PROGRESS REPORT ON NITROGEN REDUCTION STRATEGIES FOR ONSITE SEWAGE TREATMENT AND DISPOSAL SYSTEMS

February 1, 2009

Ana M. Viamonte Ros, M.D., M.P.H.
Surgeon General, Department of Health

Charlie Crist
Governor

TABLE OF CONTENTS

EXECUTIVE SUMMARY

SECTION 1.0

INTRODUCTION.....1

SECTION 2.0

ACTIONS TAKEN AFTER LEGISLATION TOOK EFFECT……..2

SECTION 2.1 DEVELOPMENT OF A SOLICITATION DOCUMENT FOR PROPOSALS……2

SECTION 2.2 RANKING OF PROPOSALS, NEGOTIATIONS, INTENT TO AWARD, AND CONTRACTING……3

SECTION 2.3 OUTLINE OF CONTRACT FOR THE MULTI-YEAR PROJECT…4

SECTION 3.0

ACTIONS PROPOSED TO BE TAKEN PRIOR TO END OF FISCAL YEAR……6

SECTION 4.0

RECOMMENDATIONS FOR FUNDING ADDITIONAL PHASES OF THE STUDY 7

SECTION 5.0

CONCLUSION 8

APPENDIX A

DETAILED SCOPE AND BUDGET.....9

APPENDIX B

ONSITE SEWAGE RESEARCH REVIEW AND ADVISORY COMMITTEE 41

Progress Report on Nitrogen Reduction Strategies for Onsite Sewage Treatment and Disposal Systems

Prepared by Department Staff: Gerald R. Briggs, Eberhard Roeder, Elke Ursin
Reviewed and Accepted by the Onsite Sewage Research Review and Advisory Committee

---

EXECUTIVE SUMMARY

This report is submitted in compliance with Line Item 1682, House Bill 5001, General Appropriations Act for Fiscal Year 2008-2009. The bill tasks the Florida Department of Health (FDOH) to contract for the first phase of a multi-year project to further develop cost-effective nitrogen reduction strategies and to develop passive strategies for nitrogen reduction that complement use of conventional onsite sewage treatment and disposal systems. Within the task for the department, there are three particular areas of concern: (1) Quantification of life-cycle costs and cost effectiveness of passive nitrogen reduction treatment technologies in comparison to more active technologies and to conventional treatment systems. (2) Characterization of nitrogen removal from effluent in the soil underneath the drainfield and in shallow groundwater. (3) Development of simple models to describe the fate and transport of nitrogen from onsite sewage treatment and disposal systems.

The bill requires this report to identify the progress that has been made, what progress is anticipated by the end of the fiscal year, as well as recommendations for funding additional phases of the study. FDOH and its Research Review and Advisory Committee (RRAC), with input from the general public, developed a competitive procurement instrument to solicit proposals. Three responding vendor teams were ranked and negotiations with the top-ranked team completed. The resulting multi-year project anticipates expending all $1 million of the appropriated funds for fiscal year 2008-2009 and annual funding at the level of $2 million for fiscal years 2009-2010 and 2010-2011 to accomplish the tasks.

The contract anticipates for the remainder of the fiscal year 2008-2009 that FDOH's consultant, in coordination with RRAC and FDOH, will complete literature reviews, prioritize nitrogen reduction technologies for field testing, design test facilities for further development of passive technologies and plume monitoring, and prepare quality assurance documents for the subsequent work. Preparation of field sites and test centers for the evaluation of nitrogen reduction techniques and beginning of sampling is planned for the fiscal year 2009-2010. Sampling and reporting of results would continue through subsequent years. Activities in the fiscal year 2008-2009 will prepare the framework for rapid implementation of a field sampling program in fiscal year 2009-2010. Funding for fiscal year 2009-2010 is required to reap the benefits of this preparation.

FDOH and its Research Review and Advisory Committee recommend the Legislature:

- Provide funding and budget authority to FDOH in the amount of $2 million for the fiscal year 2009-2010 for continuation of the contract and associated tasks.
- Allow FDOH to carry over any remaining funds from fiscal year 2008-2009 into fiscal year 2009-2010 and from fiscal year 2009-2010 into 2010-2011.
- Transfer funds for this project to FDOH.

1.0 INTRODUCTION

This report is submitted in compliance with Line Item 1682, House Bill 5001, General Appropriations Act for Fiscal Year 2008-2009. The language instructs:

> "…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."

Protection of public health and the environment is the mission of the Onsite Sewage Program of the Florida Department of Health (FDOH). Onsite Sewage Treatment and Disposal Systems (OSTDS) are a permanent solution to wastewater treatment in many locations throughout the State of Florida. In Florida, an estimated 2.3 million OSTDS are in use statewide, serving approximately a third of the population. They create one of the largest artificial ground water recharge sources in the state. Ninety percent of the water used for drinking comes from ground water. It is necessary to protect this resource to protect public health and the environment.

Florida has been a leader in the field of onsite wastewater treatment and disposal practices. Onsite system construction and use standards in the State date from 1921. A major revision occurred in 1984 from which time onward all drainfields in new onsite system construction had to be installed to provide two feet of separation from groundwater. Conventionally, OSTDS consist of a septic tank and a drainfield. Research in Florida and elsewhere has shown that OSTDS installed to modern standards effectively reduce the concentration of pathogens found in normal wastewater, but that nitrogen levels are only reduced to a limited extent. More advanced treatment, such as by aerobic treatment units or performance-based treatment systems are in use in limited areas where local regulations require more treatment or for relatively small lots.

Excessive nitrogen can have negative effects on public health and the environment. The primary impetus for this study is the increased level of nitrogen in the environment. Increased amounts of nitrogen in surface water bodies can cause eutrophication, which can lead to detrimental effects to sensitive aquatic ecosystems. Nitrogen sources to the environment include: atmospheric deposition; fertilizer from both agricultural and

residential land uses; livestock wastewater; municipal wastewater treatment systems; onsite sewage treatment and disposal systems; and stormwater. The combination of these sources adds up to a cumulative nitrogen load to ground and surface waters. As land uses change and the population and the number of onsite systems increase, the relative contribution of onsite systems to nitrogen sources in an area may change.

Various investigators have evaluated the relative contribution of onsite systems to cumulative nitrogen impacts in specific watersheds and discussed opportunities to reduce this contribution. The department has been most involved in such efforts in the Wekiva Study Area and has provided reports on nitrogen and onsite systems to the Governor in 2004 and 2007. An increasing motivation for such evaluations is the need to maintain and restore water bodies to their designated uses, implemented through the total maximum daily load program of the Florida Department of Environmental Protection.

The legislative language addressed these concerns over the management of impacts from nitrogen from onsite systems on Florida's waters by providing initial funding for a research project. In the same line item, the legislature requested a report on an inspection program to address ongoing maintenance of conventional onsite systems and an inventory of onsite systems in Florida.

2.0 ACTIONS TAKEN AFTER LEGISLATION TOOK EFFECT

2.1. Development of a solicitation document for proposals

The legislation was passed and signed into law by the Governor on June 11, 2008. The department developed an implementation plan for the passive nitrogen reduction strategy study. Implementation of this study requires close cooperation with the department's Research Review and Advisory Committee (RRAC), which the legislature charged to control the study. In preparation for the meeting of this committee on July 30, 2008, department staff addressed two issues: a draft scope for which proposals would be requested and the form of the request of proposals.

The draft scope developed by staff elaborated on elements specified in the legislative language by suggesting objectives, activities, and deliverables. $1,000,000 had been appropriated for the first phase of the project, and the total cost of the contract was anticipated to not exceed $5,000,000. Funding for future years is dependent on future legislative appropriations.

After consultation with department procurement staff the Bureau of Onsite Sewage Programs determined the use of an Invitation to Bid or a Request for Proposal would not result in the best value to the state for this procurement and decided to use an Invitation to Negotiate (ITN), according to Florida Statute 287.054(3)(a).

The justification for selecting an ITN included considerations of the following: The qualifications of the submitting vendors are more important than price, as this project involves detailed scientific knowledge of onsite sewage treatment and disposal systems. This excluded an invitation to bid. Negotiations allow for greater flexibility in development of the final scope, such as incorporation of ideas that were not included initially in a proposal by a vendor. Even though one basic approach would be outlined in the draft scope, there could be many different approaches to reaching the objectives for this project. Allowing different vendors the opportunity to offer their expertise in

developing an alternative approach and proposing innovative solutions was considered a benefit to the success of this project. At the other end of specificity, details such as site locations and sampling parameters could be subject of negotiations rather than being fixed at the outset. Small changes in specifications could make a big difference in the perceived likelihood of success.

The Department's Research Review and Advisory Committee (RRAC) met on July 30, 2008 in the Orlando area to discuss the project. One item of discussion was a clarification of roles between: the department that is to contract for the study, provide administrative support to the RRAC, review and accept the deliverables, and provide the report to the government; the RRAC which has been tasked with controlling the study; and the contractors that will perform the work, provide reports, and address comments. The RRAC voted unanimously that in controlling the study, RRAC will: rank proposals for contracts, review draft deliverables and provide comments, file a progress report, accept as completed the final report by contractors, and attach comments to the final report. The RRAC provided comments on the draft scope and directed department staff to proceed further with development of a solicitation.

The Bureau of Onsite Sewage Programs initiated review of the revised ITN by other department offices on August 7, 2008. After several meetings and revisions to the document, the final version was advertised on September 26, 2008 as DOH 08-026 with the title "*Florida Onsite Sewage Nitrogen Reduction Strategies Study: Technology Evaluation, Characterization of Environmental Fate and Transport, and an Assessment of Costs*". The ITN was advertised for approximately a month with responses due on October 29, 2008. Potential respondents were given an opportunity to ask questions in a public forum during the advertised period to assist them with preparing their proposal.

Department staff presented a status report on August 27, 2008 to the department's Technical Review and Advisory Panel (TRAP), which advises the department on onsite sewage rule making and policy per 381.0068 F.S. The TRAP voted to approve the project as presented to them and requested they be kept informed on the status of this project.

2.2. Ranking of proposals, negotiations, intent to award, and contracting

Three teams submitted proposals at the specified time. The proposals were reviewed by fifteen qualified evaluators. During the RRAC meeting on November 6, 2008 all proposals were ranked, and the proposal by the team led by Hazen and Sawyer was ranked highest, both overall and by each individual evaluator ranking.

The department invited the top-ranked team to begin negotiations. The department's negotiation team consisted of three qualified negotiators from the Bureau of Onsite Sewage Programs, as well as a certified contract negotiator from the department's procurement office. After several negotiation sessions during which aspects of the proposals were clarified and a more detailed scope of work defined, and review of the best and final offer, the negotiation team concluded Hazen and Sawyer was the best vendor to accomplish the objectives outlined in DOH 08-026 and issued an intent to award letter on December 16, 2008. The contract was routed for the necessary departmental reviews on December 23, 2008 and provided to Hazen and Sawyer for execution in January of 2009.

Hazen and Sawyer provides an experienced and cohesive team to conduct the tasks necessary to perform this study to evaluate nitrogen reduction technologies. The team members all have extensive experience and a proven track record of achievement in the area of onsite wastewater treatment systems and nitrogen fate and transport. The team also will assemble a project advisory committee made up of renowned experts in the field to provide input, review, and technical advice to the project team to ensure scientifically valid results, efficient experimental designs, and defensible testing conditions. The references for past performance all gave excellent reviews, confirming Hazen and Sawyer has a high quality of performance, they were able to adapt quickly to changes in funding, and always deliver on time and on budget.

