

January 13, 2021
ECT Proposal No. P20RA-B1511

Mr. Anthony Gubler, Environmental Specialist
Save Our Indian River Lagoon Program
2725 Judge Fran Jamieson Way
Building A, Room 219
Viera, FL 32940

**Re: Proposal for Monitoring Well Installation and Monitoring Services
Alternative Drainfield Monitoring Assessment
Six Locations in Brevard County, Florida**

Dear Mr. Gubler:

Environmental Consulting & Technology, Inc. (ECT) is pleased to submit this technical scope of work and cost proposal to Brevard County for monitoring well installation and monitoring services at six locations in Brevard County, Florida. Professional environmental services will be performed in accordance with the Terms and Conditions included within Contract No. 5-19-11 Engineering Consulting Services.

Background

Per your email on October 6, 2020, it is our understanding that Brevard County desires to install two monitoring wells (MWs) at six separate locations in Brevard County, and then monitor/sample these MWs quarterly for a period of one year. **Attachment 1** contains the email request for a statement of work, along with the Quality Assurance Project Plan (QAPP) used for this proposal.

Scope of Work

Outlined below are the proposed activities to install twelve MWs (two each at six separate locations) along with performing quarterly monitoring/sampling of these wells.

Task 1: Monitoring Well Installation

ECT will utilize Groundwater Protection Inc., a Florida licensed water well driller, to install two MWs at each of the six designated locations. Each MW will be installed to measure nutrient levels in the groundwater below the septic tank drainfield (STD). MWs will be installed outside, but adjacent to the STD and media layers, preferentially in the downgradient groundwater direction as estimated. One MW will be installed closer to the

header; the second MW will be installed further from the header. The top of casing or other field reference elevation relative to the in-ground nitrogen-reducing biofilter (INRB) layer and a benchmark will be determined. To increase the likelihood that the MW screens will intersect the water table, the MW screens will extend 12 inches deeper and higher beyond the range of water tables shown in the soil survey for that location. Each MW will be constructed of new and unused materials and installed to an approximate depth not to exceed 12 feet below land surface (bls). The MWs will be constructed with approximately two feet of 2-inch diameter polyvinyl-chloride (PVC) riser flush-threaded to approximately 10 feet of 2-inch diameter 0.006-inch machine slotted screen. Each MW will have a locking expansion cap and is finished at surface with an 8-inch steel manhole. Soil investigative derived wastes (IDWs) generated during the MW installation activities will be spread on-site.

ECT will provide a letter report to Brevard County including field notes, photographs, global positioning system (GPS) coordinates, and other information in tabular or graphical format to document the MW installation process.

Task 2: First MW Sampling and Data Collection Event

During the first sampling event, the effluent collected in the sump will be collected for analysis, the remainder purged, then another sample collected the following day. The results of the two samples will be compared for similarity. If the results are not similar, the remaining samples will be taken after purging of the lysimeter. If the results are similar, the lysimeters will not be purged before every sampling event. Water level in the sump will be measured before sampling by a Solinst Water Level Meter Model 102.

Septic effluent sampling will be from a p-trap sampling port within the pipe between the septic tank and the header, the pump tank, or the effluent chamber of resident's septic tank one foot below the water surface, in that order of preference.

Groundwater quality beneath the STD will be measured using a peristaltic pump. The water table elevation relative to the bottom of the denitrification media will be determined by the monitoring wells. Water level in the wells will be measured by a Solinst Water Level Meter Model 102 (or equivalent). Monitoring well field parameter (Temperature, Specific Conductivity, Salinity, Dissolved Oxygen and pH) will be measured with a Hydrolab HL4 multiparameter Sonde (or equivalent).

Grab samples will be collected for laboratory analysis for the following analytes at the indicated sampling locations:

- Total Kjeldahl Nitrogen (TKN)
- Nitrate/Nitrite-Nitrogen (NO_x)
- Chloride (Cl)

- Total Phosphorus
- Ammonia (NH₄)
- Total Organic Carbon
- Fecal Coliform (in effluent and wells)
- Carbonaceous Biochemical Oxygen Demand after five Days (CBOD₅) (in effluent)
- Total Suspended Solids (TSS) (in effluent)
- Orthophosphate
- Calculated Values: total nitrogen and organic nitrogen

A total of 91 samples will be collected during a task 2 for all parameter except Fecal Coliform, not including duplicates and equipment blanks. Twelve samples will be collected from the monitoring wells, 72 samples will be collected from the lysimeters, and seven samples will be collected from the septic effluent. Samples for fecal coliform have been limited to attempt to meet hold times. One sample from each of the monitoring wells, one lysimeter at each site and one sample from the effluent will be collected at each site. the samples will be expedited to the lab for processing.

If the lysimeters do not provide enough volume for all analytes, priority will be given to: Total Kjeldahl Nitrogen, Nitrate/Nitrite and Chloride. If more sample volume is available than required for the analysis of nitrogen species, Total Phosphorus, Ammonia and the other parameters in the listed order will be included.

Sample collection and documentation procedures when appropriate will conform to the requirements and criteria in DEP SOPs (DEP-SOP-001/01). All sample containers will be prepared and provided by the commercial laboratory contracted for analyzing the samples collected by the project. Sample preservation and holding times for all project samples and analytes will conform to DEP SOP Table FS 1000-4. ECT will utilize Pace Analytical Services (Pace), Department of Health, Bureau of Laboratories, and Certificate No.'s E83079 for the laboratory analyses.

Sample duplicates will be collected for Total Kjeldahl Nitrogen, Nitrate/Nitrite and Chloride when sample volume is greater than 2 liters. Equipment or field blanks will be taken after every 12 grab samples. DEP SOP FQ 1000 Field Quality Control will be followed for duplicates, equipment blanks, and field blanks.

Other supporting data to be collected includes current environmental and weather conditions, 7-day antecedent rainfall; resident's water meter reading, and water levels in wells and lysimeter sumps.

Task 3: Second, Third, and Fourth MW Sampling and Data Collection Event

Based upon the first sampling and data collection event, sample collection will occur either prior to, or after purging, the lysimeter. Water level in the sump will be measured before sampling by a Solinst Water Level Meter Model 102 (or equivalent).

