



# Florida Onsite Sewage Nitrogen Reduction Strategies Study

Task B.7

**B-HS2 Field System Monitoring Report No. 3**

**Progress Report**

May 2013

44237.001

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Environmental Engineers & Scientists

In association with



**AET**  
Applied Environmental Technology

**OTIS  
ENVIRONMENTAL  
CONSULTANTS, LLC**

# **Florida Onsite Sewage Nitrogen Reduction Strategies Study**

## **TASK B.7 PROGRESS REPORT**

### **B-HS2 Field System Monitoring Report No. 3**

#### **Prepared for:**

Florida Department of Health  
Division of Disease Control and Health Protection  
Bureau of Environmental Health  
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FDOH Contract CORCL

**May 2013**

#### **Prepared by:**

**HAZEN AND SAWYER**  
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### **1.0 Background**

Task B of the Florida Onsite Sewage Nitrogen Reduction Strategies Study (FOSNRS) includes performing field experiments to critically evaluate the performance of nitrogen removal technologies that were identified in FOSNRS Task A.9. To meet this objective, full scale treatment systems are being installed at various residential sites in Florida and monitored over an extended timeframe under actual onsite conditions. The Task B Quality Assurance Project Plan (Task B.5) documents the objectives, monitoring framework, sample frequency and duration, and analytical methods to be used at the home sites. This report documents the third sample event of the passive nitrogen reduction system at a home site B-HS2 in Hillsborough County, Florida.

### **2.0 Purpose**

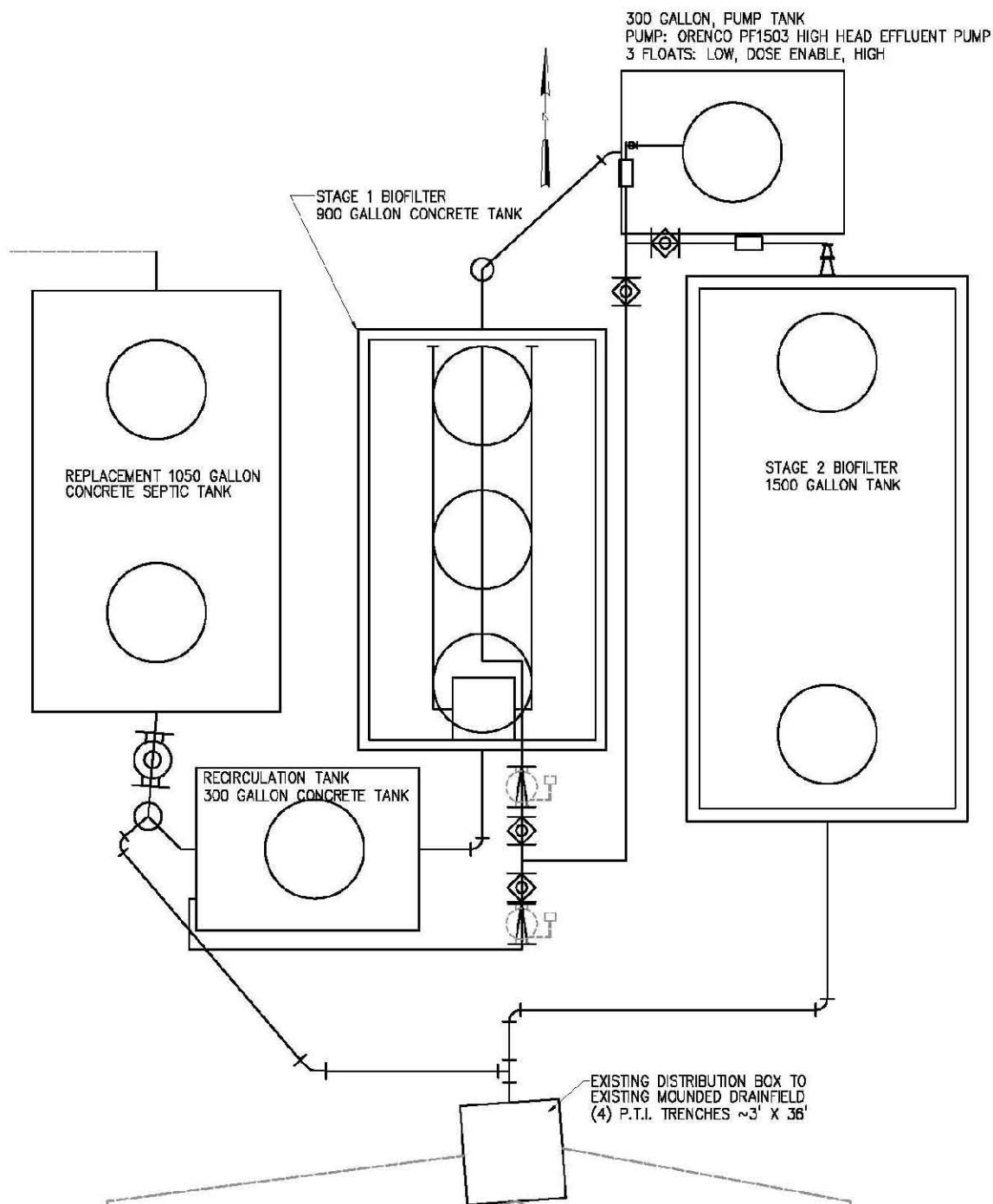
This monitoring report documents data collected from the third B-HS2 monitoring and sampling event conducted on April 16, 2013. This monitoring event consisted of collecting flow measurements from the household water use meter and the treatment system internal water meters, recording electricity use, monitoring of field parameters, collection of water samples from fifteen points in the treatment system, and sample analyses by a NELAC certified laboratory.

### **3.0 Materials and Methods**

#### **3.1 Project Site**

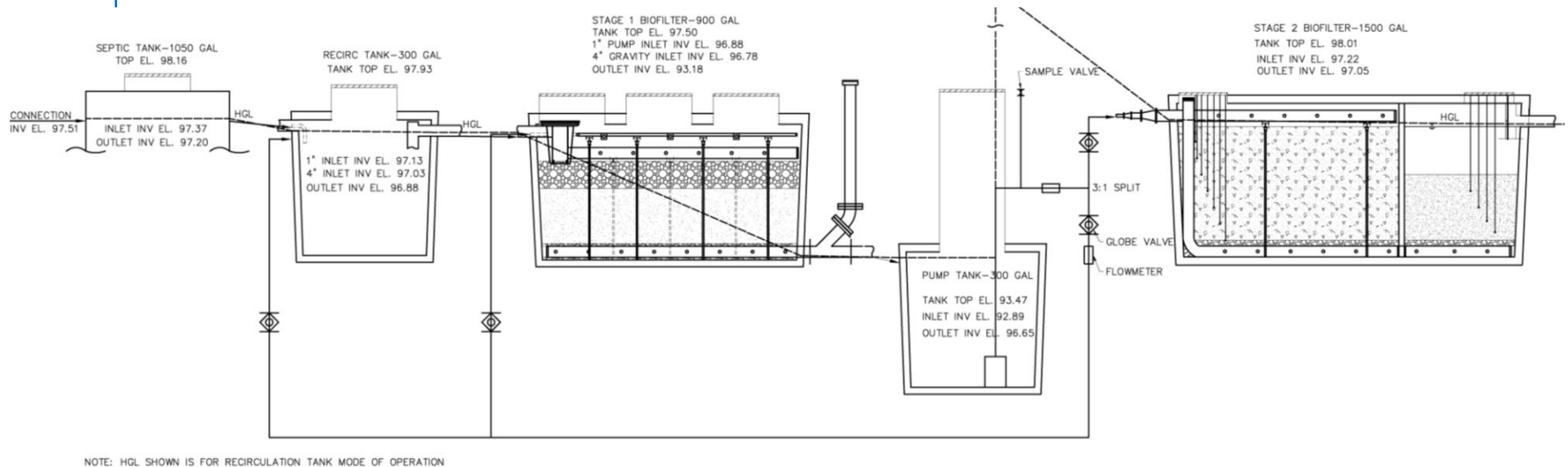
The B-HS2 field site is located in Hillsborough County, FL. The nitrogen reducing onsite treatment system for the single family residence was installed in September 2012. Design and construction details were presented previously in the Task B.6 document. Figure 1 is a system schematic showing the system components and layout of the installation. A flow schematic of the system is shown in Figure 2. The B-HS2 system tankage consists of a 1,050 gallon two chamber concrete primary tank; 300 gallon concrete recirculation tank; 900 gallon concrete Stage 1 unsaturated media biofilter; 300 gallon concrete pump tank; and 1,500 gallon two chamber concrete Stage 2 saturated

media biofilter. Based on measured average wastewater flow and tank volumes, there is over a ten day transit time through the treatment system prior to dispersal. The denitrified treated effluent is discharged into the soil via the existing mounded drainfield (P.T.I.<sup>TM</sup> bundles).



**Figure 1**  
**B-HS2 System Schematic**

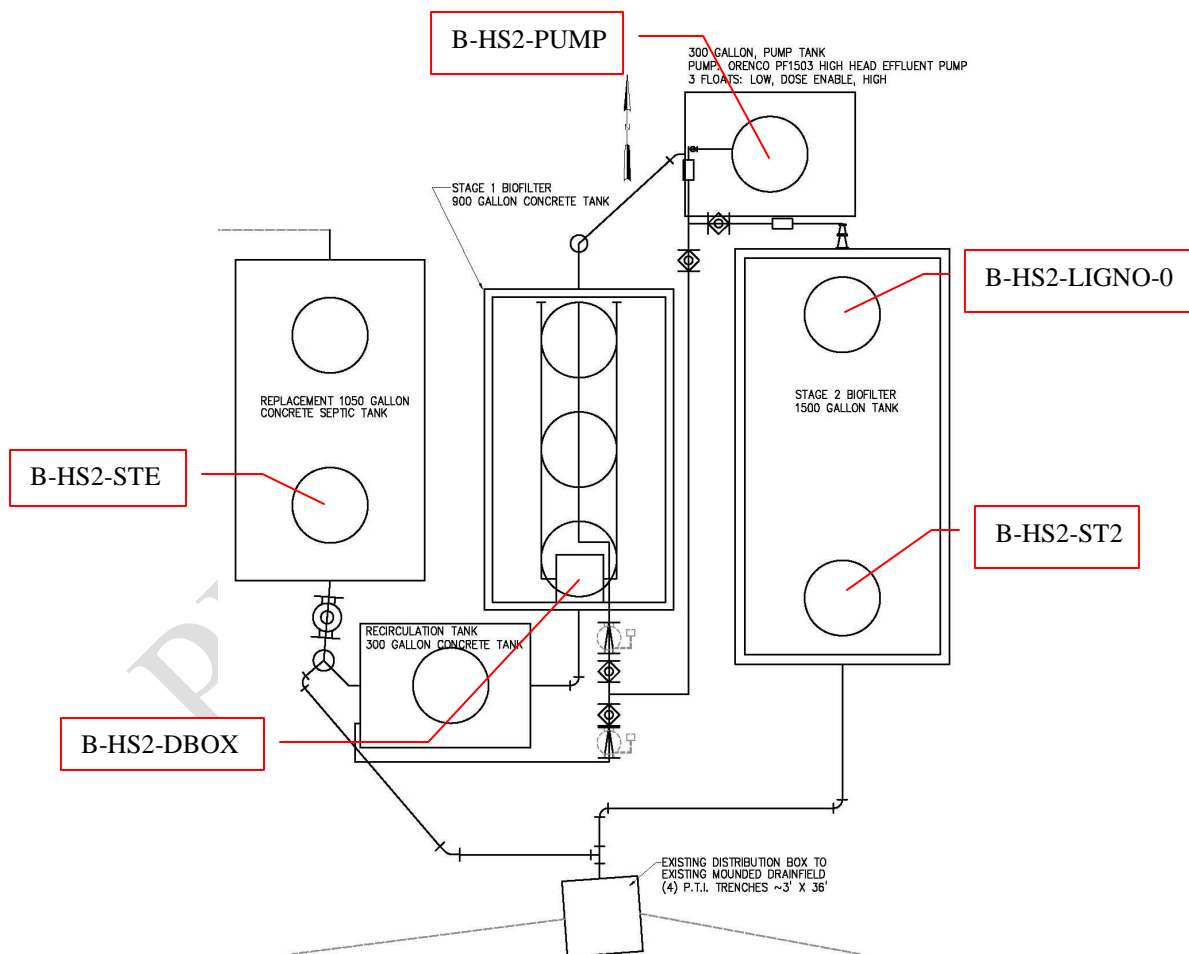
February 2013



**Figure 2**  
**Flow Schematic of B-HS2 PNRS installed in Hillsborough County**

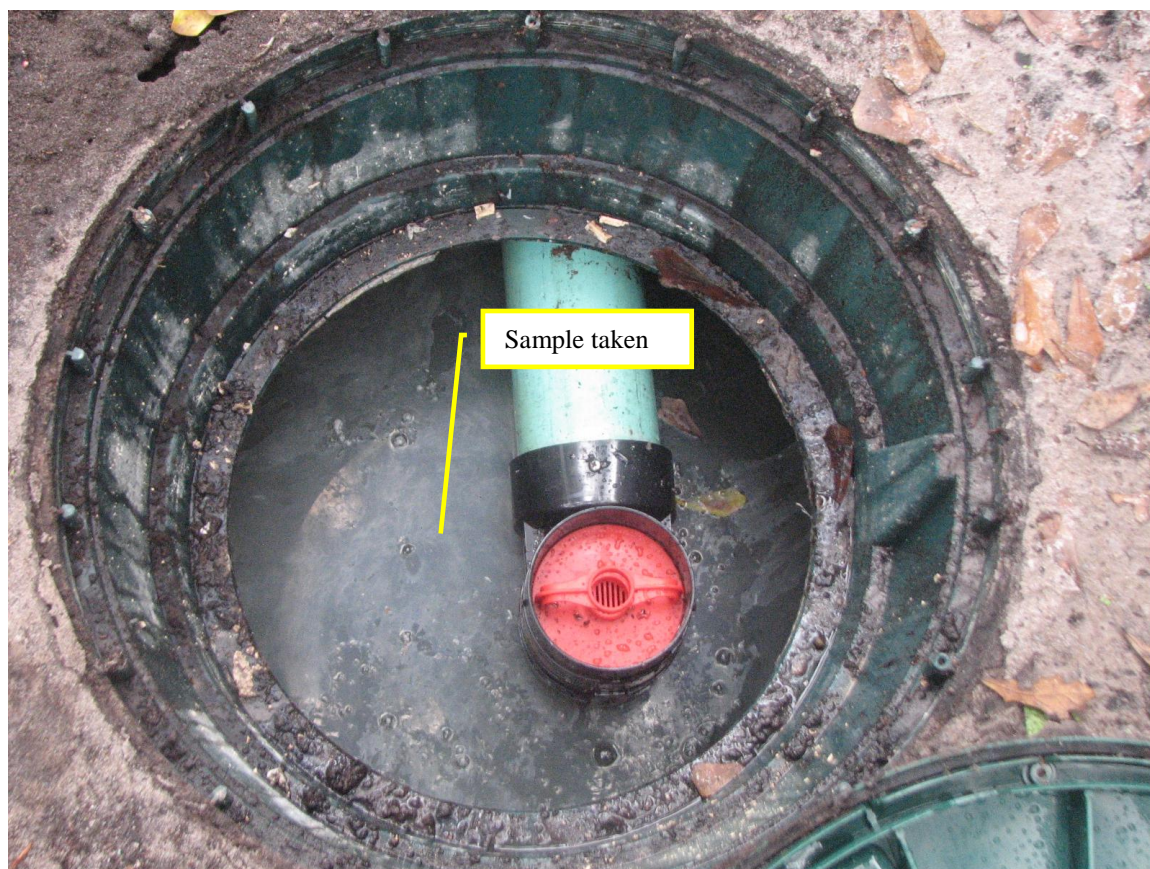
### 3.2 Monitoring and Sample Locations and Identification

The five primary monitoring points for this sample event are shown in Figure 3. The additional ten secondary monitoring points are profile samples for the Stage 2 biofilter. Household wastewater enters the 1<sup>st</sup> chamber of the primary tank and exits the second chamber as septic tank effluent through an effluent screen into the recirculation tank. The first primary monitoring point, B-HS2-STE, is the effluent sampled approximately 1.5 feet below the surface of the second chamber of the primary tank (Figure 4), which is referred to as primary effluent or septic tank effluent (STE). Samples from monitoring point B-HS2-STE are the whole household wastewater after it has had some residence time in the primary tank; it represents the influent to the remainder of the onsite nitrogen reduction system.



