



Florida Onsite Sewage Nitrogen Reduction Strategies Study

Task B.7

B-HS3 Field System Monitoring Report No. 8

Progress Report

December 2014

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Environmental Engineers & Scientists

In association with:



AET
Applied Environmental Technology

**Otis Environmental
Consultants, LLC**

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TASK B.7 PROGRESS REPORT

B-HS3 Field System Monitoring Report No. 8

Prepared for:

Florida Department of Health
Division of Disease Control and Health Protection
Bureau of Environmental Health
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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 and pilot tested in PNRS II. 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 eighth and final sample event of a passive nitrogen reduction system at home site B-HS3 in Seminole County, Florida.

2.0 Purpose

Operation of the B-HS3 system was initiated on July 12, 2013. This monitoring report documents data collected from the eighth monitoring and sampling event conducted on December 17, 2014 (Day 523). The monitoring event consisted of collecting flow measurements from the household water use meter and the treatment system flow meters, recording electricity use, monitoring of field parameters, collection of water samples from eleven points in the treatment system, and chemical analyses of water samples by a NELAC certified laboratory.

3.0 Materials and Methods

3.1 Project Site

The B-HS3 field site is located in Seminole County, FL. The nitrogen reducing onsite treatment system for the single family residence was installed in June 2013. Design and construction details were presented previously in the Task B.6 document. A system schematic identifying the system components and layout of the installation is shown in Figure 1. A flow schematic of the system is shown in Figure 2. The B-HS3 system consists of a 1,500 gallon two chamber concrete primary treatment (septic) tank that replaced the former septic tank; a 600 gallon concrete septic tank effluent (STE) dose tank; a two zone drip system; and a 1,050 gallon concrete tank enclosing a Stage 2

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saturated sulfur media biofilter. The two zone drip system consists of a Stage 1&2a lined drip zone (Zone 1), that receives primary effluent and a drip zone that receives treated effluent from the Stage 2b biofilter (Zone 2).

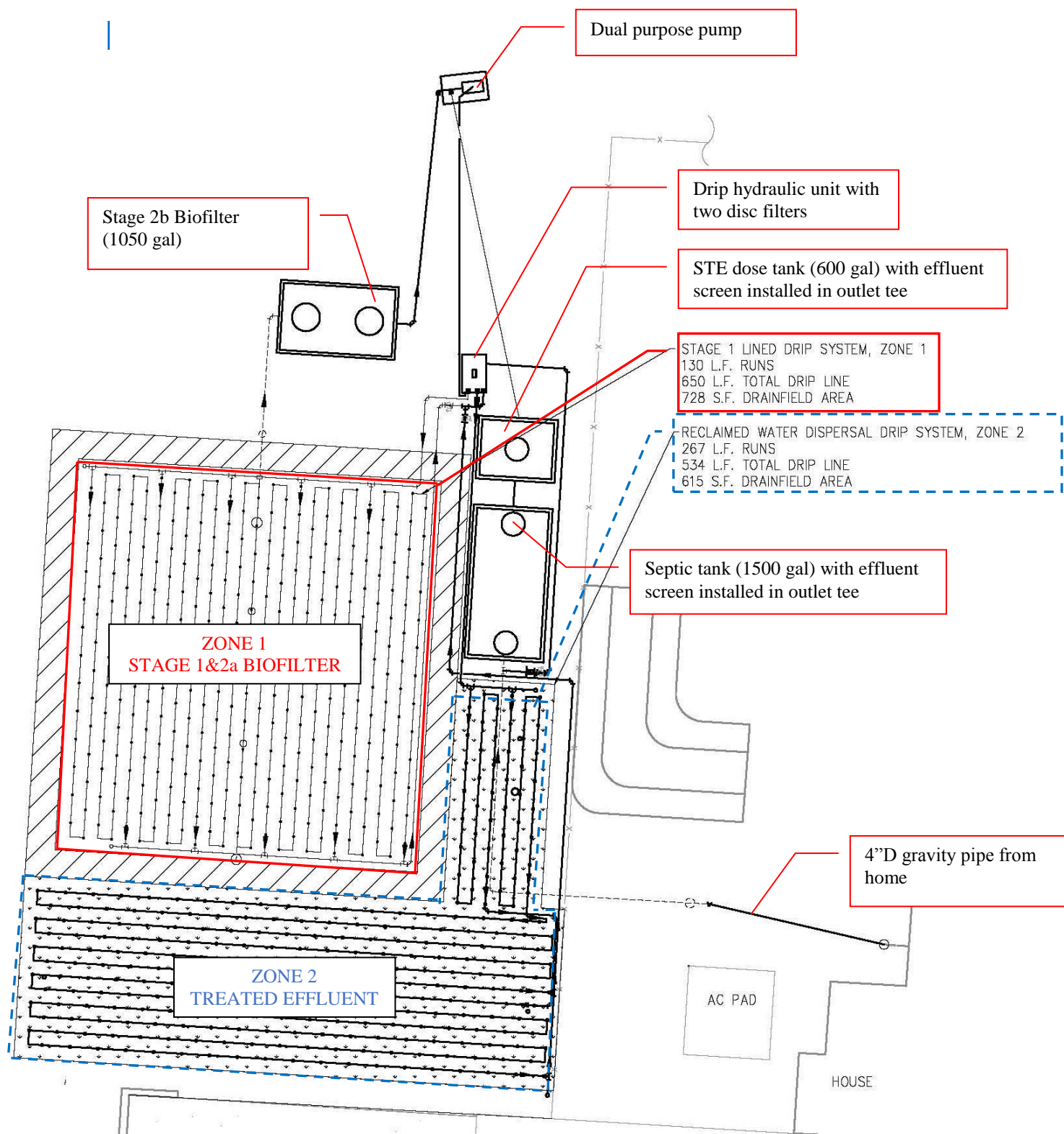


Figure 1
Plan View of B-HS3 System Layout

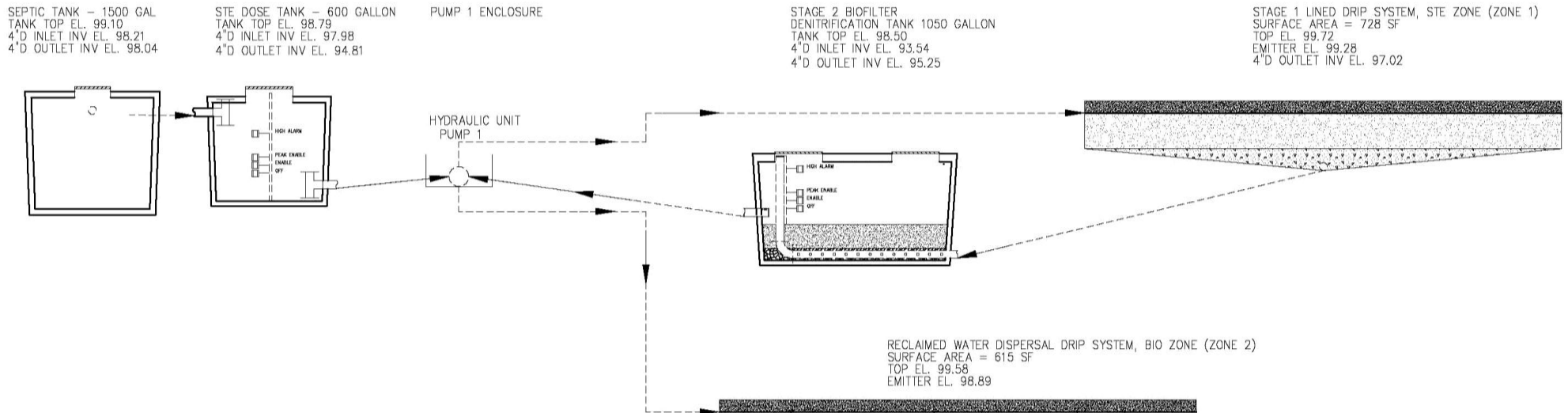


Figure 2
Flow Schematic of B-HS3 PNRS Installed in Seminole County

3.2 Monitoring and Sample Locations and Identification

3.2.1 Treatment System Monitoring Points

This monitoring event included sample collection from eleven points within the treatment system (Figure 3). In the treatment system, household wastewater enters the 1st chamber of the primary tank and exits the second chamber as septic tank effluent through an effluent screen into the STE dose tank. The first monitoring point, B-HS3-STE, is the effluent sampled approximately 1.5 feet below the surface of the second chamber of the primary tank (Figure 4) before the effluent filter, which is referred to as primary effluent or septic tank effluent (STE). Samples from monitoring point B-HS3-STE are of whole household wastewater after it has had some residence time in the primary tank and represent the influent to the remainder of the onsite nitrogen reduction system.

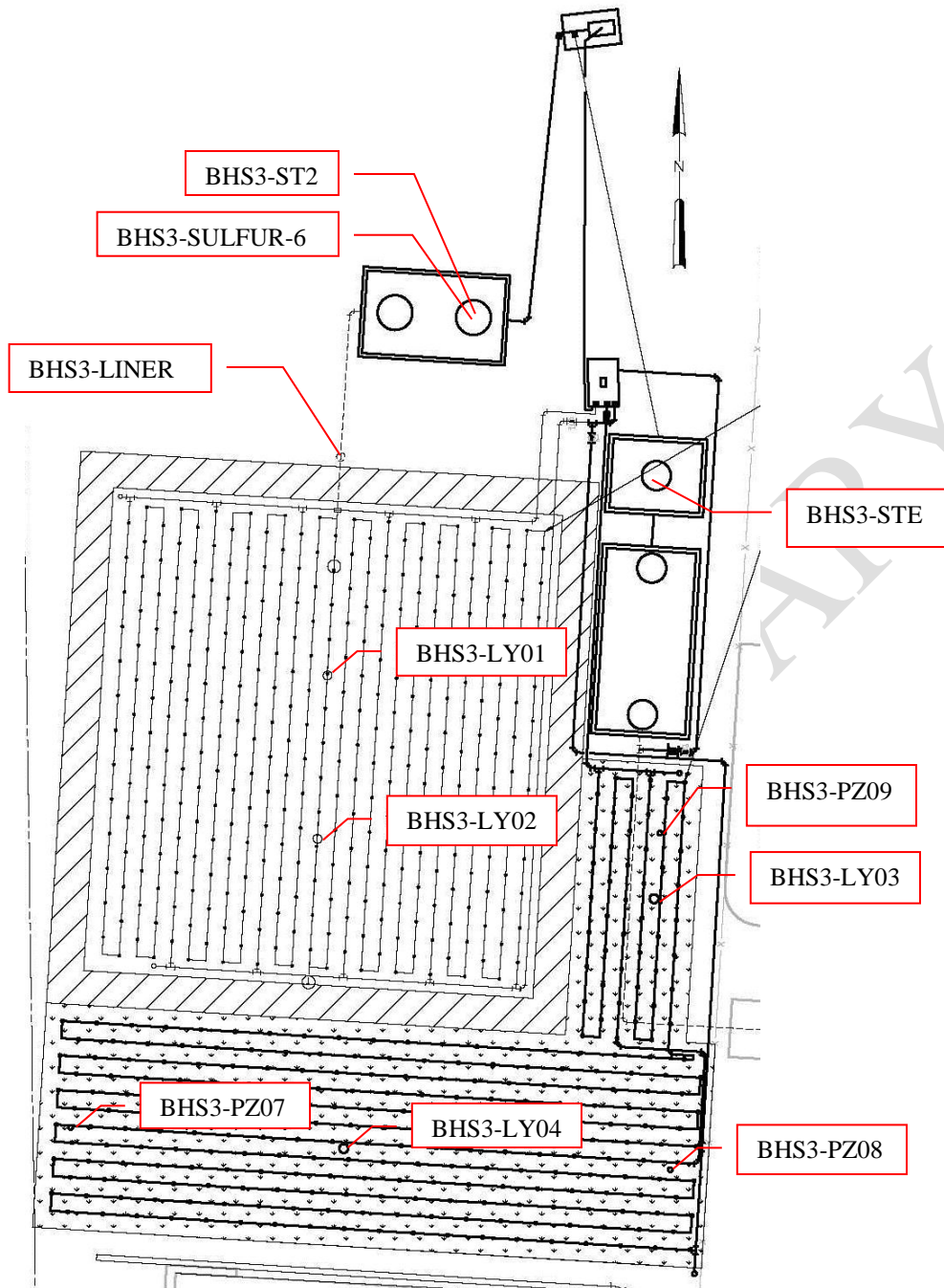


Figure 3
B-HS3 Treatment System Sampling and Monitoring Locations

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Figure 4
Second Chamber of Primary Tank (B-HS3-STE Sample)

The STE dose tank effluent is pumped through the drip system hydraulic unit and discharged to the Stage 1&2a drip system (Zone 1). In the Stage 1&2a drip area, wastewater percolates downward through an 18-inch layer of unsaturated sand and a layer of lignocellulosic and sand media (9-inch maximum thickness) placed above a 30 mil PVC liner. The second and third sampling points are two suction lysimeters (BHS3-LY01 and BHS3-LY02) located at the interface of the overlying sand (Stage 1) and underlying lignocellulosic/sand mixture (Stage 2a). The suction lysimeters were installed with the bottom of the 9-inch ceramic placed at the interface of the two media layers. These sample locations ostensibly represent wastewater that has been nitrified by passage through the overlying sand layer (Figure 5).



Figure 5
Stage 1 Suction Lysimeter (BHS3-LY01 and –LY02)

The Stage 1&2a drip system area was prepared by grading a V-shape so that effluent would collect on the liner and flow to the center where a perforated pipe within a gravel underdrain conveys the effluent to the Stage 2b denitrification tank through a pipe boot within the liner. The fourth sampling point (BHS3-LINER) is a sample port of the Stage 1&2a lined area effluent prior to the Stage 2b sulfur biofilter. At the BHS3-LINER sample point, wastewater should be denitrified by passage through the lignocellulosic media mixture (Stage 2a).

The liner effluent is conveyed to a Stage 2b biofilter, a concrete 1,050 gallon tank, containing elemental sulfur reactive media for additional treatment (denitrification). Wastewater flow is in an upward direction. The fifth sampling point, BHS3-SULFUR-6, is a stainless steel drivepoint sampler positioned 6-inches above the bottom of the sulfur media. The sixth sampling point, B-HS3-ST2, is the Stage 2b sulfur media biofilter effluent which is sampled approximately 6 inches below the water surface of the Stage 2b biofilter tank (Figure 6).



Figure 6
Second Chamber of Stage 2b Biofilter (B-HS3-ST2 Sample)

The Stage 2b biofilter effluent is pumped through the drip system hydraulic unit and discharged through the treated effluent drip system emitters (Zone 2) to natural soil. Monitoring points 7 through 11 were placed below the Zone 2 drip emitters. Their locations are shown in Figure 3. Sampling points seven and eight are suction lysimeters (BHS3-LY03 and BHS3-LY04) located in the treated effluent drip area with the top of the 9 inch ceramic cup located 24 inches below the drip emitters to represent treatment through 24-inches of unsaturated soil (Figure 7). Sampling points nine, ten and eleven are also located within the treated effluent drip area; these are standpipe piezometers (BHS3-PZ07, BHS3-PZ08, and BHS3-PZ09) positioned so that the top of the 5-foot screen is 24-inches below the drip emitters (Figure 8).



Figure 7
Treated Effluent Suction Lysimeter (B-HS3-LY03 and -LY04 sample)



Figure 8
Treated Effluent Area Standpipe Piezometers (B-HS3-PZ07, -PZ08 and -PZ09)

3.2.2 Groundwater Monitoring Points

For this monitoring event, five of the sixty-seven downgradient groundwater monitoring points that were installed as part of the C-HS2 groundwater monitoring network were included. A sampling grid for groundwater screening was developed downgradient of the original OSTDS as depicted in Figure 9. A 10-foot by 40-foot grid was staked then locations surveyed (x, y, and z). Transect lines A through D were located perpendicular to the groundwater flow direction (southwest) and increase (higher letter identification) moving southward from the mound. Transect lines 0 through 15 were located parallel to the groundwater flow direction and increase moving from southeast to northwest. Groundwater monitoring points were installed in June and July 2011. One type of monitoring point was installed using either hand or drilling methods: standpipe piezometers. Standpipe piezometers consist of either ¾-inch or 2-inch diameter PVC with a 1-foot, 2-foot, or 4-foot screen (0.010-inch slots) and riser extending to the ground surface (refer to the Task C QAPP and Task C.23 C-HS2 Instrumentation Report for additional detail).

Each monitoring location was assigned a unique identification indicating grid location (self explanatory), and depth below ground surface (bottom of the drive point or well screen in feet). For example A07-6 is a standpipe piezometer sampler located on the grid at A07 at approximately 6-feet below ground surface.

Groundwater level measurements are used to determine hydraulic gradients and directions of flow. Groundwater levels were measured using a flat tape water level meter graduated in feet (measurement accuracy is 0.01 feet). The groundwater level within the standpipe piezometers sampled was measured for this sampling event. Figure 10 illustrates the surficial groundwater contours as measured within the standpipe piezometers during this sample event.

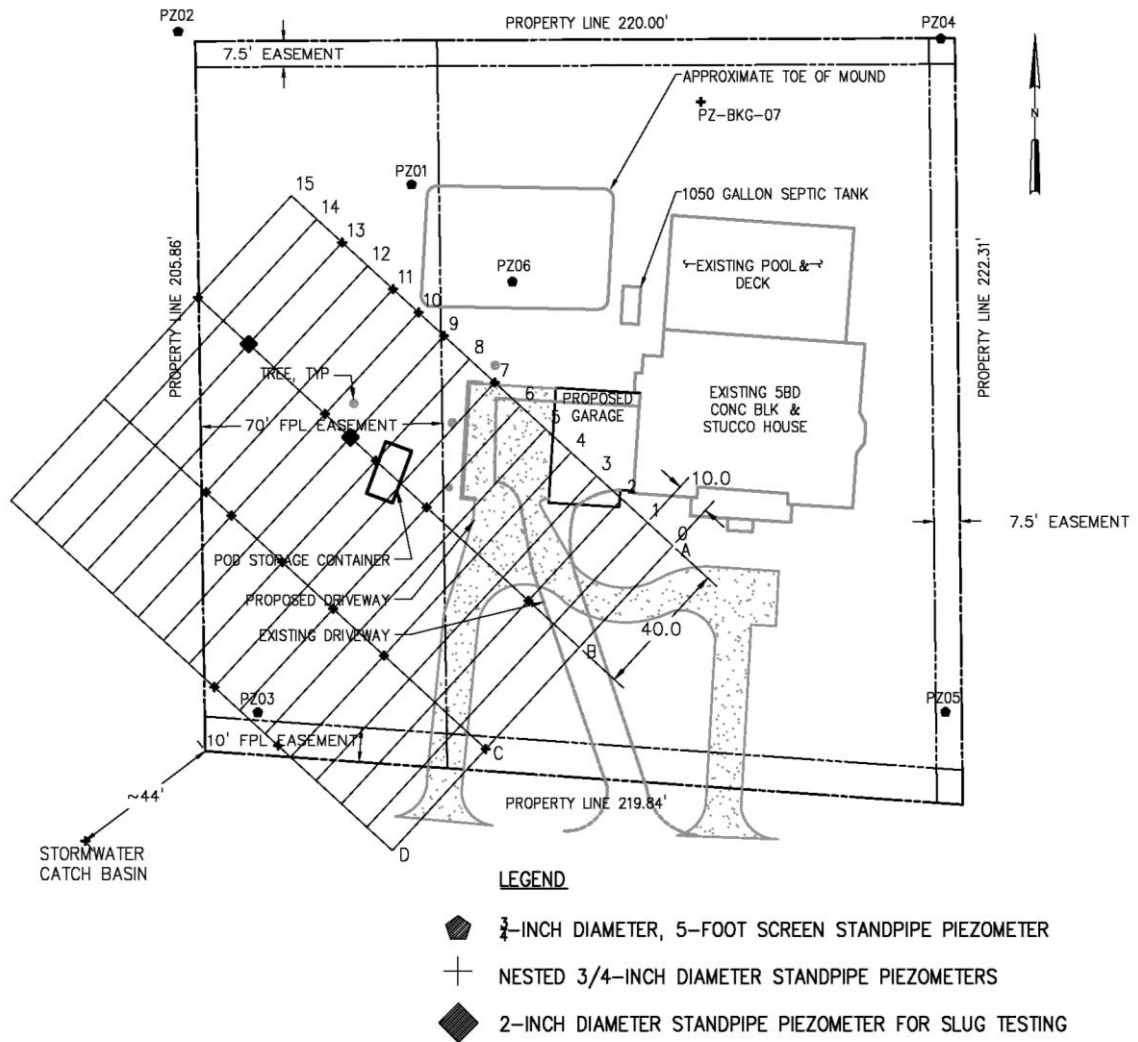


Figure 9
C-HS2 Monitoring Network

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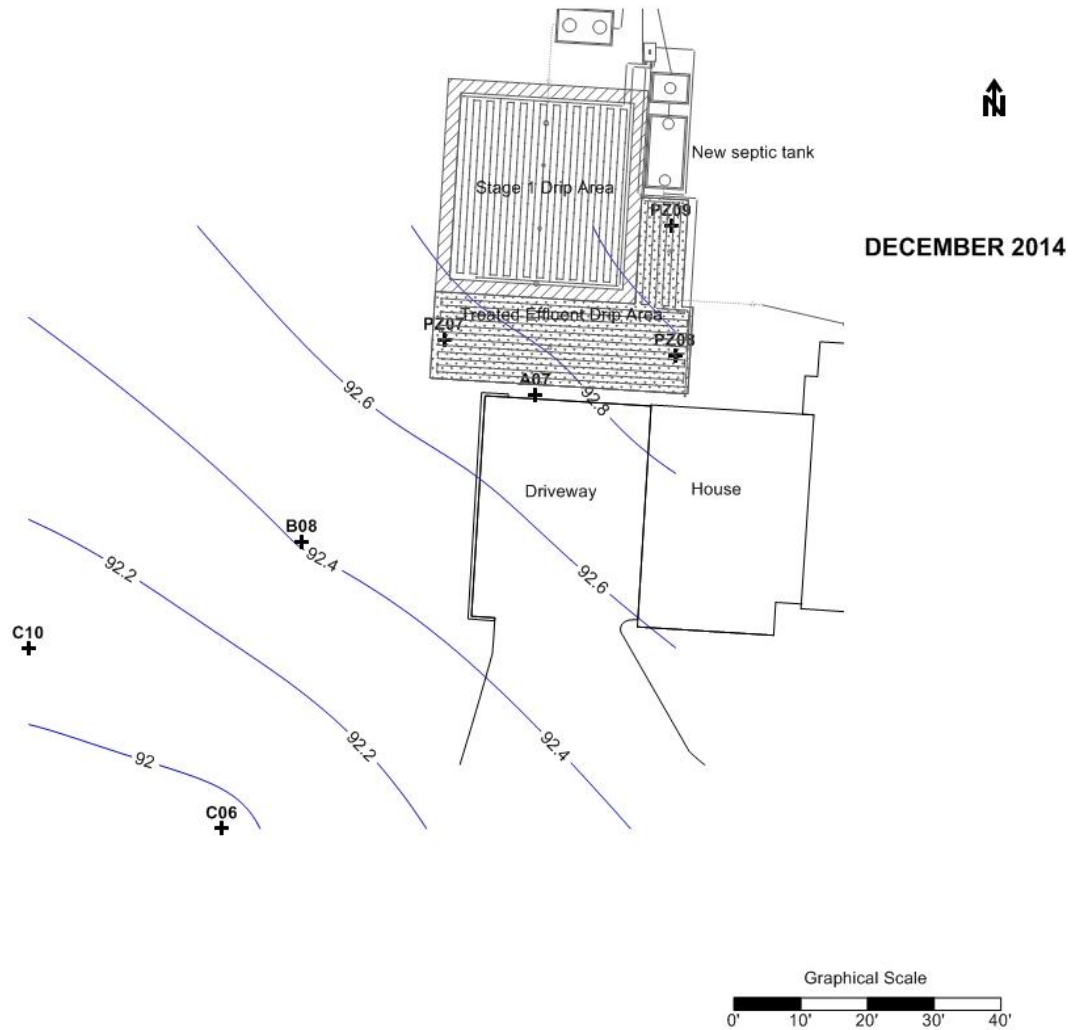


Figure 10
Groundwater Sampling Locations and
Surficial Groundwater Contours December 17, 2014

3.3 Operational Monitoring

Start-up of the system occurred on July 12, 2013 (Experimental Day 0) and the system has operated almost continually since that date. Between September 10, 2013 and September 17, 2013 the system was not operating because a replacement part for the hydraulic unit was required.