Septic effluent sampling will be from a p-trap sampling port within the pipe between the septic tank and the header, the pump tank, or the effluent chamber of resident's septic tank one foot below the water surface, in that order of preference.

Groundwater quality beneath the STD will be measured using a peristaltic pump. The water table elevation relative to the bottom of the denitrification media will be determined by the monitoring wells. Water level in the wells will be measured by a Solinst Water Level Meter Model 102 (or equivalent). Monitoring well field parameter (Temperature, Specific Conductivity, Salinity, Dissolved Oxygen and pH) will be measured with a Hydrolab HL4 multiparameter Sonde (or equivalent).

Grab samples will be collected for laboratory analysis for the following analytes at the indicated sampling locations:

- Total Kjeldahl Nitrogen (TKN)
- Nitrate/Nitrite-Nitrogen (NO_x)
- Chloride (Cl)
- Total Phosphorus
- Ammonia (NH₄)
- Total Organic Carbon
- Fecal Coliform (in effluent and wells)
- Carbonaceous Biochemical Oxygen Demand after five Days (CBOD₅) (in effluent)
- Total Suspended Solids (TSS) (in effluent)
- Orthophosphate
- Calculated Values: total nitrogen and organic nitrogen

A total of 90 samples will be collected per event during a task 3 for all parameter except Fecal Coliform, not including duplicates and equipment blanks. Task three included a total of three sampling events. Each event will include twelve samples collected from the monitoring wells, 72 samples collected from the lysimeters, and six samples collected from the septic effluent. Samples for fecal coliform have been limited to attempt to meet hold times. One sample from each of the monitoring wells, one lysimeter at each site and one sample from the effluent will be collected at each site per event. the samples will be expedited to the lab for processing.

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If the lysimeters do not provide enough volume for all analytes, priority will be given to: Total Kjeldahl Nitrogen, Nitrate/Nitrite and Chloride. If more sample volume is available than required for the analysis of nitrogen species, Total Phosphorus, Ammonia and the other parameters in the listed order will be included.

Sample collection and documentation procedures when appropriate will conform to the requirements and criteria in DEP SOPs (DEP-SOP-001/01). All sample containers will be prepared and provided by the commercial laboratory contracted for analyzing the samples collected by the project. Sample preservation and holding times for all project samples and analytes will conform to DEP SOP Table FS 1000-4. ECT will utilize Pace for the laboratory analyses.

Sample duplicates will be collected for Total Kjeldahl Nitrogen, Nitrate/Nitrite and Chloride when sample volume is greater than 2 liters. Equipment or field blanks will be taken after every 12 grab samples. DEP SOP FQ 1000 Field Quality Control will be followed for duplicates, equipment blanks, and field blanks.

Other supporting data to be collected includes current environmental and weather conditions, 7-day antecedent rainfall; resident's water meter reading, and water levels in wells and lysimeter sumps.

Task 4: Final Report

ECT will provide a letter report to Brevard County including field notes, photographs, and other information in tabular or graphical format to document the sampling activities. The letter report will summarize the data and provide interpretation of the data as specified in the QAPP

Schedule and Fee

ECT proposes the following schedule for completion of Tasks 1 through 4:

- Task 1: 60 days after receipt of PO.
- Task 2: 14 days after completion of Task 1.
- Task 3: Approximately 90 days between sampling events.
- Task 4: 14 days after completion of Task 3.

ECT has estimated the costs based upon currently available information. For unforeseen events, ECT would get approval from Brevard County prior to beginning any additional work. The proposal amounts are outlined in the following text:

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Task 1: MW Installation	\$22,807.85
Task 2: First MW Sampling and Data Collection Event	\$39,493.75
Task 3: Second, Third, and Fourth MW Sampling and Data Collection Event	\$117,558.81
Task 4: Final Report	\$7,054.91

Total Estimated Costs	\$186,915.32
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Services performed at Brevard County's request beyond that defined by the Scope of Work and/or delays caused by unforeseen occurrences including, but not limited to unfavorable weather conditions, partial or complete plant or process shutdown, strikes, floods, or fires which extend the effort required shall constitute a Change-of-Scope, and will be documented by a change order. If a specific fee for this additional work has not been fixed, then ECT's charge for services will be at the hourly rate for individuals working directly on the project, plus reimbursable expenses, as defined in Contract No. 5-19-11. **Attachment 2** includes figures depicting the monitoring locations and a cost estimate of the proposed work.

Excluded Items

Items excluded from this proposal are listed below along with assumptions made.

- Wetland studies, endangered species studies, ecological studies, or related permit procurement.
- Governmental or impact fees as may be required.
- Extra work as may be required due to changes in laws, rules, regulations, ordinances, codes, or orders of governmental authorities subsequent to the preparation of plans, permits and construction beyond the engineer's control.
- Architectural or structural plans.
- Structural engineering of any kind.
- Geotechnical study.
- Remedial actions.

Assumptions

- ECT and their subcontractors will be granted reasonable access to the properties.
- Work will be completed during normal business hours.
- Brevard County will be responsible for securing all work sites, and ECT shall not be responsible for any acts or damages due to vandalism, theft, wildfire, adverse weather conditions, pandemics, or acts of God.

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Use of Proposal/Report

This proposal is solely intended for the services as described in the Scope of Work, which may not be modified or amended, unless the changes are first agreed to by the client and ECT. Use of this proposal and resulting documents, including the final report is limited to the above referenced project and client. No other use is authorized by ECT.

Authorization

If this proposal is acceptable in terms of scope, schedule, and fee, please indicate your acceptance by issuing ECT a Purchase Order. We will then proceed with the performance of services.

Closing

ECT appreciates the opportunity to be of service to Brevard County. Should you have any questions regarding the outlined scope of work, or if we may be of any further assistance, please contact Chris Fagerstrom at (386) 427-0694 (office) or via cell at 386-852-0387.

Sincerely,

ENVIRONMENTAL CONSULTING & TECHNOLOGY, INC.



