a very high overall average score but had a perfect score on their ATU average score. Counties like Dixie, Manatee, Gilchrist, and Gulf had fairly low overall average scores but all had perfect scores for the average score from other operating permits (including PBTS). These counties did not have a very large number of advanced systems per Table 1, which combined both ATUs and PBTS.

All of the program evaluation scores relating to advanced systems were averaged together for each county, and produced the following results:

Highest average (most consistent among categories):

1. St. Lucie (93%)
2. Lake (92%)
3. Sarasota (92%)
4. Brevard (89%)
5. Sumter (89%)
6. Citrus (88%)
7. Pinellas (88%)

Lowest average (least consistent among categories):

1. Taylor (38%)
2. Wakulla (44%)
3. Putman (52%)
4. Santa Rosa (53%)
5. Palm Beach (57%)

Some of the more consistent counties with a high overall program evaluation scores over the years were Volusia County and Alachua County. Some of the most improved counties when comparing the overall program evaluation score averages with recent program evaluation scores were Taylor County, Broward County, and Gadsden. Some of the least improved counties when comparing the overall program evaluation score averages with recent program evaluation scores were Franklin County, St. Johns County, and Madison County.

When evaluating consistency between the average ATU scores over 2000 – 2009 and recent ATU program evaluation averages, the most consistently high scoring counties are Lake, Pinellas, Clay, and St. Lucie. The counties that had the most improved ATU average scores were Duval, Orange, and Okaloosa counties. The county that had the least improved ATU average score was Marion County.

There did not appear to be any correlation between the number of advanced systems a county had and the population of the county. There was also no correlation between the number of advanced systems and the population density.

There was a weak correlation (R2=0.5171 for the overall numbers and R2=0.7702 when evaluating only the 2006-2008 cycle) found that shows that it is more likely for a second maintenance inspection to occur if the first one was done.

3.5.2 System Record Completeness and Management Practices

Having a central location where permit information can be stored and accessed is accomplished through the DOH Environmental Health Database (EHD). This web-based system stores construction permit information and operating permit information. CHDs all use the EHD system, but they also maintain a paper record file for each advanced system. Many CHDs input operating permit data into the Carmody system, which allows for better communication with the maintenance entities and a tracking method for determining when inspections and/or permits expire.

CHDs felt that their inventory of advanced systems; combining information from EHD, Carmody, and paper records; is about 90-100% complete. The work load for advanced systems varied between counties, mainly due to the variable number of advanced systems. Several of the counties had additional fees for advanced systems to help cover the cost of running the program.

Many counties consistently did not have all applicable supporting documentation regarding the advanced system. Also, many counties did not conduct either CHD or ME inspections within the required time period.

3.5.3 Sample Results / Operational Assessments and Management Practices

One problem encountered during the field evaluations for advanced systems during this project was limited access to the system. Many of the systems had no risers or other access to grade. Having easy access to the treatment units, without excavation of the system, would have yielded more data points for in-situ measurements and subsequent samples.

An opposite problem that is encountered is when the lid to the treatment unit is not secured or is damaged in some way. This is another concern brought up by the CHDs.

Seasonal use of a system is a common occurrence in Florida. Many of these seasonal users shut down the system when leaving. The CHD and maintenance entity requires power to do the system inspection so coordination and communication is required to avoid wasted effort.

3.5.4 User Group Surveys and Management Practices

The answers provided in the user group surveys were compared to some general statistics and the county program evaluation information to determine if there are any best management practices that could be discovered in this information.

There was no correlation between the total number of advanced systems and the county average for those homeowners that indicated that they experienced problems with their advanced system. The program evaluation scores also did not correlate to those homeowners that indicated they had a problem with their system.

When evaluating how satisfied a homeowner was with their advanced system overall, there did not seem to be any correlation to how well a county did on their program evaluations or the number of advanced systems. This seems to indicate that those counties that have many systems do just about as good a job making homeowners satisfied as those counties that only have a few systems.

An evaluation was done looking at whether there were any correlations between program evaluation scores and whether the homeowner inspects their system, and no correlations were found. There were no correlations between whether the CHD informs the homeowner of the results of their inspections and program evaluation scores.

There were no correlations between the most recent average maintenance entity inspection scores and the average homeowner response to the question on whether there was any difficulty in finding a maintenance entity. There was also no correlation between the most recent average maintenance entity inspection scores and the homeowner’s average satisfaction with their maintenance entity.

There was a strong correlation (R2=0.9476) between the actual number of ATUs found in the inventory by county, and the number of ATUs that the regulators stated in their user group survey. There was a weak correlation (R2=0.5697) between the number of PBTS found in the inventory by county, and the number of PBTS that the regulators stated in their user group survey.

There was a weak correlation (R2=0.4972) between the number of full time employees (FTEs) a county had that dealt with advanced systems and the total number of advanced systems. There was no correlation between the number of FTEs and the overall homeowner satisfaction. There was also no correlation between the number of FTEs or the turnover rate and the average program evaluation scores. The total number of years of experience did not correlate with the average program evaluation scores.

There was a very weak correlation between the number of contractors that work in a county and the number of advanced systems in a county. There was a weak correlation between the number of maintenance entities in a county and the number of advanced systems the regulators reported as having in their county.

There was no correlation between those counties that stated on the survey that they used a checklist to perform inspections on advanced systems and the program evaluation scores. Whether or not a county had an ordinance requiring advanced systems did not affect the program evaluation scores or how satisfied homeowners were.

There was a strong correlation between the number of systems that require enforcement and the total number of advanced systems the regulators indicated they had. Some counties that were outliers in this correlation were Lee and Franklin counties, which had lots of enforcement and fewer systems; and Charlotte County, which had lots of systems with little enforcement.

The overall treatment performance regulator survey response did not correlate with the program evaluation scores.

3.5.5 Case Studies

Some county health departments and maintenance entities were selected to quantify and characterize steps in the management of advanced systems. The counties and maintenance entities are among those with many systems and/or for which survey results indicated a relatively high satisfaction by user groups. Each selected entity participated in a characterization of the status of management of advanced onsite systems. The characterization included: detailed information on the number and types of advanced systems; compliance and enforcement rates; systems used for tracking compliance; the presence and responsiveness of maintenance entities and county health departments; the role of education of stake holders; and management costs. The collected experiences and viewpoints from the county health departments' and maintenance entities' staff members will outline strengths as well as areas for further improvement in the management of advanced onsite systems.

4 Conclusions and Recommendations

[THIS SECTION HAS NOT BEEN COMPLETED AT THE TIME OF PRINTING]

Advanced OSTDS are utilized throughout Florida for various reasons and require more maintenance and management than a conventional OSTDS. By far the most common treatment approach in these systems is extended aeration.

During visits to almost five-hundred randomly selected systems, approximately one-third were found in a status that would require follow-up by the maintenance entity. The main reason for this was an apparent lack of power to the system.

Influent, or better pretreatment tank effluent, concentrations measured on the samples discussed, indicated wide variability in strength. Median cBOD5, TN, and TP concentrations were lower than reported in recent studies, which may be related to differences in water usage.

Median effluent concentrations indicated over ninety percent removal for cBOD5, about three-quarters removal for TSS, one-third for TN, and nearly none for TP. These are generally consistent with the treatment steps employed, while the lower than expected TSS removal may be in part related to the sampling process.

Advanced treatment systems assessed as operational, either as overall assessment or based on power supply and aeration effectiveness, perform significantly better than non-operational ones with respect to cBOD5 and TN-removal.

Overall, there is growth in the advanced systems program. This can be shown by the number of counties that did not get evaluated for advanced system program components in early 2000 that do now. For example 33 counties did not get evaluated on ATUs and 17 counties did not get evaluated on ATU maintenance entities until the 2006-2008 cycle.

4.1.1 Potential Improvements / Best Management Practices

4.1.1.1 Recordkeeping

One potential improvement might be to record sample information when available in the Environmental Health Database [include screen shot]. Lee County records indicated that all of the PBTS systems selected for this project were sampled as directed by the design engineer, and the sample results were provided to the county health department.

Have a central depository for scanned permit files which can be accessed electronically.

Synchronization between EHD and Carmody would also be beneficial. This is currently being done, having recently started in 2012.

A list of approved systems, along with their third-party testing results, is available on the state website. One improvement could be to also have an accessible statewide list of approved maintenance entities and which systems they are approved to service.

Determining which factors influence a program evaluation score positively is not clear at this point.

4.1.1.2 Inspection Procedures

There is no current approved statewide form available for counties to utilize to conduct an inspection of an advanced OSTDS. Various county health departments have created their own methods for conducting inspections of advanced OSTDS. A draft statewide form has been developed and may be implemented in the near future. A copy of the draft form is available in Appendix

One CHD requested that the operating permit be updated annually, instead of biannually, to allow for more contact with system owners and more stable funding for health departments. Another CHD suggested that the number of CHD inspections be increased to two times per year and to increase the permit fee to reflect this change. The second inspection was to be done at the same time as the maintenance entity inspection to allow the CHD to have closer monitoring and understanding of proper system operation.

In Volusia County, the following procedures are done when inspecting an advanced system (Bielby 2008):

1) Using a street card that indicates the original permit conditions, look for any items that may violate these conditions. This will include proper mound stabilization, and no incursion into the required unobstructed area (sidewalks, driveways, wells, drainage features, etc.).

2) Walk the area of the drainfield to look for ponding or other obvious signs of failure.

3) Check the alarm. Most have a test button that can be activated to check the audio and visual alarm. Absence of an alarm is a violation, unless you know that the alarm is inside the home.

4) Check the ATU itself for cracks in the lid, or a loose (non-childproof) lid. These items are sometimes an issue with fiberglass units. Very important: Try to detect a bubbling sound inside the unit. The inspector may have to actually put an ear to the lid of the unit to do so. The sound of the air pump running is not enough; the pump may be running, but no air may be reaching the effluent. This cannot be done with concrete tanks, like the Hoot.

5) “Sniff test” for odors around the ATU. There should be no obvious sewage odor. A sewage odor is an indication that the unit needs the attention of the maintenance entity.

6) A review of the information on the street card should indicate the effective dates of the operating permit and the maintenance contract. Problems here should be indicated on the inspection report.

7) Interview the homeowner if he or she is home. Ask if they have noticed any problems with the system, and if they are having any problems with their maintenance entity. If the alarm is inside the home, ask to test it.

The owners and the maintenance contractors receive a copy of the inspection reports.

One suggestion from a county health department was to require manufacturers of advanced systems to authorize at least two maintenance entities within 100 miles. The statute currently requires only one maintenance entity within 200 miles and it has been a source for customer and inspector dissatisfaction. Another CHD suggested possibility would be to require the manufacturer or design engineer to have at least two people available to service the unit. This will be owners of these systems more flexibility to hire someone they like. With just one approved person to do the maintenance, the owners feel they are being forced into a contract without any competition.

Lee County indicated that in 2012, twenty percent of the ATU systems inspected did not have a working alarm or the alarms were sounding. Ten percent of the systems inspected did not have a functioning aerator. To respond to these operational issues, the CHD would send a notice to abate a sanitary nuisance and send a copy of the letter to the maintenance entity (Tompkins 2012).

Also,

4.1.1.3 Sampling

Due to differences in the design of advanced systems, it is difficult to obtain comparable sample results utilizing the same methodology. For example, systems that utilize recirculation back to the trash tank will have a different influent result than those that do not utilize recirculation.

A common comment is that there is not enough sampling for these systems. If there were a clear and consistent sampling requirement tied to the system type and performance level there would be a better understanding of how these systems work utilizing real-world conditions.

4.1.1.4 Enforcement

In Duval County, the record review revealed that when a violation was noted the county health department responded the same day.

In an effort to keep operating permit renewals up-to-date, Lee and Charlotte Counties send out a reminder to the homeowner 30-45 days prior to the expiration of the operating permit and maintenance agreement contract. A letter is sent again after the permit has expired to notify them of the permit expiration and direct them to renew within 30 days. The final step includes citations, final orders, and liens on the property. By taking a proactive step toward notifying the appropriate parties of permit expirations, time is saved from having to send enforcement letters out.

Having the property owners with any type of advanced system record in the official property records that an advanced system exists and requires a perpetual maintenance agreement and operating permit for the life of the system will help avoid common enforcement issues.

4.1.1.5 Education

There are many opportunities to educate various user groups regarding advanced systems. Timely maintenance entity report submittals could result in a great efficiency of time for CHDs. This may need to be a proactive step from the CHDs to try and send reminder notices prior to due dates.

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Tompkins, Richard.

US EPA Management Model [FIND REFERENCE]

6 Acknowledgements

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7 Notice

The information contained within this paper does not necessarily reflect the official opinion of the Florida Department of Health and no official endorsement should be inferred.

Appendix A System User Survey and Cover Letter

FLORIDA DEPARTMENT OF HEALTH

Rick Scott
Governor

H. Frank Farmer, Jr., M.D., Ph.D.
State Surgeon General

May 27, 2011

Dear Sir/Madam:

You are receiving this note because your onsite sewage treatment and disposal system (OSTDS, commonly referred to as a septic tank) includes advanced treatment, such as an aerobic treatment unit or a performance based treatment system. Your system has been randomly selected for assessment and sampling.

To help us better understand how your onsite system is used, we have included the attached survey form. Your participation is voluntary, but important and will assist the Department in planning and administering its onsite sewage programs. If you wish to participate, please complete the enclosed survey and return it in the envelope provided for your convenience. The survey should take about 4 minutes to complete.

In addition, we are looking for a few systems that can be sampled a few more times during the coming year. If you are willing to participate, please indicate so on the survey.

The Florida Department of Health's Bureau of Onsite Sewage Programs develops and implements statewide rules for permitting the installation, maintenance, and repair of OSTDS within the state, including advanced systems. The Bureau also manages a state funded research program that applies for and receives grants to conduct research on OSTDS in Florida. This project is funded by a grant from the United States Environmental Protection Agency.

More information about the Bureau is available on our website:
http://myfloridaeh.com/ostds/research
The results of this project will be made available there, too.

Should you have any questions, please feel free to call Ms. Elke Ursin at (850) 245-4070 or contact her by e-mail at Elke_Ursin@doh.state.fl.us.

Thank you for your assistance.

Sincerely,

Gerald R. Briggs

Gerald R. Briggs
Bureau Chief

NOTE: Florida has a very broad public records law. Most written communications to or from state officials regarding state business are public records available to the public and the media upon request. Therefore your responses to this survey may be subject to public disclosure.

DIVISION OF
Environmental Public Health

Bureau of Onsite Sewage Programs
4052 Bald Cypress Way, Bin A08 • Tallahassee, Florida 32399-1701
Phone: (850) 245-4070 • Fax: (850) 922-6969 • http://www.floridashealth.com

System User Survey

Name: ____ Date: ____________
Address: ___________________________________ Project System ID: ____________

Home/Residents

1. Is this your first home with an on-site wastewater treatment system? YES / NO
2. Have you received any septic system user information? YES / NO
3. Did you receive as-built/construction drawings for the system? YES / NO
4. Type of use: Permanent / Seasonal If seasonal, number of months used per year _____
5. Number of people living in the home: _____
6. Adults: ____ M ____ F
   Children <13 years: ____ M ____ F
   Teenagers 13-17 years: ____ M ____ F
7. Number of bedrooms: _________
8. Number of bathrooms: ___________
9. Water supply: Private well / public water / other supply _____________________
10. Do you have an in-home business? YES / NO If "yes", what type? _______________

Appliances and Cleaning Products

11. Home equipped with water conserving fixtures/appliances? YES / NO
12. Garbage disposal? YES / NO Use: _______ times/week
13. Dishwasher used? YES / NO Use: _______ times/week
14. Laundry: Maximum _____ loads per day consecutive loads: YES / NO Total _____ loads/week
15. Brand of laundry detergents used? ________________________ powder / liquid
16. Bleach used? YES / NO powder / liquid Use: _____ cups/load _______ loads/week
17. Water temperature for washing? Hot / Warm / Cold
18. Whirlpool tub? YES / NO Use: _______ times/week
19. Is a drain cleaner used? YES / NO Type: ___________ Frequency of use:_____
20. Do you use septic system additives? YES / NO If "yes", what products? _________________
21. Hand-washing soap brand? ________________ Antibacterial? YES / NO
22. Number of rolls of toilet paper used per week? _____________
23. Toilet cleaning product brand? _____________________
24. Cleanings/week ________________
25. Continuous cleaner used in toilet tank? YES / NO
26. Please list commonly used cleaning supplies:
    Shower ________________________
    Kitchen ____________________________
    Floors _____________________________
    Other _____________________________
27. Please list any antibacterial products used:_______________________
28. Water treatment device: YES / NO
29. Is a water softener used? YES / NO
30. Back flushes to: _______________________
31. Reverse osmosis? YES / NO
32. Discharges to: ________________________
33. Air conditioner unit(s)? YES / NO
34. Condensate drains to: _______________________
35. Footing drains or basement sump pumps connected into the system? YES / NO
36. Is the sump pump working? YES / NO
37. **Would you like to volunteer your system to be sampled periodically throughout the year?** YES / NO
38. **Additional comments:**

Appendix B County Health Department Evaluation of Advanced Systems Management Practices Database Description

Table Name	**Description**
CountyStats	Contains the number of systems by various categories (total, unknown, ATU total, Innovative, PBTS non innovative, and PBTS total) by county as well as population estimates and population density estimates.
AverageFractionScoresAllCounties	Contains the average for each county of the calculation % x/(x+o) for various items, where x = the total number of permits that received a full score for that item and o = the total number of permits that received no score for that item (i.e. they failed to complete the item). The items that were scored were: ▪ ATU Inspection 1 by AME (2000 – 2010) ▪ ATU Inspection 2 by AME (2000 – 2010) ▪ ATU Inspection 1 by CHD (2000 – 2010) ▪ ATU Maintenance Contract (2000 – 2010) ▪ ATU Operating Permit (2000 – 2010) ▪ ME Contract Termination Report (2000 – 2010) ▪ ME Inspection Reports (2000 – 2010) ▪ ME Service Permit (2000 – 2010) ▪ PBTS Application (2009 – 2010) ▪ PBTS Inspection1 by CHD (2000 – 2010) ▪ PBTS Inspection 1 by ME (2009 – 2010) ▪ PBTS Inspection 2 by ME (2009 – 2010) ▪ PBTS Maintenance Contract (2009 – 2010) ▪ PBTS Monitoring (2009 – 2010) ▪ PBTS Operating Permit (2000 – 2010) The PBTS items were officially separated out in the evaluation tool starting with the 2009-2011 cycle. The items PBTS Inspection 1 by CHD and PBTS Operating Permit were both items that received a similar score for all years except the pre-2009 scores would also include information from establishments in Industrial/Manufacturing zones and establishments generating commercial strength sewage waste.

ProgEvalScoresAllYears	Contains information on the program evaluation scores from 2000 – 2011 for all counties except the ones that were not completed as of mid-September 2011 (Clay, Escambia, Okaloosa, St. Johns, Sarasota, Volusia, and Washington counties). The overall program score is given, as well as the ATU score, the maintenance entity permit files, and other operating permits (including PBTS). These scores were averaged in several different ways: total average, average over last two evaluations, and average over the last evaluation. The percent difference was calculated between the total average and the average of the last two evaluations, and the total average and the average of the last evaluation for each of the subgroups.
SurveyOwnerAveragesCombined	Contains information gathered from the user group surveys from homeowners/users for several questions: ▪ Average of users that experienced problems over the past year (question #4 from the owners survey) ▪ Average overall satisfaction with their advanced system (question #9 from the owners survey) ▪ Average number of homeowners that inspect their system and how frequently (question #12 from the owners survey) ▪ Average number of homeowners that are informed of the results of their inspections by the CHD's (question #14 from the owners survey) ▪ Average of how difficult it was to find a maintenance entity (question #17 from the owners survey) ▪ Average of how satisfied users are with the services provided by their maintenance entity (question #19 from the owners survey) ▪ Average of whether homeowners would choose to keep their advanced system if costs were equal (question #11 from the owners survey)
SurveyRegulator	Contains information gathered from the user group surveys from regulators for several questions: ▪ Number of ATU's (question #1a from the regulator survey) ▪ Number of PBTS (question #1b from the regulator survey) ▪ Number of full time employees assigned to conduct ATU/PBTS inspections (question #2 from the regulator survey) ▪ Total years of experience for those employees inspecting advanced systems (if answer was less

	than 1 year multiplied by 0.5, if answer was 1 – 2 years multiplied by 1.5, if answer was 3 – 5 years multiplied by 4, if answer was over 5 years multiplied by 6) (combination of results from question 3 from the regulator survey) ▪ Average years of experience for those employees inspecting advanced systems (averaged those that had values, for example Alachua had the total years for less than 1 year at 1 year, none for 1 – 2 or 3 – 5 years, and a total of 12 years for over 5, so the average was 6.5 ((1+12)/2) (combination of results from question 3 from the regulator survey) ▪ Whether turnover is a problem for personnel who conduct inspection on advanced systems (question #4 from the regulator survey) ▪ Number of contractors installing advanced systems (question #5a from the regulator survey) ▪ Are the number of contractors installing advanced systems adequate (question #5b from the regulator survey) ▪ Number of maintenance entities providing maintenance on advanced systems (question #6a from the regulator survey) ▪ Are the number of maintenance entities providing maintenance on advanced systems adequate (question #6b from the regulator survey) ▪ Which counties use Carmody for entering and maintaining information, keeping track of monitoring requirements, and/or keeping track of the monitoring and inspection results for ATUs and PBTS (modified combination from question #s 7, 8, and 9 from the regulator survey) ▪ Which counties have developed a checklist or form to use when conducting inspections of advanced systems (question #12a from the regulator survey) ▪ Which counties have passed ordinances that require standards for advanced systems more stringent than state rules (question #16 from the regulator survey) ▪ Number of advanced systems requiring compliance enforcement action in the past year (question #17a from the regulator survey) ▪ Overall quality of maintenance entity reports submitted (question #21 from the regulator survey) ▪ Overall treatment performance of ATUs (question #26a from the regulator survey) ▪ Overall treatment performance of PBTS (question #26b from the regulator survey)

Appendix C DRAFT DOH Operating Permit Inspection Report

FLORIDA DEPARTMENT OF HEALTH

STATE OF FLORIDA
DEPARTMENT OF HEALTH
ONSITE SEWAGE TREATMENT AND DISPOSAL SYSTEM
OPERATING PERMIT INSPECTION REPORT
AUTHORITY: 381.0065, FLORIDA STATUTES,
64E-6, FLORIDA ADMINISTRATIVE CODE

PURPOSE:
- ☐ Routine
- ☐ Re-inspection
- ☐ Complaint
- ☐ Other: ____________________

PERMITTED FOR:
- ☐ Industrial/Manufacturing
- ☐ Commercial
- ☐ Aerobic Treatment Unit
- ☐ Performance Based Treatment System

PERMIT NUMBER: ____________________

INSPECTION DATE: ____________________

Begin: ____________ **End:** ____________

ESTABLISHMENT NAME: ____

LOCATION ADDRESS: ______________________ CITY: ____________ ZIP:_______

PROPERTY OWNER/AGENT______________________________ PHONE: ____________

BUSINESS OWNER/CONTACT: ___________________________ PHONE: ____________

RESULTS:
- ☐ Satisfactory
- ☐ Incomplete
- ☐ Unsatisfactory

Correct Violations by
- ☐ Next Inspection
- ☐ 8:00 am on:

Date: ____________

Items marked below with an "x", are not in compliance with the requirements of Chapter 64E-6, Florida Administrative Code, and require correction within 72 hours unless specified otherwise under Comments and Instructions. Continued operation of this facility without making these corrections is a violation of Chapter 64E-6, Florida Administrative Code, and Chapter 381, Florida Statutes. Violations must be corrected as indicated or an administrative fine, citation or other legal action may be initiated.

GENERAL INFORMATION
- ☐ 1. Application/Business Survey(s)
- ☐ 2. Operating Permit
- ☐ 3. Conditions of Operating Permit
- ☐ 4. Sanitary Nuisance
- ☐ 5. Change In Ownership Or Tenancy
- ☐ 6. Change in Original Permitted Conditions
- ☐ 7. Setbacks to Pertinent Features
- ☐ 8. Single/Multi-Tenant (# of units): ____________
- ☐ 9. Business Activity (I/M and COM): ____________

COMMERCIAL SEWAGE
- ☐ 10. Grease Interceptor
- ☐ 11. Increase In Flow (seating etc.): ____________
- ☐ 12. Menu/Service Type
- ☐ 13. Floor Plan
- ☐ 14. Hours of Operation
- ☐ 15. Other Conditions: ____________

AEROBIC TREATMENT UNIT/PEFORMANCE-BASED TREATMENT SYSTEM
- ☐ 16. Maintenance Contract: ____________
- ☐ 17. Unit Operational
- ☐ 18. Warning Device
- ☐ 19. Bypass(ATU<1500 GPD)
- ☐ 20. Sampling Port(s) (ATU<1500 GPD)
- ☐ 21. Sampling/Monitoring(PBTS): ____________
- ☐ 22. Other Conditions: ____________

INDUSTRIAL/MANUFACTURING or EQUIVALENT
- ☐ 23. Chemical Storage/Disposal
- ☐ 24. Labeling Of Chemicals
- ☐ 25. Contracted Waste Haulers: ____________
- ☐ 26. Sampling Requirements: ____________
- ☐ 27. Floor Drains/Utility Sinks
- ☐ 28. Increase In Flow
- ☐ 29. Other Conditions: ____________

ITEM NUMBERS	COMMENTS AND INSTRUCTIONS

Inspected by: ______________________________ ____________CHD

Received by: ______________________________ Date: ____________

Delivery Method: ☐Mail ☐Hand delivery ☐Fax ☐Email

DH 4145 (04/11)

Instructions/Explanations for Operating Permit Inspection Report

PURPOSE – Indicate whether the inspection was a routine, re-inspection, complaint or other type of inspection. Routine inspections are conducted on an annual basis. 64E-6.003(2)(e).
PERMITTED FOR – Indicate the type(s) of operating permit; Industrial/Manufacturing, Commercial Sewage Waste, Aerobic Treatment Unit (ATU) or Performance Based Treatment System (PBTS). Mark all that apply. Only one operating permit is to be issued for each system.
PERMIT NUMBER – Indicate the Operating Permit Tracking number.
INSPECTION DATE – Indicate the date and the beginning and end times of the inspection.
ESTABLISHMENT NAME – Indicate the name of the business, if a single business or the name of the complex if multiple businesses are present.
LOCATION ADDRESS – Indicate the actual address of the property.
PROPERTY OWNER/AGENT'S NAME – Enter the property owner's full name or the legally authorized representative.
BUSINESS OWNER AND PHONE – Indicate the name and phone number of the business owner. If multiple businesses present, use separate sheets.

GENERAL INFORMATION

1. Application/Business Survey(s). 64E-6.003(5). The Application for Onsite Sewage Treatment and Disposal System Operating Permit (Form DH 4081, 10/96) should be completed along with the Business Survey (Form DH 4081A, 10/96), for the current operating permit.
2. Operating Permit. 64E-6.003(5)(a) – (c). and sec. 381.0065(4), FS. Annual operating permits are required for systems located in industrial/manufacturing zones or equivalent (IM), or where commercial sewage waste (COM) is generated. Biennial operating permits are required for ATU and PBTS and are obtained by the approved maintenance entity.
3. Conditions Of Operating Permit. 381.0065(4), FS, 64E-6.027(6)(b). The operating permit is issued with specific conditions based on what the system was designed and approved for. For example a specific number of seats for a food establishment, sampling requirement for an IM or PBTS, etc.
4. Sanitary Nuisance. sec. 386.01, FS. An improperly built or maintained onsite sewage disposal and treatment system (OSTDS), or any condition that may threaten or cause disease to an individual. An example would include sewage on the ground surface.
5. Change In Ownership Or Tenancy. 64E-6.003(5)(b). If the tenancy of a business changes, a new business survey form must be completed and submitted to the County Health Department (CHD).
6. Change In Original Permitted Conditions. 64E-6.001(4). If the conditions under which the original prior approved system have changed, this may cause the system to require new permit and be reapproved. This could also affect the conditions of the operating permit.
7. Setbacks to Pertinent Features. 64E.005(1)-(3). This would include setbacks to wells, surface water bodies and other features (that may have been added/altered after system approval or previous inspection). This would also constitute a change in original permitted conditions.
8. Single/Multi-Tenanted – Indicate the number of businesses/tenants that are served by the system.
9. Business Activity. 64E-6.002(13) and DOH/DEP Interagency Agreement. For Commercial and Industrial/Manufacturing permits, the currently-operating business matches the operating permit.

COMMERCIAL SEWAGE

10. Grease Interceptor. 64E-6.013(7). A grease interceptor is normally required for facilities that serve and/or prepare food and where the quantities of grease produced could cause line stoppage or hinder sewage disposal. Check to see if grease interceptor is nuisance free, access ports are sealed and if pumping is necessary.
11. Increase In Sewage Flow (seating, etc.) 64E-6.001(4) and 64E-6.008 Table I. An increase in flow may result in a change in the original permitted conditions that would void the original permit. Flow increases could result from increases/changes in items such as; food service(seats), food outlet with deli/bakery/meat (floor space), daycare(children), group care(residents), schools(students), civic/church(members, meals served), animal grooming/kennels(cages, wash tubs), and/or beauty salon (wash sink).
12. Menu/Service Type. 64E-6.008 Table I. For food establishments that operate with or without single service utensils (disposable cups, plates, and silverware). The type of food served or prepared at a food establishment. e.g. Deli, bakery, meat market, etc.
13. Floor Plan. 64E-6.008 Table I. The floor plans or square footage of the food preparation area in certain businesses that would affect the sewage flow. e.g., food outlets.
14. Hours Of Operation. 64E-6.008 Table I. In food establishments, the operating hours that would affect the sewage flow (16 hours or more or less than 16 hours according to current rule).
15. Other Conditions. Any other condition that is pertinent.

AEROBIC TREATMENT UNIT/PERFORMANCE-BASED TREATMENT SYSTEM

16. Maintenance Contract/Agreement. 64E-6.012(2)(l),(m), 64E-6.009(5)(a)20. and 64E-6.018(3). A maintenance contract/agreement is required for the life of the system and shall be initially for a period of 2 years, renewed at least annually.
17. Unit Operational. 64E-6.012(2). Power to the unit and aeration devices working properly. Access to ports shall be tamper and child resistant.
18. Warning Device. 64E-6.012(2)(c). A visual and audio warning device is required, should be installed in a conspicuous location and functional.
19. Bypass (ATU<1500 GPD). 64E-6.012(2)(f). Bypass that allows sewage to enter drainfield without treatment is not allowed.
20. Sampling Port(s) (ATU<1500 GPD). 64E-6.012(2)(b). Sampling ports should be accessible and installed between the tank outlet and drainfield.
21. Sampling/Monitoring (PBTS). 64E-6.003(5)(b). and 64E-6.029. Monitoring shall be required based on the performance level of the system according to 64E-6.029. See also Informational Memo 08-003.
22. Other Conditions. Any other condition that is pertinent.

INDUSTRIAL/MANUFACTURING or EQUIVALENT

23. Chemical Storage/Disposal. 64E-6.003(5)(a). The storage and disposal methods of the chemical compounds should be checked to ensure there is not a likelihood they will be disposed of into the OSTDS.
24. Labeling Of Chemicals. 64E-6.003(5)(a). The chemical compounds should be labeled to check for compliance with the business survey.
25. Contracted Waste Haulers. Business Survey (DH4081A, 10/96). A waste hauler that has been required by DEP to dispose of any industrial wastes generated at the site.
26. Sampling Requirements. 64E-6.003(5)(a). Sampling of chemical compounds is occurring in compliance with the conditions indicated on the annual operating permit.
27. Floor Drains/Utility Sinks. 64E-6.002(29). Wastewater from floor drains and utility sinks shall not be directed to an OSTDS. If floor drains or utility sinks are present, they shall be addressed by DEP and the method for disposal listed on the operating permit.
28. Increase In Sewage Flow. 64E-6.001(4) and 64E-6.008 Table I. A change in the business activity that would increase the flow for IM or equivalent businesses. For example doctors/medical offices (practitioners), warehouses (loading bays), offices (floor space).
29. Other Conditions. Any other condition that is pertinent.

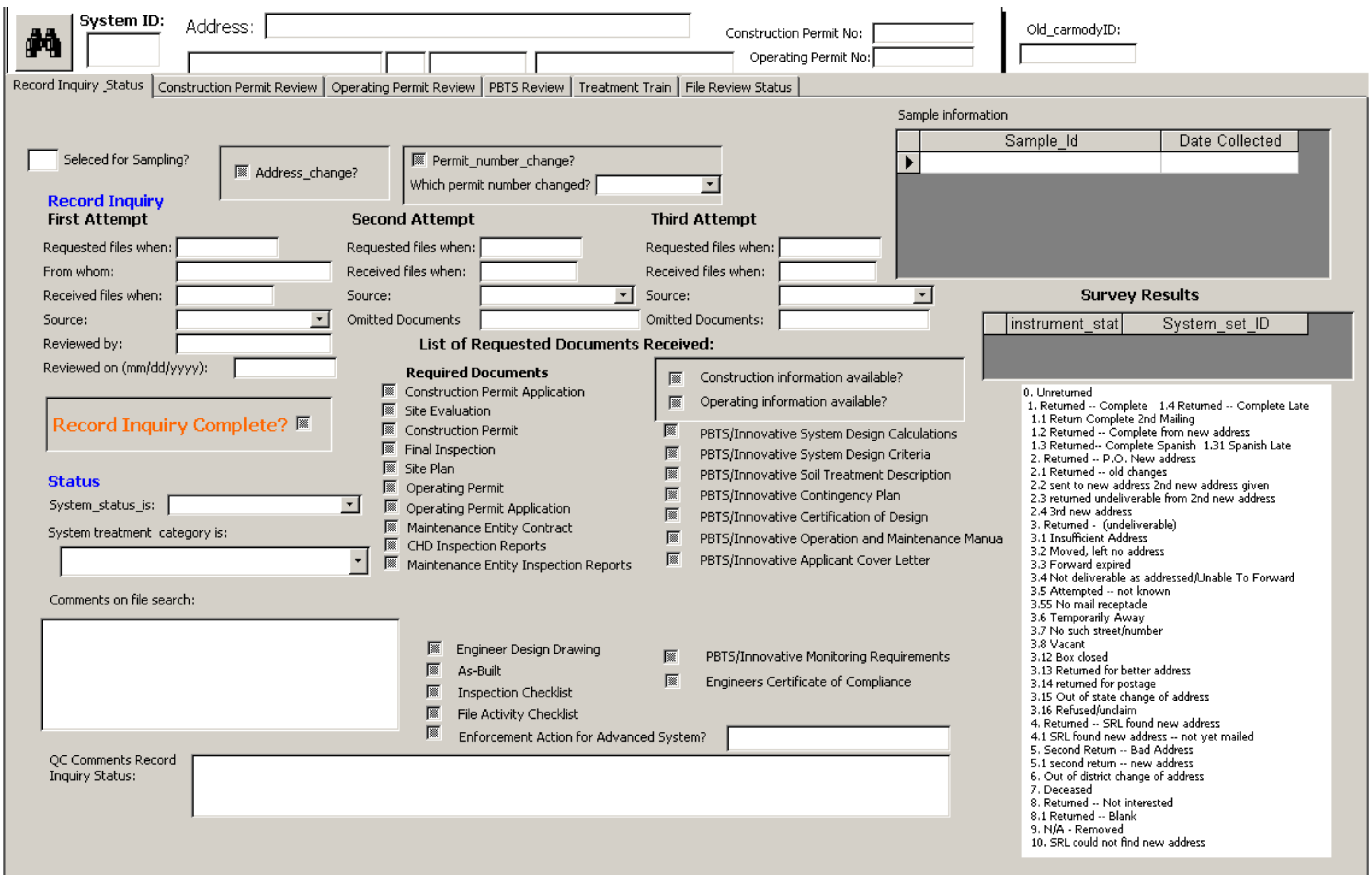
COMMENTS AND INSTRUCTIONS

Identify any comments, violations, instructions and/or corrective actions.
Inspected By. Name of certified department person conducting inspection. Print name after signature. **CHD.** Name of County Health Department.
Received By. Name of person at the site receiving inspection report or to whom the report is mailed. **Date.** Date inspection report delivered or mailed.
Delivery. Check the delivery method.

Appendix D Database Description and Forms for Permit Review and Site Evaluations

A) Step 1: Record ID Results

This section of the database provides information on the results of the Step 1 permit file review which consisted of assessing the completeness of the permit files as well as documenting basic information on document requests, the status of the permit file review, and quality control review information.



System ID:
Address:
Construction Permit No:
Operating Permit No:
Old_carmodyID:

Record Inquiry_Status | Construction Permit Review | Operating Permit Review | PBTS Review | Treatment Train | File Review Status

Seleced for Sampling?
Address_change?
Permit_number_change?
Which permit number changed?