The proposal demonstrated a strategic approach, with many tasks proposed to be occurring simultaneously. The detailed and logical approach provided an excellent launching point to achieve success. The best and final offer illustrated an efficient framework to achieving the goals of this project. The particular approach proposed by the team addressed objectives of the invitation to negotiate and also addressed three of the department's onsite sewage 2008 research priorities identified by the RRAC. This is expected to allow for cost-efficient project management by having all work run concurrently under one contract, as well as to further the mission of the Bureau of Onsite Sewage Programs to protect public health and the environment.

The process from signing of the legislation to a completed agreement took approximately six months. This is comparable to the time requirements for soliciting and contracts for smaller projects in the past.

2.3. Outline of contract for the multi-year project

The resulting contract split the project into five main tasks:

- Task A: Technology Evaluation for Field Testing: Review, Prioritization, and Development
- Task B: Field Testing of Technologies and Cost Documentation
- Task C: Evaluation of Nitrogen Reduction Provided by Soils and Shallow Groundwater
- Task D: Nitrogen Fate and Transport Modeling
- Task E: Project Management, Coordination, and Meetings

The scope of work as of January 05, 2009 is attached to this report. In order to provide an overview, the objectives of each task are listed below.

The objectives of Task A, Technology Evaluation for Field Testing: Review, Prioritization, and Development, are:

- Perform literature review to evaluate nitrogen reduction technologies
- Develop technology classification scheme
- Formulate criteria for ranking of nitrogen reducing technologies
- Rank and prioritize nitrogen reduction technologies for field testing
- Conduct technology ranking workshop with RRAC
- Prepare innovative systems application
- Conduct Technology Development in Passive Nitrogen Removal Study II

The objectives of Task B, Field Testing of Technologies and Cost Documentation, are:

- Indentify home sites and establish use agreements

- Establish vendor agreements
- Quality Assurance Project Plan
- Design and construct test facilities
- Install field systems at test facilities and home sites
- Operate and monitor field systems
- Compile results in report format
- Provide technical description of nitrogen removal technologies
- Acceptance of systems by homeowners
- Conduct Life Cycle Cost Analyses
- Final Report for Task B

The objectives of Task C, Evaluation of Nitrogen Reduction Provided by Soils and Shallow Groundwater, are:

- Critical characterization of nitrogen reduction in Florida soils and groundwater
- Develop Quality Assurance Project Plan
- Establish a controlled test facility
- Indentify home sites and make use agreements
- Instrument field systems at test facility and home sites
- Operate and monitor field systems
- Compile data in report format
- Close-out of home sites and controlled test facility
- Provide Final Report for Task C

The objectives of Task D, Nitrogen Fate and Transport Modeling, are:

- Literature review on fate and transport models
- Quality Assurance Project Plan
- Space time variable aquifer model with simplfied soil treatment
- Development-scale aquifer model creation and calibration
- Space time variable model with complex soil treatment
- Development-scale model with aquifer and soil treatment
- Uncertainty analysis
- Validate and refine models using data from Task C
- Develop decision making framework
- Final Report for Task D

The objectives of Task E, Project Management, Coordination and Meetings are:

- Conduct project kickoff meeting
- Prepare progress reports
- Make presentations to Research Review and Adivisory Committee and Technical Review and Advisory Panel
- Conduct Project Advisory Committee meetings

The proposed funds to be spent by Hazen and Sawyer prior to the end of the 2008-2009 fiscal year are $900,000, with details provided in Appendix A. Of the remaining $100,000, as of December 29, 2008, $16,592.25 has been spent for four RRAC meetings and other associated costs to discuss the scope of the project, to rank proposals, and to provide updates on the project. It is anticipated monthly RRAC meetings will be required to provide regular updates on the project. It is also anticipated a temporary employee will be hired to assist staff with the project.

3.0 ACTIONS PROPOSED TO BE TAKEN PRIOR TO END OF FISCAL YEAR

Each of the tasks associated with this project will have a significant amount of work completed prior to the end of the 2008-2009 fiscal year. The following paragraphs describe what the provider will accomplish.

For Task A, a literature review of nitrogen reducing technologies will be performed. This review will include source separation, passive systems, active systems, modifications to conventional OSTDS, and modified soil treatment units. A classification scheme will be created to classify and group nitrogen reduction technologies found in the literature review into groups such as waste stream alteration, conventional systems, passive systems, and active systems. Then criteria will be developed to rank the technologies listed in the classification scheme, so each technology can have a score that can be converted into the priority list for testing. A workshop will be held with the Research Review and Advisory Committee in April to discuss ranking and prioritization of the nitrogen reducing technologies. A final classification and ranking scheme will be developed, and a priority list for testing will be completed. Two innovative technologies that are not currently permitted by FDOH will be provided assistance in becoming permitted as innovative systems. A test facility location will be determined where further development of promising passive nitrogen removal techniques can be performed. The design for the test facility will be completed, and bids will be accepted for construction of the facility. A quality assurance project plan will outline details of this sub-project: the objectives, experimental design, system operation, analytical methods, and sampling frequencies.

For Task B, individual homeowner sites will be identified for their suitability for establishing technologies for field evaluations. These sites will be located at various points across the state (e.g. Wekiva, Wakulla, and south Florida) to capture the variety of conditions found across the state. Agreements with technology vendors will be finalized to identify how the technology will be tested. A quality assurance project plan for field testing will be developed to document the objectives, specific systems for testing, and technology configurations that will be tested, operation of the systems, sampling and monitoring methodology and frequency, analytical parameters and methods, and data and document management. A life cycle cost analysis template will be created that can be used to summarize the costs of all tested systems.

For Task C, a literature review will be completed to compile information on nitrogen fate and transport in both saturated and unsaturated soils. A quality assurance project plan will outline the monitoring framework for field sites. It is anticipated this task will be a combination of both field sampling as well as controlled experiments at a test facility. Home sites will be selected and agreements will be made with the homeowners. It is anticipated home sites will range across the State of Florida, including north Florida, central Florida (specifically the Wekiva area), and south Florida to capture diversity in site conditions. Some of the instrumentation for home sites will be started. The design for the test facility will also be completed.

For Task D, a literature review of nitrogen fate and transport models will be completed. Existing data sets will be selected for calibration of the models that will be developed, and to guide future data collection efforts. A quality assurance project plan will be developed to outline steps required to develop a model capable of predicting nitrogen concentrations at a specified location downgradient from the wastewater source. A simple model of nitrogen transport from the drainfield through unsaturated soil to the

groundwater will be developed. This model will likely use the approach of specifying removal fractions that are dependent on soil conditions and effluent quality. Initial time-variable and averaged models of the fate and transport of nitrogen in shallow groundwater will build on this simple source model.

For Task E, monthly progress reports will be provided summarizing progress on each task and what activities are planned for the folowing month. The department's Research Review and Advisory Committee will be kept up to date on the progress of this project with presentations being made twice per year or as warranted by work progress or other requirements. The provider will assemble a technical Project Advisory Committee of national independent experts. This Project Advisory Committee will meet at least once per year to evaluate the strategic direction of the project, review project activities and reports, provide technical review, and make comments and recommendations on project activities.

4.0 RECOMMENDATIONS FOR FUNDING ADDITIONAL PHASES OF THE STUDY

Activities in fiscal year 2008-2009 will prepare the framework for rapid implementation of a field sampling program in fiscal year 2009-2010. Funding for fiscal year 2009-2010 is required to reap the benefits of this preparation. Appendix A provides details on the proposed scope and budget for this project over the next several years. Funding for Year 1 of this project is already appropriated and the associated activities are described above. The remaining years of the project still require funding in order to complete the goals of this project. For the 2009-2010 budget year $2-million dollars is required to fund the continuation of this study.

During the 2009-2010 fiscal year, the tasks associated with this project will include a significant amount of construction and sampling. For Task A, the test facility will be installed and pilot testing will commence for various passive nitrogen removal technologies. For Task B, onsite systems will be installed at home locations throughout the State of Florida, and monitoring of the performance of these systems in the field will begin. The final report on the life cycle cost analysis will be submitted based on actual purchase prices, installation cost estimates, and operational costs records. For Task C, instrumentation of home sites that have been selected to evaluate nitrogen movement in the soil and groundwater will occur and monitoring will begin. The installation of a facility to allow side-by-side evaluation of multiple drainfield configurations and the resulting nitrogen groundwater fate and transport in a common environment will be completed and monitoring will begin. For Task D, the models developed during 2008-2009 will be evaluated by comparison to existing data sets. A model that allows evaluation of multiple OSTDS, such as on a development scale, will be developed. An alternative, more complex soil transport model that incorporates a more detailed analysis of transport through unsaturated soil will be developed and integrated with the groundwater transport models. These models will in subsequent years be compared to the data obtained during this project.

The results of this project will help refine strategies for cost-effective nitrogen reduction from onsite sewage treatment systems that will protect our environment, as well as, provide cost effective options for citizens of this state.

5.0 CONCLUSION

As required in Section 5 of the Conference Report On House Bill 5001, General Appropriations Act for Fiscal Year 2008-2009, this progress report identifies the progress that has been made, what immediate progress is proposed, as well as a recommendation for funding additional phases of the study.

The department and its Research Review and Advisory Committee recommend the legislature:

- Provide funding and budget authority to the department in the amount of $2 million for the fiscal year 2009-2010 for continuation of the contract and associated tasks.
- Allow the department to carry over any remaining funds from fiscal year 2008-2009 into the fiscal year 2009-2010 and from fiscal year 2009-2010 into 2010-2011.
- Transfer funds for this project to the department.

The department, with assistance from the Research Review and Advisory Committee and the general public that attended the numerous public meetings held to discuss this project, took a careful and methodical approach to make sure the best provider was selected to perform this complex and important project. All of the technology and literature review and preliminary planning for each of the major tasks for this project will be completed during this first year of funding. Once funding for future phases of this project is made available, the department and provider are ready and waiting to complete the field work of the project.

Continued support for this project will ultimately benefit Florida's onsite system owners and will improve environmental and public health protection.

APPENDIX A DETAILED SCOPE AND BUDGET

Florida Onsite Nitrogen Reduction Strategies

Preliminary Scope and Budget (Status January 05, 2009)

This document describes the tasks, subtasks and deliverables associated with the Florida Onsite Sewage Nitrogen Reduction Strategies project. Following the task and deliverable descriptions is a table (Table I) summarizing the estimated cost components by deliverable and year.

Some tasks are identified to occur in years after the first year. During the first year, funding for these tasks is not available. Details of the tasks identified for subsequent years, including deliverables and prices, will be determined in an amendment to the agreement before work on these tasks begins.

Task A: Technology Evaluation for Field Testing: Review, Prioritization, and Development

The objectives of Task A are:

- Perform literature review to evaluate nitrogen reduction technologies
- Develop technology classification scheme
- Formulate criteria for ranking of nitrogen reducing technologies
- Rank and prioritize nitrogen reduction technologies for field testing
- Conduct technology ranking workshop with RRAC
- Prepare innovative systems application
- Conduct Technology Development in Passive Nitrogen Removal Study II

Sub-tasks and Deliverables

1. **Literature Review (draft)**
   The literature review of nitrogen reducing technologies completed as part of the Passive Nitrogen Removal Project commissioned by FDOH in 2007 will be updated with information which has emerged since the original study. The scope of the review will be expanded from the Passive Nitrogen Removal Project to include source separation, active systems, modifications to conventional onsite treatment systems, including modified soil treatment units, in addition to passive systems. The provider shall produce a searchable literature reference database, compatible with Endnote X or other Department approved software format. The literature reference database shall not infringe on any copyrights. The provider shall also produce a technology database, in tabular or other Department approved format, that will facilitate establishment of categories for summary and comparison, assessment of individual citations within the context of

organizational categories, and analysis of trends and differences among systems. The categories shall include items such as treatment classification, media type, wastewater source, treatment configuration, documented effectiveness, documented and theoretical longevity, cost, nutrient recovery, and effect of water chemistry. The provider shall summarize the updated literature review in a report.