Chris R. Fagerstrom, P.E.
Principal Engineer
cfagerstrom@ectinc.com



Jeffrey J. Peters, P.G.
Principal Scientist
jpeters@ectinc.com

Attachments

Attachment 1	Email request for a statement of work, QAPP
Attachment 2	Figures depicting the monitoring locations and a cost estimate

Attachment 1

From: [Gubler, Anthony](#)
To: [Chris Fagerstrom](#)
Subject: RE: Request for Statement of Work
Date: Thursday, October 08, 2020 10:05:44 AM
Attachments: [Brevard Septic Denitrification Monitoring Plan_revisedForWastewaterMedia_final_20200417.pdf](#)

Thank you Chris.

The QAPP is attached.

Anthony Gubler

Save Our Indian River Lagoon Program

Cell: 321-205-7712 | Office: 321-633-2016

From: Chris Fagerstrom <cfagerstrom@ectinc.com>
Sent: Thursday, October 8, 2020 9:49 AM
To: Gubler, Anthony <Anthony.Gubler@brevardfl.gov>
Subject: RE: Request for Statement of Work

[EXTERNAL EMAIL] DO NOT CLICK links or attachments unless you recognize the sender and know the content is safe.

Hi Anthony,

Sorry for the delay in getting back to you. We can definitely help with this. Our samplers are trained in FDEP SOPs and we have all of our own equipment. We work with both Pace and ERD. We typically use Pace.

I'll review the scope a little more and get back to you with any questions. Can you send me the QAPP?

Thank you for reaching out to us for this work.

I am working remotely, please reach me on my cell phone. 386-852-0387

Chris R. Fagerstrom, P.E.

Principal Engineer | Senior Water Resources Manager



707 East Third Avenue | New Smyrna Beach, Florida 32169

Office: (386) 427-0694 x 305 | Mobile: (386) 852-0387 | Fax: (386) 427-0889

cfagerstrom@ectinc.com | www.ectinc.com

LinkedIn: www.linkedin.com/chris-fagerstrom

From: Gubler, Anthony <Anthony.Gubler@brevardfl.gov>

Sent: Tuesday, October 06, 2020 4:47 PM

To: Chris Fagerstrom <cfagerstrom@ectinc.com>

Subject: Request for Statement of Work

Mr. Fagerstrom,

I'm with Brevard County Natural Resources Management Department and seeking well installation and monitoring services under the Professional Services Contract executed this past April.

We have installed six experimental septic systems under a memorandum of understanding with the Florida Department of Health. The QAPP approved by FDOH is attached.

The services needed for this project include:

- Installation of 12 monitoring wells (two per septic system as shown in Figure 1 of the attached QAPP)
- Monitoring/sampling of those 12 wells
- Monitoring/sampling of 72 lysimeters already installed under the septic systems
- Monitoring/sampling of septic effluent

Per the QAPP, two monitoring wells will be installed for each septic system outside, but adjacent to the drainfield and media layers, preferentially in the downgradient groundwater direction as estimated. One well will be installed closer to the header; the second well will be installed further from the header. The top of casing or other field reference elevation relative to the INRB layer and a benchmark will be determined. To increase the likelihood that the monitoring well screens will intersect the water table, the screens will extend 12 inches deeper and higher beyond the range of water tables shown in the soil survey for that location.

As outlined on page four and five of the QAPP, sampling will consist of four quarterly samples using a peristaltic pump. Septic effluent sampling will be from a p-trap sampling port within the pipe between the septic tank and the header or from the effluent chamber of resident's septic tank one foot below the water surface. Sampling of the lysimeters beneath the drainfield and the groundwater wells will be by peristaltic pump. The water table elevation relative to the bottom of the denitrification media will be determined by the monitoring wells. Water level in the wells will be measured by a Solinst Water Level Meter Model 102. Monitoring well field parameters will be taken at the time of sampling (Temperature, Specific Conductivity, Salinity, Dissolved Oxygen and pH).

Total Kjeldahl Nitrogen, Nitrate/Nitrite and Chloride are the priority analytes. If enough sample volume is available then Total Phosphorus, Ammonia and the other parameters will be included. Sample collection and documentation procedures when appropriate will conform to the requirements and criteria in DEP SOPs. All sample containers will be prepared and provided by the commercial laboratory contracted for analyzing the samples collected by the project. Sample preservation and holding times for all project samples and analytes will conform to DEP SOP Table FS 1000-4. Environmental Research & Design or Pace Analytical Inc. are the labs approved for use under the QAPP.

Sample duplicates will be collected for Total Kjeldahl Nitrogen, Nitrate/Nitrite and Chloride when sample volume is greater than 2 liters. Equipment or field blanks will be taken after every 12 grab samples. DEP SOP FQ 1000 Field Quality Control will be followed for duplicates, equipment blanks, and field blanks. Other supporting data to be collected includes current environmental and weather conditions, 7-day antecedent rainfall; resident's water meter reading, and water levels in wells and lysimeter sumps.

The sites are all located in Titusville, FL at the following addresses:

- 2485 Dolphin Rd. Titusville, 32780
- 2465 Dolphin Rd. Titusville, 32780
- 2700 Gregory Ave. Titusville, 32796
- 2305 Dolphin Rd. Titusville, 32780
- 2425 Dolphin Rd. Titusville, 32780
- 2705 Gregory Ave. Titusville, 32796

For this work, will the samplers be trained in FDEP protocols? Will they be using their own equipment, collecting sample containers, and shipping/delivering samples? Can they use Pace Analytical Inc or Environmental Research & Design?

I can be reached on my cellphone at 321-205-7712 If it would be easier to discuss the details of this project or statement of work over the phone.