Sample information

Sample_Id	Date Collected

Record Inquiry

First Attempt
Requested files when:
From whom:
Received files when:
Source:
Reviewed by:
Reviewed on (mm/dd/yyyy):

Second Attempt
Requested files when:
Received files when:
Source:
Omitted Documents

Third Attempt
Requested files when:
Received files when:
Source:
Omitted Documents:

Survey Results

instrument_stat	System_set_ID

List of Requested Documents Received:

Required Documents
Construction Permit Application
Site Evaluation
Construction Permit
Final Inspection
Site Plan
Operating Permit
Operating Permit Application
Maintenance Entity Contract
CHD Inspection Reports
Maintenance Entity Inspection Reports

Construction information available?
Operating information available?
PBTS/Innovative System Design Calculations
PBTS/Innovative System Design Criteria
PBTS/Innovative Soil Treatment Description
PBTS/Innovative Contingency Plan
PBTS/Innovative Certification of Design
PBTS/Innovative Operation and Maintenance Manua
PBTS/Innovative Applicant Cover Letter

Record Inquiry Complete?

Status
System_status_is:
System treatment category is:

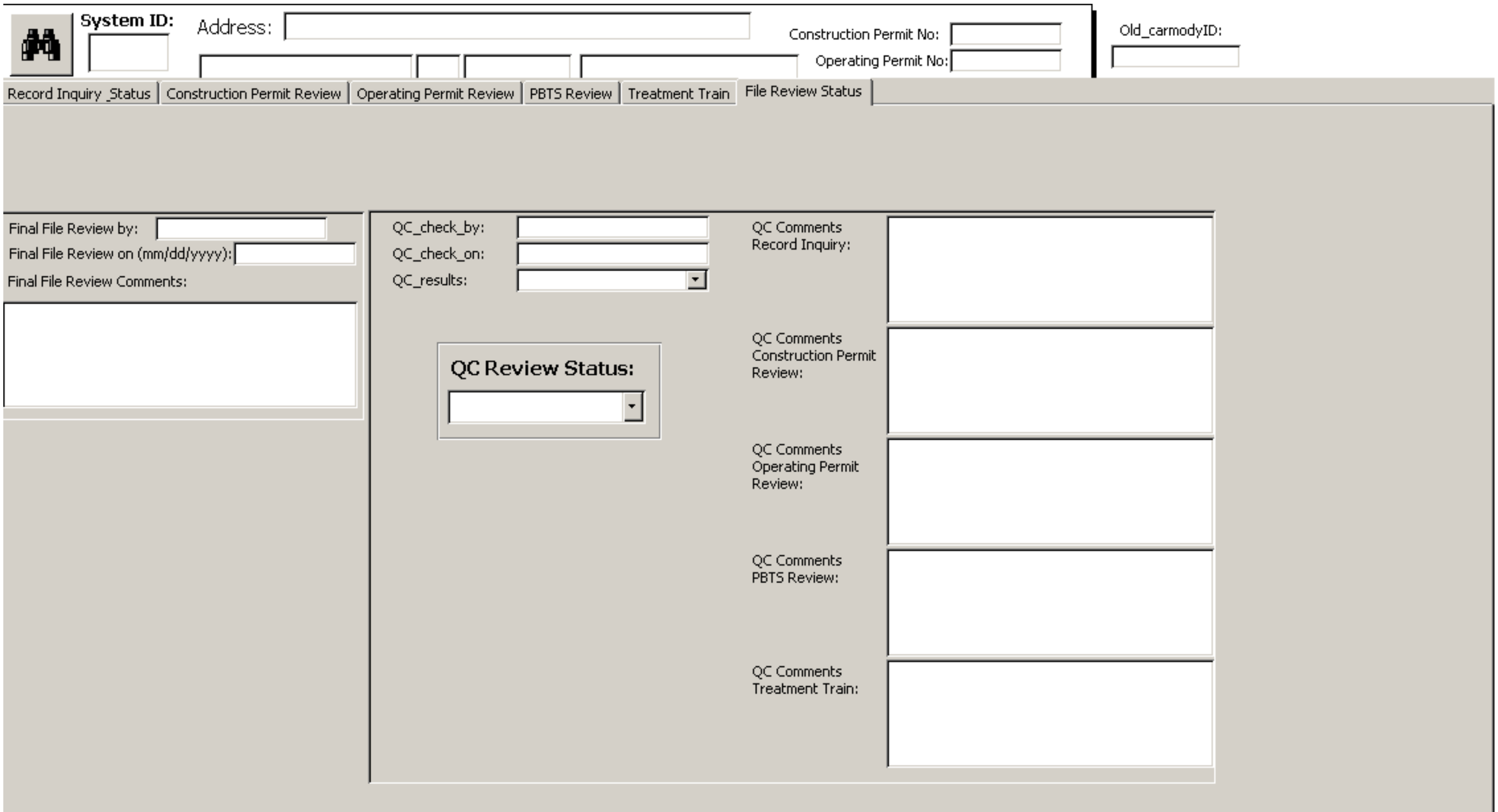
Comments on file search:

Engineer Design Drawing
As-Built
Inspection Checklist
File Activity Checklist
Enforcement Action for Advanced System?
PBTS/Innovative Monitoring Requirements
Engineers Certificate of Compliance

QC Comments Record Inquiry Status:

0. Unreturned
1. Returned -- Complete 1.4 Returned -- Complete Late
1.1 Return Complete 2nd Mailing
1.2 Returned -- Complete from new address
1.3 Returned-- Complete Spanish 1.31 Spanish Late
2. Returned -- P.O. New address
2.1 Returned -- old changes
2.2 sent to new address 2nd new address given
2.3 returned undeliverable from 2nd new address
2.4 3rd new address
3. Returned - (undeliverable)
3.1 Insufficient Address
3.2 Moved, left no address
3.3 Forward expired
3.4 Not deliverable as addressed/Unable To Forward
3.5 Attempted -- not known
3.55 No mail receptacle
3.6 Temporarily Away
3.7 No such street/number
3.8 Vacant
3.12 Box closed
3.13 Returned for better address
3.14 returned for postage
3.15 Out of state change of address
3.16 Refused/unclaim
4. Returned -- SRL found new address
4.1 SRL found new address -- not yet mailed
5. Second Return -- Bad Address
5.1 second return -- new address
6. Out of district change of address
7. Deceased
8. Returned -- Not interested
8.1 Returned -- Blank
9. N/A - Removed
10. SRL could not find new address

Screenshot of Step 1 Record Review Form Page 1



Screenshot of Step 1 Record Review Form Page 2

Table: Step1_recordID_results

Field Name	**Data Type**	**Description**
System_set_ID	Integer	System ID number assigned for this project
Address_change	Yes/No	Were address changes needed? (address usually located on the upper portion of the document)
Permit_number_change	Yes/No	Were permit number changes (OP or CP) needed? (permit number located on the upper right corner of the construction permit)
Which permit number change	Text	If there was a permit number change, which was it "add CP";"add OP";"change CP";"change OP"

System_status_is	Text	Status of system based on initial information from CHD: abandoned before file request; abandoned after file request; active; active but conventional system; not_existent; not_on_file; permit_for_ME_IM_or_facility
System_treatment system category_is	Text	Category of system based on permit files: "ATU"; "PBTS non_innovative"; "Innovative"; "PBTS innovative"; "Keys interim"; "other"
Construction_info_available?	Yes/No	Does the file contain construction information (permit or drawings)? (if any information is received regarding construction permit check this box)
Operating_info_available?	Yes/No	Does the file contain operating permit, maintenance entity and inspection information? (if any information is received regarding operating permit check this box)
Comments_on_file_search	Memo	Additional comments about finding the file and the system
Requested_files_when	Date/Time	On what date did were the files requested from CHD?
Requested_files_from_whom	Text	From whom were the files requested from CHD?
Received_files_when_1st attempt	Date/Time	On what date did were the files received by state health office in response to the first attempt?
Source_Field 1st	Text	What was the source of document collection? Carmody, EHD or County files, Laserfiche
Reviewed_1st by	Text	Who reviewed the file?
Reviewed_1st on (mm/dd/yyyy)	Date/Time	What date did the review occur?
2nd_attempt_Ommitted_documents	Text	This represents the second attempt to notify CDH regarding omitted documents?
2nd_ Date_Requested	Date/Time	Date the second request was made for omitted documents?
Received_files_when_2nd attempt	Date/Time	On what date did were the files received by SHO in response to the second

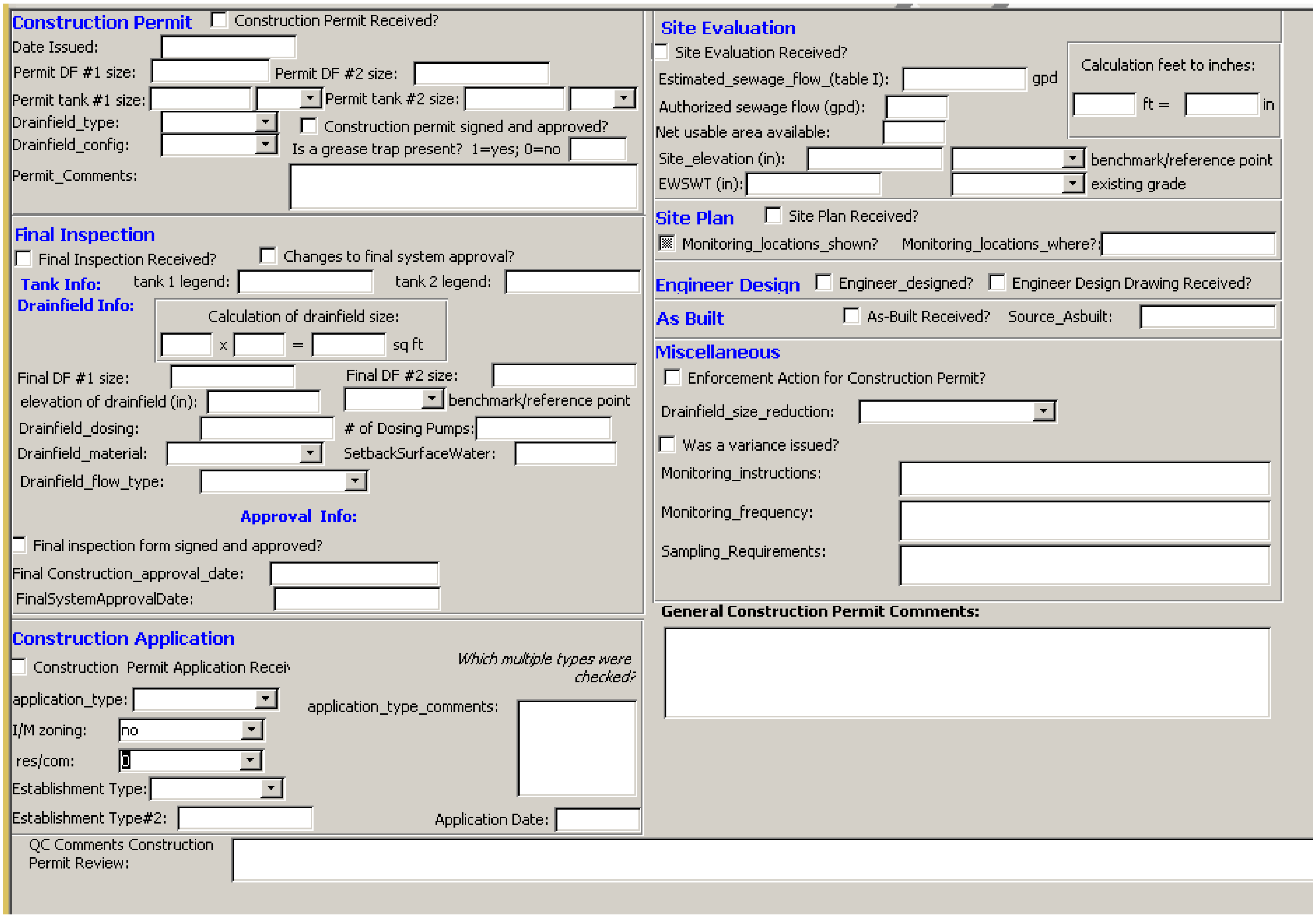
		attempt?
Source_Field 2nd	Text	What was the source of document collection? Carmody, EHD or County files, Laserfiche
3rd_attempt_Ommitted_document	Text	This represents the third attempt to notify CHD regarding omitted documents?
3rd_Date_Requested	Date/Time	Date the third request was made to notify CHD regarding omitted documents?
Received_files_when_3rd attempt	Date/Time	On what date did were the files received by state health office in response to the third attempt?
Source_Field 3rd	Text	What was the source of document collection? Carmody, EHD or County files, Laserfiche
Reviewed_final by	Text	Who reviewed the file? (The final review of all documents)
List_of_requested_documents_received	Text	List of requested documents that have been received
All requested documents received?	Yes/No	Did we receive all documents requested?
Reviewed_final comments	Text	Final comments on source data collection
Reviewed_final on (mm/dd/yyyy)	Date/Time	What date did the review occur?
Complete	Yes/No	All documents are accounted for or no additional information is needed
Construction_ Permit_Application Received	Yes/No	Is DH4015 p.1 included in the file or in EHD?
Site_Evaluation_Received?	Yes/No	Has this file been received? (typically acquired from form DH4015 page 3)
Construction_Permit_Received?	Yes/No	Is DH4016 included in the file or in EHD?
Final_Inspection_Received?	Yes/No	Has this file been received? (Form 4016 page 2 of 3)
Site_Plan_Received?	Yes/No	Is a site plan included in the file? (scaled drawing which included the approximate location of system and drainfield)
Engineer_Design_Drawing_Received?	Yes/No	Are the drawings by the engineer present? (drawing of the systems created by an engineer)
As-Built_Received?	Yes/No	Is an as-built in the file? (unscaled drawing of system and drainfield)
Operating_Permit_Received?	Yes/No	Has this file been received? (Form DH4013 (03/97))

Operating_Permit_Application_Received?	Yes/No	Has this file been received? (Form DH 4081 page 1)
Operating_Permit_Application_Comments	Text	Comments regarding operating permit application (Generally located on form DH4013 under condition of operation)
Maintenance_Entity_Contract_Received?	Yes/No	Has this file been received? (Approved Maintenance Entity provider)
Inspection_Checklist_Received?	Yes/No	Has this file been received? (This checklist represents what the CHD uses to uniformly inspect advanced systems)
File_Activity_Checklist_Received?	Yes/No	Has this file been received? (This checklist represents any written log and/or journal regarding the system)
CHD_Inspection_Reports_Received?	Yes/No	Has this file been received?
Maintenance_Entity_Inspection_Reports_Received?	Yes/No	Has this file been received? (This document contains service provided at the time of the ME inspection)
Enforcement_Action_For_Advanced_System_Received?	Yes/No	Has this file been received? (List the last documented enforcement action)
PBTS/Innovative_System_Design_Calculations_Received?	Yes/No	Has this file been received? (Typically found with required PBTS Engineer documents)
PBTS/Innovative_System_Design_Criteria_Received?	Yes/No	Has this file been received? (Typically found with required PBTS Engineer documents)
PBTS/Innovative_Soil_Treatment_Description_Received?	Yes/No	Has this file been received? (Typically found with required PBTS Engineer documents)
PBTS/Innovative_Contingency_Plan_Received?	Yes/No	Did the engineer provide contingency instructions? (Typically found with required PBTS Engineer documents)
PBTS/Innovative_Certification_of_Design_Received?	Yes/No	Is the certification of design included in the application package? (Typically found with required PBTS Engineer documents)
PBTS/Innovative_Operation and_Maintenance_Manual_Received?	Yes/No	Did the engineer include an operation and maintenance manual? (Typically found with required PBTS Engineer documents)

PBTS/Innovative_Applicant_Cover_Letter_Received?	Yes/No	if this is an innovative system, are homeowner acknowledgement form and CHD/SHO review form included?
PBTS/Innovative_Cert_of_compliance_received?	Yes/No	Did the engineer provide a certificate of compliance after the installation? (Typically found with required PBTS Engineer documents)
PBTS/Innovative_Monitoring_Requirements_Recieved?	Yes/No	Did the engineer provide a list of monitoring requirements for the system? (Typically found with required PBTS Engineer documents)
QC_check_by	Text	Initials of QC checker
QC_check_on	Date/Time	Short date of QC check
QC_results	Text	Result of QC review: complete and agrees with records; partial and agrees with records; missing some fields; data entry errors; missing some and errors
QC Comments Step 1	Memo	Comments on the QC review for Step 1
QC Review Status	Text	Status of QC review (final, follow-up)
DateModified	Date/Time	Date that this field was modified, autoentered
Primary key	Long Integer	Primary key for this table

B) Step 2a: Construction Permit File Results

This section of the database provides information on the results of the Step 2a permit file review which consisted of reviewing construction permit file information.


Construction Permit
Construction Permit Received?
Date Issued:
Permit DF #1 size:
Permit DF #2 size:
Permit tank #1 size:
Permit tank #2 size:
Drainfield_type:
Construction permit signed and approved?
Drainfield_config:
Is a grease trap present? 1=yes; 0=no
Permit_Comments:
Final Inspection
Final Inspection Received?
Changes to final system approval?
Tank Info:
tank 1 legend:
tank 2 legend:
Drainfield Info:
Calculation of drainfield size:
x = sq ft
Final DF #1 size:
Final DF #2 size:
elevation of drainfield (in):
benchmark/reference point
Drainfield_dosing:
# of Dosing Pumps:
Drainfield_material:
SetbackSurfaceWater:
Drainfield_flow_type:
Approval Info:
Final inspection form signed and approved?
Final Construction_approval_date:
FinalSystemApprovalDate:
Construction Application
Construction Permit Application Recei
Which multiple types were checked?
application_type:
application_type_comments:
I/M zoning: no
res/com: 0
Establishment Type:
Establishment Type#2:
Application Date:
QC Comments Construction Permit Review:
Site Evaluation
Site Evaluation Received?
Estimated_sewage_flow_(table I): gpd
Calculation feet to inches:
ft = in
Authorized sewage flow (gpd):
Net usable area available:
Site_elevation (in):
benchmark/reference point
EWSWT (in):
existing grade
Site Plan
Site Plan Received?
Monitoring_locations_shown?
Monitoring_locations_where?:
Engineer Design
Engineer_designed?
Engineer Design Drawing Received?
As Built
As-Built Received?
Source_Asbuilt:
Miscellaneous
Enforcement Action for Construction Permit?
Drainfield_size_reduction:
Was a variance issued?
Monitoring_instructions:
Monitoring_frequency:
Sampling_Requirements:
General Construction Permit Comments:

Screenshot of Step 2a Construction Permit Review Form

Table: Step2a_const_permit_file_results

Field Name	Data Type	Description
System_set_ID	Integer	System ID number assigned for this project
CP_Soil_Profile complete?	Yes/No	Is the soil profile filled out correctly and completely DH4015 p.3?
Employee#SignPermit	Long Integer	Employee number from the CEHP who signed off on the permit
CP_permit signed and approved	Yes/No	Is the construction permit signed and approved in the file?

final inspection form signed and approved?	Yes/No	Is the final inspection signed and approved in the file?
FinalSystemApprovalDate	Date/Time	Final date when system was final approved
Enforcement_Action	Yes/No	Is there enforcement action document relative to construction included in the file (including failed construction inspections)?
Source_Asbuilt	Text	Who drew the as-built?
CP_comments	Memo	Comments on completeness of construction permit file
Permit_Comments	Memo	Comments from the actual construction permit
Engineer_designed	Yes/No	Was the system designed by an engineer?
application_type	Text	Application type checked on application form DH4015 p.1
application_type_comments	Text	Comments on application (variance, which multiple types were checked?)
CP_Commercial/residential	Text	Does the construction permit show this as commercial or residential system?
ResidentialOrCommercialText	Text	Does the operating permit show this as commercial or residential system?
Establishment_type	Text	Type of establishment DH4015 p.1
Establishment_type2-New	Text	Type of establishment DH4015 p.1 for second type of establishment using system
Usable property_size (acres)	Single	Property size given on site evaluation or similar DH4015 p.3 in acres
Usable property_size (feet)	Double	Property size given on site evaluation or similar DH4015 p.3 in square feet
Estimated_sewage_flow_(tableI)	Single	Estimated sewage flow (Table I) DH4015 p.3
Authorized sewage flow (gpd)	Long Integer	Authorized sewage flow DH4015 p.3
Site_elevation (in)	Single	Elevation of proposed site (in) DH4015 p.3
Changes_to_Site_Evaluation	Yes/No	Check this box if changes to the site evaluations data dump occurred?
site elevation above/below	Text	Indicator of elevation of site above/below
EWSWT elevation (in)	Single	What is the estimated wet season water

		table as shown on the site evaluation? Inches below = -
EWSWT elevation above/below	Text	Indicator of elevation of EWSWT above/below
Application_date	Date/Time	When was system construction permit originally applied for? (mm/dd/yyyy) DH4015 p.1
ApplicationCompleteDate	Date/Time	Date when application was complete
Permit_Issue_date	Date/Time	When was permit issued (DH4016 p.1)
Construction_approval_date	Date/Time	When was construction approval given on DH4016 p.2
Construction_permit_approval_date_changed?	Yes/No	Was a change to the EHD-obtained construction permit approval date made based on the permit review?
Changes_to_Construction_permit_application	Yes/No	Check this box if changes to the Construction permit data dump occurred?
Changes_to_final_system_approval_date?	Yes/No	Was a change to the EHD-obtained final system approval date made based on the permit review?
permit_source	Text	Source of information on permitting (flow, authorized flow, setbacks, application)
tank 1 legend	Text	Legend 1 of tank (DH4016 p.2)
tank 2 legend	Text	Legend 2 of tank (DH4016 p.2)
Grease_Trap	Long Integer	Is a grease trap present? 1=yes; 0=no
Drainfield_Cp_Application_Size	Text	Drainfield size annotated on Construction permit application. (DH 4016 p.2)
DF1_Permit	Double	Size of drainfield #1 on the construction permit
DF2_Permit	Text	Size of drainfield #2 on the construction permit
Tank1Units	Text	Units for tank #1 (gal/gpd)
Tank2Units	Text	Units for tank #2 (gal/gpd)
Tank1	Double	Size of tank #1 on the final inspection
Tank2	Double	Size of tank #2 on the final inspection
Drainfield_TypeCode	Double	Unique identifier from EHD for the drainfield type (same as number in Drainfield_Materials table)
DocumentNumber	Text	Document number from EHD
DrainfieldInstallation_DosingPumpsNumber	Double	Number of dosing pumps

DF1_Final	Double	Size of drainfield #1 on the final inspection
DF2_Final	Text	Size of drainfield #2 on the final inspection
IndustrialManufacturingOrEquivalent	Text	Is this industrial/manufacturing or its equivalent?
Drainfield_flow_type	Text	How does water get into drainfield and soil? "drip";"gravity";"lift-dosed";"LPDS";"unknown"
Drainfield_dosing	Text	Is there a dosing pump -> dosing from DH4016 p.2?
Drainfield_type	Text	Drainfield type relative to ground surface "fill"; "mound"; "standard/subsurface"; "unknown"
Drainfield_config	Text	Drainfield configuration "bed"; "trench"; "unknown"
Drainfield_material	Text	What is the material used in the drainfield (manufacturer; product)
elevation_of_constructed_drainfield_(in)	Double	Numerical value of constructed elevation of drainfield above/below benchmark (DH 4016 p.2)
elevation_of_constructed_drainfield_above/below	Text	Indicator of constructed elevation of drainfield above/below benchmark (DH 4016 p.2)
ElevationOfProposedSystemSiteInchesOrFeet-New	Text	Is the elevation of the system site in inches or feet?
Drainfield comments	Text	Any additional comments on drainfield?
Authorized sewage flow increase	Yes/No	Was authorized sewage flow increase allowed due to PBTS?
SetbackSurfaceWater	Text	What is the setback to the surface water from the final inspection?
Setback reductions_horizontal?	Yes/No	Was a horizontal setback reduction allowed due to PBTS?
Setback reductions_vertical	Yes/No	Was a vertical setback reduction allowed due to PBTS?
Drainfield_size_reduction	Text	What drainfield size reduction was taken for the pretreatment (common numbers are 0, 25, 30, 40%)
Monitoring_locations_shown?	Text	Are monitoring locations shown or indicated in the file?

Monitoring_locations_where?	Text	What are the monitoring locations, if indicated?
Operating_manual_available?	Text	Is there an operation manual, including inspection procedures for this unit or references included?
Monitoring_instructions	Memo	What are the monitoring instructions?
Monitoring_requirements	Memo	What are the monitoring requirements?
Sampling_Requirements_in_permit	Text	Are sampling requirements specified?
Variance?	Yes/No	Has a variance been applied for?
QC Comments Step 2a	Memo	Comments on the QC review for Step 2a
DateModified	Date/Time	Date that this field was modified, autoentered
Primary Key	Long Integer	Primary key for this table

C) Step 2b: PBTS Review Results

This section of the database provides information on the results of the Step 2b PBTS review which consisted of reviewing information in the permit files.

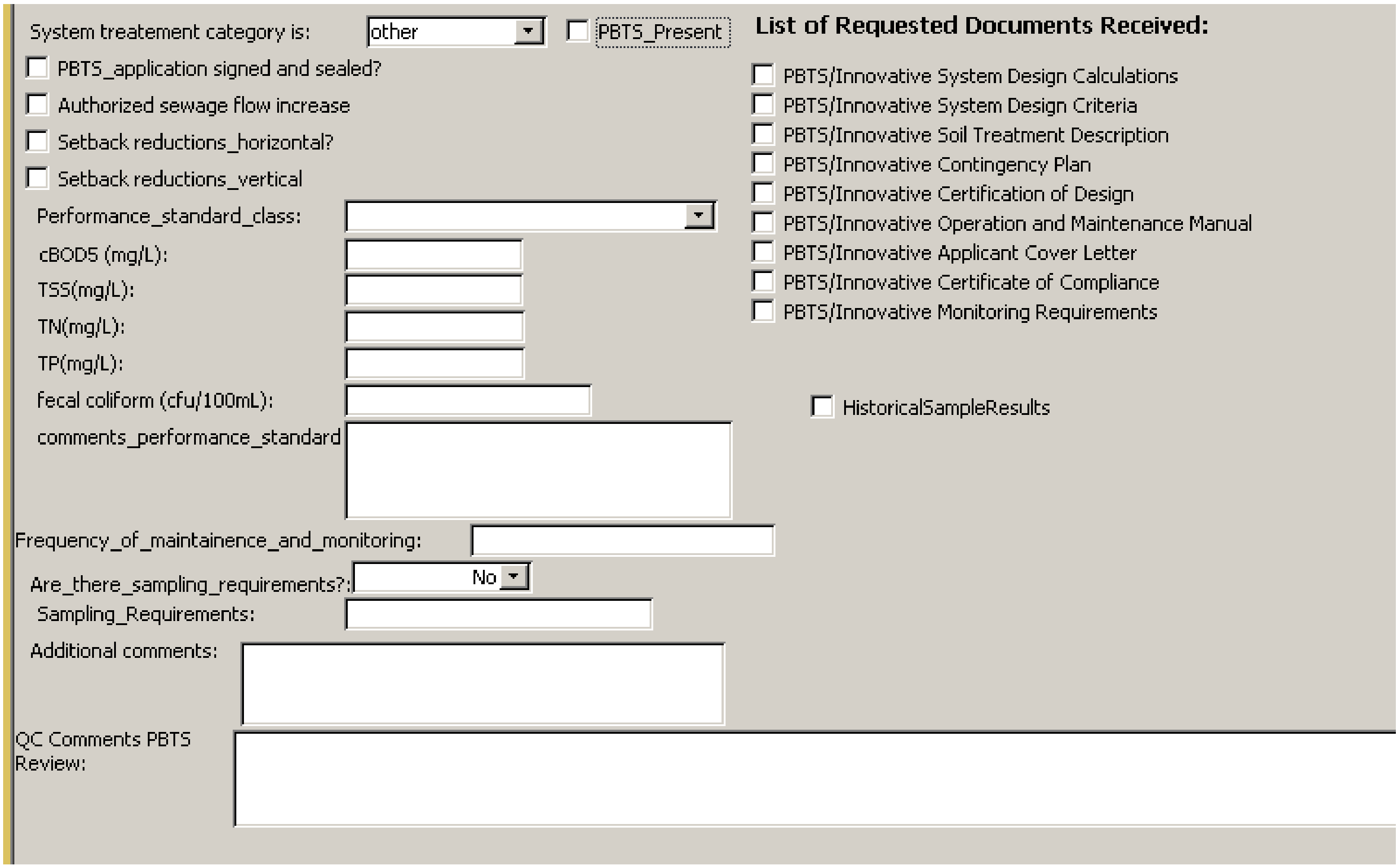


Figure 4. Screenshot of Step 2b PBTS Review Form

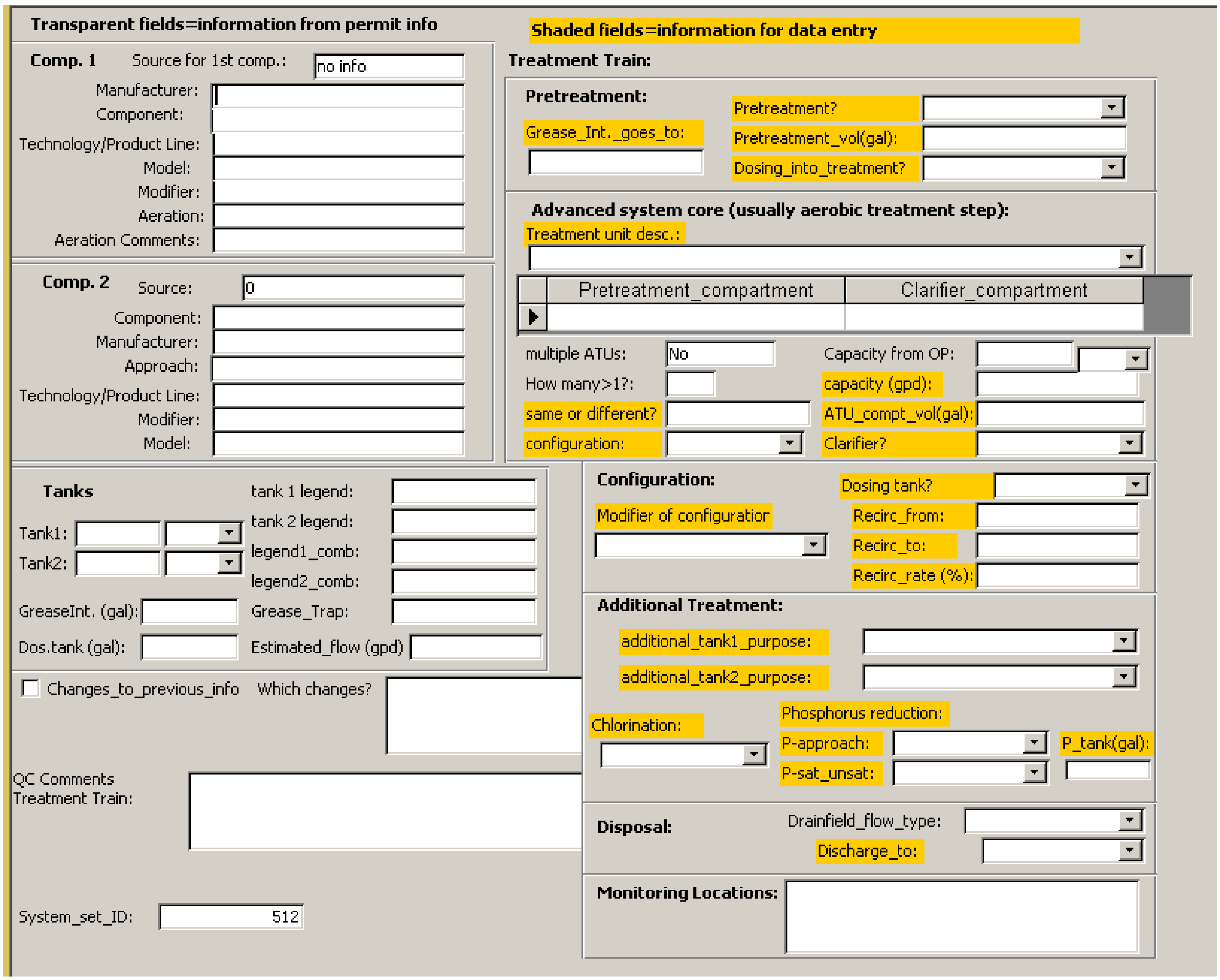
Table: Step2b_PBTSreview_results

Field Name	Data Type	Description
System_set_ID	Integer	System ID number assigned for this project
PBTS_Present	Yes/No	Is this a PBTS?
PBTS_application signed and sealed?	Yes/No	Is the PBTS application package signed and sealed? (4015 page 1)
Performance_standard_class	Text	Qualitative performance standard: "advanced sec.";"adv.sec.cBOD5/TSS (drip/DFred.)"; "advanced ww."; "adv.ww.cBOD5/TSS (drip/DFred.)";

		"baseline"; "Florida Keys"; "secondary"; "sec.CBOD5/TSS (drip/DFred.)"; "ATU";"nitrogen"; "DFred."; "not specified"; "unknown"
cBOD5 (mg/L)	Long Integer	Numerical performance standard (if specified)
TSS(mg/L)	Long Integer	Numerical performance standard (if specified)
TN(mg/L)	Long Integer	Numerical performance standard (if specified)
TP(mg/L)	Long Integer	Numerical performance standard (if specified)
fecal coliform (cfu/100mL)	Long Integer	Numerical performance standard (if specified)
comments_performance_standard	Text	Comments on performance standards (e.g. if not based on annual averages)
Engineer_required_maintainance/monitoring	Text	What frequency of maintenance and monitoring did the engineer specify?
Are_there_sampling_requirements?	Yes/No	Did the engineer specify sampling requirements?
Sampling_Requirements	Text	What are the sampling requirements?
Additional comments	Memo	Additional comments on the engineer's work
DateModified	Date/Time	Date that this field was modified, autoentered
QC Comments Step 2b	Memo	Comments on the QC review for Step 2b
HistoricalSampleResults	Yes/No	Are there any historical sample results for this system?
Primary Key	Long Integer	Primary key for this table

D) Step 2c: Treatment Train Results

This section of the database provides information on the results of the Step 2c review on the



treatment train information.