**Figure 3**  
**B-HS2 Sample and Monitoring Locations**

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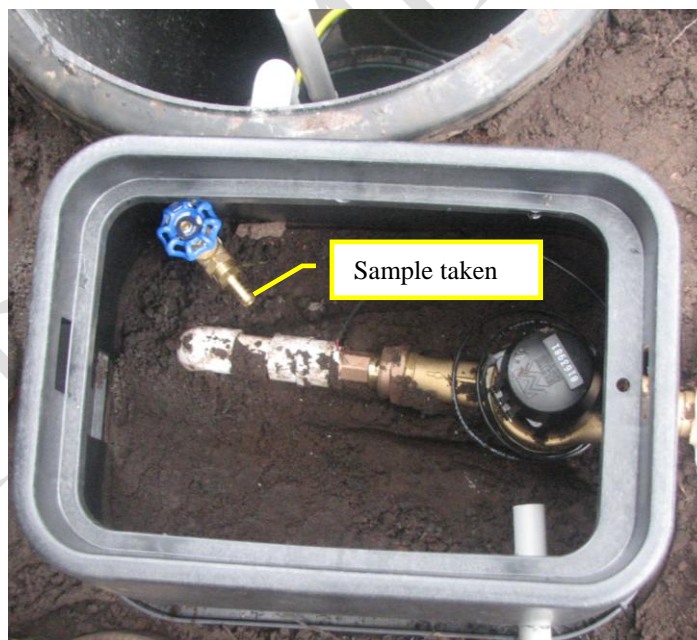
**Figure 4**  
**Second chamber of Primary Tank (B-HS2-STE sample)**

The recirculation tank contents are discharged by gravity to a distribution box, located inside the Stage 1 biofilter, which splits the flow between two perforated distribution pipes along the top of the unsaturated Stage 1 biofilter media. The second primary sampling point (B-HS2-DBOX) is taken approximately 6 inches below the surface of the distribution box (Figure 5), which contains a mixture of primary effluent (STE) and recirculated effluent from the Stage 1 biofilter. In the Stage 1 biofilter, wastewater percolates downward through the unsaturated expanded clay media where nitrification occurs. Stage 1 biofilter effluent flows into the pump tank (which contains the pump and float switches). The third primary sampling point is a sample port on the pump discharge line (B-HS2-PUMP) and represents the Stage 1 biofilter effluent (Figure 6).





**Figure 5**  
**Distribution Box within Stage 1 Unsaturated Biofilter (B-HS2-DBOX sample)**



**Figure 6**  
**Pump discharge line sample port (B-HS2-PUMP sample)**

The pump tank discharge is split via two throttling globe valves which allow for a portion of the Stage 1 biofilter effluent to be sent back for recirculation with the rest proceeding to the Stage 2 biofilter. The system was designed with two recirculation modes of operation. The first option (which is currently being tested) is to have the recirculated effluent return to the recirculation tank for mixing with incoming septic tank effluent. The second option is to have the recirculated effluent return to the top of the Stage 1 biofilter, dispersed by three spray nozzles. Effluent from the unsaturated (Stage 1) media tank enters the saturated denitrification (Stage 2) biofilter into a standing water column lying above the media in the first chamber (lignocellulosic media), flows downward through the media, moves laterally in a perforated 4-inch pipe through the baffle wall to the bottom of the second chamber, and upward through the media in the second chamber (elemental sulfur and oyster shell).

The first chamber of the Stage 2 biofilter contains 42-inches of lignocellulosic media. Stainless steel drivepoint samplers are positioned at 6-inch increments for vertical profiling throughout the lignocellulosic media. The fourth primary sampling point is a stainless steel drivepoint sampler positioned at the bottom of the lignocellulosic media (B-HS2-LIGNO-0). Six inches above B-HS2-LIGNO-0 is another stainless steel drivepoint sampler B-HS2-LIGNO-6, and so forth (B-HS2-LIGNO-12, B-HS2-LIGNO-18, B-HS2-LIGNO-24, B-HS2-LIGNO-30, and B-HS2-LIGNO-36). The B-HS2-LIGNO-0 sample represents the lignocellulosic media effluent (Figure 7).

A collection pipe along the bottom transfers the first chamber (lignocellulosic media) effluent to the second chamber, which contains 24-inches of elemental sulfur mixed with oyster shell media. Similarly to the lignocellulosic media chamber, stainless steel drivepoint samplers are positioned to create a vertical profile. B-HS2-SULFUR-3 is positioned 3-inches above the bottom of the sulfur media. B-HS2-SULFUR-7, B-HS2-SULFUR-12 and B-HS2-SULFUR-18, are placed 7, 12 and 18-inches above the bottom of the sulfur media, respectively. The fifth primary sampling point, B-HS2-ST2, is the second chamber of the Stage 2 biofilter effluent which is sampled approximately 1 foot below the surface of the effluent baffle tee. This sample location is after passage through the sulfur media; it is the final effluent from the treatment system prior to being discharged to the soil infiltration system, or drainfield (Figure 8).



**Figure 7**  
**First chamber of Stage 2 biofilter (B-HS2-LIGNO-0" sample)**



**Figure 8**  
**Second chamber of Stage 2 biofilter (B-HS2-ST2 sample)**



### 3.3 Operational Monitoring

Start-up of the system occurred on September 25, 2012 (Experimental Day 0) and the system has operated continually since that date. For this third formal sampling event, the water meter for the house and the treatment system flow meters were read and recorded on April 16, 2013 (Experimental Day 203). As previously discussed, the pump tank discharge is split via two throttling globe valves which allow for a portion of the Stage 1 biofilter effluent to be sent back for recirculation with the rest proceeding to the Stage 2 biofilter. The combined flow meter is located on the pump tank discharge line prior to the split, and records the cumulative flow in gallons pumped from the pump chamber. Therefore the measurement of the combined flow meter includes both the forward wastewater flow from the household and the recirculation flow. The Stage 2 flow meter is located following the split on the line from the pump tank to the Stage 2 biofilter and records the cumulative forward flow in gallons pumped to the Stage 2 biofilter. The control panel includes telemetry where reports are generated regarding alarms, pump cycles, and other information using a Vericomm control panel system.

### 3.4 Energy Consumption

Energy consumption was monitored using an electrical meter installed between the main power box for the house and the control panel. The electrical meter records the cumulative power usage of the system in kilowatt-hours. The power usage of the system is primarily due to the single recirculation pump in the pump chamber, although a small amount of power is used by the control panel itself. There are no chemicals added to the system. However, the Stage 2 biofilter media (lignocellulosic and sulfur) are “reactive” media which will be consumed during operation. The Stage 2 biofilter was initially filled with 42 inches of lignocellulosic media and 24 inches of sulfur media, which ostensibly will last for many years without replenishment or replacement.

### 3.5 Water Quality Sample Collection and Analyses

A full suite of influent, intermediate and effluent water quality samples from the system were collected for the third formal sample event on April 16, 2013 for water quality analysis. Samples were collected at each of the fifteen monitoring points described in Section 3.2: B-HS2-STE, B-HS2-DBOX, B-HS2-PUMP, B-HS2-LIGNO-36, B-HS2-LIGNO-30, B-HS2-LIGNO-24, B-HS2-LIGNO-18, B-HS2-LIGNO-12, B-HS2-LIGNO-6, B-HS2-LIGNO-0, B-HS2-SULFUR-3, B-HS2-SULFUR-7, B-HS2-SULFUR-12, B-HS2-SULFUR-18 and B-HS2-ST2. A peristaltic pump was used to collect samples and route them directly into analysis-specific containers after sufficient flushing of the tubing had occurred. Field parameters were then recorded.

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In addition, equipment blank (EB), tap water (TAP), and well water (WELL) samples were taken. The equipment blank was collected by pumping deionized water through the cleaned pump tubing. This sample was then analyzed for the same parameters as the monitoring samples. One tap water sample was collected by filling sample containers with tap water from a hose bib near the system. In addition, one well water sample was collected by filling sample containers with well water from a hose bib near the pump house.

The analysis-specific containers were supplied by the analytical laboratory and contained appropriate preservatives. The analysis-specific containers were labeled, placed in coolers and transported on ice to the analytical laboratories. Each sample container was secured in packing material as appropriate to prevent damage and spills, and was recorded on chain-of-custody forms supplied by the laboratory. Chain of custody forms, provided in Appendix A, were used to document the transfer of samples from field personnel to the analytical laboratory.

Field parameters were measured using portable electronic probes and included temperature (Temp), dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, and specific conductance. The field parameters were measured by placing the analytical probes in a container overflowing with sample water. The influent, intermediate, and effluent samples were analyzed by the laboratory for: total alkalinity, total Kjeldahl nitrogen (TKN-N), ammonia nitrogen ( $\text{NH}_3\text{-N}$ ), nitrate nitrogen ( $\text{NO}_3\text{-N}$ ), nitrite nitrogen ( $\text{NO}_2\text{-N}$ ), total phosphorus (TP), orthophosphate (Ortho P), total suspended solids (TSS), fecal coliform (fecal), and E.coli. All analyses were performed by independent and fully NELAC certified analytical laboratories (Southern Analytical Laboratory and Benchmark EnviroAnalytical Inc.). Table 1 lists the analytical parameters, analytical methods, and detection limits for laboratory analyses.

**Table 1**  
**Analytical Parameters, Method of Analysis, and Detection Limits**

<b>Analytical Parameter</b>	<b>Method of Analysis</b>	<b>Method Detection Limit (mg/L)</b>
Total Alkalinity as CaCO <sub>3</sub>	SM 2320B	2 mg/L
Chemical Oxygen Demand (COD)	EPA 410.4	10 mg/L
Total Kjeldahl Nitrogen (TKN-N)	EPA 351.2	0.05 mg/L
Ammonia Nitrogen (NH <sub>3</sub> -N)	EPA 350.1	0.005 mg/L
Nitrate Nitrogen (NO <sub>3</sub> -N)	EPA 300.0	0.01 mg/L
Nitrite Nitrogen (NO <sub>2</sub> -N)	EPA 300.0	0.01 mg/L
Total Phosphorus (TP)	SM 4500P-E	0.01 mg/L
Orthophosphate as P (Ortho P)	EPA 300.0	0.01 mg/L
Carbonaceous Biological Oxygen Demand (CBOD <sub>5</sub> )	SM5210B	2 mg/L
Total Solids (TS)	EPA 160.3	.01 % by wt
Total Suspended Solids (TSS)	SM 2540D	1 mg/L
Volatile Suspended Solids (VSS)	SM 2540E	1 mg/L
Fecal Coliform (fecal)	SM9222D	2 ct/100mL
E.coli	EPA1603	2 ct/100mL

## **4.0 Results and Discussion**

### **4.1 Operational Monitoring**

Table 2 provides a summary of the household water use since water meter installation on March 6, 2012. The treatment system flow meter readings and corresponding recirculation ratio for the B-HS2 field site are summarized in Table 3. The operation and maintenance log which includes actions taken since start-up is provided in Appendix B. Summary tables of the Vericomm PLC recorded data are provided in Appendix C. These include daily and cumulative pump runtime and system alarms that are used to check general pump operation and performance.

**Table 2**  
**Summary of Household Water Use**

Date	Cumulative Volume (gallons)	Average Daily Household Flow, Q (gpd)
3/6/2012	7,790	INSTALLED
4/3/2012	11,490	132
5/1/2012	14,960	124
6/5/2012	19,560	131
7/3/2012	23,120	127
8/7/2012	26,730	103
9/4/2012	29,800	110
10/2/2012	33,240	123
11/6/2012	36,510	93
12/4/2012	40,080	128
1/1/13	43,240	113
2/5/13	47,741	129
3/5/2013	50,000	81
4/16/2013	54,010	95
Total average start-up to 4/16/13		115

**Table 3**  
**Summary of System Flow**

Date and Time Read	Combined Pumped Flow, Q+R Water Meter Reading	Average Daily Combined, Q+R Flow	Stage 2, Q Flow Meter Reading	Average Daily Stage 2, Q Flow	Average Daily, R Flow	Average Recycle Ratio
	Cumulative Volume (gallons)	Gallons/day	Cumulative Volume (gallons)	Gallons/Day	Gallons/Day	Recycle: Forward Flow
9/25/2012 11:00	351.9	Installed	102.2	Installed		
9/27/2012 9:45	570.5	Valves set	149.5	Valves set		
10/5/2012 8:07	3,898.3	419.5	880.6	92.2	327.4	3.55
10/11/2012 7:55	7,888.5	525.6	1,716.6	112.5	413.0	3.67
10/23/2012 9:00	15,092.9	559.2	3,228.2	118.6	440.7	3.72
10/30/2012 14:30	18,090.1	527.7	3,904.7	113.1	414.6	3.67
11/13/2012 14:00	22,944.4	474.3	5,007.3	103.0	371.3	3.61
12/3/2012 8:00	35,555.0	522.7	7,886.8	115.6	407.1	3.52
1/3/2013 8:00	51,563.3	520.7	11,542.3	116.3	404.4	3.48
2/5/2013 8:23	72,069.0	546.0	16,185.3	122.5	423.6	3.46
2/27/2013 11:00	81,937.3	531.6	18,441.6	119.5	412.1	3.45
4/16/13 10:15	105,376.0	521.4	23,809.3	117.7	403.7	3.43
Total average start-up to 4/16/13		514.9		113.1	401.8	3.55 : 1

The two throttling globe valves control the fraction of Stage 1 effluent that is recirculated and the fraction sent to the Stage 2 biofilter. The globe valves were initially set so that 3.5 parts went back to the recirculation tank and 1 part went to the Stage 2 tank (3.5:1 recycle ratio). The household flow average was 115 gallons per day with periods of higher and lower flows. The average combined pumped flow (recirculation and forward flow to the Stage 2 biofilter) was 514.9 gallons per day, and the average forward flow to the Stage 2 biofilter was 113.1 gallons per day. Therefore, the average recirculation flow was 401.8 gallons per day, with a corresponding average recirculation ratio of 3.55:1.

## 4.2 Energy Consumption

Energy consumption is monitored using an electrical meter installed between the main power box for the house and the control panel to record cumulative power usage of the pump in kilowatt-hours. The recorded electrical use for the system is summarized in Table 4.