Thank you,

ANTHONY GUBLER

SAVE OUR INDIAN RIVER LAGOON PROGRAM

2725 Judge Fran Jamieson Way
Bldg A, Room 219
Viera, FL 32940

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Assessment of Alternative Nitrogen-Reducing Media in an In-Ground Nitrogen-Reducing Biofilter Underneath a Septic System Drainfield

Brevard County Natural Resources Management Department
2725 Judge Fran Jamieson Way, Building A-219
Viera, Florida 32940
Phone: 321-633-2016

Project Manager:
Anthony Gubler, Environmental Specialist
Anthony.Gubler@brevardfl.gov

Data Manager:
Terry Williamson, Environmental Section Supervisor
Terry.Williamson@brevardfl.gov



Final Version
April 17, 2020

(Revised Final Version that Includes the Wastewater Filtration Media)

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Introduction

This project is located in the Indian River Lagoon watershed which is subject to a county ordinance requiring 65% nitrogen reduction in certain locations. The Indian River Lagoon is also located within the North Indian River Lagoon, Central Indian River Lagoon, and Banana River Lagoon Basin Management Action Plans (BMAPs). Indian River Lagoon BMAPs are requiring nutrient reduction; however, they do not require septic system specific management. Septic systems contribute about 18% of total nitrogen loading and 33% of new nitrogen loading to the Indian River Lagoon.

This project consists of testing and monitoring different types of media in In-ground Nitrogen-reducing Biofilter (INRB) drainfields. Multiple media with known or expected denitrifying abilities will be substituted in place of woodchips. Six systems using Bold & Gold Wastewater Filtration Media will be included in the initial phase of this study. This media is composed of, by volume, 5% clay, 10% tire crumb, 10% pine sawdust, and 75% mason sand. During this test, the media will be tested using only the components described above and will not be mixed with any other fine aggregates. The grainsize distributions of the key media components were provided to the Department of Health's Onsite Sewage Program Office (OSP) on March 24, 2020. Because the fine aggregate component of the media is not in compliance with the

existing Florida Administrative Code (FAC) rule 64E-6.009(7)(a), the approval of the media after successful testing will have to address this. Two possible pathways will be the pending revision of FAC rule 64E-6.009(7)(a) or a petition for and the Department of Health granting a variance according to Chapter 120, Florida Statutes. Overall performance of the in-ground nitrogen-reducing media will be estimated as the percent difference between the total nitrogen concentrations in the septic tank effluent and effluent captured in the deep lysimeters below the media layer.

The Save Our Indian River Lagoon Program (SOIRL) will contract for the design, permitting, installation, monitoring, and reporting of nitrogen removing septic drainfields. SOIRL will prepare summary reports for the Florida Department of Health that include project locations and descriptions and resulting data and summaries.

Site Selection

Sampling sites will be residential properties selected on potential nutrient impacts to the Indian River Lagoon as mapped by Brevard County, homeowner participation, and compliance with septic permitting requirements. Priority will be given to full-time residences with water meters and average sized septic systems. For the purpose of this study, an average sized septic system is more than half a person per bedroom, an example being two persons in a three-bedroom residence. If a selected site is on a private water system, a water meter will need to be installed to estimate flow into the septic system.

System Description and Construction

The drainfields will be constructed as described in Rule 64E-6.009(7), of the Florida Administrative Code (FAC) (See Figure 1). The drainfield shall be installed over sand fill material that is at least 18 inches thick and extends at least one foot beyond the perimeter of the drainfield. The drainfield shall be centered above the sand fill area. Below the sand fill material layer, a media layer that is at least 12 inches thick and extends beneath the entire drainfield absorption surface and extends at least 24 inches beyond the perimeter of any portion of the drainfield absorption surface and any other effluent release point. The media layer shall also extend upward along the boundary of the sand fill material to a point four to six inches below the bottom of the drainfield. The drainfield shall be centered above the media layer. The bottom of the media layer shall be at least 6 inches above the wet season water table.

The sampling stations will include an effluent port, six shallow pan lysimeters, six deep pan lysimeters, and two monitoring wells as shown in Figure 1.

Pan lysimeters will be used to collect effluent samples (See Figure 2). These are constructed with a 26" diameter plastic water heater drain pan with a 2" bath drain in the middle of the pan. 12 mesh aluminium screen is glued on top of the bath drain and pea gravel is placed in the

pan over the screen to filter media and sand above the drain. A 2" PVC drain pipe is angled down from the drain by at minimum of a 20-degree angle to the sample sump. The sample sump is 2" PVC pipe capped on the bottom. A relief pipe with screened holes at the end/or bottom will exit the sump at least 20" from the bottom to ensure that the sump and drain pipe combined holds two liters of sample while keeping the water level in the sump below the bottom of the drain pan. The relief pipe will be located above the high groundwater table and directed away from underlying pan lysimeters.

Twelve pan lysimeters will be installed per drainfield for effluent collection (See Figure 1). Six (6) shallow lysimeters will be installed at the bottom of the sand fill layer (at the top of the denitrifying media) and six (6) deep lysimeters will be installed at the bottom of the denitrifying media layer. The first rows of shallow and deep lysimeters will be between two and five feet from the header because of potentially stronger loading at the head of the drainfield in gravity-fed drainfields. The second rows of shallow and deep lysimeters will be between 12 and 15 feet from the header.

For pan lysimeter installation, a V-shaped hole will be dug out from the material below the desired height of the pan to place the sump and PVC piping. The material will then be compacted and levelled around the piping to meet the drainfield standards in Rule 64E-6.009(7), FAC. The drain pan will then be attached to the sump piping and filled with pea gravel. The sediment below the pan must be compacted enough to ensure that the pan remains level and at the correct depth post construction. The sump opening will be protected during installation to ensure that it is free of sediment or media.

Two (2) monitoring wells will be installed to measure nutrient levels in the groundwater below the drainfield (DEP-SOP-001/01 FS 2200 Groundwater Sampling). Monitoring wells will be installed outside, but adjacent to the drainfield and media layers, preferentially in the downgradient groundwater direction as estimated. One well will be installed closer to the header; the second well will be installed further from the header. The top of casing or other field reference elevation relative to the INRB layer and a benchmark will be determined. To increase the likelihood that the monitoring well screens will intersect the water table, the screens will extend 12 inches deeper and higher beyond the range of water tables shown in the soil survey for that location.

Construction will be inspected by the Florida Department of Health per permit requirements and monitored by County staff to ensure compliance with the as-builts.

Sampling Methods

Four quarterly grab samples will be collected at each of the six systems by peristaltic pump. Sample volume can be expected to be a limiting factor. If not enough sample volume is

collected from a lysimeter during a specific sampling event, the lysimeter in question shall be re-sampled until enough sample volume is collected for the intended water quality parameters for at least one lysimeter at each depth but not to exceed three consecutive days of sampling. A re-sampling event will only apply to the first row of pan lysimeters closest to the header (at least one sample should be the required volume for each depth).