Figure 5. Screenshot of Step 2c Treatment Train Form

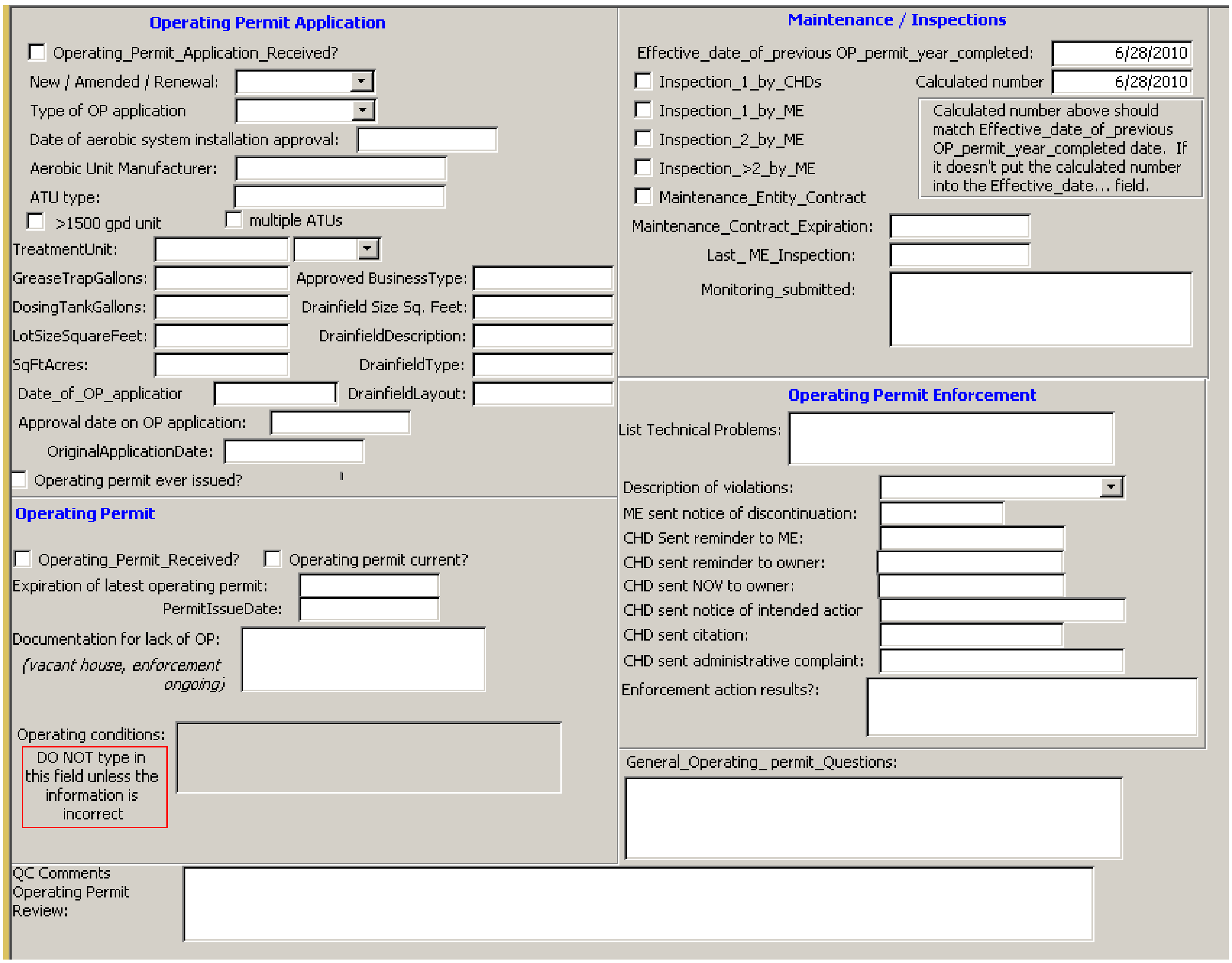
Table: Step2c_treatmenttrain_results

Field Name	**Data Type**	**Description**
System_set_ID	Integer	System ID number assigned for this project
Changes_to_previous_info	Yes/No	Was any of the previous information changed?
Which changes?	Memo	What information was added or changed?
Multiple_treatment_units_#	Long Integer	How many treatment units are there for this system permit?
Multiple_treatment_units_same	Text	If there are multiple units are they the same or different?
Multiple_treatment_units_config	Text	If there are multiple treatment units, are they in series or in parallel? "in series"; "parallel"; "unknown"
Dosing_into_treatment	Text	Is the treatment system(s) (in contrast to the drainfield) dosed?
Trash or pretreat tank/compartment	Text	Is there a trash tank or compartment present? Tank; 1st compartment; Absent
Pretreatment_vol(g)	Long Integer	Pretreatment tanks/compartment volumes (g)
Manufacturer_list	Long Integer	Manufacturer of treatment system (database info)
Manuf_Prodline_modif_model	Long Integer	Manufacturer_Product line_modifier_model of treatment system (database info)
Modifier of configuration	Text	Modifier of treatment system "with recirc";
ATU_compartment_vol(g)	Long Integer	Treatment compartment volume (g)
ATU_treatment_capacity (gpd)	Long Integer	Nominal treatment capacity (gpd)
Recirc_presence	Text	None (usual); present (drip systems will have recirculation present); questionable; unknown
Recirc_from	Text	From which compartment/tank does recirculation start (e.g. branch from discharge pipe to...)
Recirc_to	Text	To which compartment/tank does recirculation flow to
Recirc_rate	Text	Ratio recirculation flow/discharge flow
Clarifier_qualitative	Text	Compartment within ATU; separate tank;

		absent; unknown
Clarifier_vol(g)	Long Integer	Clarifier volume (gallons)
additional_tank1_qualitative	Text	Filter or recirculation tank or compartment description qualitative: absent; mineral aggregate; P-removal; recirculation; other
additional_tank2_qualitative	Text	Filter or recirculation tank or compartment description qualitative: absent; mineral aggregate; P-removal; recirculation; other
P-reduction approach	Text	P-reduction material: NONE; AOS; LECA; BRICK_CHIPS; MID-FLOC
P_red_tank_vol(g)	Long Integer	P-reduction tank or compartment volume (gal)
P-red_sat_unsat	Text	If P-reduction provided: saturated upflow; saturated downflow; unsaturated downflow
DOSE_tank_qualitative	Text	Dosing tank description: absent; part of ATU; part of filter tank; separate tank; other
DOSE_tank_vol(g)	Long Integer	Dosing tank/compartment volume (gal)
DOSE_PUMP	Text	None; lift dose; low-pressure dose; drip irrigation
Chlorination	Text	None; in dosing tank; in separate tank; in P-filter tank
Discharge_to	Text	WELL; DRAINFIELD
Monitoring_locations where	Memo	Description of monitoring locations
Grease_interceptor_to	Text	Where does the grease interceptor discharge to
DateModified	Date/Time	Date that this field was modified, autoentered
QC Comments Step 2c	Memo	Comments on the QC review for Step 2c
Primary Key	Long Integer	Primary key for this table

E) Step 2d: Operating Permit File Results

This section of the database provides information on the results of the Step 2d permit file review



which consisted of reviewing operating permit file information.

Figure 6. Screenshot of Step 2d Operating Permit Review Form

Table: Step2d_operating_permit_file_results

Field Name	**Data Type**	**Description**
System_set_ID	Integer	System ID number assigned for this project
General_operating_permit_question	Text	General questions and/or changes with regards to operating permit documentation
Application_for_OP	Yes/No	Is the OP application on file?
Date_of_OP_application	Date/Time	Date of most recent OP application on file
OriginalApplicationDate	Date/Time	Date of the original OP application
Approval date on OP application	Date/Time	Approval date on latest OP application
Operating_permit_approval_date_changed?	Yes/No	Was a change to the EHD-obtained most recent OP application permit approval date made based on the permit review?
Type of OP application	Text	Aerobic / Commercial / IM (indicate if multiple)
Aerobic	Long Integer	Is the aerobic system checkbox checked?
Commercial	Long Integer	Is the commercial system checkbox checked?
IndustrialManufacturing	Long Integer	Is the industrial/manufacturing system checkbox checked?
PerformanceBased	Long Integer	Is the performance-based system checkbox checked?
TypeOfOP-Checkboxes	Text	Result of which check box was checked, indicates the type of operating permit (Aerobic, Commercial, Industrial/Manufacturing, PBTS)
New OP application?	Text	Is this a new, amended or renewal OP application?
Installation_approved_date	Date/Time	Installation approval date per operating permit application
Manufacturer on OP_app	Text	Manufacturer per information on operating permit application
ATU_type_on OP_application	Text	ATU type per information on operating permit application
>1500 gpd unit	Text	Is >1500 gpd indicator on OP application yes or no
multiple ATUs	Text	Are multiple ATUs used on site indicated on OP application?

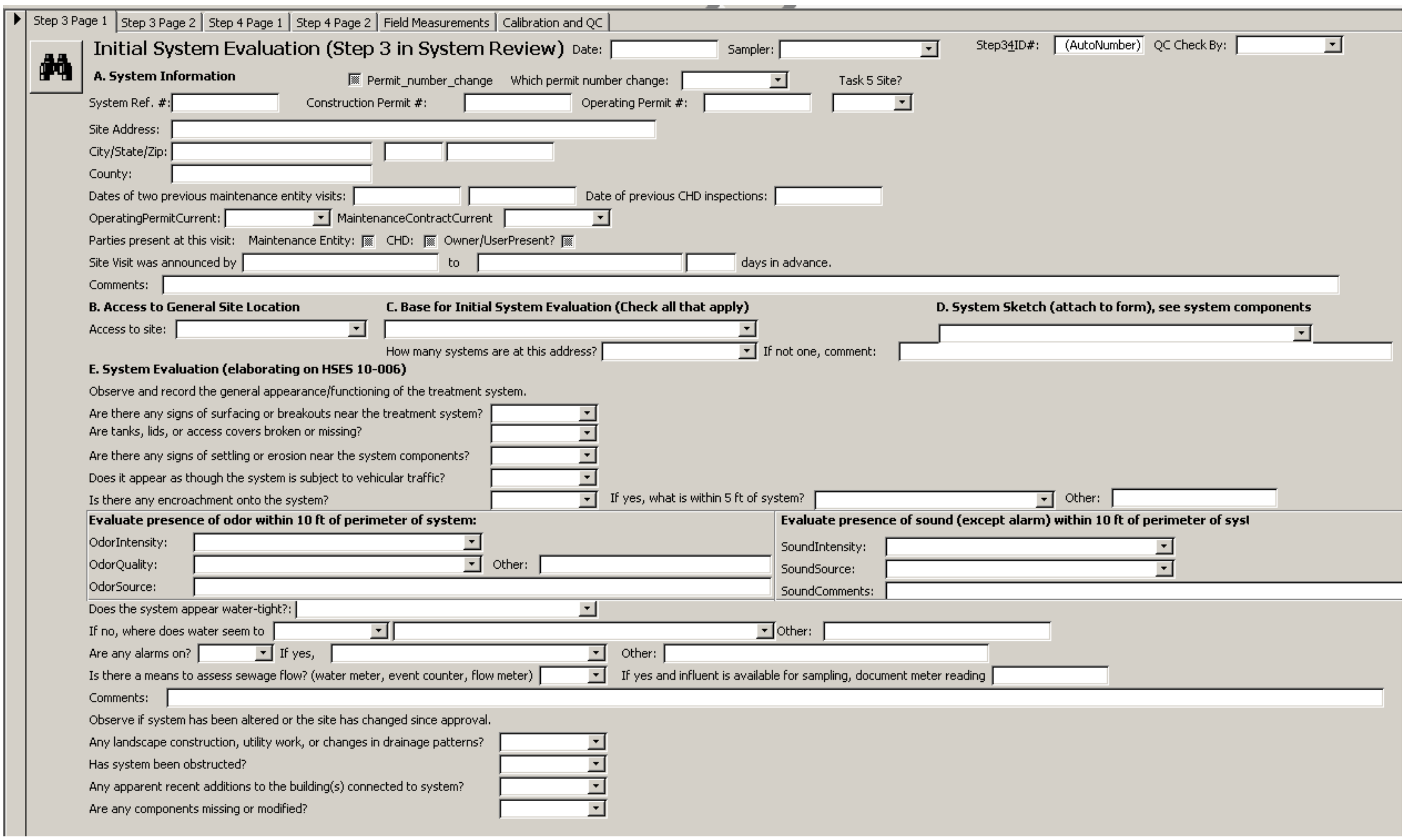
PBandInnovativeID	Double	ID number for PBTS and Innovative System from EHD
Operating permit ever issued?	Yes/No	Has an operating permit ever been issued?
TreatmentUnitCapacity	Double	Capacity of treatment unit listed on the operating permit application
TreatmentUnitUnits	Text	Is the Treatment Unit Capacity in gallons or gpd?
GreaseTrapGallons	Double	Capacity of the grease trap listed on the operating permit application
DosingTankGallons	Double	Capacity of the dosing tank listed on the operating permit application
DrainfieldSizeSquareFeet	Double	Size of the drainfield listed on the operating permit application
DrainfieldDescription	Text	Description of the drainfield listed on the operating permit application
LotSizeSquareFeet	Double	Lot size in square feet listed on the operating permit application
SqFtAcres	Text	Is the lot size in square feet or acres?
ApprovedBusinessTypes	Text	Types of approved businesses
DrainfieldType	Text	Type of drainfield (mound, subsurface, etc.)
DrainfieldLayout	Text	Layout of drainfield (trenches, bed, etc.)
Operating conditions on OP	Memo	What, if any conditions are on the OP (none, sampling, etc.)
Expiration of latest operating permit	Date/Time	Expiration data of latest operating permit
PermitIssueDate	Date/Time	Date OP was issued
How many days past due?	Long Integer	How many days is the permit past due?
Operating permit current?	Yes/No	Is there a current operating permit present? Current = 6/30/10 or later
Documentation for lack of OP	Text	Is there a reason given for the lack of a current operating permit (vacant house, enforcement ongoing)?
Changes_to_OP_permit_Application	Yes/No	Check this box if changes were made to the operating permit application data dump
Changes_to_Operating_permit	Yes/No	Check this box if changes were made to the operating permit data dump
Effective_date_of_previous OP_permit_year_completed	Date/Time	Date of beginning of most recent permit year completed by 3/31/2010 (first half of

		permits issued 4/1/2008-3/31/2009, second half of permits issued 4/1/2007-3/31/2008, year before permit issued after 3/31/09, 3/31/2009 for systems w/o permit on 3/31/09
Inspection_1_by_CHDs	Yes/No	Is there an inspection report completed by the CHD for the permit year?
Inspection_1_by_Me	Yes/No	Is there a first inspection report completed by the ME for the permit year?
Inspection_2_by_Me	Yes/No	Is there a second inspection report completed by the ME for the permit year?
Inspection_>2_by_Me	Yes/No	Are there additional inspection reports completed by the ME for the permit year (ATU>1500 gpd; boreholes in Keys)?
Maintenance_Entity_Contract	Yes/No	Is there a valid ME contract included in the files?
Maintenance_Contract_Expiration	Date/Time	When does the most recent ME contract expire?
Last_ ME_Inspection	Date/Time	What was the date of the most recent ME inspection?
Monitoring_submitted	Memo	Was sampling result were submitted by ME?
Technical Problems?	Memo	What were any technical problems noted on the inspection reports or elsewhere?
Description of violations	Text	Describe any violations documented in the file
Violation observed when?	Date/Time	When was the violation observed? (most recent occurrence)
ME sent notice of discontinuation	Date/Time	When did the ME send a notice to the CHD that the owner will not continue maintenance agreement? (most recent occurrence)
CHD Sent reminder to ME	Date/Time	When did the CHD send a reminder to ME to renew operating permit? (most recent occurrence)
CHD sent reminder to owner	Date/Time	When did the CHD send a reminder to owner to get operating permit/maintenance contract? (most recent occurrence)
CHD sent NOV to owner	Date/Time	When did the CHD send a notice of

		violation to owner about ME/OP requirement? (most recent occurrence)
CHD sent notice of intended action	Date/Time	When did the CHD send a notice of intended action to owner/ME? (most recent occurrence)
CHD sent administrative complaint	Date/Time	When did the CHD send an administrative complaint to owner/ME? (most recent occurrence)
CHD sent citation	Date/Time	When did the CHD send a citation to owner/ME? (most recent occurrence)
Enforcement action results?	Memo	What enforcement action results are documented in the file
PBandInnovativeID2	Text	ID number 2 for PBTS and Innovative System from EHD
ATU_type_on OP_application2	Text	Type of ATU on OP application #2
PBandInnovativeID3	Text	ID number 3 for PBTS and Innovative System from EHD
ATU_type_on OP_application3	Text	Type of ATU on OP application #3
PBandInnovativeID4	Text	ID number 4 for PBTS and Innovative System from EHD
ATU_type_on OP_application4	Text	Type of ATU on OP application #4
PBandInnovativeID5	Text	ID number 5 for PBTS and Innovative System from EHD
ATU_type_on OP_application5	Text	Type of ATU on OP application #5
PBandInnovativeID6	Text	ID number 6 for PBTS and Innovative System from EHD
ATU_type_on OP_application6	Text	Type of ATU on OP application #6
DateModified	Date/Time	Date that this field was modified, autoentered
General Questions	Text	List any general questions/comments about this record
QC Comments Step 2d	Memo	Comments on the QC review for Step 2d
Primary Key	Long Integer	Primary key for this table

F) Step 3 & 4: Field Evaluation

This section of the database provides information on the results of the Step 3 & 4 field evaluation.


Step 3 Page 1 | Step 3 Page 2 | Step 4 Page 1 | Step 4 Page 2 | Field Measurements | Calibration and QC

Initial System Evaluation (Step 3 in System Review) Date: Sampler: Step34ID#: (AutoNumber) QC Check By:

A. System Information Permit_number_change Which permit number change: Task 5 Site?

System Ref. #: Construction Permit #: Operating Permit #:

Site Address:

City/State/Zip:

County:

Dates of two previous maintenance entity visits: Date of previous CHD inspections:

OperatingPermitCurrent: MaintenanceContractCurrent

Parties present at this visit: Maintenance Entity: CHD: Owner/UserPresent?

Site Visit was announced by to days in advance.

Comments:

B. Access to General Site Location **C. Base for Initial System Evaluation (Check all that apply)** **D. System Sketch (attach to form), see system components**

Access to site:

How many systems are at this address? If not one, comment:

E. System Evaluation (elaborating on HSES 10-006)

Observe and record the general appearance/functioning of the treatment system.

Are there any signs of surfacing or breakouts near the treatment system?

Are tanks, lids, or access covers broken or missing?

Are there any signs of settling or erosion near the system components?

Does it appear as though the system is subject to vehicular traffic?

Is there any encroachment onto the system? If yes, what is within 5 ft of system? Other:

Evaluate presence of odor within 10 ft of perimeter of system:

OdorIntensity:

OdorQuality: Other:

OdorSource:

Evaluate presence of sound (except alarm) within 10 ft of perimeter of syst

SoundIntensity:

SoundSource:

SoundComments:

Does the system appear water-tight?:

If no, where does water seem to Other:

Are any alarms on? If yes, Other:

Is there a means to assess sewage flow? (water meter, event counter, flow meter) If yes and influent is available for sampling, document meter reading

Comments:

Observe if system has been altered or the site has changed since approval.

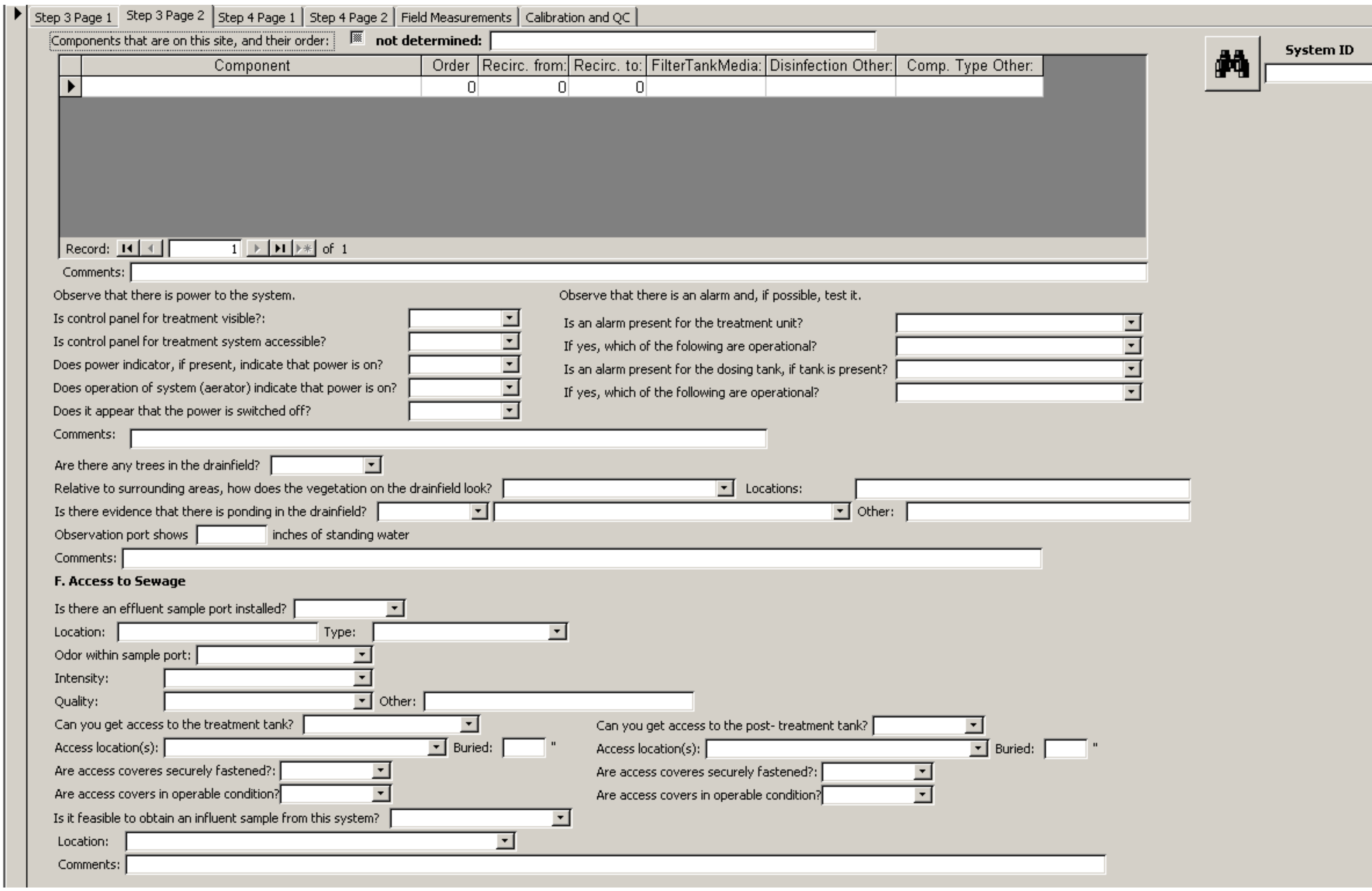
Any landscape construction, utility work, or changes in drainage patterns?

Has system been obstructed?

Any apparent recent additions to the building(s) connected to system?

Are any components missing or modified?

Figure 7. Screenshot of Step 3 & 4 Field Evaluation Data Entry Form Step 3 Page 1


Step 3 Page 1 | Step 3 Page 2 | Step 4 Page 1 | Step 4 Page 2 | Field Measurements | Calibration and QC

Components that are on this site, and their order: not determined:

System ID

Component	Order	Recirc. from:	Recirc. to:	FilterTankMedia:	Disinfection Other:	Comp. Type Other:
	0	0	0			

Record: 1 of 1

Comments:

Observe that there is power to the system.

Is control panel for treatment visible?:

Is control panel for treatment system accessible?

Does power indicator, if present, indicate that power is on?

Does operation of system (aerator) indicate that power is on?

Does it appear that the power is switched off?

Observe that there is an alarm and, if possible, test it.

Is an alarm present for the treatment unit?

If yes, which of the folowing are operational?

Is an alarm present for the dosing tank, if tank is present?

If yes, which of the following are operational?

Comments:

Are there any trees in the drainfield?

Relative to surrounding areas, how does the vegetation on the drainfield look? Locations:

Is there evidence that there is ponding in the drainfield? Other:

Observation port shows inches of standing water

Comments:

F. Access to Sewage

Is there an effluent sample port installed?

Location: Type:

Odor within sample port:

Intensity:

Quality: Other:

Can you get access to the treatment tank?

Access location(s): Buried: "

Are access coveres securely fastened?:

Are access covers in operable condition?

Can you get access to the post- treatment tank?

Access location(s): Buried: "

Are access coveres securely fastened?:

Are access covers in operable condition?

Is it feasible to obtain an influent sample from this system?

Location:

Comments:

Figure 8. Screenshot of Step 3 & 4 Field Evaluation Data Entry Form Step 3 Page 2

Table: Step3&4_field_evaluation

Field Name	**Data Type**	**Description**
Step3&4ID	Long Integer	Unique value to identify this sample event
QC Comments Step 3	Memo	Comments on the QC review for Step 3
Step3FormDate	Date/Time	Date of initial system evaluation
Step3FormSampler	Text	Name of sampler for initial system evaluation
System_set_ID	Long Integer	System ID number assigned for this project
Date#1PreviousMEVisit	Date/Time	Date of first previous ME visit

Date#2PreviousMEVisit	Date/Time	Date of second previous ME visit
DatePreviousCHDInsp	Date/Time	Date of the previous CHD inspection
OperatingPermitCurrent	Text	Is the Operating Permit current?
MaintenanceContractCurrent	Text	Is the Maintenance Contract current?
MaintenanceEntityPresent?	Yes/No	Is the Maintenance Entity present for this site visit?
CHDPresent?	Yes/No	Is the CHD present for this site visit?
Owner/UserPresent?	Yes/No	Is the Owner/User present for this site visit?
SiteVisitAnnouncedBy	Text	Who announced the site visit
SiteVisitAnnouncedTo	Text	Who was notified of the site visit
SiteVisitAnnounced#Days	Long Integer	How many days in advance was the site visit announced?
SystemInfoComments	Memo	Comments on the system information gathered
AccessToSite	Text	Permission given, Open, Obstructed (locked gate/fence), Denied, Other
BaseForInitialSystemEvaluation	Text	Observation from afar, Observation of above-ground parts and control panels, Probing of system location, Permit records
HowManySystems	Text	None found, One, More than one
CommentsIfNoSystems	Memo	If there is not a system, provide a comment
SystemSketchSource	Text	Source of the system sketch
Surfacing/Breakouts	Text	Are there signs of surfacing or breakouts near the treatment system?
Tank/Lid/CoverBroken/Missing	Text	Are tanks, lids, or access covers broken or missing?
Settling/erosion	Text	Are there any signs of settling or erosion near the system components?
VehicularTraffic	Text	Does it appear as though the system is subject to vehicular traffic?
Encroachment	Text	Is there any encroachment onto the system?
EncroachmentWithin5Ft	Text	If yes, what is within 5ft of system?
EncroachmentWithin5FtOther	Text	If Other was checked for Encroachments within 5 ft, what is the reason
OdorIntensity	Text	Evaluate intensity of odor within 10ft of

		perimeter of system
OdorQuality	Text	Evaluate quality of odor within 10ft of perimeter of system
OdorQualityOther	Text	If Other was checked for Odor Quality, what is the description
OdorSource	Memo	What is the source of the odor, if present?
SoundIntensity	Text	Evaluate intensity of sound (except alarm) within 10ft of perimeter of system
SoundSource	Text	Evaluate source of sound (except alarm) within 10ft of perimeter of system
SoundComments	Memo	Any comments on the sound evaluation?
Watertight	Text	Does the system appear water-tight?
WaterEnterOrLeave	Text	If not watertight, does the water seem to enter or leave the system?
WaterEnter/LeaveFrom	Text	If not watertight, where does the water enter or leave?
WaterEnter/LeaveFromOther	Text	If water enters/leaves from "other", what is the description?
AlarmsOn	Text	Are any alarms on?
AlarmsOnReason	Text	What alarm is on
AlarmsOnReasonOther	Text	If "other" was checked for the reason the alarm is on, describe here
AssessSewageFlow	Text	Is there a means to assess sewage flow? (water meter, event counter, flow meter)
MeterReading	Long Integer	If there is a means to assess sewage flow and influent is available for sampling, document meter reading
SystemEvaluationComments	Memo	Comments on the system evaluation
Alterations/SiteChanges	Text	Any landscape construction, utility work, or changes in drainage patterns?
Obstructed	Text	Has system been obstructed?
Additions	Text	Any apparent recent additions to the building(s) connected to system?
ComponentsMissing/Modified	Text	Are any components missing or modified?
ComponentsNotDetermined	Yes/No	Were the components not determined?
ComponentsNotDeterminedReason	Memo	Reason why components were not determined, if applicable

ComponentsComments	Memo	Comments on components list
ControlPanelVisible	Text	Is control panel for treatment system visible?
ControlPanelAccessible	Text	Is control panel for treatment system accessible?
PowerOnFromIndicator	Text	Does power indicator, if present, indicate that power is on?
PowerOnFromAerator	Text	Does operation of system (aerator) indicate that power is on?
PowerOff	Text	Does it appear that the power is switched off?
PowerComments	Memo	Comments on the power assessment
AlarmPresent	Text	Is an alarm present for the treatment unit?
AlarmPresentYes	Text	If yes, which of the following are operational?
DosingTankAlarm	Text	Is an alarm present for the dosing tank, if tank is present?
DosingTankAlarmPresentYes	Text	If yes, which of the following are operational?
TreesInDF	Text	Are there any trees in the drainfield?
DrainfieldVegetation	Text	Relative to surrounding areas, how does the vegetation on the drainfield look?
VegetationLocation	Memo	Location of drainfield vegetation listed in "drainfield vegetation" field
Ponding	Text	Is there evidence that there is ponding in the drainfield?
PondingDescription	Text	Description of ponding
PondingDescriptionObPortInches	Long Integer	Number of inches of standing water in observation port
PondingDescriptionOther	Text	Ponding description if "other" selected
DrainfieldComments	Memo	Comments on the drainfield evaluation
SamplePort	Text	Is there an effluent sample port installed?
SamplePortLocation	Text	Where is the sample port?
SamplePortType	Text	Type of sample port
SamplePortOdor	Text	Was the odor checked, not checked, or N/A?
SamplePortOdorIntensity	Text	Evaluate intensity of odor within the sample port

SamplePortOdorQuality	Text	Evaluate quality of odor within the sample port
SamplePortOdorQualityOther	Text	If Other was checked for Sample Port Odor Quality, what is the description?
TreatmentTankAccess	Text	Can you get access to the treatment tank?
AccessLocation	Text	Location of access to treatment tank
AccessLocationBuried	Long Integer	Number of inches access location is buried
AccessCoversFastened	Text	Are access covers securely fastened?
AccessCoversOperable	Text	Are access covers in operable condition?
Post-TreatmentTankAccess	Text	Can you get access to the post-treatment tank?
Post-TreatmentTankAccessLocation	Text	Location of access to post-treatment tank
Post-TreatmentTankAccessLocationBuried	Long Integer	Number of inches access location to post-treatment tank is buried
Post-TreatmentTankAccessCoversFastened	Text	Are access covers to post-treatment tank securely fastened?
Post-TreatmentTankAccessCoversOperable	Text	Are access covers to post-treatment tank in operable condition?
InfluentSample	Text	Is it feasible to obtain an influent sample from this system?
InfluentSampleLocation	Text	Location of influent sample
AccessToSewageComments	Memo	Comments on access to sewage
Step4FormDate	Date/Time	Date of system operation evaluation
Step4FormSampler	Text	Name of sampler for system operation evaluation
Region	Long Integer	Region sampler works in: 1=Monroe, 2=Charlotte, 3=Lee, 4=Statewide, 5=Volusia, 6=Headquarters
Time	Date/Time	Time of assessment
CloudCover%	Long Integer	Percent cloud cover
RainfallCurrent	Text	1 None 2 Light 3 Moderate 4 Heavy
RainfallPrev7Days	Long Integer	Amount of rainfall over the previous 7 days in inches
DateLastPumpout	Date/Time	Date of the last pumpout

AerationPresent	Text	Is an aeration chamber present?
AerationAcess	Text	Is there access to the aeration chamber?
AerationMixing	Text	Is there mixing in the aeration chamber
AerationMixingComment	Memo	Comments on mixing in aeration chamber
SSVSampleTaken	Text	Was a Settled Sludge Volume Test sample obtained?
SSVSettledBegin	Long Integer	Volume in mL/L of settled sludge at beginning
SSVFloatingBegin	Long Integer	Volume in mL/L of floating sludge at beginning
SSVBeginTime	Long Integer	Number of minutes after obtaining sample when volume of settled and floating sludge was measured
SSVSettledEnd	Long Integer	Volume in mL/L of settled sludge at end
SSVSettledEndQualifier	Text	Qualifier for SSV Settled End
SSVFloatingEnd	Long Integer	Volume in mL/L of floating sludge at end
SSVEndTime	Long Integer	Number of minutes after obtaining sample when volume of settled and floating sludge was measured
BiomassColor	Text	Color of biomass
BiomassColorOther	Text	If Other was checked for Biomass Color, what is the description
BiomassStructure	Text	Structure of biomass
Supernatant	Text	Cloudy or clear
Attached-GrowthPlugging	Text	Attached-growth media plugging?
Attached-GrowthFloating	Text	Attached-growth media floating?
Attached-GrowthMediaReplaced	Text	Attached-growth media replaced?
MediaFilter	Text	Is there a media filter?
MediaFilterDevice	Text	What is the device for the media filter?
MediaFilterDistribution	Text	Is there uniform distribution over the media filter?
MediaFilterOperation	Text	Is the media filter operating properly?
MediaFilterPonding	Text	Is there ponding associated with the media filter?
MediaFilterComments	Memo	Comments on the media filter
MediaFilterSumpPonding	Text	Is there ponding in the media filter sump?
GravityDrainage	Text	Is gravity drainage operational?
SolidsBuildupSump	Text	Is there solids buildup in the sump area?
UnderdrainVents	Text	Are underdrain vents present?

UnderdrainVentsOperable	Text	Are the underdrain vents operable?
ChlorinationSystem	Text	Is there a chlorination system present?
ChlorinationManufacturer	Text	Manufacturer of chlorination system
Chlorinator	Text	Info on the chlorinator
Dechlorinator	Text	Info on the dechlorinator
ChlorinationSystemModel	Text	Model number of the chlorination system
ChlorinationMethod	Text	Tablet, Liquid
ChlorinationCondition	Text	Does the unit appear in good condition?
ChlorinationLocation	Long Integer	Location of chlorination: Location in/after tank #___
TabletChlorinatorOperable	Text	Chlorinator appears operable
ChlorineTabletsPresent	Text	Are chlorine tablets in place?
TabletsTouchEffluent	Text	Are the tablets in contact with effluent?
ContactChamberOperable	Text	Is the contact chamber operable?
FreeChlorineResidual	Double	Free chlorine residual ppm
TotalChlorineResidual	Long Integer	Total chlorine residual ppm
EffluentScreenLocation	Text	Location of effluent screen / tertiary filter
EffluentScreenClogging	Text	Evidence of clogging of effluent screen / tertiary filter?
QC Check By	Text	Who performed QC check
Task 5 Site	Yes/No	Was this a Task 5 site?

G) Step 3 & 4: Components

This section of the database provides information on the results of the component details from the Step 3 & 4 field evaluation.

Table: Step3&4_Components

Field Name	**Data Type**	**Description**
ComponentID#	Long Integer	Automatic generated number for this system's component information
System_set_ID	Long Integer	System ID number assigned for this project
ComponentEvalDate	Date/Time	Date that the component was evaluated
ComponentType	Text	Type of component
ComponentOrder	Long Integer	Order of the component (1-10)

ComponentTypeRecirculationFrom	Long Integer	If recirculation was selected as a component type, which component is it coming from
ComponentTypeRecirculationTo	Long Integer	If recirculation was selected as a component type, which component is it going to
ComponentTypeFilterTankMedia	Text	If filter tank was selected as a component type, what sort of media is it?
ComponentTypeDisinfectionOther	Text	If disinfection was selected as a component type and the type of disinfection was listed as other, what is it?
ComponentTypeOther	Text	If other was selected as the component type and it is not a sampling port, what is it?
ComponentFunction	Text	Function of component
ComponentFunctionOther	Text	If other was selected as the component function, what is it?
ComponentMaterial	Text	Material of component CO-concrete FG-fiberglass PE-polyethylene OT-other ___________
ComponentMaterialOther	Text	Description of the component material if it is other
Tank structural condition	Text	0-structually sound, 1-rebar exposed, 2-spalling, 3-corrosion, 4-roots inside of compartment, 5-cracks, 6-deflection, 7-inlet seal missing/broken, 8-outlet seal missing/broken, 9-holes, 10-lid broken/missing, 11-manhole cover missing/broken, 12-other
ConditionOther	Text	If other was listed for the tank structural condition, what is it?
LiquidLevelOutlet	Text	Liquid level relative to outlet (in) (NA for pump tank)
LiquidLevelOutletAbove/Below	Text	Liquid level relative to outlet above or below
LiquidLevelInlet	Text	Liquid level relative to outlet (in) (NA for pump tank)
LiquidLevelInletAbove/Below	Text	Liquid level relative to outlet above or below

LiquidLevelHigher	Text	Evidence liquid level has been higher
LiquidLevelDropped	Text	Evidence liquid level dropped (no pump)
Non-sewageInflow	Text	Evidence of non-sewage inflow
Watertight	Text	Appears to be watertight (no visual leaks)
OilyFilm/Sheen	Text	Oily film/sheen present
OdorIntensity/Quality	Text	Intensity: 0 None perceivable 1 barely perceivable 2 faint but identifiable 3 easily perceivable 4 Strong Quality: SEP Septic EARTHY Earthy/Musty/Moldy CHEM Chemical SOUR Sour/Rancid/Putrid OTH Other_____ N/A
SampleTaken	Yes/No	Sample taken?
ScumDepth	Long Integer	Depth of scum in inches
ScumColor	Text	Color of scum BL Black BR Brown MU Mustard GR Gray WH White TAN Tan OTH Other_____ NO None
ScumColorOther	Text	Description of other color for scum color if selected
ScumClarity/Structure	Text	CLEAR Clear CLOUD Cloudy MILK Milky MUD Muddy FLOC Flocked GRA Grainy FLU Fluffy
ClearZoneDepth	Long Integer	Depth of clear zone in inches
ClearZoneColor	Text	Color of clear zone BL Black BR Brown MU Mustard GR Gray WH White TAN Tan OTH Other_____ NO None
ClearZoneColorOther	Text	Description of other color for clear zone color if selected
ClearZoneClarity/Structure	Text	CLEAR Clear CLOUD Cloudy MILK Milky MUD Muddy FLOC Flocked GRA Grainy FLU Fluffy
SludgeDepth	Long Integer	Depth of sludge in inches
SludgeColor	Text	Color of sludge BL Black BR Brown MU Mustard GR Gray WH White TAN Tan OTH Other_____ NO None
SludgeColorOther	Text	Description of other color for sludge color if selected
SludgeClarity/Structure	Text	CLEAR Clear CLOUD Cloudy MILK Milky MUD Muddy FLOC Flocked GRA

		Grainy FLU Fluffy
Comments	Memo	Comments on component
YSIStationDescription	Text	Description of station where YSI readings were taken (i.e. pump tank). Should match type of component field.
YSIDate	Date/Time	Date in yy/mm/dd for YSI reading
YSITime	Date/Time	Time in hr:min YSI reading was taken
YSIWaterTemp	Double	Water temperature
YSIDO	Double	Dissolved oxygen
YSI%Sat	Double	Percent saturation
YSI%SatTrend	Text	Trend for dissolved oxygen
YSIORP	Double	Oxygen reduction potential
YSICond	Double	Specific Conductance
YSISalinity	Double	Salinity
YSIpH	Double	pH
Step3&4ID	Long Integer	Primary key from Step3&4_field_evaluation table
SampleLocation	Text	AC-aeration chamber CL-clarifier DS-disinfection ND- not determined OT-other MF-media filter PO-phosphorus sorption PU- pump/dosing/ recirc chamber SP-sampling port TT-trash/pretmt tank PEB-pre-cleaned EB FBL-field blank FEB-field-cleaned EB

H) Step 4: Field Analysis Form

This section of the database provides information on the results of the Step 4 field analysis form.

