



# Ellis & Associates inc.

Environmental ■ Geotechnical ■ Materials Testing  
*Integrated Engineering Services*

December 12, 2006

Mr. David M. Wiggins  
Environmental Supervisor  
Environmental Health & Safety  
State of Florida  
Department of Management Services  
Division of Real Estate Development & Management  
4050 Esplanade Way, Suite 315-A  
Tallahassee, Florida 32399-0950

RE: Proposal for Nitrogen Loading Assessments in Multiple Locations  
Wekiva Study Area  
E&A Proposal No. P2219-0001

Dear Mr. Wiggins:

Ellis & Associates, Inc. (E&A) is pleased to provide this proposal for the above-referenced project. Please find attached the completed Technical Specifications and Fixed Price Presentation (Attachment 1).

If you have any questions or comments concerning this proposal, do not hesitate to contact the undersigned at (904) 880-0960.

Sincerely,

**ELLIS & ASSOCIATES, INC.**

Mark Mechling, P.E.  
Principal Engineer

Attachment 1 for Multiple Nitrogen Loading Assessments Wekiva Study Area, State Project  
Number DOH-26032000

cc: Eberhard Roeder, Ph.D., P.E., Florida Department of Health

**Attachment 1 for Multiple Nitrogen Loading Assessments Wekiva Study Area;**

**State Project Number DOH-26032000**

**A. SERVICES TO BE PROVIDED**

**1. Definition of Terms**

- a) Bureau - Bureau of Onsite Sewage Programs
- b) CBOD5- The carbonaceous biochemical oxygen demand over a 5-day period (mg/L)
- c) Department - Florida Department of Health, Bureau of Onsite Sewage Programs
- d) DMS – Department of Management Services
- e) FDEP – Florida Department of Environmental Protection
- f) Fecal Coliform – fecal bacteria that form blue colonies after incubation on M-FC medium (SM 9222D). Fecal coliform include E. coli
- g) Field parameters - parameters measured by one or more instruments at the time and general location of taking a sample: nitrate and ammonia at the option of provider, chloride, turbidity, dissolved oxygen, pH, electric conductivity, temperature, oxygen reduction potential, redox indicator such as ferric/ferrous iron; Substitutions and changes permissible contingent on approval by the department.
- h) OSTDS – Onsite Sewage Treatment and Disposal System, synonymous with OWTS
- i) OWTS – Onsite Wastewater Treatment System, synonymous with OSTDS
- j) Provider – entity or entities performing work outlined in this attachment for the Department of Management Services (DMS)
- k) RRAC – Research Review and Advisory Committee for the Bureau
- l) TN - Total Nitrogen concentration in a water sample (mg/L)
- m) TP - Total Phosphorus concentration in a water sample (mg/L)
- n) TSS - Total Suspended Solids concentration in a water sample (mg/L)
- o) WAVA – Wekiva Aquifer Vulnerability Assessment, see Florida Geological Survey Report of Investigation 104; available at [www.dep.state.fl.us/water/wastewater/dom/docs/RI\\_104a\\_FGS\\_Report.pdf](http://www.dep.state.fl.us/water/wastewater/dom/docs/RI_104a_FGS_Report.pdf)
- p) Wekiva Study Area - Area delineated by the Wekiva Parkway and Protection Act of 2004 (<http://www.dca.state.fl.us/fdcp/DCP/wekiva/wekivaact/study%20area%20map.pdf>)

**2. General Description**

- a) General statement: The provider(s) will be activated by DMS and will conduct multiple field investigations at individual onsite wastewater treatment systems (OWTS) to further identify and quantify the fate of nitrogen loaded by (OWTS) in the Wekiva Study Area.

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- b) Authority: The Bureau of Onsite Sewage Programs operates under Section 381.065, Florida Statutes
- c) Scope of Service: The field work shall take place in the Wekiva Study Area. All deliverables shall be completed no later than May 30, 2007. The provider shall prepare deliverables using software and hardware applications that are consistent with the Department standards (currently Microsoft software, PC-compatible)
- d) Major Program Goals: The goals of the Wekiva Onsite Nitrogen Fate and Transport Study are to systematically evaluate the fate and transport of nitrogen from OWTS in shallow groundwater. Nitrogen loading is important to the mission of the Bureau of Onsite Sewage Programs, "Protecting the public health and environment through a comprehensive onsite sewage program".