Deliverables: Draft updated literature reference database; draft updated technology database; draft updated literature review report.

2. **Literature Review (final)**
The Department will gather comments on the draft documents of sub-task A.1. from RRAC and any other commenters and transmit to the provider within one month of receiving the draft. The provider will address these comments in preparing final deliverables for the literature review within one month of receiving comments.

Deliverables: Updated literature reference database; updated technology database; updated literature review report acceptable by FDOH.

3. **Classification of Technologies (draft)**
The provider will develop a scheme to classify and group identified nitrogen reduction technologies and practices to summarize the literature and facilitate comparisons between similar technologies. Four classifications are envisioned: waste stream alteration (such as blackwater systems, and urine separation); conventional OSTDS alteration (such as dosed vs. gravity systems, operational strategies, installation depth); passive nitrogen removal (OSTDS systems using no more than one pump and excluding aerators); active nitrogen removal (mechanical systems utilizing pumps, and aerators). The preliminary classification scheme will be presented to the RRAC at a workshop, which will provide a forum for full vetting and discussion.

Deliverable: Draft classification scheme of technologies report.

4. **Technology Ranking Criteria (draft)**
The provider will develop weighting criteria to rank technologies and practices to determine which best meet the goals of the project and shall have priority for further development or field evaluation. Criteria will build on and may lead to revisions to the categories developed in the literature review and include characterizations of nitrogen removal effectiveness, maturity of technology including status in Florida, costs (energy, maintenance, monitoring, replacement of parts and media), critical knowledge gaps, likelihood of success, need to field test, and the feasibility of obtaining data from existing installations in Florida. The provider will evaluate the technologies classified in sub-task A-3 relative to each criteria. The provider will propose draft sets of weights for a) work during the initial funding period; b) work during future funding periods. The provider will

prepare a working document, such as a calculation table, that shows the ranking of technologies given sets of weights. The provider will summarize criteria and weights in a report.

Deliverables: Draft summary of criteria and proposed weights for short-term and long-term testing, working document for obtaining ranks from weights.

5. **Priority List for Testing (draft)**
   The provider will propose additional criteria to consider in establishing priorities for testing from the top ranked technologies and practices. Such criteria may address representation of several technology classifications (sub-task A.3), similarity of technologies or several maturity levels in the study. The purpose of prioritization is to select the more promising technologies that may not have sufficient prior testing or that may be differently configured to improve performance, and to avoid duplicating testing where substantial experience already exists. The provider will also list technologies to be considered for sub task A-10 and A-11 (innovative system application assistance). A value engineering type exercise will be used to assist with priority list development.

   Deliverable: Draft summary of additional criteria; Draft priority list for testing.

6. **Technology Classification, Ranking and Prioritization Workshop**
   The provider will present the preliminary technology classification, rankings and priority lists developed in sub-task A.3, A.4 and A.5 to the RRAC at a public workshop, which will provide a forum for full vetting and discussion of weighting criteria and assigned weights. This one day roundtable workshop with the Research Review and Advisory Committee (RRAC) will present the results and recommendations contained in the draft reports of technology classification, ranking and prioritization. The provider will facilitate RRAC's development of guidance on modifications to the draft classification, ranking and prioritization. Unless this guidance results in a need for further information collection by the provider, RRAC will provide comments on the priority lists for the initial and future funding periods. The comments and concerns of the RRAC will be documented and incorporated into the three final reports.

   Deliverable: Public RRAC-Workshop, Summary of the workshop.

7. **Classification of Technologies (final)**
   The provider will incorporate RRAC comments and concerns and comments provided by the Department within two weeks of the workshop into the final classification scheme.

   Deliverable: Final report will be acceptable by FDOH.

8. **Technology Ranking Criteria (final)**

The provider will incorporate RRAC comments and concerns and comments provided by the Department within two weeks of the workshop into the final technology ranking scheme.

Deliverable: Final report will be acceptable by FDOH.

9. **Priority List for Testing (final)**
   The provider will incorporate RRAC comments and concerns and comments provided by the Department within two week of the workshop into the draft priority list.

   Deliverable: Final report will be acceptable by FDOH.

10. **Innovative Systems Application Report (draft)**
    Based on the technology evaluation in sub-task A-5, the provider will identify emerging and innovative technologies that have not matured or are not currently permitted by FDOH but rank high for consideration for testing. For up to five technologies, the provider will complete or assist the manufacturer if appropriate, in completing an innovative system application for acceptance by FDOH, for which field testing of task B will be part of the proposed innovative system monitoring protocol.

    Deliverable: Innovative system application (per technology, up to five).

11. **Innovative Systems Application Report (final)**
    The provider will respond or assist the manufacturer in responding to any requests for additional information by the department in regard to the innovative system applications.

    Deliverable: Additional information resulting in an innovative permit by the department.

12. **Identification of Test Facility Sites (per agreement)**
    Potential sites will be identified and evaluated for their suitability for establishing test centers. Test facility site evaluations will include the feasibility of multiple treatment technology testing as well as the ability to monitor non-comingled subsurface plumes and the assessment of subsurface nitrogen fate and transport. Salient issues include space availability, site access, wastewater source of sufficient quantity and availability, subsurface hydrology, power supply, and security. Agreements will be established with entities for establishing and operating test centers, and for ownership after project is completed.

    Deliverable: Test Facility Site Agreement(s).

13. Passive Nitrogen Removal Study II Quality Assurance Project Plan (draft)

The provider will develop a draft Quality Assurance Project Plan (QAPP) that documents the objectives, experimental design, system operation, analytical methods and sampling frequencies to be used in PNRS II. The objectives are to 1) directly address denitrification, which the provider proposes as the highest priority onsite nitrogen removal knowledge gap; 2) expand the performance envelope for the innovative unsaturated filter media filters demonstrated in the PNRS I; 3) delineate TN removal capability of PNRS I media using predenitrification;4) establish test systems that are close to full scale; 5) enable critical testing of a large number of systems to be completed within the first project year; 5) produce key data which can then be used directly for design of denitrification filters for subsequent full scale testing at home sites; 6) develop data for preliminary life cycle cost analysis and resource needs.

The experimental design is expected to consist of a battery of passive nitrogen removal treatment systems fabricated to evaluate salient design features of passive nitrogen removal systems including filter media, media stratification, surface loading rates, filter length, geometry, and aspect ratios, and unsaturated filter recycle for pre-denitrification and alkalinity recovery. The test configuration is anticipated to consist of a common wastewater feedstream, a suite of vertical unsaturated filters supplied by a common septic tank effluent (STE) feedstream, mixing of the unsaturated filter effluents to provide a common influent to denitrification filters; a suite of horizontal saturated filters using lignocellulosic and sulfur reactive media and liquid carbon dosing; and alternative system designs. The QAPP will address additives issues per Florida Administrative Code (FAC) Chapter 64E-6. The draft QAPP will propose where the test facility will be located (Gulf Coast Research and Education Center, USF Lysimeter Station, or other) and operated to determine nitrogen removal performance and optimize design variables.

Deliverable: Draft QAPP.

14. Recommendation for Process Forward

Based on the details agreed upon in the draft QAPP, the provider will develop a recommendation whether or not to proceed with the remainder of Task A as outlined below, or recommend an amendment to this contract, and present a revised cost estimate. This will include a recommendation on whether the USF Lysimeter Station should be renovated and utilized as a test facility for this project. Both the provider and FDOH shall reach a written agreement prior to moving forward with the remaining parts of Task A.

Deliverable: Meeting summary and recommended scope and budget revisions.

15. PNRS II Quality Assurance Project Plan (final)

The Department will gather comments on the draft QAPP from RRAC and any other commenter's and transmit to the provider within one month of receiving the

draft. The provider will address these comments in preparing final deliverables within one month of receiving comments.

Deliverable: Final QAPP to be approved by FDOH.

16. PNRS Specification Reports

The provider will prepare procurement and assembly reports that document design and fabrication of the test systems, procurement of materials and filter media, site preparation, instrumentation and operational testing of the PNRS II systems.

Deliverables: Specification reports and as-built diagrams of the PNRS tested.

17. Test Facility Design (50%)

The Test facility 50% design submittal will include preliminary layout sketches and design concepts and criteria. Provisions for supporting the installation and operation of in-tank treatment systems or unsaturated groundwater monitoring systems, including supply of power, individual energy monitoring for each treatment system or treatment system sub-components, a common wastewater source at controllable flowrates, provision for effluent routing to soil treatment units, sampling collection and monitoring appurtenances, and staging of field analytical work and sampling will be included. If the USF Lysimeter Facility is recommended as a test facility, the renovations of the facility necessary for its continued use will be included in the design documents. The 50% design documents will be submitted to FDOH for review and comment. Comments will be provided within two weeks of receipt.

Deliverable: 50% design documents.

18. Test Facility Design (100%)

The test facility 100% design submittal will be based on the concepts agreed upon based on review of the 50% design submittal. The 100% design submittal will include all design details and technical specifications necessary to estimate construction cost. These documents will be submitted to FDOH for review and comment. Comments will be provided within two weeks of receipt.

Deliverable: 100% design documents.

19. Test Facility Design (Final)

The test facility final design submittal will include final revisions based on the review of the 100% design submittal. This will result in a set of signed and sealed contract documents suitable for obtaining competitive bids for facility construction.

Deliverable: Signed and sealed contract documents.

20. Test Facility construction bid acceptance

Provider will respond to bidder requests for information (RFI's) and prepare any necessary addenda. Bids for construction will be reviewed for completeness and conformance with contract documents. Qualified bids will be reviewed and a contractor selected for facility construction. A contract amendment will be required if bids are above the budgeted amount.

Deliverable: Contract with construction contractor.

21. Test Facility Construction (shop drawing review by provider)

Shop drawings will be reviewed by the provider as necessary for conformance with the design concept and contract requirements.

Deliverable: Completed review of each shop drawing by provider as submitted to contractor.

22. Test Facility Construction (construction)

Provider will monitor facility construction as needed to monitor progress and conformance with design documents. This task will include the construction cost of the facility based on the accepted bid and any addenda. For budgeting purposes herein, we have assumed an arbitrary construction cost value in this scope and budget.

Deliverable: Construction Progress Report.

23. Test Facility Construction (substantial completion)

Provider will conduct one substantial completion site inspection to determine if the project is substantially complete. The inspection will result in the preparation of a punch list to be delivered to the contractor in writing for final completion.

Deliverable: Construction punch list.

24. Test Facility Construction (accept construction)

The provider will conduct one final inspection for the project to determine if the work has been completed in accordance with the contract documents and punch list. Subsequent to this final inspection, the provider will recommend in writing final payment to the contractor and give written notice to FDOH the work is complete. As-built drawings will then be developed for the facility.

Deliverable: As-built drawings of the test facility.

25. Sample Event Reports

The provider will provide sample event reports verifying operation of the test systems, flowrate monitoring, field parameter results, and Chain of Custody forms that document sample collection and delivery to the analytical laboratory.

Number of events shall be determined in the QAPP and is subject to available funding.

Deliverables: Sampling event report.

26. Data Summary Reports

The provider will provide data reports that verify completion of analyses by analytical laboratory and that include compiled data from field and analytical laboratory analyses in electronic and paper form.

Deliverables: Data Summary Reports (per event).

27. PNRS II Report (draft)

The provider will prepare a PNRS II report that includes PNRS II objectives, experimental methods, results, discussion, conclusions and recommendations. For each nitrogen reduction technology a technical description will be prepared that includes name, supplier, operating principles, salient physical description, flow sequence, pertinent design details, manufacturer or designer claims or treatment goals, and operating recommendations. The draft report will be provided for comments prior to submitting a final report.

Deliverable: Draft report.

28. PNRS II Report (final)

The Department will gather comments on the draft report from RRAC and any other commenters and transmit to the provider within one month of receiving the draft. The provider will address these comments in preparing final deliverables within one month of receiving comments.