During the first sampling event, the effluent collected in the sump will be collected for analysis, the remainder purged, then another sample collected the following day. The results of the two samples will be compared for similarity. If the results are not similar, the remaining samples will be taken after purging of the lysimeter. If the results are similar, the lysimeters will not be purged before every sampling event. Water level in the sump will be measured before sampling by a Solinst Water Level Meter Model 102.

Septic effluent sampling will be from a p-trap sampling port within the pipe between the septic tank and the header, the pump tank, or the effluent chamber of resident's septic tank one foot below the water surface, in that order of preference.

Groundwater quality beneath the drainfield will be measured quarterly using a peristaltic pump. The water table elevation relative to the bottom of the denitrification media will be determined by the monitoring wells. Water level in the wells will be measured by a Solinst Water Level Meter Model 102. Monitoring well field parameter (Temperature, Specific Conductivity, Salinity, Dissolved Oxygen and pH) will be measured with a Hydrolab HL4 multiparameter Sonde.

Grab samples will be collected for laboratory analysis for the following analytes at the indicated sampling locations:

- Total Kjeldahl Nitrogen (TKN)
- Nitrate/Nitrite-Nitrogen (NO_x)
- Chloride (Cl)
- Total Phosphorus
- Ammonia (NH₄)
- Total Organic Carbon
- Fecal Coliform (in effluent and wells)
- Carbonaceous Biochemical Oxygen Demand after five Days (CBOD₅) (in effluent)
- Total Suspended Solids (TSS) (in effluent)
- Orthophosphate
- Calculated Values: total nitrogen and organic nitrogen

If the lysimeters do not provide enough volume for all analytes, priority will be given to: Total Kjeldahl Nitrogen, Nitrate/Nitrite and Chloride. If more sample volume is available than

required for the analysis of nitrogen species, Total Phosphorus, Ammonia and the other parameters in the listed order will be included.

Sample collection and documentation procedures when appropriate will conform to the requirements and criteria in DEP SOPs (DEP-SOP-001/01). All sample containers will be prepared and provided by the commercial laboratory contracted for analysing the samples collected by the project. Sample preservation and holding times for all project samples and analytes will conform to DEP SOP Table FS 1000-4. Environmental Research & Design (E1031026) is our primary lab for this project and Pace Analytical Inc. (E83079) is our secondary.

Sample duplicates will be collected for Total Kjeldahl Nitrogen, Nitrate/Nitrite and Chloride when sample volume is greater than 2 liters. Equipment or field blanks will be taken after every 12 grab samples. DEP SOP FQ 1000 Field Quality Control will be followed for duplicates, equipment blanks, and field blanks.

Other supporting data to be collected includes current environmental and weather conditions, 7-day antecedent rainfall; resident's water meter reading, and water levels in wells and lysimeter sumps.

Data Interpretation

Parameter concentrations will be compared at the effluent port, above and below denitrification media, and in the groundwater downgradient below the drainfield. The spatial distribution of effluent in the drainfield and the extent and direction of effluent plume in the groundwater at each system and how they change over time are not known. It is also not known how successful sampling will be. A first step in the analysis will be to assess completeness and representativeness of samples from the several sampling points of each system. Parameters such as chloride and specific conductivity will be used to identify samples that represent septic tank effluent as it is undergoing treatment and transported through the drainfield and shallow groundwater. To account for dilution, a normalization of nutrient concentrations to chloride or specific conductivity may be necessary. A dilution assessment will also be used to assess if all lysimeter and well results should be weighed equally or differently. The end result of this first step of analysis will be for each sampling event at each system, representative water quality and nitrogen concentrations for the septic tank effluent, the effluent after passing through the sand fill, the effluent after passing through sand fill and media, and shallow groundwater, in which the percolate from the drainfield has mixed to some extent with groundwater.

These data will be examined to assess overall performance of the in-ground nitrogen-reducing media. The percent nitrogen reduction by the in-ground nitrogen reducing biofilter will be estimated as the percent difference between the total nitrogen concentrations in the septic

tank effluent and effluent captured in the deep lysimeters at the bottom of the media layer. The extent of nitrification and total nitrogen removal by the unsaturated media layer will also be assessed.

Inspection of these data for temporal trends will inform a determination if and how individual sampling events can be averaged, and if treatment effectiveness appears to increase or decrease over time.

Data Analysis

Data will be stored on Brevard County's servers

The design target of the INRB's with alternative nitrogen-reducing media is 65 percent total nitrogen removal efficiency as described in 64E-6.009(7), of the Florida Administrative Code. The calculated percent total nitrogen reduction between the septic tank effluent and the lower lysimeter grab samples will be compared to the target percent reduction of 65% for the INRB. The statistical approach described in this document includes three major steps described below:

- (1) The median value from all sampling events for data points collected/estimated for a given parameter is estimated for each system and compared to the design target value to determine whether the median of each individual system meets the design target. If 100% of tested systems meet the design target, the central tendency of the proposed technology is considered meeting the design target. If not all systems meet the design target, record the number of systems that meet the design target and go to step (2).
- (2) Use Table 2 to determine, with the given total number of systems tested, what is the number of systems required to meet the design criteria. If 100% of the tested systems meet the design criteria, or if the observed number of systems meeting the design criteria is larger than the required number of systems listed in Table 2, the overall system performance is considered meeting the design criteria. This means that we can have 90% confidence that more than 50% of systems have a median that meets the design criteria (one-tailed test). If the observed number of systems meeting the design criteria is smaller than the required number of systems listed in the table, the overall system performance is considered not meeting the design criteria.
- (3) In order to ensure that most grab sample data points show that the tested system provide at least a treatment efficiency somewhat better than a baseline system, all sample event points from all tested system are pooled. The "somewhat better than a baseline system" design criterion is determined as the average between the baseline system (35%) and the design criterion of the INRB (65%), so 50%. The minimum number of system sample events meeting this criterion shall follow the minimum number of grab sample values shown in Table 3. If the observed number of system sample events meeting the average target point is larger than the required number of system sample

events for the total number of observations specified in Table 3, the system is considered functioning as designed at a compliance frequency significantly better than 75% with 90% confidence level.