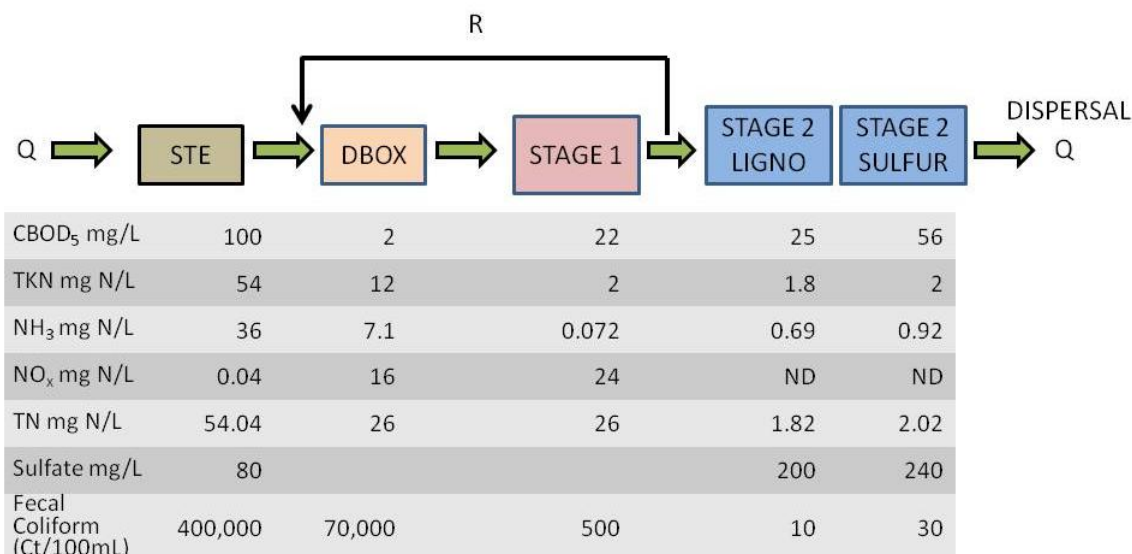
**Table 4**  
**Summary of System Electrical Use**

Date and Time Read	Electrical Meter Reading	Average Daily Electrical Use	Average Electrical Use per Gallon Treated
	Cumulative (kWh)	(kWh/day)	(kWh/gal)
9/25/2012 11:05	0.2	Installed	
9/27/2012 9:58	0.3	Start-up	
10/5/2012 8:07	2.6	0.29	0.0031
10/11/2012 7:55	5.0	0.40	0.0036
10/23/2012 9:00	9.5	0.37	0.0032
10/30/2012 14:30	11.8	0.32	0.0028
11/13/2012 14:00	14.8	0.21	0.0021
12/3/2012 8:00	22.8	0.41	0.0035
1/3/2013 8:00	33.0	0.33	0.0028
2/5/2013 7:45	45.5	0.38	0.0031
2/27/2013 11:00	51.5	0.27	0.0023
4/16/2013 10:15	65.8	0.30	0.0025
Total average start-up to 4/16/13		0.33	0.0029

The total average electrical use through April 16, 2013 was 0.33 kWh per day. The average electrical use per gallon treated was 0.0029 kWh per gallon, and this parameter has been fairly stable since start-up.

### 4.3 Water Quality

The following discussion summarizes the water quality analytical results. The performance of the various system components was compared by considering the changes through treatment of nitrogen species (TKN-N,  $\text{NH}_3\text{-N}$ , and  $\text{NO}_x\text{-N}$ ), as well as supporting water quality parameters. The nitrogen results are graphically displayed in Figure 11. Water quality analytical results for Sample Event No. 3 are listed in Table 5. A summary of the water quality data collected to date for the test system is presented in Table 6. The laboratory report containing the raw analytical data is included in Appendix A.



**Figure 11**  
**Graphical Representation of Nitrogen Results**

**Septic Tank Effluent (STE) Quality:** The water quality characteristics of STE collected in Sample Event 3 were within the typical range generally expected for domestic STE. The measured STE total nitrogen (TN) concentration was 54 mg/L, which is within the range that has been typically reported for Florida single family residence STE.

**DBOX and Stage 1 Effluent (DBOX and Pump):** The DBOX and Stage 1 effluent NH<sub>3</sub>-N levels were 7.1 mg/L and 0.07 mg/L, respectively with a DO level at 5.68 mg/L in the Stage 1 effluent (Table 5). The DBOX TSS concentration was 12 mg/L and CBOD<sub>5</sub> was below the detection limit of 2 mg/L. The Stage 1 effluent TSS and CBOD<sub>5</sub> were 68 mg/L and 22 mg/L respectively. The DBOX NO<sub>x</sub>-N was 16 mg/L, and the Stage 1 effluent NO<sub>x</sub>-N was 24 mg/L. These results indicate significant pre-denitrification (approximately 52% reduction of STE nitrogen) was occurring as the effluent was recirculated back into the recirculation tank. The Stage 1 biofilter showed fairly complete nitrification with an effluent NH<sub>3</sub>-N concentration of 0.072 mg/L and TKN of 2 mg/L.

**Stage 2 Biofilter Effluent (LIGNO-0" and ST2):** Effluent NO<sub>x</sub>-N from the Stage 2 biofilter was below the method detection limit of 0.02 mg/L. The low NO<sub>x</sub>-N was accompanied by a measured 0.24 mg/L DO and -219 mV ORP. The lignocellulosic media effluent NO<sub>x</sub>-N was also below the method detection limit. The Stage 2 system produced a highly reducing environment and achieved essentially complete NO<sub>x</sub>-N reduction. Final total nitrogen (TN) in the treatment system effluent was 2 mg/L, and it appears that there is still a slight increase in nitrogen through the Stage 2 lignocellulosic

and sulfur media, but less than measured in sample events 1 and 2. Increases in  $\text{CBOD}_5$  and TN have been reported previously for lignocellulosic denitrification during start-up, and it will be interesting to track these results as the system matures. The Stage 2 biofilter lignocellulosic effluent  $\text{CBOD}_5$  was 25 mg/L and the sulfur effluent was 56 mg/L. It is anticipated that the  $\text{CBOD}_5$  concentration will decrease over time. The Stage 2 effluent sulfate concentration was 240 mg/L.

As previously discussed in Section 3.2, Sample Event 3 also included Stage 2 biofilter profile samples. As depicted in Figure 12, the unsaturated Stage 1 biofilter effluent is pumped to the top of the first chamber of the Stage 2 biofilter which contains lignocellulosic media. The effluent flows downward through the lignocellulosic media, moves laterally in a perforated 4-inch pipe through the baffle wall to the bottom of the second chamber, and upward through the sulfur media mixture in the second chamber. The nitrogen results at the various depths of the Stage 2 biofilter are graphically displayed in Figure 12. Each stainless steel drivepoint sampler was assigned a unique identification indicating the depth (in inches) the sampler was placed above the bottom of the media. For example LIGNO-36 is a stainless steel drivepoint sampler located at 36 inches above the bottom of the lignocellulosic media. The profile results from this event indicate that the  $\text{NO}_x\text{-N}$  was effectively reduced below the method detection limit at profile sampler LIGNO-12. The first chamber of the Stage 2 biofilter contains 42-inches of lignocellulosic media; therefore, the effluent has passed through 30 inches of lignocellulosic media at that depth (42 inches minus 12 inches).

FROM PUMP	TKN	NH3-N	NOX-N		TKN	NH3-N	NOX-N
Influent	2	0.072	24	Effluent	2	0.92	0.02
LIGNO-36	2.9	0.46	18				
LIGNO-30	4.2	1.7	9.8				
LIGNO-24	4.0	1.8	9.4				
LIGNO-18	2.9	1.6	0.43	SULFUR-18	1.8	0.79	0.02
LIGNO-12	1.5	0.3	0.02	SULFUR-12	1.8	0.80	0.02
LIGNO-6	1.4	0.53	0.02	SULFUR-7	1.9	0.74	0.02
LIGNO-0	1.8	0.69	0.02	SULFUR-3	2	0.73	0.05

**Figure 12**  
**Graphical Representation of Stage 2 Biofilter Profile Nitrogen Results**

**Table 5**  
**Water Quality Analytical Results**

Sample ID	Sample Date/Time	Temp (°C)	pH	Specific Conductance (uS/cm)	DO (mg/L)	ORP (mV)	Total Alkalinity (mg/L)	TSS (mg/L)	VSS (mg/L)	CBOD <sub>5</sub> (mg/L)	COD (mg/L)	TN (mg/L N) <sup>1</sup>	TKN (mg/L N)	Organic N (mg/L N) <sup>2</sup>	NH <sub>3</sub> -N (mg/L N)	NO <sub>3</sub> -N (mg/L N)	NO <sub>2</sub> -N (mg/L N)	NO <sub>x</sub> (mg/L N)	TIN (mg/L N) <sup>3</sup>	TP (mg/L)	Ortho P (mg/L P)	Sulfate (mg/L)	Hydrogen Sulfide (mg/L)	Sulfide (mg/L)	Fecal (Ct/100 mL)	E-coli (Ct/100 mL)	TOC (mg/L)
BHS2-STE-SAL	4/16/13 10:10	23.8	7.6	1320	0.56	-367.6	440	18	15	100	300	54.04	54	18	36	0.04	0.01	0.04	36.04	4.8	3.6	80	10	65	4,000		34
BHS2-STE-BENCHMARK	4/16/13 10:10																								400,000	410,000	
BHS2-DBOX-SAL	4/16/13 10:00	23.1	7.2	1195	1.65	-71.2	280	12	8	2	80	28.00	12	4.9	7.1	14	2	16	23.10	3.8	1.4				28,000		17
BHS2-DBOX-BENCHMARK	4/16/13 10:00																								70,000	109,000	
BHS2-PUMP-SAL	4/16/13 9:50	22.8	7.1	1190	5.68	-59.9	210	68	12	22	26	26.00	2	1.928	0.072	24	0.01	24	24.07	3.5	1.1				1,700		12
BHS2-PUMP-BENCHMARK	4/16/13 9:50																								500	738	
BHS2-LIGNO-36	4/16/13 9:40	22.8	6.9	1168	1.54	-186.3						20.90	2.9	2.44	0.46	18	0.17	18	18.46								
BHS2-LIGNO-30	4/16/13 9:30	22.8	7.0	1155	0.65	-237.6						14.20	4.2	2.5	1.7	9.8	0.23	10	11.70								
BHS2-LIGNO-24	4/16/13 9:26	22.6	7.0	1158	1.14	-210.4						13.70	4	2.2	1.8	9.4	0.32	9.7	11.50								
BHS2-LIGNO-18	4/16/13 9:22	22.5	7.1	1134	1.14	-276.8						3.33	2.9	1.3	1.6	0.43	0.01	0.43	2.03								
BHS2-LIGNO-12	4/16/13 9:14	22.2	7.1	1132	1.21	-303.2						1.52	1.5	1.2	0.3	0.01	0.01	0.02	0.32								
BHS2-LIGNO-6	4/16/13 9:05	21.9	7.3	1132	1.01	-322.8						1.42	1.4	0.87	0.53	0.01	0.01	0.02	0.55								
BHS2-LIGNO-0-SAL	4/16/13 8:54	21.8	7.1	1141	0.54	-323.8	410	30	30	25	81	1.82	1.8	1.11	0.69	0.01	0.01	0.02	0.71	2.9	2.6	200	9.8	26	60		16
BHS2-LIGNO-0-BENCHMARK	4/16/13 8:54																								10	52	
BHS2-SULFUR-3	4/16/13 8:44	21.6	7.0	1180	0.23	-353.7						2.05	2	1.27	0.73	0.05	0.01	0.05	0.78			230					
BHS2-SULFUR-7	4/16/13 8:33	21.5	6.9	1208	0.22	-346.1						1.92	1.9	1.16	0.74	0.01	0.01	0.02	0.76			260					
BHS2-SULFUR-12	4/16/13 8:23	21.0	6.8	1219	0.24	-341.2						1.82	1.8	1	0.8	0.01	0.01	0.02	0.82			260					
BHS2-SULFUR-18	4/16/13 8:18	21.7	6.8	1232	0.24	-340.4						1.82	1.8	1.01	0.79	0.01	0.01	0.02	0.81			260					
BHS2-ST2-SAL	4/16/13 8:05	23.0	6.9	1257	0.24	-218.8	220	2	2	56	220	2.02	2	1.08	0.92	0.01	0.01	0.02	0.94	2.9	3.3	240	30	54	10		20
BHS2-ST2-BENCHMARK	4/16/13 8:05																								30	23	
BHS2-EB-SAL	4/16/13 10:45	27.7	8.2	1.82	7.49	NR	2	1	1	2	10	0.07	0.05	0.041	0.009	0.01	0.01	0.02	0.03	0.01	0.01	0.2	0.01	0.1	1		0.5
BHS2-EB-BENCHMARK	4/16/13 10:45																								10	10	
BHS2-WELL	4/16/13 10:30	24.6	7.9	838	4.10	-247.0	190	4	2	2	18	0.47	0.44	0.19	0.25	0.03	0.01	0.03	0.28	0.039	0.011	260	0.23	2.1	1		5.4
BHS2-TAP	4/16/13 10:24	23.9	8.0	832	4.91	NR	160	1	1	2	16	0.54	0.44	0.354	0.086	0.10	0.01	0.1	0.19	0.034	0.031	280	0.01	0.1	1		5.4

Notes:

<sup>1</sup>Total Nitrogen (TN) is a calculated value equal to the sum of TKN and NO<sub>x</sub>.

<sup>2</sup>Organic Nitrogen (ON) is a calculated value equal to the difference of TKN and NH<sub>3</sub>.

<sup>3</sup>Total Inorganic Nitrogen (TIN) is a calculated value equal to the sum of NH<sub>3</sub> and NO<sub>x</sub>.

SAL = Southern Analytical Laboratories; BENCHMARK = Benchmark EnviroAnalytical Inc.

Gray-shaded data points indicate values below method detection level (mdl), mdl value used for statistical analyses.

Yellow-shaded data points indicate the reported value is between the laboratory method detection limit and the laboratory practical quantitation limit, value used for statistical analysis.

Too many colonies were present. The numeric value represents the filtration volume.

Results based on colony counts outside the ideal range.