Deliverable: Final report acceptable by FDOH.

29. Task A Final Report (draft)

The final report will summarize results of the technology classification, ranking and prioritization efforts in Task A and provide recommendations for funding additional phases of the project. If warranted, this report will also recommend a revised priority list for testing of future systems.

Deliverable: Draft report.

30. Task A Final Report (final)

Deliverable: Final report acceptable by FDOH.

Task B Field Testing of Technologies and Cost Documentation

The objectives of Task B are:

- Indentify home sites and establish use agreements
- Establish vendor agreements
- Quality Assurance Project Plan
- Design and construct test facilities
- Install field systems at test facilities and home sites
- Operate and monitor field systems
- Compile results in report format
- Provide technical description of nitrogen removal technologies
- Acceptance of systems by homeowners
- Conduct Life Cycle Cost Analyses
- Final Report for Task B

Sub-tasks and Deliverables

1. **Identification of Home Sites (per homeowner agreement)**
   The provider will identify individual homeowner sites for their suitability for establishing technologies for field evaluation. Criteria considered in the suitability will include homeowner willingness, site access, number of residents and continuousness of occupancy, power supply, security, location, adequate space, access for monitoring and maintenance, participation in previous or concurrent studies, and pre-existing treatment technologies. The provider will survey the homeowners and/or system users on use characteristics. Homeowner agreements will also specify expected energy costs and the arrangements in regards to responsibility for application for permits, modifications, operation, maintenance, monitoring, inspections, removal or leaving the system in place at study termination. Agreements will be established with homeowners for establishing and monitoring treatment systems. If a homeowner site will also be used for fate and transport studies (task C), then access will be needed for monitoring equipment in the downgradient direction and lack of interference with other systems must be ascertained. Up to ten (10) homesites at various locations in Florida (e.g. Wekiva, Wakulla and south Florida) will be indentified for testing under this task.

   Deliverable: Homeowner agreement, completed homeowner survey.

2. **Vendor Agreement Report (per vendor agreement)**
   The provider will contact technology vendors to explain the testing project, to identify specifics of the technology offering and special considerations, to delineate to the vendor the arrangements by which testing will be conducted, to identify specific models to be tested, and to obtain a price quotation for purchase or ascertain vendor interest in donating a system. Vendors will agree to specifications that vendors will not be allowed to physically modify or manipulate

equipment once installed. Any exceptions to this default policy will be fully documented. Up to 8 vendors will be identified for testing under this task. Operating permits and maintenance entity contracts will be provided for systems as necessary.

Deliverable: Vendor agreement.

3. **Quality Assurance Project Plan for Field Testing (draft)**
A Quality Assurance Project Plan (QAPP) will be developed to document the objectives, specific systems for testing, and technology configurations that will be tested, operation of the systems, sampling and monitoring methodology and frequency, analytical parameters and methods, and data and document management. The monitoring program will develop performance data sets for total treatment systems and also for intermediate points such as aerobic treatment unit effluent or mixed aerobic effluent with STE and pre-denitrification. Monitoring of intermediate locations will provide data sets for separate evaluation of loading and performance for individual treatment components. The anticipated monitoring program will begin six weeks after startup and approximately 8 sample events per system will be conducted. Monitoring points will include septic tank effluent (STE), aerobic effluent (if applicable), and denitrification filter effluent (if applicable). Anticipated parameters for influent STE include TSS, cBOD5, TKN, NH4+, and NOx, as well as temperature, pH, alkalinity, dissolved oxygen, and oxidation reduction potential. Stage 1 and Stage 2 effluents will be monitored for the same parameters, with less frequent analyses for TSS and cBOD5. Lower frequency monitoring will be conducted as necessary for a number of parameters: total phosphorus, PO4, and fecal coliform in STE, aerobic and denitrification effluents, SO4 and H_2S in sulfur denitrification filter influent and effluent, and cBOD5 in lignocellulosic filter effluents.

The provider will develop a data management and storage template for cataloging and assessing performance data from disparate treatment systems and technology combinations and influent wastewater characteristics.

The selection of systems for testing will follow recommendations developed in Task A. The provider will consider the use of and the addition of components to existing systems.

The exact sequencing of installations over the multi-year project will be established in the QAPP based on the priority list developed in Task A and refinements through the study.

Deliverable: A draft QAPP within three months of notice to proceed.

4. **Recommendation for Process Forward (per meeting)**
Based on the details agreed upon in the final QAPP, the provider will develop a revised cost estimate and recommendation as to the number of systems included

in the initial and future funding phases and whether or not to proceed with the remainder of Task B as outlined below, or recommend an amendment to this contract. Both the provider and FDOH shall reach a written agreement prior to moving forward with Task B.

Deliverable: Meeting summary and recommended scope and budget revisions.

5. **Quality Assurance Project Plan (final)**
   The Department will gather comments on the draft QAPP from RRAC and any other commenters and transmit to the provider within one month of receiving the draft. The provider will address these comments in preparing final deliverables within one month of receiving comments.

   Deliverable: Final QAPP accepted by FDOH.

6. **Field Systems Installation Report (per system)**
   The provider will perform existing system evaluations, modifications or new system permitting as appropriate for the respective home sites. The provider will be or hire an engineer of record for innovative or performance-based treatment system applications and identify the maintenance entity for each system. The provider will be responsible for individual field test systems to be purchased or fabricated and installed at individual homeowner sites. Field system installation will include providing all materials and assembly needed to produce a fully functional and working treatment system, including initial test evaluation and installation report. If necessary an existing system evaluation will be conducted per FAC Chapter 64E-6. A $5000 contingency allowance is included in the cost of this task to be used in the event the homeowner seeks withdraw from the program and to be used towards the cost of installing a replacement onsite wastewater system or for system repair or maintenance.

   Deliverable: Copy of final system permit including operating permit if necessary; detailed installation report, construction costs.

7. **Field Systems Monitoring Report (per event)**
   Subject to details specified in the QAPP, the provider, in cooperation with the homeowner and the maintenance entity, will operate field technologies for a base period of up to 24 months and monitored for at least the following parameters: temperature, pH, alkalinity, DO, ORP, TKN, NH_3, NO_x, TSS, C-BOD_5. Additonal parameters will be monitored less frequently for other parameters of interest (COD, TP, PO_4, fecal coliform, total enterococci, and SO_4 and H_2S for systems with sulfur-based denitrification).

   Deliverables will be submitted after each monitoring event for the systems installed in task B6, and will also include results for flowrate or treated volume, electricity and/or media use, field parameter results, Chain of Custody forms for

samples delivered to analytical laboratory, analytical laboratory reports, and compiled results.

Deliverables: Monitoring reports in tabular form.

8. **Field Systems Operation, Maintenance, and Repairs Report (per system)**
   The provider, in cooperation with the homeowner, maintenance entity, and county health department, will maintain copies of records of repairs, maintenance actions, inspection results and system observations. The provider will develop a report form for each entity and a summary report for each treatment system. Records will include date, description of repair and pertinent factors, and repair cost.

   Deliverable: Report form for each system, summary report of observations.

9. **Technical Description of Nitrogen Reduction Technology Report**
   The provider will develop a technical description for each nitrogen reduction technology studied, including information such as if the technology is vendor supplied or custom design, trade name, model number, unit specifications, purported operating principals, description of process flows and hydraulics, physical features including tanks, fixed film media, pumps, aerators, and other appurtenances, addition of chemicals or other materials, performance claims, observations, operational experience, and measured performance during the study. The report will include a brief description of nitrogen removal processes and factsheets for each nitrogen removal system studied.

   Deliverable: Draft and final nitrogen reduction technology report.

10. **Acceptance of System by Owner Report (per system)**
    At the conclusion of system monitoring, a homeowner acceptance document will be provided that transfers complete ownership and operational responsibility of the system to the homeowner and a waiver of liability to the Department and the provider. In the event the homeowner does not desire to keep the study systems, the contingency allowance from task B6 will be utilized to restore the system to its original condition.

    Deliverable: Acceptance of System by Owner Report.

11. **Life Cycle Cost Analysis draft (template and user guidelines)**
    The provider will develop a Life Cycle Cost Analysis (LCCA) template, with the PNRS I LCCA as a starting point and will summarize features of the template in a user guidelines document. Costs will be expressed in a variety of ways, such as uniform annual cost, cost effectiveness of nitrogen removal, marginal cost effectiveness of additional treatment components, etc. The analysis will include equipment, material and installation costs for treatment systems, recurrent costs for energy, maintenance, repair, permitting and monitoring, and replacement of

materials such as reactive media or electron donor supply for denitrification. Materials costs include purchase cost and delivery cost of vendor systems, or costs to purchase and prepare materials and media for custom designed systems. Use of a common LCCA template will enable all nitrogen removal technologies to be evaluated on an equivalent basis, and will be useful for future systems that are not evaluated within this project. In developing the template, the provider will illustrate its use with existing data, such as developed as part of task A, the Keys OWNRS study or the information obtained from homeowners surveyed during this task.

Deliverable: Draft LCCA template and user guidelines.

12. Life Cycle Cost Analysis final (template and user guidelines)

The Department will gather comments on the draft LCCA from RRAC and any other commenters and transmit to the provider within one month of receiving the draft. The provider will address these comments in preparing final deliverables within one month of receiving comments.

Deliverable: Final LCCA template and user guidelines.

13. Life Cycle Cost Analysis Report (per system)

Based on the LCCA Template, the provider will conduct an LCCA analysis for each nitrogen reduction technology evaluted during field testing using actual purchase prices, installation cost estimates, and operational costs records.

Deliverable: LCCA Report (per system tested) including cost analysis.

14. Task B Final Report (draft)

The provider will develop a final report that will summarize the results of the Task B evaluations of treatment technologies, including an aggregation of technology reports and LCCA completed over the course of the study. The report will provide summary recommendations for deploying the tested technologies to meet the objectives of the Florida Onsite Nitrogen Removal Strategy. The report will include the data on which it is based, in tabular form.

Deliverable: Draft Task B Final Report.

15. Task B Final Report (final)

The Department will gather comments on the draft final report from RRAC and any other commenters and transmit to the provider within one month of receiving the draft. The provider will address these comments in preparing final deliverables within one month of receiving comments.

Deliverable: Task B Final Report acceptable by FDOH.

Task C. Evaluation of Nitrogen Reduction Provided by Soils and Shallow Groundwater

The objectives of Task C are:

- Critical characterization of nitrogen reduction in Florida soils and groundwater
- Develop Quality Assurance Project Plan
- Establish a controlled test facility
- Indentify home sites and make use agreements
- Instrument field systems at test facility and home sites
- Operate and monitor field systems
- Compile data in report format
- Close-out of home sites and controlled test facility
- Provide Final Report for Task C

Sub-tasks and Deliverables

1. **Literature Review (draft)**
   The provider will review available literature to assess the current status of knowledge related to nitrogen fate and transport in saturated and unsaturated soils. Literature from other fields (e.g. agriculture, agronomy, hydrogeology, soil science, environmental science, ecology, biosystems engineering) will be reviewed for its application to onsite wastewater treatment systems in Florida. Particular focus will be placed on studies that have measured and documented denitrification rates in soil and groundwater. This review will expand on the literature review on denitrification in soil performed for the department's Wekiva study and a complementary literature review, recently completed by the Colorado School of Mines. Results of the literature reviewed in this task will be added to the searchable literature reference database established in Task A.

   Deliverable: Draft literature review and updated reference database.

2. **Literature Review (final)**
   The Department will gather comments on the draft final report from RRAC and any other commenters and transmit to the provider within one month of receiving the draft. The provider will address these comments in preparing final deliverables within one month of receiving comments.

   Deliverable: Final report and updated reference database acceptable to FDOH.