### **B Manner of Service Provision**

#### **1. Service Tasks**

##### a) Task List

###### *Task 1. Development of QAPP:*

- a) DMS will activate the provider(s) and will manage its contract with the provider(s) throughout the agreement period.

To guide the field work and laboratory analyses at each site contained in the subsequent tasks, the provider shall develop a project specific work and quality assurance project plan (QAPP). This QAPP shall summarize approach and the standard operating procedures covering field exploration, acquisition of field parameters, and the obtaining, transporting and analysis of samples.

- b) The provider shall submit a draft QAPP for review to the department and DMS within seven business days after project activation by DMS.
- c) The department shall provide comments and concerns within seven business days after receiving the draft QAPP. The provider shall address these in finalizing the QAPP. The final version shall be approved by the department before field work commences. Partial approval for individual tasks will be considered by the Department to expedite progress. This task shall be accomplished within one month of activation by DMS.

###### *Task 2. Site Selection*

RRAC has provided selection criteria for guidance in the selection process (see Table 1).

- a) The department, in coordination with local County Health Departments, will map subdivisions or delineated areas for each county in which criteria 2,4,5,7,8 are generally expected to be acceptable. The department will make an effort to first delineate areas for the highest priority water table condition (3). The Department will provide maps for each delineated area with summarized information about size of lots, age of systems, mapped soils, and soil descriptions generally encountered in permit records along with items 2, 3, 4, 5, 7, and 8 (from following table) to provider by December 8, 2006 for Seminole County, and by December 31 for Orange County delineated areas. If no appropriate area is identified in Lake County by January 10,

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2007, DOH and provider will select a third site from among the candidates previously provided in Seminole and Orange Counties.

Running number	Criterion	Positive or negative specification
1	County	One in each county (Lake, Orange, Seminole)
2	Depth to water table	The water table is reachable when using direct push (approximately 0-30 ft below ground surface)
3	Variety of water table conditions	deep seasonal high water table (>60") highest priority, shallow SHWT (<18") second, intermediate last (to coordinate with the WAVA protection zones if possible)
4	System Age	Sites that are 1982 or younger  Systems that are older than about seven years, without repair
5	Lot Size	Have a larger lot size so as to avoid plumes from other systems and have better site access (approximately 1-acre)
6	Fertilizer Application	Lots using minimum amounts of fertilizer
7	Irrigation	Lots not using reclaimed water
8	Water Supply	Public water
9	Home Use	Residential, no seasonal home usage
10	System Flow	No excessive number of occupants
11	WAVA vulnerability classes	If compatible with other criteria, one site in each vulnerability class

Table 1. Selection criteria provided by RRAC at the meeting on 10/24/2006

- b) After receipt of information in Task 2A from DOH, the provider will identify residences which comply with criteria 9 and 10 (2-5 occupants, and average flow less than code flow) are met, and confirm the applicability of criterion 2 through interviews of knowledgeable persons. An additional criterion will be that residences with advanced treatment (such as ATU's and Performance-based treatment systems) shall be excluded. Residences may be outside the delineated areas if all criteria are acceptable to the department according to the list above. The provider will list and describe such sites as they are identified for approval by the department and secure written permission for sampling of sewage and shallow groundwater. To allow for subsequent inaccessibility, unsuitability, or availability of resources for sampling, the

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provider will identify at least one and a maximum of three residences in each area delineated by DOH. Work on Task 3 may start with the first OWTS immediately after approval by the department of that residence. The DOH will provide approval of provider's list of residences within five business days of submittal to DOH.

### *Task 3. Overall OWTS characterization*

- a) For each OWTS, provider will develop a site map, such as used for DOH site evaluations, for which survey by tape measure and leveling relative to a reference elevation benchmark will be sufficient. Latitude and longitude will be determined for reference locations to allow mapping. The provider will record water use, interview the system users about use patterns, and will note recent weather and flooding patterns.
- b) For each residence site the provider will perform an existing system evaluation according to the procedure outlined in 64E-6 F.A.C. Pump-out of the septic tank shall occur after field work for Task 4 has been completed.
- c) As part of the existing system evaluation the provider will auger to characterize the soil material underneath the drainfield. This characterization shall be done according to USDA classification, and texture shall be confirmed by sieve analysis of two samples from the vadose zone at an elevation below the infiltrative surface.
- d) The provider shall sample septic tank effluent as a grab sample at an accessible location nearest to the drainfield (e.g. outlet filter, pump tank or pump vault) on three separate days and analyze samples for cBOD5, TSS, TN and TP. Field parameters of sewage will be measured at the same location on the same occasion.