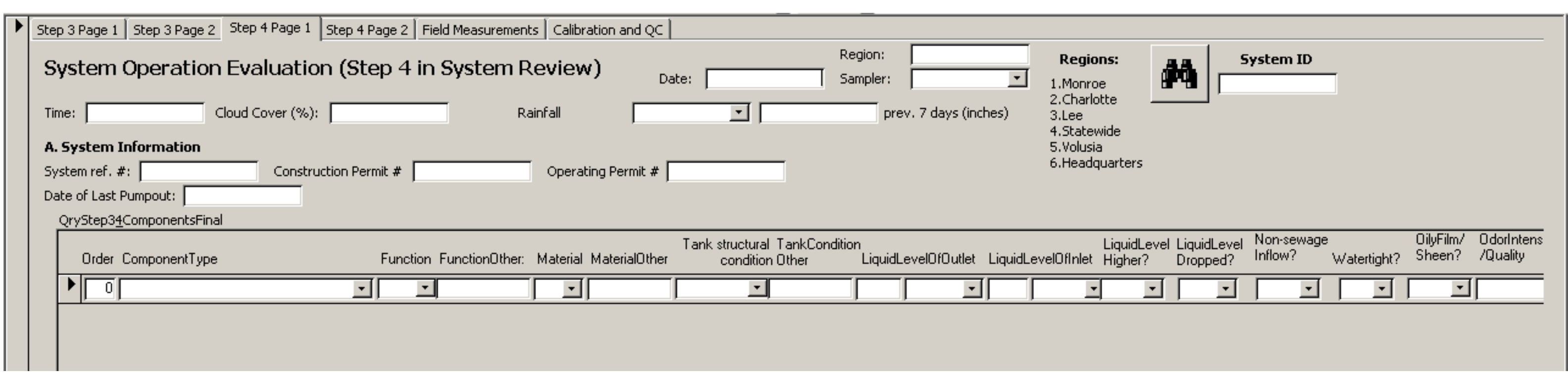


Figure 9. Screenshot of Step 3 & 4 Field Evaluation Data Entry Form Step 4 Page 1 Part 1

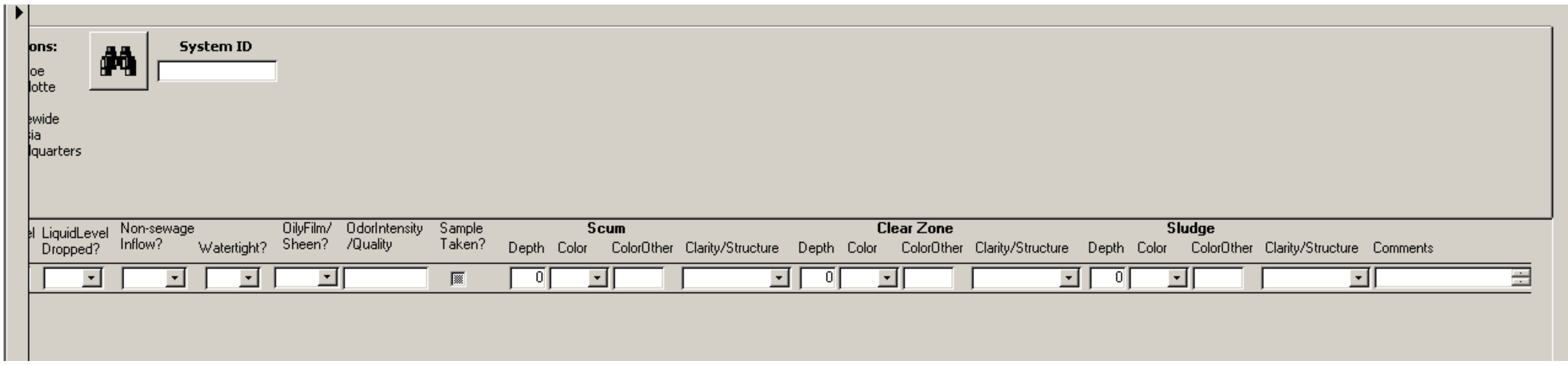


Figure 10. Screenshot of Step 3 & 4 Field Evaluation Data Entry Form Step 4 Page 1 Part 2

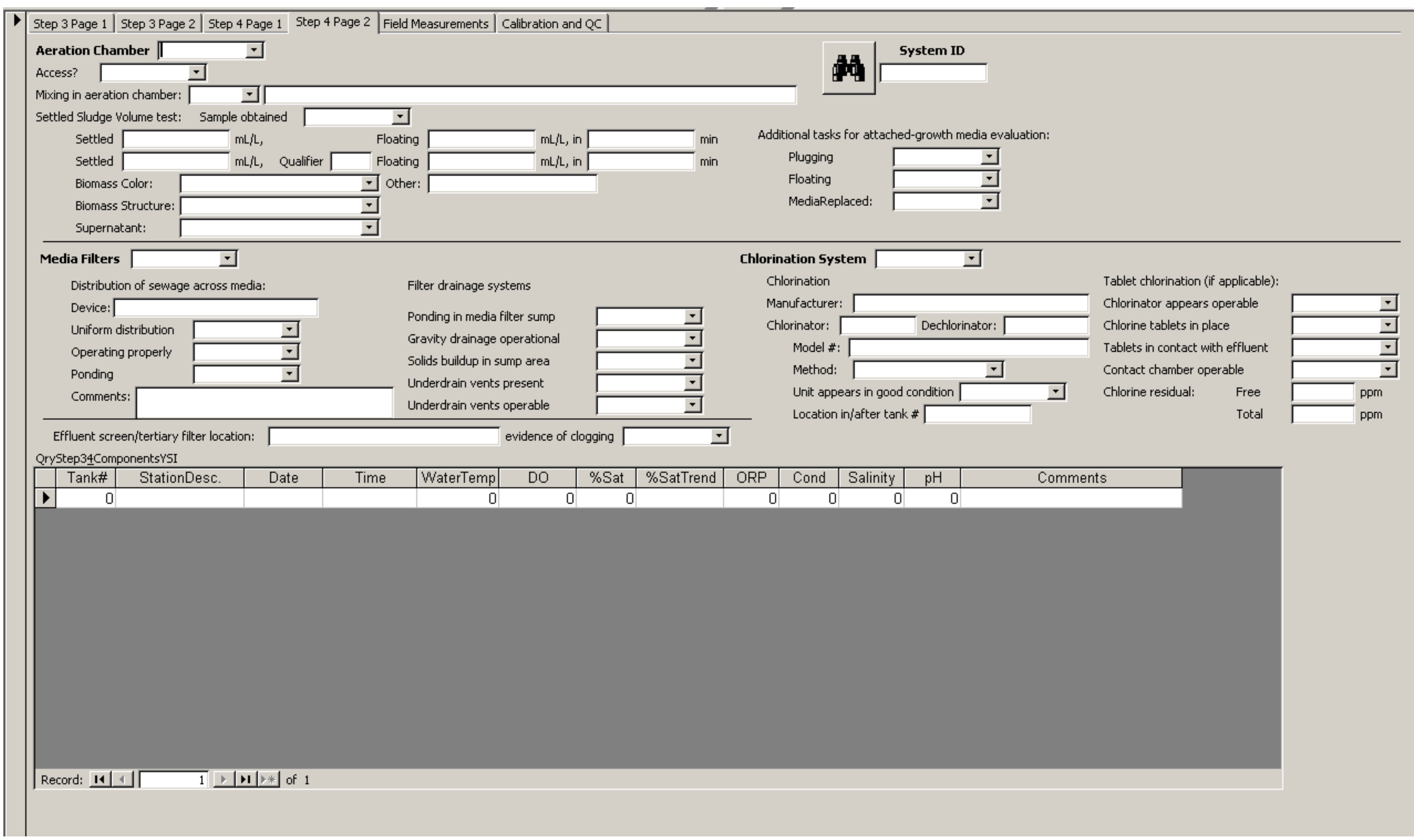


Figure 11. Screenshot of Step 3 & 4 Field Evaluation Data Entry Form Step 4 Page 2

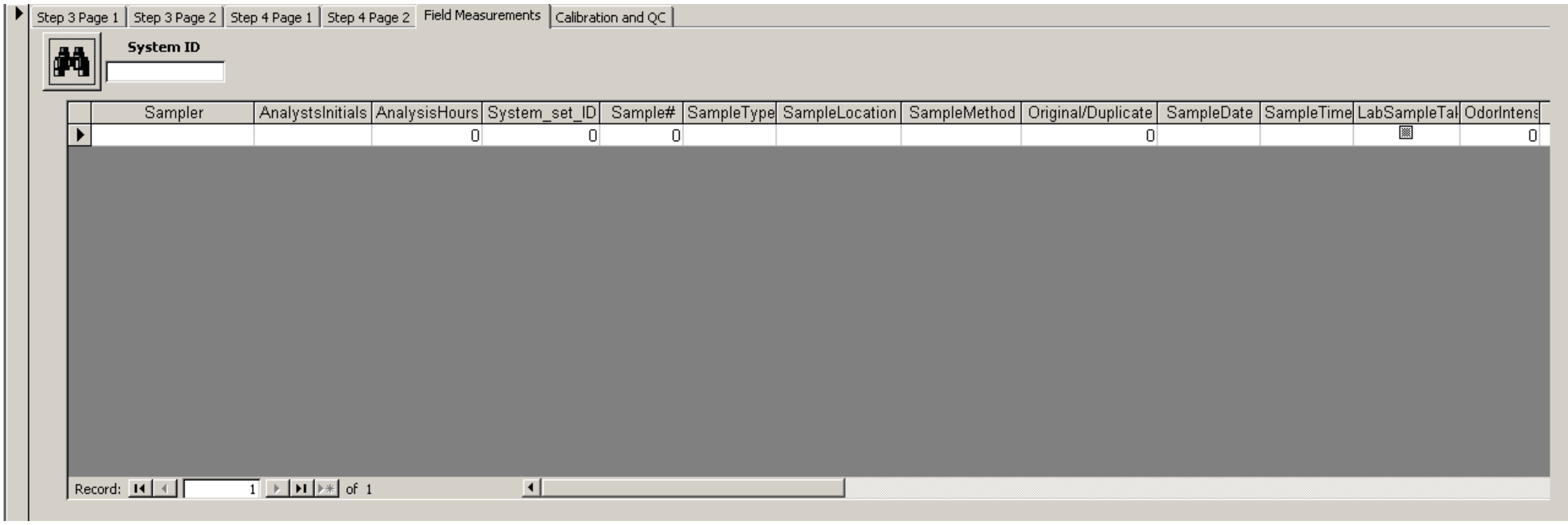


Figure 12. Screenshot of Step 3 & 4 Field Evaluation Data Entry Form Field Measurements Part 1

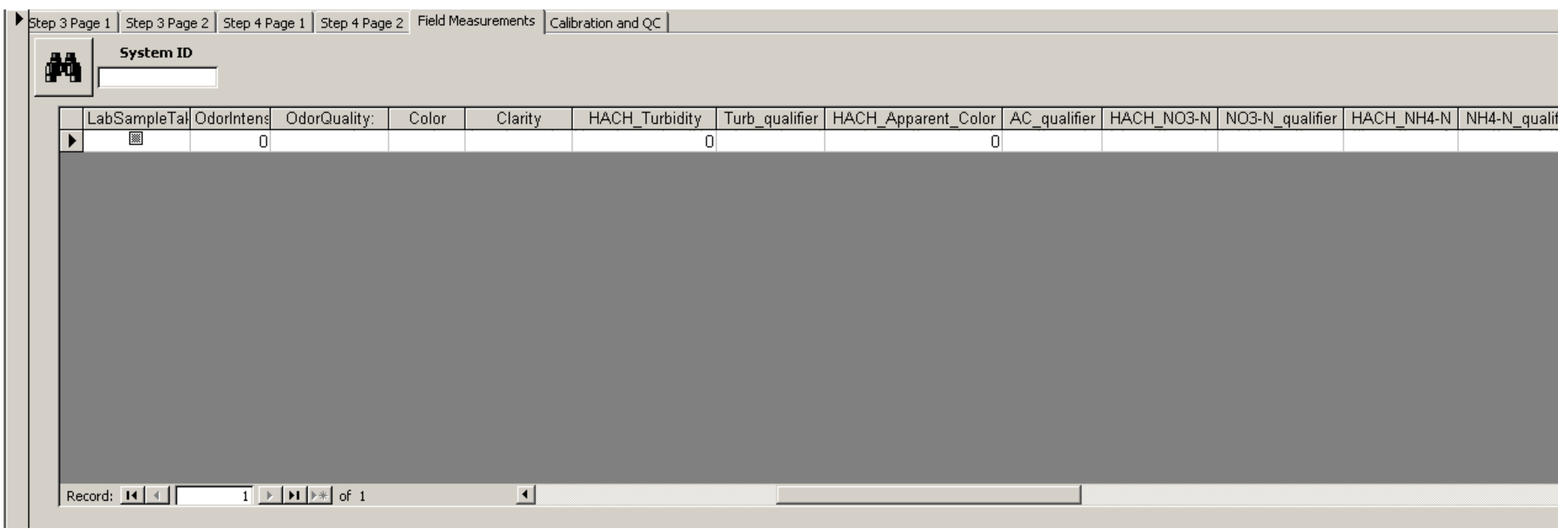


Figure 13. Screenshot of Step 3 & 4 Field Evaluation Data Entry Form Field Measurements Part 2

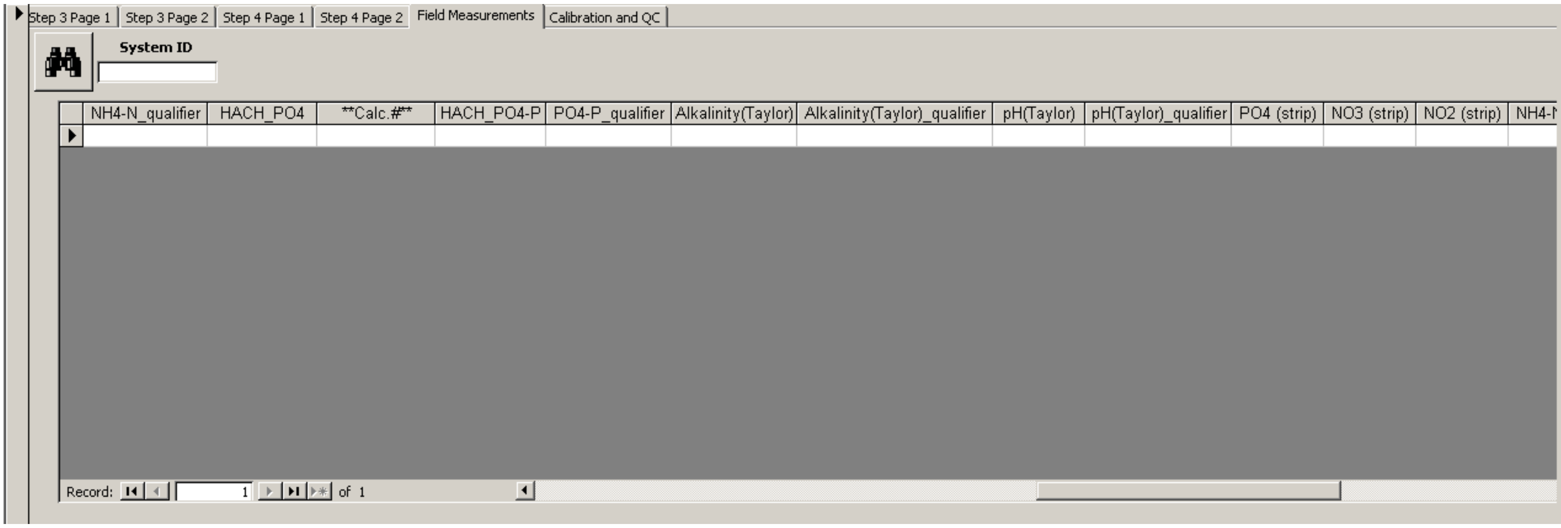


Figure 14. Screenshot of Step 3 & 4 Field Evaluation Data Entry Form Field Measurements Part 3

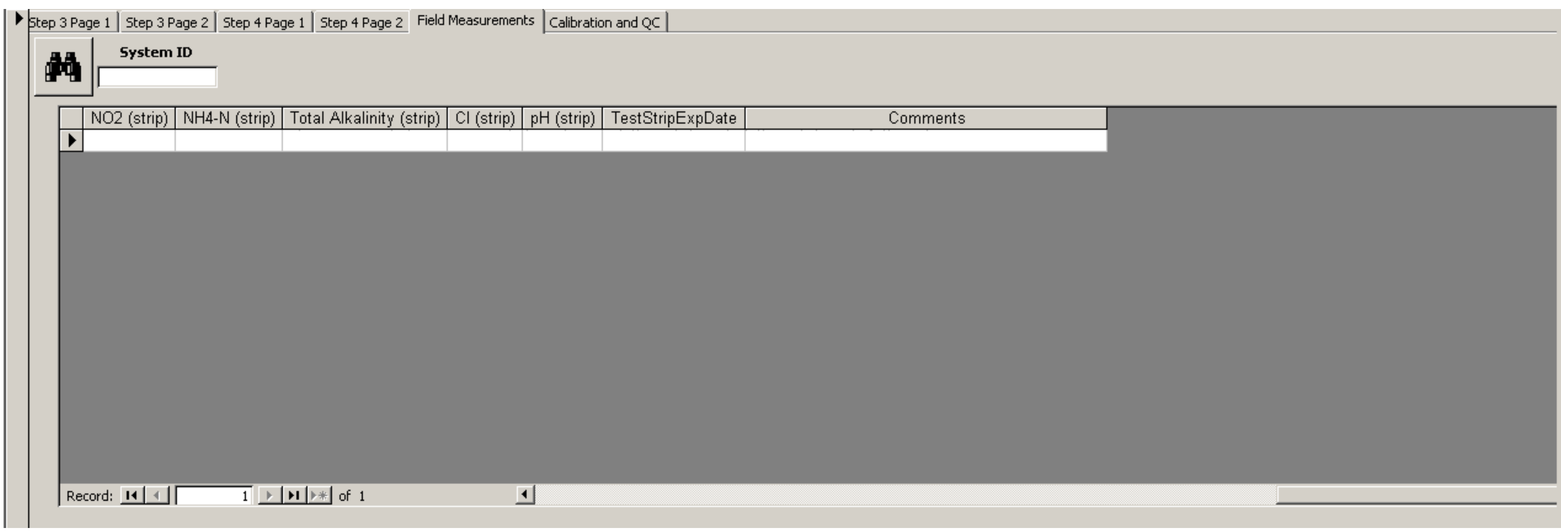


Figure 15. Screenshot of Step 3 & 4 Field Evaluation Data Entry Form Field Measurements Part 4

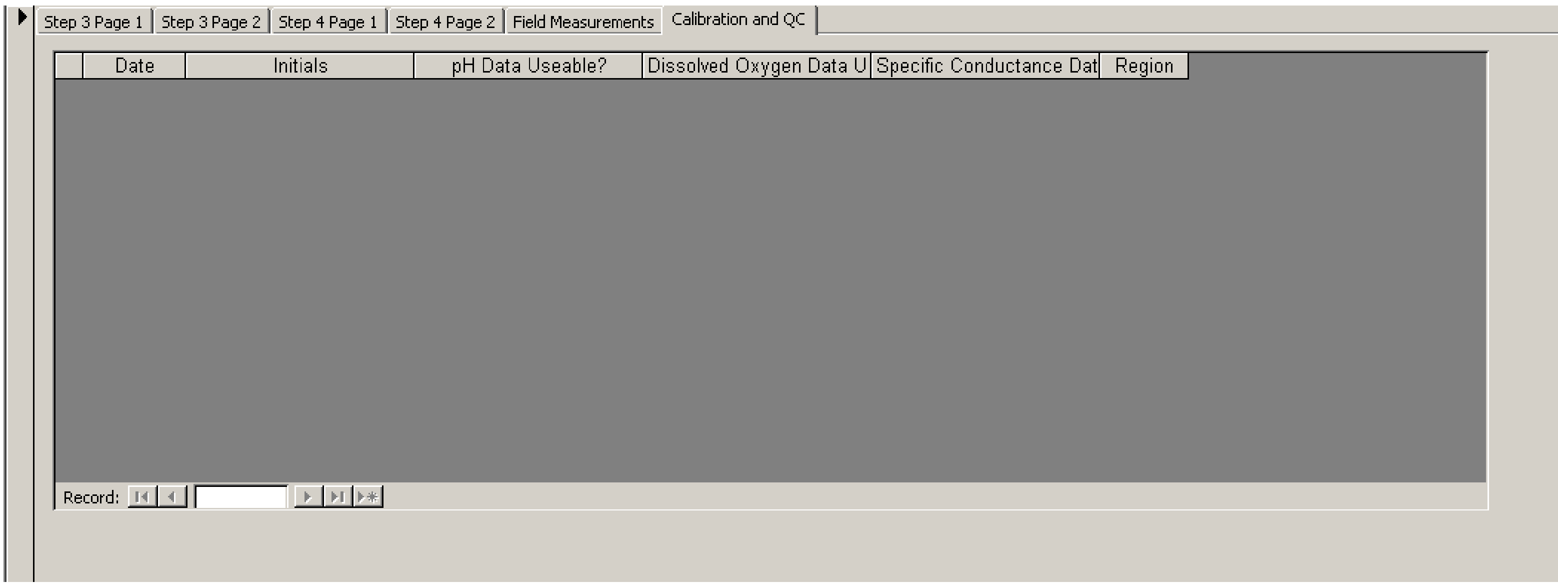


Figure 16. Screenshot of Step 3 & 4 Field Evaluation Data Entry Form Calibration and QC Results

Table: Step4_field_analysis_form

Field Name	Data Type	Description
System_set_ID	Long Integer	System ID number assigned for this project
FieldAnalysisID	Long Integer	Automatically generated number to associate with this sample
Sampler	Text	Name of the sampler
TestStripExpDate	Date/Time	Date that the test strip brand/lot expires
Sample#	Long Integer	Number of the sample within this sampling event (1-6)
SAMPLE_DATE	Date/Time	Date - Short
SAMPLE_TIME	Date/Time	Time - Medium
SampleType	Text	Eff =effluent Inf=Influent Tap=tap water QC=quality control
SampleLocation	Text	AC-aeration chamber CL-clarifier DS-disinfection ND- not determined OT-other MF-media filter PO-phosphorus sorption PU- pump/dosing/ recirc chamber SP-sampling port TT-trash/pretmt tank PEB-pre-cleaned EB

		FBL-field blank FEB-field-cleaned EB
SampleMethod	Text	i=intermediate container d=directly from free fall, spigot etc. p=peristaltic pump
Original/Duplicate	Integer	01-original sample 02-duplicate
LabSampleTaken	Yes/No	Was a lab sample taken?
Color	Text	BLack BRown MUstard GRay WHite TAN OTher _____ NOne
Clarity	Text	Clear Cloudy Milky Muddy Flocced Grainy Fluffy
OdorIntensity	Long Integer	0 None perceivable 1barely perceivable 2 faint but identifiable 3 clearly perceivable 4 strong
OdorQuality	Text	Septic Earthy/Musty/Moldy Chemical Sour/Rancid/Putrid Other_____ N/A
HACH_Apparent_Color	Long Integer	Value for apparent color from HACH Colorimeter DR/890
HACH_Apparent_Color_qualifier	Text	Qualifier for apparent color from HACH Colorimeter DR/890
HACH_Turbidity	Long Integer	Value of turbidity from HACH Colorimeter DR/890
HACH_Turbidity_qualifier	Text	Qualifier for turbidity from HACH Colorimeter DR/890
HACH_NH4-N	Double	Value of NH3-N from HACH Colorimeter DR/890
HACH_NH4-N_qualifier	Text	Qualifier for NH3-N from HACH Colorimeter DR/890
HACH_NO3-N	Double	Value of NO3-N from HACH Colorimeter DR/890
HACH_NO3-N_qualifier	Text	Qualifier for NO3-N from HACH Colorimeter DR/890
HACH_PO4	Double	Value of PO4 from HACH Colorimeter DR/890
HACH_PO4-P	Double	Value of PO4-P (=PO4 *.3261) from HACH Colorimeter DR/890
HACH_PO4-P_qualifier	Text	Qualifier for PO4-P from HACH Colorimeter DR/890
pH(Taylor)	Double	Taylor Kit pH
pH(Taylor)_qualifier	Text	Qualifier Taylor Kit pH
Alkalinity(Taylor)	Double	Taylor Kit total alkalinity

Alkalinity(Taylor)_qualifier	Text	Qualifier Taylor Kit total alkalinity
PO4 (strip)	Double	Test strip (mg/L) PO4
NO3 (strip)	Double	Test strip (mg/L) NO3-N
NO2 (strip)	Double	Test strip (mg/L) NO2-N
NH4-N (strip)	Double	Test strip (mg/L) NH3-N
Total Alkalinity (strip)	Double	Test strip (mg/L) total alkalinity
Cl (strip)	Double	Test strip (mg/L) Cl
pH (strip)	Double	Test strip
AnalystsInitials	Text	Initials of analyst
AnalysisHours	Long Integer	Analysis done within ___ hours
Comments	Memo	Comments on field analysis
QC to do	Text	Lab values seem odd, need checking; comments of changes
DateCreated	Date/Time	Date that this field was created, autoentered
DateModified	Date/Time	Date that this field was modified, autoentered
pH YSI Calibration Successful?	Yes/No	Was the YSI calibration successful for pH?
DO YSI Calibration Successful?	Yes/No	Was the YSI calibration successful for dissolved oxygen?
ORP YSI Calibration Successful?	Yes/No	Was the YSI calibration successful for specific conductance?
QC Comments Step 4b	Memo	Comments on the QC review for Step 4b
Step3&4ID	Long Integer	Step 3&4 ID number

I) Lab Results

This section of the database provides information on the lab results of the sampling efforts. Information from several labs have been combined into one table along with an analysis of the quality control review.

Table: TblSamplersRegion

Field Name	Data Type	Description
Step5_lab_results_System ID	Double	System ID number assigned for this project
Step5_lab_results_Sample Type	Text	Eff =effluent Inf=Influent Tap=tap water QC=quality control
Step5_lab_results_Sampling Location	Text	AC-aeration chamber CL-clarifier DS-disinfection ND- not determined OT-other MF-media filter PO-phosphorus sorption PU- pump/dosing/ recirc chamber SP-sampling port TT-trash/pretmt tank PEB-pre-cleaned EB FBL-field blank FEB-field-cleaned EB
Step5_lab_results_Sampling Method	Text	i=intermediate container d=directly from free fall, spigot etc. p=peristaltic pump
Step5_lab_results_Original/Duplicate	Text	01-original sample 02-duplicate
Step5_lab_results_Sampler	Text	Sampler name
Wo_Number	Double	Work order number from the analyzing lab
Step5_lab_results_Sample_Id	Text	Sample ID from chain of custody form
Lab_Sample_Id	Text	Lab assigned sample ID number
Matrix	Text	W – water, WW – wastewater
Date Collected	Date/Time	Date sample was collected
Time Collected	Date/Time	Time sample was collected
Date Received	Date/Time	Date sample was received
Time Received	Date/Time	Time sample was received
Sample_temp_preservation intact?	Text	Was the sample temperature and preservation intact?
DOH NELAP certification number	Text	DOH NELAP certification number
Total Alkalinity_Method	Text	Analysis method for Total Alkalinity
Total Alkalinity Result	Double	Total Alkalinity result
Total Alkalinity RL	Double	Total Alkalinity reporting limit
Total Alkalinity MDL	Double	Total Alkalinity method detection limit
Total Alkalinity Units	Text	Units Total Alkalinity was measured in
Total Alkalinity DF	Double	Dilution factor for Total Alkalinity
Total Alkalinity Analysis Date	Date/Time	Total Alkalinity analysis date
Total Alkalinity Analysis Time	Date/Time	Total Alkalinity analysis time
Total Alkalinity Flag	Text	Total Alkalinity flag

Total Alkalinity Comments	Text	Total Alkalinity Comments
Total CBOD_Method	Text	Analysis method for CBOD5
CBOD5 Result	Double	CBOD5 result
CBOD5 RL	Double	CBOD5 reporting limit
CBOD5 MDL	Double	CBOD5 method detection limit
CBOD5 Units	Text	Units CBOD5 was measured in
CBOD5 DF	Double	Dilution factor for CBOD5
CBOD5 Analysis Date	Date/Time	CBOD5 analysis date
CBOD5 Analysis Time	Date/Time	CBOD5 analysis time
CBOD5 Flag	Text	CBOD5 flag
CBOD5 Comments	Text	CBOD5 Comments
TKN Method	Text	Analysis method for TKN
TKN Result	Double	TKN result
TKN RL	Double	TKN reporting limit
TKN MDL	Double	TKN method detection limit
TKN Units	Text	Units TKN was measured in
TKN DF	Double	Dilution factor for TKN
TKN Analysis Date	Date/Time	TKN analysis date
TKN Analysis Time	Date/Time	TKN analysis time
TKN Flag	Text	TKN flag
TKN Comments	Text	TKN Comments
Nitrate-Nitrite Method	Text	Analysis method for Nitrate-Nitrite
Nitrate-Nitrite Result	Double	Nitrate-Nitrite result
Nitrate-Nitrite RL	Double	Nitrate-Nitrite reporting limit
Nitrate-Nitrite MDL	Double	Nitrate-Nitrite method detection limit
Nitrate-Nitrite Units	Text	Units Nitrate-Nitrite was measured in
Nitrate-Nitrite DF	Double	Dilution factor for Nitrate-Nitrite
Nitrate-Nitrite Analysis Date	Date/Time	Nitrate-Nitrite analysis date
Nitrate-Nitrite Analysis Time	Date/Time	Nitrate-Nitrite analysis time
Nitrate-Nitrite Flag	Text	Nitrate-Nitrite flag
Nitrate-Nitrite Comments	Text	Nitrate-Nitrite Comments
TSS Method	Text	Analysis method for TSS
TSS Result	Double	TSS result
TSS RL	Double	TSS reporting limit
TSS MDL	Double	TSS method detection limit
TSS Units	Text	Units TSS was measured in
TSS DL	Double	Dilution factor for TSS
TSS Analysis Date	Date/Time	TSS analysis date
TSS Analysis Time	Date/Time	TSS analysis time

TSS Flag	Text	TSS flag
TSS Comments	Text	TSS Comments
Total Nitrogen Method	Text	Analysis method for Total Nitrogen
Total Nitrogen Result	Double	Total Nitrogen result (calculated by adding TKN and Nitrate-Nitrite)
Total Nitrogen RL	Double	Total Nitrogen reporting limit
Total Nitrogen MDL	Double	Total Nitrogen method detection limit
Total Nitrogen Units	Text	Units Total Nitrogen was measured in
Total Nitrogen DF	Double	Dilution factor for Total Nitrogen
Total Nitrogen Analysis Date	Date/Time	Total Nitrogen analysis date
Total Nitrogen Analysis Time	Date/Time	Total Nitrogen analysis time
Total Nitrogen Flag	Text	Total Nitrogen flag
Total Nitrogen Comments	Text	Total Nitrogen Comments
Total Phosphorus Method	Text	Analysis method for Total Phosphorus
Total Phosphorus Result	Double	Total Phosphorus result
Total Phosphorus RL	Double	Total Phosphorus reporting limit
Total Phosphorus MDL	Double	Total Phosphorus method detection limit
Total Phosphorus Units	Text	Units Total Phosphorus was measured in
Total Phosphorus DF	Double	Dilution factor for Total Phosphorus
Total Phosphorus Analysis Date	Date/Time	Total Phosphorus analysis date
Total Phosphorus Analysis Time	Date/Time	Total Phosphorus analysis time
Total Phosphorus Flag	Text	Total Phosphorus flag
Total Phosphorus Comments	Memo	Total Phosphorus Comments
Total Alkalinity QC	Text	QC results for Total Alkalinity
CBOD5 QC	Text	QC results for CBOD5
TKN QC	Text	QC results for TKN
Nitrate-Nitrite QC	Text	QC results for Nitrate-Nitrite
TSS QC	Text	QC results for TSS
Total Nitrogen QC	Text	QC results for Total Nitrogen
Total Phosphorus QC	Text	QC results for Total Phosphorus
Step5_lab_results_QC Comments	Text	Comments on QC results
Step5_lab_results_Region	Double	Region where sample was taken
Step5_fecal_lab_resultstable_ Sampler	Text	Sampler name for fecal sample collection
Step5_fecal_lab_resultstable_System ID	Double	System ID number assigned for this project for fecal sample taken
Step5_fecal_lab_resultstable_Sample Type	Text	Eff =effluent Inf=Influent Tap=tap water QC=quality control
Step5_fecal_lab_resultstable_Sam	Text	AC-aeration chamber CL-clarifier DS-

pling Location		disinfection ND- not determined OT-other MF-media filter PO-phosphorus sorption PU- pump/dosing/ recirc chamber SP-sampling port TT-trash/pretmt tank PEB-pre-cleaned EB FBL-field blank FEB-field-cleaned EB
Step5_fecal_lab_resultstable_Sampling Method	Text	i=intermediate container d=directly from free fall, spigot etc. p=peristaltic pump
Step5_fecal_lab_resultstable_Original/Duplicate	Text	01-original sample 02-duplicate
Step5_fecal_lab_resultstable_Sample_Id	Text	Sample ID from fecal sample chain of custody form
Fecal_Lab_Sample_Id	Text	Fecal lab assigned sample ID number
Fecal Date Collected	Date/Time	Date sample was collected
Fecal Time Collected	Date/Time	Time sample was collected
Fecal Date Received	Date/Time	Date sample was received
Fecal Time Received	Date/Time	Time sample was received
Fecal Sample temp_preservative intact?	Text	Was the sample temperature and preservation intact?
Fecal Lab DOH NELAP certification number	Text	DOH NELAP certification number
Fecal Method	Text	Analysis method for Fecal Coliform
Fecal Result	Double	Fecal Coliform result
Fecal RL	Text	Fecal Coliform reporting limit
Fecal MDL	Text	Fecal Coliform method detection limit
Fecal Units	Text	Units Fecal Coliform was measured in
Fecal DF	Double	Dilution factor for Fecal Coliform
Fecal Analysis Date	Date/Time	Fecal Coliform analysis date
Fecal Analysis Time	Text	Fecal Coliform analysis time
Fecal Flag	Text	Fecal Coliform flag
Fecal Comments	Text	Fecal Coliform Comments
PREPDATE	Date/Time	Date fecal sample was prepped
PREPTIME	Text	Time fecal sample was prepped
Fecal QC	Text	QC results for fecal samples
Step5_fecal_lab_resultstable_QC Comments	Text	Comments on QC results for fecal samples
Step5_fecal_lab_resultstable_Region	Double	Region where fecal sample was taken

Appendix E System Evaluation Forms

Initial System Evaluation (Step 3 in System Review) Date:_______Sampler:___________________

A. System Information

System Ref. #: ___________Construction Permit # __________________Operating Permit # __________________

Site Address:____

City/State/Zip:____

County:____

Dates of two previous maintenance entity visits:_____________________Date of previous CHD inspection:______

Operating Permit current: **Yes ___ No ___** Maintenance Contract current: Yes ___ No____

Parties present at this visit: Maintenance Entity__________________CHD:__________Owner/User:_____________

Site Visit was announced by_______________ to _____________________ ____ days in advance.