The number of systems/parameter values required to meet the design target listed in Tables 2 and 3 are generated using the margin of error equation for binomial distribution (Equation 1).

$$M = Z_{1-\frac{\sigma}{2}} * \sqrt{\frac{P*(1-P)}{n}} \quad \text{Equation 1}$$

Where,

- M is the margin of error.
- $Z_{1-\sigma/2}$ is the one-tail Z score for select confidence level. For this document, since 90% is selected as the testing confidence level, the one-tail Z score is 1.28.
- P is the compliance frequency at which systems/parameter values meet the design target. 1-P is the frequency at which units/parameter values failed to meet the design target.
- n is the number of units/number of parameter values being tested.

To evaluate whether a proposed technology meets the design target, the compliance frequency limit is set at 50% for system testing, which means that the tested systems should meet the design target at a compliance frequency significantly better than 50%. Therefore, $p = 0.5$.

Using Equation 1, the margin of error is calculated as $1.28 * \sqrt{0.5*(1-0.5)/n}$. Because of the existence of the margin of error, for a given set of system being tested, the observed compliance frequency may range from $0.5 - M$ to $0.5 + M$. To ensure that the expected population compliance frequency is significantly better than 0.5, $0.5 + M$ is used as the minimum compliance frequency. This generates the minimum number of systems that are required to meet the design target when total number of systems being tested is n, which is

$$Nr = n * (0.5 + M) \quad \text{Equation 2}$$

Where,

- Nr is the minimum number of systems required to meet the design target.

Calculated Nrs in most cases are not integers. To ensure that the minimum number of systems required to meet the design target will not be lower than the 50% compliance frequency, Nr values are all rounded up to the next higher integer. In this analysis, the rounded-up Nr is defined as adjusted Nr. Table 2 lists the total number of systems tested, the calculated margin of error at 50% compliance frequency with 90% confidence level (one-tailed), the required

compliance frequency when tested systems is n , the N_r , and adjusted N_r . It should be noted that, in order to use Table 2, the number of tested systems shall be at least three.

Table 3 listed the minimum number of parameter values that are required to meet the design target at total parameter values of n when all parameter values from all tested systems are pooled together. The minimum number of parameter values required to meet the design target are estimated using the same procedure that the minimum numbers of units required to meet the design target in Table 2 are estimated. The confidence level for Table 2 is also 90% (one-tailed). The only difference between Tables 2 and 3 is that the compliance frequency for Table 3 is set at 75% (i.e. $p=0.75$, and the minimum compliance frequency is $0.75 + M$). Note that, in order to use Table 3 to evaluate the overall compliance frequency, at least five data point should be available.

Reporting

Brevard County staff will report by email to the Florida Department of Health and interested parties when properties are enrolled and when an In-ground Nitrogen-Reducing Biofilter is installed. A quarterly project report by Brevard County staff to the Florida Department of Health will include documentation of installation for each site, sampling results, and documentation of laboratories' National Environmental Laboratory Accreditation Program certification. Quarterly reports are due on the twelfth of March, June, September, and December.

Reports and correspondence will be addressed to the following in the Onsite Sewage Programs of the Florida Department of Health:

- Eberhard Roeder, PhD, PE, CPM, at Eberhard.Roeder@flhealth.gov
- Xueqing Gao, Ph.D., at Xueqing.Gao@flhealth.gov
- Christie McNamara at Christie.McNamara@flhealth.gov