**Table 6**  
**Summary of Water Quality Data**

Sample ID	Statistical Parameter	pH	Temp (°C)	Specific Conductance (uS/cm)	DO (mg/L)	ORP (mV)	Total Alkalinity (mg/L)	TSS (mg/L)	VSS (mg/L)	CBOD <sub>5</sub> (mg/L)	COD (mg/L)	TN (mg/L N) <sup>3</sup>	TKN (mg/L N)	Organic N (mg/L N) <sup>2</sup>	NH <sub>3</sub> -N (mg/L N)	NO <sub>3</sub> -N (mg/L N)	NO <sub>2</sub> -N (mg/L N)	NOx (mg/L N)	TIN (mg/L N) <sup>3</sup>	TP (mg/L)	Ortho P (mg/L P)	Sulfate (mg/L)	Hydrogen Sulfide (mg/L)	Sulfide (mg/L)	Fecal (Ct/100 mL)	E-coli (Ct/100 mL)	TOC (mg/L)
STE	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
	MEAN	7.4	21.9	1338.0	0.3	-362.7	480.0	26.3	22.3	120.0	376.7	51.4	51.3	11.0	40.3	0.0	0.01	0.04	40.4	5.5	3.8	56.7	13.7	53.3	80,000	105,989	58.0
	STD. DEV.			53.33	0.25	4.23	36.06	9.07	8.74	20.00	68.07	2.52	2.52	8.89	6.66	0.01	0.00	0.01	6.65	0.62	0.44	24.58	3.51	12.01			
	MIN	7.2	18.8	1296.0	0.1	-367.6	440.0	18.0	15.0	100.0	300.0	49.0	49.0	1.0	36.0	0.03	0.01	0.03	36.0	4.8	3.5	31.0	10.0	41.0	800	2,420	34.0
	MAX	7.6	23.8	1398.0	0.6	-360.0	510.0	36.0	32.0	140.0	430.0	54.0	54.0	18.0	48.0	0.04	0.01	0.04	48.0	6.0	4.3	80.0	17.0	65.0	1,600,000	1,200,000	82.0
DBOX	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	0	0	0	3	3	2
	MEAN	7.1	21.1	1204.3	1.0	-127.2	283.3	14.7	9.3	15.0	96.7	19.7	14.3	4.6	9.7	4.7	0.7	5.3	15.0	3.9	1.6				38,099	44,980	24.0
	STD. DEV.			3.23	0.82	55.31	15.28	3.06	4.16	17.58	15.28	7.22	2.08	0.55	2.25	8.08	1.15	9.23	6.97	0.32	0.57						
	MIN	7.1	17.4	1173.0	0.1	-181.8	270.0	12.0	6.0	2.0	80.0	15.0	12.0	4.0	7.1	0.01	0.01	0.02	11.0	3.7	1.1				1,000	2,420	17.0
	MAX	7.2	23.1	1245.0	1.7	-71.2	300.0	18.0	14.0	35.0	110.0	28.0	16.0	5.0	11.0	14.0	2.0	16.0	23.1	4.3	2.2				790,000	345,000	31.0
PUMP	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	0	0	0	3	3	2
	MEAN	6.9	20.7	1184.3	4.7	-38.9	233.3	28.0	7.7	9.7	25.0	17.9	3.5	2.2	1.3	14.1	0.2	14.4	15.8	3.7	1.1				232.7	189.5	14.5
	STD. DEV.			4.0	1.0	81.3	20.8	35.3	5.9	10.8	11.5	7.1	2.3	0.4	2.0	9.0	0.1	8.9	7.4	0.2	0.4						
	MIN	6.7	16.1	1137.0	3.6	-107.6	210.0	1.0	1.0	2.0	13.0	12.5	2.0	1.9	0.1	6.3	0.01	6.3	9.9	3.5	0.7				6.0	2.0	12.0
	MAX	7.1	23.2	1226.0	5.7	50.8	250.0	68.0	12.0	22.0	36.0	26.0	6.2	2.6	3.6	24.0	0.3	24.0	24.1	3.9	1.6				4200.0	4611.0	17.0
LIGNO-0	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
	MEAN	7.0	21.0	1172.0	0.5	-320.0	380.0	12.0	11.7	47.0	128.0	3.7	3.6	1.4	2.2	0.02	0.01	0.02	2.3	2.8	1.8	168.7	10.7	24.4	94.1	160.5	18.0
	STD. DEV.			2.0	0.3	38.9	79.4	15.7	15.9	42.5	79.7	1.6	1.6	0.4	1.4	0.01	0.00	0.01	1.4	0.2	1.0	72.3	6.9	16.4			
	MIN	6.8	18.7	1141.0	0.2	-356.9	290.0	1.0	1.0	20.0	81.0	1.8	1.8	1.1	0.7	0.01	0.01	0.02	0.7	2.6	0.7	86.0	4.2	7.3	10.0	40.0	16.0
	MAX	7.1	22.4	1228.0	0.8	-279.4	440.0	30.0	30.0	96.0	220.0	4.6	4.6	1.8	3.3	0.03	0.01	0.03	3.3	3.0	2.6	220.0	18.0	40.0	1300.0	1986.0	20.0
ST2	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
	MEAN	6.9	20.6	1224.0	0.1	-294.5	316.7	5.3	4.7	66.0	193.3	4.7	4.7	1.4	3.3	0.01	0.01	0.02	3.4	3.4	2.8	196.7	19.7	37.7	110.52	46.93	22.5
	STD. DEV.			3.6	0.1	66.4	95.0	3.1	3.1	39.9	55.1	2.4	2.4	0.2	2.1	0.00	0.00	0.00	2.1	1.3	1.7	37.9	9.0	14.4			
	MIN	6.9	16.5	1181.0	0.1	-342.9	220.0	2.0	2.0	32.0	130.0	2.0	2.0	1.1	0.9	0.01	0.01	0.02	0.9	2.4	0.9	170.0	14.0	27.0	30	23	20.0
	MAX	7.0	23.0	1257.0	0.2	-218.8	410.0	8.0	8.0	110.0	230.0	6.5	6.5	1.5	5.0	0.01	0.01	0.02	5.0	4.8	4.1	240.0	30.0	54.0	300	155	25.0
FB-TAP	n	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	2	0	2
	MEAN	7.5	21.7	825.7	5.4	57.5	155.0	4.5	3.5	2.0	16.0	0.5	0.3	0.3	0.05	0.12	0.01	0.12	0.2	0.03	0.02	256.7	0.01	0.07	1		6.7
	STD. DEV.			3.0	11.8	0.4	16.5	7.1	4.9	3.5	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	20.8	0.0	0.1			1.8
	MIN	7.1	18.3	812.0	4.9	45.8	150.0	1.0	1.0	2.0	16.0	0.4	0.2	0.2	0.009	0.10	0.01	0.10	0.1	0.026	0.01	240.0	0.01	0.01	1		5.4
	MAX	8.0	23.9	833.0	5.7	69.2	160.0	8.0	6.0	2.0	16.0	0.5	0.4	0.4	0.09	0.13	0.01	0.13	0.2	0.03	0.03	280.0	0.01	0.10	1		8.0
EB	n	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
	MEAN	8.0	22.2	1.9	8.5	27.0	2.0	3.0	2.0	3.3	11.3	0.1	0.06	0.05	0.01	0.01	0.01	0.02	0.03	0.01	0.01	0.20	0.01	0.07	6.84	2.15	0.5
	STD. DEV.			7.09	0.44	0.88	5.23	0.06	3.46	1.73	2.31	2.31	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.05			0.0
	MIN	7.8	14.2	1.6	7.5	23.3	2.0	1.0	1.0	2.0	10.0	0.1	0.05	0.04	0.009	0.01	0.01	0.02	0.03	0.01	0.01	0.20	0.01	0.01	1	1	0.5
	MAX	8.2	27.7	2.4	9.2	30.7	2.1	7.0	4.0	6.0	14.0	0.1	0.07	0.06	0.009	0.01	0.01	0.02	0.03	0.02	0.01	0.20	0.01	0.10	32.0	10.0	0.5

Notes:

<sup>1</sup>Total Nitrogen (TN) is a calculated value equal to the sum of TKN and NO<sub>x</sub>.

<sup>2</sup>Organic Nitrogen (ON) is a calculated value equal to the difference of TKN and  $\text{NH}_3$ .

<sup>3</sup>Total Inorganic Nitrogen (TIN) is a calculated value equal to the sum of  $\text{NH}_3$  and  $\text{NO}_x$ .

Gray-shaded data points indicate values below method detection level (mdl), mdl value used for statistical analyses.

Yellow-shaded data points indicate the reported value is between the laboratory method detection limit and the laboratory practical quantitation limit, value used for statistical analysis.

Too many colonies were present. The numeric value represents the filtration volume.

Results based on colony counts outside the ideal range.

## **5.0 B-HS2 Sample Event No. 3: Summary and Recommendations**

### **5.1 Summary**

The results of the third sampling event indicate that the system is operating well and no adjustments are recommended at this time. The Sample Event No. 3 results indicate that:

- Septic tank effluent (STE) quality is characteristic of typical household STE quality. The total nitrogen concentration of 54 mg/L is within the range of values typically reported for Florida single family residence STE.
- The Stage 1 biofilter was effective in converting most of the ammonia N to oxidized nitrogen; effluent contained 2 mg/L TKN, of which 0.072 mg/L was ammonia.
- The Stage 2 biofilter was effective in producing a reducing environment and effluent  $\text{NO}_x\text{-N}$  was below the method detection limit.
- The total nitrogen concentration in the final effluent from the total treatment system was approximately 2 mg/L, an approximately 96% reduction from STE.

### **5.2 Recommendations**

No operational adjustments are recommended at this time, and continued sampling should provide additional insight to system performance.



## **Appendix A: Laboratory Report**

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PRELIMINARY

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**Hazen and Sawyer**  
**10002 Princess Palm Ave, Suite 200**  
**Tampa, FL 33619**

**May 10, 2013**  
**Work Order: 1303529**

## Laboratory Report

**Project Name** Hillsborough County B-HS2 SE#3

Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
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Sample Description **BHS2-STE**  
 Matrix **Wastewater**  
 SAL Sample Number **1303529-01**  
 Date/Time Collected **04/16/13 10:10**  
 Collected by **Josephine Edeback-Hirst**  
 Date/Time Received **04/16/13 13:00**

### Inorganics

Hydrogen Sulfide (Unionized)	mg/L	10	SM 4550SF	0.04	0.01	04/17/13 10:34	04/17/13 10:35	1
Ammonia as N	mg/L	36	EPA 350.1	2.0	0.47		04/25/13 11:13	50
Carbonaceous BOD	mg/L	100	SM 5210B	2	2	04/17/13 12:03	04/22/13 10:03	1
Chemical Oxygen Demand	mg/L	300	EPA 410.4	25	10	04/22/13 10:45	04/22/13 15:00	1
Nitrate (as N)	mg/L	0.04	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Orthophosphate as P	mg/L	3.6	EPA 300.0	0.040	0.010		04/16/13 16:36	1
Phosphorous - Total as P	mg/L	4.8	SM 4500P-E	0.40	0.10	04/18/13 13:24	04/23/13 14:12	10
Sulfate	mg/L	80	EPA 300.0	0.60	0.20		04/16/13 16:36	1
Sulfide	mg/L	65	SM 4500SF	0.40	0.10		04/16/13 13:24	1
Total Alkalinity	mg/L	440	SM 2320B	8.0	2.0		04/22/13 13:00	1
Total Kjeldahl Nitrogen	mg/L	54	EPA 351.2	0.20	0.05	04/22/13 09:53	04/23/13 17:15	41.67
Total Organic Carbon	mg/L	34	SM 5310B	1.0	0.50		04/16/13 15:43	1
Total Suspended Solids	mg/L	18	SM 2540D	1	1	04/19/13 11:09	04/23/13 14:35	1
Volatile Suspended Solids	mg/L	15	EPA 160.4**	1	1	04/19/13 11:09	04/23/13 14:35	1
Nitrate+Nitrite (N)	mg/L	0.04 I	EPA 300.0	0.08	0.02		04/16/13 16:36	1

### Microbiology

Fecal Coliforms	CFU/100 ml	4,000	SM 9222D	1	1	04/16/13 13:41	04/17/13 12:58	1
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Sample Description **BHS2-DBOX**  
 Matrix **Wastewater**  
 SAL Sample Number **1303529-02**  
 Date/Time Collected **04/16/13 10:00**  
 Collected by **Josephine Edeback-Hirst**  
 Date/Time Received **04/16/13 13:00**

### Inorganics

Ammonia as N	mg/L	7.1	EPA 350.1	0.40	0.095		04/25/13 10:55	10
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/17/13 12:03	04/22/13 10:03	1
Chemical Oxygen Demand	mg/L	80	EPA 410.4	25	10	04/22/13 10:45	04/22/13 15:00	1
Nitrate (as N)	mg/L	14	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Nitrite (as N)	mg/L	2.0	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Orthophosphate as P	mg/L	1.4	EPA 300.0	0.040	0.010		04/16/13 16:36	1
Phosphorous - Total as P	mg/L	3.8	SM 4500P-E	0.40	0.10	04/18/13 13:24	04/23/13 14:13	10
Total Alkalinity	mg/L	280	SM 2320B	8.0	2.0		04/22/13 13:00	1
Total Kjeldahl Nitrogen	mg/L	12	EPA 351.2	0.20	0.05	04/22/13 09:53	04/23/13 16:06	5
Total Organic Carbon	mg/L	17	SM 5310B	1.0	0.50		04/16/13 15:43	1



Hazen and Sawyer  
 10002 Princess Palm Ave, Suite 200  
 Tampa, FL 33619

May 10, 2013  
 Work Order: 1303529

### Laboratory Report

Project Name		Hillsborough County B-HS2 SE#3						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution

Sample Description **BHS2-DBOX**  
 Matrix **Wastewater**  
 SAL Sample Number **1303529-02**  
 Date/Time Collected **04/16/13 10:00**  
 Collected by **Josephine Edeback-Hirst**  
 Date/Time Received **04/16/13 13:00**

Total Suspended Solids	mg/L	12	SM 2540D	1	1	04/19/13 11:09	04/23/13 14:35	1
Volatile Suspended Solids	mg/L	8	EPA 160.4**	1	1	04/19/13 11:09	04/23/13 14:35	1
Nitrate+Nitrite (N)	mg/L	16	EPA 300.0	0.08	0.02		04/16/13 16:36	1

#### Microbiology

Fecal Coliforms	CFU/100 ml	28,000	SM 9222D	1	1	04/16/13 13:41	04/17/13 12:58	1
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Sample Description **BHS2-PUMP**  
 Matrix **Wastewater**  
 SAL Sample Number **1303529-03**  
 Date/Time Collected **04/16/13 09:50**  
 Collected by **Josephine Edeback-Hirst**  
 Date/Time Received **04/16/13 13:00**

#### Inorganics

Ammonia as N	mg/L	0.072	EPA 350.1	0.040	0.009		04/25/13 09:48	1
Carbonaceous BOD	mg/L	22	SM 5210B	2	2	04/17/13 12:03	04/22/13 10:03	1
Chemical Oxygen Demand	mg/L	26	EPA 410.4	25	10	04/22/13 10:45	04/22/13 15:00	1
Nitrate (as N)	mg/L	24	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Orthophosphate as P	mg/L	1.1	EPA 300.0	0.040	0.010		04/16/13 16:36	1
Phosphorous - Total as P	mg/L	3.5	SM 4500P-E	0.40	0.10	04/18/13 13:24	04/23/13 14:14	10
Total Alkalinity	mg/L	210	SM 2320B	8.0	2.0		04/22/13 13:00	1
Total Kjeldahl Nitrogen	mg/L	2.0	EPA 351.2	0.20	0.05	04/22/13 09:53	04/23/13 16:07	5
Total Organic Carbon	mg/L	12	SM 5310B	1.0	0.50		04/16/13 15:43	1
Total Suspended Solids	mg/L	68	SM 2540D	1	1	04/19/13 11:09	04/23/13 14:35	1
Volatile Suspended Solids	mg/L	12	EPA 160.4**	1	1	04/19/13 11:09	04/23/13 14:35	1
Nitrate+Nitrite (N)	mg/L	24	EPA 300.0	0.08	0.02		04/16/13 16:36	1

#### Microbiology

Fecal Coliforms	CFU/100 ml	1,700	SM 9222D	1	1	04/16/13 13:41	04/17/13 12:58	1
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Sample Description **BHS2-LIGNO-36**  
 Matrix **Wastewater**  
 SAL Sample Number **1303529-04**  
 Date/Time Collected **04/16/13 09:40**  
 Collected by **Josephine Edeback-Hirst**  
 Date/Time Received **04/16/13 13:00**

#### Inorganics

**Hazen and Sawyer**  
**10002 Princess Palm Ave, Suite 200**  
**Tampa, FL 33619**

**May 10, 2013**  
**Work Order: 1303529**

## Laboratory Report

<b>Project Name</b>	<b>Hillsborough County B-HS2 SE#3</b>
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Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description <b>BHS2-LIGNO-36</b>								
Matrix <b>Wastewater</b>								
SAL Sample Number <b>1303529-04</b>								
Date/Time Collected <b>04/16/13 09:40</b>								
Collected by <b>Josephine Edeback-Hirst</b>								
Date/Time Received <b>04/16/13 13:00</b>								
Ammonia as N	mg/L	0.46	EPA 350.1	0.040	0.009		04/25/13 09:50	1
Nitrate (as N)	mg/L	18	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Nitrite (as N)	mg/L	0.17	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Total Kjeldahl Nitrogen	mg/L	2.9	EPA 351.2	0.20	0.05	04/22/13 09:53	04/23/13 16:09	5
Nitrate+Nitrite (N)	mg/L	18	EPA 300.0	0.08	0.02		04/16/13 16:36	1

Sample Description **BHS2-LIGNO-30**  
 Matrix **Wastewater**  
 SAL Sample Number **1303529-05**  
 Date/Time Collected **04/16/13 09:30**  
 Collected by **Josephine Edeback-Hirst**  
 Date/Time Received **04/16/13 13:00**

**Inorganics**

Ammonia as N	mg/L	1.7	EPA 350.1	0.040	0.009		04/25/13 09:52	1
Nitrate (as N)	mg/L	9.8	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Nitrite (as N)	mg/L	0.23	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Total Kjeldahl Nitrogen	mg/L	4.2	EPA 351.2	0.20	0.05	04/22/13 09:53	04/23/13 16:11	5
Nitrate+Nitrite (N)	mg/L	10	EPA 300.0	0.08	0.02		04/16/13 16:36	1