Comments:____

____

B. Access to General Site Location

1. Access to site: ☐ Permission given ☐ Open ☐ Obstructed (locked gate/fence) ☐ Denied ☐ Other

C. Base for Initial System Evaluation (Check all that apply)

☐ Observation from afar ☐ Observation of above-ground parts and control panels
☐ Probing of system location ☐ Permit records

How many systems are at this address? ☐ none found ☐ one ☐ more than one

If not one, comment: ____

D. System Sketch (attach to form), see system components

☐ from final construction inspection ☐ from site plan ☐ created during site visit
☐ from engineer's as-built ☐ other file material

E. System Evaluation (elaborating on HSES 10-006)

1. Observe and record the general appearance/functioning of the treatment system.

a. Are there any signs of surfacing or breakouts near the treatment system? Yes ___ No____

b. Are tanks, lids, or access covers broken or missing? Yes ___ No____ NA____

c. Are there any signs of settling or erosion near the system components? Yes ___ No____

d. Does it appear as though the system is subject to vehicular traffic? Yes ___ No____

e. Is there any encroachment onto the system? If yes, what is within 5ft of system? Yes ___ No____
☐ Building ☐ Driveways ☐Utility easements ☐ Patios ☐ Decks ☐ Gardening ☐ Pets ☐Other________

f. Evaluate presence of odor within 10ft of perimeter of system:
Intensity: ☐ None perceivable ☐ barely perceivable ☐ faint but identifiable ☐ clearly perceivable ☐ strong
Quality: ☐ Septic ☐ Earthy/Musty/Moldy ☐ Chemical ☐ Sour/Rancid/Putrid ☐ Other_____ ☐ N/A
Source of odor, if present: ____

g. Evaluate presence of sound (except alarm) within 10ft of perimeter of system:
Intensity: ☐ None perceivable ☐ Quiet ☐ Clearly Perceivable ☐ Loud
Source: ☐ Compressor/Aspirator/Blower ☐ Pump ☐ Other ☐ N/A
Comments: ____

e. Does the system appear water-tight? Yes____No_____Unable to determine_____
If no, where does water seem to ☐ enter or ☐ leave system ?
☐ access cover ☐ lid ☐ inlet/outlet ☐ ports ☐ tank ☐ riser attachment to tank ☐ other_____

f. Are any alarms on? Yes____No_____
If yes, ☐ Air pressure ☐ High water ☐ Remote ☐ Unknown ☐ Other____________

g. Is there a means to assess sewage flow? (water meter, event counter, flow meter) Yes____No_____
If yes **and** influent is available for sampling, document meter reading ___________________

h. Comments: ____

2. Observe if system has been altered or the site has changed since approval.

a. Any landscape construction, utility work, or changes in drainage patterns? Yes ___ No____ ND____

b. Has system been obstructed? Yes ___ No____

c. Any apparent recent additions to the building(s) connected to system? Yes ___ No____ ND____

d. Are any components missing or modified? Yes ___ No____ ND____
e. Components that are on this site, and their order: ☐ **not determined: ___________________________**

Component	Order	Component	Order
☐ pretreatment/ trash (☐ part of ATU ☐ separate)		☐ grease interceptor	
☐ treatment unit (☐ aeration ☐ media filter)		☐ clarifier (☐ part of ATU ☐ separate)	
☐ pump tank/compartment (s)		☐ filter tank (media ___________________)	
☐ recirculation from____ to ____		☐ disinfection (☐ chlorine ☐ other________)	
☐ drainfield (☐mound/fill / ☐ below grade)		☐ other (Sampling Port;________________)	

f. Comments: ____

3. Observe that there is power to the system.
   a. Is control panel for treatment system visible? Yes ___ No____ N/A____
   b. Is control panel for treatment system accessible? Yes ___ No____ N/A____
   c. Does power indicator, if present, indicate that power is on? Yes ___ No____ N/A____
   d. Does operation of system (aerator) indicate that power is on? Yes ___ No____ N/A____
   e. Does it appear that the power is switched off? Yes____No____ N/A____
   f. Comments: ____
4. Observe that there is an alarm and, if possible, test it.
   a. Is an alarm present for the treatment unit? Yes ___ No____ N/A____
   b. If yes, which of the following are operational? Audio ___ Visual_____ Unable to test_____
   c. Is an alarm present for the dosing tank, if tank is present? Yes ___ No____ N/A____
   d. If yes, which of the following are operational? Audio ___ Visual_____ Unable to test_____
5. Observe the drainfield area and record conditions.
   a. Are there any trees in the drainfield? Yes ___ No____ N/A____
   b. Relative to surrounding areas, how does the vegetation on the drainfield look?
      ☐ Same ☐ More vegetation. ☐ Uneven vegetation ☐ Less vegetation
      Location(s): ____
   c. Is there evidence that there is ponding in the drainfield? Yes ___ No____ N/A____
      ☐ Standing water on the drainfield surface ☐ Saturated soil only above ☐all ☐some drainfield area
      ☐ Observation port shows ____ inches of standing water ☐ Other ___________________
   d. Comments: ____

F. Access to Sewage

1. Is there an effluent sample port installed? Yes ___ No____ N/A____
   a. Location: _______________Type: ☐ P-trap ☐ Tee ☐ Cross ☐ Distribution box ☐ Petcock (drip) ☐ Other
   b. Odor within sample port: checked ___ not checked __ N/A____
   c. Intensity: ☐ None perceivable ☐ barely perceivable ☐ faint but identifiable ☐ clearly perceivable ☐ strong
   d. Quality: ☐ Septic ☐ Earthy/Musty/Moldy ☐ Chemical ☐ Sour/Rancid/Putrid ☐ Other_____ ☐ N/A
2. Can you get access to the treatment tank? ☐ Directly ☐ Riser ☐ No ☐ N/A
   a. Access location(s): ☐ Inlet ☐ Outlet ☐ Center ☐ Located at grade ☐ Buried_________“ ☐ Not determined
   b. Are access covers securely fastened? Yes ___ No____ N/A____
   c. Are access covers in operable condition? Yes ___ No____ N/A____
3. Can you get access to a post-treatment or dosing tank? ☐ Directly ☐ Riser ☐ No ☐ N/A
   a. Access location(s): ☐ Inlet ☐ Outlet ☐ Center ☐ Located at grade ☐ Buried____“ ☐ Not determined
   b. Are access covers securely fastened? Yes____No_____N/A___
   c. Are access covers in operable condition? Yes____No_____N/A___
4. Is it feasible to obtain an influent sample from this system? Yes ___ No____ Questionable____
   a. Location: ☐ Through building sewer cleanout to first compartment ☐ Access to pretreatment compartment
5. Comments: ____

System Operation Evaluation (Step 4 in System Review)

Date:_________Sampler:___________
Time:_______ Cloud Cover (%):________ Rainfall:_____________current _____________ prev. 7 days (inches)

A. System Information

System Ref. #: ___________Construction Permit # __________________Operating Permit # __________________
Date of Last Pumpout:_______________________________________

Tank/Compartment # accessed (Section E.2.e from initial system eval.)						
Function						
Material						
Tank Structural Condition						
Liquid level relative to outlet (in) (NA for pump tank)		☐Above ☐Below	☐Above ☐Below	☐Above ☐Below	☐Above ☐Below	☐Above ☐Below
Liquid level relative to inlet (in) (NA for pump tank)		☐Above ☐Below	☐Above ☐Below	☐Above ☐Below	☐Above ☐Below	☐Above ☐Below
Evidence liquid level has been higher						
Evidence liquid level dropped (no pump)						
Evidence of non-sewage inflow						
Appears to be watertight (no visual leaks)						
Oily film/sheen present						
Odor (Intensity/Quality)						
Sample taken?		☐Yes ☐ No	☐Yes ☐ No	☐Yes ☐ No	☐Yes ☐ No	☐Yes ☐ No
Scum	Depth (in)					
	Color					
	Clarity/Structure					
Clear Zone	Depth (in)					
	Color					
	Clarity/Structure					
Sludge	Depth (in)					
	Color					
	Clarity/Structure					
Comments						

<u>Current Rainfall Code</u> 1 None 2 Light 3 Moderate 4 Heavy

<u>Function Code</u> AC aeration chamber CL clarifier DS disinfection
PU pump/dosing/recirc chamber TT trash/pretreatment NN not known OT Other _____
MF media filter (except phosphorus) PO phosphorus sorption media

<u>Material Code</u> CO concrete FG fiberglass PE polyethylene OT other __________

<u>Structural Condition Code</u>

0 structurally sound
1 rebar exposed 2 spalling 3 corrosion present 4 roots inside of compartment
5 cracks present 6 deflection noted 7 inlet seal missing/broken 8 outlet seal missing/broken
9 holes present 10 lid broken/missing 11 manhole cover missing/broken 12 other (list)

<u>Odor Code</u>

Intensity: 0 None perceivable 1 barely perceivable 2 faint but identifiable 3 easily perceivable 4 Strong
Quality: SEP <u>Sep</u>tic EARTHY <u>Earthy</u>/Musty/Moldy CHEM <u>Chem</u>ical SOUR <u>Sour</u>/Rancid/Putrid OTH Other_____ N/A <u>N/A</u>

<u>Color Code</u> BL Black BR Brown MU Mustard GR Gray WH White TAN Tan OTH Other_____ NO None

<u>Clarity/Structure Code</u> CLEAR Clear CLOUD Cloudy MILK Milky MUD Muddy FLOC Flocced GRA Grainy FLU Fluffy

<u>Aeration Chamber</u> □ N.A. □ Yes □ No

1. Aeration chamber:
   Access? □ Yes □ No
   Mixing in aeration chamber: □ Yes □ No Comment: ____
   Settled Sludge Volume test: Sample obtained □ Yes □ No
   Settled __________mL/L, Floating ______mL/L in _______ min
   Settled __________mL/L, Floating ______mL/L in <u>30</u> min
   Biomass color: □ Black □ Brown □ Mustard □ Gray □ White □ Other ________
   Biomass structure: □ fluffy □ flocced □ grainy
   Supernatant: □ cloudy □ clear
2. Additional tasks for attached-growth media evaluation:
   a. Plugging □ Yes □ No
   b. Floating □ Yes □ No
   d. Media replaced □ Yes □ No □ Unknown

<u>Media Filters</u> □ N.A. □ Yes □ No

1. Distribution of sewage across media:
   Device: ______________________________
   Uniform distribution □ N.D. □ Yes □ No
   Operating properly □ N.D. □ Yes □ No
   Ponding □ N.D. □ Yes □ No
   Comments: ______________________________________
2. Filter drainage systems
   Ponding in media filter sump □ N.D. □ Yes □ No
   Gravity drainage operational □ N.D. □ Yes □ No
   Solids buildup in sump area □ N.D. □ Yes □ No
   Underdrain vents present □ N.D. □ Yes □ No
   Underdrain vents operable □ N.D. □ Yes □ No

<u>Chlorination System</u> □ N.A. □ Yes □ No

1. Chlorination

Manufacturer: ________________________________
Chlorinator: ________ Dechlorinator:_________
Model #: __________________________________
Method: □ Tablet □ Liquid
Unit appears in good condition. □ Yes □ No
Location in/after tank # ___________

2. Tablet chlorination (if applicable):
   Chlorinator appears operable □ N.D. □ Yes □ No
   Chlorine tablets in place □ N.D. □ Yes □ No
   Tablets in contact with effluent □ N.D. □ Yes □ No
   Contact chamber operable □ N.D. □ Yes □ No
3. Chlorine residual: □ Free _______ ppm
   □ Total_______ ppm

Effluent screen/tertiary filter location: evidence of clogging □ N.A. □ Yes □ No

---

SYSTEM NUMBER / TANK NUMBER	STATION DESCRIPTION	PARAMETER	DATE	TIME	WATER TEMP	DO	%SAT DO	Trend	ORP	COND	SALINITY	PH
		UNIT	yy/mm/dd	hr:min	Celsius	mg/L	%		mV	µS/cm	ppt	su

Advanced Systems Assessment Field Analysis Form

Sampler:

Test Strip brand/lot/expiration date

Sample Identification									Olfactory/Visual				HACH Colorimeter DR/890						Taylor Kits		Test Strip / Other				
SYSTEM I.D.	Sample Number	Sample Type	Sampling Location	Sampling Method	original/dup	Date mm/dd/yy	Time hh:mm	Lab Sample Taken (y/n)	Odor Intensity	Odor Quality	Color	Clarity	Turbidity	Apparent Color	NO3-N	NH4-N	PO4	PO4-P (=PO4 *.3261)	Total Alkalinity	pH					
									code	code	code	code	FAU	units Pt-Co	mg/L	mg/L	mg/L	mg/L	mg/L CaCO3	su					
	1																								
	2																								
	3																								
	4																								
	5																								
	6																								
					Analyst's Initials:																				
See Table 8					Analysis done within ___hours:																				

		Sample Number	Additional Comments on Sample
Sample Type	Eff =effluent Inf=Influent Tap=tap water QC=quality control		
Sampling Location	For Eff: AC-aeration chamber CL-clarifier DS-disinfection ND- not determined OT-other MF-media filter (except phosphorus) PO-phosphorus sorption media PU- pump/dosing/ recirc chamber SP-sampling port; For Inf: TT-trash/pretreatment tank; for QC: PEB=pre-cleaned EB FBL=field blank FEB=field-cleaned EB		
Sampling Method	i=intermediate container d=directly from free fall, spigot etc. p=peristaltic pump	1	
original/dup	01-original sample 02-duplicate 1	2	
Odor Intensity	0 None perceivable 1barely perceivable 2 faint but identifiable 3 clearly perceivable 4 strong	3	
Odor Quality	Septic Earthy/Musty/Moldy Chemical Sour/Rancid/Putrid Other____ N/A	4	
Color	BLack BRown MUstard GRay WHite TAN OTher _____ NOne	5	
Clarity	Clear Cloudy Milky Muddy Flocced Grainy Fluffy	6	

FLORIDA DEPARTMENT OF HEALTH
ONSITE NITROGEN REDUCTION STRATEGIES STUDY

PROGRESS REPORT NO. 16
(August, 2012)

Task	Task Status	Activity this Period	Technical, Schedule, or Budget Problems Encountered	Recommended Methods to Resolve Problems
Task A – Technology Evaluation for Field Testing: Review, Prioritization, and Development				
Task A.1, Draft Literature Review Report	Task Complete	Task Complete	None	N/A
Task A.2, Final Literature Review Report	Task Complete	Task Complete	None	N/A
Task A.3, Draft Classification of Technologies Report	Task Complete	Task Complete	None	N/A
Task A.4, Draft Technology Ranking Criteria Report	Task Complete	Task Complete	None	N/A
Task A.5, Draft Priority List for Testing Report	Task Complete	Task Complete	None	N/A
Task A.6, Technology Classification, Ranking and Prioritization Workshop	Task Complete	Task Complete	None	N/A
Task A.7, Final Classification of Technologies Report	Task Complete	Task Complete	None	N/A
Task A.8, Final Technology Ranking Criteria Report	Task Complete	Task Complete	None	N/A
Task A.9, Final Priority List for Testing Report	Task Complete	Task Complete	None	N/A
Task A.10, Draft Innovative Systems Applications Reports	Not started	No activity	N/A	N/A
Task A.11, Final Innovative Systems Applications Reports	Not started	No activity	N/A	N/A
Task A.12, Identification of Test Facility Sites	Task Complete	Task Complete	None	N/A
Task A.13, Draft QAPP PNRS II	Task Complete	Task Complete	None	N/A
Task A.14, Recommendation for Process Forward Meeting	Task Complete	Task Complete	None	N/A

Task	Task Status	Activity this Period	Technical, Schedule, or Budget Problems Encountered	Recommended Methods to Resolve Problems
Task A.15, Final QAPP PNRS II	Task Complete	Task Complete	None	N/A
Task A.16 Materials Testing for FDOH Additives Rule	Task Complete	Task Complete	None	N/A
Task A.17, PNRS Specification Reports	Task Complete	Task Complete	None	N/A
Task A.18, Test Facility Design 50%	Task Complete	Task Complete	None	N/A
Task A.19, Test Facility Design 100%	Task Complete	Task Complete	None	N/A
Task A.20 PNRS II Test Facility Construction Support & Administration	Task Complete	Task Complete	None	N/A
Task A.21 PNRS II Test Facility Construction 50%	Task Complete	Task Complete	None	N/A
Task A.22 PNRS II Test Facility Construction 100%	Task Complete	Task Complete	None	N/A
Task A.23 PNRS II Test Facility Construction Substantial Completion	Task Complete	Task Complete	None	N/A
Task A.24 PNRS II Test Facility Accept Construction	Task Complete	Task Complete	None	N/A
Task A.25 Monitoring & Sample Event Reports	Task Complete	Task Complete	None	N/A
Task A.26 Data Summary Reports	Task Complete	Task Complete	None	N/A
Task A.27 Draft PNRS II Report	Underway	Started work on draft PNRS II report.	None	N/A
Task A.28 Final PNRS II Report	Not started	No activity	N/A	N/A
Task A.31Change-order Allowance	Underway	FDOH authorized $19,000 to perform a simulation of bioreactor filtration treatment of onsite wastewater April 4, 2011. The Biotool Task 1a and 1b reports completed on December 8, 2011. Remaining change-order budget = $ 1000.	None	N/A

Task	Task Status	Activity this Period	Technical, Schedule, or Budget Problems Encountered	Recommended Methods to Resolve Problems
Task B – Field Testing of Technologies and Cost Documentation				
Task B.1, Identification of Home Sites	Task Complete	Task Complete	None	N/A
Task B.2, Vendor Agreement Reports	Underway	One vendor agreement remains in Ph3A budget to be completed.	None	N/A
Task B.3, Draft QAPP for Field Testing	Task Complete	Task Complete	None	N/A
Task B.4, Recommendation for Process Forward Meeting	Task Complete	Task Complete	None	N/A
Task B.5, Final QAPP Field Testing	Task Complete	Task Complete	None	N/A
Task B.6 Field Systems Installation Report (per system)	Underway	Design and permitting of B-HS2, located in Hillsborough County, completed in August 2012. Construction scheduled for the week of September 10, 2012. Started design of B-HS3, located in Seminole County.	None	N/A
Task B.7 Field Systems Monitoring Report (per event)	Underway	Fifth B-HS1 sample event conducted August 6, 2012. B-HS1 Monitoring Report (MR) completed on: 3. June 8, 2012 4. July 30, 2012 5. September 28, 2012	None	N/A
Task B.9, Technical Description of Nitrogen Reduction Technology Report	Not started	No activity	N/A	N/A
Task B.11, LCCA Template Report (draft)	Not started	No activity	N/A	N/A

Task	Task Status	Activity this Period	Technical, Schedule, or Budget Problems Encountered	Recommended Methods to Resolve Problems
Task B.12 LCCA Template Report (final)	Not started	No activity	N/A	N/A
Task B.16 Change-order Allowance	Underway	Remaining change-order budget = $39,448.95.	None	N/A
Task C – Evaluation of Nitrogen Reduction Provided by Soils and Shallow Groundwater				
Task C.1, Draft Literature Review on Nitrogen Reduction in Soils & Shallow GW Report	Task Complete	Task Complete	None	N/A
Task C.2, Final Literature Review on Nitrogen Reduction in Soils & Shallow GW Report	Task Complete	Task Complete	None	N/A
Task C.3, Draft QAPP Evaluation of Nitrogen Reduction Provided by Soils & Shallow GW	Task Complete	Task Complete	None	N/A
Task C.4, Recommendation for Process Forward Meeting	Task Complete	Task Complete	None	N/A
Task C.5, Final QAPP Evaluation of Nitrogen Reduction Provided by Soils & Shallow GW	Task Complete	Task Complete	None	N/A
Task C.6, S&GW Test Facility Design 50%	Task Complete	Task Complete	None	N/A
Task C.7, S&GW Test Facility Design 100%	Task Complete	Task Complete	None	N/A
Task C.8, S&GW Test Facility Design Final	Task Complete	Task Complete	None	N/A
Task C.9, S&GW Test Facility Construction Support & Administration	Task Complete	Task Complete	None	N/A
Task C.10, S&GW Test Facility Construction 50%	Task Complete	Task Complete	None	N/A
Task C.11, S&GW Test Facility Construction 100%	Task Complete	Task Complete	None	N/A
Task C.12, S&GW Test Facility Construction Substantial Completion	Task Complete	Task Complete	None	N/A

Task	Task Status	Activity this Period	Technical, Schedule, or Budget Problems Encountered	Recommended Methods to Resolve Problems
Task C.13, S&GW Test Facility Accept Construction	Task Complete	Task Complete	None	N/A
Task C.14, Soils & Hydrogeologic & Monitoring Plan for S&GW Test Facility	Underway	Started work on soils, hydrogeologic and monitoring plan for S&GW test facility.	None	N/A
Task C.15, Tracer Testing at GCREC	Underway	A second tracer test for the S&GW test facility was started November 9, 2011. Tracer Test Memo No. 2 completed on July 26, 2012. There is one remaining tracer test at GCREC to be completed with Phase 3A budget.	None	N/A
Task C.16 S&GW Sample Event Report	Underway	S&GW Test Facility Sample Event Report (SER) No. 1 completed on July 30, 2012. Sample Event No. 2 conducted August 20 through 27, 2012.	None	N/A
Task C.17 S&GW Data Summary Report	Underway	Started work on S&GW Test Facility Data Summary Report (DSR) No. 1.	None	N/A
Task C.18 Test Facility Closeout Report	Not started	No activity	N/A	N/A
Task C.19 Field Site Selection	Task Complete	Task Complete	None	N/A
Task C.20 Instrumentation of GCREC Mound System	Task Complete	Task Complete	None	N/A
Task C.21 GCREC Mound Sample Event Report	Task Complete	Task Complete	None	N/A

Task	Task Status	Activity this Period	Technical, Schedule, or Budget Problems Encountered	Recommended Methods to Resolve Problems
Task C.22 GCREC Mound Data Summary Report	Task Complete	Task Complete	None	N/A
Task C.23 Instrumentation of Remaining Field Sites	Underway	Instrumentation at C-HS3 located in Polk County completed in June 2012. Instrumentation report completed July 30, 2012. Started instrumentation at C-HS4 located in Hillsborough County in August 2012.	None	N/A
Task C.24 Field Sites Sample Event Reports (SER)	Underway	C-HS2: SER No. 3 completed on June 8, 2012. SER No. 4 completed on August 14, 2012 C-HS3: Sample Event No. 1 conducted on August 28, 2012.	None	N/A
Task C.25 Field Sites Data Summary Report (DSR)	Underway	C-HS2: DSR No. 3 completed on June 8, 2012. DSR No. 4 completed on September 28, 2012.	None	N/A
Task C.26 Draft Site Summary and Close-out Report (per site)	Not started	No activity	N/A	N/A
Task C.27 Final Site Close-Out Report (per site)	Not started	No activity	N/A	N/A

Task	Task Status	Activity this Period	Technical, Schedule, or Budget Problems Encountered	Recommended Methods to Resolve Problems
Task C.30 Change-order Allowance	Not started	No activity	N/A	N/A
Task D – Nitrogen Fate and Transport Modeling				
Task D.1, Draft Literature Review on Nitrogen Fate & Transport Model Report	Task Complete	Task Complete	None	N/A
Task D.2, Final Literature Review on Nitrogen Fate & Transport Model Report	Task Complete	Task Complete	None	N/A
Task D.3, Selection of Existing Data Set for Calibration Report	Task Complete	Task Complete	None	N/A
Task D.4, Draft QAPP N Fate and Transport Modeling	Task Complete	Task Complete	None	N/A
Task D.5, Recommendation for Process Forward	Task Complete	Task Complete	None	N/A
Task D.6, Final QAPP N Fate and Transport Modeling	Task Complete	Task Complete	None	N/A
Task D.7 Simple Soil Tools	Underway	FDOH and project team conference call (July 18, 2012) to discuss model conditions. Soil parameters have continued to be statistically evaluated incorporating the soil series with the highest number of permits.	Further progress and final deliverable depends on agreement between FDOH, H&S, and CSM on the conditions to be represented. Departure of Mia Tuchloke at CSM has delayed finalization of soil parameters.	N/A

Task	Task Status	Activity this Period	Technical, Schedule, or Budget Problems Encountered	Recommended Methods to Resolve Problems
Task D.8 Complex Soil Model	Underway	Task is 80% complete with continued model development coding and preliminary testing of incorporating a shallow groundwater table.	Finalization of soil parameters is required for completion.	N/A
Task D.9 Complex Soil Model Performance Evaluation	Not Started	No activity	N/A	N/A
Task D.10 Validate/Refine Complex Soil Model	Not Started	No activity	N/A	N/A
Task D.11 Aquifer Model Combined with Complex Soil Model Development	Not Started	No activity	N/A	N/A
Task D.12 Aquifer-Complex Soil Model Performance Evaluation	Not Started	No activity	N/A	N/A
Task D.13 Validate/Refine Aquifer-Complex Soil Model with Data Collection from Task C	Not Started	No activity	N/A	N/A
Task D.14 Development of Aquifer-Complex Soil Model for Multiple Spatial Inputs	Not Started	No activity	N/A	N/A
Task D.16 Task D Guidance Manual (Draft)	Not Started	No activity	N/A	N/A
Task D.17 Task D Guidance Manual (Final)	Not Started	No activity	N/A	N/A
Task D.18 Change-order Allowance	Not Started	No activity	N/A	N/A
Task E – Project Management, Coordination and Meetings				
Task E.1, Project Kick-off Meeting	Task Complete	Task Complete	None	N/A

Task	Task Status	Activity this Period	Technical, Schedule, or Budget Problems Encountered	Recommended Methods to Resolve Problems
Task E.2, PM-Project Progress Report	Underway	The August 2012 bimonthly progress report (this report) was completed September 28, 2012.	None	N/A
Task E.3, RRAC or TRAP Presentation	Underway	No activity	None	N/A
Task E.4 RRAC or TRAP Meeting Attendance	Underway	No activity	None	N/A
Task E.4, PAC Meeting	Not started	No activity	N/A	N/A

STATUS REPORT ON PHASE II AND PHASE III OF THE FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY

Division of Disease Control and Health Protection
Bureau of Environmental Health
Onsite Sewage Programs

October 1, 2012

John H. Armstrong, MD, FACS
Surgeon General & Secretary
Department of Health

Rick Scott
Governor

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STATUS REPORT ON PHASE II AND PHASE III OF THE FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY – OCTOBER 2012

EXECUTIVE SUMMARY

This report is submitted in compliance with Line Item 512 Section 3, Conference Report on House Bill 5001, General Appropriations Act for Fiscal Year 2012-2013. The purpose of this project is to develop cost-effective, passive strategies for nitrogen reduction for onsite sewage treatment and disposal systems (OSTDS). Regardless of the source, excessive nitrogen has negative effects on public health and the environment.

The Florida Legislature has provided a total of $4.4 million for Phases I, II, and the first part of Phase III of a three phase project. The project remains within the original total estimated budget of $5.1 million so there is no cost over-run. Funds appropriated and expended to date have established necessary viable protocols and have been appropriately used to test, calibrate, and refine technologies and strategies to be tested in the field.

This project is in its fourth year of six, which means a time over-run. The contract was developed for a five year term due to the complexity and magnitude of work necessary to get meaningful results as executed in January, 2009. During each fiscal year, the Department authorized the provider to work on tasks for which there was sufficient budget and spending authority causing some delay in project completion which means there is a time over-run. With the final appropriation of funds, the project is now on track to be completed by January 16, 2015. This project has been endorsed by Florida TaxWatch as a good use of public funds (Wenner 2008).

During the 2012-2013 fiscal year efforts are focused on installing, monitoring, and modeling various full-scale OSTDS field sites at locations throughout the State of Florida to evaluate nitrogen reducing technologies and gathering information on how nitrogen moves through the soil and shallow groundwater. This field testing phase is crucial, so that the project will yield practical results that can be used to develop viable, cost-effective alternative passive technologies for use by homeowners for nitrogen issues associated with onsite systems. There are ten sites in progress as contractually required.

The tasks associated with the final phase include: continuation and completion of field monitoring of the performance and cost of technologies at home sites and of nitrogen fate and transport in the shallow groundwater; development of nitrogen fate and transport models that will be calibrated with the field sampling results; and final reporting on all tasks with recommendations on onsite sewage nitrogen reduction strategies.

The Department's Research Review and Advisory Committee (RRAC) supports concluding this study as originally scoped and recommends:

1. For fiscal year 2013-2014, this project would require the Legislature to provide the final installment of cash in the amount of $700,000 and budget authority in the amount of $1,000,000 to continue the field testing.
2. For the fiscal year 2014-2015, this project would require the Legislature to provide budget authority in the amount of $500,000 for continuation and completion of the tasks associated with this legislatively mandated study.

Continued support for this project will ultimately benefit Florida's approximately 2.7 million onsite system owners by finding cost-effective nitrogen reduction strategies that will improve environmental and public health protection.

1 INTRODUCTION

The Florida Legislature tasked the Department of Health to conduct a study to develop passive strategies for nitrogen reduction for onsite sewage treatment and disposal systems (OSTDS). Regardless of the source, excessive nitrogen has negative effects on public health and the environment. The primary motivations for this study are the environmental impacts that the increased levels of nitrogen in water bodies can cause. Programs within DEP identify water bodies impaired by excessive nitrogen, establish targets for maximum nutrient loads, and develop management action plans to restore the water bodies. The relative impact of OSTDS on total nitrogen levels varies from watershed to watershed with estimates ranging from below five to more than 20 percent. There is widespread interest in the management of OSTDS and their nitrogen impacts. The significance of this innovative project is that it evaluates and develops strategies to reduce nitrogen impacts from OSTDS regulated by the Florida Department of Health (DOH). The goal is to develop systems that complement the use of conventional OSTDS and are also affordable and ecologically protective with reduced engineering and installation costs that assist in sustainable development.

This study was based on budget language in 2008 (Line Item 1682, House Bill 5001, General Appropriations Act for Fiscal Year 2008-2009) that instructed:

> …the Department of Health to further develop cost-effective nitrogen reduction strategies. The Department of Health shall contract, by request for proposal, for Phase I of an anticipated 3-year project to develop passive strategies for nitrogen reduction that complement use of conventional onsite wastewater treatment systems. The project shall be controlled by the Department of Health's Research Review and Advisory Committee and shall include the following components: 1) comprehensive review of existing or ongoing studies on passive technologies; 2) field testing of nitrogen reducing technologies at actual home sites for comparison of conventional, passive technologies and performance-based treatment systems to determine nitrogen reduction performance; 3) documentation of all capital, energy and life-cycle costs of various technologies for nitrogen reduction; 4) evaluation of nitrogen reduction provided by soils and the shallow groundwater below and down gradient of various systems; and 5) development of a simple model for predicting nitrogen fate and transport from onsite wastewater systems. A progress report shall be presented to the Executive Office of the Governor, the President of the Senate and the Speaker of the House of Representatives on February 1, 2009, including recommendations for funding additional phases of the study.

The 2010 legislature (included in Appendix A) specified that the existing contract for this project will remain in full force; that the Department, the Department's Research Review and Advisory Committee (RRAC), and the Florida Department of Environmental Protection (DEP) shall work together to provide technical oversight; that DEP will have maximum technical input; that the main focus and priority for work in Phase II shall be in developing, testing, and recommending cost-effective passive technologies for nitrogen reduction; that field installations for this project will be subject to significant testing and monitoring; and that no state agency shall implement any rule or policy that requires nitrogen reducing systems or increases their costs until the study is complete.

The 2011 and 2012 legislature (included in Appendix B and Appendix C respectively) specified that the existing contract for this project will remain in full force; that the Department, the Department's Research Review and Advisory Committee (RRAC), and the Florida Department of Environmental Protection (DEP) shall work together to provide technical oversight; that completion of Phase II and Phase III must be consistent with the terms of the existing contract; that the main focus and priority for Phase III be developing, testing, and recommending cost-effective passive technology design criteria for nitrogen reduction; the installed systems are experimental in nature and shall be installed with significant field testing and monitoring; and that no state agency shall implement any rule or policy that requires nitrogen reducing systems or increases their costs until the study is complete.

The Florida Legislature has provided a total of $4.4 million for Phases I, II, and the first part of Phase III of a three phase project with a total estimated cost of $5.1 million (Table 1). This includes an initial appropriation of $900,000 by the 2008 Legislature for the first phase of this study and an appropriation of $2,000,000 by the 2010 Legislature for the second phase of this study, and an appropriation of $1,500,000 by the 2012 Legislature for the first part of the third phase of this study. This project will require additional cash in the amount of $700,000 to complete the study and budget authority in the amount of $1,000,000 for work to continue during fiscal year 2013-2014. This report is submitted in compliance with Line Item 512 Section 3, Conference Report on House Bill 5001, General Appropriations Act for Fiscal Year 2012-2013, which appropriated the funding for the study.

This project has been endorsed by Florida TaxWatch as a study that is a good use of public funds and that provides homeowners with cost-effective options for nitrogen reduction (email communication from Kurt Wenner to Jerry McDaniel June 2, 2008).

Table 1. Summary of Legislative Funding

Total Project Budget	$5,100,000
Total Funding To Date	($4,400,000)
Balance to Complete (2013-2014 Fiscal Year Projected Funding Need)	$700,000

The study contract was awarded in January 2009 to a Project Team led by Hazen and Sawyer, P.C., and was based upon an anticipated budget of $5 million over a 3 – 5 year project timeframe, with an additional $100,000 budget to DOH for project management. As a result of the time required for contracting, unspent monies in fiscal year 2008-2009 were budgeted in 2009 to complete the initial tasks of the project. The contract identifies the following tasks:

Task A – Technology Evaluation for Field Testing: Review, Prioritization, and Development: This task includes literature review, technology evaluation, prioritization of technologies to be examined during field testing, and further experimentation with approaches tested in a previous DOH passive nitrogen removal study. Objectives of this task are to prioritize technologies for testing at actual home sites and to perform controlled tests at a test facility to develop design criteria for new passive nitrogen reduction systems.

Task B – Field Testing of Technologies and Cost Documentation: This task includes installation of top-ranked nitrogen reduction technologies at actual homes, with documentation of their performance and cost. Cost documentation for the systems will be broken down by permitting, design, materials and construction, and operation and maintenance.

Task C – Evaluation of Nitrogen Reduction Provided by Soils and Shallow Groundwater: This task includes several field evaluations of nitrogen reduction in Florida soils and shallow groundwater and also will provide data for the development of a simple planning model in Task D.

Task D – Nitrogen Fate and Transport Modeling: The objective of this task is to develop a simple fate and transport model of nitrogen from OSTDS that can be used for assessment, planning and siting of OSTDS.

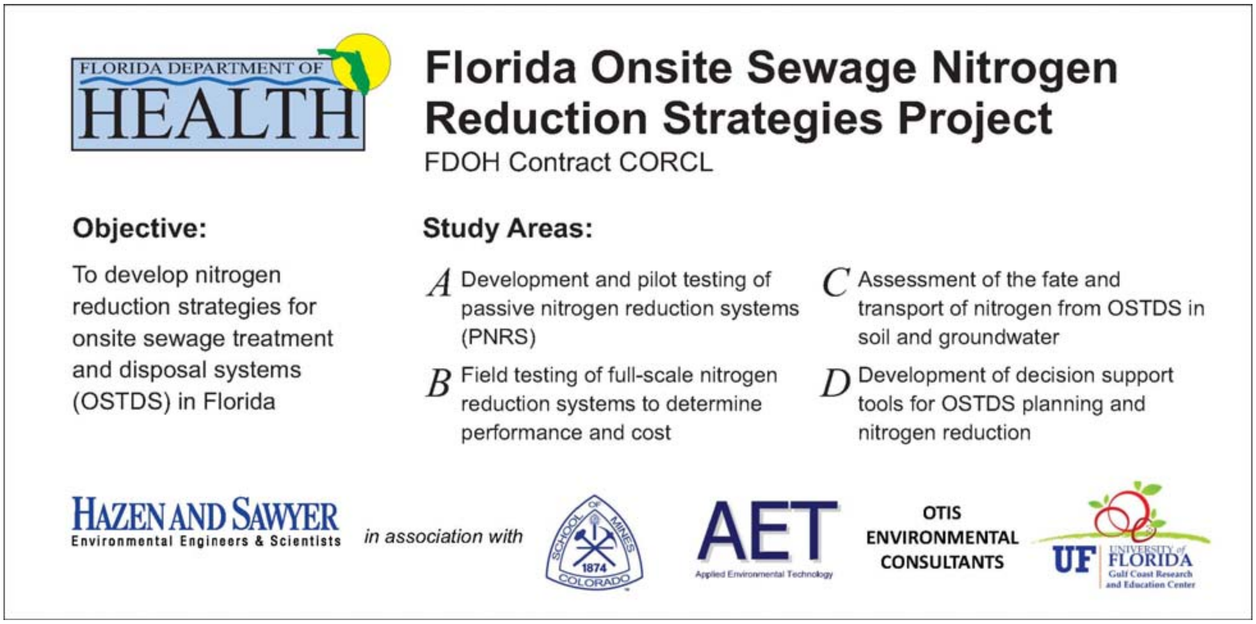

Figure 1. Sign posted at the University of Florida's Gulf Coast Research & Education Center's test facility.

2 PROJECT STATUS

Funding for the first and second phases of this project has been appropriated. The 2012 legislature approved funding for the first part of Phase III. A summary of the major project elements and their timing with funding phases is shown in Table 1. The contractor, in coordination with the RRAC and DOH, has successfully completed parts of Tasks A, B, C, and D, including literature reviews; ranking of nitrogen reduction technologies for field testing; design and construction of a test facility for further development of passive technologies; development of quality assurance documents for the test facility work, groundwater monitoring, field testing, and nitrogen fate and transport modeling; installation of nitrogen reducing systems at two home sites; completion of several sampling events of passive systems at the test facility and field sites; design and construction of a soil and groundwater test facility; and field sampling of the soil and groundwater under OSTDS at residential homes throughout Florida and at the test facility.

Figure 2. Test facility constructed at the University of Florida's Gulf Coast Research & Education Center.

Current efforts and work remaining for the 2012-2013 fiscal year includes: installation and field sampling of additional sites at residential homes throughout Florida for the testing of passive systems and to test the soil and groundwater under OSTDS; sampling at the soil and groundwater test facility; and initiating development of a nitrogen fate and transport model. RRAC supports concluding this study as originally scoped. The following work by task will proceed with the current funding level:

1. Task A. The technology evaluation included a total of 7 sample events at the passive nitrogen test facility, measuring 14 different analytes at over 40 sampling points in 11 systems, as well as a final report on the pilot passive nitrogen removal study at the Gulf Coast Research and Education Center (GCREC).
   Current Status as of October 2012: All sample events at the test facility have been completed. Test results are encouraging after 12 months of testing, showing a reduction in total nitrogen of over 95%, with a final effluent concentration of 2.6 mg/L or less for several of the systems. Analysis of the results from the 11 systems and report writing is underway. Two additional, drainfield-based systems have been installed and monitored for four months.
2. Task B. For field testing of technologies, the quality assurance project plan has been finalized. The research design proposes that seven onsite systems, utilizing various nitrogen removal technologies, will be installed at home locations throughout the State of Florida. It is anticipated that a total of seven field system performance monitoring events will be conducted on each these systems with the current funding level, measuring 16 different analytes at 2-8 different sampling points. A report providing a technical description of nitrogen reduction technologies will be written, as well as a report providing a template and user guidelines for system life cycle cost assessments.
   Current Status as of October 2012: Eleven homeowners residing at locations across Florida have agreed to participate in the study to date for Task B (Table 2).