Regular maintenance includes checking and cleaning, as necessary, the primary tank effluent screen and the STE dose tank effluent screen installed within the outlet tees. During sample event site visits, this is done after sampling. The cleaning of the disc filters in the hydraulic unit is an automated process. A backflush of the filters occurs at the beginning of each dose cycle, and the backflush flow is directed to the primary tank.

3.4 Flow Monitoring

The eighth formal sampling event was conducted December 17, 2014 (Experimental Day 523). For the eighth formal sampling event, the water meter for the house and the treatment system flow meters were read and recorded on December 17, 2014. The household potable water use is recorded via a water meter (Meter 1) located in the front yard which includes indoor and outdoor water use. The household has a separate irrigation well which supplies the irrigation system; however the metered potable water use includes filling the pool, car washing, etc. The combined pump flow meter is located inside the hydraulic unit following the hydraulic unit filters prior to the split between the two zones, and records the cumulative pumped flow in gallons pumped from both the STE dose tank and Stage 2b biofilter tank (Meter 2). Therefore, the measurement of the combined flow meter includes both the STE flow from the household and the treated effluent flow from the Stage 2b biofilter. The Stage 2b treated effluent flow meter (Meter 3) is located following the split on the line from the pump to the treated effluent drip system and records the cumulative flow in gallons pumped from the Stage 2b biofilter tank. The control panel includes telemetry which logs alarms, cumulative pump cycles, and cumulative field flush cycles.

The daily wastewater volume supplied to the passive nitrogen removal system was the volume that was pumped to the lined Stage 1&2a biofilter (Drip Zone 1); it was estimated by calculating the difference between the volume readings of Meter 2 and Meter 3. This calculation does not account for water entering or leaving the Stage 1/2a biofilter (Drip Zone 1) through hydrologic processes such as precipitation, irrigation, and evapotranspiration.

Flow calculations using the metered data:

Combined pumped flow = Meter 2

Treated effluent flow (Zone 2) = Meter 3

Stage 1&2a biofilter wastewater flow (Zone 1) = Meter 2 – Meter 3

Additional Zone 1 inputs/outputs = Meter 3 - [Meter 2- Meter 3]

3.5 Energy, Chemical and/or Additives 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 pump, although a small amount of power is used by the control panel itself. There are no chemicals added to the system. However, the denitrification media (lignocellulosic and sulfur) are “reactive” media which will be consumed during operation. The Stage 1&2a lined area was initially filled with 9 inches of lignocellulosic and sand media mixture and the Stage 2b biofilter was initially filled with 12 inches of sulfur and oyster shell media mixture, which ostensibly will last for many years without replenishment or replacement.

3.6 Water Quality Sample Collection and Analyses

The eighth formal sample event was conducted on December 17, 2014 and included a full suite of influent, intermediate and effluent water quality samples from the system. Samples were collected at each of the sixteen monitoring points described previously in Section 3.2 and illustrated in Figures 3 and 10: eleven treatment system monitoring points and six groundwater sampling points. A peristaltic pump was used to collect the treatment system samples and route them directly into analysis-specific containers after sufficient flushing of the tubing had occurred. Field parameters were then recorded.

Groundwater samples were obtained using a peristaltic pump, which was attached directly to dedicated standpipe piezometer tubing. Samples were collected after sufficient purging (the sample was clear and field readings had stabilized) had occurred.

In addition, a field blank, equipment blank (EB), and field sample duplicates were taken. The field blank was collected by filling sample containers with deionized water that had been transported into the field along with other sample containers. The equipment blank was collected by pumping deionized water through the cleaned pump tubing. The field sample duplicates (B-HS3-ST2 and PZ-B8-5) were collected immediately subsequent to

the regular samples. These samples were then analyzed for the same parameters as the monitoring samples.

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, chemical oxygen demand (COD), Carbonaceous Biological Oxygen Demand (CBOD₅), total Kjeldahl nitrogen (TKN-N), ammonia nitrogen (NH₃-N), nitrate nitrogen (NO₃-N), nitrite nitrogen (NO₂-N), total phosphorus (TP), orthophosphate (Ortho P), total suspended solids (TSS), volatile suspended solids (VSS), total organic carbon (TOC), chloride, fecal coliform (fecal), and E. coli. The influent and sulfur media samples included sulfate, sulfide, and hydrogen sulfide (unionized). All analyses were performed by an independent and fully NELAC certified analytical laboratory (Southern Analytical Laboratory). Table 1 lists the analytical parameters, analytical methods, and detection limits for these analyses.

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

| Analytical Parameter | Method of Analysis | Method Detection Limit (mg/L) |
|--|---------------------------|--------------------------------------|
| Total Alkalinity as CaCO ₃ | 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 ₃ -N) | EPA 350.1 | 0.005 mg/L |
| Nitrate Nitrogen (NO ₃ -N) | EPA 300.0 | 0.01 mg/L |
| Nitrite Nitrogen (NO ₂ -N) | EPA 300.0 | 0.01 mg/L |
| Nitrate+Nitrite Nitrogen (NOX-N) | EPA 300.0 | 0.02 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 ₅) | SM5210B | 2 mg/L |
| Total Suspended Solids (TSS) | SM 2540D | 1 mg/L |
| Volatile Suspended Solids (VSS) | SM 2540E | 1 mg/L |
| Total Organic Carbon (TOC) | SM5310B | 0.06 mg/L |
| Chloride | EPA 300.0 | 0.50 mg/L |
| Sulfate | EPA 300.0 | 2.0 mg/L |
| Sulfide | SM 4500SF | 0.10 mg/L |
| Hydrogen Sulfide (unionized) | SM 4550SF | 0.01 mg/L |
| Fecal Coliform (fecal) | SM 9222D | 2 ct/100mL |
| E.coli | SM 9223B | 2 ct/100mL |

4.0 Results and Discussion

4.1 Operational Monitoring

Table 2 provides a summary of the household water use since July 13, 2011. The treatment system flow meter readings for the B-HS3 field site are summarized in Table 3. The operation and maintenance log which includes actions taken since start-up is provided in Appendix B.

Table 2
Summary of Household Water Use

| Date | Cumulative Volume (gallons) | Average Daily Household Flow, Q Between readings (gpd) | Comments |
|------------------|-----------------------------|--|---|
| 7/13/2011 14:45 | 5302677.9 | | Installed |
| 7/20/2011 17:50 | 5304207.8 | 214.6 | |
| 7/26/2011 15:19 | 5305257.9 | 178.1 | |
| 10/27/2011 15:19 | 5327920.4 | 243.7 | |
| 11/30/2011 8:00 | 5355610.4 | 821.8 | |
| 3/13/2012 8:10 | 5378780.2 | 222.8 | |
| 7/10/2012 16:15 | 5453899.3 | 629.5 | |
| 10/18/2012 15:30 | 5470593.1 | 167.0 | |
| 3/7/2013 14:00 | 5488517.4 | 128.1 | |
| 6/7/2013 14:00 | 5504725.9 | 176.2 | |
| 7/9/2013 12:50 | 5508873.0 | 129.8 | |
| 7/12/13 | | | PNRS start-up |
| 7/12/13 14:01 | 5509172.1 | 98.1 | |
| 7/17/13 13:55 | 5509884.1 | 142.5 | |
| 7/29/13 9:50 | 5510830.9 | 80.0 | |
| 8/6/13 10:40 | 5511588.8 | 94.3 | |
| 8/12/13 11:07 | 5512244.8 | 109.0 | |
| 8/15/13 8:48 | 5513128.8 | 304.5 | Prelim Event No. 1 |
| 9/5/13 15:31 | 5514810.2 | 79.0 | |
| 9/10/13 | | | Septic tank pumped |
| 9/17/13 | | | System running again |
| 9/27/13 8:00 | 5517331.9 | 116.3 | |
| 9/30/13 8:00 | 5517622.5 | 96.9 | Sample Event No. 1 |
| 10/11/13 8:30 | 5518421.6 | 72.5 | |
| 10/17/13 11:00 | 5519187.0 | 125.4 | |
| 11/15/2013 10:00 | 5524455.0 | 181.9 | |
| 11/27/2013 9:10 | 5525784.8 | 111.1 | |
| 12/2/2013 8:30 | 5527623.5 | 369.8 | Several guests stayed in the home over the Thanksgiving holiday |
| 12/4/2013 8:51 | 5527809.2 | 92.2 | Sample Event No. 2 |
| 12/23/2013 11:45 | 5529755.3 | 101.8 | |
| 1/23/2014 11:00 | 5532487.5 | 88.2 | |
| 1/30/2014 9:00 | 5533156.8 | 96.8 | |
| 2/3/2014 8:00 | 5533482.0 | 82.2 | Sample Event No. 3 |
| 2/4/2014 8:15 | 5533499.6 | 17.4 | Sample Event No. 4 |

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Table 2
Summary of Household Water Use

| Date | Cumulative Volume (gallons) | Average Daily Household Flow, Q Between readings (gpd) | Comments |
|---|-----------------------------|--|------------------------------------|
| 2/5/2014 10:45 | 5533558.4 | 53.3 | Sample Event No. 5 |
| 2/6/2014 10:45 | 5533690.6 | 132.2 | Sample Event No. 6 |
| 2/7/2014 8:00 | 5533788.6 | 110.7 | Sample Event No. 7 |
| 2/12/14 10:00 | 5534282.7 | 97.2 | |
| 3/14/14 8:24 | 5537363.8 | 102.9 | |
| 4/3/14 8:45 | 5539932.0 | 128.3 | Sample Event No. 8 (formal No. 4) |
| 4/29/14 10:10 | 5544794.2 | 186.6 | |
| 5/29/14 10:00 | 5549396.9 | 153.5 | Sample Event No. 9 (formal No. 5) |
| 6/9/14 12:45 | 5550719.1 | 119.0 | |
| 7/29/14 9:30 | 5555927.1 | 104.4 | |
| 8/22/14 7:30 | 5557593.9 | 69.7 | Sample Event No. 10 (formal No. 6) |
| 9/19/2014 12:48 | 5560271.5 | 94.9 | |
| 10/23/2014 15:45 | 5564131.1 | 113.1 | Sample Event No. 11 (formal No. 7) |
| 12/17/2014 8:00 | 5570112.8 | 109.4 | Sample Event No. 12 (formal No. 8) |
| Total average PNRS start-up to 12/17/14 | | 116.6 | |

**Table 3
Summary of System Flow**

| Date and Time Read | Meter 2 Combined Pumped Flow | Average Daily Combined Pumped Flow between readings | Calc Flow to Stage 1&2a [Meter 2 – Meter 3] ² | Average Daily Calculated Flow to Stage 1&2a between readings ² | Meter 3 Treated Effluent Flow | Average Daily Treated Effluent Flow between readings | Stage 1&2a Area Water Input or Output ¹ |
|--------------------|------------------------------|---|--|---|-------------------------------|--|--|
| | Cum Vol. (gal) | Gal/ Day | Cum Vol. (gal) | Gal/ Day | Cum Vol. (gal) | Gal/ Day | Gal/ Day |
| 7/12/13 14:01 | 206.9 | Start-up | Start-up | Start-up | 58.6 | Start-up | Start-up |
| 7/17/13 11:57 | 423.0 | 44.0 | 40.6 | | 234.2 | 35.7 | |
| 7/29/13 9:52 | 3,345.1 | 245.3 | 765.3 | 60.8 | 2,431.6 | 184.5 | 123.6 |
| 8/6/13 9:45 | 6,541.1 | 399.7 | 1,045.1 | 35.0 | 5,347.8 | 364.8 | 329.8 |
| 8/12/13 11:07 | 8,953.1 | 398.2 | 2,360.0 | 217.1 | 6,444.9 | 181.1 | -36.0 |
| 8/15/13 8:48 | 10,131.2 | 405.8 | 3,084.3 | 249.4 | 6,898.7 | 156.3 | -93.1 |
| 9/5/13 15:31 | 18,696.5 | 402.5 | 7,734.4 | 218.5 | 10,813.8 | 184.0 | -34.5 |
| 9/9/13 9:00 | 19,884.6 | 318.7 | 8,287.6 | 148.4 | 11,448.8 | 170.3 | 22.0 |
| 9/17/13 10:12 | 20,912.4 | 127.7 | 8,785.2 | 61.8 | 11,979.0 | 65.9 | 4.0 |
| 9/27/13 8:00 | 22,142.0 | 124.1 | 9,239.3 | 45.8 | 12,754.5 | 78.3 | 32.4 |
| 9/30/13 8:00 | 22,885.0 | 247.7 | 9,692.2 | 151.0 | 13,044.6 | 96.7 | -54.2 |
| 10/11/13 8:30 | 26,428.9 | 321.6 | 11,417.0 | 156.5 | 14,863.7 | 165.1 | 8.5 |
| 10/17/13 11:00 | 28,781.4 | 385.4 | 12,823.8 | 230.5 | 15,809.4 | 154.9 | -75.5 |
| 11/8/13 12:30 | 34,278.1 | 249.1 | 15,844.0 | 136.9 | 18,285.9 | 112.2 | -24.6 |
| 11/27/13 9:10 | 39,031.1 | 252.0 | 18,656.6 | 149.1 | 20,226.3 | 102.9 | -46.2 |
| 12/2/13 8:30 | 42,081.5 | 613.5 | 20,437.6 | 358.2 | 21,495.7 | 255.3 | -102.9 |
| 12/4/13 8:51 | 42,599.8 | 257.3 | 20,729.5 | 144.9 | 21,722.1 | 112.4 | -32.6 |
| 12/23/13 11:45 | 47,135.0 | 237.2 | 23,346.3 | 136.9 | 23,640.5 | 100.3 | -44.3 |
| 1/23/14 11:00 | 54,702.9 | 244.4 | 27,486.2 | 133.7 | 27,068.4 | 110.7 | -23.0 |
| 1/30/14 9:00 | 56,954.9 | 325.6 | 28,619.7 | 163.9 | 28,187.0 | 161.7 | -2.2 |
| 2/3/14 8:00 | 58,390.4 | 362.7 | 29,205.1 | 147.9 | 29,037.1 | 214.8 | 66.9 |
| 2/4/14 8:15 | 58,688.7 | 295.2 | 29,298.1 | 92.0 | 29,242.4 | 203.2 | 111.1 |
| 2/5/14 10:45 | 58,870.7 | 164.8 | 29,393.9 | 86.7 | 29,328.6 | 78.1 | -8.6 |
| 2/6/14 10:45 | 59,118.7 | 248.0 | 29,553.8 | 159.9 | 29,416.7 | 88.1 | -71.9 |
| 2/7/14 8:00 | 59,354.0 | 265.8 | 29,704.7 | 170.4 | 29,501.1 | 95.4 | -75.0 |

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Table 3 (con't)
Summary of System Flow

| Date and Time Read | Meter 2 Combined Pumped Flow | Average Daily Combined Pumped Flow between readings | Calc Flow to Stage 1&2a [Meter 2 – Meter 3]² | Average Daily Calculated Flow to Stage 1&2a between readings² | Meter 3 Treated Effluent Flow | Average Daily Treated Effluent Flow between readings | Stage 1&2a Area Water Input or Output¹ |
|---------------------------|-------------------------------------|--|--|---|--------------------------------------|---|--|
| | Cum Vol. (gal) | Gal/ Day | Cum Vol. (gal) | Gal/ Day | Cum Vol. (gal) | Gal/ Day | Gal/ Day |
| 2/12/14 10:00 | 61,023.9 | 328.5 | 30,135.7 | 84.8 | 30,739.9 | 243.7 | 158.9 |
| 3/14/14 8:24 | 67,901.2 | 229.8 | 34,391.1 | 142.2 | 33,361.9 | 87.6 | -54.6 |
| 4/3/14 8:45 | 73,953.4 | 302.4 | 37,466.0 | 153.6 | 36,339.2 | 148.8 | -4.9 |
| 4/29/14 10:10 | 81,273.0 | 280.9 | 41,710.4 | 162.9 | 39,414.4 | 118.0 | -44.9 |
| 5/29/14 10:00 | 86,833.4 | 185.4 | 44,628.2 | 97.3 | 42,057.0 | 88.1 | -9.2 |
| 6/9/14 12:45 | 90,633.4 | 341.9 | 46,511.8 | 169.5 | 43,973.4 | 172.4 | 3.0 |
| 7/11/14 14:45 | 98,858.8 | 256.4 | 50,797.4 | 133.6 | 47,913.2 | 122.8 | -10.8 |
| 7/29/14 9:30 | 105,444.4 | 370.4 | 54,191.1 | 190.9 | 51,105.1 | 179.5 | -11.3 |
| 8/22/14 7:30 | 110,175.4 | 197.8 | 56,565.4 | 99.3 | 53,461.8 | 98.5 | -0.7 |
| 9/19/2014 12:48 | 118,258.6 | 286.4 | 60,754.3 | 148.4 | 57,356.1 | 138.0 | -10.4 |
| 10/23/2014 15:45 | 130,079.5 | 346.4 | 65,886.9 | 150.4 | 64,044.4 | 196.0 | 45.6 |
| 11/21/2014 9:30 | 139,036.3 | 311.7 | 71,279.4 | 187.6 | 67,608.7 | 124.0 | -63.6 |
| 12/17/2014 8:00 | 147,921.6 | 342.6 | 75,970.7 | 180.9 | 71,802.7 | 161.7 | -19.2 |
| Avg start-up to 12/17/14 | | 282.6 | | 145.3 | | 137.2 | -8.1 |

¹This value is the difference between the calculated flow to Stage 1&2a and metered Treated Effluent flow (Meter 3) from the Stage 2b biofilter. A positive value indicates an additional water input to the Stage 1&2a area (precipitation, irrigation, etc.) whereas a negative value indicates a water output (evapotranspiration, etc.).

²The additional volume in the Stage 1&2a flow as compared to the household water use meter is the volume returned to the septic tank during field flushing of the drip lines.

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The average household water use since the PNRS system start-up was 116.6 gallons per day with periods of higher and lower flows. Since the PNRS system start-up, the average combined pumped flow (flow to the Stage 1&2a drip system and treated effluent drip system) was 282.6 gallons per day, the average calculated Stage 1&2a drip system (STE) flow was 145.3 gallons per day and the average treated effluent drip system (Stage 2b biofilter effluent) flow was 137.2 gallons per day. The calculated Stage 1&2a drip system (STE) flow includes pumped water used for field flushing of the drip lines, which is returned to the septic tank after flushing. This is the reason that the calculated STE flow is considerably higher than the flow measured by the household potable water meter. Actual system treated flow is probably closer to the potable water meter flow value.

The difference between the flow to the Stage 1&2a drip system (STE) and the treated effluent drip system (Stage 2b biofilter effluent) are due to water inputs and outputs. Water inputs include precipitation, applied STE, and any lawn irrigation water collected in the Stage 1&2a lined area. Water outputs include evapotranspiration. The last column in Table 3 summarizes the difference in the Stage 1&2a and treated effluent flows for each time period. The positive values indicate higher treated effluent flow (water inputs) which are likely attributed to precipitation and irrigation water collected in the lined area. The negative values indicate higher Stage 1&2a flow (water outputs) which is likely attributed to evapotranspiration. Overall, there was a net loss of water equal to approximately 8.1 gallons per day.

A weather station (Lake Wayman Heights, Longwood, FL) is located approximately 5 miles from the site. Data from this weather station is available at the following website: <http://www.wunderground.com>. Recorded meteorological data is provided in Appendix C, Table C.1 from this weather station. Table 4 provides daily precipitation totals leading up to and during the sample event. There was approximately 0.01 inches of rain in the 5 days ending on December 17th.

Table 4
Precipitation Data Daily Totals Measured December 1, 2014 through December 17, 2014
Sample Event No. 8

| Date | Precipitation (inches) |
|------------|---------------------------|
| 12/1/2014 | 0 |
| 12/2/2014 | 0.01 |
| 12/3/2014 | 0 |
| 12/4/2014 | 0 |
| 12/5/2014 | 0.01 |
| 12/6/2014 | 0.01 |
| 12/7/2014 | 0.11 |
| 12/8/2014 | 0.11 |
| 12/9/2014 | 0 |
| 12/10/2014 | 0 |
| 12/11/2014 | 0 |
| 12/12/2014 | 0 |
| 12/13/2014 | 0.01 |
| 12/14/2014 | 0 |
| 12/15/2014 | 0 |
| 12/16/2014 | 0 |
| 12/17/2014 | 0 |

4.2 Energy, Chemical and/or Additives 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 5. The total average electrical use through December 17, 2014 was 0.90 kWh per day. The average electrical use per 1,000 gallons treated was 6.168 kWh per 1,000 gallons, and this parameter varies based on the amount of additional pumped flow attributed to precipitation.

