



**INTERIM STUDY AND REPORT ON PHASE II OF THE  
FLORIDA ONSITE SEWAGE NITROGEN REDUCTION  
STRATEGIES STUDY**

Bureau of Onsite Sewage Programs

**February 1, 2011**

Rick Scott  
Governor

**Table of Contents**

EXECUTIVE SUMMARY..... 3  
1 INTRODUCTION..... 4  
2 PROJECT STATUS ..... 6  
3 ANTICIPATED PROGRESS IN 2011-2012 ..... 7  
4 FUNDING NEEDS ..... 9  
5 RECOMMENDATIONS..... 9  
APPENDIX A. 2010 Legislative Language ..... 11

**List of Figures**

Figure 1. Sign posted at the University of Florida’s Gulf Coast Research & Education Center’s test facility. .... 5  
Figure 2. Test facility constructed at the University of Florida’s Gulf Coast Research & Education Center. .... 6

**List of Tables**

Table 1. Summary of Funding Phase Tasks and Associated Number of Deliverables... 8

# INTERIM STUDY AND REPORT ON PHASE II OF THE FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY

## EXECUTIVE SUMMARY

The Florida Legislature has appropriated a total of \$2.9 million for Phases I and II of an anticipated 3-5 year project with a total estimated cost of \$5.1 million to develop passive strategies for nitrogen reduction for onsite sewage treatment and disposal systems (OSTDS). This report is submitted in compliance with Line Item 486 Section 3, Conference Report on House Bill 5001, General Appropriations Act for Fiscal Year 2010-2011. Currently, this project is in its third year and requires an additional \$2.2 million to complete the study.

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. Without further funding for the final Phase 3 of the project, necessary and extensive field testing will not occur and, if field testing does not occur, the project will essentially not 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.

Regardless of the source, excessive nitrogen has negative effects on public health and the environment. 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 are affordable and ecologically protective with reduced engineering and installation costs that assist in sustainable development. This project has been endorsed by Florida TaxWatch as a good use of public funds.

The contractor, in coordination with DOH and the Department's Research Review and Advisory Committee (RRAC), has successfully completed portions of each major task. Work expected to be completed this fiscal year includes: initiating field sampling of passive systems; field sampling of the soil and groundwater under OSTDS at residential homes throughout Florida and at the test facility; and development of both simple and complex soil models.

Further testing is required to verify the results to date and to provide data for development of the specifications for full system designs. 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.

DOH and its Research Review and Advisory Committee recommend that the Legislature:

1. Provide additional funding and budget authority to DOH in the amount of \$2.2 million for the fiscal year 2011-2012 for continuation and completion of the tasks associated with this legislatively mandated study.
2. Provide DOH budget authority for any remaining funds from the 2010 appropriation to carry over to fiscal year 2011-2012.

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. If fully funded, the results of this project will assist economic growth and jobs creation while producing systems that protect groundwater with both reduced life-cycle costs and lower energy demands.

## 1 INTRODUCTION

The 2010 Legislature appropriated \$2.0 million for Phase II of an anticipated 3-5 year project with a total estimated cost of \$5.1 million to develop passive strategies for nitrogen reduction for onsite sewage treatment and disposal systems (OSTDS). This followed an initial appropriation of \$900,000 by the 2008 Legislature for the first phase of this study. Currently, this project is in its third year and requires an additional \$2.2 million to complete the study. This report is submitted in compliance with Line Item 486 Section 3, Conference Report on House Bill 5001, General Appropriations Act for Fiscal Year 2010-2011, which appropriated the funding for the study.

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 legislative direction (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 and 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.

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 contribution of OSTDS to total nitrogen impacts 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. 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). 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.

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.