3. **Quality Assurance Project Plan for field and test center sites (draft)**
   The provider will develop a Quality Assurance Project Plan (QAPP) to document Task C objectives and the monitoring framework for field sites. Information gained during the literature review conducted as part of Task D will be incorporated, as appropriate, into the monitoring framework to ensure data required for model inputs will be collected. The monitoring framework will

encompass the “Observational Approach” to allow information obtained in the field and during other tasks (e.g., task D2, D7, D10, etc.) to be utilized to direct subsequent monitoring. The QAPP will describe the number and type of homeowner systems to be monitored, sample frequency and duration, analytical parameters and methods, data handling and management, and document control.

It is anticipated each site will be monitored to delineate the OWTS effluent quality, hydraulic and nitrogen loading rates to the soil, and potential groundwater impacts. Flow meters will be installed as needed to determine actual soil loading rates. Shallow piezometers will be installed within the soil treatment unit and downgradient of the system to evaluate nitrogen fate and transport. Tracer tests using a conservative tracer will be conducted to determine connectivity of the OWTS-vadose zone-groundwater system as well as evaluate subsurface travel times. Water quality analyses will be conducted on all field samples and will include temperature, total nitrogen, ammonium nitrogen, nitrate-nitrogen, and chloride. Less frequent analyses will be conducted on samples as necessary and will include pH, alkalinity, cBOD5, total phosphorus, anions, cations, fecal coliform, and E. coli. Should a total nitrogen plume be identified from an OWTS, additional piezometers may be installed to enable further hydrogeologic characterization affecting fate and transport (i.e., groundwater velocity, hydraulic gradient) and assessment of nitrogen concentrations over time. This field monitoring framework will enable evaluation of the current nitrogen reduction in soil and groundwater and provide input to parameter selection for Task D. Results will also enable validation and verification of simple models developed and refined as described in Task D.

It is anticipated at least two subsurface monitoring sites will be established at each of three dispersed locations in Florida to provide geographical variety. Example candidate locations are the Wakulla area (north Florida), the Wekiva area (central Florida), and a south Florida site to be determined. It is anticipated that four monitoring events will be conducted at each site. Sites will be selected and monitored to encompass a range of conditions affecting nitrogen mass loading to the environment and the resulting groundwater concentrations. Site selection will be leveraged, to the extent possible, with Task B to enable complete evaluation of the onsite system from STE through nitrogen treatment units and including soils. The key conditions of importance will be the hydraulic loading rate of effluent to the soil, and the effluent quality discharged to the soil.

It is anticipated a test center will also be established in this task to provide performance evaluations of multiple wastewater treatment systems; systems that will provide a broad range of nitrogen removal capabilities. The subsequent application of treated effluent to soil treatment and dispersal units will result in separate, non-comingled plumes which can be used for monitoring of nitrogen fate and transport in the subsurface. Subsurface monitoring will be used to develop data sets for nitrogen fate and transport for parallel systems receiving

widely varying nitrogen concentrations. Subsurface sites at the test center will be monitored for a variety of parameters at different frequencies, including pH, alkalinity, DO, ORP, TKN, NH_3, NO_x, C-BOD_5, TP, PO_4, fecal coliform, and total enterococci. Duration and frequency of monitoring at each of the sites will be specified in the QAPP.

Deliverables: Draft QAPP for field sites and test center.

4. **Recommendation for Process Forward**
   Based on the details agreed upon in the draft QAPP, the provider will develop a revised cost estimate and a recommendation whether or not to proceed with the remainder of Task C as outlined below, or recommend an amendment to this contract. Both the provider and FDOH shall reach a written agreement prior to moving forward with Task C.

   Deliverable: Meeting summary and recommended scope and budget revisions.

5. **Quality Assurance Project Plan (final)**
   The Department will gather comments on the draft final report from RRAC and any other commenters and transmit to the provider within one month of receiving the draft. The provider will address these comments in preparing final deliverables within one month of receiving comments.

   Deliverable: Final QAPP acceptable to FDOH.

6. **Home Site Selection (per homeowner agreement)**
   Candidate homeowner sites will be identified for subsurface monitoring activities. FDOH permit information will be gathered as available on candidate sites, and a system inspection and evaluation conducted on selected sites. Monitoring at the sites will be used to assess the current level of nitrogen reduction obtained by Florida soils, to assess groundwater impacts due to conventional and nitrogen removal systems, and to provide data for parameter estimation, and verification and validation of models developed in Task D. Sites will be monitored to encompass a range of conditions affecting nitrogen mass loading to the environment and the resulting groundwater concentrations. Specifically, key conditions of importance will be the hydraulic loading regime (e.g., trench vs. drip), the rate of effluent discharged to the soil, effluent quality (e.g. BOD, nitrogen) discharged to the soil, and the density of onsite wastewater treatment systems (OWS). Factors considered during site selection include homeowner amenability, site access, occupancy, system age, type of system and daily household flow. While numerous subtleties exist between individual OWS, monitoring a range of these key conditions and factors will enable comparison of sites.

   Agreements will be established with homeowners for establishing monitoring systems. It is anticipated up to eight (8) homeowner sites will be identified for

potential inclusion in the study. Task B.7 will establish which of these will be included for monitoring.

Deliverable: Homeowner agreement.

7. **Instrumentation of Home Sites Report (per site)**
   The QAPP will document the objectives, monitoring framework, sample frequency and duration, and analytical methods to be used at the home sites. Instrumentation of the sites, in accordance with the QAPP, will include providing all materials and assembly needed to establish the monitoring framework at each home site. An installation report will be provided for each of up to six (6) individual home sites describing the monitoring system.

   Deliverable: Installation report.

8. **Monitoring Report (per sampling event, per site)**
   The monitoring framework will be described in the QAPP including number of sampling points at each site, sampling frequency and duration, and analytical parameters. Monitoring reports, based on the QAPP framework, will be provided that describe site conditions and interim sample results (i.e., compiled data from field and analytical laboratory analyses).

   Deliverable: Monitoring report.

9. **Draft Site Summary and Close-out Report (each site)**
   The provider will summarize the observations for each site, including site conditions, onsite system characteristics and soil and ground water concentrations and conditions found.

   At the conclusion of home site monitoring, either homeowner acceptance documents will be provided that transfer ownership and responsibility of monitoring points to the homeowner (e.g., piezometers) or all monitoring points will be removed and the site returned to its original configuration. A report will be provided to document close-out of each home site.

   Deliverable: Draft Site Close-out report.

10. **Final Site Close-Out Report (per site)**
    The draft close-out reports will be submitted to FDOH for review and comment. Comments will be provided within two weeks of receipt and a final close-out report will be prepared.

    Deliverable: Final site close-out report acceptable to FDOH.

11. Test Facility Design (50%)

The Gulf Coast Research & Education Center of the University of Florida (or other location) will be evaluated for suitability for establishing a controlled test site for side-by-side evaluation of multiple soil treatment unit regimes and the resulting nitrogen groundwater fate and transport. This task will be leveraged with Tasks B and D.

The Test facility 50% design submittal will include preliminary layout sketches and design concepts and criteria. Provisions for supporting installation, operation, and monitoring of treatment systems and groundwater plumes, including controllable dosing flowrates, effluent quality, soil hydraulic loading rates, and staging for field efforts. The monitoring framework will support evaluation of time and spatial variations of soil treatment and groundwater plume configurations (e.g. groundwater flow velocity, concentrations, etc.). Provisions for supporting the installation and operation of in-tank treatment systems or unsaturated groundwater monitoring systems, including supply of power, individual energy monitoring for each treatment system or treatment system sub-components, a common wastewater source at controllable flowrates, provision for effluent routing to soil treatment units, sampling collection and monitoring appurtenances, and staging of field analytical work and sampling will be included.

The 50% design documents will be submitted to FDOH for review and comment. Comments will be provided within two weeks of receipt.

Deliverable: 50% design documents.

12. Test Facility Design (100%)

The test facility 100% design submittal will be based on the concepts agreed upon based on review of the 50% design submittal. The 100% design submittal will include all design details and technical specifications necessary to estimate construction cost. These documents will be submitted to FDOH for review and comment. Comments will be provided within two weeks of receipt.

Deliverable: 100% design documents.

13. Test Facility Design (Final)

The test facility final design submittal will include final revisions based on the review of the 100% design submittal. This will result in a set of signed and sealed contract documents suitable for obtaining competitive bids for facility construction.

Deliverable: Signed and sealed contract documents.

14. Test Facility construction bid acceptance

Provider will respond to bidder requests for information (RFI) and prepare any necessary addenda. Bids for construction will be reviewed for completeness and

conformance with contract documents. Qualified bids will be reviewed and a contractor selected for facility construction. A contract amendment will be required if bids are above the budgeted amount.

Deliverable: Contract with construction contractor.

15. Test Facility Construction (shop drawing review)

Shop drawings will be reviewed as necessary for conformance with the design concept and contract requirements.

Deliverable: Completed review of each shop drawing as submitted to contractor.

16. Test Facility Construction (construction)

Provider will monitor facility construction as needed to monitor progress and conformance with design documents. This task budget will include the construction cost of the facility based on the accepted bid and any addenda. For budgeting purposes herein, we have assumed an arbitrary construction cost value in this scope and budget.

Deliverable: Construction Progress Report.

17. Test Facility Construction (substantial completion)

Provider will conduct one substantial completion site inspection to determine if the project is substantially complete. The inspection will result in the preparation of a punch list to be delivered to the contractor in writing for final completion.

Deliverable: Construction punch list.

18. Test Facility Construction (accept construction)

The provider will conduct one final inspection for the project to determine if the work has been completed in accordance with the contract documents and the punch list. Subsequent to this final inspection, the provider will recommend in writing final payment to the contractor and give written notice to FDOH that the work is complete. As-built drawings will then be developed for the facility.

Deliverable: As-built drawings of the test facility.

19. Monitoring Reports (per system sampling event)

The monitoring framework will be described in the QAPP including number of sampling points for each plume, sampling frequency and duration, and analytical parameters. Monitoring reports, based on the QAPP framework, will be provided that describe site conditions and interim sample results (i.e., compiled data from field and analytical laboratory analyses). A brief description of the monitoring progress as well as field assessment for Task D model parameter estimation, model verification and validation will also be included.

Deliverable: Monitoring report.

20. **Test Facility Closeout Report**
    At the conclusion of controlled test site monitoring, an acceptance document will be provided that transfers ownership and complete responsibility of test site infrastructure to the owner. A report will be provided to document close-out of the site.

    Deliverable: Test Facility Closeout Report.

21. **Task C Final Report (draft)**
    The final report will summarize results of task C activities on nitrogen reduction in Florida soil and shallow groundwater. The report will include task objectives, methods, results, discussion, conclusions and recommendations.

    Deliverable: A draft report will be provided for comment prior to submittal of the final report.

22. **Task C Final Report (final)**
    The Department will gather comments on the draft final report from RRAC and any other commenters and transmit to the provider within one month of receiving the draft. The provider will address these comments in preparing final deliverables within one month of receiving comments.

    Deliverable: Final report acceptable by FDOH.

Task D Nitrogen Fate and Transport Modeling

The objectives of Task D are:

- Literature review on fate and transport models
- Quality Assurance Project Plan
- Space time variable aquifer model with simplied soil treatment
- Development-scale aquifer model creation and calibration
- Space time variable model with complex soil treatment
- Development-scale model with aquifer and soil treatment
- Uncertainty analysis
- Validate and refine models using data from Task C
- Develop decision making framework
- Final Report for Task D

Sub-tasks and Deliverables

1. **Literature Review of Nitrogen Fate and Transport Models (draft)**
   A literature review will be conducted to determine the current practice for modeling nitrogen fate and transport in soils and ground-water. Particular attention will be paid to data gathered from the Task C literature reviews that

have relevance to model parameterization of nitrogen fate and transport. If feasible, sensitivity analysis will be conducted based on previous work for conditions relevant to Florida soil and hydrology, to help direct Task C monitoring and future modeling efforts.