Table 5
Summary of System Electrical Use

| Date and Time Read | Electrical Meter Reading | Average Daily Electrical Use between readings | Average Electrical Use Per Treated Gallon between readings | Average Electrical Use Per 1,000 Gallons Treated between readings |
|---------------------------|---------------------------------|--|---|--|
| | Cumulative (kWh) | (kWh/day) | (kWh/gal) | (kWh/1,000 gal) |
| 7/12/13 14:01 | 0.6 | Start-up | Start-up | Start-up |
| 7/17/13 11:57 | 1.1 | 0.10 | 0.011 | 10.763 |
| 7/29/13 9:52 | 8.9 | 0.65 | 0.036 | 36.456 |
| 8/6/13 9:45 | 19.1 | 1.28 | 0.007 | 6.692 |
| 8/12/13 11:07 | 27.9 | 1.45 | 0.006 | 6.351 |
| 8/15/13 8:48 | 32.5 | 1.58 | 0.008 | 7.978 |
| 9/5/13 15:31 | 69.6 | 1.74 | 0.023 | 22.959 |
| 9/9/13 9:00 | 82.3 | 3.41 | 0.008 | 7.838 |
| 9/17/13 10:12 | 86.2 | 0.48 | 0.006 | 5.725 |
| 9/27/13 8:00 | 88.8 | 0.26 | 0.004 | 3.975 |
| 9/30/13 8:00 | 90.6 | 0.60 | 0.005 | 4.580 |
| 10/11/13 8:30 | 98.5 | 0.72 | 0.004 | 4.407 |
| 10/17/13 11:00 | 104.7 | 1.02 | 0.005 | 5.430 |
| 11/8/13 12:30 | 121.1 | 0.74 | 0.005 | 5.155 |
| 11/27/13 9:10 | 135.6 | 0.77 | 0.005 | 5.334 |
| 12/2/13 8:30 | 145.1 | 1.91 | 0.006 | 5.823 |
| 12/4/13 8:51 | 146.8 | 0.84 | 0.000 | 0.000 |
| 1/23/14 11:00 | 185.1 | 0.76 | 0.006 | 5.720 |
| 1/30/14 9:00 | 192.3 | 1.04 | 0.006 | 6.352 |
| 2/3/14 8:00 | 197.0 | 1.19 | 0.008 | 8.029 |
| 2/4/14 8:15 | 198.0 | 0.99 | 0.011 | 10.753 |
| 2/5/14 10:45 | 198.6 | 0.54 | 0.006 | 6.266 |
| 2/6/14 10:45 | 199.3 | 0.73 | 0.005 | 4.556 |
| 2/7/14 8:00 | 200.2 | 0.98 | 0.006 | 5.776 |
| 2/12/14 10:00 | 205.7 | 1.08 | 0.013 | 12.760 |
| 3/14/14 8:24 | 228.2 | 0.75 | 0.005 | 5.287 |
| 4/3/14 8:45 | 248.3 | 1.00 | 0.007 | 6.537 |
| 4/29/14 10:10 | 272.5 | 0.93 | 0.006 | 5.702 |
| 5/29/14 10:00 | 290.2 | 0.59 | 0.006 | 6.066 |
| 6/9/14 12:45 | 302.0 | 1.06 | 0.006 | 6.265 |
| 7/11/14 14:45 | 327.3 | 0.79 | 0.006 | 5.903 |
| 7/29/14 9:30 | 347.3 | 1.12 | 0.006 | 5.893 |
| 8/22/14 7:30 | 361.4 | 0.59 | 0.006 | 5.939 |
| 9/19/14 12:48 | 385.1 | 0.84 | 0.006 | 5.658 |

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Table 5 (con't)
Summary of System Electrical Use

| Date and Time Read | Electrical Meter Reading | Average Daily Electrical Use between readings | Average Electrical Use Per Treated Gallon between readings | Average Electrical Use Per 1,000 Gallons Treated between readings |
|------------------------------------|---------------------------------|--|---|--|
| | Cumulative (kWh) | (kWh/day) | (kWh/gal) | (kWh/1,000 gal) |
| 10/23/14 15:45 | 420.7 | 1.04 | 0.007 | 6.936 |
| 11/21/14 9:30 | 442.5 | 0.76 | 0.004 | 4.043 |
| 12/17/14 8:00 | 469.2 | 1.03 | 0.006 | 5.691 |
| Total average start-up to 12/17/14 | | 0.90 | 0.006 | 6.168 |

4.3 Water Quality

Water quality analytical results, for Sample Event No. 8 are listed in Table 6 and graphically displayed in Figure 11. The laboratory report containing the raw analytical data is included in Appendix A. The following discussion summarizes the water quality analytical results for the Sample Event No. 8. The performance of the various system components was compared by considering the changes through treatment of nitrogen species (TKN, $\text{NH}_3\text{-N}$, and $\text{NO}_x\text{-N}$), as well as supporting water quality parameters.

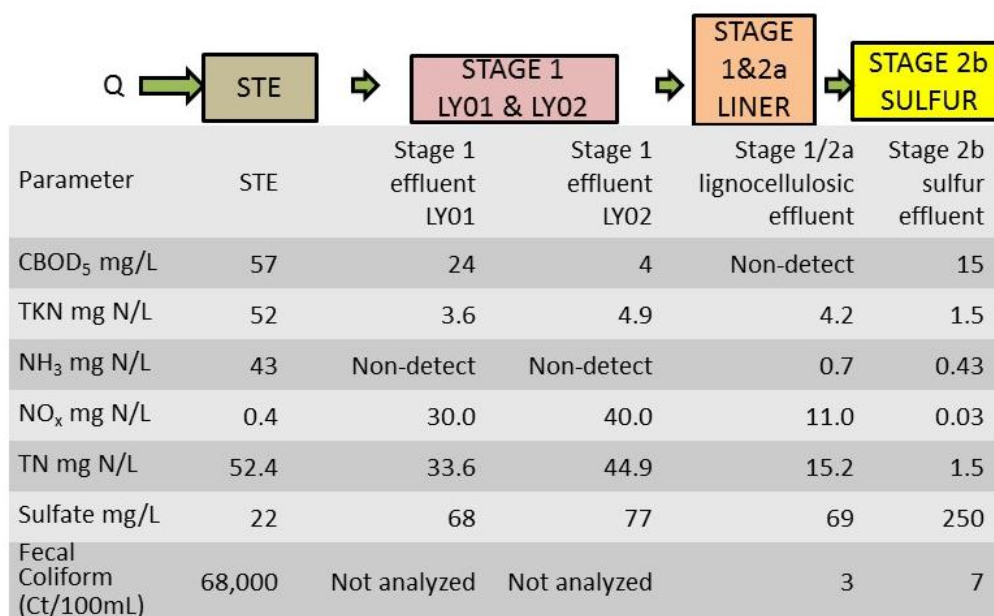


Figure 11
Graphical Representation of Water Quality Results
Sample Event No. 8, December 17, 2014

Septic Tank Effluent (STE) Quality: The water quality characteristics of STE collected in Sample Event 8 were within the typical range generally expected for domestic STE. The measured STE total nitrogen (TN) concentration was 52 mg/L, which is within the range that has been typically reported for Florida single family residence STE. The measured STE CBOD₅ was 57 mg/L which is in the low end of the typical range.

Stage 1 (Bottom of Sand Layer) Soil Suction Lysimeters (LY01 and LY02): The soil suction lysimeters LY01 and LY02 effluent $\text{NH}_3\text{-N}$ levels were below the method detection limit of 0.009 mg/L (Table 6). The $\text{NO}_x\text{-N}$ was 30 mg/L and 40 mg/L for LY01 and LY02, respectively. The Stage 1 biofilter sand layer showed nearly complete ammonium removal and significant removal of total nitrogen with an effluent concentration equal to

or less than: $\text{NH}_3\text{-N}$ below the method detection limit of 0.009 mg/L, $\text{NO}_x\text{-N}$ of 40 mg/L and TKN of 4.9 mg/L.

Stage 1&2a (Bottom of Lignocellulosic Layer) Liner Effluent (Liner): The lignocellulosic (Stage 1&2a) effluent $\text{NH}_3\text{-N}$ level was 0.66 mg/L with a DO level at 2.00 mg/L (Table 6). TSS was 2 mg/L, and CBOD_5 was below the method detection limit of 2 mg/L. The Stage 1&2a effluent $\text{NO}_x\text{-N}$ was 11 mg/L. These results indicate nitrate removal by passage through the lignocellulosic/sand layer in the Stage 1&2a lined area (between 63 and 73% reduction of $\text{NO}_x\text{-N}$). The combined Stage 1&2a liner area biofilter showed ammonium removal and removal of $\text{NO}_x\text{-N}$ with an effluent $\text{NH}_3\text{-N}$ of 0.66 mg/L, $\text{NO}_x\text{-N}$ of 11 mg/L and TKN of 4.2 mg/L.

Stage 2b Biofilter (Sulfur) Effluent (ST2): Effluent $\text{NO}_x\text{-N}$ from the Stage 2b sulfur media biofilter was 0.03 mg/L with a DO level at 0.1 mg/L and ORP at -215 mV. Final total nitrogen (TN) in the passive nitrogen removal system effluent was 1.53 mg/L. The Stage 2b biofilter effluent CBOD_5 concentration was 15 mg/L, TSS was below the method detection limit of 1 mg/L and sulfate was 250 mg/L.

As previously discussed in Section 3.3, Sample Event 8 also included a Stage 2b biofilter sample taken 6 inches within the sulfur media. The BHS3-SULFUR-6 stainless steel drivepoint sampler results from this event indicate that the $\text{NO}_x\text{-N}$ was effectively reduced to 0.08 mg/L and sulfate concentration was 170 mg/L after passage through 6 inches of the sulfur media.

Treated Effluent Soil Suction Lysimeters (LY03 and LY04): The treated effluent drip system monitoring devices LY03 and LY04 $\text{NO}_x\text{-N}$ concentrations were 5.6 mg/L and 2 mg/L, respectively, which is higher than the Stage 2b effluent concentration. This has been noted in each sampling event since system start-up. It appears that there must be another source of nitrogen to the effluent irrigation area, and it is suspected that fertilizer from the new sod installed in the area is still contributing to this result. The $\text{NO}_x\text{-N}$ concentrations did appear to decrease with time following sod installation and in the winter months with less rainfall; however in March and June the $\text{NO}_x\text{-N}$ concentrations increased possibly from sod fertilizer runoff in the rainy season (Figure 12).

Field Blank and Equipment Blank (FB & EB): Described in Section 3.5, the equipment blank (EB) and field blank (FB) results for most of the parameters measured were at or below the method detection limit. The slightly elevated parameters were TKN, total phosphorus and total organic carbon in both samples.

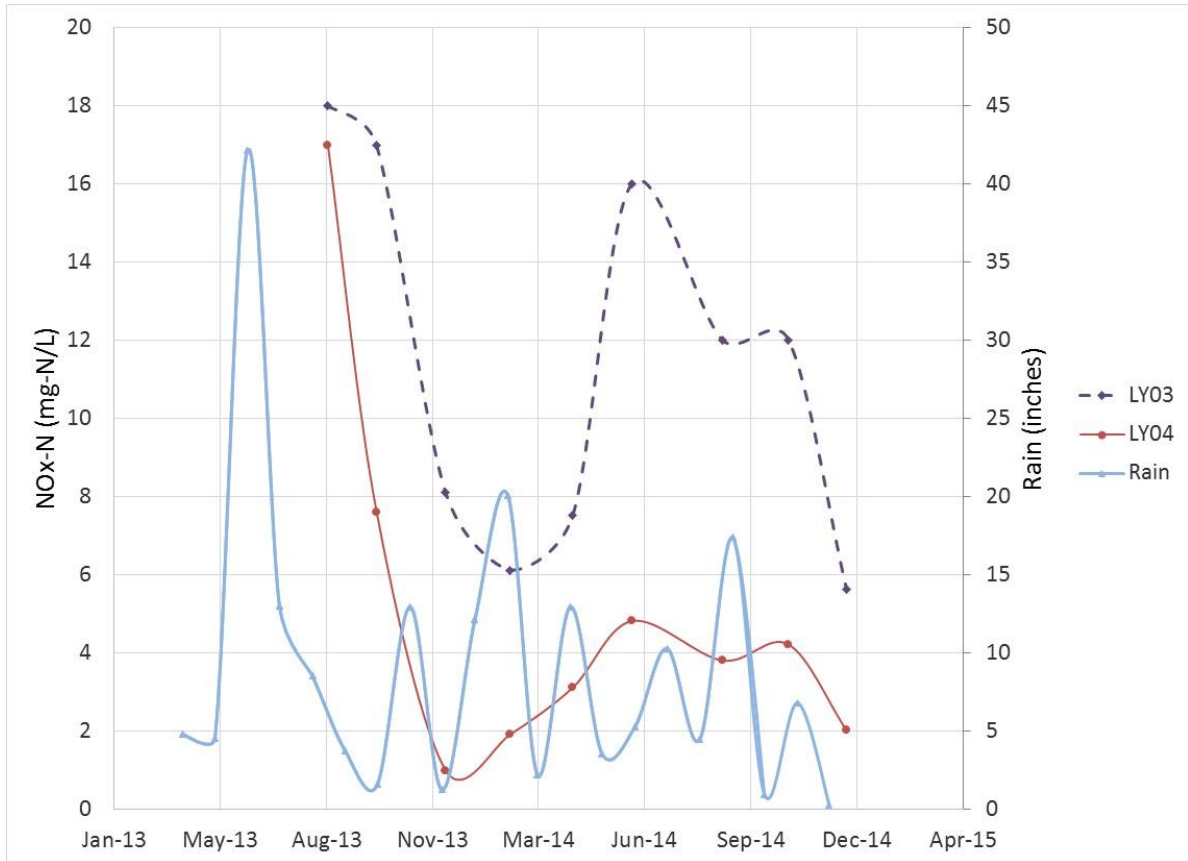


Figure 12
LY03 and LY04 NO_x-N Time Series

Table 6
Sample Event 8 Water Quality Results

| Sample ID | Sample Date/Time | Temp (°C) | pH | Specific Conductance (uS/cm) | DO (mg/L) | ORP (mV) | TSS (mg/L) | CBOD ₅ (mg/L) | COD (mg/L) | TN (mg/L N) ¹ | TKN (mg/L N) | Organic N (mg/L N) ² | NH ₃ -N (mg/L N) | NO ₃ -N (mg/L N) | NO ₂ -N (mg/L N) | NO _x (mg/L N) | TIN (mg/L N) ³ | TP (mg/L) | Chloride (mg/L) | Sulfate (mg/L) | Hydrogen Sulfide (mg/L) | Sulfide (mg/L) | Fecal (Ct/100 mL) | E-coli (Ct/100 mL) | TOC (mg/L) |
|--------------------|------------------|-----------|------|------------------------------|-----------|----------|------------|--------------------------|------------|--------------------------|--------------|---------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------|---------------------------|-----------|-----------------|----------------|-------------------------|----------------|-------------------|--------------------|------------|
| BHS3-STE | 12/17/2014 9:26 | 18.27 | 7.26 | 1055 | 0.19 | -244.3 | 18 | 57 | 140 | 52.4 | 52 | 9 | 43 | 0.34 | 0.06 | 0.4 | 43.4 | 4.6 | | 22 | 0.5 | 1.4 | 68000 | 61000 | 33 |
| BHS3-ST1-LY01 | 12/17/2014 9:05 | 15.00 | 6.90 | 652 | 5.73 | 95.4 | 1 | 24 | 16 | 33.61 | 3.6 | 3.591 | 0.009 | 30 | 0.01 | 30.01 | 30.019 | 0.92 | | 68 | | | | | 15 |
| BHS3-ST1-LY02 | 12/17/2014 9:20 | 16.20 | 6.41 | 737 | 6.23 | 129.9 | 1 | 4 | 31 | 44.92 | 4.9 | 4.891 | 0.009 | 40 | 0.02 | 40.02 | 40.029 | 2.7 | | 77 | | | | | |
| BHS3-ST1&2a-LINER | 12/17/2014 8:35 | 18.50 | 6.80 | 810 | 2.00 | 89.5 | 2 | 2 | 22 | 15.24 | 4.2 | 3.54 | 0.66 | 11 | 0.04 | 11.04 | 11.7 | 0.46 | | 69 | | | 3 | 2 | 12 |
| BHS3-ST2b-SULFUR-6 | 12/17/2014 9:06 | 18.96 | 6.53 | 986 | 1.11 | -241.6 | | 38 | | 2.58 | 2.5 | 1.77 | 0.73 | 0.06 | 0.02 | 0.08 | 0.81 | | | 170 | | | | | |
| BHS3-ST2b | 12/17/2014 8:20 | 18.49 | 6.39 | 1067 | 0.10 | -214.5 | 1 | 15 | 47 | 1.53 | 1.5 | 1.07 | 0.43 | 0.02 | 0.01 | 0.03 | 0.46 | 0.62 | 39 | 250 | 0.57 | 0.82 | 7 | 6.3 | 15 |
| BHS3-ST2b-DUP | 12/17/2014 8:40 | 18.49 | 6.39 | 1067 | 0.10 | -214.5 | 3 | 14 | 56 | 1.53 | 1.5 | 0.92 | 0.58 | 0.02 | 0.01 | 0.03 | 0.61 | 0.66 | 42 | 240 | 0.57 | 0.82 | 4 | 3.1 | 12 |
| BHS3-LY03 | 12/17/2014 11:10 | 18.30 | 6.64 | 760 | 6.05 | 181.0 | 1 | 2 | 16 | 7.21 | 1.6 | 1.18 | 0.42 | 5.6 | 0.01 | 5.61 | 6.03 | 0.33 | 25 | 160 | | 0.1 | | | |
| BHS3-LY04 | 12/17/2014 9:30 | 15.40 | 6.80 | 753 | 6.75 | 153.8 | 1 | 2 | 12 | 2.92 | 0.91 | 0.901 | 0.009 | 2 | 0.01 | 2.01 | 2.019 | 0.33 | 27 | 160 | | 0.1 | | | |
| BHS3-PZ07 | 12/17/2014 10:28 | 18.33 | 6.29 | 596 | 6.61 | 62.2 | 2 | 2 | 27 | 2.36 | 0.95 | 0.941 | 0.009 | 1.4 | 0.01 | 1.41 | 1.419 | 0.3 | 20 | 99 | 0.01 | 0.1 | 1 | 2 | 23 |
| BHS3-PZ08 | 12/17/2014 10:04 | 18.54 | 6.56 | 658 | 4.01 | 55.9 | 91 | 2 | 33 | 1.65 | 0.83 | 0.821 | 0.009 | 0.81 | 0.01 | 0.82 | 0.829 | 0.59 | 24 | 140 | 0.01 | 0.1 | 1 | 2 | 19 |
| BHS3-PZ09 | 12/17/2014 10:00 | 18.80 | 6.41 | 268 | 6.08 | 171.1 | 150 | 2 | 60 | 6.91 | 2.1 | 2.091 | 0.009 | 4.8 | 0.01 | 4.81 | 4.819 | 1.7 | 5.2 | 16 | 1.2 | 1.4 | 1 | 2 | 46 |
| PZ-A7-6 | 12/17/2014 11:22 | 20.14 | 6.45 | 702 | 2.39 | 64.8 | | | | 1.88 | 1.4 | 1.391 | 0.009 | 0.44 | 0.04 | 0.48 | 0.489 | | 22 | 120 | | | | | |
| PZ-A7-8 | 12/17/2014 11:34 | 20.85 | 6.38 | 461 | 0.81 | 26.7 | | | | 3.23 | 3.2 | 2.76 | 0.44 | 0.02 | 0.01 | 0.03 | 0.47 | | 11 | 30 | | | | | |
| PZ-B8-5 | 12/17/2014 11:25 | 19.70 | 6.19 | 507 | 1.22 | -2.8 | | | | 1.64 | 1.6 | 1.43 | 0.17 | 0.03 | 0.01 | 0.04 | 0.21 | | 23 | 55 | | | | | |
| PZ-B8-5-DUP | 12/17/2014 11:30 | 20.00 | 6.13 | 505 | 1.22 | -2.8 | | | | 1.65 | 1.6 | 1.48 | 0.12 | 0.04 | 0.01 | 0.05 | 0.17 | | 21 | 51 | | | | | |
| PZ-C06-5 | 12/17/2014 12:24 | 21.25 | 5.67 | 478 | 3.16 | 70.7 | | | | 1.53 | 1.5 | 1.28 | 0.22 | 0.02 | 0.01 | 0.03 | 0.25 | | 21 | 59 | | | | | |
| PZ-C10-6 | 12/17/2014 12:06 | 21.91 | 6.00 | 276 | 1.22 | 37.2 | | | | 4.62 | 2.8 | 2.716 | 0.084 | 1.8 | 0.02 | 1.82 | 1.904 | | 5.8 | 15 | | | | | |
| EB | 12/17/2014 10:40 | 17.50 | 6.00 | 1.94 | 8.41 | 155.0 | 1 | 2 | 10 | 0.23 | 0.2 | 0.191 | 0.009 | 0.02 | 0.01 | 0.03 | 0.039 | 0.18 | | 0.2 | 0.01 | 0.1 | 1 | 2 | 3.1 |
| FB | 12/17/2014 10:50 | 18.40 | 6.01 | 2.47 | 8.29 | 144.8 | 1 | 2 | 10 | 0.18 | 0.15 | 0.141 | 0.009 | 0.02 | 0.01 | 0.03 | 0.039 | 0.2 | | 0.2 | 0.01 | 0.1 | 1 | 2 | 0.64 |

Notes:

¹Total Nitrogen (TN) is a calculated value equal to the sum of TKN and NO_x

²Organic Nitrogen (ON) is a calculated value equal to the difference of TKN and NH₃.