Attachment 2

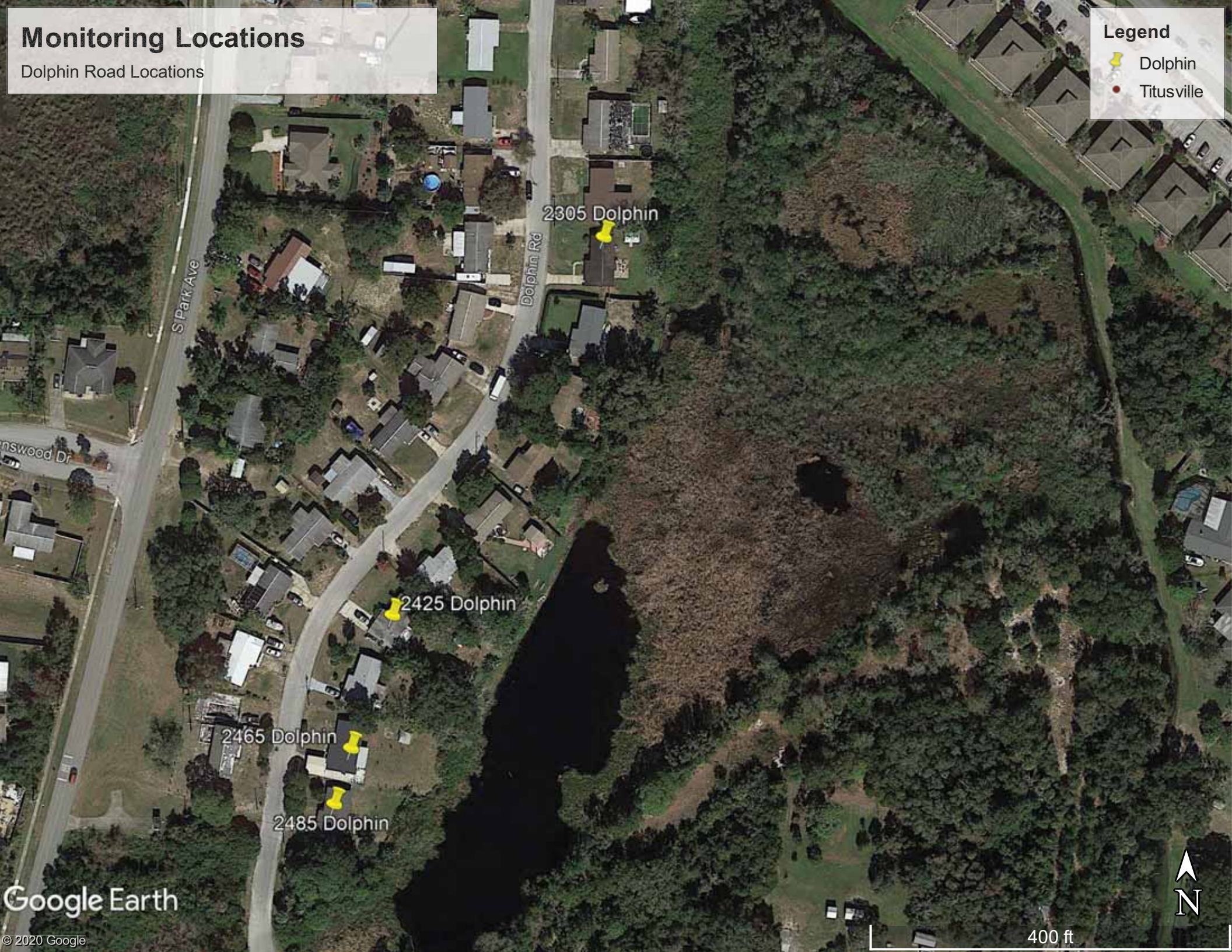
Monitoring Locations

Dolphin Road Locations

Legend

 Dolphin

 Titusville



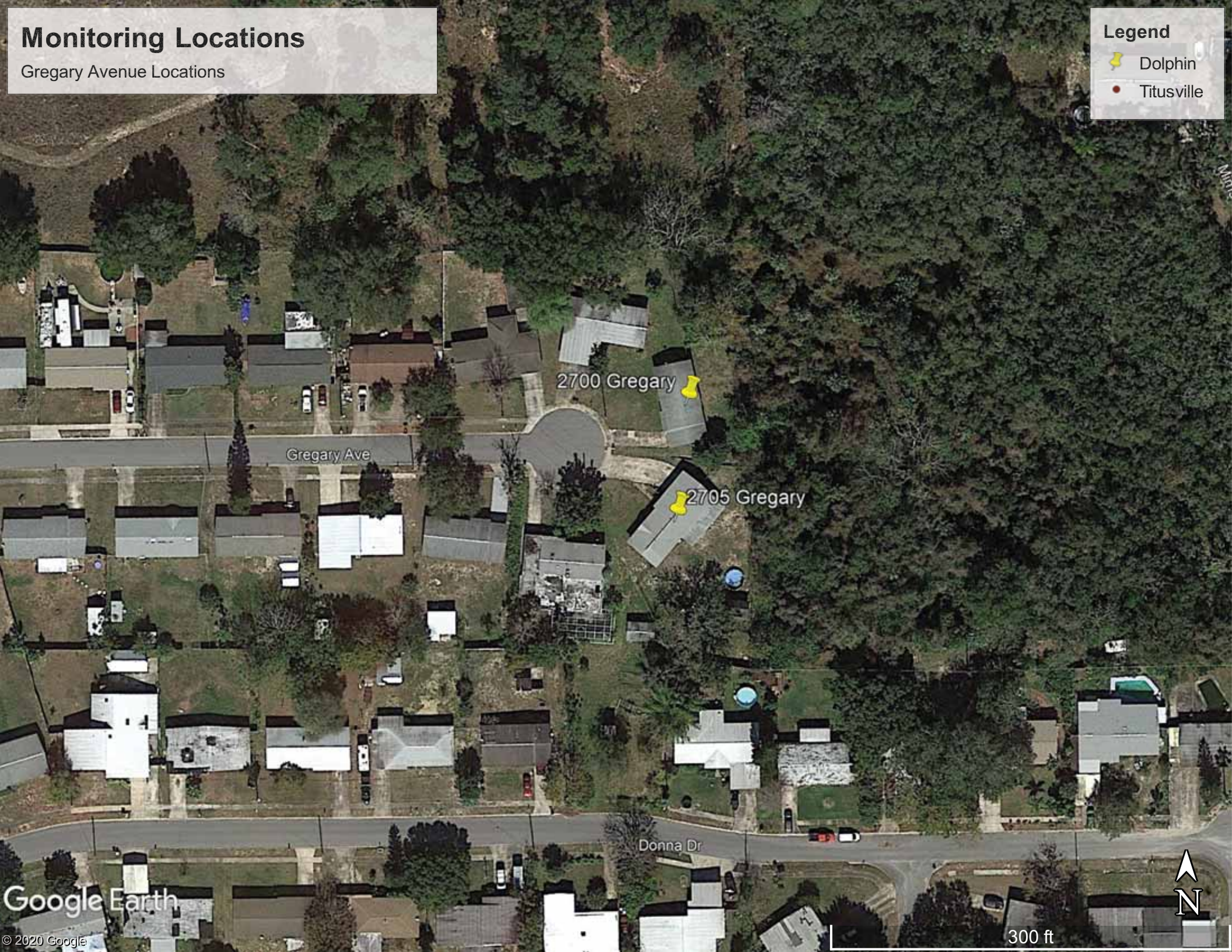
Monitoring Locations

Gregary Avenue Locations

Legend

 Dolphin

 Titusville

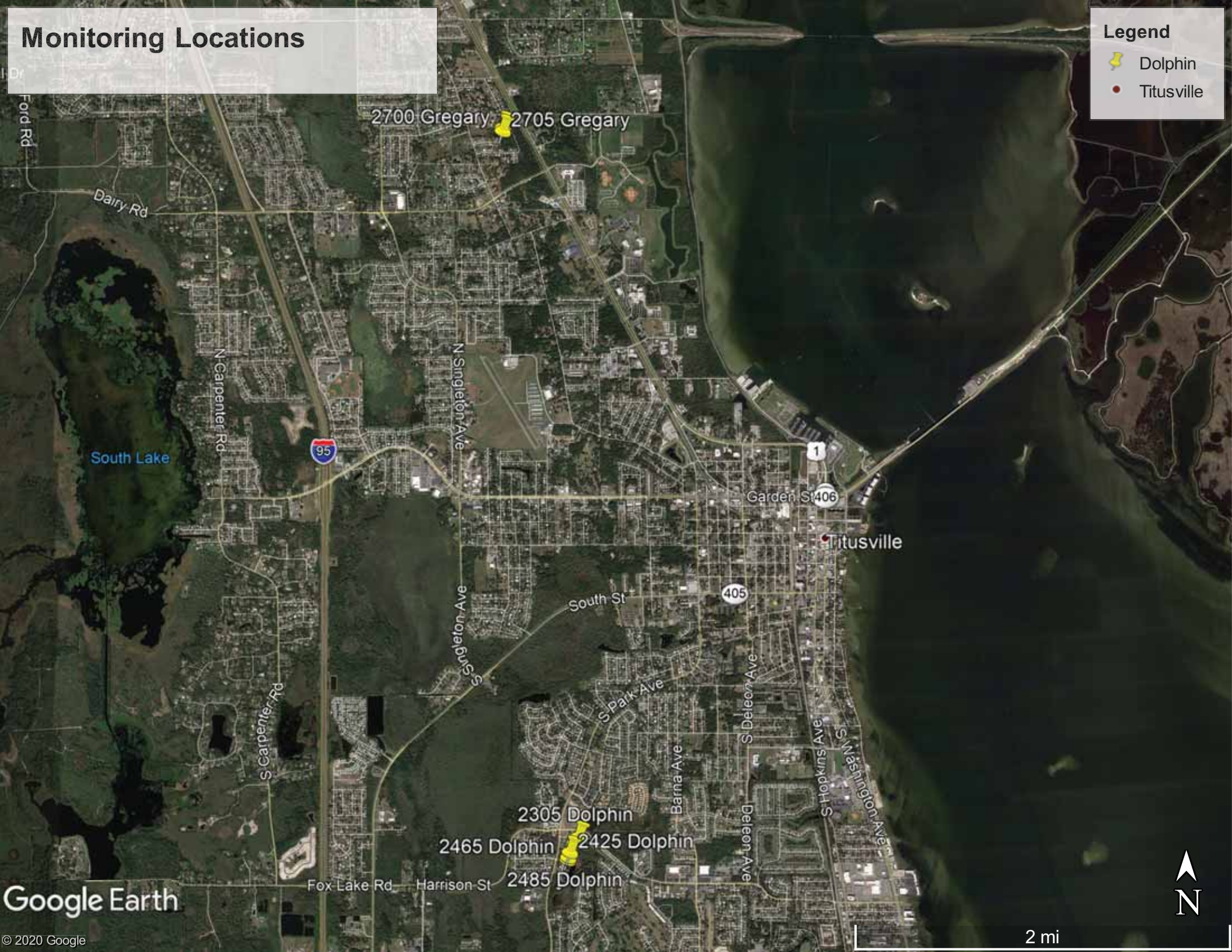


Monitoring Locations

Legend

 Dolphin

 Titusville



Environmental Consulting & Technology, Inc. Brevard County Contract No.	Project/Site Name: Alternative Drainfield Monitoring Assess Scope of Work: MW Installation/monitoring Proposal Date: 10/20/2020	Task 1: MW Installation Task 2: 1st Sampling Event Task 3: 2nd, 3rd, 4th Sampling Events Task 4: Final Report
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Labor Category	Labor Description	Unit of Measure	Contract Rate	Task 1	Task 2	Task 3	Task 4		Extended Price
E/S32	Principal Engineer/Scientist	Hour	\$194.00	2	2	6	4		\$2,716.00
E/S26-32	Project Manager	Hour	\$175.24	4	4	12	4		\$4,205.76
E/S26-30	Senior Engineer/Scientist	Hour	\$177.00	10	10	30	12		\$10,974.00
E/S22-25	Staff Engineer/Scientist/GIS Analyst	Hour	\$155.00	2	4	12	8		\$4,030.00
E/S18-20	Senior Associate Engineer/Scientist	Hour	\$112.00	0	0	0	0		\$0.00
E/S15-19	Associate Engineer/Scientist	Hour	\$95.77	40	20	60	16		\$13,024.72
T08-14	Environmental Technician	Hour	\$83.71	40	20	60	0		\$10,045.20
A04-10	Administrative Assistant	Hour	\$77.61	4	4	8	8		\$1,862.64