If during existing system evaluation it is determined that the selected site is unsuitable based on improper operation of the septic system, the department may make an immediate (in the field) determination that the results of this task preclude further work on a site or make it unsuitable for further study, in which case Task 3 may remain incomplete and no further task will be performed on this OWTS.

### *Task 4. Instantaneous delineation of OWTS-effluent plume*

Approximately 15 probings with associated measurements will be performed at each site.

#### a) Probing

The plume of effluent in groundwater will be delineated with probes using direct push technologies or approved alternates that allow monitoring of field parameters and ground water sampling at a resolution of two feet or less (Nielsen et al., 2002; Charette and Allen, 2006).

Electrical conductivity will be the guiding parameter to delineate the boundary between effluent-influenced and other ground water, unless provider has provided and the Department has accepted in the QAPP validation for another diagnostic field parameter. Field parameters readings and water samples will be taken in regular intervals (2 foot or less) from the capillary fringe until the plume boundary has been crossed by five feet or probe refusal is reached. To address the creation of preferential pathways, the provider will proceed with probing with appropriate procedures.

A typical probing scheme will look as follows:

1. The provider will probe at approximately three locations (putative upstream, downstream, and sideways) at some distance from the drainfield to a depth of at

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least 20 feet under the water table or refusal to determine background concentrations. Temporary piezometers will be installed and surveyed at these locations to determine hydraulic gradient. Hydraulic conductivity estimates based on subsurface properties combined with the gradient estimates can be used to assess the direction, velocity, depth, width of the plume.

2. The provider will probe at approximately four locations close to the drainfield or between drainfield trenches to determine the depth of the plume, mounding, and concentrations at the water table.
3. The provider will probe approximately eight locations to obtain at least one cross section of the plume and assess attenuation downgradient from the source. If near-drainfield probing, above, indicates that the plume is moving predominantly vertical, these probes will serve to further delineate the horizontal and vertical extent of the plume.

If results of the first sites indicate and the provider and the department mutually agree that a different number of probings is more appropriate, the revised number will be used in subsequent site assessments. The last sites may have fewer probings to address budget constraints.

### b) Water quality analysis

1. All water samples will be analyzed for TN. Half of the water samples, usually including the topmost sample of every probing, will be analyzed for cBOD5. 10% of samples, usually including the topmost sample of a probing, will be analyzed for TSS, TP, and fecal coliforms to assess the efficacy of the vadose zone in removing these contaminants and preferential flow paths. Analyses will be performed in NELAP-certified labs within the applicable holding times. QA/QC samples to the extent of approximately 10% of the number of laboratory analyzed samples shall be included. If results for the first site establish that field methods, such as ammonia and nitrate probes or colorimetric kits, result in an average relative absolute deviation from the laboratory analysis of less than 25% for lab results under 2 mg/L and less than 10% for samples above 2 mg/L and a 90%-tile relative absolute deviation less than three times these values, laboratory analyses for the respective parameters can be halved.
2. Approximately four samples at each site, which may include a septic tank effluent sample, will be analyzed for nitrogen isotopes to characterize the isotope ratios for evidence of denitrification upstream, directly underneath the drainfield, and some distance in the plume downstream.

### *Task 5 Data interpretation and mass balance modeling*

Data interpretation shall include at least:

- a) Tabulation of results and graphical representation of parameter concentrations across the cross section, and as applicable along a long section, of the plume;
- b) A mass balance of a conservative tracer and nitrogen, in which loading of tracer and nitrogen inputs from the OWTS to the water table and from upstream are balanced by first or zeroth order denitrification and transport through the cross section established during field work (e.g., Anderson, 1998). Results will be compared to values given in reviews such as by McCray et al. (2005).

### *Task 6. Report*

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Data Analysis and Report Writing. Provider shall summarize work, interpret obtained data, and develop conclusions. The report will include:

- i. Executive Summary
  - ii. Introduction - Provides background information about Wekiva Study Area, nitrogen, and OWTS
  - iii. Methodology - Describe the approach and analytical techniques used (QAPP)
  - iv. Results – Summary of results from Tasks 2 through 5.
  - v. Discussion - The provider will discuss results and observations and assess patterns and validity. In particular, based on available data, such as groundwater monitoring by others or literature, the provider will discuss the effect that seasonal variability has on the observations and reach a conclusion what, if any adjustments, will be made to the data before use as either seasonal or yearly averages.
  - vi. Conclusions -
  - vii. Literature citations - List all references
  - viii. Appendices - Include all field records, data, charts, graphics, etc.
- a) The provider shall present an update on the status of the project at a RRAC-meeting in February 2007.
- b) The provider shall submit twenty copies of a draft final report for the first site investigated and an electronic copy to the department by March 23, 2007. The provider will give a presentation on this draft final report to the RRAC early in April 2007. The department shall be responsible for soliciting review of the draft final report by interested parties.