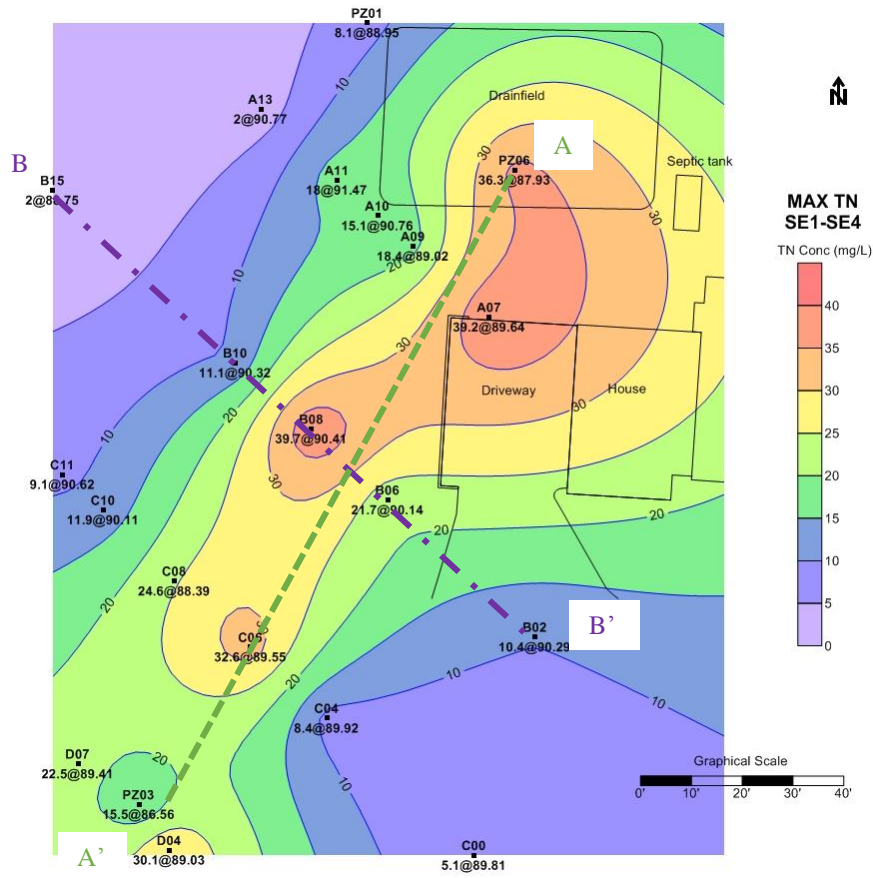
³Total Inorganic Nitrogen (TIN) is a calculated value equal to the sum of NH₃ and NO_x.

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.

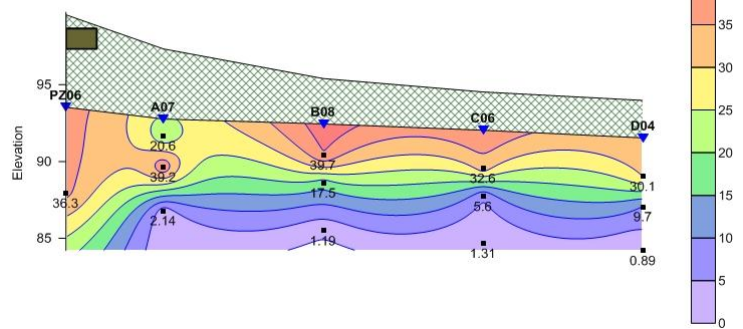
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Groundwater Monitoring Standpipe Piezometers: As discussed in Section 3.2.2, five downgradient groundwater monitoring points installed as part of the C-HS2 groundwater monitoring network were sampled during this event. Figure 13 depicts a site plan of maximum TN concentrations at all locations where groundwater samples were obtained during the four sample events (July 2011 through July 2012) conducted as part of the C-HS2 monitoring events (taken prior to PNRS installation). In addition, illustrated in Figure 13 are two transect cross sections A-A' and B-B'. For comparison, Figure 14 depicts the maximum TN concentration at all locations where groundwater samples were obtained during this sample event (December 17, 2014) along with similar transect cross section A-A'. Figure 15 is a time series plot of total nitrogen concentrations measured at PZ-A7-08, PZ-B8-5 and PZ-C10-6 which shows the highest concentrations during the Task C monitoring. A significant decrease in total nitrogen concentration in the groundwater plume downgradient of the PNRS system has occurred since PNRS system installation (Figure 15).



Cross Section A-A'

Horizontal Scale
0 5 10 15 20



Cross Section B-B'

Horizontal Scale
0 5 10 15 20

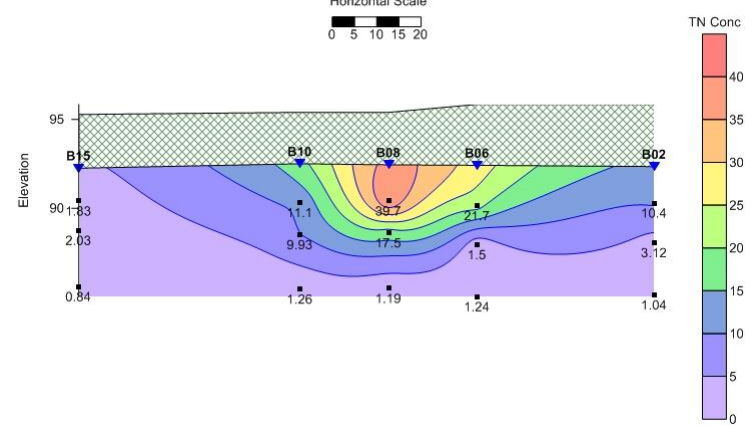


Figure 13
C-HS2 Maximum TN Concentrations (July 2011 through July 2012)

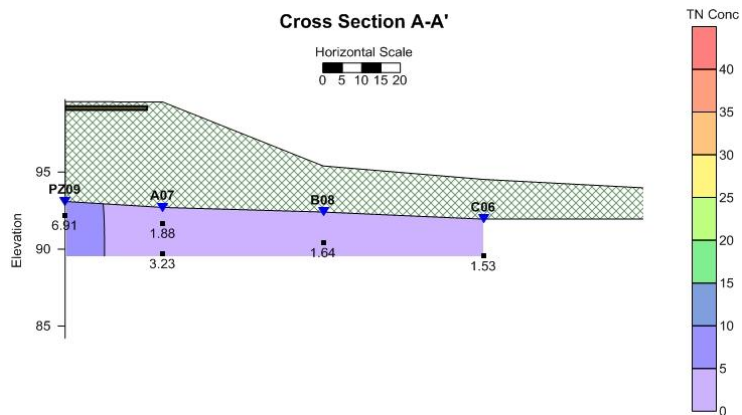
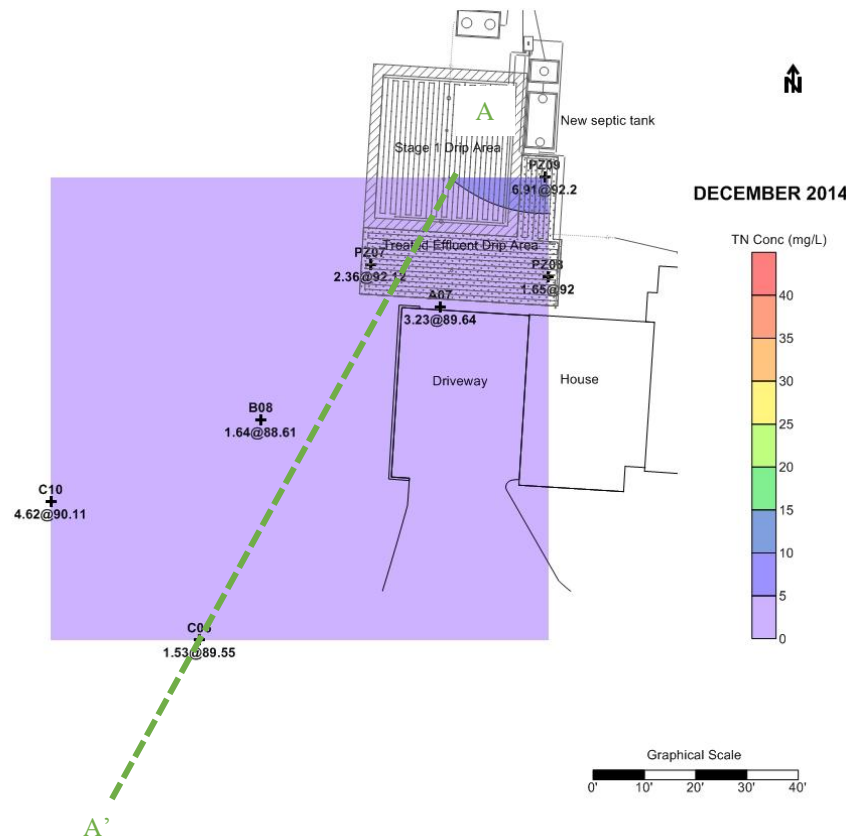


Figure 14
B-HS3 TN Concentrations (December 17, 2014)

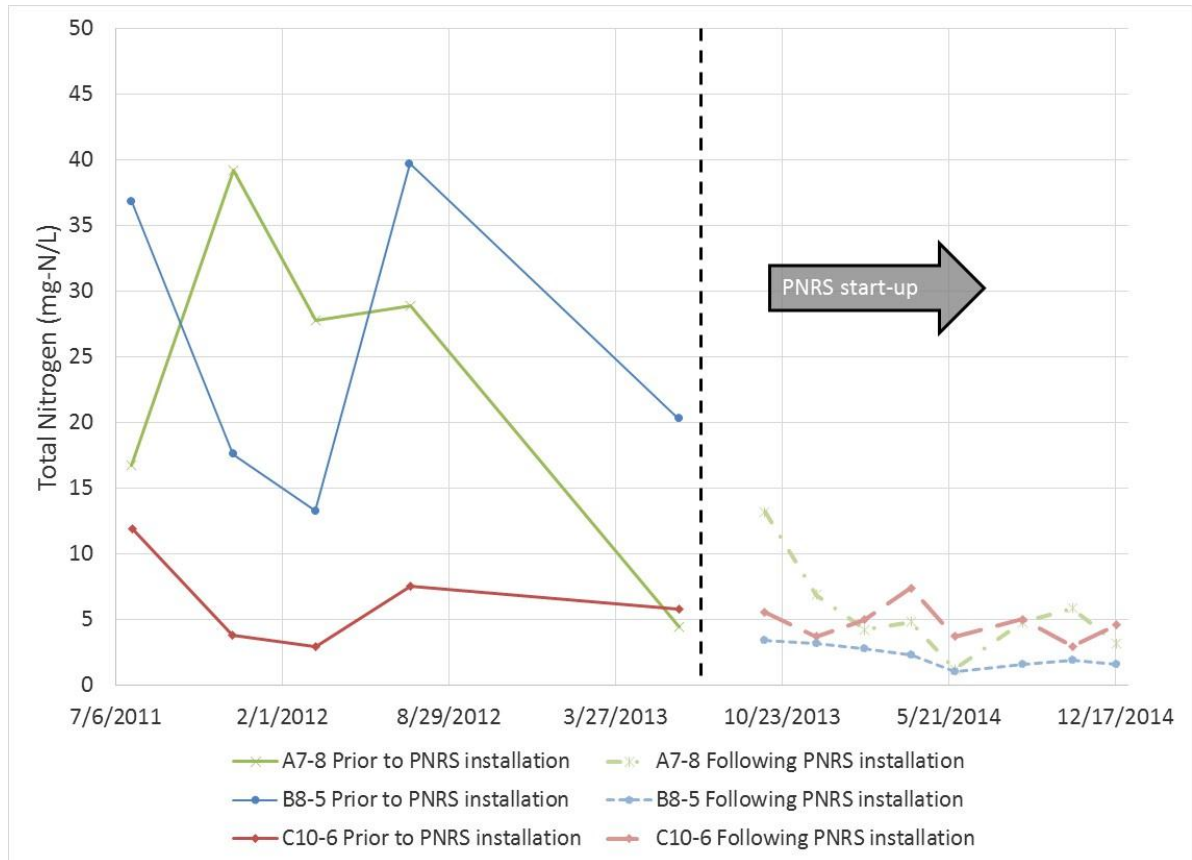


Figure 15
TN Time Series for Various Groundwater Wells

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4.4 Water Quality Monitoring Summary

A summary of the water quality data collected for the test system is presented in Table 7. Figure 16 provides a time series of influent and effluent TN over the study period. Figures 17 through 22 show box and whisker plots of the various monitoring points for the key parameters measured during the study period. Both Stage 1 monitoring points (LY01 and LY02) are shown separately, because the total nitrogen and $\text{NO}_x\text{-N}$ results indicate consistent differences. The reason for the difference is unknown but could be attributed to the location of the ceramic cup relative to the lignocellulosic media, vicinity to a drip emitter, distribution of effluent, or other factors.

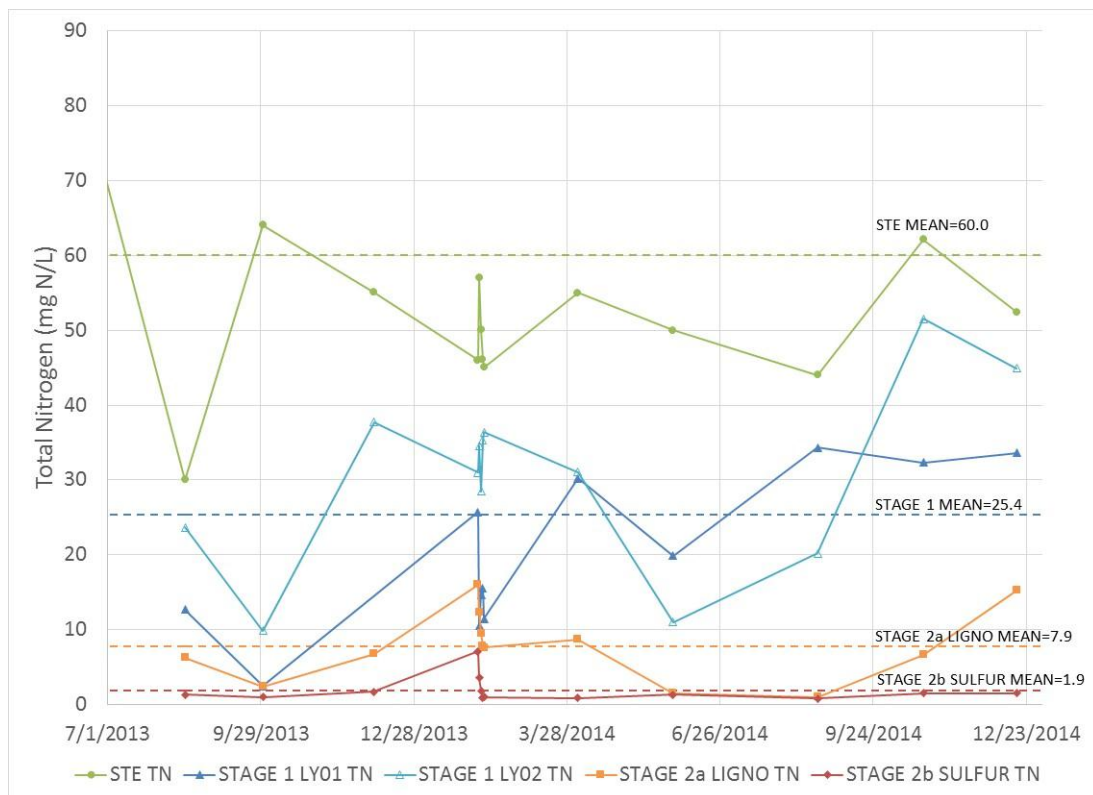


Figure 16
Total Nitrogen Time Series Graph
August 15, 2013 through December 17, 2014