Home sites have been identified in Wakulla County, the Wekiva area, and several other areas throughout the State. At least one of the home sites will have a gravity-fed system installed. Construction has been completed for two systems. Sampling is half-way completed for the first system and the second system will be sampled in the near future.

3. Task C. To evaluate nitrogen reduction provided by soils and shallow groundwater, a soil and groundwater test facility has been constructed to show how groundwater fate and transport of nitrogen occurs in multiple soil treatment unit regimes. Six sampling events will be completed with the current funding level, sampling six different locations at each site, and measuring multiple parameters in the effluent, soil, and groundwater. The existing OSTDS mound system at the University of Florida's Gulf Coast Research & Education Center (GCREC) in Wimauma, Florida will be instrumented to study how nitrogen behaves in the soil and groundwater. Four sampling events that examine multiple parameters have been completed at the existing OSTDS mound system at GCREC. At least three soil and groundwater monitoring events will occur at up to three home sites to evaluate nitrogen movement in the soil and groundwater in the field, measuring multiple parameters in the effluent, soil, and groundwater.
   Current Status as of October 2012: Tasks that have been completed thus far are the testing of media components per 381.0065(4)(m) F.S., two tracer tests to determine existing groundwater flow characteristics, and construction of the soil and groundwater test facility. Two of four monitoring events have been completed at four groundwater test areas at the soil and groundwater test facility to show how groundwater fate and transport of nitrogen occurs. Instrumentation of the existing OSTDS mound system at GCREC has been completed and four sample events have been conducted. Six homeowners have agreed to participate in the study to date for Task C (Table 2). Three home sites have been selected and instrumented. One sample event has occurred at the first of these sites, however, the groundwater flow direction could not be delineated, and no additional sampling events will occur at that site. Sampling is complete at the second instrumented site, and the third site is currently being monitored.

Table 2. Field Work Status by County for Task B and Task C

County	# Sites Evaluated	# Agreements	Sites in Progress
Charlotte	12	0	0
Hernando	1	0	0
Hillsborough	4	3	3
Lake	1	0	0
Lee	4	1	0
Marion	8	3	0
Orange	2	0	0
Polk	3	1	1
Sarasota	13	0	0
Seminole	8	6	4
Wakulla	4	4	2
TOTAL	**60**	**18**	**10**

1. Task D. To address nitrogen fate and transport modeling from onsite systems in Florida a simple tool will be developed in Task D to assist in evaluating nitrogen loading from these systems. This will include development of a soil model to show how nitrogen is affected by treatment in Florida-specific soils, and a groundwater model to evaluate the movement of nitrogen down gradient from these systems. A final quality assurance project plan has been completed and the first steps will include the development of a soil model to show how nitrogen is affected by treatment in Florida-specific soils.
   Current Status as of October 2012: Work has focused primarily on soil modeling under the current budget. Soil models are currently being developed and refined, and groundwater modeling will soon be underway. These models will be utilized to generate a simple tool for prediction of nitrogen fate, transport, and removal in Florida soils and groundwater.

3 ANTICIPATED PROGRESS IN 2013-2014

During the 2013-2014 fiscal year, additional funding will be critical to complete the tasks associated with the final phase. These include: continuation and completion of field monitoring of performance and cost of technologies at home sites and of nitrogen fate and transport in the shallow groundwater; calibration and refinement of various nitrogen fate and transport models that will be calibrated with the field sampling results; and final reporting on all tasks with recommendations on onsite sewage nitrogen reduction strategies. In particular, the following work will occur with the final phase of funding being requested with this report:

1. For Task A, the final task report will be written. This report will include a summary of the accomplishments of the passive nitrogen removal test facility.
2. For Task B, it is anticipated that one final field system performance monitoring event will be conducted on each of the seven systems; and completion of final reporting on all of the field work associated with this task. Cost documentation for the systems will be broken down by permitting, design, materials and construction, and operation and maintenance.
3. For Task C, monitoring events at three home sites will be conducted to evaluate nitrogen movement in the soil and groundwater in the field. Final reporting for this task will be completed.
4. For Task D, the soil model will be completed and integrated with groundwater models which will be calibrated, and validated, utilizing the results of the field work collected in previous tasks, and a final task report will be written summarizing the results of this task.

4 FUNDING NEEDS

Activities in fiscal years 2008-2012 have prepared the framework for rapid implementation of all remaining project tasks in fiscal years 2013-2015. A final appropriation of cash in the amount of $700,000 is required in 2013-2014. Budget authorization in the amount of $1,000,000 in 2013-2014 and $500,000 in 2014-2015 is required to reap the benefits of all previous work and to complete the goals of this project.

This project is in its fourth of six years and is within the original $5.1 million budget. Funds appropriated and expended to date have established necessary viable protocols and have been appropriately used to test, calibrate, and refine technologies and strategies to be tested in the field. Continued funding for Phase III of the project is necessary for extensive field testing (the major portion of Task B) to be completed. Field testing is crucial, so that the project will yield results that can be used to develop viable, cost-effective alternative passive technologies for use by homeowners for nitrogen issues associated with onsite systems.

Project Tasks (described previously) are broken down further into funding phases as follows:

<u>Initial Funding in 2008-2010 (Phase I)</u>: $900,000 (cash and budget authority) appropriated (in 2008 and 2009 state budgets) – Status: Complete. The initial funding was targeted to prioritize systems for testing, summarize existing knowledge, develop testing protocols, and establish a test facility for detailed soil and groundwater monitoring and for preliminary testing of pilot scale passive nitrogen reduction systems.

<u>Funding in 2010-2011</u>: $2 million (cash and budget authority) appropriated (in 2010 state budget) – Status: Ongoing. This funding is for field monitoring over at least a one-year monitoring period of performance and cost of technologies at home sites, and of nitrogen fate and transport. This funding will also continue the development and monitoring work at the test facility and continue the modeling work.

<u>Funding in 2011-2012</u>: Although $2.75 million in budget authorization was appropriated in the 2011 state budget, no additional cash accompanied the budget authorization – Status: Ongoing. The remaining cash from the 2010-2011 appropriation is being used to continue the monitoring of systems and the soil modeling work. The preliminary results of the project are encouraging.

<u>Funding in 2012-2013</u>: $1.5 million (cash and budget authority) appropriated (in 2012 state budget) – Status: Ongoing. These funds are being used to continue to install and monitor nitrogen reducing systems, draft a life cycle cost assessment template report for systems evaluated in this study, monitor nitrogen in the groundwater under existing OSTDS, and to develop, validate, and refine the soil modeling work.

<u>Funding in 2013-2015</u>: To adequately fund the final phase of the project, $700,000 cash is required to fund the completion of scheduled tasks. Further testing and analysis is required to confirm the results to date with field data and to provide data for development of the engineering specifications for full system designs. The funds will be used to complete monitoring and other field activities, perform additional testing as deemed appropriate by the Legislature, and for final reporting with recommendations on onsite sewage nitrogen reduction strategies for Florida's future. Budget authority is required in the amount of $1,000,000 in the 2013 budget and $500,000 in the 2014 budget.

Further information on this project, including previous legislative reports and detailed project reports, can be found on the Department's website:

http://www.doh.state.fl.us/environment/ostds/research/Nitrogen.html

Table 3. Summary of Funding Phase Tasks and Progress

	Task	Status	Phase I	Phase II	Phase IIIa	Phase IIIb
A	**Task A: Technology Selection & Prioritization**		**$352,144**	**$336,514**	**$0**	**$35,480**
	Literature review	Complete				
	Ranking of nitrogen reduction technologies for field testing	Complete				
	Design and construction of test facility	Complete				
	Quality assurance project plan	Complete				
	Monitoring and sample events (7 events)	Complete				
	Final test facility report	Underway				
	Final task report	Funding required[1]				
B	**Task B: Field Testing of Technologies**		**$50,202**	**$599,610**	**$265,408**	**$263,834**
	Quality assurance project plan	Complete				
	Installation of ranked nitrogen reduction technologies at 7 field sites	Underway				
	System performance monitoring events at 7 sites	Underway				
	Life cycle cost assessment template development	Not started				
	Final life cycle cost assessment report (per system)	Funding required[1]				
	Final task report	Funding required[1]				
C	**Task C: Evaluation of Nitrogen Reduction by Soils & Shallow Groundwater**		**$216,164**	**$1,095,977**	**$436,220**	**$162,640**
	Quality assurance project plan	Complete				
	Design of test facility	Complete				
	Construction of test facility	Complete				
	Test facility monitoring and sample events (4 test areas sampled 6 times)	Underway, partially funded[2]				
	Instrumentation of existing OSTDS mound at GCREC facility	Complete				
	GCREC mound sample events	Complete				
	Field sites sample events (4 sites, 3 sites will be sampled 3 times, 1 site discontinued)	Underway, partially funded[2]				
	Final task report	Funding required[1]				
D	**Task D: Nitrogen Fate and Transport Models**		**$74,357**	**$292,021**	**$251,334**	**$190,310**
	Quality assurance project plan	Complete				
	Soil model development (simple and complex)	Underway				
	Performance evaluation and refinement of soil models	Not started				
	Shallow groundwater/soil model development	Funding required[1]				
	Performance evaluation and refinement of soil/groundwater model	Funding required[1]				
	Decision making framework	Funding required[1]				
	Final task report	Funding required[1]				
	Project Management (sum of contractor and Department of Health)		**$119,953**	**$149,003**	**$105,407**	**$103,422**
	Contractor project management	Underway	$90,695	$109,003	$90,407	$87,679
	Department of Health project management	Underway	$29,258	$40,000	$15,000	$15,743
	Total Project Budget		**$812,820**	**$2,473,125**	**$1,058,369**	**$755,686**
	Total Spent as of September 26, 2012		**$812,820**	**$1,379,912**	**$0**	**$0**
	Balance		**$0**	**$1,093,213**	**$0**	**$0**

1 A “funding required” subtask status indicates that the $700,000 requested for fiscal year 2013-2014 is required to fund the subtask

2 A “partially funded” subtask status indicates that a subtask has received partial funding, but still requires a portion of the $700,000 required to complete the funding for the project

GCREC – Gulf Coast Research & Education Center
OSTDS – Onsite Sewage Treatment and Disposal Systems

5 RECOMMENDATIONS

The Department's Research Review and Advisory Committee (RRAC) supports concluding this study as originally scoped and recommends:

1. For fiscal year 2013-2014, this project would require the Legislature to provide the final installment of cash in the amount of $700,000 and budget authority in the amount of $1,000,000 to continue the field testing.
2. For the fiscal year 2014-2015, this project would require the Legislature to provide budget authority in the amount of $500,000 for continuation and completion of the tasks associated with this legislatively mandated study.

This final funding will be applied to the final phase of the project, for completion of field monitoring of performance and cost of technologies at home sites and of nitrogen fate and transport in the shallow groundwater, calibration and refinement of various nitrogen fate and transport models that will be calibrated with the field sampling results, and final reporting on all tasks with recommendations on onsite sewage nitrogen reduction strategies.

Continued support for this project will ultimately benefit Florida's approximately 2.7 million onsite system owners by finding cost-effective nitrogen reduction strategies that will improve environmental and public health protection. When fully funded, the results of this project will assist with producing nitrogen reducing systems that protect groundwater through reduced life-cycle costs and lower energy demands.

APPENDIX A. 2010 Legislative Language

SECTION 3 – HUMAN SERVICES

486	SPECIAL CATEGORIES	
	CONTRACTED SERVICES	
	FROM GENERAL REVENUE FUND	153,772
	FROM ADMINISTRATIVE TRUST FUND . . .	337,765
	FROM FEDERAL GRANTS TRUST FUND . . .	348,235
	FROM GRANTS AND DONATIONS TRUST FUND	2,648,438
	FROM RADIATION PROTECTION TRUST FUND	150,000

From the funds in Specific Appropriation 486, $2,000,000 from the Grants and Donations Trust Fund is provided to the department to continue phase II and complete the study authorized in Specific Appropriation 1682 of chapter 2008-152, Laws of Florida. The report shall include recommendations on passive strategies for nitrogen reduction that complement use of conventional onsite wastewater treatment systems. The department shall submit an interim report of phase II on February 1, 2011, a subsequent status report on May 16, 2011, and a final report upon completion of phase II to the Governor, the President of the Senate, and the Speaker of the House of Representatives prior to proceeding with any nitrogen reduction activities.

Section 14. In order to implement Specific Appropriation 486 of the 2010-2011 General Appropriations Act, and for the 2010-2011 fiscal year only, the following requirements shall govern Phase 2 of the Department of Health's Florida Onsite Sewage Nitrogen Reduction Strategies Study:

(1) The underlying contract for which the study was let shall remain in full force and effect with the Department of Health and funding the contract for Phase 2 of the study shall be through the Department of Health.

(2) The Department of Health, the Department of Health's Research Review and Advisory Committee, and the Department of Environmental Protection shall work together to provide the necessary technical oversight of Phase 2 of the project, with the Department of Environmental Protection having maximum technical input.

(3) Management and oversight of Phase 2 shall be consistent with the terms of the existing contract; however, the main focus and priority for work to be completed for Phase 2 shall be in developing, testing, and recommending cost-effective passive technology design criteria for nitrogen reduction.

(4) The systems installed at actual home sites are experimental in nature and shall be installed with significant field testing and monitoring. The Department of Health is specifically authorized to allow installation of these experimental systems. In addition, before Phase 2 of the study is complete and notwithstanding any law to the contrary, a state agency may not adopt or implement a rule or policy that:

(a) Mandates, establishes, or implements any new nitrogen-reduction standards that apply to existing or new onsite sewage treatment systems or modification of such systems;

(b) Increases the cost of treatment for nitrogen reduction from onsite sewage treatment systems; or

(c) Directly requires or has the indirect effect of requiring, for nitrogen reduction, the use of performance-based treatment systems or any similar technology; provided the Department of Environmental Protection administrative orders recognizing onsite system modifications, developed through a basin management action plan adopted pursuant to section 403.067, Florida Statutes, are not subject to the above restrictions where implementation of onsite system modifications are phased in after completion of Phase 2, except that no onsite system modification developed in a basin management action plan shall directly or indirectly require the installation of performance-based treatment systems.

APPENDIX B. 2011 Legislative Language

SECTION 3 – HUMAN SERVICES

465 SPECIAL CATEGORIES
CONTRACTED SERVICES

FROM GENERAL REVENUE FUND	97,489
FROM ADMINISTRATIVE TRUST FUND . . .	335,165
FROM FEDERAL GRANTS TRUST FUND . . .	643,776
FROM GRANTS AND DONATIONS TRUST FUND	3,401,038
FROM RADIATION PROTECTION TRUST FUND	150,000

From the funds in Specific Appropriation 465, $2,725,000 in nonrecurring funds from the Grants and Donations Trust Fund is provided to the department to complete phase II and phase III and complete the study authorized in Specific Appropriation 1682 of chapter 2008-152, Laws of Florida. The report shall include recommendations on passive strategies for nitrogen reduction that complement use of conventional onsite wastewater treatment systems. The department shall submit an interim report of the completion of phase II and progress on phase III on February 1, 2012, a subsequent status report on May 16, 2012, and a final report upon completion of phase III to the Governor, the President of the Senate, and the Speaker of the House of Representatives prior to proceeding with any nitrogen reduction activities.

Section 7. In order to implement Specific Appropriation 465 of the 2011-2012 General Appropriations Act, and for the 2011-2012 fiscal year only, the following requirements govern the completion of Phase 2 and Phase 3 of the Department of Health's Florida Onsite Sewage Nitrogen Reduction Strategies Study:

(1) The Department of Health's underlying contract for the study remains in full force and effect and funding for completion of Phase 2 and Phase 3 is through the Department of Health.

(2) The Department of Health, the Department of Health's Research Review and Advisory Committee, and the Department of Environmental Protection shall work together to provide the necessary technical oversight of the completion of Phase 2 and Phase 3 of the project.

(3) Management and oversight of the completion of Phase 2 and Phase 3 must be consistent with the terms of the existing contract. However, the main focus and priority to be completed during Phase 3 shall be developing, testing, and recommending cost-effective passive technology design criteria for nitrogen reduction.

(4) The systems installed at homesites are experimental in nature and shall be installed with significant field testing and monitoring. The Department of Health is specifically authorized to allow installation of these experimental systems. Notwithstanding any other law, before Phase 3 of the study is completed, a state agency may not adopt or implement a rule or policy that:

(a) Mandates, establishes, or implements more restrictive nitrogen-reduction standards to existing or new onsite sewage treatment systems or modification of such systems; or

(b) Directly or indirectly requires the use of performance-based treatment systems or similar technology, such as through an administrative order developed by the Department of Environmental Protection as part of a basin management action plan adopted pursuant to s. 403.067, Florida Statutes. However, the implementation of more restrictive nitrogen-reduction standards for onsite systems may be required through a basin management action plan if such plan is phased in after completion of Phase 3.

APPENDIX C. 2012 Legislative Language

SECTION 3 – HUMAN SERVICES

512	SPECIAL CATEGORIES CONTRACTED SERVICES		
	FROM GENERAL REVENUE FUND	2,047,489	
	FROM ADMINISTRATIVE TRUST FUND . . .		335,165
	FROM FEDERAL GRANTS TRUST FUND . . .		643,776
	FROM GRANTS AND DONATIONS TRUST FUND		676,038
	FROM RADIATION PROTECTION TRUST FUND		150,000

From the funds in Specific Appropriation 512, $1,500,000 in nonrecurring funds from the General Revenue Fund is provided to the department to complete phase II and phase III of the study authorized in Specific Appropriation 1682 of chapter 2008-152, Laws of Florida. The funds will be spent for installing field systems and sampling, installing and sampling the soil and groundwater at various sites throughout Florida to determine how nitrogen moves, and developing various models to show how nitrogen is affected by treatment in Florida-specific soils. The department shall submit a status report before October 1, 2012, a subsequent status report before February 1, 2013, and a final report upon completion of phase III to the Governor, the President of the Senate, and the Speaker of the House of Representatives prior to proceeding with any nitrogen reduction activities.

Section 5. (1) In order to implement Specific Appropriation 512 of the 2012-2013 General Appropriations Act, and for the 2012-2013 fiscal year only, the following requirements govern the completion of Phase 2 and Phase 3 of the Department of Health's Florida Onsite Sewage Nitrogen Reduction Strategies Study:

(a) The Department of Health's underlying contract for the study remains in full force and effect and funding for completion of Phase 2 and Phase 3 is through the Department of Health.

(b) The Department of Health, the Department of Health's Research Review and Advisory Committee, and the Department of Environmental Protection shall work together to provide the necessary technical oversight of the completion of Phase 2 and Phase 3 of the project.

(c) Management and oversight of the completion of Phase 2 and Phase 3 must be consistent with the terms of the existing contract. However, the main focus and priority to be completed during Phase 3 shall be developing, testing, and recommending cost-effective passive technology design criteria for nitrogen reduction.

(d) The systems installed at homesites are experimental in nature and shall be installed with significant field testing and monitoring. The Department of Health is specifically authorized to allow installation of these experimental systems. Notwithstanding any other law, before Phase 3 of the study is completed, a state agency may not adopt or implement a rule or policy that:

1. Mandates, establishes, or implements more restrictive nitrogen-reduction standards to existing or new onsite sewage treatment systems or modification of such systems; or

2. Directly or indirectly requires the use of performance-based treatment systems or similar technology, such as through an administrative order developed by the Department of Environmental Protection as part of a basin management action plan adopted pursuant to s. 403.067, Florida Statutes.

However, the implementation of more restrictive nitrogen-reduction standards for onsite systems may be required through a basin management action plan if such plan is phased in after completion of Phase 3.

(2) This section expires July 1, 2013.

STATUS REPORT ON PHASE II AND PHASE III OF THE FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY

Division of Disease Control and Health Protection
Bureau of Environmental Health
Onsite Sewage Programs

October 1, 2012

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May 16

John H. Armstrong, MD, FACS
Surgeon General & Secretary
Department of Health

Rick Scott
Governor

Deleted: Steven L. Harris, M.D., M.Sc.¶
Interim State

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STATUS REPORT ON PHASE II AND PHASE III OF THE FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY – OCTOBER 2012

EXECUTIVE SUMMARY

This report is submitted in compliance with Line Item 512 Section 3, Conference Report on House Bill 5001, General Appropriations Act for Fiscal Year 2012-2013. The purpose of this project is to develop cost-effective, passive strategies for nitrogen reduction for onsite sewage treatment and disposal systems (OSTDS). Regardless of the source, excessive nitrogen has negative effects on public health and the environment.

The Florida Legislature has provided a total of $4.4 million for Phases I, II, and the first part of Phase III of a three phase project. The project remains within the original total estimated budget of $5.1 million so there is no cost over-run. Funds appropriated and expended to date have established necessary viable protocols and have been appropriately used to test, calibrate, and refine technologies and strategies to be tested in the field.

This project is in its fourth year of six, which means a time over-run. The contract was developed for a five year term due to the complexity and magnitude of work necessary to get meaningful results as executed in January, 2009. During each fiscal year, the Department authorized the provider to work on tasks for which there was sufficient budget and spending authority causing some delay in project completion which means there is a time over-run. With the final appropriation of funds, the project is now on track to be completed by January 16, 2015. This project has been endorsed by Florida TaxWatch as a good use of public funds (Wenner 2008).

During the 2012-2013 fiscal year efforts are focused on installing, monitoring, and modeling various full-scale OSTDS field sites at locations throughout the State of Florida to evaluate nitrogen reducing technologies and gathering information on how nitrogen moves through the soil and shallow groundwater. This field testing phase is crucial, so that the project will yield practical results that can be used to develop viable, cost-effective alternative passive technologies for use by homeowners for nitrogen issues associated with onsite systems. There are ten sites in progress as contractually required.

The tasks associated with the final phase include: continuation and completion of field monitoring of the performance and cost of technologies at home sites and of nitrogen fate and transport in the shallow groundwater; development of nitrogen fate and transport models that will be calibrated with the field sampling results; and final reporting on all tasks with recommendations on onsite sewage nitrogen reduction strategies.

The Department's Research Review and Advisory Committee (RRAC) supports concluding this study as originally scoped and recommends:

1. For fiscal year 2013-2014, this project would require the Legislature to provide the final installment of cash in the amount of $700,000 and budget authority in the amount of $1,000,000 to continue the field testing.
2. For the fiscal year 2014-2015, this project would require the Legislature to provide budget authority in the amount of $500,000 for continuation and completion of the tasks associated with this legislatively mandated study.

Continued support for this project will ultimately benefit Florida's approximately 2.7 million onsite system owners by finding cost-effective nitrogen reduction strategies that will improve environmental and public health protection.

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During the 2012-2013 fiscal year efforts will be focused on installing, monitoring, and modeling various field sites at locations throughout the State of Florida to evaluate nitrogen reducing technologies and to gather information on how nitrogen moves through the soil and shallow groundwater. The final phase of funding, which will be required for the 2013-2014 fiscal year, will include completion of remaining field monitoring; completion of nitrogen fate and transport models that will be calibrated with the field sampling results; and final reporting on all tasks with recommendations on onsite sewage nitrogen reduction strategies.

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1 INTRODUCTION

The Florida Legislature tasked the Department of Health to conduct a study to develop passive strategies for nitrogen reduction for onsite sewage treatment and disposal systems (OSTDS). Regardless of the source, excessive nitrogen has negative effects on public health and the environment. The primary motivations for this study are the environmental impacts that the increased levels of nitrogen in water bodies can cause. Programs within DEP identify water bodies impaired by excessive nitrogen, establish targets for maximum nutrient loads, and develop management action plans to restore the water bodies. The relative impact of OSTDS on total nitrogen levels varies from watershed to watershed with estimates ranging from below five to more than 20 percent. There is widespread interest in the management of OSTDS and their nitrogen impacts. The significance of this innovative project is that it evaluates and develops strategies to reduce nitrogen impacts from OSTDS regulated by the Florida Department of Health (DOH). The goal is to develop systems that complement the use of conventional OSTDS and are also affordable and ecologically protective with reduced engineering and installation costs that assist in sustainable development.

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Deleted: Table 1. Summary of Legislative Funding¶
Total Project Budget ... [2]

This study was based on budget language in 2008 (Line Item 1682, House Bill 5001, General Appropriations Act for Fiscal Year 2008-2009) that instructed:

> …the Department of Health to further develop cost-effective nitrogen reduction strategies. The Department of Health shall contract, by request for proposal, for Phase I of an anticipated 3-year project to develop passive strategies for nitrogen reduction that complement use of conventional onsite wastewater treatment systems. The project shall be controlled by the Department of Health's Research Review and Advisory Committee and shall include the following components: 1) comprehensive review of existing or ongoing studies on passive technologies; 2) field testing of nitrogen reducing technologies at actual home sites for comparison of conventional, passive technologies and performance-based treatment systems to determine nitrogen reduction performance; 3) documentation of all capital, energy and life-cycle costs of various technologies for nitrogen reduction; 4) evaluation of nitrogen reduction provided by soils and the shallow groundwater below and down gradient of various systems; and 5) development of a simple model for predicting nitrogen fate and transport from onsite wastewater systems. A progress report shall be presented to the Executive Office of the Governor, the President of the Senate and the Speaker of the House of Representatives on February 1, 2009, including recommendations for funding additional phases of the study.

The 2010 legislature (included in Appendix A) specified that the existing contract for this project will remain in full force; that the Department, the Department's Research Review and Advisory Committee (RRAC), and the Florida Department of Environmental Protection (DEP) shall work together to provide technical oversight; that DEP will have maximum technical input; that the main focus and priority for work in Phase II shall be in developing, testing, and recommending cost-effective passive technologies for nitrogen reduction; that field installations for this project will be subject to significant testing and monitoring; and that no state agency shall implement any rule or policy that requires nitrogen reducing systems or increases their costs until the study is complete.

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The 2011 and 2012 legislature (included in Appendix B and Appendix C respectively) specified that the existing contract for this project will remain in full force; that the Department, the Department's Research Review and Advisory Committee (RRAC), and the Florida Department of Environmental Protection (DEP) shall work together to provide technical oversight; that

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completion of Phase II and Phase III must be consistent with the terms of the existing contract; that the main focus and priority for Phase III be developing, testing, and recommending cost-effective passive technology design criteria for nitrogen reduction; the installed systems are experimental in nature and shall be installed with significant field testing and monitoring; and that no state agency shall implement any rule or policy that requires nitrogen reducing systems or increases their costs until the study is complete.

The Florida Legislature has provided a total of $4.4 million for Phases I, II, and the first part of Phase III of a three phase project with a total estimated cost of $5.1 million (Table 1). This includes an initial appropriation of $900,000 by the 2008 Legislature for the first phase of this study and an appropriation of $2,000,000 by the 2010 Legislature for the second phase of this study, and an appropriation of $1,500,000 by the 2012 Legislature for the first part of the third phase of this study. This project will require additional cash in the amount of $700,000 to complete the study and budget authority in the amount of $1,000,000 for work to continue during fiscal year 2013-2014. This report is submitted in compliance with Line Item 512 Section 3, Conference Report on House Bill 5001, General Appropriations Act for Fiscal Year 2012-2013, which appropriated the funding for the study.

This project has been endorsed by Florida TaxWatch as a study that is a good use of public funds and that provides homeowners with cost-effective options for nitrogen reduction (email communication from Kurt Wenner to Jerry McDaniel June 2, 2008).

Table 1. Summary of Legislative Funding

Total Project Budget	$5,100,000
Total Funding To Date	($4,400,000)
Balance to Complete (2013-2014 Fiscal Year Projected Funding Need)	$700,000

The study contract was awarded in January 2009 to a Project Team led by Hazen and Sawyer, P.C., and was based upon an anticipated budget of $5 million over a 3 – 5 year project timeframe, with an additional $100,000 budget to DOH for project management. As a result of the time required for contracting, unspent monies in fiscal year 2008-2009 were budgeted in 2009 to complete the initial tasks of the project. The contract identifies the following tasks:

Task A – Technology Evaluation for Field Testing: Review, Prioritization, and Development: This task includes literature review, technology evaluation, prioritization of technologies to be examined during field testing, and further experimentation with approaches tested in a previous DOH passive nitrogen removal study. Objectives of this task are to prioritize technologies for testing at actual home sites and to perform controlled tests at a test facility to develop design criteria for new passive nitrogen reduction systems.

Task B – Field Testing of Technologies and Cost Documentation: This task includes installation of top-ranked nitrogen reduction technologies at actual homes, with documentation of their performance and cost. Cost documentation for the systems will be broken down by permitting, design, materials and construction, and operation and maintenance.

Task C – Evaluation of Nitrogen Reduction Provided by Soils and Shallow Groundwater: This task includes several field evaluations of nitrogen reduction in Florida soils and shallow groundwater and also will provide data for the development of a simple planning model in Task D.

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Deleted: The significance of this innovative project is that it evaluates and develops strategies to reduce nitrogen impacts from OSTDS regulated by the Florida Department of Health (DOH). The goal is to develop systems that complement the use of conventional OSTDS and are also affordable and ecologically protective with reduced engineering and installation costs that assist in sustainable development.

Task D – Nitrogen Fate and Transport Modeling: The objective of this task is to develop a simple fate and transport model of nitrogen from OSTDS that can be used for assessment, planning and siting of OSTDS.

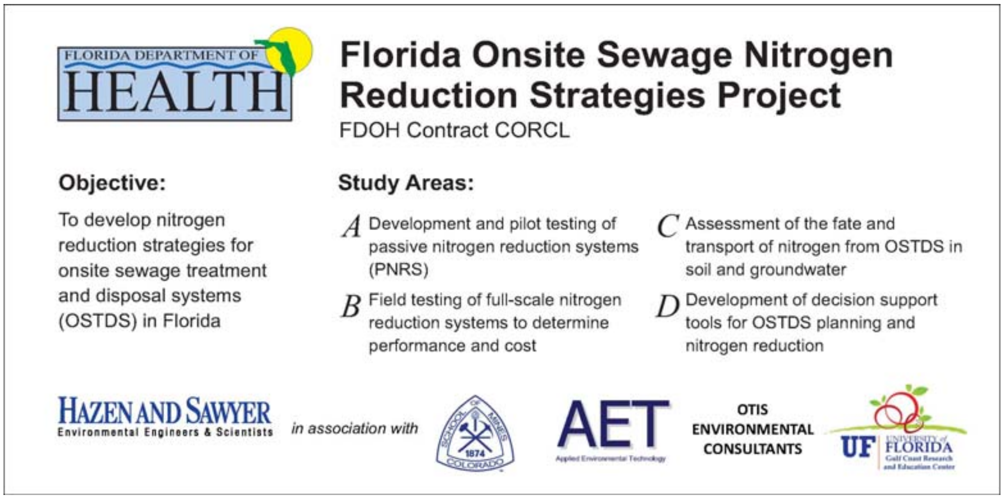

Figure 1. Sign posted at the University of Florida's Gulf Coast Research & Education Center's test facility.

2 PROJECT STATUS

Funding for the first and second phases of this project has been appropriated. The 2012 legislature approved funding for the first part of Phase III. A summary of the major project elements and their timing with funding phases is shown in Table 1. The contractor, in coordination with the RRAC and DOH, has successfully completed parts of Tasks A, B, C, and D, including literature reviews; ranking of nitrogen reduction technologies for field testing; design and construction of a test facility for further development of passive technologies; development of quality assurance documents for the test facility work, groundwater monitoring, field testing, and nitrogen fate and transport modeling; installation of nitrogen reducing systems at two home sites; completion of several sampling events of passive systems at the test facility and field sites; design and construction of a soil and groundwater test facility; and field sampling of the soil and groundwater under OSTDS at residential homes throughout Florida and at the test facility.

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Figure 2. Test facility constructed at the University of Florida's Gulf Coast Research & Education Center.

Current efforts and work remaining for the 2012-2013 fiscal year includes: installation and field sampling of additional sites at residential homes throughout Florida for the testing of passive systems and to test the soil and groundwater under OSTDS; sampling at the soil and groundwater test facility; and initiating development of a nitrogen fate and transport model. RRAC supports concluding this study as originally scoped. The following work by task will proceed with the current funding level:

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1. Task A. The technology evaluation included a total of 7 sample events at the passive nitrogen test facility, measuring 14 different analytes at over 40 sampling points in 11 systems, as well as a final report on the pilot passive nitrogen removal study at the Gulf Coast Research and Education Center (GCREC).
   Current Status as of October 2012: All sample events at the test facility have been completed. Test results are encouraging after 12 months of testing, showing a reduction in total nitrogen of over 95%, with a final effluent concentration of 2.6 mg/L or less for several of the systems. Analysis of the results from the 11 systems and report writing is underway. Two additional, drainfield-based systems have been installed and monitored for four months.

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2. Task B. For field testing of technologies, the quality assurance project plan has been finalized. The research design proposes that seven onsite systems, utilizing various nitrogen removal technologies, will be installed at home locations throughout the State of Florida. It is anticipated that a total of seven field system performance monitoring events will be conducted on each these systems with the current funding level, measuring 16 different analytes at 2-8 different sampling points. A report providing a technical description of nitrogen reduction technologies will be written, as well as a report providing a template and user guidelines for system life cycle cost assessments..
   Current Status as of October 2012: Eleven homeowners residing at locations across Florida have agreed to participate in the study to date for Task B (Table 2).

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Home sites have been identified in Wakulla County, the Wekiva area, and several other areas throughout the State. At least one of the home sites will have a gravity-fed system installed. Construction has been completed for two systems. Sampling is half-way completed for the first system and the second system will be sampled in the near future.

3. Task C. To evaluate nitrogen reduction provided by soils and shallow groundwater, a soil and groundwater test facility has been constructed to show how groundwater fate and transport of nitrogen occurs in multiple soil treatment unit regimes. Six sampling events will be completed with the current funding level, sampling six different locations at each site, and measuring multiple parameters in the effluent, soil, and groundwater. The existing OSTDS mound system at the University of Florida's Gulf Coast Research & Education Center (GCREC) in Wimauma, Florida will be instrumented to study how nitrogen behaves in the soil and groundwater. Four sampling events that examine multiple parameters have been completed at the existing OSTDS mound system at GCREC. At least three soil and groundwater monitoring events will occur at up to three home sites to evaluate nitrogen movement in the soil and groundwater in the field, measuring multiple parameters in the effluent, soil, and groundwater.

Current Status as of October 2012: Tasks that have been completed thus far are the testing of media components per 381.0065(4)(m) F.S., two tracer tests to determine existing groundwater flow characteristics, and construction of the soil and groundwater test facility. Two of four monitoring events have been completed at four groundwater test areas at the soil and groundwater test facility to show how groundwater fate and transport of nitrogen occurs. Instrumentation of the existing OSTDS mound system at GCREC has been completed and four sample events have been conducted. Six homeowners have agreed to participate in the study to date for Task C (Table 2). Three home sites have been selected and instrumented. One sample event has occurred at the first of these sites, however, the groundwater flow direction could not be delineated, and no additional sampling events will occur at that site. Sampling is complete at the second instrumented site, and the third site is currently being monitored.

Table 2. Field Work Status by County for Task B and Task C

County	# Sites Evaluated	# Agreements	Sites in Progress
Charlotte	12	0	0
Hernando	1	0	0
Hillsborough	4	3	3
Lake	1	0	0
Lee	4	1	0
Marion	8	3	0
Orange	2	0	0
Polk	3	1	1
Sarasota	13	0	0
Seminole	8	6	4
Wakulla	4	4	2
TOTAL	**60**	**18**	**10**

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4. Task D. To address nitrogen fate and transport modeling from onsite systems in Florida a simple tool will be developed in Task D to assist in evaluating nitrogen loading from these systems. This will include development of a soil model to show how nitrogen is affected by treatment in Florida-specific soils, and a groundwater model to evaluate the movement of nitrogen down gradient from these systems. A final quality assurance project plan has been completed and the first steps will include the development of a soil model to show how

   Current Status as of October 2012: Work has focused primarily on soil modeling under the current budget. Soil models are currently being developed and refined, and groundwater modeling will soon be underway. These models will be utilized to generate a simple tool for prediction of nitrogen fate, transport, and removal in Florida soils and groundwater.

3 ANTICIPATED PROGRESS IN 2013-2014

During the 2013-2014 fiscal year, additional funding will be critical to complete the tasks associated with the final phase. These include: continuation and completion of field monitoring of performance and cost of technologies at home sites and of nitrogen fate and transport in the shallow groundwater; calibration and refinement of various nitrogen fate and transport models that will be calibrated with the field sampling results; and final reporting on all tasks with recommendations on onsite sewage nitrogen reduction strategies. In particular, the following work will occur with the final phase of funding being requested with this report:

1. For Task A, the final task report will be written. This report will include a summary of the accomplishments of the passive nitrogen removal test facility.
2. For Task B, it is anticipated that one final field system performance monitoring event will be conducted on each of the seven systems; and completion of final reporting on all of the field work associated with this task. Cost documentation for the systems will be broken down by permitting, design, materials and construction, and operation and maintenance.
3. For Task C, monitoring events at three home sites will be conducted to evaluate nitrogen movement in the soil and groundwater in the field. Final reporting for this task will be completed.
4. For Task D, the soil model will be completed and integrated with groundwater models which will be calibrated, and validated, utilizing the results of the field work collected in previous tasks, and a final task report will be written summarizing the results of this task.