In developing the final report, the provider shall consider the comments of the department and other reviewers as may have commented. The department will provide these comments for the first site investigated by April 13, 2007.

The second draft report (for the first and subsequent sites investigated) will be provided to RRAC by May 2, 2006. The department shall be responsible for soliciting review of the draft report by interested parties. The department will provide these comments by May 16, 2007

- c) The provider shall submit twenty copies of the final report for the first site and subsequent sites and also supply the department with at least one electronic copy of the final report and of tabulated analytical results in a format compatible with department software May 30, 2007. The provider will give a presentation on this draft final report to the RRAC early in June 2007

### b) Task limits

The provider shall not perform any tasks related to the project other than those described in the Task List without the express written consent of the Department.

## **2. Staffing Requirements**

### a) Staffing levels and qualifications

Provider will have at least one project manager and a qualified person to do field work available on staff. Qualifications shall include evidence of either work experience or training in use of direct push equipment to take ground water samplers at a high resolution. If such staff ceases to be available, provider may substitute staff with equivalent qualifications, provided that the substitute shall be trained on the QAPP by the provider, and the Department is given two weeks notice of such a change and the provider's plan for the transition. Subcontractors may be used by the provider; their role shall be described in the QAPP.

### 3. Service Location and Equipment

The service shall be performed at the provider's lab and work environment, field locations in the Wekiva Study Area and the location of any certified labs used in the analysis of samples. The provider shall provide any equipment necessary to perform the tasks. All deliverables shall be delivered to the Department of Health, Bureau of Onsite Sewage Programs; 4042 Bald Cypress Way Room #240 (physical); 4052 Bald Cypress Way Bin#A-08 (mail); Tallahassee FL 32399-1713.

### 4. Deliverables

#### a) Service Tasks

- Task 1: a) copy of activation letter from DMS to provider  
b) one draft QAPP for the project submitted to the department  
c) one final QAPP, approved by the department
- Task 2. Site Selection: For each OWTS: Site description and permission to sample agreement for an onsite wastewater treatment system approved for inclusion by the department (min. 3, max. 9)
- Task 3. Overall OWTS characterization. For each OWTS (min. 3):  
a) site map and system use descriptions  
b) Existing system evaluation,  
c) Two soil sieve analyses to USDA classification,  
d) Results of three septic tank effluent analyses
- Task 4. Instantaneous Delineation of Plume. For each OWTS, approximately 15 probings:  
a) For each probing: results of probing and field parameters  
b) For each OWTS: results of laboratory analysis,  
1. Dependent on number of samples taken:  
TN,  
cBOD5  
TSS, TP, fecal coliform  
2. Four samples for nitrogen isotopes
- Task 5. Data interpretation and mass balance modeling:* For each OWTS  
a) tabulations of results and cross and/or long sections of measured parameters in plume  
b) tracer and nitrogen loading from septic tank effluent, to the water table, and attenuation factors in shallow ground water
- Task 6. Report on field investigations of OWTS nitrogen loading in the Wekiva Study Area.*  
a) update presentation for RRAC in February 2007  
b) electronic and 20 copies of draft report of first site investigated by March 23, 2007 and presentation to RRAC in early April 2007  
c) electronic and 20 copies of final report of first and subsequent sites by May 30, 2007 and presentation to RRAC in early June 2007

#### b) Reports:

Where this agreement requires the delivery of reports to the Department, mere receipt by the Department shall not be construed to mean or imply acceptance of those reports. It is specifically intended by the parties that acceptance of required reports shall constitute a separate act of the Department. The Department reserves the right to reject reports as incomplete, inadequate or unacceptable according to the parameters set forth in this agreement. The Department, at its

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option, may allow additional time within which the provider may remedy the objections noted by the Department.

### c) Records and Documentation:

Copies of deliverables shall be kept at the provider's office in electronic and paper format. Field records shall be kept at the provider's office in the format they were obtained. See the provisions of the standard contract for length of record keeping.