	TOTAL HOURS			102	64	188	52		\$0.00
	SUBTOTAL LABOR			\$10,658.60	\$7,379.00	\$21,826.56	\$6,994.16	\$0.00	\$46,858.32
Direct Cost Category	Direct Cost / Packaged Workscopes Description	Unit of Measure	Contract Rate	Task 1	Task 2	Task 3	Task 4		Extended Price
1004	Copies - 8.5 x 11 B&W	per copy	\$0.10	100	100	100	300		\$60.00
1008	Copies - 8.5 x 11 Color	per copy	\$0.75	10	10	10	30		\$45.00
1020	Document Binding	document	\$2.75	1	1	3	3		\$22.00
1251	Vehicle-Field Truck with Tools	day	\$125.00	4	2	6	0		\$1,500.00
9219	Digital Camera	day	\$10.00	4	2	6	0		\$120.00
9218	Field Kit	day	\$30.00	4	2	6	0		\$360.00
9088	MW Installation Kit	day	\$185.00	4	0	0	0		\$740.00
9360	GPS Trimble 6000 Series	day	\$100.00	4	0	0	0		\$400.00
9090	Groundwater Sampling Kit	day	\$100.00	0	2	12	0		\$1,400.00
									\$0.00
									\$0.00
	SUBTOTAL DC/PWs			\$1,820.25	\$550.25	\$2,215.75	\$60.75	\$0.00	\$4,647.00
Subcontractor Costs		Unit of Measure	Contract Rate	Task 1	Task 2	Task 3	Task 4		Extended Price
Drillpro, Inc.		Each		9,390.00	0.00	0.00	0.00	0.00	\$9,390.00
Laboratory Services - Pace		Each		0.00	28,695.00	85,015.00	0.00	0.00	\$113,710.00
SUBTOTAL SUBCONTRACTOR (with 10% markup)				\$10,329.00	\$31,564.50	\$93,516.50	\$0.00	\$0.00	\$135,410.00
TOTAL PRICE				\$22,807.85	\$39,493.75	\$117,558.81	\$7,054.91	\$0.00	\$186,915.32