Sample Description **BHS2-LIGNO-24**  
 Matrix **Wastewater**  
 SAL Sample Number **1303529-06**  
 Date/Time Collected **04/16/13 09:26**  
 Collected by **Josephine Edeback-Hirst**  
 Date/Time Received **04/16/13 13:00**

**Inorganics**

Ammonia as N	mg/L	1.8	EPA 350.1	0.040	0.009		04/25/13 09:54	1
Nitrate (as N)	mg/L	9.4	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Nitrite (as N)	mg/L	0.32	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Total Kjeldahl Nitrogen	mg/L	4.0	EPA 351.2	0.20	0.05	04/22/13 09:53	04/23/13 16:12	5
Nitrate+Nitrite (N)	mg/L	9.7	EPA 300.0	0.08	0.02		04/16/13 16:36	1

**Hazen and Sawyer**  
**10002 Princess Palm Ave, Suite 200**  
**Tampa, FL 33619**

**May 10, 2013**  
**Work Order: 1303529**

## Laboratory Report

<b>Project Name</b>	<b>Hillsborough County B-HS2 SE#3</b>
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Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
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Sample Description	<b>BHS2-LIGNO-18</b>
Matrix	<b>Wastewater</b>
SAL Sample Number	<b>1303529-07</b>
Date/Time Collected	<b>04/16/13 09:22</b>
Collected by	<b>Josephine Edeback-Hirst</b>
Date/Time Received	<b>04/16/13 13:00</b>

**Inorganics**

Ammonia as N	mg/L	1.6	EPA 350.1	0.040	0.009		04/25/13 09:56	1
Nitrate (as N)	mg/L	0.43	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Total Kjeldahl Nitrogen	mg/L	2.9	EPA 351.2	0.20	0.05	04/22/13 09:53	04/23/13 16:14	5
Nitrate+Nitrite (N)	mg/L	0.43	EPA 300.0	0.08	0.02		04/16/13 16:36	1

Sample Description	<b>BHS2-LIGNO-12</b>
Matrix	<b>Wastewater</b>
SAL Sample Number	<b>1303529-08</b>
Date/Time Collected	<b>04/16/13 09:14</b>
Collected by	<b>Josephine Edeback-Hirst</b>
Date/Time Received	<b>04/16/13 13:00</b>

**Inorganics**

Ammonia as N	mg/L	0.30	EPA 350.1	0.20	0.047		04/23/13 15:56	5
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Total Kjeldahl Nitrogen	mg/L	1.5	EPA 351.2	0.20	0.05	04/16/13 14:36	04/22/13 13:35	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/16/13 16:36	1

Sample Description	<b>BHS2-LIGNO-6</b>
Matrix	<b>Wastewater</b>
SAL Sample Number	<b>1303529-09</b>
Date/Time Collected	<b>04/16/13 09:05</b>
Collected by	<b>Josephine Edeback-Hirst</b>
Date/Time Received	<b>04/16/13 13:00</b>

**Inorganics**

Ammonia as N	mg/L	0.53	EPA 350.1	0.20	0.047		04/23/13 15:58	5
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Total Kjeldahl Nitrogen	mg/L	1.4	EPA 351.2	0.20	0.05	04/16/13 14:36	04/22/13 13:36	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/16/13 16:36	1

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**May 10, 2013**  
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## Laboratory Report

<b>Project Name</b>	<b>Hillsborough County B-HS2 SE#3</b>
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Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		<b>BHS2-LIGNO-0</b>						
Matrix		<b>Wastewater</b>						
SAL Sample Number		<b>1303529-10</b>						
Date/Time Collected		<b>04/16/13 08:54</b>						
Collected by		<b>Josephine Edeback-Hirst</b>						
Date/Time Received		<b>04/16/13 13:00</b>						

### Inorganics

Hydrogen Sulfide (Unionized)	mg/L	9.8	SM 4550SF	0.04	0.01	04/17/13 10:34	04/17/13 10:35	1
Ammonia as N	mg/L	0.69	EPA 350.1	0.20	0.047		04/23/13 16:00	5
Carbonaceous BOD	mg/L	25	SM 5210B	2	2	04/17/13 12:03	04/22/13 10:03	1
Chemical Oxygen Demand	mg/L	81	EPA 410.4	25	10	04/22/13 10:45	04/22/13 15:00	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/16/13 16:36	1
Orthophosphate as P	mg/L	2.6	EPA 300.0	0.040	0.010		04/16/13 16:36	1
Phosphorous - Total as P	mg/L	2.9	SM 4500P-E	0.40	0.10	04/18/13 13:24	04/23/13 14:15	10
Sulfate	mg/L	200	EPA 300.0	0.60	0.20		04/20/13 01:15	1
Sulfide	mg/L	26	SM 4500SF	0.40	0.10		04/16/13 13:24	1
Total Alkalinity	mg/L	410	SM 2320B	8.0	2.0		04/22/13 13:00	1
Total Kjeldahl Nitrogen	mg/L	1.8	EPA 351.2	0.20	0.05	04/16/13 14:36	04/22/13 13:38	1
Total Organic Carbon	mg/L	16	SM 5310B	1.0	0.50		04/16/13 15:43	1
Total Suspended Solids	mg/L	30	SM 2540D	1	1	04/19/13 11:09	04/23/13 14:35	1
Volatile Suspended Solids	mg/L	30	EPA 160.4**	1	1	04/19/13 11:09	04/23/13 14:35	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/16/13 16:36	1

### Microbiology

Fecal Coliforms	CFU/100 ml	60	SM 9222D	1	1	04/16/13 13:41	04/17/13 12:58	1
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Sample Description **BHS2-SULFUR-3**  
 Matrix **Wastewater**  
 SAL Sample Number **1303529-11**  
 Date/Time Collected **04/16/13 08:44**  
 Collected by **Josephine Edeback-Hirst**  
 Date/Time Received **04/16/13 13:00**

### Inorganics

Ammonia as N	mg/L	0.73	EPA 350.1	0.20	0.047		04/23/13 16:02	5
Nitrate (as N)	mg/L	0.05	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Sulfate	mg/L	230	EPA 300.0	0.60	0.20		04/20/13 01:15	1
Total Kjeldahl Nitrogen	mg/L	2.0	EPA 351.2	0.20	0.05	04/16/13 14:36	04/22/13 13:39	1
Nitrate+Nitrite (N)	mg/L	0.05 I	EPA 300.0	0.08	0.02		04/17/13 01:23	1

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**May 10, 2013**  
**Work Order: 1303529**

## Laboratory Report

<b>Project Name</b>	<b>Hillsborough County B-HS2 SE#3</b>
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Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
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Sample Description	<b>BHS2-SULFUR-7</b>
Matrix	<b>Wastewater</b>
SAL Sample Number	<b>1303529-12</b>
Date/Time Collected	<b>04/16/13 08:33</b>
Collected by	<b>Josephine Edeback-Hirst</b>
Date/Time Received	<b>04/16/13 13:00</b>

**Inorganics**

Ammonia as N	mg/L	0.74	EPA 350.1	0.20	0.047		04/23/13 16:04	5
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Sulfate	mg/L	260	EPA 300.0	0.60	0.20		04/20/13 01:15	1
Total Kjeldahl Nitrogen	mg/L	1.9	EPA 351.2	0.20	0.05	04/16/13 14:36	04/22/13 13:41	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/17/13 01:23	1

Sample Description	<b>BHS2-SULFUR-12</b>
Matrix	<b>Wastewater</b>
SAL Sample Number	<b>1303529-13</b>
Date/Time Collected	<b>04/16/13 08:23</b>
Collected by	<b>Josephine Edeback-Hirst</b>
Date/Time Received	<b>04/16/13 13:00</b>

**Inorganics**

Ammonia as N	mg/L	0.80	EPA 350.1	0.20	0.047		04/23/13 16:06	5
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Sulfate	mg/L	260	EPA 300.0	0.60	0.20		04/20/13 01:15	1
Total Kjeldahl Nitrogen	mg/L	1.8	EPA 351.2	0.20	0.05	04/16/13 14:36	04/22/13 13:42	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/17/13 01:23	1

Sample Description	<b>BHS2-SULFUR-18</b>
Matrix	<b>Wastewater</b>
SAL Sample Number	<b>1303529-14</b>
Date/Time Collected	<b>04/16/13 08:18</b>
Collected by	<b>Josephine Edeback-Hirst</b>
Date/Time Received	<b>04/16/13 13:00</b>

**Inorganics**

Ammonia as N	mg/L	0.79	EPA 350.1	0.20	0.047		04/23/13 16:09	5
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Sulfate	mg/L	260	EPA 300.0	0.60	0.20		04/20/13 01:15	1
Total Kjeldahl Nitrogen	mg/L	1.8	EPA 351.2	0.20	0.05	04/16/13 14:36	04/22/13 13:43	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/17/13 01:23	1



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**May 10, 2013**  
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## Laboratory Report

Project Name		Hillsborough County B-HS2 SE#3						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS2-ST2						
Matrix		Wastewater						
SAL Sample Number		1303529-15						
Date/Time Collected		04/16/13 08:05						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		04/16/13 13:00						
<b><u>Inorganics</u></b>								
Hydrogen Sulfide (Unionized)	mg/L	30	SM 4550SF	0.04	0.01	04/17/13 10:34	04/17/13 10:35	1
Ammonia as N	mg/L	0.92	EPA 350.1	0.20	0.047		04/23/13 16:11	5
Carbonaceous BOD	mg/L	56	SM 5210B	2	2	04/17/13 12:03	04/22/13 10:03	1
Chemical Oxygen Demand	mg/L	220	EPA 410.4	25	10	04/22/13 10:45	04/22/13 15:00	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Orthophosphate as P	mg/L	3.3	EPA 300.0	0.040	0.010		04/17/13 01:23	1
Phosphorous - Total as P	mg/L	2.9	SM 4500P-E	0.40	0.10	04/18/13 13:24	04/23/13 14:16	10
Sulfate	mg/L	240	EPA 300.0	0.60	0.20		04/20/13 01:15	1
Sulfide	mg/L	54	SM 4500SF	0.40	0.10		04/16/13 13:24	1
Total Alkalinity	mg/L	220	SM 2320B	8.0	2.0		04/22/13 13:00	1
Total Kjeldahl Nitrogen	mg/L	2.0	EPA 351.2	0.20	0.05	04/16/13 14:36	04/22/13 13:44	1
Total Organic Carbon	mg/L	20	SM 5310B	1.0	0.50		04/16/13 15:43	1
Total Suspended Solids	mg/L	2	SM 2540D	1	1	04/19/13 11:09	04/23/13 14:35	1
Volatile Suspended Solids	mg/L	2	EPA 160.4**	1	1	04/19/13 11:09	04/23/13 14:35	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/17/13 01:23	1
<b><u>Microbiology</u></b>								
Fecal Coliforms	CFU/100 ml	10	SM 9222D	1	1	04/16/13 13:41	04/17/13 12:58	1
Sample Description		BHS2-EB						
Matrix		Reagent Water						
SAL Sample Number		1303529-16						
Date/Time Collected		04/16/13 10:45						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		04/16/13 13:00						
<b><u>Inorganics</u></b>								
Hydrogen Sulfide (Unionized)	mg/L	0.01 U	SM 4550SF	0.04	0.01	04/17/13 10:34	04/17/13 10:35	1
Ammonia as N	mg/L	0.009 U	EPA 350.1	0.040	0.009		04/23/13 17:19	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/17/13 12:03	04/22/13 10:03	1
Chemical Oxygen Demand	mg/L	10 U	EPA 410.4	25	10	04/22/13 10:45	04/22/13 15:00	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Orthophosphate as P	mg/L	0.010 U	EPA 300.0	0.040	0.010		04/17/13 01:23	1
Phosphorous - Total as P	mg/L	0.010 U	SM 4500P-E	0.040	0.010	04/18/13 13:24	04/23/13 13:27	1
Sulfate	mg/L	0.20 U	EPA 300.0	0.60	0.20		04/17/13 01:23	1
Sulfide	mg/L	0.10 U	SM 4500SF	0.40	0.10		04/16/13 13:24	1

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**May 10, 2013**  
**Work Order: 1303529**

## Laboratory Report

Project Name		Hillsborough County B-HS2 SE#3						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS2-EB						
Matrix		Reagent Water						
SAL Sample Number		1303529-16						
Date/Time Collected		04/16/13 10:45						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		04/16/13 13:00						
Total Alkalinity	mg/L	2.0 U	SM 2320B	8.0	2.0		04/22/13 13:00	1
Total Kjeldahl Nitrogen	mg/L	0.05 U	EPA 351.2	0.20	0.05	04/16/13 14:36	04/22/13 13:46	1
Total Organic Carbon	mg/L	0.50 U	SM 5310B	1.0	0.50		04/16/13 15:43	1
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	04/19/13 11:09	04/23/13 14:35	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4**	1	1	04/19/13 11:09	04/23/13 14:35	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/17/13 01:23	1
<b>Microbiology</b>								
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	04/16/13 13:41	04/17/13 12:58	1
Sample Description		BHS2-WELL						
Matrix		Groundwater						
SAL Sample Number		1303529-17						
Date/Time Collected		04/16/13 10:30						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		04/16/13 13:00						
<b>Inorganics</b>								
Hydrogen Sulfide (Unionized)	mg/L	0.23	SM 4550SF	0.04	0.01	04/17/13 10:34	04/17/13 10:35	1
Ammonia as N	mg/L	0.25	EPA 350.1	0.040	0.009		04/23/13 16:15	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/17/13 12:03	04/22/13 10:03	1
Chemical Oxygen Demand	mg/L	18 I	EPA 410.4	25	10	04/22/13 10:45	04/22/13 15:00	1
Nitrate (as N)	mg/L	0.03 I	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Orthophosphate as P	mg/L	0.011 I	EPA 300.0	0.040	0.010		04/17/13 01:23	1
Phosphorous - Total as P	mg/L	0.039 I	SM 4500P-E	0.040	0.010	04/18/13 13:24	04/23/13 13:28	1
Sulfate	mg/L	260	EPA 300.0	0.60	0.20		04/20/13 01:15	1
Sulfide	mg/L	2.1	SM 4500SF	0.40	0.10		04/16/13 13:24	1
Total Alkalinity	mg/L	190	SM 2320B	8.0	2.0		04/22/13 13:00	1
Total Kjeldahl Nitrogen	mg/L	0.44	EPA 351.2	0.20	0.05	04/16/13 14:36	04/22/13 13:47	1
Total Organic Carbon	mg/L	5.4	SM 5310B	1.0	0.50		04/16/13 15:43	1
Total Suspended Solids	mg/L	4	SM 2540D	1	1	04/19/13 11:09	04/23/13 14:35	1
Volatile Suspended Solids	mg/L	2	EPA 160.4**	1	1	04/19/13 11:09	04/23/13 14:35	1
Nitrate+Nitrite (N)	mg/L	0.03 I	EPA 300.0	0.08	0.02		04/17/13 01:23	1
<b>Microbiology</b>								
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	04/16/13 13:41	04/17/13 12:58	1

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**May 10, 2013**  
**Work Order: 1303529**

## Laboratory Report

Project Name		Hillsborough County B-HS2 SE#3						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS2-TAP						
Matrix		Drinking Water						
SAL Sample Number		1303529-18						
Date/Time Collected		04/16/13 10:24						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		04/16/13 13:00						
<b><u>Inorganics</u></b>								
Hydrogen Sulfide (Unionized)	mg/L	0.01 U	SM 4550SF	0.04	0.01	04/17/13 10:34	04/17/13 10:35	1
Ammonia as N	mg/L	0.086	EPA 350.1	0.040	0.009		04/23/13 16:25	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/17/13 12:03	04/22/13 10:03	1
Chemical Oxygen Demand	mg/L	16 I	EPA 410.4	25	10	04/22/13 10:45	04/22/13 15:00	1
Nitrate (as N)	mg/L	0.10	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/17/13 01:23	1
Orthophosphate as P	mg/L	0.031 I	EPA 300.0	0.040	0.010		04/17/13 01:23	1
Phosphorous - Total as P	mg/L	0.034 I	SM 4500P-E	0.040	0.010	04/18/13 13:24	04/23/13 13:29	1
Sulfate	mg/L	280	EPA 300.0	0.60	0.20		04/20/13 01:15	1
Sulfide	mg/L	0.10 U	SM 4500SF	0.40	0.10		04/16/13 13:24	1
Total Alkalinity	mg/L	160	SM 2320B	8.0	2.0		04/22/13 13:00	1
Total Kjeldahl Nitrogen	mg/L	0.44	EPA 351.2	0.20	0.05	04/16/13 14:34	04/22/13 12:44	1
Total Organic Carbon	mg/L	5.4	SM 5310B	1.0	0.50		04/16/13 15:43	1
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	04/19/13 11:09	04/23/13 14:35	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4**	1	1	04/19/13 11:09	04/23/13 14:35	1
Nitrate+Nitrite (N)	mg/L	0.10	EPA 300.0	0.08	0.02		04/17/13 01:23	1
<b><u>Microbiology</u></b>								
Fecal Coliforms	CFU/100 ml	68	SM 9222D	1	1	04/16/13 13:41	04/17/13 12:58	1

**Hazen and Sawyer**

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**Tampa, FL 33619**

**May 10, 2013**

**Work Order: 1303529**

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**\* Qualifiers, Notes and Definitions**

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Results followed by a "U" indicate that the sample was analyzed but the compound was not detected. Results followed by "I" indicate that the reported value is between the laboratory method detection limits and the laboratory practical quantitation limit.