Table 7
Summary of Water Quality Analytical Results

| Sample ID | Statistic | Temp (°C) | pH | Specific Conductance (uS/cm) | DO (mg/L) | ORP (mV) | Total Alkalinity (mg/L) | TSS (mg/L) | VSS (mg/L) | CBOD ₅ (mg/L) | COD (mg/L) | TN (mg/L N) ¹ | TKN (mg/L N) | Organic N (mg/L N) ² | NH ₃ -N (mg/L N) | NO ₃ -N (mg/L N) | NO ₂ -N (mg/L N) | NO _x (mg/L N) | TIN (mg/L N) ³ | TP (mg/L) | Ortho P (mg/L P) | Chloride | Sulfate (mg/L) | Hydrogen Sulfide (mg/L) | Sulfide (mg/L) | Fecal (Ct/100 mL) | E-coli (Ct/100 mL) |
|--|-----------|-----------|------|------------------------------|-----------|----------|-------------------------|------------|------------|--------------------------|------------|--------------------------|--------------|---------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------|---------------------------|-----------|------------------|----------|----------------|-------------------------|----------------|-------------------|--------------------|
| STE | n | 18 | 18 | 18 | 18 | 13 | 16 | 14 | 11 | 14 | 13 | 18 | 18 | 18 | 18 | 16 | 15 | 18 | 18 | 14 | 13 | 15 | 15 | 13 | 13 | 14 | 7 |
| | MEAN | 23.60 | 7.27 | 1090.17 | 0.30 | -288.82 | 414.38 | 24.64 | 21.27 | 78.29 | 178.46 | 59.99 | 59.83 | 10.78 | 49.06 | 0.09 | 0.08 | 0.16 | 49.22 | 5.59 | 4.10 | 54.20 | 20.75 | 3.28 | 7.91 | 62,180 | 28,671 |
| | STD. DEV. | 4.00 | | 135.66 | 0.44 | 32.22 | 39.66 | 13.90 | 12.60 | 45.51 | 72.44 | 19.01 | 18.89 | 11.07 | 14.80 | 0.21 | 0.24 | 0.42 | 14.87 | 1.74 | 1.51 | 12.70 | 12.68 | 2.80 | 3.67 | | |
| | MIN | 18.27 | 6.88 | 868.00 | 0.00 | -341.70 | 330.00 | 12.00 | 9.00 | 42.00 | 120.00 | 30.05 | 30.00 | 0.00 | 27.00 | 0.01 | 0.01 | 0.02 | 27.05 | 3.50 | 2.20 | 39.00 | 0.82 | 0.01 | 1.00 | 20,000 | 10,000 |
| | MAX | 29.60 | 7.82 | 1322.00 | 1.20 | -244.30 | 490.00 | 61.00 | 55.00 | 210.00 | 400.00 | 110.06 | 110.00 | 45.00 | 85.00 | 0.82 | 0.94 | 1.80 | 85.06 | 9.00 | 7.50 | 87.00 | 40.00 | 8.90 | 12.00 | 420,000 | 240,000 |
| Stage 1 LY01 | n | 12 | 12 | 12 | 11 | 11 | 4 | 6 | 5 | 6 | 11 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 11 | 10 | 10 | 11 | 0 | 0 | 0 | 0 |
| | MEAN | 22.54 | 6.81 | 553.83 | 5.97 | 125.80 | 91.00 | 1.50 | 1.40 | 9.50 | 37.64 | 20.31 | 1.89 | 1.84 | 0.06 | 18.39 | 0.02 | 18.42 | 18.47 | 0.27 | 0.12 | 38.10 | 40.64 | | | | |
| | STD. DEV. | 4.71 | | 116.88 | 2.71 | 93.86 | 31.84 | 0.84 | 0.55 | 9.07 | 48.42 | 10.64 | 0.73 | 0.73 | 0.08 | 10.31 | 0.03 | 10.29 | 10.30 | 0.29 | 0.21 | 11.92 | 14.62 | | | | |
| | MIN | 15.00 | 6.33 | 330.00 | 0.54 | -75.00 | 55.00 | 1.00 | 1.00 | 2.00 | 10.00 | 2.50 | 0.99 | 0.93 | 0.01 | 1.30 | 0.01 | 1.30 | 1.38 | 0.05 | 0.01 | 15.00 | 21.00 | | | | |
| | MAX | 30.90 | 7.24 | 711.00 | 9.92 | 301.90 | 130.00 | 3.00 | 2.00 | 24.00 | 180.00 | 34.30 | 3.60 | 3.59 | 0.30 | 33.00 | 0.13 | 33.00 | 33.01 | 0.92 | 0.52 | 61.00 | 68.00 | | | | |
| Stage 1 LY02 | n | 13 | 13 | 13 | 13 | 13 | 5 | 9 | 8 | 9 | 12 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 12 | 11 | 11 | 12 | 0 | 0 | 1 | 1 |
| | MEAN | 22.59 | 6.55 | 756.62 | 4.48 | 113.04 | 134.80 | 2.00 | 1.63 | 6.00 | 24.25 | 30.45 | 2.34 | 2.16 | 0.17 | 27.99 | 0.08 | 28.12 | 28.29 | 2.10 | 1.56 | 42.27 | 45.00 | | | 1,000 | 2 |
| | STD. DEV. | 4.56 | | 90.31 | 2.84 | 79.46 | 45.88 | 1.50 | 1.41 | 6.87 | 11.92 | 12.04 | 1.27 | 1.41 | 0.43 | 11.69 | 0.15 | 11.76 | 11.82 | 0.97 | 0.95 | 7.70 | 14.27 | | | | |
| | MIN | 14.60 | 6.18 | 559.00 | 0.73 | -25.30 | 74.00 | 1.00 | 1.00 | 2.00 | 10.00 | 9.90 | 1.00 | 0.10 | 0.01 | 7.10 | 0.01 | 7.10 | 7.12 | 0.18 | 0.01 | 23.00 | 26.00 | | | 1,000 | 2 |
| | MAX | 30.20 | 6.99 | 871.00 | 10.23 | 279.20 | 180.00 | 5.00 | 5.00 | 23.00 | 49.00 | 51.56 | 4.90 | 4.89 | 1.60 | 47.00 | 0.47 | 47.06 | 47.10 | 3.20 | 2.80 | 52.00 | 77.00 | | | 1,000 | 2 |
| Stage 1&2a Lignoecullosic Effluent (Liner) | n | 13 | 13 | 13 | 13 | 13 | 11 | 12 | 11 | 12 | 12 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 12 | 11 | 11 | 11 | 5 | 5 | 12 | 11 |
| | MEAN | 22.91 | 6.72 | 730.54 | 2.66 | -1.43 | 269.09 | 16.25 | 8.55 | 3.83 | 26.58 | 7.85 | 2.07 | 1.90 | 0.18 | 5.76 | 0.02 | 5.78 | 5.96 | 0.49 | 0.03 | 35.09 | 31.02 | 0.42 | 0.66 | 32 | 3 |
| | STD. DEV. | 4.44 | | 101.04 | 2.43 | 93.98 | 42.06 | 34.47 | 12.34 | 3.66 | 13.53 | 4.72 | 0.82 | 0.68 | 0.21 | 4.36 | 0.02 | 4.36 | 4.44 | 0.83 | 0.06 | 7.78 | 18.15 | 0.42 | 0.60 | | |
| | MIN | 18.10 | 6.39 | 552.00 | 0.31 | -199.70 | 210.00 | 1.00 | 1.00 | 2.00 | 10.00 | 0.99 | 0.93 | 0.89 | 0.04 | 0.01 | 0.01 | 0.02 | 0.07 | 0.01 | 0.01 | 15.00 | 5.50 | 0.01 | 0.10 | 1 | 2 |
| | MAX | 31.80 | 7.15 | 925.00 | 9.09 | 124.50 | 360.00 | 125.00 | 45.00 | 14.00 | 60.00 | 16.01 | 4.20 | 3.54 | 0.66 | 14.00 | 0.08 | 14.01 | 14.07 | 2.90 | 0.22 | 43.00 | 69.00 | 1.10 | 1.60 | 6,800 | 310 |
| Stage 2b Sulfur Effluent (ST2) | n | 13 | 13 | 13 | 13 | 13 | 11 | 12 | 11 | 12 | 12 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 12 | 11 | 12 | 13 | 13 | 13 | 12 | 11 |
| | MEAN | 22.40 | 6.79 | 860.15 | 0.25 | -215.02 | 274.55 | 4.33 | 3.36 | 14.33 | 35.25 | 1.91 | 1.30 | 0.97 | 0.33 | 0.35 | 0.26 | 0.61 | 0.93 | 0.21 | 0.07 | 36.00 | 113.85 | 2.51 | 4.96 | 5 | 3 |
| | STD. DEV. | 4.05 | | 100.48 | 0.26 | 82.66 | 27.34 | 3.23 | 2.06 | 21.63 | 13.01 | 1.72 | 0.36 | 0.33 | 0.22 | 0.89 | 0.64 | 1.52 | 1.48 | 0.24 | 0.16 | 7.77 | 56.50 | 3.40 | 5.23 | | |
| | MIN | 18.49 | 6.39 | 653.00 | 0.01 | -299.90 | 240.00 | 1.00 | 1.00 | 2.00 | 10.00 | 0.84 | 0.82 | 0.44 | 0.02 | 0.01 | 0.01 | 0.02 | 0.04 | 0.01 | 0.01 | 15.00 | 27.00 | 0.01 | 0.10 | 1 | 2 |
| | MAX | 29.70 | 7.15 | 1067.00 | 0.91 | 38.20 | 310.00 | 12.00 | 6.00 | 81.00 | 50.00 | 7.10 | 1.80 | 1.58 | 0.87 | 3.20 | 2.10 | 5.30 | 5.52 | 0.62 | 0.51 | 45.00 | 250.00 | 12.00 | 16.00 | 300 | 10 |
| Treated Effluent LY03 | n | 9 | 9 | 9 | 9 | 9 | 4 | 6 | 5 | 6 | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 8 | 7 | 8 | 9 | 4 | 5 | 1 | 1 |
| | MEAN | 24.05 | 6.47 | 723.19 | 5.14 | 146.46 | 182.40 | 2.17 | 2.40 | 21.00 | 40.75 | 13.64 | 2.27 | 2.17 | 0.10 | 11.37 | 0.01 | 11.37 | 11.47 | 0.18 | 0.06 | 26.50 | 96.56 | 0.24 | 0.28 | 1 | 2 |
| | STD. DEV. | 3.06 | | 257.32 | 1.90 | 46.10 | 116.06 | 1.47 | 1.52 | 43.67 | 45.91 | 5.23 | 0.63 | 0.71 | 0.14 | 4.80 | 0.01 | 4.80 | 4.77 | 0.07 | 0.06 | 9.24 | 34.27 | 0.29 | 0.27 | | |
| | MIN | 18.30 | 6.27 | 75.70 | 2.05 | 103.30 | 9.60 | 1.00 | 1.00 | 2.00 | 10.00 | 7.21 | 1.60 | 1.18 | 0.01 | 5.60 | 0.01 | 5.61 | 6.03 | 0.09 | 0.01 | 13.00 | 50.00 | 0.01 | 0.10 | 1 | 2 |
| | MAX | 29.00 | 6.64 | 934.00 | 9.09 | 248.70 | 250.00 | 4.00 | 4.00 | 110.00 | 150.00 | 21.60 | 3.60 | 3.57 | 0.42 | 18.00 | 0.05 | 18.00 | 18.04 | 0.33 | 0.13 | 38.00 | 160.00 | 0.60 | 0.71 | 1 | 2 |
| Treated Effluent LY04 | n | 9 | 9 | 9 | 9 | 9 | 6 | 6 | 5 | 7 | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 8 | 7 | 8 | 9 | 3 | 4 | 1 | 1 |
| | MEAN | 24.12 | 6.49 | 767.89 | 4.69 | 128.40 | 220.00 | 1.17 | 1.20 | 3.43 | 25.88 | 6.64 | 1.59 | 1.55 | 0.04 | 5.04 | 0.01 | 5.05 | 5.09 | 0.13 | 0.02 | 25.51 | 95.78 | 0.28 | 0.30 | 1 | 2 |
| | STD. DEV. | 3.93 | | 68.47 | 2.52 | 58.10 | 38.99 | 0.41 | 0.45 | 2.70 | 13.87 | 5.89 | 1.03 | 1.01 | 0.04 | 4.89 | 0.00 | 4.89 | 4.91 | 0.11 | 0.02 | 13.49 | 37.48 | 0.24 | 0.25 | | |
| | MIN | 15.40 | 6.21 | 619.00 | 1.41 | 66.20 | 160.00 | 1.00 | 1.00 | 2.00 | 12.00 | 1.79 | 0.80 | 0.79 | 0.01 | 0.99 | 0.01 | 0.99 | 1.00 | 0.01 | 0.01 | 0.05 | 40.00 | 0.01 | 0.10 | 1 | 2 |
| | MAX | 29.40 | 6.80 | 821.00 | 9.98 | 265.50 | 270.00 | 2.00 | 2.00 | 9.00 | 56.00 | 21.00 | 4.00 | 3.91 | 0.10 | 17.00 | 0.01 | 17.00 | 17.09 | 0.33 | 0.06 | 42.00 | 160.00 | 0.48 | 0.60 | 1 | 2 |
| Groundwater PZ07 | n | 7 | 7 | 7 | 7 | 7 | 4 | 5 | 4 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 5 | 6 | 6 | 5 | 5 | 4 | 4 |
| | MEAN | 25.01 | 6.39 | 713.00 | 3.99 | 37.89 | 225.00 | 5.40 | 4.25 | 2.83 | 29.50 | 6.10 | 1.83 | 1.67 | 0.16 | 4.24 | 0.03 | 4.27 | 4.43 | 0.21 | 0.08 | 22.00 | 75.50 | 0.23 | 0.30 | 1 | 2 |
| | STD. DEV. | 5.40 | | 120.08 | 2.06 | 145.50 | 60.28 | 4.72 | 2.75 | 1.33 | 10.99 | 4.08 | 1.09 | 0.87 | 0.26 | 3.24 | 0.05 | 3.21 | 3.32 | 0.12 | 0.07 | 9.06 | 30.12 | 0.15 | 0.14 | | |
| | MIN | 18.33 | 6.18 | 516.00 | 0.59 | -248.70 | 160.00 | 1.00 | 1.00 | 2.00 | 10.00 | 2.36 | 0.84 | 0.83 | 0.01 | 1.40 | 0.01 | 1.41 | 1.42 | 0.04 | 0.01 | 15.00 | 35.00 | 0.01 | 0.10 | 1 | 2 |
| | MAX | 34.70 | 6.74 | 833.00 | 6.61 | 189.60 | 290.00 | 11.00 | 7.00 | 5.00 | 43.00 | 12.30 | 4.00 | 3.26 | 0.74 | 10.00 | 0.15 | 10.00 | 10.08 | 0.37 | 0.17 | 40.00 | 120.00 | 0.35 | 0.41 | 1 | 2 |

Table 7 (con't)
Summary of Water Quality Analytical Results

| Sample ID | Statistic | Temp (°C) | pH | Specific Conductance (uS/cm) | DO (mg/L) | ORP (mV) | Total Alkalinity (mg/L) | TSS (mg/L) | VSS (mg/L) | CBOD ₅ (mg/L) | COD (mg/L) | TN (mg/L N) ¹ | TKN (mg/L N) | Organic N (mg/L N) ² | NH ₃ -N (mg/L N) | NO ₃ -N (mg/L N) | NO ₂ -N (mg/L N) | NO _x (mg/L N) | TIN (mg/L N) ³ | TP (mg/L) | Ortho P (mg/L P) | Chloride | Sulfate (mg/L) | Hydrogen Sulfide (mg/L) | Sulfide (mg/L) | Fecal (Ct/100 mL) | E-coli (Ct/100 mL) |
|---------------------|-----------|-----------|------|------------------------------|-----------|----------|-------------------------|------------|------------|--------------------------|------------|--------------------------|--------------|---------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------|---------------------------|-----------|------------------|----------|----------------|-------------------------|----------------|-------------------|--------------------|
| Groundwater PZ08 | n | 7 | 7 | 7 | 7 | 7 | 4 | 5 | 4 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 5 | 6 | 6 | 6 | 6 | 5 | 5 |
| | MEAN | 23.65 | 6.26 | 655.86 | 3.57 | 73.56 | 167.50 | 30.00 | 7.25 | 4.33 | 31.67 | 7.34 | 1.47 | 1.24 | 0.23 | 5.86 | 0.01 | 5.87 | 6.10 | 0.44 | 0.23 | 21.12 | 81.67 | 0.09 | 0.17 | 2 | 2 |
| | STD. DEV. | 4.12 | | 157.71 | 1.36 | 64.30 | 26.30 | 35.80 | 5.74 | 3.83 | 14.50 | 7.04 | 0.74 | 0.92 | 0.56 | 6.39 | 0.01 | 6.39 | 6.41 | 0.12 | 0.18 | 10.89 | 43.79 | 0.13 | 0.12 | | |
| | MIN | 18.54 | 5.67 | 492.00 | 2.12 | -21.90 | 130.00 | 4.00 | 2.00 | 2.00 | 10.00 | 1.65 | 0.83 | 0.00 | 0.01 | 0.81 | 0.01 | 0.82 | 0.83 | 0.29 | 0.05 | 7.70 | 35.00 | 0.01 | 0.10 | 1 | 2 |
| Groundwater PZ09 | MAX | 29.70 | 6.56 | 962.00 | 5.67 | 186.00 | 190.00 | 91.00 | 14.00 | 11.00 | 50.00 | 21.50 | 2.50 | 2.48 | 1.50 | 19.00 | 0.04 | 19.00 | 19.02 | 0.59 | 0.48 | 40.00 | 140.00 | 0.32 | 0.41 | 10 | 2 |
| | n | 6 | 6 | 6 | 6 | 6 | 3 | 4 | 3 | 4 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 4 | 5 | 5 | 5 | 5 | 4 | 4 |
| | MEAN | 24.88 | 5.83 | 462.17 | 4.08 | 137.18 | 116.67 | 60.25 | 13.33 | 2.00 | 97.00 | 10.88 | 2.05 | 2.02 | 0.03 | 8.82 | 0.01 | 8.83 | 8.86 | 2.04 | 1.72 | 17.56 | 49.50 | 0.66 | 0.76 | 1 | 2 |
| | STD. DEV. | 3.92 | | 153.60 | 1.95 | 98.85 | 5.77 | 67.36 | 9.71 | 0.00 | 113.83 | 5.67 | 0.71 | 0.69 | 0.03 | 5.08 | 0.00 | 5.07 | 5.10 | 1.42 | 1.31 | 15.03 | 44.93 | 0.34 | 0.38 | | |
| Groundwater PZ09 | MIN | 18.80 | 5.09 | 268.00 | 0.62 | 38.30 | 110.00 | 6.00 | 5.00 | 2.00 | 35.00 | 1.86 | 1.00 | 0.99 | 0.01 | 0.84 | 0.01 | 0.86 | 0.87 | 1.00 | 0.73 | 3.60 | 4.50 | 0.37 | 0.41 | 1 | 2 |
| | MAX | 28.90 | 6.41 | 629.00 | 6.08 | 256.40 | 120.00 | 150.00 | 24.00 | 2.00 | 300.00 | 17.10 | 3.10 | 3.03 | 0.07 | 14.00 | 0.02 | 14.00 | 14.07 | 4.50 | 3.50 | 41.00 | 110.00 | 1.20 | 1.40 | 1 | 2 |
| Groundwater PZA7-6 | n | 12 | 12 | 12 | 12 | 8 | 9 | 0 | 0 | 0 | 3 | 12 | 12 | 12 | 12 | 9 | 8 | 12 | 12 | 2 | 1 | 10 | 9 | 0 | 0 | 1 | 1 |
| | MEAN | 23.23 | 6.09 | 516.25 | 2.22 | 43.09 | 114.67 | | | | 186.67 | 4.07 | 1.77 | 1.62 | 0.15 | 0.41 | 0.02 | 2.30 | 2.45 | 0.62 | 1.00 | 22.17 | 58.24 | | | 1 | 2 |
| | STD. DEV. | 3.23 | | 178.44 | 1.87 | 99.17 | 49.59 | | | | 15.28 | 5.80 | 1.07 | 1.03 | 0.11 | 0.57 | 0.02 | 5.03 | 5.07 | 0.51 | | 10.05 | 40.90 | | | | |
| | MIN | 18.50 | 5.80 | 242.00 | 0.09 | -51.40 | 58.00 | | | | 170.00 | 0.58 | 0.56 | 0.44 | 0.01 | 0.01 | 0.01 | 0.02 | 0.04 | 0.26 | 1.00 | 5.70 | 0.20 | | | 1 | 2 |
| Groundwater PZA7-6 | MAX | 28.00 | 6.45 | 702.00 | 5.50 | 249.90 | 190.00 | | | | 200.00 | 20.60 | 3.60 | 3.30 | 0.35 | 1.70 | 0.06 | 17.00 | 17.30 | 0.98 | 1.00 | 42.00 | 120.00 | | | 1 | 2 |
| Groundwater PZA7-8 | n | 13 | 13 | 13 | 13 | 8 | 10 | 0 | 0 | 0 | 4 | 13 | 13 | 13 | 13 | 11 | 11 | 13 | 13 | 2 | 2 | 11 | 10 | 0 | 0 | 1 | 1 |
| | MEAN | 23.49 | 6.02 | 548.69 | 0.81 | -14.08 | 108.30 | | | | 90.50 | 12.42 | 3.05 | 2.27 | 0.78 | 6.07 | 0.03 | 9.38 | 10.16 | 5.00 | 3.00 | 22.45 | 46.90 | | | 1 | 2 |
| | STD. DEV. | 2.28 | | 149.25 | 0.81 | 97.12 | 102.79 | | | | 57.88 | 12.16 | 1.48 | 1.24 | 1.19 | 8.25 | 0.04 | 11.85 | 11.97 | 0.42 | 1.41 | 11.53 | 21.05 | | | | |
| | MIN | 20.00 | 5.60 | 186.00 | 0.11 | -200.20 | 2.00 | | | | 36.00 | 1.24 | 0.89 | 0.58 | 0.01 | 0.02 | 0.01 | 0.03 | 0.47 | 4.70 | 2.00 | 3.90 | 14.00 | | | 1 | 2 |
| Groundwater PZA7-8 | MAX | 26.90 | 6.38 | 784.00 | 2.91 | 115.30 | 270.00 | | | | 150.00 | 39.20 | 5.80 | 4.87 | 4.10 | 23.00 | 0.12 | 37.00 | 37.01 | 5.30 | 4.00 | 40.00 | 84.00 | | | 1 | 2 |
| Groundwater PZB8-5 | n | 13 | 13 | 13 | 13 | 8 | 10 | 0 | 0 | 0 | 5 | 13 | 13 | 13 | 13 | 12 | 11 | 13 | 13 | 2 | 3 | 11 | 12 | 0 | 0 | 1 | 1 |
| | MEAN | 23.52 | 5.85 | 468.00 | 0.97 | 61.89 | 81.10 | | | | 86.20 | 11.20 | 2.62 | 2.48 | 0.15 | 5.87 | 0.05 | 8.58 | 8.73 | 0.75 | 0.70 | 23.27 | 43.67 | | | 1 | 2 |
| | STD. DEV. | 2.84 | | 80.98 | 0.94 | 86.19 | 46.30 | | | | 51.74 | 13.67 | 1.09 | 1.18 | 0.16 | 9.16 | 0.06 | 12.84 | 12.77 | 0.92 | 0.26 | 6.50 | 22.01 | | | | |
| | MIN | 19.70 | 5.50 | 296.00 | 0.10 | -41.10 | 21.00 | | | | 0.00 | 1.02 | 1.00 | 0.72 | 0.03 | 0.01 | 0.01 | 0.02 | 0.10 | 0.10 | 0.49 | 13.00 | 0.00 | | | 1 | 2 |
| Groundwater PZB8-5 | MAX | 29.00 | 6.19 | 586.00 | 3.51 | 213.30 | 180.00 | | | | 130.00 | 39.70 | 4.70 | 4.67 | 0.64 | 28.00 | 0.18 | 35.00 | 35.03 | 1.40 | 0.99 | 34.00 | 76.00 | | | 1 | 2 |
| Groundwater PZB8-7 | n | 12 | 12 | 12 | 11 | 7 | 9 | 0 | 0 | 0 | 4 | 12 | 12 | 12 | 12 | 8 | 8 | 12 | 12 | 2 | 0 | 10 | 7 | 0 | 0 | 1 | 1 |
| | MEAN | 23.76 | 5.88 | 349.92 | 1.03 | 104.07 | 51.89 | | | | 55.25 | 5.79 | 1.60 | 1.46 | 0.15 | 2.34 | 0.06 | 4.19 | 4.34 | 0.50 | | 28.99 | 16.14 | | | 1 | 2 |
| | STD. DEV. | 2.24 | | 87.33 | 1.75 | 68.30 | 25.17 | | | | 23.82 | 6.38 | 0.57 | 0.60 | 0.21 | 5.54 | 0.10 | 5.92 | 5.93 | 0.38 | | 11.60 | 10.68 | | | | |
| | MIN | 20.84 | 5.46 | 249.00 | 0.10 | 32.10 | 2.00 | | | | 36.00 | 0.77 | 0.75 | 0.60 | 0.01 | 0.01 | 0.01 | 0.02 | 0.10 | 0.23 | | 6.90 | 4.00 | | | 1 | 2 |
| Groundwater PZC10-6 | MAX | 27.80 | 6.14 | 518.00 | 6.19 | 207.00 | 93.00 | | | | 90.00 | 18.00 | 2.50 | 2.36 | 0.73 | 16.00 | 0.30 | 16.00 | 16.02 | 0.77 | | 44.00 | 30.00 | | | 1 | 2 |
| Groundwater PZC10-6 | n | 13 | 13 | 13 | 13 | 8 | 10 | 0 | 0 | 0 | 4 | 13 | 13 | 13 | 13 | 10 | 9 | 13 | 13 | 2 | 1 | 11 | 9 | 0 | 0 | 1 | 1 |
| | MEAN | 24.15 | 5.92 | 364.90 | 1.18 | 26.61 | 119.20 | | | | 97.75 | 5.40 | 3.48 | 2.86 | 0.62 | 1.19 | 0.02 | 1.92 | 2.54 | 0.10 | 0.01 | 15.83 | 13.93 | | | 1 | 2 |
| | STD. DEV. | 2.85 | | 147.63 | 1.19 | 100.70 | 97.54 | | | | 17.75 | 2.45 | 0.73 | 0.76 | 0.47 | 1.10 | 0.04 | 2.52 | 2.54 | 0.02 | | 8.83 | 6.81 | | | | |
| | MIN | 19.19 | 5.10 | 200.70 | 0.10 | -70.70 | 15.00 | | | | 77.00 | 2.98 | 2.70 | 1.50 | 0.08 | 0.01 | 0.01 | 0.02 | 0.21 | 0.08 | 0.01 | 5.80 | 4.00 | | | 1 | 2 |
| Groundwater PZC10-6 | MAX | 29.00 | 6.30 | 689.00 | 3.78 | 230.00 | 270.00 | | | | 120.00 | 11.90 | 5.00 | 4.75 | 1.40 | 2.80 | 0.12 | 9.20 | 9.51 | 0.11 | 0.01 | 32.00 | 23.00 | | | 1 | 2 |

Notes:

¹Total Nitrogen (TN) is a calculated value equal to the sum of TKN and NO_x.

²Organic Nitrogen (ON) is a calculated value equal to the difference of TKN and NH₃.

³Total Inorganic Nitrogen (TIN) is a calculated value equal to the sum of NH₃ and 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.