Currently available models for nitrogen fate and transport will be reviewed, and the hydraulic and transport/transformation parameters for the most simple, yet robust models and estimation tools will be summarized so that a plan for fieldwork can begin to be developed at an early stage in the project. Existing available models specific to OWTS or similar source types will also be reviewed to determine the appropriate starting point for model development for this project.

Results of the literature reviewed in this task will be added to the searchable literature reference database established in Task A.

Deliverable: Draft literature review and updated reference database.

2. **Literature Review of Nitrogen Fate and Transport Models (final)**
   The Department will gather comments on the draft literature review and transmit to the provider within one month of receiving the draft. The provider will address these comments in preparing final deliverables within one month of receiving comments.

   Deliverable: Final literature review and updated reference database.

3. **Selection of Existing Data Set for Calibration Report**
   Data will be selected from existing sites in Florida or elsewhere to evaluate the performance of an aquifer model, and to guide future data collection efforts for model calibration. The sites should have information on a nitrogen plume, and data will be obtained via document review and by working with FDOH.

   Deliverable: Brief memorandum describing calibration data set.

4. **Quality Assurance Project Plan Nitrogen Fate and Transport Models (draft)**
   A detailed Quality Assurance Project Plan (QAPP) will be drafted describing the sub-tasks to be completed in Task D. The overall goal will be to develop a model capable of predicting nitrogen concentrations at a specified location downgradient of an OWTS source or to determine nitrogen loadings/mass flux at a specified location. A simplified, user friendly modeling approach (e.g., programmed Microsoft Excel spreadsheet) will be employed that includes the dominant soil and hydraulic factors that influence nitrogen assimilation. The development of the fate and transport model will be accompanied with a parallel assessment of soil characterization at individual sites that provide data for model parameterization and calibration (Task C). The Florida soils classification system is one potential source of soil characterization data that could be used for a simple estimation of unsaturated zone transport.

Model performance data will guide data collection, and verification to data may necessitate revision and improvements to the model. The model calibration, data collection, and verification process will be an iterative process based on information available during the course of the project using the "observational approach" with feedback to both Tasks C and Task D. Uncertainty for predictive models when no calibration data is available and the framework for decision making will be developed.

Deliverable: Draft Task D QAAP.

5. **Recommendation for Process Forward (per meeting)**
   Based on the details agreed upon in the final QAPP, the provider will develop a recommendation whether or not to proceed with the remainder of Task D as outlined below, a revised cost estimate, or recommend an amendment to this contract. Both the provider and FDOH shall reach a written agreement prior to moving forward with Task D.

   Deliverable: Meeting summary and recommended scope and budget revisions.

6. **Quality Assurance Project Plan Nitrogen Fate and Transport Models (final)**
   The Department will gather comments on the draft QAPP from RRAC and any other commenters and transmit to the provider within one month of receiving the draft. The provider will address these comments in preparing final deliverables within one month of receiving comments.

   Deliverable: Final QAPP acceptable by FDOH.

7. **Simple Soil Model Development**
   This model will use a simplified algorithm for soil treatment based on prior research. A soil classification model will be adapted (such as developed by D. Otis for the Wekiva study) or developed. A more detailed module for soil treatment will be developed in a subsequent task (subtask D15), however, a simple soil treatment module would allow aquifer model development to proceed much sooner, and may also be easier to use for many sites where soil treatment information is not available.

   Deliverable: Simple Soil Model Specification memo.

8. **Non-steady state aquifer model with simple soil model**
   A non-steady state aquifer model will be developed, possibly by revising an existing model, to simulate nitrogen concentrations and mass flux in space and time from a single onsite wastewater treatment (OWTS) source, or a surface area that can be estimated as a single OWTS source. The simple soil model from D7 would be linked to this model, and it is anticipated that areal nitrogen input and loading will depend on factors such as pretreatment, recharge, soil

conditions, and property size. Model development will be based on information gained in the literature review. The models will be initially calibrated using existing data sets from Florida sites.

Deliverable: Brief modeling memo and model in electronic format (e.g., Microsoft Excel spreadsheet).

9. **Aquifer model with averaged output with simple soil model**
   A model will be developed, possibly by revising the model developed in Task D.8, to produce averaged output predictions for nitrogen concentration or mass flux.

   Deliverable: Brief modeling memo and model in electronic format.

10. **Multiple source aquifer model**
    A model will be developed, possibly by revising an existing model, to simulate nitrogen concentrations and mass flux in space and time from several OWTS in a development-scale area.

    Deliverable: Brief modeling memo and model in electronic format.

11. **Calibrate non-steady state aquifer model to existing data sets**
    The aquifer model performance will be evaluated using available actual field data and rigorous calibration techniques. This task may result in "verification" of the model, but will more likely be useful to better understand the quality and quantity of data required to enable a rigorous calibration using data from Task C.

    Deliverable: Model calibration memo.

12. **Calibrate aquifer model with averaged output to existing data sets**
    The aquifer model will be calibrated using existing data sets based on metrics such as average concentration in the plume or mass flux crossing a boundary.

    Deliverable: Model calibration memo.

13. **Calibrate multi-source aquifer model to existing data sets**
    The aquifer model will be calibrated using existing data from a development-scale plume, based on metrics such as average concentration in the plume or mass flux crossing a boundary.

    Deliverable: Model calibration memo.

14. **Complex Soil Model**
    The “complex” soil model will be based on rigorous unsaturated soil mechanisms, and based on Florida-specific soil and climate data, but still incorporated into a simplified approach (e.g., programmed into a Microsoft Excel

spreadsheet) useable by most practitioners with basic training. For example, the complex soil model may incorporate the field-capacity/mass-balance approach for water flow similar to that used by the Yucca Mountain project to estimate infiltration. The soil treatment module would enable estimation of site-specific soil treatment in the vadose zone, and model output will be the loading at the water table to the aquifer models. Development of the complex soil treatment module will be further described in the QAPP.

Deliverable: Complex Soil Model specification memo.

15. **Non-steady state aquifer model with complex soil model**
The complex soil-treatment model from D14 will be interfaced with the non-steady state aquifer model. Development of the non-steady state aquifer model based on a complex soil treatment module will be further described in the QAPP.

Deliverable: Brief modeling memo and model in electronic format.

16. **Aquifer model with averaged output, with complex soil model**
The complex soil-treatment model will be interfaced with the averaged aquifer model.

Deliverable: Brief modeling memo and model in electronic format.

17. **Multi-source aquifer model, with complex soil model**
The complex soil-treatment model will be interfaced with the averaged aquifer model, taking into account numerous onsite wastewater treatment systems in an area.

Deliverable: Brief modeling memo and model in electronic format.

18. **Calibrate non-steady state aquifer and complex soil model to existing data sets**
Aquifer model performance will be evaluated using available actual field data and rigorous calibration techniques for the integrated soil-treatment/aquifer model. This task may result in "verification" of the model, but will more likely be useful to better understand the quality and quantity of data required to rigorously calibrate the model (Task C).

Deliverable: Model calibration memo.

19. **Calibrate multi-source aquifer model and complex soil model to existing data sets**
Aquifer model performance will be evaluated using data from a development-scale plume and rigorous calibration techniques for the integrated soil treatment/aquifer model.

Deliverable: Model calibration memo.

20. Uncertainty Analysis for Non-Calibrated Models

A methodology will be developed whereby models can be used for decision making even if sufficient data does not exist to calibrate the model. Probability-based ranges for model input parameters will be used to generate probable model outcomes, providing planners with the option of using the most-probable model outcome in the decision making process, or the model outcome that would lead to a more conservative or liberal decision as the specific case warrants. To the extent possible (without precluding model-performance evaluation of the aquifer model in year 1), model uncertainty and sensitivity analyses will be conducted.

Deliverable: Uncertainty analysis memo.

21. Validate/Refine non-steady state aquifer model with data collection from Task C

Aquifer model performance will be evaluated using ground-water data collected from Task C and rigorous calibration techniques. The calibration procedure will be an iterative process and may suggest revisions in the data collection plan or in the model itself.

Deliverable: Model validation memo.

22. Validate/Refine complex soil model with data collected from Task C

Soil treatment model performance will be evaluated using field data collected from Task C (soil, vadose zone, shallow water table) and rigorous calibration techniques. The calibration procedure will be an iterative process and may suggest revisions in the data collection plan or in the model itself.

Deliverable: Model validation memo.

23. Uncertainty analysis for calibrated models

The uncertainty in results produced by calibrated models (e.g., nitrogen concentration or mass flux) will be determined based on factors such as range in calibrated parameter set values that result in similar goodness of calibration, model-parameter correlation and bias, and non-uniqueness of model input parameters to achieve calibration.

Deliverable: Model uncertainty analysis memo.

24. Validate/Refine non-steady state aquifer, complex soil model with Data Collected from Task C

Soil/aquifer integrated model performance will be evaluated using site-scale field data collected from Task C and rigorous calibration techniques. The calibration

procedure will be an iterative process and may suggest revisions in the data collection plan or in the model itself.

Deliverable: Model validation memo.

25. Decision-Making Framework Considering Uncertainty

A methodology will be developed to describe how planners can include the uncertainty associated with both calibrated and non-calibrated models in the decision-making process.

The final product of Task D will be a simplified site scale model that predicts nitrogen concentration and mass flux at selected distances downgradient from the source loading location. The model will be a combination of a simple soil model and averaged aquifer model. The simple soil model will predict nitrogen reduction in unsaturated soil and the loading of nitrogen to the aquifer at the groundwater table surface. The simplified soil model may take the form of a simple algorithm or correlation that predicts nitrogen reduction as a function of such unsaturated soil characteristics as grain size distribution, water content and organic matter. The aquifer model will likely be time averaged and predict nitrogen concentration and attenuation with distance from the source. Input information includes the direction of groundwater flow at the average groundwater flow velocity and organic matter content. Model parameter values will be derived from calibration for Florida locations using data from Task C and suggested model parameters will be provided.

Deliverable: Modeling decision-making memo.

26. Validate/Refine multi-source aquifer model, complex soil model with data collected from Task C

Soil/aquifer integrated model performance will be evaluated using development-scale plume field data collected from Task C and rigorous calibration techniques. The calibration procedure will be an iterative process and may suggest revisions in the data collection plan or in the model itself.

Deliverable: Model validation memo.

27. Task D Final Report (draft)

The draft final report will be developed to summarize the results of the Task D modeling development.

Deliverable: Draft Task D Report.

28. Task D Final Report (final)

The final report will summarize the results of the Task D modeling.

Deliverable: Final Task D Report, acceptable by FDOH.

Task E Project Management, Coordination and Meetings

The objectives of Project management, coordination and meetings are:

- Conduct project kickoff meeting
- Prepare progress reports
- Make presentations to RRAC and TRAP
- Conduct PAC meetings

Sub-tasks and Deliverables

1. **Project Kick-Off Meeting (conference call)**
   A project kick-off meeting will be held to establish contact information, routes of communication, points of contact, and administrative procedures. A list of attendees, contact information sheet and meeting minutes will be produced.

2. **PM - Project Progress Reports (per monthly report)**
   A monthly progress report will be provided that summarizes the general status of each task, progress during the reporting period, activities planned in the next reporting period, and any issues, problems or decisions with significant effect on project implementation. This task includes time for the project manager, for project team and program coordination, subcontract maintenance, project financial analysis, and invoicing.

3. **RRAC Meetings (per meeting)**
   Project results will be presented to the RRAC on a twice per year basis, or as warranted by work progress or other requirements.

4. **PAC Meetings (per meeting)**
   Project Advisory Committee meetings will be held at least once per year or more frequently to evaluate the strategic direction of the project, review project activities and reports, provide technical review, and make comments and recommendations on project activities. PAC review will be documented in a summary report for each review meeting.