A statement of estimated uncertainty of test results is available upon request.

For methods marked with \*\*, all QC criteria have been met for this method which is equivalent to a SAL certified method.

Test results in this report meet all the requirements of the NELAC standards. Any applicable qualifiers are shown below.

Questions regarding this report should be directed to :

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**June 3, 2013**  
**Work Order: 1303529**

## Workorder Quality Control Data Results

### Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BD31619 - Sulfide prep</b>										
<b>Blank (BD31619-BLK1)</b>					Prepared & Analyzed: 04/16/13					
Sulfide	0.10 U	0.40	0.10	mg/L						
<b>LCS (BD31619-BS1)</b>					Prepared & Analyzed: 04/16/13					
Sulfide	4.42	0.40	0.10	mg/L	5.0		88	85-115		
<b>Matrix Spike (BD31619-MS1)</b>					<b>Source: 1303994-02</b>		Prepared & Analyzed: 04/16/13			
Sulfide	4.42	0.40	0.10	mg/L	5.0	ND	88	85-115		
<b>Matrix Spike Dup (BD31619-MSD1)</b>					<b>Source: 1303994-02</b>		Prepared & Analyzed: 04/16/13			
Sulfide	4.42	0.40	0.10	mg/L	5.0	ND	88	85-115	0	14
<b>Batch BD31623 - Ion Chromatography 300.0 Prep</b>										
<b>Blank (BD31623-BLK1)</b>					Prepared & Analyzed: 04/16/13					
Sulfate	0.20 U	0.60	0.20	mg/L						
Orthophosphate as P	0.010 U	0.040	0.010	mg/L						
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Nitrite (as N)	0.01 U	0.04	0.01	mg/L						
<b>LCS (BD31623-BS1)</b>					Prepared & Analyzed: 04/16/13					
Sulfate	9.52	0.60	0.20	mg/L	9.0		106	85-115		
Orthophosphate as P	0.944	0.040	0.010	mg/L	0.90		105	85-115		
Nitrate (as N)	1.80	0.04	0.01	mg/L	1.7		106	85-115		
Nitrite (as N)	1.29	0.04	0.01	mg/L	1.4		92	85-115		
<b>LCS Dup (BD31623-BSD1)</b>					Prepared & Analyzed: 04/16/13					
Sulfate	9.47	0.60	0.20	mg/L	9.0		105	85-115	0.5	200
Orthophosphate as P	0.978	0.040	0.010	mg/L	0.90		109	85-115	4	200
Nitrite (as N)	1.32	0.04	0.01	mg/L	1.4		94	85-115	2	200
Nitrate (as N)	1.81	0.04	0.01	mg/L	1.7		106	85-115	0.6	200



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## Workorder Quality Control Data Results

### Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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#### Batch BD31623 - Ion Chromatography 300.0 Prep

<b>Matrix Spike (BD31623-MS1)</b>		<b>Source: 1304047-01</b>			Prepared & Analyzed: 04/16/13					
Nitrite (as N)	1.37	0.04	0.01	mg/L	1.4	ND	98	85-115		
Sulfate	90.0 L	0.60	0.20	mg/L	9.0	273	NR	85-115		
Nitrate (as N)	1.77	0.04	0.01	mg/L	1.7	0.0463	101	85-115		
Orthophosphate as P	0.931	0.040	0.010	mg/L	0.90	0.120	90	85-115		
<b>Matrix Spike (BD31623-MS2)</b>		<b>Source: 1303529-10</b>			Prepared & Analyzed: 04/16/13					
Sulfate	90.0 L	0.60	0.20	mg/L	9.0	125	NR	85-115		
Orthophosphate as P	3.58	0.040	0.010	mg/L	0.90	2.61	108	85-115		
Nitrite (as N)	1.47	0.04	0.01	mg/L	1.4	ND	105	85-115		
Nitrate (as N)	1.72	0.04	0.01	mg/L	1.7	ND	101	85-115		

#### Batch BD31624 - Ion Chromatography 300.0 Prep

<b>Blank (BD31624-BLK1)</b>		Prepared & Analyzed: 04/17/13								
Nitrite (as N)	0.01 U	0.04	0.01	mg/L						
Sulfate	0.20 U	0.60	0.20	mg/L						
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Orthophosphate as P	0.010 U	0.040	0.010	mg/L						
<b>LCS (BD31624-BS1)</b>		Prepared & Analyzed: 04/17/13								
Sulfate	9.72	0.60	0.20	mg/L	9.0		108	85-115		
Nitrite (as N)	1.33	0.04	0.01	mg/L	1.4		95	85-115		
Orthophosphate as P	0.963	0.040	0.010	mg/L	0.90		107	85-115		
Nitrate (as N)	1.81	0.04	0.01	mg/L	1.7		106	85-115		
<b>LCS Dup (BD31624-BSD1)</b>		Prepared & Analyzed: 04/17/13								
Sulfate	9.68	0.60	0.20	mg/L	9.0		108	85-115	0.4	200
Nitrite (as N)	1.35	0.04	0.01	mg/L	1.4		96	85-115	1	200
Orthophosphate as P	0.982	0.040	0.010	mg/L	0.90		109	85-115	2	200
Nitrate (as N)	1.81	0.04	0.01	mg/L	1.7		106	85-115	0	200

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## Workorder Quality Control Data Results

### Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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#### Batch BD31624 - Ion Chromatography 300.0 Prep

<b>Matrix Spike (BD31624-MS1)</b>		<b>Source: 1304069-01</b>			Prepared & Analyzed: 04/17/13					
Nitrite (as N)	1.39	0.04	0.01	mg/L	1.4	ND	99	85-115		
Nitrate (as N)	2.73	0.04	0.01	mg/L	1.7	0.890	108	85-115		
Sulfate	50.5	0.60	0.20	mg/L	9.0	41.3	102	85-115		
Orthophosphate as P	1.36	0.040	0.010	mg/L	0.90	0.529	92	85-115		
<b>Matrix Spike (BD31624-MS2)</b>		<b>Source: 1304074-01</b>			Prepared & Analyzed: 04/17/13					
Nitrite (as N)	1.53	0.04	0.01	mg/L	1.4	ND	109	85-115		
Nitrate (as N)	1.85	0.04	0.01	mg/L	1.7	0.0637	105	85-115		
Orthophosphate as P	0.927	0.040	0.010	mg/L	0.90	ND	103	85-115		
Sulfate	11.2	0.60	0.20	mg/L	9.0	1.40	109	85-115		

#### Batch BD31630 - Digestion for TKN by EPA 351.2

<b>Blank (BD31630-BLK1)</b>		Prepared: 04/16/13 Analyzed: 04/22/13								
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						
<b>LCS (BD31630-BS1)</b>		Prepared: 04/16/13 Analyzed: 04/22/13								
Total Kjeldahl Nitrogen	2.34	0.20	0.05	mg/L	2.5		92	90-110		
<b>Matrix Spike (BD31630-MS1)</b>		<b>Source: 1303529-18</b>			Prepared: 04/16/13 Analyzed: 04/22/13					
Total Kjeldahl Nitrogen	3.00	0.20	0.05	mg/L	2.5	0.443	101	90-110		
<b>Matrix Spike (BD31630-MS2)</b>		<b>Source: 1304060-01</b>			Prepared: 04/16/13 Analyzed: 04/23/13					
Total Kjeldahl Nitrogen	6.21	0.20	0.05	mg/L	2.5	3.60	103	90-110		
<b>Matrix Spike Dup (BD31630-MSD1)</b>		<b>Source: 1303529-18</b>			Prepared: 04/16/13 Analyzed: 04/22/13					
Total Kjeldahl Nitrogen	2.88	0.20	0.05	mg/L	2.5	0.443	96	90-110	4	20

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## Workorder Quality Control Data Results

### Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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#### Batch BD31630 - Digestion for TKN by EPA 351.2

<b>Matrix Spike Dup (BD31630-MSD2)</b>		<b>Source: 1304060-01</b>			Prepared: 04/16/13 Analyzed: 04/23/13					
Total Kjeldahl Nitrogen	6.37	0.20	0.05	mg/L	2.5	3.60	109	90-110	3	20

#### Batch BD31631 - Digestion for TKN by EPA 351.2

<b>Blank (BD31631-BLK1)</b>					Prepared: 04/16/13 Analyzed: 04/22/13					
Total Kjeldahl Nitrogen	0.0862 I	0.20	0.05	mg/L						

<b>LCS (BD31631-BS1)</b>					Prepared: 04/16/13 Analyzed: 04/22/13					
Total Kjeldahl Nitrogen	2.46	0.20	0.05	mg/L	2.5		97	90-110		

<b>Matrix Spike (BD31631-MS1)</b>		<b>Source: 1303529-16</b>			Prepared: 04/16/13 Analyzed: 04/23/13					
Total Kjeldahl Nitrogen	2.47	0.20	0.05	mg/L	2.5	ND	98	90-110		

<b>Matrix Spike Dup (BD31631-MSD1)</b>		<b>Source: 1303529-16</b>			Prepared: 04/16/13 Analyzed: 04/23/13					
Total Kjeldahl Nitrogen	2.46	0.20	0.05	mg/L	2.5	ND	97	90-110	0.4	20

#### Batch BD31704 - TOC prep

<b>Blank (BD31704-BLK1)</b>					Prepared & Analyzed: 04/16/13					
Total Organic Carbon	0.50 U	1.0	0.50	mg/L						

<b>LCS (BD31704-BS1)</b>					Prepared & Analyzed: 04/16/13					
Total Organic Carbon	9.97	1.0	0.50	mg/L	10		100	90-110		

<b>Matrix Spike (BD31704-MS1)</b>		<b>Source: 1304034-07</b>			Prepared & Analyzed: 04/16/13					
Total Organic Carbon	11.7	1.0	0.50	mg/L	10	1.63	100	85-115		

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## Workorder Quality Control Data Results

### Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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#### Batch BD31704 - TOC prep

<b>Matrix Spike Dup (BD31704-MSD1)</b>		<b>Source: 1304034-07</b>			Prepared & Analyzed: 04/16/13					
Total Organic Carbon	11.8	1.0	0.50	mg/L	10	1.63	102	85-115	1	10

#### Batch BD31724 - BOD

Blank (BD31724-BLK1)					Prepared: 04/17/13 Analyzed: 04/22/13				
Carbonaceous BOD	2 U	2	2	mg/L					
LCS (BD31724-BS1)					Prepared: 04/17/13 Analyzed: 04/22/13				
Carbonaceous BOD	191	2	2	mg/L	200	95	85-115		
LCS Dup (BD31724-BSD1)					Prepared: 04/17/13 Analyzed: 04/22/13				
Carbonaceous BOD	198	2	2	mg/L	200	99	85-115	4	200
Duplicate (BD31724-DUP1)		Source: 1304069-01			Prepared: 04/17/13 Analyzed: 04/22/13				
Carbonaceous BOD	160	2	2	mg/L	150			9	25

#### Batch BD31817 - Ion Chromatography 300.0 Prep

Blank (BD31817-BLK1)					Prepared & Analyzed: 04/18/13				
Nitrate (as N)	0.01 U	0.04	0.01	mg/L					
LCS (BD31817-BS1)					Prepared & Analyzed: 04/18/13				
Nitrate (as N)	1.83	0.04	0.01	mg/L	1.7	108	85-115		
LCS Dup (BD31817-BSD1)					Prepared & Analyzed: 04/18/13				
Nitrate (as N)	1.84	0.04	0.01	mg/L	1.7	108	85-115	0.5	200

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## Workorder Quality Control Data Results

### Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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#### Batch BD31817 - Ion Chromatography 300.0 Prep

<b>Matrix Spike (BD31817-MS1)</b>		<b>Source: 1304211-01</b>			Prepared & Analyzed: 04/18/13					
Nitrate (as N)	1.93	0.04	0.01	mg/L	1.7	0.0988	108	85-115		
<b>Matrix Spike (BD31817-MS2)</b>		<b>Source: 1304201-01</b>			Prepared & Analyzed: 04/18/13					
Nitrate (as N)	1.91	0.04	0.01	mg/L	1.7	0.107	106	85-115		

#### Batch BD31830 - Digestion for TP by EPA 365.2/SM4500PE

<b>Blank (BD31830-BLK1)</b>		Prepared: 04/18/13 Analyzed: 04/23/13								
Phosphorous - Total as P	0.010 U	0.040	0.010	mg/L						
<b>LCS (BD31830-BS1)</b>		Prepared: 04/18/13 Analyzed: 04/23/13								
Phosphorous - Total as P	0.822	0.040	0.010	mg/L	0.80		103	90-110		
<b>Matrix Spike (BD31830-MS1)</b>		<b>Source: 1303529-16</b>			Prepared: 04/18/13 Analyzed: 04/23/13					
Phosphorous - Total as P	1.06	0.040	0.010	mg/L	1.0	ND	106	90-110		
<b>Matrix Spike (BD31830-MS2)</b>		<b>Source: 1303529-18</b>			Prepared: 04/18/13 Analyzed: 04/23/13					
Phosphorous - Total as P	1.02	0.040	0.010	mg/L	1.0	0.0337	99	90-110		
<b>Matrix Spike Dup (BD31830-MSD1)</b>		<b>Source: 1303529-16</b>			Prepared: 04/18/13 Analyzed: 04/23/13					
Phosphorous - Total as P	1.05	0.040	0.010	mg/L	1.0	ND	105	90-110	0.7	25
<b>Matrix Spike Dup (BD31830-MSD2)</b>		<b>Source: 1303529-18</b>			Prepared: 04/18/13 Analyzed: 04/23/13					
Phosphorous - Total as P	1.02	0.040	0.010	mg/L	1.0	0.0337	99	90-110	0.3	25

#### Batch BD31909 - VSS Prep

<b>Blank (BD31909-BLK1)</b>		Prepared: 04/19/13 Analyzed: 04/23/13								
Total Suspended Solids	1 U	1	1	mg/L						
Volatile Suspended Solids	1 U	1		mg/L						



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## Workorder Quality Control Data Results

### Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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#### Batch BD31909 - VSS Prep

<b>LCS (BD31909-BS1)</b>					Prepared: 04/19/13 Analyzed: 04/23/13					
Total Suspended Solids	44.5	1	1	mg/L	50		89	85-115		
<b>Duplicate (BD31909-DUP1)</b>					Source: 1303529-01 Prepared: 04/19/13 Analyzed: 04/23/13					
Volatile Suspended Solids	17.0	1		mg/L		15.0			12	20
Total Suspended Solids	14.0	1	1	mg/L		18.0			25	30