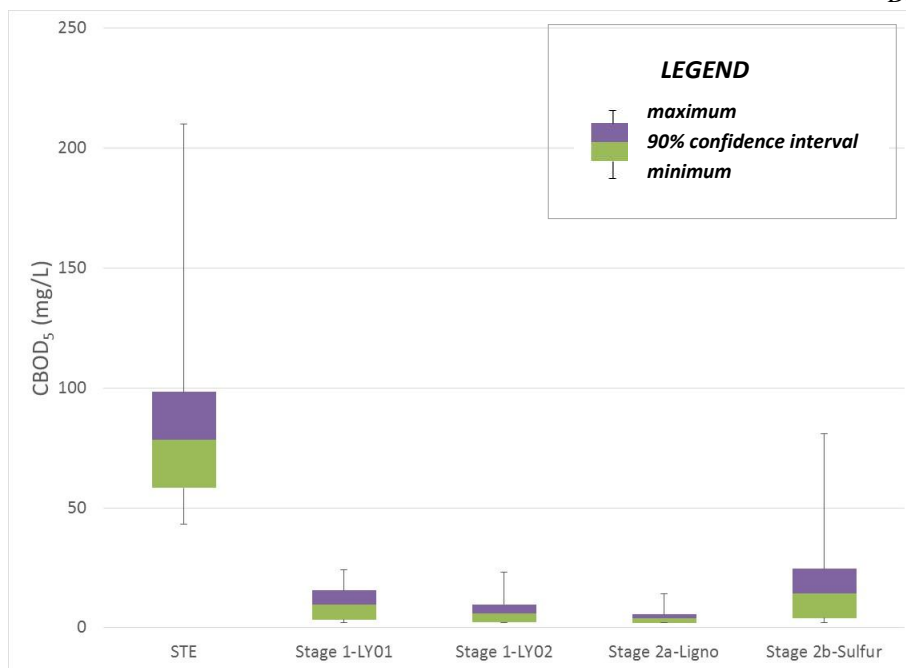


Figure 17
CBOD₅ Box and Whisker Plot

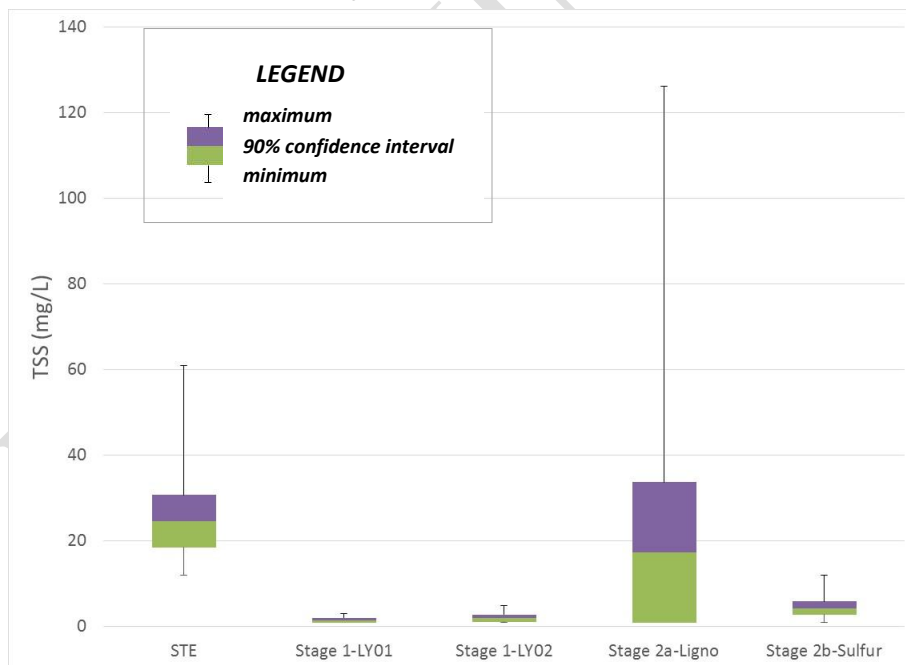


Figure 18
TSS Box and Whisker Plot

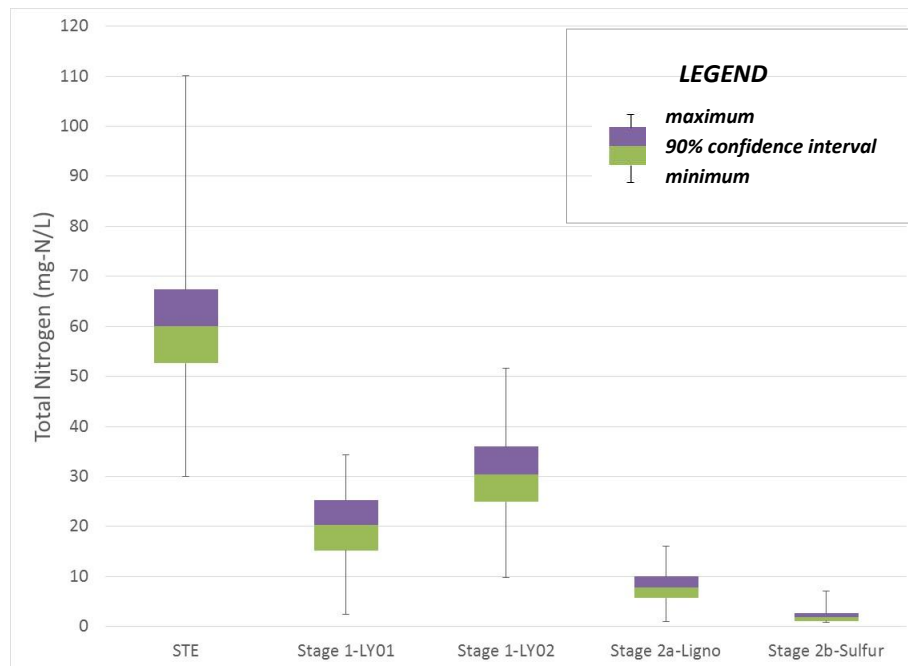


Figure 19
Total Nitrogen (TN) Box and Whisker Plot

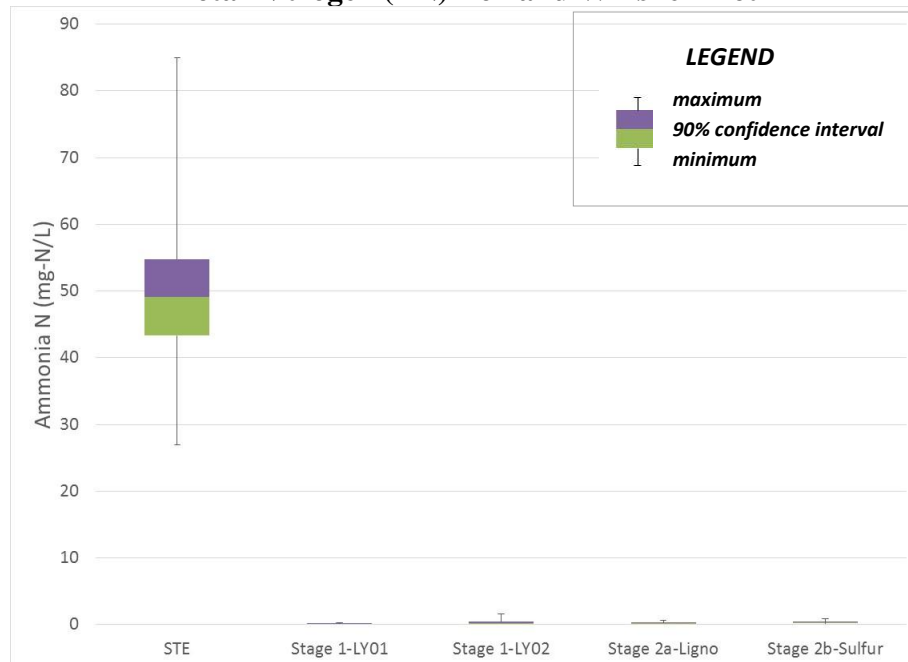


Figure 20
Ammonia N (NH₃-N) Box and Whisker Plot

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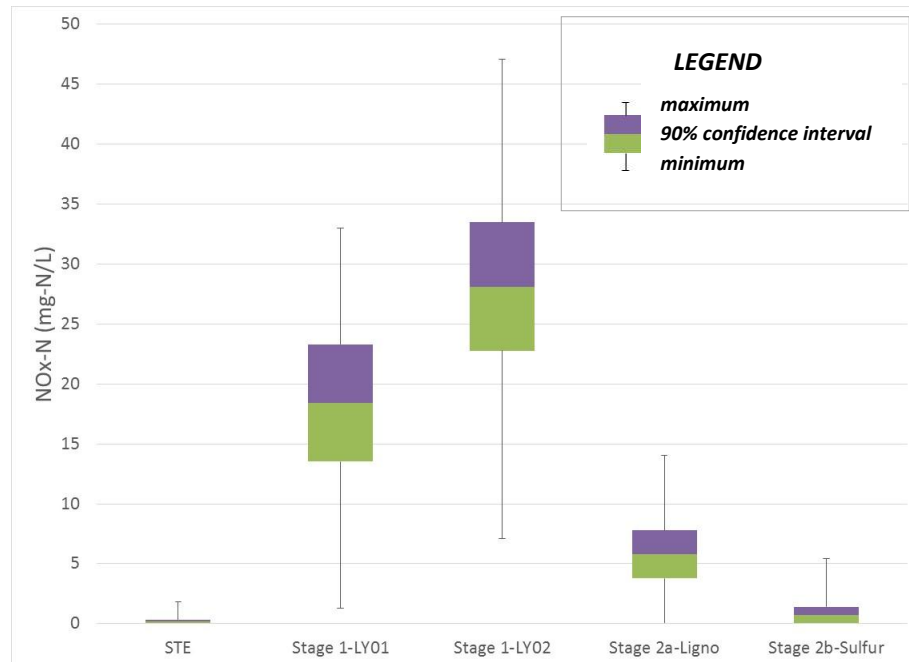


Figure 21
Nitrate+Nitrite Nitrogen (NO_x-N) Box and Whisker Plot

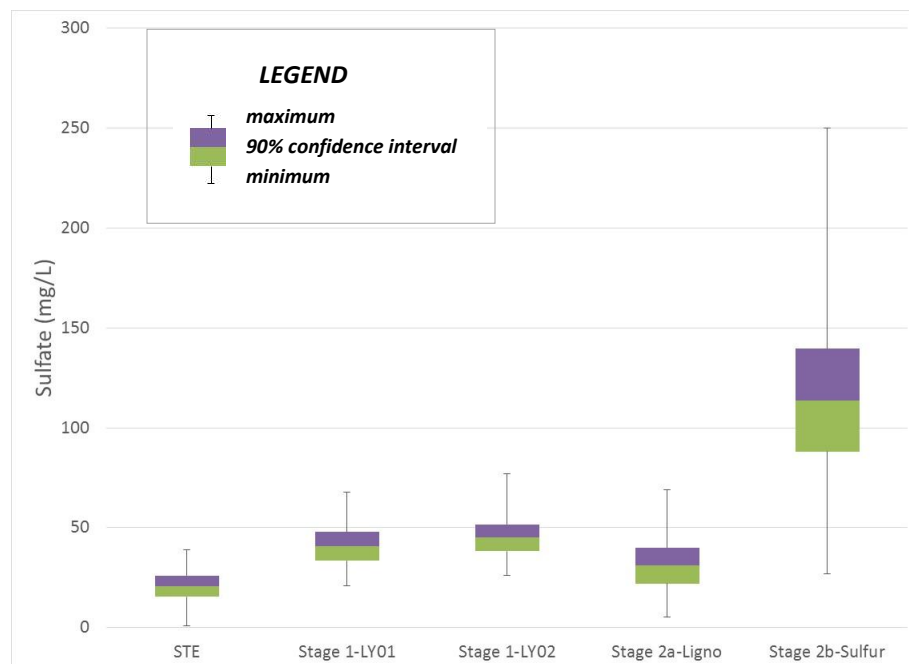


Figure 22
Sulfate (SO₄) Box and Whisker Plot

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5.0 B-HS3 Sample Event No. 8: Summary and Recommendations

5.1 Summary

The results of the eighth sampling event indicate that the system is operating well and no adjustments are recommended at this time. The Sample Event No. 8 results indicate that:

- Septic tank effluent (STE) quality is characteristic of typical household STE quality. The total nitrogen concentration of 52 mg/L is within the range of values typically reported for Florida single family residence STE. However, the CBOD₅ concentration of 57 mg/L is in the low end of the typical range of values.
- The combined Stage 1&2a lined drip system with lignocellulosic media was effective in converting ammonium to oxidized nitrogen; effluent contained 4.2 mg/L TKN, of which 0.66 mg/L was ammonia. The Stage 2a layer of lignocellulosic media produced a reducing environment and effluent NO_x-N was 11 mg/L.
- The Stage 2b sulfur media biofilter effluent NO_x-N was 0.03 mg/L.
- The total nitrogen concentration in the final effluent from the total treatment system was approximately 1.5 mg/L, an approximately 97% reduction from STE.

5.2 Conclusions

Sample Event 8 was the last funded sample event for the B-HS3 treatment system. Section 4.4 summarized the water quality data collected over the 1.4 year monitoring period for this system. These results indicate that:

- The septic tank effluent average total nitrogen concentration of 60 mg/L is in the range of values typically reported for Florida single family residence STE.
- The combined Stage 1&2a lined drip system with lignocellulosic media provided significant ammonia removal with an average NH₃-N concentration of 0.2 mg/L and average TKN of 2.1 mg/L. The average Stage 1&2a biofilter effluent NO_x-N was 5.8 mg/L. These results indicate significant NO_x-N removal (approximately 87% total nitrogen reduction) was occurring.
- The Stage 2b biofilter with sulfur media was effective in producing a reducing environment and achieving significant NO_x-N removal (average NO_x-N concentration of 0.61 mg/L). The average final total nitrogen (TN) in the treatment sys-

tem effluent was 1.9 mg/L, primarily TKN (average TKN concentration of 1.3 mg/L). This represents a 96 percent average reduction in total nitrogen from STE for this PNRS system over the study period.

- Additional monitoring of the downgradient groundwater monitoring points installed as part of the C-HS2 groundwater monitoring network showed a significant decrease in total nitrogen concentration in the groundwater plume downgradient of the PNRS system following PNRS system installation.

Further analysis of the results obtained at this site will occur as Task B results are compiled and summarized. The results of the data collected to date have provided insights into the performance of a full-scale passive single pass nitrogen reduction system monitored over an extended timeframe (523 experimental days) under actual onsite conditions.



Appendix A: Laboratory Report

PRELIMINARY

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

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

December 31, 2014
Work Order: 1412942

Laboratory Report

| Project Name | | BHS3 SE#12 | | | | | | |
|------------------------------|------------|----------------|-----------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS3-STE | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-01 | | | | | | |
| Date/Time Collected | | 12/17/14 09:26 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Hydrogen Sulfide (Unionized) | mg/L | 0.50 | SM 4550SF | 0.04 | 0.01 | 12/24/14 10:01 | 12/24/14 10:06 | 1 |
| Ammonia as N | mg/L | 43 | EPA 350.1 | 4.0 | 0.95 | | 12/18/14 18:15 | 100 |
| Carbonaceous BOD | mg/L | 57 | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Chemical Oxygen Demand | mg/L | 140 | EPA 410.4 | 25 | 10 | 12/22/14 10:37 | 12/22/14 12:39 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.40 | EPA 353.2 | 0.04 | 0.01 | | 12/30/14 15:33 | 1 |
| Nitrite (as N) | mg/L | 0.06 | SM 4500NO2-B | 0.04 | 0.01 | | 12/30/14 11:46 | 1 |
| Phosphorous - Total as P | mg/L | 4.6 | SM 4500P-E | 0.80 | 0.20 | 12/18/14 15:47 | 12/22/14 13:43 | 20 |
| Sulfate | mg/L | 22 | EPA 300.0 | 0.60 | 0.20 | | 12/23/14 18:58 | 1 |
| Sulfide | mg/L | 1.4 | SM 4500SF | 0.40 | 0.10 | | 12/23/14 13:56 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 52 | EPA 351.2 | 4.0 | 1.0 | 12/18/14 15:47 | 12/22/14 13:43 | 20 |
| Total Organic Carbon | mg/L | 33 | SM 5310B | 10 | 0.60 | | 12/19/14 14:08 | 10 |
| Total Suspended Solids | mg/L | 18 | SM 2540D | 1 | 1 | 12/18/14 08:28 | 12/19/14 16:06 | 1 |
| Nitrate (as N) | mg/L | 0.34 | EPA 353.2 | 0.08 | 0.02 | | 12/30/14 15:33 | 1 |
| <u>Microbiology</u> | | | | | | | | |
| E. Coli | MPN/100 mL | 61,000 | SM 9223B | 2.0 | 2.0 | 12/17/14 14:42 | 12/18/14 09:47 | 1 |
| Fecal Coliforms | CFU/100 ml | 68,000 | SM 9222D | 1 | 1 | 12/17/14 14:41 | 12/18/14 14:03 | 1 |
| Sample Description | | BHS3-LY01 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-02 | | | | | | |
| Date/Time Collected | | 12/17/14 09:05 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Ammonia as N | mg/L | 0.009 U | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 16:37 | 1 |
| Carbonaceous BOD | mg/L | 24 | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Chemical Oxygen Demand | mg/L | 16 I | EPA 410.4 | 25 | 10 | 12/22/14 10:37 | 12/22/14 12:39 | 1 |
| Nitrate+Nitrite (N) | mg/L | 30 | EPA 353.2 | 0.96 | 0.24 | | 12/18/14 16:55 | 24 |
| Nitrite (as N) | mg/L | 0.01 U | SM 4500NO2-B | 0.04 | 0.01 | | 12/17/14 16:05 | 1 |
| Phosphorous - Total as P | mg/L | 0.92 | SM 4500P-E | 0.20 | 0.050 | 12/18/14 15:47 | 12/22/14 13:43 | 5 |
| Sulfate | mg/L | 68 | EPA 300.0 | 0.60 | 0.20 | | 12/23/14 19:09 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 3.6 | EPA 351.2 | 1.0 | 0.25 | 12/18/14 15:47 | 12/22/14 13:43 | 5 |
| Total Organic Carbon | mg/L | 15 | SM 5310B | 1.0 | 0.060 | | 12/19/14 14:08 | 1 |
| Total Suspended Solids | mg/L | 171 | SM 2540D | 1 | 1 | 12/18/14 08:28 | 12/19/14 16:06 | 1 |
| Nitrate (as N) | mg/L | 30 | EPA 353.2 | 1.0 | 0.25 | | 12/18/14 16:55 | 24 |

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December 31, 2014
Work Order: 1412942

Laboratory Report

| Project Name | | BHS3 SE#12 | | | | | | |
|----------------------------|------------|----------------|-----------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS3-LY02 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-03 | | | | | | |
| Date/Time Collected | | 12/17/14 09:20 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Ammonia as N | mg/L | 0.009 U | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 16:39 | 1 |
| Carbonaceous BOD | mg/L | 4 | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Chemical Oxygen Demand | mg/L | 31 | EPA 410.4 | 25 | 10 | 12/22/14 10:37 | 12/22/14 12:39 | 1 |
| Nitrate+Nitrite (N) | mg/L | 40 | EPA 353.2 | 0.96 | 0.24 | | 12/18/14 16:56 | 24 |
| Nitrite (as N) | mg/L | 0.02 I | SM 4500NO2-B | 0.04 | 0.01 | | 12/17/14 16:06 | 1 |
| Phosphorous - Total as P | mg/L | 2.7 | SM 4500P-E | 0.20 | 0.050 | 12/18/14 15:47 | 12/22/14 13:43 | 5 |
| Sulfate | mg/L | 77 | EPA 300.0 | 0.60 | 0.20 | | 12/23/14 19:20 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 4.9 | EPA 351.2 | 1.0 | 0.25 | 12/18/14 15:47 | 12/22/14 13:43 | 5 |
| Total Suspended Solids | mg/L | 1 U | SM 2540D | 1 | 1 | 12/18/14 08:28 | 12/19/14 16:06 | 1 |
| Nitrate (as N) | mg/L | 40 | EPA 353.2 | 1.0 | 0.25 | | 12/18/14 16:56 | 24 |
| Sample Description | | BHS3-LINER | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-04 | | | | | | |
| Date/Time Collected | | 12/17/14 08:35 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Ammonia as N | mg/L | 0.66 | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 16:41 | 1 |
| Carbonaceous BOD | mg/L | 2 U | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Chemical Oxygen Demand | mg/L | 22 I | EPA 410.4 | 25 | 10 | 12/22/14 10:37 | 12/22/14 12:39 | 1 |
| Nitrate+Nitrite (N) | mg/L | 11 | EPA 353.2 | 0.96 | 0.24 | | 12/18/14 16:57 | 24 |
| Nitrite (as N) | mg/L | 0.04 | SM 4500NO2-B | 0.04 | 0.01 | | 12/17/14 16:06 | 1 |
| Phosphorous - Total as P | mg/L | 0.46 | SM 4500P-E | 0.20 | 0.050 | 12/18/14 15:47 | 12/22/14 13:43 | 5 |
| Sulfate | mg/L | 69 | EPA 300.0 | 0.60 | 0.20 | | 12/23/14 19:32 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 4.2 | EPA 351.2 | 1.0 | 0.25 | 12/18/14 15:47 | 12/22/14 13:43 | 5 |
| Total Organic Carbon | mg/L | 12 | SM 5310B | 1.0 | 0.060 | | 12/19/14 14:08 | 1 |
| Total Suspended Solids | mg/L | 2 | SM 2540D | 1 | 1 | 12/18/14 08:28 | 12/19/14 16:06 | 1 |
| Nitrate (as N) | mg/L | 11 | EPA 353.2 | 1.0 | 0.25 | | 12/18/14 16:57 | 24 |
| <u>Microbiology</u> | | | | | | | | |
| E. Coli | MPN/100 mL | 2.0 U | SM 9223B | 2.0 | 2.0 | 12/17/14 14:42 | 12/18/14 09:47 | 1 |
| Fecal Coliforms | CFU/100 ml | 3 | SM 9222D | 1 | 1 | 12/17/14 14:41 | 12/18/14 14:03 | 1 |

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Laboratory Report

| Project Name | | BHS3 SE#12 | | | | | | |
|------------------------------|------------|----------------|------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS3-SULFUR-6 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-05 | | | | | | |
| Date/Time Collected | | 12/17/14 09:06 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Ammonia as N | mg/L | 0.73 | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 16:43 | 1 |
| Carbonaceous BOD | mg/L | 38 | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.08 | EPA 353.2 | 0.04 | 0.01 | | 12/19/14 14:59 | 1 |
| Nitrite (as N) | mg/L | 0.02 I | SM | 0.04 | 0.01 | | 12/17/14 16:07 | 1 |
| | | | 4500NO2-B | | | | | |
| Sulfate | mg/L | 170 | EPA 300.0 | 6.0 | 2.0 | | 12/26/14 10:17 | 10 |
| Total Kjeldahl Nitrogen | mg/L | 2.5 | EPA 351.2 | 1.0 | 0.25 | 12/18/14 15:47 | 12/22/14 13:43 | 5 |
| Nitrate (as N) | mg/L | 0.06 I | EPA 353.2 | 0.08 | 0.02 | | 12/19/14 14:59 | 1 |
| | | | | | | | | |
| Sample Description | | BHS3-ST2 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-06 | | | | | | |
| Date/Time Collected | | 12/17/14 08:20 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Hydrogen Sulfide (Unionized) | mg/L | 0.57 | SM 4550SF | 0.04 | 0.01 | 12/24/14 10:01 | 12/24/14 10:06 | 1 |
| Ammonia as N | mg/L | 0.43 | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 16:44 | 1 |
| Carbonaceous BOD | mg/L | 15 | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Chemical Oxygen Demand | mg/L | 47 | EPA 410.4 | 25 | 10 | 12/22/14 10:37 | 12/22/14 12:39 | 1 |
| Chloride | mg/L | 39 | EPA 300.0 | 0.20 | 0.050 | | 12/23/14 19:54 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.01 I | EPA 353.2 | 0.04 | 0.01 | | 12/19/14 14:59 | 1 |
| Nitrite (as N) | mg/L | 0.01 I | SM | 0.04 | 0.01 | | 12/17/14 16:08 | 1 |
| | | | 4500NO2-B | | | | | |
| Phosphorous - Total as P | mg/L | 0.62 | SM 4500P-E | 0.040 | 0.010 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Sulfate | mg/L | 250 | EPA 300.0 | 6.0 | 2.0 | | 12/26/14 10:26 | 10 |
| Sulfide | mg/L | 0.82 | SM 4500SF | 0.40 | 0.10 | | 12/23/14 13:56 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 1.5 | EPA 351.2 | 0.20 | 0.05 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Total Organic Carbon | mg/L | 15 | SM 5310B | 1.0 | 0.060 | | 12/19/14 14:08 | 1 |
| Total Suspended Solids | mg/L | 1 U | SM 2540D | 1 | 1 | 12/18/14 08:28 | 12/19/14 16:06 | 1 |
| Nitrate (as N) | mg/L | 0.02 U | EPA 353.2 | 0.08 | 0.02 | | 12/19/14 14:59 | 1 |
| <u>Microbiology</u> | | | | | | | | |
| E. Coli | MPN/100 mL | 6.3 | SM 9223B | 2.0 | 2.0 | 12/17/14 14:42 | 12/18/14 09:47 | 1 |
| Fecal Coliforms | CFU/100 ml | 7 | SM 9222D | 1 | 1 | 12/17/14 14:41 | 12/18/14 14:03 | 1 |