Task F. Other Services

Other subtasks, including deliverables and prices, may be defined and added to this contract by amendment. These subtasks shall be within the general scope of this ITN. Criteria to initiate an amendment will include: either RRAC-direction or changes in funding and/or direction by the legislature, and agreement between the department and the provider.

Table I

TASK NO.	Task	Per Deliverable Subtotal	No. of Deliverables										Total Cost										
			Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	YR 2	YR 3	YR 4	YR 5	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	YR 2	YR 3	YR 4	YR 5	Total
A	Task A: Technology Selection & Prioritization	$608,999	3	2	7	7	1	2	37	4	0	0	$18,247	$17,958	$101,040	$86,742	$2,884	$14,384	$314,854	$52,892	$0	$0	$608,999
A.1	A.1 Draft Literature Review Report	$13,796			1								$0	$0	$13,796	$0	$0	$0	$0	$0	$0	$0	$13,796
A.2	A.2 Final Literature Review Report	$6,092				1							$0	$0	$0	$6,092	$0	$0	$0	$0	$0	$0	$6,092
A.3	A.3 Draft Classification of Technologies Report	$12,831			1								$0	$0	$12,831	$0	$0	$0	$0	$0	$0	$0	$12,831
A.4	A.4 Draft Technology Ranking Criteria Report	$10,096			1								$0	$0	$10,096	$0	$0	$0	$0	$0	$0	$0	$10,096
A.5	A.5 Draft Priority List for Testing Report	$14,859			1								$0	$0	$14,859	$0	$0	$0	$0	$0	$0	$0	$14,859
A.6	A.6 Technology Classification, Ranking and Prioritization Workshop	$18,243				1							$0	$0	$0	$18,243	$0	$0	$0	$0	$0	$0	$18,243
A.7	A.7 Final Classification of Technologies Report	$5,044				1							$0	$0	$0	$5,044	$0	$0	$0	$0	$0	$0	$5,044
A.8	A.8 Final Technology Ranking Criteria Report	$7,944				1							$0	$0	$0	$7,944	$0	$0	$0	$0	$0	$0	$7,944
A.9	A.9 Final Priority List for Testing Report	$7,787				1							$0	$0	$0	$7,787	$0	$0	$0	$0	$0	$0	$7,787
A.10	A.10 Draft Innovative Systems Applications Report (per technology, up to five)	$7,192						2	3				$0	$0	$0	$0	$0	$14,384	$21,575	$0	$0	$0	$35,959
A.11	A.11 Final Innovative Systems Applications Report (per technology, up to five)	$8,344							5				$0	$0	$0	$0	$0	$0	$41,720	$0	$0	$0	$41,720
A.12	A.12 Identification of Test Facility Sites (per agreement)	$2,538	2										$5,077	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5,077
A.13	A.13 Draft QAPP PNRS II	$13,171	1										$13,171	$0	$0	$0	$0	$0	$0	$0	$0	$0	$13,171
A.14	A.14 Recommendation for Process Forward (per meeting)	$6,237		1									$0	$6,237	$0	$0	$0	$0	$0	$0	$0	$0	$6,237
A.15	A.15 Final QAPP PNRS II	$4,496			1								$0	$0	$4,496	$0	$0	$0	$0	$0	$0	$0	$4,496
A.16	A.16 PNRS Specification Reports	$28,762			1	1							$0	$0	$28,762	$28,762	$0	$0	$0	$0	$0	$0	$57,524
A.17	A.17 Test Facility Design 50%	$11,721		1									$0	$11,721	$0	$0	$0	$0	$0	$0	$0	$0	$11,721
A.18	A.18 Test Facility Design 100%	$16,201			1								$0	$0	$16,201	$0	$0	$0	$0	$0	$0	$0	$16,201
A.19	A.19 Test Facility Design Final	$12,871				1							$0	$0	$0	$12,871	$0	$0	$0	$0	$0	$0	$12,871
A.20	A.20 Test Facility Accept Bid	$2,884					1						$0	$0	$0	$0	$2,884	$0	$0	$0	$0	$0	$2,884
A.21	A.21 Test Facility Shop Drawing Review (per dwg)	$898							10				$0	$0	$0	$0	$0	$0	$8,980	$0	$0	$0	$8,980
A.22	A.22 Test Facility Construction	$56,857							1				$0	$0	$0	$0	$0	$0	$56,857	$0	$0	$0	$56,857
A.23	A.23 Test Facility Construction Substantial Completion	$2,884							1				$0	$0	$0	$0	$0	$0	$2,884	$0	$0	$0	$2,884
A.24	A.24 Test Facility Accept Construction	$2,884							1				$0	$0	$0	$0	$0	$0	$2,884	$0	$0	$0	$2,884
A.25	A.25 Sample Event Reports (per event)	$20,126							8				$0	$0	$0	$0	$0	$0	$161,008	$0	$0	$0	$161,008
A.26	A.26 Data Summary Report (per event)	$2,368							8				$0	$0	$0	$0	$0	$0	$18,946	$0	$0	$0	$18,946
A.27	A.27 Draft PNRS II Report	$22,110								1			$0	$0	$0	$0	$0	$0	$0	$22,110	$0	$0	$22,110
A.28	A.28 Final PNRS II Report	$12,054								1			$0	$0	$0	$0	$0	$0	$0	$12,054	$0	$0	$12,054
A.29	A.29 Draft Task A Final Report	$12,384								1			$0	$0	$0	$0	$0	$0	$0	$12,384	$0	$0	$12,384

Table I

TASK NO.	Task	Per Deliverable Subtotal	No. of Deliverables										Total Cost										
			Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	YR 2	YR 3	YR 4	YR 5	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	YR 2	YR 3	YR 4	YR 5	Total
A.30	A.30 Task A Final Report	$6,343								1			$0	$0	$0	$0	$0	$0	$0	$6,343	$0	$0	$6,343
B	Task B: Field Testing of Technologies	$973,147	0	0	3	6	6	7	15	15	4	14	$0	$0	$9,415	$17,021	$43,444	$39,906	$499,670	$218,793	$18,305	$126,594	$973,147
B.1	B.1 Identification of Home Sites (per homeowner agreement)	$3,138			3	3	2	2					$0	$0	$9,415	$9,415	$6,277	$6,277	$0	$0	$0	$0	$31,383
B.2	B.2 Vendor Agreement Report (per vendor agreement)	$2,535				3	3	2					$0	$0	$0	$7,606	$7,606	$5,071	$0	$0	$0	$0	$20,282
B.3	B.3 Draft QAPP for Field Testing	$29,562					1						$0	$0	$0	$0	$29,562	$0	$0	$0	$0	$0	$29,562
B.4	B.4 Recommendation for Process Forward (per meeting)	$6,237						1					$0	$0	$0	$0	$0	$6,237	$0	$0	$0	$0	$6,237
B.5	B.5 Final QAPP Field Testing	$10,414						1					$0	$0	$0	$0	$0	$10,414	$0	$0	$0	$0	$10,414
B.6	B.6 Field Systems Installation Report (per system)	$43,057							8				$0	$0	$0	$0	$0	$0	$344,452	$0	$0	$0	$344,452
B.7	B.7 Field Systems Monitoring Report (per event)	$24,599							6	6			$0	$0	$0	$0	$0	$0	$147,594	$147,594	$0	$0	$295,188
B.8	B.8 Field Systems Operation, Maintenance and Repairs Report (per system)	$7,050								8			$0	$0	$0	$0	$0	$0	$0	$56,398	$0	$0	$56,398
B.9	B.9 Technical Description of Nitrogen Reduction Technology Report	$14,801								1			$0	$0	$0	$0	$0	$0	$0	$14,801	$0	$0	$14,801
B.10	B.10 Acceptance of System by Owner Report (per system)	$3,758										8	$0	$0	$0	$0	$0	$0	$0	$0	$0	$30,066	$30,066
B.11	B.11 LCCA Template Report (draft template and user guidelines)	$11,908						1					$0	$0	$0	$0	$0	$11,908	$0	$0	$0	$0	$11,908
B.12	B.12 LCCA Template Report (final template and user guidelines)	$7,624							1				$0	$0	$0	$0	$0	$0	$7,624	$0	$0	$0	$7,624
B.13	B.13 LCCA Report (per system)	$4,576									4	4	$0	$0	$0	$0	$0	$0	$0	$0	$18,305	$18,305	$36,611
B.14	B.14 Draft Task B Final Report	$51,435										1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$51,435	$51,435
B.15	B.15 Task B Final Report	$26,788										1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$26,788	$26,788
C	Task C: Evaluation of Nitrogen Reduction by Soils & Shallow GW	$1,921,383	0	2	4	4	6	3	38	20	20	3	$0	$14,601	$64,841	$27,408	$119,505	$95,815	$728,995	$490,457	$263,307	$116,455	$1,921,383
C.1	C.1 Draft Literature Review on Nitrogen Reduction in Soil Report	$11,300			1								$0	$0	$11,300	$0	$0	$0	$0	$0	$0	$0	$11,300
C.2	C.2 Final Literature Review on Nitrogen Reduction in Soil Report	$6,900				1							$0	$0	$0	$6,900	$0	$0	$0	$0	$0	$0	$6,900
C.3	C.3 Draft QAPP Evaluation of N Reduction by Soils & Shallow GW	$38,940			1								$0	$0	$38,940	$0	$0	$0	$0	$0	$0	$0	$38,940
C.4	C.4 Recommendation for Process Forward (per meeting)	$5,907				1							$0	$0	$0	$5,907	$0	$0	$0	$0	$0	$0	$5,907
C.5	C.5 Final QAPP Evaluation of N Reduction by Soils & Shallow GW	$9,190					1						$0	$0	$0	$0	$9,190	$0	$0	$0	$0	$0	$9,190
C.6	C.6 Home Site Selection (per homeowner agreement)	$7,301		2	2	2	2						$0	$14,601	$14,601	$14,601	$14,601	$0	$0	$0	$0	$0	$58,404