#### Batch BD31914 - Ion Chromatography 300.0 Prep

<b>Blank (BD31914-BLK1)</b>					Prepared & Analyzed: 04/20/13					
Sulfate	0.20 U	0.60	0.20	mg/L						
<b>LCS (BD31914-BS1)</b>					Prepared & Analyzed: 04/20/13					
Sulfate	9.44	0.60	0.20	mg/L	9.0		105	85-115		
<b>LCS Dup (BD31914-BSD1)</b>					Prepared & Analyzed: 04/20/13					
Sulfate	9.42	0.60	0.20	mg/L	9.0		105	85-115	0.2	200
<b>Matrix Spike (BD31914-MS1)</b>					Source: 1303529-17 Prepared & Analyzed: 04/20/13					
Sulfate	359	0.60	0.20	mg/L	90	262	108	85-115		
Nitrate (as N)	17.9	0.04	0.01	mg/L	17	ND	105	85-115		
<b>Matrix Spike (BD31914-MS2)</b>					Source: 1304144-01 Prepared & Analyzed: 04/20/13					
Sulfate	435	0.60	0.20	mg/L	180	242	107	85-115		

#### Batch BD32206 - Digestion for TKN by EPA 351.2

<b>Blank (BD32206-BLK1)</b>					Prepared: 04/22/13 Analyzed: 04/23/13					
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						

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## Workorder Quality Control Data Results

### Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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#### Batch BD32206 - Digestion for TKN by EPA 351.2

<b>LCS (BD32206-BS1)</b>					Prepared: 04/22/13 Analyzed: 04/23/13					
Total Kjeldahl Nitrogen	2.34	0.20	0.05	mg/L	2.5		92	90-110		
<b>Matrix Spike (BD32206-MS1)</b>					Source: 1303693-01 Prepared: 04/22/13 Analyzed: 04/23/13					
Total Kjeldahl Nitrogen	3.63	0.20	0.05	mg/L	2.5	1.31	92	90-110		
<b>Matrix Spike (BD32206-MS2)</b>					Source: 1304177-03 Prepared: 04/22/13 Analyzed: 04/23/13					
Total Kjeldahl Nitrogen	3.41	0.20	0.05	mg/L	2.5	0.750	105	90-110		
<b>Matrix Spike Dup (BD32206-MSD1)</b>					Source: 1303693-01 Prepared: 04/22/13 Analyzed: 04/23/13					
Total Kjeldahl Nitrogen	3.71	0.20	0.05	mg/L	2.5	1.31	95	90-110	2	20
<b>Matrix Spike Dup (BD32206-MSD2)</b>					Source: 1304177-03 Prepared: 04/22/13 Analyzed: 04/23/13					
Total Kjeldahl Nitrogen	3.27	0.20	0.05	mg/L	2.5	0.750	99	90-110	4	20

#### Batch BD32219 - COD prep

<b>Blank (BD32219-BLK1)</b>					Prepared & Analyzed: 04/22/13					
Chemical Oxygen Demand	10 U	25	10	mg/L						
<b>LCS (BD32219-BS1)</b>					Prepared & Analyzed: 04/22/13					
Chemical Oxygen Demand	53	25	10	mg/L	50		106	90-110		
<b>Matrix Spike (BD32219-MS1)</b>					Source: 1304263-01 Prepared & Analyzed: 04/22/13					
Chemical Oxygen Demand	81	25	10	mg/L	50	36	90	85-115		
<b>Matrix Spike Dup (BD32219-MSD1)</b>					Source: 1304263-01 Prepared & Analyzed: 04/22/13					
Chemical Oxygen Demand	79	25	10	mg/L	50	36	86	85-115	2	32

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### Workorder Quality Control Data Results

#### Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BD32314 - Ammonia by SEAL</b>										
<b>Blank (BD32314-BLK1)</b>					Prepared & Analyzed: 04/23/13					
Ammonia as N	0.009 U	0.040	0.009	mg/L						
<b>LCS (BD32314-BS1)</b>					Prepared & Analyzed: 04/23/13					
Ammonia as N	0.48	0.040	0.009	mg/L	0.50		96	90-110		
<b>Matrix Spike (BD32314-MS1)</b>					<b>Source: 1304279-01</b>		Prepared & Analyzed: 04/23/13			
Ammonia as N	0.51	0.040	0.009	mg/L	0.50	0.050	91	90-110		
<b>Matrix Spike (BD32314-MS2)</b>					<b>Source: 1304320-07</b>		Prepared & Analyzed: 04/23/13			
Ammonia as N	0.53	0.040	0.009	mg/L	0.50	0.019	103	90-110		
<b>Matrix Spike Dup (BD32314-MSD1)</b>					<b>Source: 1304279-01</b>		Prepared & Analyzed: 04/23/13			
Ammonia as N	0.51	0.040	0.009	mg/L	0.50	0.050	92	90-110	0.5	10
<b>Matrix Spike Dup (BD32314-MSD2)</b>					<b>Source: 1304320-07</b>		Prepared & Analyzed: 04/23/13			
Ammonia as N	0.52	0.040	0.009	mg/L	0.50	0.019	100	90-110	3	10

#### Batch BD32340 - alkalinity

<b>Blank (BD32340-BLK1)</b>					Prepared & Analyzed: 04/22/13					
Total Alkalinity	2.0 U	8.0	2.0	mg/L						
<b>Blank (BD32340-BLK2)</b>					Prepared & Analyzed: 04/22/13					
Total Alkalinity	2.0 U	8.0	2.0	mg/L						
<b>LCS (BD32340-BS1)</b>					Prepared & Analyzed: 04/22/13					
Total Alkalinity	130	8.0	2.0	mg/L	120		105	90-110		

Hazen and Sawyer  
 10002 Princess Palm Ave, Suite 200  
 Tampa, FL 33619

June 3, 2013  
 Work Order: 1303529

### Workorder Quality Control Data Results

#### Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
---------	--------	-----	-----	-------	-------------	---------------	------	-------------	-----	-----------

#### Batch BD32340 - alkalinity

<b>LCS (BD32340-BS2)</b>					Prepared & Analyzed: 04/22/13					
Total Alkalinity	130	8.0	2.0	mg/L	120		105	90-110		
<b>Matrix Spike (BD32340-MS1)</b>					Source: 1304047-01 Prepared & Analyzed: 04/22/13					
Total Alkalinity	280	8.0	2.0	mg/L	120	160	96	80-120		
<b>Matrix Spike (BD32340-MS2)</b>					Source: 1304214-01 Prepared & Analyzed: 04/22/13					
Total Alkalinity	270	8.0	2.0	mg/L	120	160	87	80-120		
<b>Matrix Spike Dup (BD32340-MSD1)</b>					Source: 1304047-01 Prepared & Analyzed: 04/22/13					
Total Alkalinity	280	8.0	2.0	mg/L	120	160	96	80-120	0	26
<b>Matrix Spike Dup (BD32340-MSD2)</b>					Source: 1304214-01 Prepared & Analyzed: 04/22/13					
Total Alkalinity	270	8.0	2.0	mg/L	120	160	87	80-120	0	26

#### Batch BD32437 - Ammonia by SEAL

<b>Blank (BD32437-BLK1)</b>					Prepared & Analyzed: 04/25/13					
Ammonia as N	0.009 U	0.040	0.009	mg/L						
<b>LCS (BD32437-BS1)</b>					Prepared & Analyzed: 04/25/13					
Ammonia as N	0.52	0.040	0.009	mg/L	0.50		105	90-110		
<b>Matrix Spike (BD32437-MS1)</b>					Source: 1304144-01 Prepared & Analyzed: 04/25/13					
Ammonia as N	0.52	0.040	0.009	mg/L	0.50	0.033	97	90-110		
<b>Matrix Spike (BD32437-MS2)</b>					Source: 1304340-01 Prepared & Analyzed: 04/25/13					
Ammonia as N	0.52	0.040	0.009	mg/L	0.50	0.035	97	90-110		

# SOUTHERN ANALYTICAL LABORATORIES, INC.

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Hazen and Sawyer  
10002 Princess Palm Ave, Suite 200  
Tampa, FL 33619

June 3, 2013  
Work Order: 1303529

## Workorder Quality Control Data Results

### Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
---------	--------	-----	-----	-------	-------------	---------------	------	-------------	-----	-----------

### Batch BD32437 - Ammonia by SEAL

<b>Matrix Spike Dup (BD32437-MSD1)</b>		<b>Source: 1304144-01</b>			Prepared & Analyzed: 04/25/13					
Ammonia as N	0.53	0.040	0.009	mg/L	0.50	0.033	100	90-110	3	10
<b>Matrix Spike Dup (BD32437-MSD2)</b>		<b>Source: 1304340-01</b>			Prepared & Analyzed: 04/25/13					
Ammonia as N	0.54	0.040	0.009	mg/L	0.50	0.035	101	90-110	4	10



# SOUTHERN ANALYTICAL LABORATORIES, INC.

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Tampa, FL 33619

June 3, 2013  
Work Order: 1303529

## Workorder Quality Control Data Results

### Microbiology - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BD31621 - FC-MF</b>										
<b>Blank (BD31621-BLK1)</b>					Prepared: 04/16/13 Analyzed: 04/17/13					
Fecal Coliforms	1 U	1	1	CFU/100 ml						
<b>Duplicate (BD31621-DUP1)</b>					Source: 1304067-02 Prepared: 04/16/13 Analyzed: 04/17/13					
Fecal Coliforms	1 U	1	1	CFU/100 ml		ND				200
<b>Duplicate (BD31621-DUP2)</b>					Source: 1303529-16 Prepared: 04/16/13 Analyzed: 04/17/13					
Fecal Coliforms	1 U	1	1	CFU/100 ml		ND				200

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Tampa, FL 33619

June 3, 2013  
Work Order: 1303529

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**Workorder Quality Control Data Results**

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**\* Qualifiers, Notes and Definitions**

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Results followed by a "U" indicate that the sample was analyzed but the compound was not detected. Results followed by "I" indicate that the reported value is between the laboratory method detection limits and the laboratory practical quantitation limit.

A statement of estimated uncertainty of test results is available upon request.

For methods marked with \*\*, all QC criteria have been met for this method which is equivalent to a SAL certified method.

Test results in this report meet all the requirements of the NELAC standards. Any applicable qualifiers are shown below.  
Questions regarding this report should be directed to Client Services at 813-855-1844.

## SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

SAL Project No. 1303529

Client Name Hazen and Sawyer														Contact / Phone:									
Project Name / Location BHS2 SE#3																							
Samplers: (Signature) <i>[Signature]</i>														PARAMETER / CONTAINER DESCRIPTION									
Matrix Codes: DW-Drinking Water WW-Wastewater SW-Surface Water SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water		Date	Time	Matrix	Composite	Grab	500mLP, Cool Total Alkalinity, TSS, VSS, CBOD, NOx, OP, SO <sub>4</sub>	125mLP, H <sub>2</sub> SO <sub>4</sub> COD, TKN, NH <sub>3</sub> , TP	500mLP, NaOH, Zn Acetate H <sub>2</sub> S	40mL aV, HCl TOC	125mLP, Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> FC-MF	500mLP, Cool Total Alkalinity, TSS, VSS, CBOD, NOx, OP	125mLP, H <sub>2</sub> SO <sub>4</sub> TKN, NH <sub>3</sub>	500mLP, Cool NOx	500mLP, Cool NOx, SO <sub>4</sub>	Field pH	Field Temperature	Field Conductivity	Field DO	No. of Containers (Total per each location)			
Sample Description																							
01	BHS2-STE	04/16/13	10:10	WW		X	1	1	1	2	2					7.63	23.8	1320	0.56				
02	BHS2-DBOX		10:00	WW		X		1		2	2	1				7.19	23.1	1195	1.65				
03	BHS2-PUMP		09:50	WW		X		1		2	2	1				7.07	22.8	1190	5.68				
04	BHS2-LIGNO-36		09:40	WW		X							1	1		6.93	22.8	1168	1.54				
05	BHS2-LIGNO-30		09:30	WW		X							1	1		7.00	22.8	1155	0.65				
06	BHS2-LIGNO-24		09:26	WW		X							1	1		7.02	22.6	1158	1.14				
07	BHS2-LIGNO-18		09:22	WW		X							1	1		7.08	22.5	1134	1.14				
08	BHS2-LIGNO-12		09:14	WW		X							1	1		7.11	22.2	1132	1.21				
09	BHS2-LIGNO-6		09:05	WW		X							1	1		7.27	21.9	1132	1.01				
10	BHS2-LIGNO-0		08:54	WW		X	1	1	1	2	2					7.14	21.8	1141	0.54				
11	BHS2-SULFUR-3		08:44	WW		X							1		1	7.01	21.6	1180	0.23				
12	BHS2-SULFUR-7		08:33	WW		X							1		1	6.87	21.5	1208	0.22				
Containers Prepared/Relinquished:		Date/Time:	Received:	Date/Time:		Seal intact?		Samples intact upon arrival?		Received on ice? Temp _____		Proper preservatives indicated?		Rec'd w/in holding time?		Volatiles rec'd w/out headspace?		Proper containers used?		Instructions / Remarks:			
<i>[Signature]</i>		4/16/13 1400	<i>[Signature]</i>	4/15/13 1400		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A							
<i>[Signature]</i>		4/16/13 11:55	<i>[Signature]</i>	4/16/13 11:55		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A							
<i>[Signature]</i>			<i>[Signature]</i>	4-16-13 1300		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A							
<i>[Signature]</i>			<i>[Signature]</i>			<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A		<input checked="" type="checkbox"/> N N/A							

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SAL Project No. 1303529

[illegible]

Chain of Custody.xls  
Rev.Date 11/19/01

### Chain of Custody

April 25, 2013

Ms. Josefin Edebeck-Hirst  
Hazen and Sawyer, P.C  
10002 Princess Palm Avenue  
Suite 200  
Tampa, FL 33619

RE: Project: Fosnrs  
Pace Project No.: 3589810

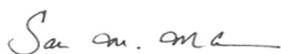
Dear Ms. Edebeck-Hirst:

Enclosed are the analytical results for sample(s) received by the laboratory on April 16, 2013. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

Some analyses have been subcontracted outside of the Pace Network. The subcontracted laboratory report has been attached.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Sakina McKenzie

sakina.mckenzie@pacelabs.com  
Project Manager

Enclosures



## REPORT OF LABORATORY ANALYSIS

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## SAMPLE SUMMARY

Project: Fosnrs  
Pace Project No.: 3589810

Lab ID	Sample ID	Matrix	Date Collected	Date Received
3589810001	B-HS2-STE	Water	04/16/13 10:10	04/16/13 11:35
3589810002	B-HS2-DBOX	Water	04/16/13 10:00	04/16/13 11:35
3589810003	B-HS2-PUMP	Water	04/16/13 09:50	04/16/13 11:35
3589810004	B-HS2-ST2	Water	04/16/13 08:05	04/16/13 11:35
3589810005	B-HS2-LINGNO-O	Water	04/16/13 08:54	04/16/13 11:35
3589810006	B-HS2-EB	Water	04/16/13 10:45	04/16/13 11:35

## REPORT OF LABORATORY ANALYSIS

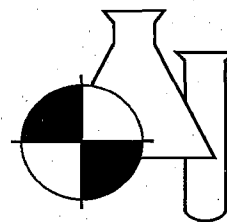
Page 2 of 2

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# BENCHMARK

*EnviroAnalytical Inc.*



NELAC Certification # E84167

## ANALYTICAL TEST REPORT

THESE RESULTS MEET NELAC STANDARDS

Submission Number : 13040636

Pace Analytical Services, Inc.  
8 East Tower Circle  
Ormond Beach, FL 32174

Project Name : 3589810 FOSNRS  
Date Received : 04/16/2013  
Time Received : 1135

Sakina Mc Kenzie

Submission Number 13040636

Sample Number: 001      Sample Description: B-HS2-STE - 3589810001  
Sample Date: 04/16/2013      Sample Method: Grab  
Sample Time: 1010