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December 31, 2014
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Laboratory Report

| Project Name | | BHS3 SE#12 | | | | | | |
|------------------------------|------------|----------------|------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS3-ST2-DUP | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-07 | | | | | | |
| Date/Time Collected | | 12/17/14 08:40 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Hydrogen Sulfide (Unionized) | mg/L | 0.57 | SM 4550SF | 0.04 | 0.01 | 12/24/14 10:01 | 12/24/14 10:06 | 1 |
| Ammonia as N | mg/L | 0.58 | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 16:46 | 1 |
| Carbonaceous BOD | mg/L | 14 | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Chemical Oxygen Demand | mg/L | 56 | EPA 410.4 | 25 | 10 | 12/22/14 10:37 | 12/22/14 12:39 | 1 |
| Chloride | mg/L | 42 | EPA 300.0 | 0.20 | 0.050 | | 12/23/14 20:05 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.01 U | EPA 353.2 | 0.04 | 0.01 | | 12/19/14 15:00 | 1 |
| Nitrite (as N) | mg/L | 0.01 I | SM | 0.04 | 0.01 | | 12/17/14 16:09 | 1 |
| | | | 4500NO2-B | | | | | |
| Phosphorous - Total as P | mg/L | 0.66 | SM 4500P-E | 0.040 | 0.010 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Sulfate | mg/L | 240 | EPA 300.0 | 6.0 | 2.0 | | 12/23/14 20:05 | 10 |
| Sulfide | mg/L | 0.82 | SM 4500SF | 0.40 | 0.10 | | 12/23/14 13:56 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 1.5 | EPA 351.2 | 0.20 | 0.05 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Total Organic Carbon | mg/L | 12 | SM 5310B | 1.0 | 0.060 | | 12/19/14 14:08 | 1 |
| Total Suspended Solids | mg/L | 3 | SM 2540D | 1 | 1 | 12/18/14 08:28 | 12/19/14 16:06 | 1 |
| Nitrate (as N) | mg/L | 0.02 U | EPA 353.2 | 0.08 | 0.02 | | 12/19/14 15:00 | 1 |
| <u>Microbiology</u> | | | | | | | | |
| E. Coli | MPN/100 mL | 3.1 | SM 9223B | 2.0 | 2.0 | 12/17/14 14:42 | 12/18/14 09:47 | 1 |
| Fecal Coliforms | CFU/100 ml | 4 | SM 9222D | 1 | 1 | 12/17/14 14:41 | 12/18/14 14:03 | 1 |
| Sample Description | | BHS3-LY03 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-08 | | | | | | |
| Date/Time Collected | | 12/17/14 11:10 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Ammonia as N | mg/L | 0.42 | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 16:48 | 1 |
| Carbonaceous BOD | mg/L | 2 | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Chemical Oxygen Demand | mg/L | 16 I | EPA 410.4 | 25 | 10 | 12/22/14 10:37 | 12/22/14 12:39 | 1 |
| Chloride | mg/L | 25 | EPA 300.0 | 0.20 | 0.050 | | 12/23/14 20:16 | 1 |
| Nitrate+Nitrite (N) | mg/L | 5.6 | EPA 353.2 | 0.20 | 0.05 | | 12/19/14 15:01 | 5 |
| Nitrite (as N) | mg/L | 0.01 U | SM | 0.04 | 0.01 | | 12/17/14 16:10 | 1 |
| | | | 4500NO2-B | | | | | |
| Phosphorous - Total as P | mg/L | 0.33 | SM 4500P-E | 0.040 | 0.010 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Sulfate | mg/L | 160 | EPA 300.0 | 6.0 | 2.0 | | 12/23/14 20:16 | 10 |
| Sulfide | mg/L | 0.10 U | SM 4500SF | 0.40 | 0.10 | | 12/23/14 13:56 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 1.6 | EPA 351.2 | 0.20 | 0.05 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |

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Laboratory Report

| Project Name | | BHS3 SE#12 | | | | | | |
|------------------------------|-------|----------------|--------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS3-LY03 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-08 | | | | | | |
| Date/Time Collected | | 12/17/14 11:10 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| Total Suspended Solids | mg/L | 1 | SM 2540D | 1 | 1 | 12/18/14 08:28 | 12/19/14 16:06 | 1 |
| Nitrate (as N) | mg/L | 5.6 | EPA 353.2 | 0.24 | 0.06 | | 12/19/14 15:01 | 5 |
| Sample Description | | BHS3-LY09 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-09 | | | | | | |
| Date/Time Collected | | 12/17/14 09:30 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| Inorganics | | | | | | | | |
| Ammonia as N | mg/L | 0.009 U | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 16:56 | 1 |
| Carbonaceous BOD | mg/L | 2 U | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Chemical Oxygen Demand | mg/L | 12 I | EPA 410.4 | 25 | 10 | 12/22/14 10:37 | 12/22/14 12:39 | 1 |
| Chloride | mg/L | 27 | EPA 300.0 | 0.20 | 0.050 | | 12/23/14 21:01 | 1 |
| Nitrate+Nitrite (N) | mg/L | 2.0 | EPA 353.2 | 0.20 | 0.05 | | 12/19/14 15:02 | 5 |
| Nitrite (as N) | mg/L | 0.01 U | SM 4500NO2-B | 0.04 | 0.01 | | 12/17/14 16:14 | 1 |
| Phosphorous - Total as P | mg/L | 0.33 | SM 4500P-E | 0.040 | 0.010 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Sulfate | mg/L | 160 | EPA 300.0 | 6.0 | 2.0 | | 12/23/14 21:01 | 10 |
| Sulfide | mg/L | 0.10 U | SM 4500SF | 0.40 | 0.10 | | 12/23/14 13:56 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 0.91 | EPA 351.2 | 0.20 | 0.05 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Total Suspended Solids | mg/L | 1 | SM 2540D | 1 | 1 | 12/18/14 08:28 | 12/19/14 16:06 | 1 |
| Nitrate (as N) | mg/L | 2.0 | EPA 353.2 | 0.24 | 0.06 | | 12/19/14 15:02 | 5 |
| Sample Description | | BHS3-PZ-07 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-10 | | | | | | |
| Date/Time Collected | | 12/17/14 10:28 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| Inorganics | | | | | | | | |
| Hydrogen Sulfide (Unionized) | mg/L | 0.01 U | SM 4550SF | 0.04 | 0.01 | 12/24/14 10:01 | 12/24/14 10:06 | 1 |
| Ammonia as N | mg/L | 0.009 U | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 16:58 | 1 |
| Carbonaceous BOD | mg/L | 2 U | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Chemical Oxygen Demand | mg/L | 27 | EPA 410.4 | 25 | 10 | 12/22/14 10:37 | 12/22/14 12:39 | 1 |
| Chloride | mg/L | 20 | EPA 300.0 | 0.20 | 0.050 | | 12/23/14 21:12 | 1 |
| Nitrate+Nitrite (N) | mg/L | 1.4 | EPA 353.2 | 0.04 | 0.01 | | 12/19/14 15:03 | 1 |

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Laboratory Report

| Project Name | | BHS3 SE#12 | | | | | | |
|------------------------------|------------|----------------|--------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS3-PZ-07 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-10 | | | | | | |
| Date/Time Collected | | 12/17/14 10:28 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| Nitrite (as N) | mg/L | 0.01 U | SM 4500NO2-B | 0.04 | 0.01 | | 12/17/14 16:15 | 1 |
| Phosphorous - Total as P | mg/L | 0.30 | SM 4500P-E | 0.040 | 0.010 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Sulfate | mg/L | 99 | EPA 300.0 | 0.60 | 0.20 | | 12/23/14 21:12 | 1 |
| Sulfide | mg/L | 0.10 U | SM 4500SF | 0.40 | 0.10 | | 12/23/14 13:56 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 0.95 | EPA 351.2 | 0.20 | 0.05 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Total Organic Carbon | mg/L | 23 | SM 5310B | 1.0 | 0.060 | | 12/19/14 14:08 | 1 |
| Total Suspended Solids | mg/L | 2 | SM 2540D | 1 | 1 | 12/18/14 08:28 | 12/19/14 16:06 | 1 |
| Nitrate (as N) | mg/L | 1.4 | EPA 353.2 | 0.08 | 0.02 | | 12/19/14 15:03 | 1 |
| <u>Microbiology</u> | | | | | | | | |
| E. Coli | MPN/100 mL | 2.0 U | SM 9223B | 2.0 | 2.0 | 12/17/14 14:42 | 12/18/14 09:47 | 1 |
| Fecal Coliforms | CFU/100 ml | 1 U | SM 9222D | 1 | 1 | 12/17/14 14:41 | 12/18/14 14:03 | 1 |
| Sample Description | | BHS3-PZ08 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-11 | | | | | | |
| Date/Time Collected | | 12/17/14 10:04 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Hydrogen Sulfide (Unionized) | mg/L | 0.01 U | SM 4550SF | 0.04 | 0.01 | 12/24/14 10:01 | 12/24/14 10:06 | 1 |
| Ammonia as N | mg/L | 0.009 U | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 17:00 | 1 |
| Carbonaceous BOD | mg/L | 2 U | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Chemical Oxygen Demand | mg/L | 33 | EPA 410.4 | 25 | 10 | 12/22/14 10:37 | 12/22/14 12:39 | 1 |
| Chloride | mg/L | 24 | EPA 300.0 | 0.20 | 0.050 | | 12/23/14 21:24 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.83 | EPA 353.2 | 0.04 | 0.01 | | 12/19/14 15:04 | 1 |
| Nitrite (as N) | mg/L | 0.01 I | SM 4500NO2-B | 0.04 | 0.01 | | 12/17/14 16:15 | 1 |
| Phosphorous - Total as P | mg/L | 0.59 | SM 4500P-E | 0.040 | 0.010 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Sulfate | mg/L | 140 | EPA 300.0 | 6.0 | 2.0 | | 12/26/14 10:36 | 10 |
| Sulfide | mg/L | 0.10 U | SM 4500SF | 0.40 | 0.10 | | 12/23/14 13:56 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 0.83 | EPA 351.2 | 0.20 | 0.05 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Total Organic Carbon | mg/L | 19 | SM 5310B | 1.0 | 0.060 | | 12/19/14 14:08 | 1 |
| Total Suspended Solids | mg/L | 91 | SM 2540D | 1 | 1 | 12/18/14 08:28 | 12/19/14 16:06 | 1 |
| Nitrate (as N) | mg/L | 0.81 | EPA 353.2 | 0.08 | 0.02 | | 12/19/14 15:04 | 1 |
| <u>Microbiology</u> | | | | | | | | |
| E. Coli | MPN/100 mL | 2.0 U | SM 9223B | 2.0 | 2.0 | 12/17/14 14:42 | 12/18/14 09:47 | 1 |
| Fecal Coliforms | CFU/100 ml | 1 U | SM 9222D | 1 | 1 | 12/17/14 14:41 | 12/18/14 14:03 | 1 |

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December 31, 2014
Work Order: 1412942

Laboratory Report

| Project Name | | BHS3 SE#12 | | | | | | |
|------------------------------|------------|----------------|--------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS3-PZ09 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-12 | | | | | | |
| Date/Time Collected | | 12/17/14 10:00 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Hydrogen Sulfide (Unionized) | mg/L | 1.2 | SM 4550SF | 0.04 | 0.01 | 12/24/14 10:01 | 12/24/14 10:06 | 1 |
| Ammonia as N | mg/L | 0.009 U | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 17:01 | 1 |
| Carbonaceous BOD | mg/L | 2 U | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Chemical Oxygen Demand | mg/L | 60 | EPA 410.4 | 25 | 10 | 12/22/14 10:37 | 12/22/14 12:39 | 1 |
| Chloride | mg/L | 5.2 | EPA 300.0 | 0.20 | 0.050 | | 12/23/14 21:35 | 1 |
| Nitrate+Nitrite (N) | mg/L | 4.8 | EPA 353.2 | 0.20 | 0.05 | | 12/19/14 15:05 | 5 |
| Nitrite (as N) | mg/L | 0.01 I,J5 | SM 4500NO2-B | 0.04 | 0.01 | | 12/17/14 16:16 | 1 |
| Phosphorous - Total as P | mg/L | 1.7 | SM 4500P-E | 0.040 | 0.010 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Sulfate | mg/L | 16 | EPA 300.0 | 0.60 | 0.20 | | 12/23/14 21:35 | 1 |
| Sulfide | mg/L | 1.4 | SM 4500SF | 0.40 | 0.10 | | 12/23/14 13:56 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 2.1 | EPA 351.2 | 0.20 | 0.05 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Total Organic Carbon | mg/L | 46 | SM 5310B | 10 | 0.60 | | 12/19/14 14:08 | 10 |
| Total Suspended Solids | mg/L | 150 | SM 2540D | 1 | 1 | 12/18/14 08:28 | 12/19/14 16:06 | 1 |
| Nitrate (as N) | mg/L | 4.8 | EPA 353.2 | 0.24 | 0.06 | | 12/19/14 15:05 | 5 |
| <u>Microbiology</u> | | | | | | | | |
| E. Coli | MPN/100 mL | 2.0 U | SM 9223B | 2.0 | 2.0 | 12/17/14 14:42 | 12/18/14 09:47 | 1 |
| Fecal Coliforms | CFU/100 ml | 1 U | SM 9222D | 1 | 1 | 12/17/14 14:41 | 12/18/14 14:03 | 1 |

Sample Description **PZ-A7-6**
 Matrix **Wastewater**
 SAL Sample Number **1412942-13**
 Date/Time Collected **12/17/14 11:22**
 Collected by **Josefin Hirst**
 Date/Time Received **12/17/14 13:50**

| | | | | | | | | |
|--------------------------|------|---------|--------------|-------|-------|----------------|----------------|----|
| <u>Inorganics</u> | | | | | | | | |
| Ammonia as N | mg/L | 0.009 U | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 17:03 | 1 |
| Chloride | mg/L | 22 | EPA 300.0 | 0.20 | 0.050 | | 12/23/14 21:46 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.48 | EPA 353.2 | 0.04 | 0.01 | | 12/19/14 13:08 | 1 |
| Nitrite (as N) | mg/L | 0.04 | SM 4500NO2-B | 0.04 | 0.01 | | 12/17/14 16:17 | 1 |
| Sulfate | mg/L | 120 | EPA 300.0 | 6.0 | 2.0 | | 12/26/14 10:45 | 10 |
| Total Kjeldahl Nitrogen | mg/L | 1.4 | EPA 351.2 | 0.20 | 0.05 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Nitrate (as N) | mg/L | 0.44 | EPA 353.2 | 0.08 | 0.02 | | 12/19/14 13:08 | 1 |

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December 31, 2014
Work Order: 1412942

Laboratory Report

| Project Name | | BHS3 SE#12 | | | | | | |
|--------------------------|-------|----------------|-----------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | PZ-A7-8 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-14 | | | | | | |
| Date/Time Collected | | 12/17/14 11:34 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Ammonia as N | mg/L | 0.44 | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 17:05 | 1 |
| Chloride | mg/L | 11 | EPA 300.0 | 0.20 | 0.050 | | 12/23/14 21:57 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.02 I | EPA 353.2 | 0.04 | 0.01 | | 12/19/14 13:10 | 1 |
| Nitrite (as N) | mg/L | 0.01 U | SM | 0.04 | 0.01 | | 12/17/14 16:18 | 1 |
| | | | 4500NO2-B | | | | | |
| Sulfate | mg/L | 30 | EPA 300.0 | 0.60 | 0.20 | | 12/23/14 21:57 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 3.2 | EPA 351.2 | 0.20 | 0.05 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Nitrate (as N) | mg/L | 0.02 I | EPA 353.2 | 0.08 | 0.02 | | 12/19/14 13:10 | 1 |
| | | | | | | | | |
| Sample Description | | PZ-B8-5 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-15 | | | | | | |
| Date/Time Collected | | 12/17/14 11:25 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Ammonia as N | mg/L | 0.17 J5 | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 17:07 | 1 |
| Chloride | mg/L | 23 | EPA 300.0 | 0.20 | 0.050 | | 12/23/14 22:09 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.03 I | EPA 353.2 | 0.04 | 0.01 | | 12/19/14 13:12 | 1 |
| Nitrite (as N) | mg/L | 0.01 U | SM | 0.04 | 0.01 | | 12/18/14 12:09 | 1 |
| | | | 4500NO2-B | | | | | |
| Sulfate | mg/L | 55 | EPA 300.0 | 0.60 | 0.20 | | 12/23/14 22:09 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 1.6 | EPA 351.2 | 0.20 | 0.05 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Nitrate (as N) | mg/L | 0.03 I | EPA 353.2 | 0.08 | 0.02 | | 12/19/14 13:12 | 1 |
| | | | | | | | | |
| Sample Description | | PZ-B8-5-DUP | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-16 | | | | | | |
| Date/Time Collected | | 12/17/14 11:30 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Ammonia as N | mg/L | 0.12 | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 17:08 | 1 |
| Chloride | mg/L | 21 | EPA 300.0 | 0.20 | 0.050 | | 12/23/14 22:20 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.04 | EPA 353.2 | 0.04 | 0.01 | | 12/19/14 13:14 | 1 |

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December 31, 2014
Work Order: 1412942

Laboratory Report

| Project Name | | BHS3 SE#12 | | | | | | |
|------------------------------|------------|----------------|-----------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | PZ-B8-5-DUP | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1412942-16 | | | | | | |
| Date/Time Collected | | 12/17/14 11:30 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| Nitrite (as N) | mg/L | 0.01 U | SM 4500NO2-B | 0.04 | 0.01 | | 12/18/14 12:09 | 1 |
| Sulfate | mg/L | 51 | EPA 300.0 | 0.60 | 0.20 | | 12/23/14 22:20 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 1.6 | EPA 351.2 | 0.20 | 0.05 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Nitrate (as N) | mg/L | 0.04 I | EPA 353.2 | 0.08 | 0.02 | | 12/19/14 13:14 | 1 |
| Sample Description | | EB | | | | | | |
| Matrix | | Reagent Water | | | | | | |
| SAL Sample Number | | 1412942-19 | | | | | | |
| Date/Time Collected | | 12/17/14 10:40 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Hydrogen Sulfide (Unionized) | mg/L | 0.01 U | SM 4550SF | 0.04 | 0.01 | 12/24/14 10:01 | 12/24/14 10:06 | 1 |
| Ammonia as N | mg/L | 0.009 U | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 17:13 | 1 |
| Carbonaceous BOD | mg/L | 2 U | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Chemical Oxygen Demand | mg/L | 10 U | EPA 410.4 | 25 | 10 | 12/22/14 10:37 | 12/22/14 12:39 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.01 U | EPA 353.2 | 0.04 | 0.01 | | 12/22/14 16:00 | 1 |
| Nitrite (as N) | mg/L | 0.01 U | SM 4500NO2-B | 0.04 | 0.01 | | 12/17/14 16:21 | 1 |
| Phosphorous - Total as P | mg/L | 0.18 | SM 4500P-E | 0.040 | 0.010 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Sulfate | mg/L | 0.20 U | EPA 300.0 | 0.60 | 0.20 | | 12/23/14 22:42 | 1 |
| Sulfide | mg/L | 0.10 U | SM 4500SF | 0.40 | 0.10 | | 12/23/14 13:56 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 0.20 | EPA 351.2 | 0.20 | 0.05 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Total Organic Carbon | mg/L | 3.1 | SM 5310B | 1.0 | 0.060 | | 12/19/14 14:08 | 1 |
| Total Suspended Solids | mg/L | 1 U | SM 2540D | 1 | 1 | 12/18/14 08:28 | 12/19/14 16:06 | 1 |
| Nitrate (as N) | mg/L | 0.02 U | EPA 353.2 | 0.08 | 0.02 | | 12/22/14 16:00 | 1 |
| <u>Microbiology</u> | | | | | | | | |
| E. Coli | MPN/100 mL | 2.0 U | SM 9223B | 2.0 | 2.0 | 12/17/14 14:42 | 12/18/14 09:47 | 1 |
| Fecal Coliforms | CFU/100 ml | 1 U | SM 9222D | 1 | 1 | 12/17/14 14:41 | 12/18/14 14:03 | 1 |

Sample Description **FB**
Matrix **Reagent Water**
SAL Sample Number **1412942-20**
Date/Time Collected **12/17/14 10:50**
Collected by **Josefin Hirst**
Date/Time Received **12/17/14 13:50**

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December 31, 2014
Work Order: 1412942