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During the 2012-2013 fiscal year, the following progress is anticipated: ¶
¶
<#>For Task A, analysis of the results from the passive nitrogen test facility research is underway.¶
For Task B, it is anticipated that four field sites will be installed, bringing the total installations to seven; at least four field system performance monitoring events will be conducted on each of the seven systems; a report providing a technical description of nitrogen reduction technologies will be written, as well as a report providing a template and user guidelines for system life cycle cost assessments. ¶
<#>For Task C, three final monitoring events at the soil and groundwater test facility will be conducted, and monitoring events at three home sites will be performed to evaluate nitrogen movement in the soil and groundwater in the field. ¶
<#>For Task D, soil models demonstrating performance evaluation will be developed and refined, as well as development of model demonstrating nitrogen movement in the shallow groundwater and soil. ¶

4 FUNDING NEEDS

Activities in fiscal years 2008-2012 have prepared the framework for rapid implementation of all remaining project tasks in fiscal years 2013-2015. A final appropriation of cash in the amount of $700,000 is required in 2013-2014. Budget authorization in the amount of $1,000,000 in 2013-2014 and $500,000 in 2014-2015 is required to reap the benefits of all previous work and to complete the goals of this project.

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This project is in its fourth of six years and is within the original $5.1 million budget. Funds appropriated and expended to date have established necessary viable protocols and have been appropriately used to test, calibrate, and refine technologies and strategies to be tested in the field. Continued funding for Phase III of the project is necessary for extensive field testing (the major portion of Task B) to be completed. Field testing is crucial, so that the project will yield results that can be used to develop viable, cost-effective alternative passive technologies for use by homeowners for nitrogen issues associated with onsite systems.

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Project Tasks (described previously) are broken down further into funding phases as follows:

Initial Funding in 2008-2010 (Phase I): $900,000 (cash and budget authority) appropriated (in 2008 and 2009 state budgets) – Status: Complete. The initial funding was targeted to prioritize systems for testing, summarize existing knowledge, develop testing protocols, and establish a test facility for detailed soil and groundwater monitoring and for preliminary testing of pilot scale passive nitrogen reduction systems.

Funding in 2010-2011: $2 million (cash and budget authority) appropriated (in 2010 state budget) – Status: Ongoing. This funding is for field monitoring over at least a one-year monitoring period of performance and cost of technologies at home sites, and of nitrogen fate and transport. This funding will also continue the development and monitoring work at the test facility and continue the modeling work.

Funding in 2011-2012: Although $2.75 million in budget authorization was appropriated in the 2011 state budget, no additional cash accompanied the budget authorization – Status: Ongoing. The remaining cash from the 2010-2011 appropriation is being used to continue the monitoring of systems and the soil modeling work. The preliminary results of the project are encouraging.

Funding in 2012-2013: $1.5 million (cash and budget authority) appropriated (in 2012 state budget) – Status: Ongoing. These funds are being used to continue to install and monitor nitrogen reducing systems, draft a life cycle cost assessment template report for systems evaluated in this study, monitor nitrogen in the groundwater under existing OSTDS, and to develop, validate, and refine the soil modeling work.

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Funding in 2013-2015: To adequately fund the final phase of the project, $700,000 cash is required to fund the completion of scheduled tasks. Further testing and analysis is required to confirm the results to date with field data and to provide data for development of the engineering specifications for full system designs. The funds will be used to complete monitoring and other field activities, perform additional testing as deemed appropriate by the Legislature, and for final reporting with recommendations on onsite sewage nitrogen reduction strategies for Florida's future. Budget authority is required in the amount of $1,000,000 in the 2013 budget and $500,000 in the 2014 budget.

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Further information on this project, including previous legislative reports and detailed project reports, can be found on the Department's website:

http://www.doh.state.fl.us/environment/ostds/research/Nitrogen.html

Table 3. Summary of Funding Phase Tasks and Progress

	Task	Status	Phase I	Phase II	Phase IIIa	Phase IIIb
A	**Task A: Technology Selection & Prioritization**		**$352,144**	**$336,514**	**$0**	**$35,480**
	Literature review	Complete				
	Ranking of nitrogen reduction technologies for field testing	Complete				
	Design and construction of test facility	Complete				
	Quality assurance project plan	Complete				
	Monitoring and sample events (7 events)	Complete				
	Final test facility report	Underway				
	Final task report	Funding required[1]				
B	**Task B: Field Testing of Technologies**		**$50,202**	**$599,610**	**$265,408**	**$263,834**
	Quality assurance project plan	Complete				
	Installation of ranked nitrogen reduction technologies at 7 field sites	Underway				
	System performance monitoring events at 7 sites	Underway				
	Life cycle cost assessment template development	Not started				
	Final life cycle cost assessment report (per system)	Funding required[1]				
	Final task report	Funding required[1]				
C	**Task C: Evaluation of Nitrogen Reduction by Soils & Shallow Groundwater**		**$216,164**	**$1,095,977**	**$436,220**	**$162,640**
	Quality assurance project plan	Complete				
	Design of test facility	Complete				
	Construction of test facility	Complete				
	Test facility monitoring and sample events (4 test areas sampled 6 times)	Underway, partially funded[2]				
	Instrumentation of existing OSTDS mound at GCREC facility	Complete				
	GCREC mound sample events	Complete				
	Field sites sample events (4 sites, 3 sites will be sampled 3 times, 1 site discontinued)	Underway, partially funded[2]				
	Final task report	Funding required[1]				
D	**Task D: Nitrogen Fate and Transport Models**		**$74,357**	**$292,021**	**$251,334**	**$190,310**
	Quality assurance project plan	Complete				
	Soil model development (simple and complex)	Underway				
	Performance evaluation and refinement of soil models	Not started				
	Shallow groundwater/soil model development	Funding required[1]				
	Performance evaluation and refinement of soil/groundwater model	Funding required[1]				
	Decision making framework	Funding required[1]				
	Final task report	Funding required[1]				
	Project Management (sum of contractor and Department of Health)		**$119,953**	**$149,003**	**$105,407**	**$103,422**
	Contractor project management	Underway	$90,695	$109,003	$90,407	$87,679
	Department of Health project management	Underway	$29,258	$40,000	$15,000	$15,743
	Total Project Budget		**$812,820**	**$2,473,125**	**$1,058,369**	**$755,686**
	Total Spent as of September 26, 2012		**$812,820**	**$1,379,912**	**$0**	**$0**
	Balance		**$0**	**$1,093,213**	**$0**	**$0**

1 A "funding required" subtask status indicates that the $700,000 requested for fiscal year 2013-2014 is required to fund the subtask

2 A "partially funded" subtask status indicates that a subtask has received partial funding, but still requires a portion of the $700,000 required to complete the funding for the project

GCREC – Gulf Coast Research & Education Center
OSTDS – Onsite Sewage Treatment and Disposal Systems

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5 RECOMMENDATIONS

The Department's Research Review and Advisory Committee (RRAC) supports concluding this study as originally scoped and recommends:

1. For fiscal year 2013-2014, this project would require the Legislature to provide the final installment of cash in the amount of $700,000 and budget authority in the amount of $1,000,000 to continue the field testing.
2. For the fiscal year 2014-2015, this project would require the Legislature to provide budget authority in the amount of $500,000 for continuation and completion of the tasks associated with this legislatively mandated study.

This final funding will be applied to the final phase of the project, for completion of field monitoring of performance and cost of technologies at home sites and of nitrogen fate and transport in the shallow groundwater, calibration and refinement of various nitrogen fate and transport models that will be calibrated with the field sampling results, and final reporting on all tasks with recommendations on onsite sewage nitrogen reduction strategies.

Continued support for this project will ultimately benefit Florida's approximately 2.7 million onsite system owners by finding cost-effective nitrogen reduction strategies that will improve environmental and public health protection. When fully funded, the results of this project will assist with producing nitrogen reducing systems that protect groundwater through reduced life-cycle costs and lower energy demands.

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APPENDIX A. 2010 Legislative Language

SECTION 3 – HUMAN SERVICES

486	SPECIAL CATEGORIES	
	CONTRACTED SERVICES	
	FROM GENERAL REVENUE FUND	153,772
	FROM ADMINISTRATIVE TRUST FUND . . .	337,765
	FROM FEDERAL GRANTS TRUST FUND . . .	348,235
	FROM GRANTS AND DONATIONS TRUST FUND	2,648,438
	FROM RADIATION PROTECTION TRUST FUND	150,000

From the funds in Specific Appropriation 486, $2,000,000 from the Grants and Donations Trust Fund is provided to the department to continue phase II and complete the study authorized in Specific Appropriation 1682 of chapter 2008-152, Laws of Florida. The report shall include recommendations on passive strategies for nitrogen reduction that complement use of conventional onsite wastewater treatment systems. The department shall submit an interim report of phase II on February 1, 2011, a subsequent status report on May 16, 2011, and a final report upon completion of phase II to the Governor, the President of the Senate, and the Speaker of the House of Representatives prior to proceeding with any nitrogen reduction activities.

Section 14. In order to implement Specific Appropriation 486 of the 2010-2011 General Appropriations Act, and for the 2010-2011 fiscal year only, the following requirements shall govern Phase 2 of the Department of Health's Florida Onsite Sewage Nitrogen Reduction Strategies Study:

(1) The underlying contract for which the study was let shall remain in full force and effect with the Department of Health and funding the contract for Phase 2 of the study shall be through the Department of Health.

(2) The Department of Health, the Department of Health's Research Review and Advisory Committee, and the Department of Environmental Protection shall work together to provide the necessary technical oversight of Phase 2 of the project, with the Department of Environmental Protection having maximum technical input.

(3) Management and oversight of Phase 2 shall be consistent with the terms of the existing contract; however, the main focus and priority for work to be completed for Phase 2 shall be in developing, testing, and recommending cost-effective passive technology design criteria for nitrogen reduction.

(4) The systems installed at actual home sites are experimental in nature and shall be installed with significant field testing and monitoring. The Department of Health is specifically authorized to allow installation of these experimental systems. In addition, before Phase 2 of the study is complete and notwithstanding any law to the contrary, a state agency may not adopt or implement a rule or policy that:

(a) Mandates, establishes, or implements any new nitrogen-reduction standards that apply to existing or new onsite sewage treatment systems or modification of such systems;

(b) Increases the cost of treatment for nitrogen reduction from onsite sewage treatment systems; or

(c) Directly requires or has the indirect effect of requiring, for nitrogen reduction, the use of performance-based treatment systems or any similar technology; provided the Department of Environmental Protection administrative orders recognizing onsite system modifications, developed through a basin management action plan adopted pursuant to section 403.067, Florida Statutes, are not subject to the above restrictions where implementation of onsite system modifications are phased in after completion of Phase 2, except that no onsite system modification developed in a basin management action plan shall directly or indirectly require the installation of performance-based treatment systems.

APPENDIX B. 2011 Legislative Language

SECTION 3 – HUMAN SERVICES

465	SPECIAL CATEGORIES	
	CONTRACTED SERVICES	
	FROM GENERAL REVENUE FUND	97,489
	FROM ADMINISTRATIVE TRUST FUND . . .	335,165
	FROM FEDERAL GRANTS TRUST FUND . . .	643,776
	FROM GRANTS AND DONATIONS TRUST FUND	3,401,038
	FROM RADIATION PROTECTION TRUST FUND	150,000

From the funds in Specific Appropriation 465, $2,725,000 in nonrecurring funds from the Grants and Donations Trust Fund is provided to the department to complete phase II and phase III and complete the study authorized in Specific Appropriation 1682 of chapter 2008-152, Laws of Florida. The report shall include recommendations on passive strategies for nitrogen reduction that complement use of conventional onsite wastewater treatment systems. The department shall submit an interim report of the completion of phase II and progress on phase III on February 1, 2012, a subsequent status report on May 16, 2012, and a final report upon completion of phase III to the Governor, the President of the Senate, and the Speaker of the House of Representatives prior to proceeding with any nitrogen reduction activities.

Section 7. In order to implement Specific Appropriation 465 of the 2011-2012 General Appropriations Act, and for the 2011-2012 fiscal year only, the following requirements govern the completion of Phase 2 and Phase 3 of the Department of Health's Florida Onsite Sewage Nitrogen Reduction Strategies Study:

(1) The Department of Health's underlying contract for the study remains in full force and effect and funding for completion of Phase 2 and Phase 3 is through the Department of Health.

(2) The Department of Health, the Department of Health's Research Review and Advisory Committee, and the Department of Environmental Protection shall work together to provide the necessary technical oversight of the completion of Phase 2 and Phase 3 of the project.

(3) Management and oversight of the completion of Phase 2 and Phase 3 must be consistent with the terms of the existing contract. However, the main focus and priority to be completed during Phase 3 shall be developing, testing, and recommending cost-effective passive technology design criteria for nitrogen reduction.

(4) The systems installed at homesites are experimental in nature and shall be installed with significant field testing and monitoring. The Department of Health is specifically authorized to allow installation of these experimental systems. Notwithstanding any other law, before Phase 3 of the study is completed, a state agency may not adopt or implement a rule or policy that:

(a) Mandates, establishes, or implements more restrictive nitrogen-reduction standards to existing or new onsite sewage treatment systems or modification of such systems; or

(b) Directly or indirectly requires the use of performance-based treatment systems or similar technology, such as through an administrative order developed by the Department of Environmental Protection as part of a basin management action plan adopted pursuant to s. 403.067, Florida Statutes. However, the implementation of more restrictive nitrogen-reduction standards for onsite systems may be required through a basin management action plan if such plan is phased in after completion of Phase 3.

APPENDIX C. 2012 Legislative Language

SECTION 3 – HUMAN SERVICES

512 SPECIAL CATEGORIES
CONTRACTED SERVICES

FROM GENERAL REVENUE FUND	2,047,489	
FROM ADMINISTRATIVE TRUST FUND . . .		335,165
FROM FEDERAL GRANTS TRUST FUND . . .		643,776
FROM GRANTS AND DONATIONS TRUST FUND		676,038
FROM RADIATION PROTECTION TRUST FUND		150,000

From the funds in Specific Appropriation 512, $1,500,000 in nonrecurring funds from the General Revenue Fund is provided to the department to complete phase II and phase III of the study authorized in Specific Appropriation 1682 of chapter 2008-152, Laws of Florida. The funds will be spent for installing field systems and sampling, installing and sampling the soil and groundwater at various sites throughout Florida to determine how nitrogen moves, and developing various models to show how nitrogen is affected by treatment in Florida-specific soils. The department shall submit a status report before October 1, 2012, a subsequent status report before February 1, 2013, and a final report upon completion of phase III to the Governor, the President of the Senate, and the Speaker of the House of Representatives prior to proceeding with any nitrogen reduction activities.

Section 5. (1) In order to implement Specific Appropriation 512 of the 2012-2013 General Appropriations Act, and for the 2012-2013 fiscal year only, the following requirements govern the completion of Phase 2 and Phase 3 of the Department of Health's Florida Onsite Sewage Nitrogen Reduction Strategies Study:

(a) The Department of Health's underlying contract for the study remains in full force and effect and funding for completion of Phase 2 and Phase 3 is through the Department of Health.

(b) The Department of Health, the Department of Health's Research Review and Advisory Committee, and the Department of Environmental Protection shall work together to provide the necessary technical oversight of the completion of Phase 2 and Phase 3 of the project.

(c) Management and oversight of the completion of Phase 2 and Phase 3 must be consistent with the terms of the existing contract. However, the main focus and priority to be completed during Phase 3 shall be developing, testing, and recommending cost-effective passive technology design criteria for nitrogen reduction.

(d) The systems installed at homesites are experimental in nature and shall be installed with significant field testing and monitoring. The Department of Health is specifically authorized to allow installation of these experimental systems. Notwithstanding any other law, before Phase 3 of the study is completed, a state agency may not adopt or implement a rule or policy that:

1. Mandates, establishes, or implements more restrictive nitrogen-reduction standards to existing or new onsite sewage treatment systems or modification of such systems; or

2. Directly or indirectly requires the use of performance-based treatment systems or similar technology, such as through an administrative order developed by the Department of Environmental Protection as part of a basin management action plan adopted pursuant to s. 403.067, Florida Statutes. However, the implementation of more restrictive nitrogen-reduction standards for onsite systems may be required through a basin management action plan if such plan is phased in after completion of Phase 3.

(2) This section expires July 1, 2013.

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When fully funded, the results of this project will assist with producing nitrogen reducing systems that protect groundwater through reduced life-cycle costs and lower energy demands.

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Table 1. Summary of Legislative Funding

Total Project Budget	$5,100,000
Total Funding To Date	($4,400,000)
Balance to Complete (2013-2014 Fiscal Year Projected Funding Need)	$700,000

Department of Health
Bureau of Environmental Health
Onsite Sewage Programs
Research Review and Advisory Committee

Wednesday November 14, 2012

10:00 am – 2:00 pm

Agenda:

- Introductions and Housekeeping
- Review Minutes of Meeting June 21, 2012
- Nitrogen Study Update
  - October 2012 Legislative Status Report
  - Project Update
- Overview of TMDL Program at DEP
- Discussion on Draft Report On The Performance and Management of Advanced Onsite Sewage Treatment and Disposal Systems in Florida
- Update on Other Projects
  - Inventory of OSTDS
  - Correlations between water quality, OSTDS, and health effects
- Other Business
- Public Comment
- Closing Comments, Next Meeting, and Adjournment

Introductions & Housekeeping

- Roll call
- Identification of audience
- How to view web conference
- DO NOT PUT YOUR PHONE ON HOLD!!!!
- Download reports:

http://www.myfloridaeh.com/ostds/research/Index.html

Introductions & Housekeeping

Tom Miller, Local Government member, has resigned due to relocation out of state. Proposed replacements have been named, working on gathering all information for appointments.

Groups that have terms expiring January 2013:

- Real Estate Professionals
- Professional Engineer
- Home Building Industry

Introductions & Housekeeping

Restructuring of Department of Health:

New Division of Disease Control and Health Protection

New Bureau of Environmental Health

New Water and Onsite Sewage Section

Review Minutes of Meeting June 21, 2012

- See draft minutes

Florida Onsite Sewage Nitrogen Reduction Strategies Study

Purpose: Develop passive strategies for nitrogen reduction that complement use of conventional onsite sewage treatment and disposal systems, and further develop cost-effective nitrogen reduction strategies

Florida Onsite Sewage Nitrogen Reduction Strategies Study

- Project received $1,500,000 in budget and cash for continuation of the study for FY 2012-2013
- Staff, in coordination with the provider, authorized work to begin on additional tasks

Florida Onsite Sewage Nitrogen Reduction Strategies Study

- Discussion October 2012 Legislative Status Report

Florida Onsite Sewage Nitrogen Reduction Strategies Study

Project update since June 21, 2012 meeting:

Task A

- Josefin Hirst presented a paper on the Task A PNRS II pilot study results at the annual FEHA conference in September.

Task B (7 total sites)

- 3 additional sample events have been conducted at the Task B HS1 home system.
- The second Task B home system (B-HS2) design was completed, and the system was constructed. Start-up occurred in late September.
- Design has begun on 3 Task B home systems in Seminole County.

Florida Onsite Sewage Nitrogen Reduction Strategies Study

Project update since June 21, 2012 meeting:

Task C (4 sites)

- 3 additional sample events have been conducted at the Soil and Groundwater Test Facility (at GCREC).
- The fourth and final sample event was conducted at site C-HS2.
- The third Task C groundwater monitoring homesite (C-HS3) was established in Polk County and instrumentation of the site for monitoring was completed.
- The first sample event was conducted at C-HS3.
- The fourth Task C home system (C-HS4) groundwater monitoring was initiated. The site was partially instrumented and one sample event was conducted prior to installation of the B-HS2 PNR system. This site will provide a before and after case study for improved treatment performance.

Florida Onsite Sewage Nitrogen Reduction Strategies Study

Project update since June 21, 2012 meeting:

Task D

- Staff participated in a conference call with Hazen and Sawyer and the Colorado School of Mines on 7/18/2012 and 10/3/12. The approach was discussed for a simple soil tool that can be used to illustrate the subsurface behavior of wastewater. The scope and approach were refined and the deliverables were clearly specified and agreed to by all parties.

Florida Onsite Sewage Nitrogen Reduction Strategies Study

Project update since June 21, 2012 meeting:

Other updates

- Staff updated financial document forms in the Florida Accountability Contract Tracking System (FACTS). The update brought the paperwork into the new format and updated encumbrances for this fiscal year ($1.5 million non-recurring). The FACTS system allows for public transparency on state contracts.
- Contract monitoring event conduced on 8/31/12 at the research facility.
- Creation of webpage summarizing progress and providing links to all deliverables for the nitrogen study is ongoing.

Overview of Total Maximum Daily Load Program at the Florida Department of Environmental Protection and How It Relates to OSTDS

- Presented by Rick Hicks

Performance and Management of Advanced Onsite Systems

Assess:

- Water quality protection
- Administration of program
- Effective monitoring practices

Tasks:

Keys study → Database → Survey → Sampling → Best management practices

Performance and Management of Advanced Onsite Systems

Progress:

- Granting period is complete
- Final invoice sent to DEP in 2011
- Final reports submitted for Monroe Diurnal and Seasonal Variability of Advanced Systems in 2011
- Final report submitted for Database of Advanced Systems in 2011
- Final report submitted for Survey of User Groups in 2011

Performance and Management of Advanced Onsite Systems

Discussion on **draft** final project report with understanding that more data analysis has yet to be completed and written up

All data entry and quality control review completed on 10/30/2012: 1,014 system files reviewed and had a quality control review

Draft final report mailed to RRAC on 11/8/2012

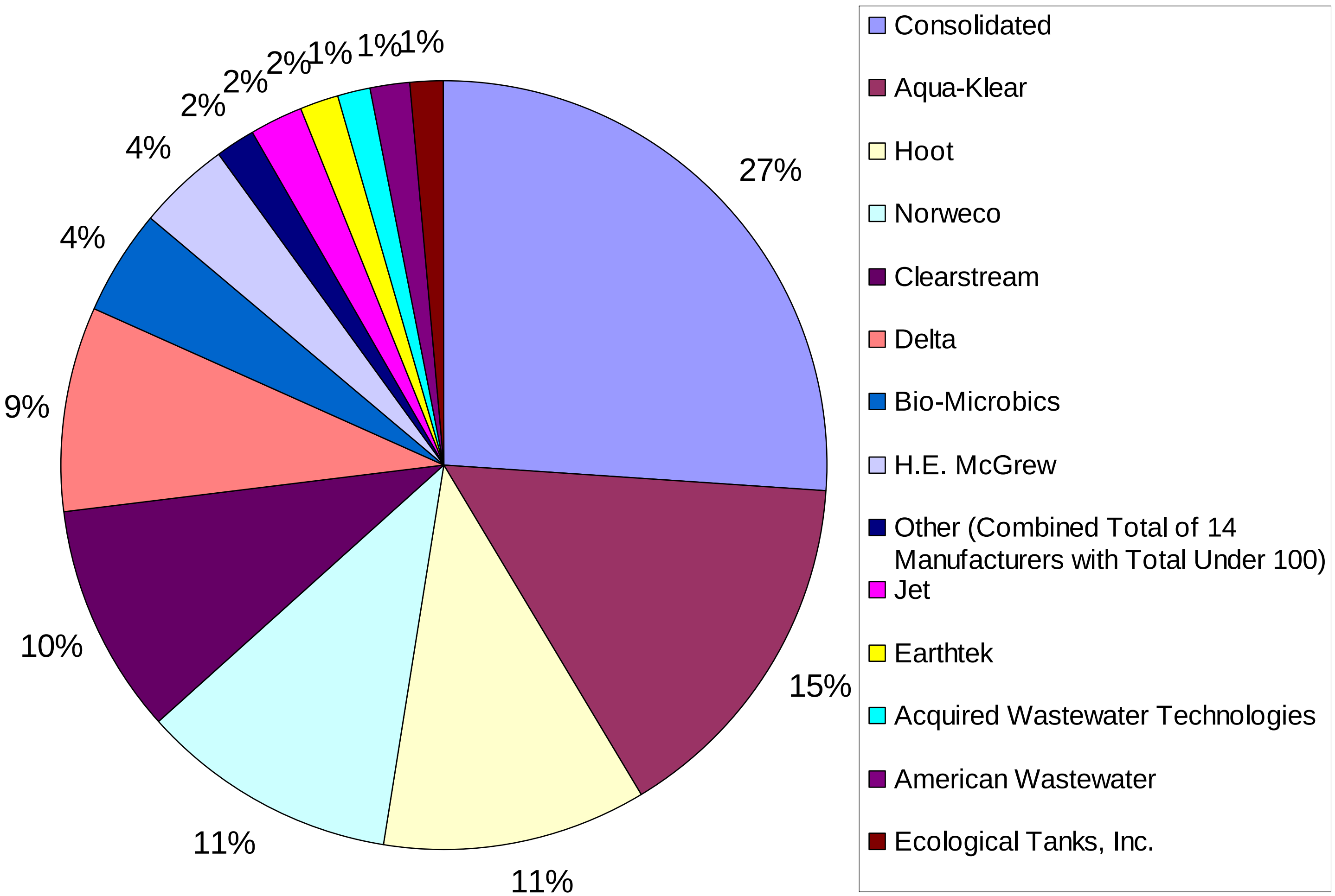
Performance and Management of Advanced Onsite Systems

Introduction

- Problem definition / background
- Glossary of Terms
- Statewide statistics on advanced systems
    - ~16,600 advanced systems in Florida
    - 60% can be found in either Monroe, Charlotte, Brevard, Franklin, or Lee counties
    - Most are residential ATUs
    - Over half of the systems with a recorded installation date were installed between 2005 and 2008

Database of Advanced Systems

Treatment Technology Manufacturers



- 90% are extended aeration

Performance and Management of Advanced Onsite Systems

Methods

- Sampling (as outlined in Quality Assurance Project Plan)
  - Sampling Process Design
    - Keys study to validate sampling protocol
    - Site selection – mostly random with some thought into obtaining representative information on technology
    - Detailed permit file review
    - Selection of samplers and labs
    - Sampling process, analytical methods, and quality control

Performance and Management of Advanced Onsite Systems

Methods

- Evaluation of Management Practices
  - County Program Evaluations
    - Historical
    - Reviewed files
  - User group surveys

Performance and Management of Advanced Onsite Systems

Analysis

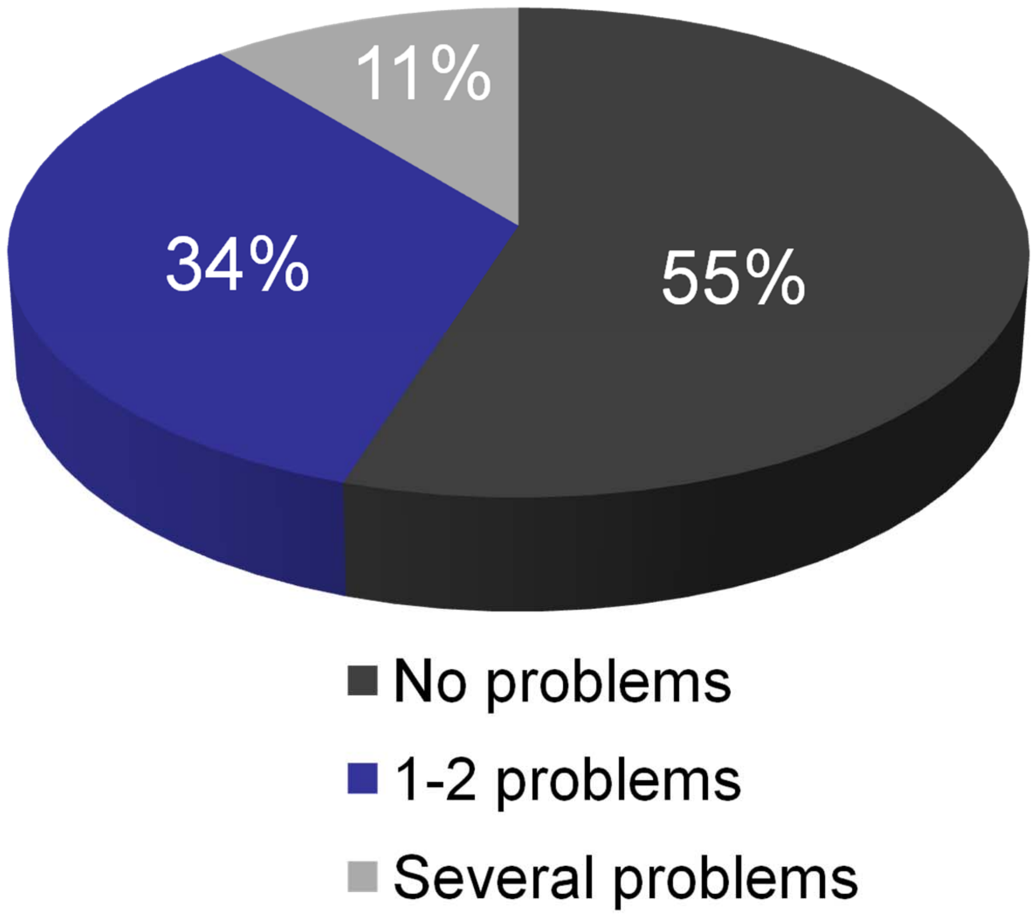
- Permit files summary statistics and quality assurance results
- User group survey results (summarized from FSU task report for each user group and includes analysis of questions among user groups)

Survey of User Groups
General Statistics

- ~3,800 surveys sent to system users throughout Florida, 660 completed surveys were returned
- Most surveys completed by full-time residents that own the home with the system
- Most systems served less than 4 people

Survey of System Users

Analysis of Problems

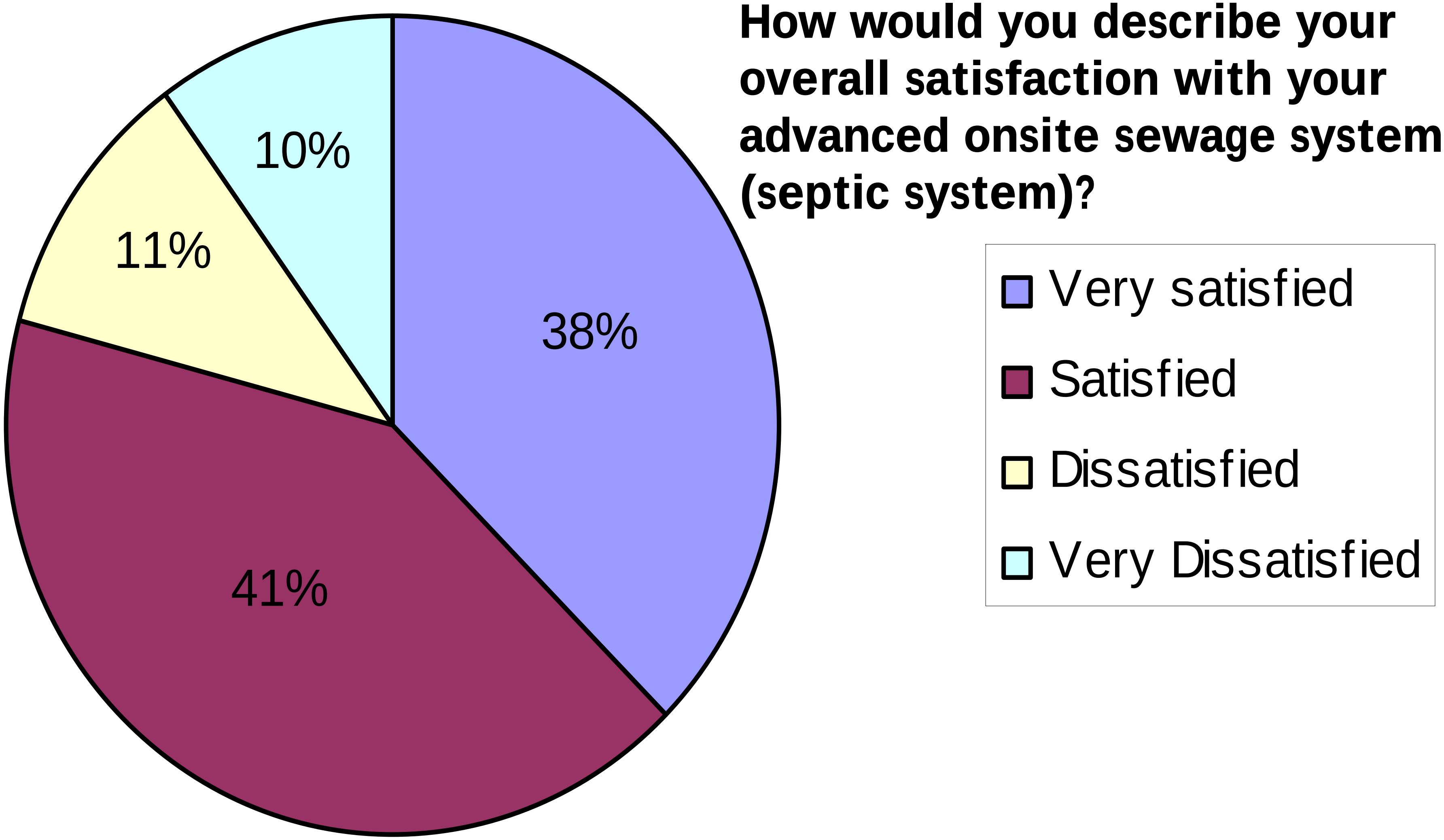


Major sources of problems were due to system malfunctions:

- **Pump failures**
- **Electrical malfunctions**
- **Faulty alarms**
- **Bad motors**

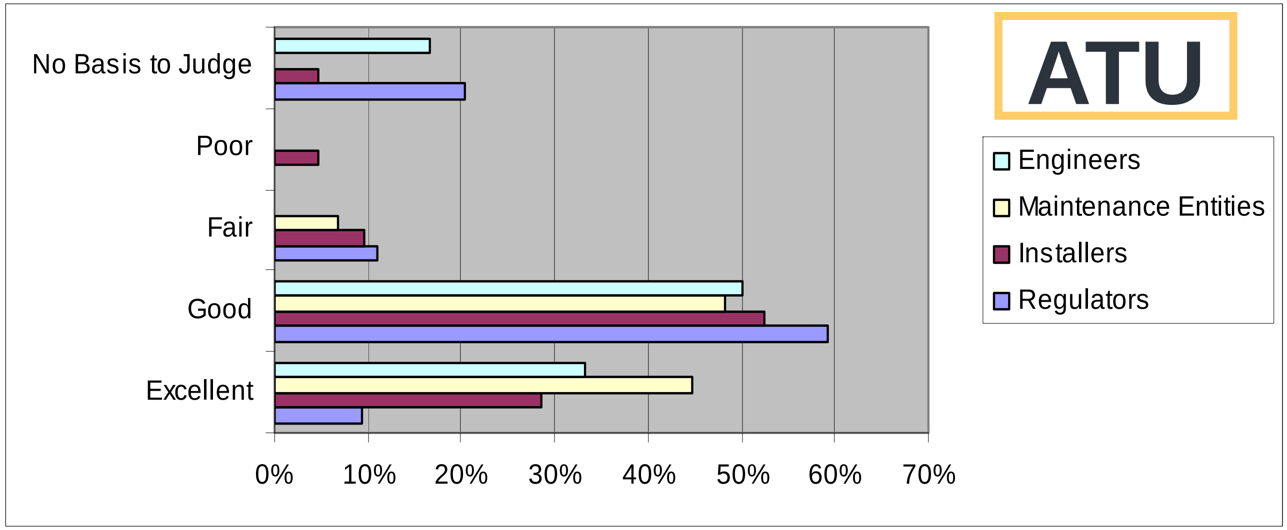
Survey of System Users

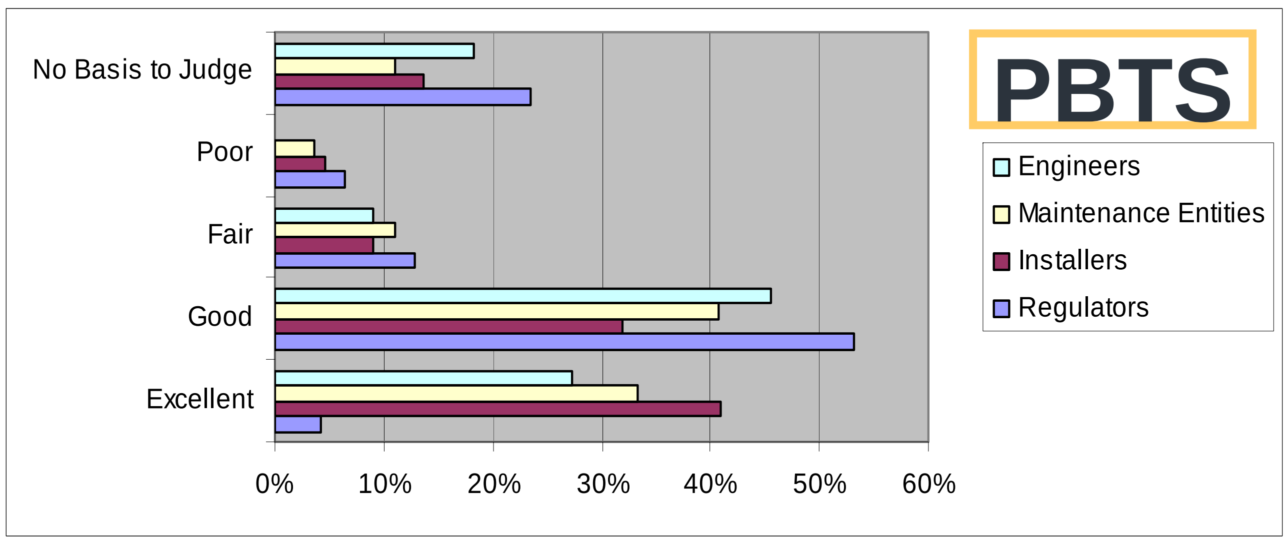
How would you describe your overall satisfaction with your advanced onsite sewage system (septic system)?