Parameter	Result	Units	MDL	PQL	Procedure	Analysis		Analyst
						Date	Time	
FECAL COLIFORM	400000 B	#/100 ML	100000	100000	SM9222D	04/16/2013	13:20	MR
E-COLI BY MPN	410000	#/100 ML	100000	100000	SM9223B	04/16/2013	12:45	MR

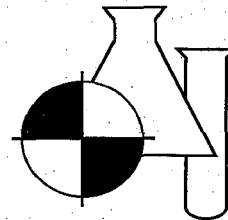
Submission Number 13040636

Sample Number: 002      Sample Description: B-HS2-DBOX - 3589810002  
Sample Date: 04/16/2013      Sample Method: Grab  
Sample Time: 1000

Parameter	Result	Units	MDL	PQL	Procedure	Analysis		Analyst
						Date	Time	
FECAL COLIFORM	70000 B	#/100 ML	10000	10000	SM9222D	04/16/2013	13:20	MR
E-COLI BY MPN	109000	#/100 ML	10000	10000	SM9223B	04/16/2013	12:45	MR

# BENCHMARK

*EnviroAnalytical Inc.*



NELAC Certification # E84167

Submission Number 13040636

Sample Number: 003

Sample Description: B-HS2-PUMP - 3589810003

Sample Date: 04/16/2013

Sample Method: Grab

Sample Time: 0950

Parameter	Result	Units	MDL	PQL	Procedure	Analysis		Analyst
						Date	Time	
FECAL COLIFORM	500 B	#/100 ML	100	100	SM9222D	04/16/2013	13:20	MR
E-COLI BY MPN	738	#/100 ML	10	10	SM9223B	04/16/2013	12:45	MR

Submission Number 13040636

Sample Number: 004

Sample Description: B-HS2-ST2 - 3589810004

Sample Date: 04/16/2013

Sample Method: Grab

Sample Time: 0805

Parameter	Result	Units	MDL	PQL	Procedure	Analysis		Analyst
						Date	Time	
FECAL COLIFORM	30 B	#/100 ML	10	10	SM9222D	04/16/2013	13:20	MR
E-COLI BY MPN	23	#/100 ML	10	10	SM9223B	04/16/2013	12:45	MR

Submission Number 13040636

Sample Number: 005

Sample Description: B-HS2-LINGNO-O - 3589810005

Sample Date: 04/16/2013

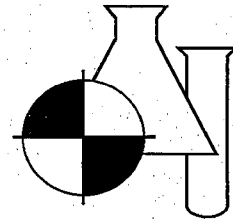
Sample Method: Grab

Sample Time: 0854

Parameter	Result	Units	MDL	PQL	Procedure	Analysis		Analyst
						Date	Time	
FECAL COLIFORM	10 B	#/100 ML	10	10	SM9222D	04/16/2013	13:20	MR
E-COLI BY MPN	52	#/100 ML	10	10	SM9223B	04/16/2013	12:45	MR

# BENCHMARK

*EnviroAnalytical Inc.*



NELAC Certification # E84167

Submission Number 13040636

Sample Number: 006

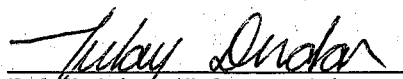
Sample Description: B-HS2-EB - 3589810006

Sample Date: 04/16/2013

Sample Method: Grab

Sample Time: 1045

Parameter	Result	Units	MDL	PQL	Procedure	Analysis		Analyst
						Date	Time	
FECAL COLIFORM	10 U	#/100 ML	10	10	SM9222D	04/16/2013	13:20	MR
E-COLI BY MPN	10 U	#/100 ML	10	10	SM9223B	04/16/2013	12:45	MR

  
Dale D. Dixon / Laboratory Director  
Tülay Tanrısever / QC Officer  
Jennifer Jordan / QC Officer

04/17/2013

Date

#### DATA QUALIFIERS THAT MAY APPLY:

A = Value reported is an average of two or more determinations.

B = Results based upon colony counts outside the ideal range.

H = Value based on field kit determination. Results may not be accurate.

I = Reported value is between the laboratory MDL and the PQL.

J = Estimated value.

J1 = Est. value surrogate recovery limits exceeded.

J2 = Est. value. No quality control criteria exists for component.

J3 = Est. value quality control criteria for precision or accuracy not met.

J4 = Est. value. Sample matrix interference suspected.

J5 = Est. value. Data questionable due to improper lab or field protocols.

K = Off-scale low. Value is known to be < the value reported.

L = Off-scale high. Value is known to be > the value reported

#### NOTES:

PQL = 4xMDL.

MBAS calculated as LAS; molecular weight = 348.

X = Value exceed MCL.

N = Presumptive evidence of presence of material.

O = Sampled, but analysis lost or not performed.

Q = Sample held beyond accepted hold time.

T = Value reported is < MDL. Reported for informational purposes only and shall not be used in statistical analysis.

U = Analyte analyzed but not detected at the value indicated.

V = Analyte detected in sample and method blank. Results for this analyte in associated samples may be biased high. Standard, Duplicate and Spike values are within control limits. Reported data are usable

Y = Analysis performed on an improperly preserved sample. Data may be inaccurate.

Z = Too many colonies were present (TNTC). The numeric value represents the filtration volume.

! = Data deviate from historically established concentration ranges.

? = Data rejected and should not be used. Some or all of QC data were outside criteria, and the Presence or absence of the analyte cannot be determined from the data.

\* = Not reported due to interference.

ND = Not Detected at or above adjusted reporting limit.

NOTES:

For questions and comments regarding these results, please contact Bettina Beilfuss at (941) 723-9986

*Results relate only to the samples.*

# Chain of Custody



Workorder: 3589810

Workorder Name: Fosnrs

Results Requested 4/25/2013

Report/Invoice To: Subcontract To: Requested Analysis:

Sakina McKenzie  
Pace Analytical Ormond Beach  
8 East Tower Circle  
Ormond Beach, FL 32174  
Phone (386)672-5668  
Email: sakina.mckenzie@pacelabs.com

P.O. FLS-4518

Benchmark

Item	Sample ID	Collect Date/Time	Lab ID	Matrix	Preserved Containers										LAB USE ONLY
					Other										
1	B-HS2-STE	4/16/2013 10:10	3589810001	Water											
2	B-HS2-DBOX	4/16/2013 10:00	3589810002	Water											
3	B-HS2-PUMP	4/16/2013 09:50	3589810003	Water											
4	B-HS2-ST2	4/16/2013 08:05	3589810004	Water											
5	B-HS2-LINGNO-O	4/16/2013 08:54	3589810005	Water											
6	B-HS2-EB	4/16/2013 10:45	3589810006	Water											

Fecal + E-coli

Comments:

Transfers	Released By	Date/Time	Received By	Date/Time
1				
2				
3				

Cooler Temperature on Receipt °C	Custody Seal Y or N	Received on Ice Y or N	Samples Intact Y or N
----------------------------------	---------------------	------------------------	-----------------------

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## Appendix B: Operation & Maintenance Log

**Table B.1**  
**Operation and Maintenance Log**

Date	Description
7/31/12	Existing system evaluation performed. Septic tank was pumped out.
8/15/2012	Local DOH performed site evaluation
9/10/2012	System construction started
9/25/2012	System start-up
9/27/2012	Globe valves were set at 3.5:1 recirculation ratio
10/5/2012	Tanks full
10/11/2012	Preliminary sample event 1
10/23/2012	Preliminary sample event 2
10/30/2012	Preliminary sample event 3. Low level in pump tank.
11/7/2012	Very high level in pump tank.
	Pulled float tree up (reset floats), and pump immediately came on.
11/13/2012	Water level below top float in pump tank
12/3/2012	Sample Event No. 1
12/21/2012	Very high level in pump tank.
	Pulled float tree up (reset floats), and pump immediately came on.
12/22/2012	Very high level in pump tank. Audio alarm came on and was reset.
1/3/2013	Water level below top float in pump tank
	Re-positioned floats and zip-tied wires to tree.
1/10/2013	Very high level in pump tank.
	Pulled float tree up (reset floats), and pump immediately came on.
1/11/2013	Water level below top float in pump tank
1/15/2013	Low level in pump tank
1/16/2013	Floats not registering in panel
	Pulled float tree up (reset floats)
1/17/2013	Moved bottom float down
	Re-wrapped wires and checked lights in panel, floats registered.
2/5/2013	Sample Event No. 2
2/27/2013	Site visit. Cleaned out leaves from DBOX.
4/16/2013	Sample Event No. 3

o:\44237-001\Wpdocs\Report\Draft





## Appendix C: Vericomm PLC Data

System Status			4/16/2013	3/23/2013	3/2/2013	2/23/2013
Point	Description	Status	Value	Value	Value	Value
1	Alarm Status	Automatic	OK	OK	OK	OK
2	Alert Status	Automatic	OK	OK	OK	OK
3	System Mode	Automatic	Normal	Normal	Normal	Normal
5	Timer Mode	Automatic	Normal	Normal	Override	Off
6	Active Off Time	Automatic	58.8 Minutes	58.8 Minutes	15.0 Minutes	58.8 Minutes
7	Active On Time	Automatic	1.2 Minutes	1.2 Minutes	1.2 Minutes	1.2 Minutes
9	Pump Mode	Automatic	OffCycl	OffCycl	OffCycl	Off
10	Pump Status	Automatic	Off	Off	Off	Off
12	Pump Cycles Today	Automatic	6.0 Cycles	3.0 Cycles	20.0 Cycles	1.0 Cycles
13	Override Cycles Today	Automatic	0.0 Cycles	0.0 Cycles	5.0 Cycles	0.0 Cycles
14	Pump Run Time Today	Automatic	6.2 Minutes	3.7 Minutes	23.1 Minutes	0.7 Minutes
Settings						
Point	Description	Status	Value	Value	Value	Value
17	Off Cycle Time	Constant/Setpoint	58.8 Minutes	58.8 Minutes	58.8 Minutes	58.8 Minutes
18	On Cycle Time	Constant/Setpoint	1.2 Minutes	1.2 Minutes	1.2 Minutes	1.2 Minutes
19	Override Off Cycle Time	Constant/Setpoint	15.0 Minutes	15.0 Minutes	15.0 Minutes	15.0 Minutes
20	Override On Cycle Time	Constant/Setpoint	1.2 Minutes	1.2 Minutes	1.2 Minutes	1.2 Minutes
21	Minimum Override Cycles	Automatic	3.0 Cycles	3.0 Cycles	3.0 Cycles	3.0 Cycles
23	Override Cycle Limit per Day	Automatic	10.0 Cycles	10.0 Cycles	10.0 Cycles	10.0 Cycles
24	Time Limit per Day	Constant/Setpoint	40.0 Minutes	40.0 Minutes	40.0 Minutes	40.0 Minutes
25	High Level Pump Test	Automatic	2.0 Minutes	2.0 Minutes	2.0 Minutes	2.0 Minutes
28	Alarm Update Interval	Automatic	120.0 Minutes	120.0 Minutes	240.0 Minutes	120.0 Minutes
29	Page Delay	Automatic	960.0 Minutes	960.0 Minutes	960.0 Minutes	960.0 Minutes
30	Page Interval	Automatic	30.0 Minutes	30.0 Minutes	30.0 Minutes	30.0 Minutes
31	Local Alarm Delay	Constant/Setpoint	1140.0 Minutes	1140.0 Minutes	1140.0 Minutes	1140.0 Minutes
32	Local Reactivate Delay	Automatic	120.0 Minutes	120.0 Minutes	120.0 Minutes	120.0 Minutes
Troubleshooting						
Point	Description	Status	Value	Value	Value	Value
33	Top Float Status	Automatic	OK	OK	OK	OK
34	Middle Float Status	Automatic	OK	OK	OK	OK
35	Bottom Float Status	Automatic	OK	OK	OK	OK
37	Contactors Status	Automatic	OK	OK	OK	OK
38	Pump Status	Automatic	OK	OK	OK	OK
40	Filter Status	Automatic	OK	OK	OK	OK
41	Tank Status	Automatic	OK	OK	OK	OK
43	Power Status	Automatic	OK	OK	OK	OK
Flow Data						
Point	Description	Status	Value	Value	Value	Value
49	Pump Run Time Today	Automatic	6.2 Minutes	3.7 Minutes	23.1 Minutes	0.7 Minutes
50	Override Cycles Today	Automatic	0	0	5	0
51	Pump Cycles Today	Automatic	6.0 Cycles	3.0 Cycles	20.0 Cycles	1.0 Cycles
52	Average Run Time per Cycle Today	Automatic	1.0 Minutes	1.2 Minutes	1.2 Minutes	0.7 Minutes
54	Brownouts Today	Automatic	0	0	0	0

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			4/16/2013	3/23/2013	3/2/2013	2/23/2013
<b>30-Day History Data</b>						
Point	Description	Status	Value	Value	Value	Value
65	30 Day Average Run Time per Day	Automatic	24.9 Minutes	22.7 Minutes	25.2 Minutes	24.9 Minutes
66	30 Day Average Override Cycles per Day	Automatic	3.8 Cycles	2.0 Cycles	5.2 Cycles	4.6 Cycles
67	30 Day Average Cycles per Day	Automatic	21.6 Cycles	19.7 Cycles	22.1 Cycles	21.9 Cycles
68	30 Day Average Run Time per Cycle	Automatic	1.2 Minutes	1.2 Minutes	1.1 Minutes	1.1 Minutes
71	30 Day Total Pump Run Time	Automatic	746.3 Minutes	679.7 Minutes	756.8 Minutes	747.2 Minutes
72	30 Day Total Override Cycles	Automatic	113.0 Cycles	59.0 Cycles	156.0 Cycles	138.0 Cycles
73	30 Day Total Cycles	Automatic	647.0 Cycles	592.0 Cycles	663.0 Cycles	656.0 Cycles
76	30 Day Total Brownouts	Automatic	0	2	0	0
<b>Totalized Pump Data</b>						
Point	Description	Status	Value	Value	Value	Value
82	Pump Total Run Time	Automatic	90.5 Hours	80.5 Hours	72.4 Hours	69.5 Hours
83	Pump Total Cycles	Automatic	4594.0 Cycles	4071.0 Cycles	3652.0 Cycles	3503.0 Cycles
<b>Miscellaneous</b>						
Point	Description	Status	Value	Value	Value	Value
145	Pump On Auto	Automatic	Off	Off	Off	Off
147	Pump Test Today	Automatic	Off	Off	On	Off
148	Pump Check Enable	Automatic	Off	Off	Off	Off
149	Total Override Cycles	Automatic	0	0	1	0
150	High Level Condition	Automatic	Off	Off	Off	Off
151	Leak Check Enable	Automatic	On	On	On	Off
152	Brownout State	Automatic	Off	Off	Off	Off
153	Test Mode	Automatic	Off	Off	Off	Off
<b>Alarm Points</b>						
Point	Description	Status	Value	Value	Value	Value
161	General Alarm	Automatic	Off	Off	Off	Off
162	New Alarm	Automatic	Off	Off	Off	Off
163	Update Central Enable	Automatic	On	On	On	On
167	Page Alarm Start	Automatic	Off	Off	Off	Off
168	Pager Signal	Override Off	Off	Off	Off	Off
169	Local Alarm Start	Automatic	Off	Off	Off	Off
170	Local Alarm Silence	Automatic	Off	Off	Off	Off
<b>Inputs &amp; Outputs</b>						
Point	Description	Status	Value	Value	Value	Value
177	High Level/Override Timer Float Input	Automatic	Off	Off	Off	Off
178	Timer Float Input	Automatic	On	On	On	Off
179	Redundant Off Float & Low Level Alarm Input	Automatic	On	On	On	On
181	Push To Silence Input	Automatic	Off	Off	Off	Off
182	Auxiliary Contact Input	Automatic	Off	Off	Off	Off
186	Pump Output	Automatic	Off	Off	Off	Off
188	Alarm Light Output	Automatic	Off	Off	Off	Off
189	Audible Alarm Output	Automatic	Off	Off	Off	Off

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