**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.

**FLORIDA DEPARTMENT OF HEALTH**

**Florida Onsite Sewage Nitrogen Reduction Strategies Project**  
FDOH Contract CORCL

**Objective:**  
To develop nitrogen reduction strategies for onsite sewage treatment and disposal systems (OSTDS) in Florida

**Study Areas:**

- A* Development and pilot testing of passive nitrogen reduction systems (PNRS)
- B* Field testing of full-scale nitrogen reduction systems to determine performance and cost
- C* Assessment of the fate and transport of nitrogen from OSTDS in soil and groundwater
- D* Development of decision support tools for OSTDS planning and nitrogen reduction

**HAZEN AND SAWYER**  
Environmental Engineers & Scientists *in association with*

**UNIVERSITY OF COLORADO**  
1874

**AET**  
Applied Environmental Technology

**OTIS ENVIRONMENTAL CONSULTANTS**

**UNIVERSITY OF FLORIDA**  
Gulf Coast Research and Education Center

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. 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; and completion of several sampling events at the test facility.



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

Current efforts and work expected to be completed this fiscal year include: initiating field sampling of passive systems; installation of field sites at residential homes throughout Florida for the testing of passive systems and to test the soil and groundwater under OSTDS; design and construction of a soil and groundwater test facility; sampling at the soil and groundwater test facility; continued sampling of passive technologies at the test facility; and development of both simple and complex soil models. In particular, the following work by task will proceed with the current funding level:

1. The technology evaluation (Task A) will include a total of 7 sample events at the passive nitrogen test facility, measuring 14 different analytes at 23 sampling points, as well as a final report on the pilot passive nitrogen removal study at the Gulf Coast Research and Education Center (GCREC).
2. For field testing of technologies (Task B), the quality assurance project plan has been finalized. Approximately four onsite systems utilizing various nitrogen removal technologies will be installed at home locations throughout the State of Florida. It is

anticipated that four field system performance monitoring events will be conducted on these systems, measuring 16 different analytes at 8 different sampling points. A life cycle cost assessment template will also be completed.

3. To evaluate nitrogen reduction provided by soils and shallow groundwater (Task C), it is anticipated that a soil and groundwater test facility will be constructed to show how groundwater fate and transport of nitrogen occurs in multiple soil treatment unit regimes. Three sampling events will be completed, sampling six different locations at each site, measuring multiple parameters in the effluent, soil, groundwater, and soil moisture. Instrumentation of the existing OSTDS mound system at the University of Florida's Gulf Coast Research & Education Center (GCREC) in Wimauma, Florida will be done to study how nitrogen behaves in the soil and groundwater. Four sampling events, examining multiple parameters, will be completed at the existing OSTDS mound system at GCREC. At least one soil and groundwater monitoring event will occur at up to four home sites to evaluate nitrogen movement in the soil and groundwater in the field, measuring multiple parameters in the effluent, soil, and groundwater.
4. To address nitrogen fate and transport modeling for Task D, a final quality assurance project plan has been completed, and the first steps are the development of simple and complex soil models to show how nitrogen is affected by treatment in Florida-specific soils.

### **3 ANTICIPATED PROGRESS IN 2011-2012**

During the 2011-2012 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; development 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 by task will occur with the final phase of funding, which is being requested with this report:

1. For Task A, the final task report will be written, which will include a summary of the accomplishments of the passive nitrogen removal test facility.
2. For Task B, it is anticipated that an additional four onsite systems utilizing various nitrogen removal technologies will be installed at home locations throughout the State of Florida, four field system performance monitoring events will be conducted on these systems, and final reporting on all of the field work associated with this task, including life cycle cost assessments, will be completed.
3. For Task C, monitoring events will occur at four home sites to evaluate nitrogen movement in the soil and groundwater in the field, and at six groundwater test areas at the soil and groundwater test facility to show how groundwater fate and transport of nitrogen occurs. Final reporting for this task will be completed.
4. For Task D, shallow groundwater models will be developed, 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.

Table 1. Summary of Funding Phase Tasks and Associated Number of Deliverables.