Table I

			No. of Deliverables										Total Cost										
TASK NO.	Task	Per Deliverable Subtotal	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	YR 2	YR 3	YR 4	YR 5	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	YR 2	YR 3	YR 4	YR 5	Total
C.7	C.7 Instrumentation of Home Sites Report (per site)	$34,622					2	2	2				$0	$0	$0	$0	$69,244	$69,244	$69,244	$0	$0	$0	$207,732
C.8	C.8 Monitoring Report (per sampling event, per site)	$28,017							12	12			$0	$0	$0	$0	$0	$0	$336,200	$336,200	$0	$0	$672,400
C.9	C.9 Draft Site Summary and Close-Out Report (per site)	$13,686									6		$0	$0	$0	$0	$0	$0	$0	$0	$82,114	$0	$82,114
C.10	C.10 Final Site Close-Out Report (per site)	$4,489									6		$0	$0	$0	$0	$0	$0	$0	$0	$26,936	$0	$26,936
C.11	C.11 Test Facility Design 50%	$26,471					1						$0	$0	$0	$0	$26,471	$0	$0	$0	$0	$0	$26,471
C.12	C.12 Test Facility Design 100%	$26,571						1					$0	$0	$0	$0	$0	$26,571	$0	$0	$0	$0	$26,571
C.13	C.13 Test Facility Design Final	$21,207							1				$0	$0	$0	$0	$0	$0	$21,207	$0	$0	$0	$21,207
C.14	C.14 Test Facility Accept Bid	$8,464							1				$0	$0	$0	$0	$0	$0	$8,464	$0	$0	$0	$8,464
C.15	C.15 Test Facility Shop Drawing Review (per dwg)	$3,288							15				$0	$0	$0	$0	$0	$0	$49,320	$0	$0	$0	$49,320
C.16	C.16 Test Facility Construction	$132,229							1				$0	$0	$0	$0	$0	$0	$132,229	$0	$0	$0	$132,229
C.17	C.17 Test Facility Construction Substantial Completion	$23,681							1				$0	$0	$0	$0	$0	$0	$23,681	$0	$0	$0	$23,681
C.18	C.18 Test Facility Accept Construction	$11,523							1				$0	$0	$0	$0	$0	$0	$11,523	$0	$0	$0	$11,523
C.19	C.19 Monitoring Report (per system sampling event)	$19,282							4	8	8		$0	$0	$0	$0	$0	$0	$77,128	$154,257	$154,257	$0	$385,642
C.20	C.20 Test Facility Close-Out Report	$14,921										1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$14,921	$14,921
C.21	C.21 Draft Task C Final Report	$69,891										1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$69,891	$69,891
C.22	C.22 Task C Final Report	$31,644										1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$31,644	$31,644
D	Task D: Nitrogen Fate and Transport Models	$784,606	0	1	2	2	2	2	8	5	4	2	$0	$15,533	$47,279	$11,545	$19,921	$37,061	$239,278	$176,882	$209,523	$27,584	$784,606
D.1	D.1 Draft Literature Review on Nitrogen Fate & Transport Model Report	$15,533		1									$0	$15,533	$0	$0	$0	$0	$0	$0	$0	$0	$15,533
D.2	D.2 Final Literature Review on Nitrogen Fate & Transport Model Report	$5,211				1							$0	$0	$0	$5,211	$0	$0	$0	$0	$0	$0	$5,211
D.3	D.3 Selection of Existing Data Set for Calibration Report	$15,092			1								$0	$0	$15,092	$0	$0	$0	$0	$0	$0	$0	$15,092
D.4	D.4 Draft QAPP N Fate and Transport Models	$32,187			1								$0	$0	$32,187	$0	$0	$0	$0	$0	$0	$0	$32,187
D.5	D.5 Recommendation for Process Forward (per meeting)	$6,334				1							$0	$0	$0	$6,334	$0	$0	$0	$0	$0	$0	$6,334
D.6	D.6 Final QAPP N Fate and Transport Models	$15,657					1						$0	$0	$0	$0	$15,657	$0	$0	$0	$0	$0	$15,657
D.7	D.7 Simple Soil Model Development	$4,263					1						$0	$0	$0	$0	$4,263	$0	$0	$0	$0	$0	$4,263
D.8	D.8 Non-Steady State Aquifer Model, Simple Soil Model	$17,053						1					$0	$0	$0	$0	$0	$17,053	$0	$0	$0	$0	$17,053
D.9	D.9 Aquifer Model with Averaged Output, Simple Soil Model	$20,008						1					$0	$0	$0	$0	$0	$20,008	$0	$0	$0	$0	$20,008
D.10	D.10 Multi-Source Aquifer Model	$22,835							1				$0	$0	$0	$0	$0	$0	$22,835	$0	$0	$0	$22,835
D.11	D.11 Calibrate Non-Steady State Aquifer Model to Existing Data Sets	$34,034							1				$0	$0	$0	$0	$0	$0	$34,034	$0	$0	$0	$34,034

Table I

TASK NO.	Task	Per Deliverable Subtotal	No. of Deliverables										Total Cost										
			Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	YR 2	YR 3	YR 4	YR 5	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	YR 2	YR 3	YR 4	YR 5	Total
D.12	D.12 Calibrate Aquifer Model with Averaged Output to Existing Data Sets	$11,635							1				$0	$0	$0	$0	$0	$0	$11,635	$0	$0	$0	$11,635
D.13	D.13 Calibrate Multi-Source Aquifer Model to Existing Data Sets	$22,835							1				$0	$0	$0	$0	$0	$0	$22,835	$0	$0	$0	$22,835
D.14	D.14 Complex Soil Model Development	$63,937							1				$0	$0	$0	$0	$0	$0	$63,937	$0	$0	$0	$63,937
D.15	D.15 Non-Steady State Aquifer Model, Complex Soil Model	$27,401							1				$0	$0	$0	$0	$0	$0	$27,401	$0	$0	$0	$27,401
D.16	D.16 Aquifer Model with Averaged Output, Complex Soil Model	$12,943							1				$0	$0	$0	$0	$0	$0	$12,943	$0	$0	$0	$12,943
D.17	D.17 Multi-Source Aquifer Model, Complex Soil Model	$12,943								1			$0	$0	$0	$0	$0	$0	$0	$12,943	$0	$0	$12,943
D.18	D.18 Calibrate Non-Steady State Aquifer Model, Complex Soil Model to Existing Data Sets	$16,481								1			$0	$0	$0	$0	$0	$0	$0	$16,481	$0	$0	$16,481
D.19	D.19 Calibrate Multi-Source Aquifer Model, Complex Soil Model to Existing Data Sets	$16,481								1			$0	$0	$0	$0	$0	$0	$0	$16,481	$0	$0	$16,481
D.20	D.20 Uncertainty Analysis for Non-Calibrated Models	$43,659							1				$0	$0	$0	$0	$0	$0	$43,659	$0	$0	$0	$43,659
D.21	D.21 Validate/Refine Non-Steady State Aquifer Model with Data Collection from Task C	$65,925								1			$0	$0	$0	$0	$0	$0	$0	$65,925	$0	$0	$65,925
D.22	D.22 Validate/Refine Complex Soil Model with Data Collected from Task C	$65,053								1			$0	$0	$0	$0	$0	$0	$0	$65,053	$0	$0	$65,053
D.23	D.23 Uncertainty Analysis for Calibrated Models	$33,128									1		$0	$0	$0	$0	$0	$0	$0	$0	$33,128	$0	$33,128
D.24	D.24 Validate/Refine Non-Steady State Aquifer, Complex Soil Model with Data Collected from Task C	$66,257									1		$0	$0	$0	$0	$0	$0	$0	$0	$66,257	$0	$66,257
D.25	D.25 Decision-Making Framework Considering Uncertainty	$44,753									1		$0	$0	$0	$0	$0	$0	$0	$0	$44,753	$0	$44,753
D.26	D.26 Validate Refine Multi-Source Aquifer Model, Complex Soil Model with Data Collected from Task C	$65,385									1		$0	$0	$0	$0	$0	$0	$0	$0	$65,385	$0	$65,385
D.27	D.27 Draft Task D Final Report	$18,160										1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$18,160	$18,160
D.28	D.28 Task D Final Report	$9,424										1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,424	$9,424
E	Task E: Project Management, Coordination, and Meetings	$711,864	2	1	1	1	2	2	15	15	15	15	$17,022	$9,298	$9,298	$9,298	$21,030	$28,589	$154,332	$154,332	$154,332	$154,332	$711,864
E.1	E.1 Project Kick-Off Meeting (conference call)	$7,724	1						0	0	0	0	$7,724	$0	$0	$0	$0	$0	$0	$0	$0	$0	$7,724
E.2	E.2 PM-Project Progress Reports (per monthly report)	$9,298	1	1	1	1	1	1	12	12	12	12	$9,298	$9,298	$9,298	$9,298	$9,298	$9,298	$111,576	$111,576	$111,576	$111,576	$502,092
E.3	E.3 RRAC Meetings (per meeting)	$11,732					1		2	2	2	2	$0	$0	$0	$0	$11,732	$0	$23,465	$23,465	$23,465	$23,465	$105,590

Table I

			No. of Deliverables										Total Cost										
TASK NO.	**Task**	**Per Deliverable Subtotal**	**Jan-09**	**Feb-09**	**Mar-09**	**Apr-09**	**May-09**	**Jun-09**	**YR 2**	**YR 3**	**YR 4**	**YR 5**	**Jan-09**	**Feb-09**	**Mar-09**	**Apr-09**	**May-09**	**Jun-09**	**YR 2**	**YR 3**	**YR 4**	**YR 5**	**Total**
E.4	E.4 PAC Meetings (per meeting)	$19,291						1	1	1	1	1	$0	$0	$0	$0	$0	$19,291	$19,291	$19,291	$19,291	$19,291	$96,457
F	Task F: Other																						
		TOTAL COST ESTIMATE																					
	PROJECT TOTALS	**$4,999,999**											$35,269	$57,390	$231,872	$152,013	$206,785	$215,754	$1,937,128	$1,093,355	$645,468	$424,964	$4,999,999
	PROJECT YEARLY TOTALS																	**$899,083**	**$1,937,128**	**$1,093,355**	**$645,468**	**$424,964**	**$4,999,999**

APPENDIX B **ONSITE SEWAGE RESEARCH REVIEW AND ADVISORY COMMITTEE**

Updated on December 22, 2008

The list has the same order as 381.0065(4)(o) Florida Statutes

Division of Environmental Health, Department of Health
(term expires 01/2009)

Member:	Alternate:
• **Paul Davis** Citrus County Health Department 3650 W. Sovereign Path, Suite #125 Lecanto, FL 34461	• **Jim Rashley** Citrus County Health Department 3650 W. Sovereign Path Lecanto, FL 34461-8071

Septic Tank Industry (Florida Onsite Wastewater Association)
(term expires 01/2009)

Member:	Alternate:
• **Anthony Gaudio** 2335 Grassroots Way Tallahassee, FL 32311	• **Sam Averett** Averett Septic Tank Company P.O. Box 266 Eaton Park, FL 33840 • **Mike McInarnay** JAX Plumbing & Septic Tank Inc. 1766 Blair Rd. Jacksonville, FL 32221-2017

Home Building Industry (Florida Home Builder's Association)
(term expires 01/2010)

Member:	Alternate:
• **David Carter, P.E.** 137 5th Street N.W. Winter Haven, FL 33881	• **Marc Hawes, P.E.** Miller Legg 631 S. Orlando Ave., #200 Winter Park, FL 32789

Environmental Interest Group (Florida Chapter, Sierra Club)
(term expires 01/2009)

Member:	Alternate:
• **vacant**	• **Patricia Sanzone** 1933 Lawson Road Tallahassee, FL 32308-4844

State University System:
(term expires 01/2011)

Member:	Alternate:
• **John Schert** The Bill Hinkley Center for Solid and Hazardous Waste Management The University of Florida, College of Engineering 4635 NW 53rd Ave., Suite 205 Gainesville, FL 32653	• **John Dryden** Construction Management Department University of North Florida 1 UNF Drive Jacksonville FL 32224-2645

Professional Engineer (Florida Engineering Society)
(term expires 01/2010)

Member:	Alternate:
• **Clay Tappan, P.E.** Camp Dresser, McKee, Inc. 1715 N. West Shore Blvd. Suite 875 Tampa, FL 33607	• **James H. Peters, P.E.** Senior Consultant Brown and Caldwell 850 Trafalgar Ct #300 Maitland, FL 32751

Real Estate Profession (Florida Association of Realtors)
(term expires 01/2010)

Member:	Alternate:
• **Pam Tucker** Veteran Real Estate P. O. Box 608639 Orlando, FL 32860-8639	• **vacant**

Restaurant Industry (Florida Restaurant Association)
(term expires 01/2011)

Member:	Alternate:
• **Geoff Luebkemann** Florida Restaurant and Lodging Association 230 S. Adams Tallahassee, FL 32301	• **Susan McKinley** Florida Restaurant and Lodging Association 230 S. Adams Tallahassee, FL 32301

Consumer
(term expires 01/2011)

Member:	Alternate:
• **Bill Melton** 4619 Louvinia Dr. Tallahassee, FL 32311	• **Eanix Poole** 6310 Birchwood Rd. Marianna, FL 32448-5202

Local Government (Florida Association of Counties and Florida League of Cities)

(term expires 01/2011)

Member:	Alternate:
• **Jim Oskowis** City of Tallahassee Water Utility 3805 Springhill Rd. Tallahassee, FL 32305	• **vacant**