## **5. Performance Specifications**

- a) Outcomes shall be measured in service tasks as specified in 4 a. The deliverables will be evaluated for accuracy and percentage completed.
- b) Monitoring and Evaluation Methodology. The department shall monitor performance of the provider by review of the deliverables and by attending at least one day of field work to observe if sampling procedures outlined in the QAPP are followed. Any observed shortcomings shall be noted to the provider and resolved.

## **6. Provider responsibility**

The provider shall perform the tasks outlined above. DMS shall activate and manage the contract between the provider and DMS.

## **7. Department responsibility**

The department shall perform task 2a) and facilitate review and approval of QAPP and other deliverables. Department staff shall also be present for at least one workday during field work performed by provider.

## **C Method of Payment**

### **1. Payment Clause.**

This is a fixed price (unit cost) contract. The department shall pay the provider and DMS, upon satisfactory completion of the services outlined in this attachment I to the client agency agreement between DMS and the department, a total dollar amount not to exceed \$193,000.00 to the provider and \$7,000.00 to DMS, subject to the availability of funds.

### **Fixed Price Presentation**

Deliverables, listed in B4, developed during completion of the tasks described in B1a) shall be paid according to the following schedule:

Deliverable	Due Date	Unit	Price (due provider except task 1a)
Task 1 a) copy of activation letter to provider by DMS		One	\$7,000 to DMS
Task 1 b) (QAPP draft)		One	\$1,500.00
Task 1 c) (final QAPP)		One	\$250.00
Task 2 b) Approved sites, permission to sample		Each site (3-9)	\$600.00
Task 3 Overall OWTS Characterization			

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a) site map and use descriptions		Each OWTS	\$750.00
b) existing system evaluation		Each OWTS	\$1,500.00
c) two soil sieve analyses		Each OWTS	\$250.00
d) three septic tank effluent analyses		Each OWTS	\$383.00
<b>Task 4 Instantaneous Plume Delineation</b>			
a) results of probing and field parameters		Each probing	\$2,480.00
b) results of laboratory analysis			
TN		Each analysis	\$67.85
cBOD5		Each analysis	\$23.00
TSS, TP, fecal coliform		Each set of analyses	\$65.55
four analyses for nitrogen isotopes		Each OWTS	\$1,150.00
compensation for property owner for costs and inconvenience associated with field work		Each OWTS	\$800.00
<b>Task 5 Data interpretation and mass balance modeling</b>			
a) tabulation of results and cross and/or long sections of measured parameters in plume		each OWTS	\$3,500.00
b) tracer and nitrogen loading from septic tank effluent, to the water table, and attenuation factors in shallow ground water		each OWTS	\$3,500.00
<b>Task 6 Reports</b>			
a) update presentation at RRAC meeting		One	\$1,000.00
b) draft final report and presentation		One	\$14,000.00
c) final report and presentation		One	\$3,500.00

**2. Invoice Requirements.**

The provider shall submit an invoice to the DMS contract manager on a monthly basis using the form of attachment 2, within 30 days following the end of the period for which payment is being requested. DMS contract manager. DMS contract manager will review and forward to the department Documentation of completion of service tasks shall be submitted to the department prior to, or with the invoice. Payment may be authorized only for service tasks on the invoice that are in accord with the above list and other terms and conditions of this agreement. Partially completed tasks may be invoiced and paid based on the percentage of the service task completed.

**D Special Provisions:**

Changes to this attachment within the general description of work may be made by the department by written notification from the Bureau to DMS' contract manager and the provider.

**E Literature**

Anderson, D.L., 1998. Natural denitrification in groundwater impacted by onsite wastewater treatment systems. In: On-site wastewater treatment: Proceedings of the eighth

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national symposium on individual and small community sewage systems. St. Joseph, MI: American Society of Agricultural Engineers. 336-345

Charette, M.A., Allen, M.C., 2006. Precision ground water sampling in coastal aquifers using a direct-push, shielded-screen well-point system. *Ground Water Monitoring and Remediation*. 26(2): 87-93

McCray, J.E., Kirkland, S.L., Siegrist, R.L., Thyne, G.D., 2005. Model parameters for simulating fate and transport of on-site wastewater nutrients. *Ground Water* 43 no.4: 628-639.

Nielsen, A. M., DeCarvalho, A.J., McAvay, D.C., Kravetz, L., Cano, M.L., Anderson, D.L., 2002. Investigation of an onsite wastewater treatment system in sandy soil: characterization and fate of anionic and nonionic surfactants. *Env. Toxicology and Chemistry*, 21(12): 2606-2616.

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