Task	Phase I <sup>a</sup> \$900,000 (July 2008- November 2010, completed)	Phase II <sup>a</sup> \$2,000,000 (Current Funding, in progress)	Phase III <sup>a</sup> \$2,200,000 (Future Funding, yet to be funded)
<b>A Task A: Technology Selection &amp; Prioritization</b>	<b>\$352,144</b>	<b>\$399,136</b>	<b>\$35,480</b>
Literature review	1		
Ranking of nitrogen reduction technologies for field testing	1		
Design and construction of test facility	1		
Quality assurance project plan	1		
Monitoring and sample events		7	
Final test facility report		1	
Final task report			1
<b>B Task B: Field Testing of Technologies</b>	<b>\$50,202</b>	<b>\$471,035</b>	<b>\$559,115</b>
Quality assurance project plan		1	
Installation of ranked nitrogen reduction technologies at 8 field sites		4	4
System performance monitoring events at 8 sites		4	4
Life cycle cost assessment template development		1	
Final life cycle cost assessment report (per system)			8
Final task report			1
<b>C Task C: Evaluation of Nitrogen Reduction by Soils &amp; Shallow Groundwater</b>	<b>\$216,164</b>	<b>\$1,027,848</b>	<b>\$662,940</b>
Quality assurance project plan	1		
Design of test facility	1		
Construction of test facility		1	
Monitoring and sample events (6 test areas)		3	3
Instrumentation of existing OSTDS mound at GCREC facility		1	
GCREC mound sample events		4	
Field sites sample events (4 sites)		1	3
Final task report			1
<b>D Task D: Nitrogen Fate and Transport Models</b>	<b>\$74,357</b>	<b>\$93,857</b>	<b>\$639,808</b>
Quality assurance project plan	0.5	0.5	
Simple soil model		1	
Complex soil model		1	
Shallow groundwater models for simple and complex soil models			2
Calibration of models to existing data sets			2
Uncertainty analysis for models			2
Validation and refinement of models			2
Final task report			1
<b>Project Management (sum of contractor and DOH)</b>	<b>\$119,953</b>	<b>\$95,304</b>	<b>\$302,657</b>
Contractor project management	\$90,695	\$77,932	\$249,247
DOH project management	\$29,258	\$17,372 <sup>b</sup>	\$53,410 <sup>b</sup>
<b>Total Budget<sup>c</sup></b>	<b>\$812,820</b>	<b>\$2,087,180</b>	<b>\$2,200,000</b>
<b>Total Budget Remaining as of November 2010</b>	<b>\$0</b>	<b>\$2,062,328</b>	<b>\$2,200,000</b>

a. Numbers in each subtask represent the numbers of budgeted deliverables.

b. DOH project management costs for Phases II and III are estimated costs.

c. Budgeted totals differ from the legislative funding amounts due to scheduling.

DOH – Department of Health

GCREC – Gulf Coast Research & Education Center

OSTDS – Onsite Sewage Treatment and Disposal Systems

## 4 FUNDING NEEDS

Activities in fiscal years 2008-2011 have prepared the framework for rapid implementation of all remaining project tasks in fiscal year 2011-2012. Funding for fiscal year 2011-2012 is required to reap the benefits of all previous work and to complete the goals of this project. For the 2011-2012 budget year, \$2.2 million dollars is required to fund the completion of this study.

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. Without further funding for the final Phase 3 of the project, necessary and extensive field testing, the major portion of Task B, will not occur and, if field testing does not occur, the project will essentially not 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:

Initial Funding in 2008-2010 (Phase I): \$900,000 already appropriated (in 2008 and 2009 state budgets) – status: Largely 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 already appropriated (in 2010 state budgets) – 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: To adequately fund the final phase of the project, \$2.2 million will need to be appropriated during the 2011 legislative session. The preliminary results of the project are encouraging. Further testing is required to verify the results to date 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, additional testing as deemed appropriate by the Legislature, and final reporting with recommendations on onsite sewage nitrogen reduction strategies for Florida's future.

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>**

## 5 RECOMMENDATIONS

DOH and its Research Review and Advisory Committee recommend that the Legislature:

1. Provide additional funding and budget authority to DOH in the amount of \$2.2 million for the fiscal year 2011-2012 for continuation and completion of the tasks associated with the legislatively mandated Florida Onsite Sewage Nitrogen Reduction Strategies Study.
2. Provide DOH budget authority for any remaining funds from the 2010 appropriation to carry over to fiscal year 2011-2012.

This additional funding will be applied to the final phase of the project, primarily 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, development 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. If fully funded, the results of this project will assist economic growth and jobs creation while producing systems that protect groundwater with both 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.