Survey of Engineers, Maintenance Entities, Installers, and Regulators

How would you rate the OVERALL TREATMENT PERFORMANCE of the advanced systems you are involved with?



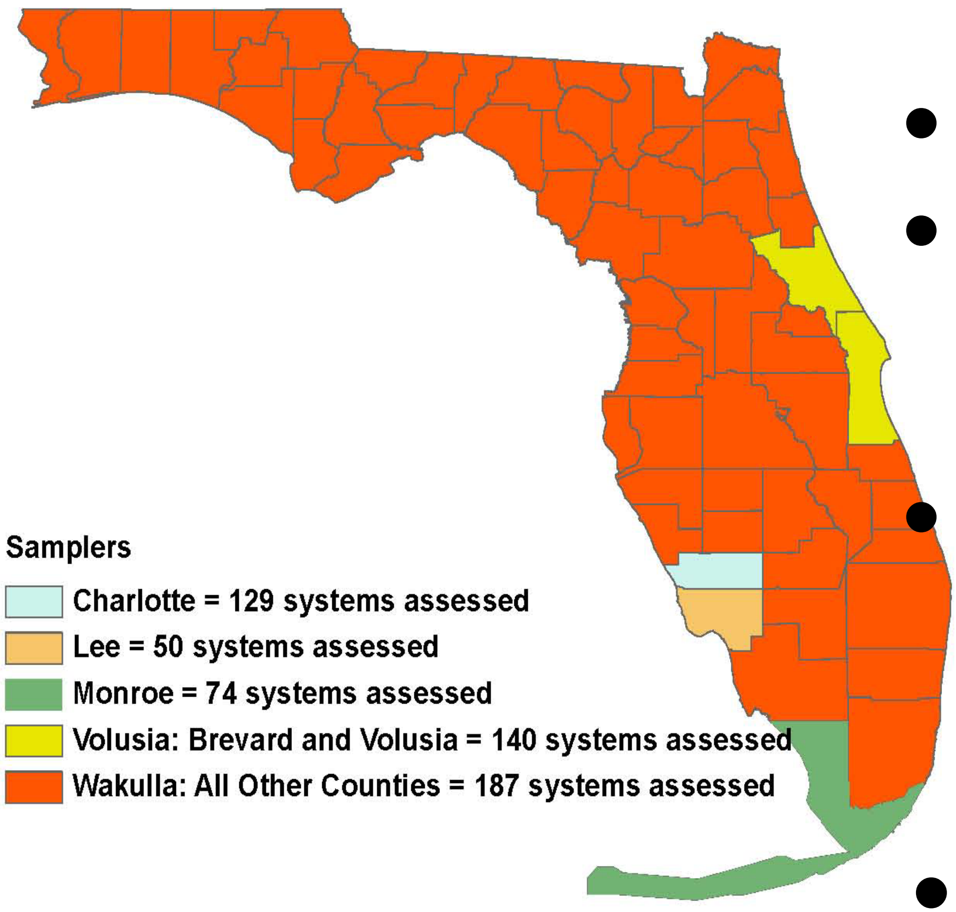


Performance and Management of Advanced Onsite Systems

Analysis

- Preliminary assessment of treatment systems (summarized results of the Keys sampling)
  - Compared grab samples to time-composite samples and found that there was no big difference
  - Found that a detailed field evaluation of existing site conditions is important to go along with sample results to provide context

Statewide Sampling of Systems



- ~550 TOTAL systems visited
- ~350 systems sampled
- ~650 total points sampled (i.e. trash tank, clarifier, pump tank, sample port)
- Sampled for: cBOD5, TSS, TKN, NOx, TN, TP, and sometimes fecal coliform
- ~5% of the visited sites were vacant

Statewide Sampling of Systems

Selected 901 systems randomly and 113 systems based on technology (total 1014)

Statewide Sampling of Systems

Field Assessment Form – General Information

System ID # ____

Initial System Evaluation (Step 3 in System Review) Date:_______ Sampler:_________________

A. System Information

System Ref. #: __________ Construction Permit # _________________ Operating Permit # _________________

Site Address:____

City/State/Zip:____

County:____

Dates of two previous maintenance entity visits:____________________ Date of previous CHD inspection:______

Operating Permit current: **Yes** ___ **No** ___ Maintenance Contract current: Yes ___ No____

Parties present at this visit: Maintenance Entity_________________CHD:_________Owner/User:____________

Site Visit was announced by______________ to ____________________ ____ days in advance.

Comments:____

____

B. Access to General Site Location

1. Access to site: ☐ Permission given ☐ Open ☐ Obstructed (locked gate/fence) ☐ Denied ☐ Other

C. Base for Initial System Evaluation (Check all that apply)

☐ Observation from afar ☐ Observation of above-ground parts and control panels

☐ Probing of system location ☐ Permit records

How many systems are at this address? ☐ none found ☐ one ☐ more than one

If not one, comment: ____

D. System Sketch (attach to form), see system components

☐ from final construction inspection ☐ from site plan ☐ created during site visit

☐ from engineer's as-built ☐ other file material

Statewide Sampling of Systems

Field Assessment Form – System Evaluation

E. System Evaluation (elaborating on HSES 10-006)

1. Observe and record the general appearance/functioning of the treatment system.

a. Are there any signs of surfacing or breakouts near the treatment system? Yes ___ No____

b. Are tanks, lids, or access covers broken or missing? Yes ___ No____ NA____

c. Are there any signs of settling or erosion near the system components? Yes ___ No____

d. Does it appear as though the system is subject to vehicular traffic? Yes ___ No____

e. Is there any encroachment onto the system? If yes, what is within 5ft of system? Yes ___ No____
☐ Building ☐ Driveways ☐Utility easements ☐ Patios ☐ Decks ☐ Gardening ☐ Pets ☐Other________

f. Evaluate presence of odor within 10ft of perimeter of system:
Intensity: ☐ None perceivable ☐ barely perceivable ☐ faint but identifiable ☐ clearly perceivable ☐ strong
Quality: ☐ Septic ☐ Earthy/Musty/Moldy ☐ Chemical ☐ Sour/Rancid/Putrid ☐ Other_____ ☐ N/A
Source of odor, if present: ____

g. Evaluate presence of sound (except alarm) within 10ft of perimeter of system:
Intensity: ☐ None perceivable ☐ Quiet ☐ Clearly Perceivable ☐ Loud
Source: ☐ Compressor/Aspirator/Blower ☐ Pump ☐ Other ☐ N/A
Comments: ____

e. Does the system appear water-tight? Yes____No_____Unable to determine______
If no, where does water seem to ☐ enter or ☐ leave system ?
☐ access cover ☐ lid ☐ inlet/outlet ☐ ports ☐ tank ☐ riser attachment to tank ☐ other_____

f. Are any alarms on? Yes____No_____
If yes, ☐ Air pressure ☐ High water ☐ Remote ☐ Unknown ☐ Other_____________

g. Is there a means to assess sewage flow? (water meter, event counter, flow meter) Yes____No_____
If yes **and** influent is available for sampling, document meter reading __________________

h. Comments: ____

2. Observe if system has been altered or the site has changed since approval.

a. Any landscape construction, utility work, or changes in drainage patterns? Yes ___ No____ ND____

b. Has system been obstructed? Yes ___ No____

c. Any apparent recent additions to the building(s) connected to system? Yes ___ No____ ND____

d. Are any components missing or modified? Yes ___ No____ ND____

Statewide Sampling of Systems

Field Assessment Form – System Evaluation

e. Components that are on this site, and their order: ☐ **not determined:** ______________________

Component	Order	Component	Order
☐ pretreatment/ trash (☐ part of ATU ☐ separate)		☐ grease interceptor	
☐ treatment unit (☐ aeration ☐ media filter)		☐ clarifier (☐ part of ATU ☐ separate)	
☐ pump tank/compartment (s)		☐ filter tank (media ____________________)	
☐ recirculation from____ to ____		☐ disinfection (☐ chlorine ☐ other________)	
☐ drainfield (☐mound/fill / ☐ below grade)		☐ other (Sampling Port;________________)	

f. Comments: ____

3. Observe that there is power to the system.
   - a. Is control panel for treatment system visible? Yes ___ No____ N/A____
   - b. Is control panel for treatment system accessible? Yes ___ No____ N/A____
   - c. Does power indicator, if present, indicate that power is on? Yes ___ No____ N/A____
   - d. Does operation of system (aerator) indicate that power is on? Yes ___ No____ N/A____
   - e. Does it appear that the power is switched off? Yes____No____ N/A____
   - f. Comments: ____

4. Observe that there is an alarm and, if possible, test it.
   - a. Is an alarm present for the treatment unit? Yes ___ No____ N/A____
   - b. If yes, which of the following are operational? Audio ___ Visual_____ Unable to test_____
   - c. Is an alarm present for the dosing tank, if tank is present? Yes ___ No____ N/A____
   - d. If yes, which of the following are operational? Audio ___ Visual_____ Unable to test_____

5. Observe the drainfield area and record conditions.
   - a. Are there any trees in the drainfield? Yes ___ No____ N/A____
   - b. Relative to surrounding areas, how does the vegetation on the drainfield look?
     ☐ Same ☐ More vegetation. ☐ Uneven vegetation ☐ Less vegetation
     Location(s): ____
   - c. Is there evidence that there is ponding in the drainfield? Yes ___ No____ N/A____
     ☐ Standing water on the drainfield surface ☐ Saturated soil only above ☐all ☐some drainfield area
     ☐ Observation port shows ____ inches of standing water ☐ Other __________________
   - d. Comments: ____

Statewide Sampling of Systems

Field Assessment Form – System Operation

System Operation Evaluation (Step 4 in System Review)

Date:________Sampler:___________

Time:_______ Cloud Cover (%):________ Rainfall:_____________current ____________ prev. 7 days (inches)

A. System Information

System Ref. #: __________Construction Permit # _________________Operating Permit # _________________

Date of Last Pumpout:_____________________________________

Tank/Compartment # accessed (Section E.2.e from initial system eval.)						
Function						
Material						
Tank Structural Condition						
Liquid level relative to outlet (in) (NA for pump tank)		☐Above ☐Below	☐Above ☐Below	☐Above ☐Below	☐Above ☐Below	☐Above ☐Below
Liquid level relative to inlet (in) (NA for pump tank)		☐Above ☐Below	☐Above ☐Below	☐Above ☐Below	☐Above ☐Below	☐Above ☐Below
Evidence liquid level has been higher						
Evidence liquid level dropped (no pump)						
Evidence of non-sewage inflow						
Appears to be watertight (no visual leaks)						
Oily film/sheen present						
Odor (Intensity/Quality)						
Sample taken?		☐Yes ☐No	☐Yes ☐No	☐Yes ☐No	☐Yes ☐No	☐Yes ☐No
Scum	Depth (in)					
	Color					
	Clarity/Structure					
Clear Zone	Depth (in)					
	Color					
	Clarity/Structure					
Sludge	Depth (in)					
	Color					
	Clarity/Structure					
Comments						

Statewide Sampling of Systems

Field Assessment Form – System Operation

<u>Aeration Chamber</u> ☐ N.A. ☐ Yes ☐ No

1. Aeration chamber:
   Access? ☐ Yes ☐ No
   Mixing in aeration chamber: ☐ Yes ☐ No Comment: ______________________________
   Settled Sludge Volume test: Sample obtained ☐ Yes ☐ No
   Settled __________ mL/L, Floating ______ mL/L in _______ min
   Settled __________ mL/L, Floating ______ mL/L in <u>30</u> min
   Biomass color: ☐ Black ☐ Brown ☐ Mustard ☐ Gray ☐ White ☐ Other ________
   Biomass structure: ☐ fluffy ☐ flocced ☐ grainy
   Supernatant: ☐ cloudy ☐ clear
2. Additional tasks for attached-growth media evaluation:
   a. Plugging ☐ Yes ☐ No
   b. Floating ☐ Yes ☐ No
   d. Media replaced ☐ Yes ☐ No ☐ Unknown

<u>Media Filters</u> ☐ N.A. ☐ Yes ☐ No

1. Distribution of sewage across media:
   Device: ______________________________
   Uniform distribution ☐ N.D. ☐ Yes ☐ No
   Operating properly ☐ N.D. ☐ Yes ☐ No
   Ponding ☐ N.D. ☐ Yes ☐ No
   Comments: ______________________________
2. Filter drainage systems
   Ponding in media filter sump ☐ N.D. ☐ Yes ☐ No
   Gravity drainage operational ☐ N.D. ☐ Yes ☐ No
   Solids buildup in sump area ☐ N.D. ☐ Yes ☐ No
   Underdrain vents present ☐ N.D. ☐ Yes ☐ No
   Underdrain vents operable ☐ N.D. ☐ Yes ☐ No

<u>Chlorination System</u> ☐ N.A. ☐ Yes ☐ No

1. Chlorination
Manufacturer: ______________________________
Chlorinator: ________ Dechlorinator: ________
Model #: ______________________________
Method: ☐ Tablet ☐ Liquid
Unit appears in good condition. ☐ Yes ☐ No
Location in/after tank # ___________

2. Tablet chlorination (if applicable):
   Chlorinator appears operable ☐ N.D. ☐ Yes ☐ No
   Chlorine tablets in place ☐ N.D. ☐ Yes ☐ No
   Tablets in contact with effluent ☐ N.D. ☐ Yes ☐ No
   Contact chamber operable ☐ N.D. ☐ Yes ☐ No
3. Chlorine residual: ☐ Free _______ ppm
   ☐ Total_______ ppm

Effluent screen/tertiary filter location: evidence of clogging ☐ N.A. ☐ Yes ☐ No

Statewide Sampling of Systems

Field Assessment Form – Field Parameters

SYSTEM NUMBER / TANK NUMBER	STATION DESCRIPTION	PARAMETER	DATE	TIME	WATER TEMP	DO	%SAT DO	Trend	ORP	COND	SALINITY	PH
		UNIT	yy/mm/dd	hr:min	Celsius	mg/L	%		mV	µS/cm	ppt	su

Statewide Sampling of Systems

Field Analysis Form – Field Parameters

Advanced Systems Assessment Field Analysis Form

Sampler:

Sample Identification									Olfactory/Visual				HACH Colorimeter DR/890						Taylor Kits	
SYSTEM I.D.	Sample Number	Sample Type	Sampling Location	Sampling Method	original/dup	Date mm/dd/yy	Time hh:mm	Lab Sample Taken (y/n)	Odor Intensity	Odor Quality	Color	Clarity	Turbidity	Apparent Color	NO3-N	NH4-N	PO4	PO4-P (=PO4 * .3261)	Total Alkalinity	pH
									code	code	code	code	FAU	units Pt-Co	mg/L	mg/L	mg/L	mg/L	mg/L CaCO3	su
	1																			
	2																			
	3																			
	4																			

Data quality of chemical analyses

- More than 95% of analysis results met lab standards
  - Exception: cBOD5 (63%)
- Blank (field and equipment): mostly below detection, some low concentrations, sporadically (<10%) higher concentrations
- Duplicates: at least 70% meet 20% relative percent difference (RPD), no systematic bias

Data quality of fecal coliform

- Many qualifiers and variable reporting limits
- Field equipment blanks indicate frequent (~50%) detects, but usually limited to less than 200 cfu/100 mL
- Duplicates agree within 20% (log) in 67% of the cases, variability is smaller for higher values (>1500 cfu/100 mL)

Other assessments

- No detectable differences in quality between sampler groups

- Limited assessment: differences between labs

Importance of sampling location

- Most samples from clarifiers, pump chambers, and sampling ports between treatment units and drainfield
- Some from aeration chamber (FAST), bore hole (dilution), monitoring point in drainfield (additional treatment)
- Significant differences between aeration chambers (few FAST samples), clarifier, and pump chambers for TSS, but not for nutrients, cBOD5, fecal coliform and total alkalinity
- Significant differences for cBOD5, TSS, TKN and fecal coliform between sampling ports and aeration chambers (few FAST samples), clarifier and pump chambers, but not for TN, TP, and total alkalinity

Screening assessments

- Some association between odor, color and clarity
- Some association between visual color and clarity and field test results for apparent color and turbidity
- Correlations between apparent color and cBOD5 and TSS, and between measured turbidity and cBOD5 and TSS; less for TKN, no correlation for TN and TP

Nutrient field tests

- Good correlations between NO3 (field) and NOx (lab) and NH3 (field) and TKN (lab), less for PO4 (field) and TP (lab)
- Influence of measurement limits
- Need further procedural work to screen raw data into quantitatively useful data

Task 5 Repeat Sampling

- 25 sites
- Fecal, TP, and TN appear somewhat less variable than TSS and cBOD5
- Generally (half –three-quarters) within a factor of two
- Influent and effluent variability about the same

Effluent	cBOD5	TSS	TKN	Nox	TN	TP	log fecal
count	26	26	27	27	27	26	8
average	36.1	37.0	16.8	20.2	37.0	7.8	4.0
stdev	62.9	52.3	23.7	19.5	23.3	2.3	1.1
25-percentile	3.0	6.9	2.5	4.9	20.7	6.6	3.4
median	8.6	16.5	5.2	17.2	34.6	7.8	3.8
75-percentile	24.9	47.6	24.7	27.5	52.3	8.6	5.1
Influent	**cBOD5**	**TSS**	**TKN**	**Nox**	**TN**	**TP**	**log fecal**
count	22	22	22	22	22	21	3
average	145.9	86.1	50.2	2.7	52.9	8.2	6.2
stdev	116.4	131.3	31.7	7.3	30.4	3.2	0.2
25-percentile	49.1	23.2	22.4	0.0	24.8	5.8	6.2
median	117.5	59.5	40.9	0.2	49.8	8.3	6.3
75-percentile	242.3	83.3	76.2	1.5	76.6	9.6	6.3
Removal (average)	75%	57%	67%		30%	5%	2.2 units
Removal (median)	93%	72%	87%		31%	6%	2.5 units

Average concentrations of sampling pairs during subsequent visits at a site

Operational Assessment

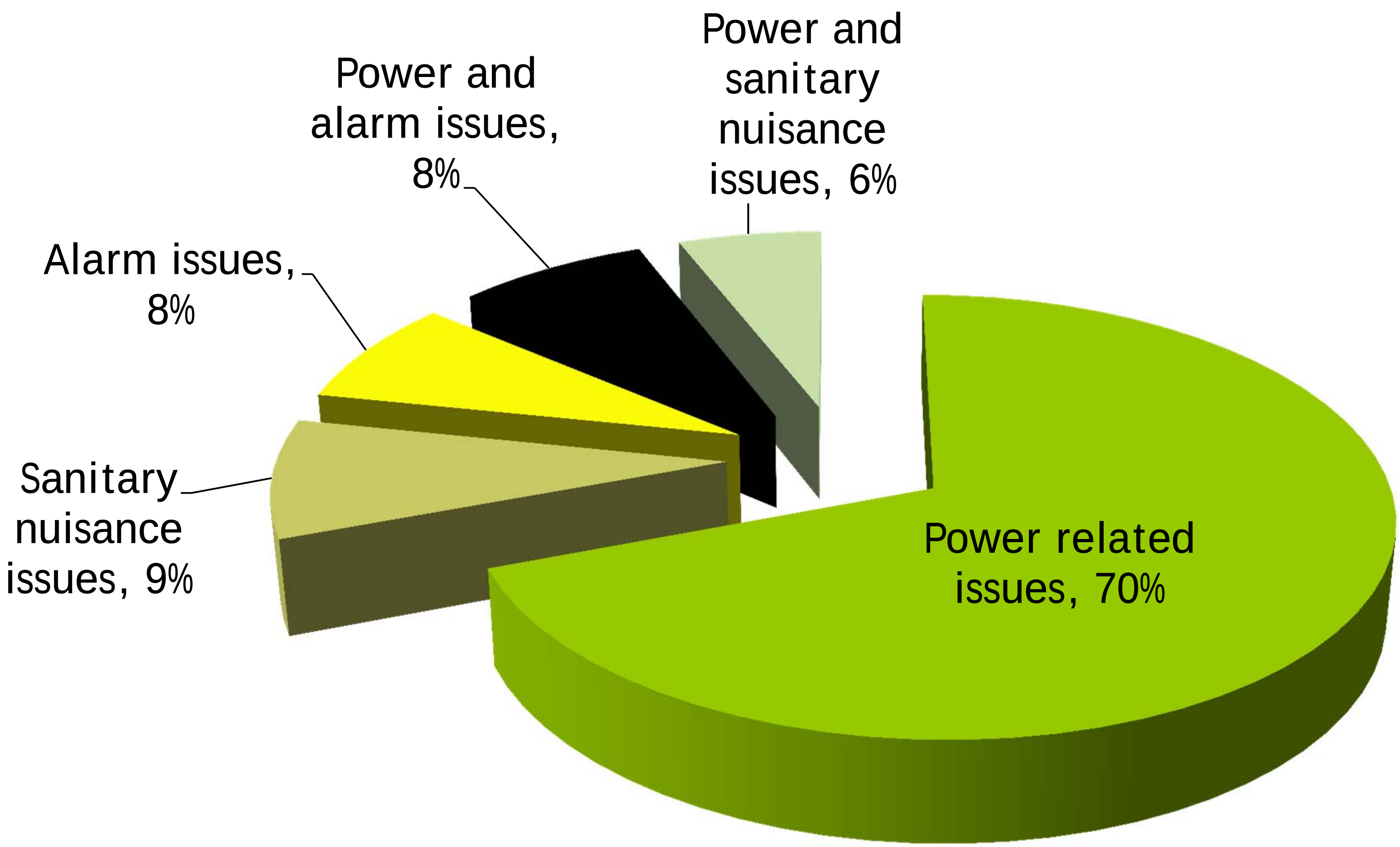
The following results analyze the RANDOM samples only

Evaluate from field assessment whether:

- **Power is on**
- **No sanitary nuisance**
- **Aeration occurring**
- **Alarms are off**

30% of visited sites were not operating properly

Operational Assessment



Sampling Results

Median	$cBOD_5$ (mg/L)	TSS (mg/L)	TN (mg/L)	TP (mg/L)
Influent	76.4	68.0	45.9	8.3
Effluent	5.4	19.0	30.3	7.5
% Difference	92.9%	72.1%	34.0%	9.6%
Performance Standard For Adv. Secondary Grab Sample	20	20	40	20

Comparison of Sample Results Between Operational and Non-Operational Systems

Parameter	Influent	Operational		Non-Operational	
		Result	% Removal	Result	% Removal
$cBOD_5$ (mg/L)	76.4	5.4	93%	15.8	79%
TSS (mg/L)	68.0	18.0	74%	24.5	64%
TN (mg/L)	45.9	27.8	39%	37.6	18%
TP(mg/L)	8.3	7.35	11%	7.7	7%

Parameter	Influent	Power On		Power Off	
		Result	% Removal	Result	% Removal
$cBOD_5$ (mg/L)	76.4	5.4	93%	29.5	61%
TSS (mg/L)	68.0	19.0	72%	23.5	65%
TN (mg/L)	45.9	28.3	38%	47.8	-4%
TP(mg/L)	8.3	7.4	11%	8.5	-3%

Summary

- Advanced OSTDS require more maintenance and management than conventional systems
- 1/3 of systems visited required follow-up by maintenance entity
- Influent strength varied with lower concentrations than other recent studies
- Properly operating treatment units typically met secondary treatment standards for $cBOD_5$ and TSS, and achieved some limited TN reduction
- Systems with the power off had significantly higher $CBOD_5$ and TN effluent concentrations

Relationship Between Sample Results / Operational Assessment / System Use Surveys / User Surveys

- Staff mentored two FAMU MPH students during the summer. One analyzed the system use surveys returned by homeowners visited as part of the advanced system project. The other analyzed survey results from users of advanced onsite sewage treatment and disposal systems, along with their corresponding wastewater sample results and system operational status, and determined if there were any trends. The results were written in a report and did indicate that there was an association between the systems operational status and the sample results as well as the users perceptions of any issues with their system.

Performance and Management of Advanced Onsite Systems

Analysis continued

- Assessment of Management Practices relating to:
  - Program evaluations
  - System record completeness
  - Sample results and operational assessment
  - User group surveys
  - Case studies

Performance and Management of Advanced Onsite Systems

Conclusions and Recommendations

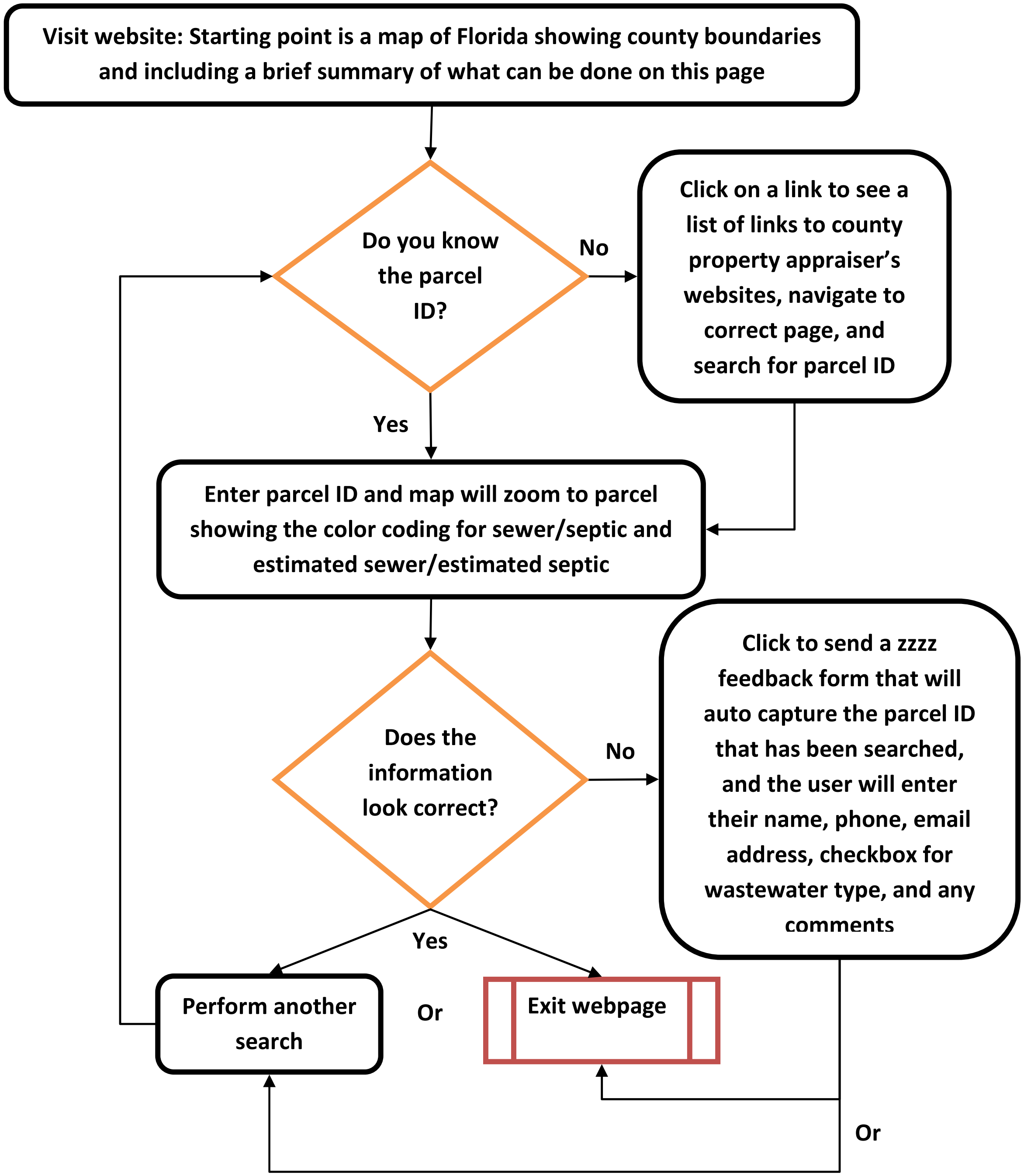
- Not complete at this time as more data analysis will occur
- Booklet of best management practices will be developed as another project deliverable

Update on Other Projects

Continuation of Inventory of OSTDS in Florida

- Update 2009 inventory and develop method to automate this process
- Prioritized in 2011: #1 Ranked project
- First step is to figure out how to update the data (i.e. provide an interface)
- Staff collaborated internally to begin developing both public and DOH websites that will allow for accessing and editing inventory data

Public View


Visit website: Starting point is a map of Florida showing county boundaries and including a brief summary of what can be done on this page
Do you know the parcel ID?
No
Click on a link to see a list of links to county property appraiser's websites, navigate to correct page, and search for parcel ID
Yes
Enter parcel ID and map will zoom to parcel showing the color coding for sewer/septic and estimated sewer/estimated septic
Does the information look correct?
No
Click to send a zzzz feedback form that will auto capture the parcel ID that has been searched, and the user will enter their name, phone, email address, checkbox for wastewater type, and any comments
Yes
Perform another search
Or
Exit webpage
Or

Demonstration of Wastewater Inventory Public View

- Allows user to find the parcel of interest, see what the wastewater method is, and provides an option for them to “update” the information by sending DOH an email
- DOH view to come next after resolving / updating server ArcGIS software

Correlations Between Water Quality, OSTDS, and Health Effects

- Perform an analysis using GIS of any correlations between water quality in drinking water wells, OSTDs, and health effects
- Prioritized in 2011: #5 Ranked project
- Volunteer intern Nicole Pritchard, working on her MPH at Nova Southeastern University, started on 8/8/12
- Collaboration with DOH epidemiology staff

The Relationship Between Wastewater Disposal and the Incidence of Salmonella and Campylobacter in the State of Florida

Nicole Pritchard, BS
Florida Department of Health
Bureau of Environmental Health
OSTDS section

Abstract

- Aim: to discover the risks associated with living in an area with sewer vs. living in an area with septic systems and becoming ill with *Salmonella* or *Campylobacter*
- Disease data and Parcel level data for centralized sewer septic systems was used in GIS
- Addresses and geocoded coordinates were plotted by ArcMap
- Cross-tabulation tables were made in SPSS based on information from ArcMap
- Two by two tables and risk ratios were then calculated

Septic Systems, Centralized Sewer, and Pathogens

- Two types of distribution systems to remove pathogens from wastewater
  - Septic systems
  - Centralized sewer
- Improperly treated wastewater can result in the release of pathogens into groundwater

Hypothesis

- Determine if parcels with septic systems in the state of Florida have an increased risk of acquiring illness from *Salmonellosis* or *Campylobacteriosis*

Methods

- Eleven different counties were examined based on accuracy of inventory data (Dade, Duval, Leon, Monroe, Hernando, Hillsborough, Santa Rosa, Sarasota, Palm Beach, Pinellas and Orange)
- Disease information came from a state-wide disease reporting database
- ArcMap was used to map and identify diseases and parcels. Parcels were grouped by wastewater type.
- ArcToolbox was used to spatially join diseases with specific wastewater parcels; producing new attribute tables.

Methods Continued

- Attribute tables were imported into SPSS producing cross tabulation tables of diseases, wastewater parcels, and location names.
- Two by two tables were made based on exposure and non-exposure

Relative risk was then calculated:

RR= A/(A+B) / C/(C+D)=

Incidence rate of exposed/Incidence rate of non-exposed

	Disease (+)	Disease (-)	Total
Exposure (+)	A	B	A+B
Exposure (-)	C	D	C +D
	A+C	B+D	N

- **Exposed= Septic Households**
- **Unexposed= Sewer Households**
- **Comparison based on two methods:**
  1. **Known septic/sewer parcel per disease**
  2. **Known + estimated septic/sewer parcel per disease**

Data Summary

- Disease data included 10,008 reported cases, of which 8,482 were used, based on exposure status.
- Inventory data included 786,436 known and estimated septic parcels and 1.9 million known and estimated sewer parcels.

Results: Data Analysis

- Four data tables were produced for each of the eleven counties comparing sickness with exposure to a septic system.
- Each of these four tables produced associated risk ratios for known and known + estimated systems and for *Campylobacter* and *Salmonella* sickness.
- As seen on the chart the greatest overall risk is associated with Salmonella and being served on a known septic system.

	K=C	K+E=C	K= S	K+E=S	Total # of C cases	Total # of S cases
Leon	RR=0.72	RR=1.18	RR=1.17	RR=1.28	39	368
Duval	RR=1.54	RR=1.68	RR=0.79	RR=0.98	78	1327
Dade	RR=0.81	RR=0.875	RR=1.05	RR=0.87	614	1515
Hernando	<20 cases	<20 cases	<20 cases	<20 cases	4	17
Hillsborough	RR=1.50	RR=2.85	RR=1.10	RR=1.52	212	818
Monroe	<20 cases	<20 cases	RR= n/a	RR=0.33	6	36
Santa Rosa	RR=0	RR=7.27	RR=0.52	RR=0.85	19	143
Sarasota	RR=1.43	RR=1.17	RR=1.53	RR=3.76	52	223
Palm Beach	RR=2.23	RR=1.02	RR=2.38	RR=1.59	159	966
Pinellas	RR=1.49	RR=1.75	RR=1.42	RR=1.29	124	765
Orange	RR=0.77	RR=0.751	RR=0.92	RR=0.94	134	863
Combined	RR=1.19	RR=1.15	RR=1.28	RR=1.08	1441	7041

C=Campylobacter and S=Salmonella * K= known and E= estimated parcels* *n/a denotes denominator was equal to 0*

Results: Data Analysis for Hillsborough County

Known + estimated septic/sewer systems

Exposure/Sickness	Campylobacter (+)	Campylobacter (-)	Total
Septic	76 (A)	61776 (B)	68152
Sewer	136 (C)	346908 (D)	347044
	212	408684	415196

Risk ratio: 76/68152 / 136/347044 = 0.0011/0.00039 = 2.85

Known + estimated septic/sewer systems

Exposure/Sickness	Salmonella (+)	Salmonella (-)	Total
Septic	188 (A)	67964 (B)	68152
Sewer	630 (C)	346414 (D)	347044
	818	414378	415196

Risk ratio: 188/68152 / 630/347044 = 0.0027/0.0018= 1.52

- Table one interpretation: The risk associated with becoming ill with Campylobacter is 2.85 times greater for those individuals being served on a known + estimated septic system

- Table two interpretation: The risk associated with becoming ill with Salmonella is 1.52 times greater for those individuals being served on a known + estimated septic system

Limitations

- Limitations involving GIS include:

  1. Spatial analysis results- the wrong diseases assigned to the wrong parcel

  2. Geocoding Results- Providing inaccurate definitions of rooftop

- Limitations involving data include:

  1. Under reporting of diseases
  2. Parcels based on estimations
  3. Accuracy of addressed provided
  4. Unknown age of system
  5. Lack of known failure reports

Conclusions

- Despite limitations in the methodology and data, the results suggest that there is an increased risk in specific counties for cases of Salmonella and Campylobacter in individuals served on a septic system.
- The combined risk ratios were calculated for all eleven counties; indicating that the greatest risk is associated with acquiring Salmonella while strictly being served on a known septic system.

Acknowledgements

- Special thanks to my two mentors: Elke Ursin and Eberhard Roeder and to the Bureau of Environmental Health

Work Products

- Nicole Pritchard is presenting a poster for the 2012 Seven Hills Regional User Group (SHRUG) for GIS Workshop. The poster summarizes the information presented.
- A project report is currently being drafted.

Other Research Program Activities, Continued

- Presentations on the research program were given at the FOWA 2012 Convention and Trade Show Educational Program, the Gulf Coast District of the Florida Environmental Health Association at their annual OSTDS continuing education course, and an online training for certified environmental health professionals.
- Research program website update is nearing completion. This update will provide a much easier to navigate user interface.

Other Research Program Activities, Continued

- Staff participated in a conference call with a Water Environment Research Foundation (WERF) project team for a project titled "Applicability Analysis of Existing Models for Site-Specific Water Quality Criteria to Protect Designated Uses from Nutrient Impacts". The discussion focused on the development of a nutrient impact modeling toolbox that could be used by regulatory agencies to assist with setting site-specific nutrient goals.
- Reviewed and provided comments for several DEP reports.

Other Business

Public Comment

Next Meeting

Upcoming meeting topics:

- Discussion on next Nitrogen Study Legislative Status Report (due February 1, 2013)
- Discussion on process forward with research priorities
- Discussion on final Advanced Systems Report and any potential for follow-up

Proposed dates for next meeting:

- Will send email to RRAC at a future date to determine next meeting

Closing Comments and Adjournment