Laboratory Report

| Project Name | | BHS3 SE#12 | | | | | | |
|------------------------------|------------|----------------|--------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | FB | | | | | | |
| Matrix | | Reagent Water | | | | | | |
| SAL Sample Number | | 1412942-20 | | | | | | |
| Date/Time Collected | | 12/17/14 10:50 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 12/17/14 13:50 | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Hydrogen Sulfide (Unionized) | mg/L | 0.01 U | SM 4550SF | 0.04 | 0.01 | 12/24/14 10:01 | 12/24/14 10:06 | 1 |
| Ammonia as N | mg/L | 0.009 U | EPA 350.1 | 0.040 | 0.009 | | 12/18/14 17:15 | 1 |
| Carbonaceous BOD | mg/L | 2 U | SM 5210B | 2 | 2 | 12/18/14 12:07 | 12/23/14 11:06 | 1 |
| Chemical Oxygen Demand | mg/L | 10 U | EPA 410.4 | 25 | 10 | 12/22/14 10:37 | 12/22/14 12:39 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.01 U | EPA 353.2 | 0.04 | 0.01 | | 12/18/14 15:41 | 1 |
| Nitrite (as N) | mg/L | 0.01 U | SM 4500NO2-B | 0.04 | 0.01 | | 12/17/14 16:21 | 1 |
| Phosphorous - Total as P | mg/L | 0.20 | SM 4500P-E | 0.040 | 0.010 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Sulfate | mg/L | 0.20 U | EPA 300.0 | 0.60 | 0.20 | | 12/23/14 22:53 | 1 |
| Sulfide | mg/L | 0.10 U | SM 4500SF | 0.40 | 0.10 | | 12/23/14 13:56 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 0.15 I | EPA 351.2 | 0.20 | 0.05 | 12/18/14 15:47 | 12/22/14 13:43 | 1 |
| Total Organic Carbon | mg/L | 0.64 I | SM 5310B | 1.0 | 0.060 | | 12/19/14 14:08 | 1 |
| Total Suspended Solids | mg/L | 1 U | SM 2540D | 1 | 1 | 12/18/14 08:28 | 12/19/14 16:06 | 1 |
| Nitrate (as N) | mg/L | 0.02 U | EPA 353.2 | 0.08 | 0.02 | | 12/18/14 15:41 | 1 |
| <u>Microbiology</u> | | | | | | | | |
| E. Coli | MPN/100 mL | 2.0 U | SM 9223B | 2.0 | 2.0 | 12/17/14 14:42 | 12/18/14 09:47 | 1 |
| Fecal Coliforms | CFU/100 ml | 1 U | SM 9222D | 1 | 1 | 12/17/14 14:41 | 12/18/14 14:03 | 1 |

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December 31, 2014
Work Order: 1412942

Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|-----------|------|------|-------|---|---------------|------|-------------|-----|-----------|
| Batch BL41724 - Nitrite SM 4500NO2-B by seal | | | | | | | | | | |
| Blank (BL41724-BLK1) | | | | | Prepared & Analyzed: 12/17/14 16:01 | | | | | |
| Nitrite (as N) | 0.01 U | 0.04 | 0.01 | mg/L | | | | | | |
| Blank (BL41724-BLK2) | | | | | Prepared & Analyzed: 12/17/14 16:25 | | | | | |
| Nitrite (as N) | 0.01 U | 0.04 | 0.01 | mg/L | | | | | | |
| LCS (BL41724-BS1) | | | | | Prepared & Analyzed: 12/17/14 16:01 | | | | | |
| Nitrite (as N) | 0.0765 | 0.04 | 0.01 | mg/L | 0.080 | | 96 | 90-110 | | |
| LCS (BL41724-BS2) | | | | | Prepared & Analyzed: 12/17/14 16:26 | | | | | |
| Nitrite (as N) | 0.0817 | 0.04 | 0.01 | mg/L | 0.080 | | 102 | 90-110 | | |
| Matrix Spike (BL41724-MS1) | | | | | Source: 1412942-01 Prepared & Analyzed: 12/30/14 11:46 | | | | | |
| Nitrite (as N) | 0.134 | 0.04 | 0.01 | mg/L | 0.10 | 0.0608 | 73 | 77-119 | | |
| Matrix Spike (BL41724-MS2) | | | | | Source: 1412942-12 Prepared & Analyzed: 12/17/14 16:12 | | | | | |
| Nitrite (as N) | 0.0853 J2 | 0.04 | 0.01 | mg/L | 0.10 | 0.0124 | 73 | 77-119 | | |
| Matrix Spike (BL41724-MS3) | | | | | Source: 1413254-03 Prepared & Analyzed: 12/17/14 16:26 | | | | | |
| Nitrite (as N) | 0.0724 J2 | 0.04 | 0.01 | mg/L | 0.10 | ND | 72 | 77-119 | | |
| Matrix Spike Dup (BL41724-MSD1) | | | | | Source: 1412942-01 Prepared & Analyzed: 12/30/14 11:46 | | | | | |
| Nitrite (as N) | 0.143 J2 | 0.04 | 0.01 | mg/L | 0.10 | 0.0608 | 82 | 77-119 | 6 | 20 |
| Matrix Spike Dup (BL41724-MSD2) | | | | | Source: 1412942-12 Prepared & Analyzed: 12/17/14 16:13 | | | | | |
| Nitrite (as N) | 0.0844 J2 | 0.04 | 0.01 | mg/L | 0.10 | 0.0124 | 72 | 77-119 | 1 | 20 |
| Matrix Spike Dup (BL41724-MSD3) | | | | | Source: 1413254-03 Prepared & Analyzed: 12/17/14 16:27 | | | | | |
| Nitrite (as N) | 0.0755 J2 | 0.04 | 0.01 | mg/L | 0.10 | ND | 76 | 77-119 | 4 | 20 |

SOUTHERN ANALYTICAL LABORATORIES, INC.

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



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December 31, 2014
Work Order: 1412942

Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|--------|------|------|-------|--|---------------|------|-------------|-----|-----------|
| Batch BL41728 - Sulfide prep | | | | | | | | | | |
| Blank (BL41728-BLK1) | | | | | Prepared & Analyzed: 12/23/14 13:56 | | | | | |
| Sulfide | 0.10 U | 0.40 | 0.10 | mg/L | | | | | | |
| Blank (BL41728-BLK2) | | | | | Prepared & Analyzed: 12/23/14 13:56 | | | | | |
| Sulfide | 0.10 U | 0.40 | 0.10 | mg/L | | | | | | |
| LCS (BL41728-BS1) | | | | | Prepared & Analyzed: 12/23/14 13:56 | | | | | |
| Sulfide | 4.92 | 0.40 | 0.10 | mg/L | 5.0 | | 98 | 85-115 | | |
| LCS (BL41728-BS2) | | | | | Prepared & Analyzed: 12/23/14 13:56 | | | | | |
| Sulfide | 4.92 | 0.40 | 0.10 | mg/L | 5.0 | | 98 | 85-115 | | |
| Matrix Spike (BL41728-MS1) | | | | | Source: 1412942-20 Prepared & Analyzed: 12/23/14 13:56 | | | | | |
| Sulfide | 4.72 | 0.40 | 0.10 | mg/L | 5.0 | ND | 94 | 85-115 | | |
| Matrix Spike (BL41728-MS2) | | | | | Source: 1412943-12 Prepared & Analyzed: 12/23/14 13:56 | | | | | |
| Sulfide | 4.82 | 0.40 | 0.10 | mg/L | 5.0 | ND | 96 | 85-115 | | |
| Matrix Spike Dup (BL41728-MSD1) | | | | | Source: 1412942-20 Prepared & Analyzed: 12/23/14 13:56 | | | | | |
| Sulfide | 4.72 | 0.40 | 0.10 | mg/L | 5.0 | ND | 94 | 85-115 | 0 | 14 |
| Matrix Spike Dup (BL41728-MSD2) | | | | | Source: 1412943-12 Prepared & Analyzed: 12/23/14 13:56 | | | | | |
| Sulfide | 4.82 | 0.40 | 0.10 | mg/L | 5.0 | ND | 96 | 85-115 | 0 | 14 |
| Batch BL41802 - TSS prep | | | | | | | | | | |
| Blank (BL41802-BLK1) | | | | | Prepared: 12/18/14 Analyzed: 12/19/14 16:06 | | | | | |
| Total Suspended Solids | 1 U | 1 | 1 | mg/L | | | | | | |

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Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|--------|--------------------|------|-------|---|---------------|------|-------------|-----|-----------|
| Batch BL41802 - TSS prep | | | | | | | | | | |
| Blank (BL41802-BLK2) | | | | | Prepared: 12/18/14 Analyzed: 12/19/14 16:06 | | | | | |
| Total Suspended Solids | 1 U | 1 | 1 | mg/L | | | | | | |
| LCS (BL41802-BS1) | | | | | Prepared: 12/18/14 Analyzed: 12/19/14 16:06 | | | | | |
| Total Suspended Solids | 45.5 | 1 | 1 | mg/L | 50 | | 91 | 85-115 | | |
| LCS (BL41802-BS2) | | | | | Prepared: 12/18/14 Analyzed: 12/19/14 16:06 | | | | | |
| Total Suspended Solids | 51.5 | 1 | 1 | mg/L | 50 | | 103 | 85-115 | | |
| Duplicate (BL41802-DUP1) | | Source: 1413251-01 | | | Prepared: 12/18/14 Analyzed: 12/19/14 16:06 | | | | | |
| Total Suspended Solids | 197 | 1 | 1 | mg/L | | 198 | | | 0.5 | 30 |
| Duplicate (BL41802-DUP2) | | Source: 1413274-01 | | | Prepared: 12/18/14 Analyzed: 12/19/14 16:06 | | | | | |
| Total Suspended Solids | 38.0 | 1 | 1 | mg/L | | 35.0 | | | 8 | 30 |
| Batch BL41803 - Nitrite SM 4500NO2-B by seal | | | | | | | | | | |
| Blank (BL41803-BLK1) | | | | | Prepared & Analyzed: 12/18/14 10:07 | | | | | |
| Nitrite (as N) | 0.01 U | 0.04 | 0.01 | mg/L | | | | | | |
| LCS (BL41803-BS1) | | | | | Prepared & Analyzed: 12/18/14 10:08 | | | | | |
| Nitrite (as N) | 0.0803 | 0.04 | 0.01 | mg/L | 0.080 | | 100 | 90-110 | | |
| Matrix Spike (BL41803-MS1) | | Source: 1413284-01 | | | Prepared & Analyzed: 12/18/14 10:08 | | | | | |
| Nitrite (as N) | 0.170 | 0.04 | 0.01 | mg/L | 0.080 | 0.105 | 81 | 77-119 | | |
| Matrix Spike Dup (BL41803-MSD1) | | Source: 1413284-01 | | | Prepared & Analyzed: 12/18/14 16:29 | | | | | |
| Nitrite (as N) | 0.167 | 0.04 | 0.01 | mg/L | 0.080 | 0.105 | 78 | 77-119 | 2 | 20 |

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Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|---------|------|-------|-------|--|---------------|------|-------------|-----|-----------|
| Batch BL41808 - TOC prep | | | | | | | | | | |
| Blank (BL41808-BLK1) | | | | | Prepared & Analyzed: 12/19/14 14:08 | | | | | |
| Total Organic Carbon | 0.060 U | 1.0 | 0.060 | mg/L | | | | | | |
| LCS (BL41808-BS1) | | | | | Prepared & Analyzed: 12/19/14 14:08 | | | | | |
| Total Organic Carbon | 9.12 | 1.0 | 0.060 | mg/L | 10 | | 91 | 90-110 | | |
| Matrix Spike (BL41808-MS1) | | | | | Source: 1412942-01 Prepared & Analyzed: 12/19/14 14:08 | | | | | |
| Total Organic Carbon | 12.2 L2 | 1.0 | 0.060 | mg/L | 10 | 33.0 | NR | 85-115 | | |
| Matrix Spike Dup (BL41808-MSD1) | | | | | Source: 1412942-01 Prepared & Analyzed: 12/19/14 14:08 | | | | | |
| Total Organic Carbon | 12.6 L2 | 1.0 | 0.060 | mg/L | 10 | 33.0 | NR | 85-115 | 3 | 10 |
| Batch BL41816 - Nitrate 353.2 by seal | | | | | | | | | | |
| Blank (BL41816-BLK1) | | | | | Prepared & Analyzed: 12/18/14 15:24 | | | | | |
| Nitrate+Nitrite (N) | 0.01 U | 0.04 | 0.01 | mg/L | | | | | | |
| LCS (BL41816-BS1) | | | | | Prepared & Analyzed: 12/18/14 15:26 | | | | | |
| Nitrate+Nitrite (N) | 0.820 | 0.04 | 0.01 | mg/L | 0.80 | | 102 | 90-110 | | |
| Matrix Spike (BL41816-MS1) | | | | | Source: 1412942-01 Prepared & Analyzed: 12/18/14 15:29 | | | | | |
| Nitrate+Nitrite (N) | 1.04 J2 | 0.04 | 0.01 | mg/L | 1.0 | 0.403 | 64 | 90-110 | | |
| Matrix Spike (BL41816-MS2) | | | | | Source: 1413281-01 Prepared & Analyzed: 12/18/14 15:56 | | | | | |
| Nitrate+Nitrite (N) | 0.953 | 0.04 | 0.01 | mg/L | 1.0 | ND | 95 | 90-110 | | |
| Matrix Spike Dup (BL41816-MSD1) | | | | | Source: 1412942-01 Prepared & Analyzed: 12/18/14 15:31 | | | | | |
| Nitrate+Nitrite (N) | 1.02 J2 | 0.04 | 0.01 | mg/L | 1.0 | 0.403 | 62 | 90-110 | 2 | 20 |

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| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---------------------------------------|--------|--------------------|------|-------|---|---------------|--------|-------------|-----|-----------|
| Batch BL41816 - Nitrate 353.2 by seal | | | | | | | | | | |
| Matrix Spike Dup (BL41816-MSD2) | | Source: 1413281-01 | | | Prepared & Analyzed: 12/18/14 15:58 | | | | | |
| Nitrate+Nitrite (N) | 1.01 | 0.04 | 0.01 | mg/L | 1.0 | ND | 101 | 90-110 | 6 | 20 |
| Batch BL41818 - BOD | | | | | | | | | | |
| Blank (BL41818-BLK1) | | | | | Prepared: 12/18/14 Analyzed: 12/23/14 11:06 | | | | | |
| Carbonaceous BOD | 2 U | 2 | 2 | mg/L | Prepared: 12/18/14 Analyzed: 12/23/14 11:06 | | | | | |
| Blank (BL41818-BLK2) | | | | | | | | | | |
| Carbonaceous BOD | 2 U | 2 | 2 | mg/L | Prepared: 12/18/14 Analyzed: 12/23/14 11:06 | | | | | |
| LCS (BL41818-BS1) | | | | | | | | | | |
| Carbonaceous BOD | 188 | 2 | 2 | mg/L | 200 | 94 | 85-115 | | | |
| LCS (BL41818-BS2) | | | | | Prepared: 12/18/14 Analyzed: 12/23/14 11:06 | | | | | |
| Carbonaceous BOD | 189 | 2 | 2 | mg/L | 200 | 94 | 85-115 | | | |
| LCS Dup (BL41818-BSD1) | | | | | Prepared: 12/18/14 Analyzed: 12/23/14 11:06 | | | | | |
| Carbonaceous BOD | 175 | 2 | 2 | mg/L | 200 | 87 | 85-115 | | 7 | 200 |
| LCS Dup (BL41818-BSD2) | | | | | Prepared: 12/18/14 Analyzed: 12/23/14 11:06 | | | | | |
| Carbonaceous BOD | 187 | 2 | 2 | mg/L | 200 | 93 | 85-115 | | 1 | 200 |
| Duplicate (BL41818-DUP1) | | Source: 1412942-01 | | | Prepared: 12/18/14 Analyzed: 12/23/14 11:06 | | | | | |
| Carbonaceous BOD | 51 | 2 | 2 | mg/L | 57 | | | | 9 | 25 |
| Duplicate (BL41818-DUP2) | | Source: 1413274-01 | | | Prepared: 12/18/14 Analyzed: 12/23/14 11:06 | | | | | |
| Carbonaceous BOD | 240 | 2 | 2 | mg/L | 240 | | | | 0.6 | 25 |

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Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---------|-------|-------|-------|---|---------------|------|-------------|-----|-----------|
| Batch BL41823 - Ammonia by SEAL | | | | | | | | | | |
| Blank (BL41823-BLK1) | | | | | Prepared & Analyzed: 12/18/14 16:29 | | | | | |
| Ammonia as N | 0.009 U | 0.040 | 0.009 | mg/L | | | | | | |
| LCS (BL41823-BS1) | | | | | Prepared & Analyzed: 12/18/14 16:31 | | | | | |
| Ammonia as N | 0.51 | 0.040 | 0.009 | mg/L | 0.50 | | 103 | 90-110 | | |
| Matrix Spike (BL41823-MS1) | | | | | Source: 1412942-01 Prepared & Analyzed: 12/18/14 18:12 | | | | | |
| Ammonia as N | 40 L2 | 4.0 | 0.95 | mg/L | 0.50 | 43 | NR | 90-110 | | |
| Matrix Spike (BL41823-MS2) | | | | | Source: 1412942-15 Prepared & Analyzed: 12/18/14 16:53 | | | | | |
| Ammonia as N | 0.75 J2 | 0.040 | 0.009 | mg/L | 0.50 | 0.17 | 116 | 90-110 | | |
| Matrix Spike Dup (BL41823-MSD1) | | | | | Source: 1412942-01 Prepared & Analyzed: 12/18/14 18:13 | | | | | |
| Ammonia as N | 40 L2 | 4.0 | 0.95 | mg/L | 0.50 | 43 | NR | 90-110 | 0.4 | 10 |
| Matrix Spike Dup (BL41823-MSD2) | | | | | Source: 1412942-15 Prepared & Analyzed: 12/18/14 16:55 | | | | | |
| Ammonia as N | 0.74 J2 | 0.040 | 0.009 | mg/L | 0.50 | 0.17 | 113 | 90-110 | 2 | 10 |
| Batch BL41828 - Digestion for TP and TKN | | | | | | | | | | |
| Blank (BL41828-BLK1) | | | | | Prepared: 12/18/14 Analyzed: 12/22/14 13:43 | | | | | |
| Phosphorous - Total as P | 0.010 U | 0.040 | 0.010 | mg/L | | | | | | |
| Total Kjeldahl Nitrogen | 0.05 U | 0.20 | 0.05 | mg/L | | | | | | |
| Blank (BL41828-BLK2) | | | | | Prepared: 12/18/14 Analyzed: 12/22/14 13:43 | | | | | |
| Total Kjeldahl Nitrogen | 0.05 U | 0.20 | 0.05 | mg/L | | | | | | |
| Phosphorous - Total as P | 0.010 U | 0.040 | 0.010 | mg/L | | | | | | |

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Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|--------|-------|-------|-------|---|---------------|---|-------------|-----|-----------|
| Batch BL41828 - Digestion for TP and TKN | | | | | | | | | | |
| LCS (BL41828-BS1) | | | | | Prepared: 12/18/14 Analyzed: 12/22/14 13:43 | | | | | |
| Phosphorous - Total as P | 1.09 | 0.040 | 0.010 | mg/L | 1.0 | | 109 | 90-110 | | |
| Total Kjeldahl Nitrogen | 1.01 | 0.20 | 0.05 | mg/L | 1.0 | | 101 | 90-110 | | |
| LCS (BL41828-BS2) | | | | | Prepared: 12/18/14 Analyzed: 12/22/14 13:43 | | | | | |
| Phosphorous - Total as P | 0.996 | 0.040 | 0.010 | mg/L | 1.0 | | 100 | 90-110 | | |
| Total Kjeldahl Nitrogen | 1.08 | 0.20 | 0.05 | mg/L | 1.0 | | 108 | 90-110 | | |
| Matrix Spike (BL41828-MS1) | | | | | Source: 1412942-19 | | Prepared: 12/18/14 Analyzed: 12/22/14 13:43 | | | |
| Phosphorous - Total as P | 1.27 | 0.040 | 0.010 | mg/L | 1.0 | 0.183 | 109 | 90-110 | | |
| Total Kjeldahl Nitrogen | 1.28 | 0.20 | 0.05 | mg/L | 1.0 | 0.203 | 108 | 90-110 | | |
| Matrix Spike (BL41828-MS2) | | | | | Source: 1412942-20 | | Prepared: 12/18/14 Analyzed: 12/22/14 13:43 | | | |
| Phosphorous - Total as P | 1.19 | 0.040 | 0.010 | mg/L | 1.0 | 0.201 | 99 | 90-110 | | |
| Total Kjeldahl Nitrogen | 1.10 | 0.20 | 0.05 | mg/L | 1.0 | 0.148 | 95 | 90-110 | | |
| Matrix Spike (BL41828-MS3) | | | | | Source: 1413273-01 | | Prepared: 12/18/14 Analyzed: 12/22/14 13:43 | | | |
| Phosphorous - Total as P | 1.30 | 0.040 | 0.010 | mg/L | 1.0 | 0.374 | 93 | 90-110 | | |
| Total Kjeldahl Nitrogen | 1.52 | 0.20 | 0.05 | mg/L | 1.0 | 0.594 | 93 | 90-110 | | |
| Matrix Spike (BL41828-MS4) | | | | | Source: 1413274-07 | | Prepared: 12/18/14 Analyzed: 12/22/14 13:43 | | | |
| Phosphorous - Total as P | 1.28 | 0.040 | 0.010 | mg/L | 1.0 | 0.357 | 92 | 90-110 | | |
| Matrix Spike Dup (BL41828-MSD1) | | | | | Source: 1412942-19 | | Prepared: 12/18/14 Analyzed: 12/22/14 13:43 | | | |
| Phosphorous - Total as P | 1.21 | 0.040 | 0.010 | mg/L | 1.0 | 0.183 | 103 | 90-110 | 5 | 25 |
| Total Kjeldahl Nitrogen | 1.19 | 0.20 | 0.05 | mg/L | 1.0 | 0.203 | 99 | 90-110 | 7 | 20 |
| Matrix Spike Dup (BL41828-MSD2) | | | | | Source: 1412942-20 | | Prepared: 12/18/14 Analyzed: 12/22/14 13:43 | | | |
| Total Kjeldahl Nitrogen | 1.09 | 0.20 | 0.05 | mg/L | 1.0 | 0.148 | 94 | 90-110 | 0.5 | 20 |
| Phosphorous - Total as P | 1.20 | 0.040 | 0.010 | mg/L | 1.0 | 0.201 | 100 | 90-110 | 0.7 | 25 |

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|--|----------|--------------------|-------|-------|---|---------------|------|-------------|-----|-----------|
| Batch BL41828 - Digestion for TP and TKN | | | | | | | | | | |
| Matrix Spike Dup (BL41828-MSD3) | | Source: 1413273-01 | | | Prepared: 12/18/14 Analyzed: 12/22/14 13:43 | | | | | |
| Phosphorous - Total as P | 1.33 | 0.040 | 0.010 | mg/L | 1.0 | 0.374 | 96 | 90-110 | 2 | 25 |
| Total Kjeldahl Nitrogen | 1.51 | 0.20 | 0.05 | mg/L | 1.0 | 0.594 | 92 | 90-110 | 0.5 | 20 |
| Matrix Spike Dup (BL41828-MSD4) | | Source: 1413274-07 | | | Prepared: 12/18/14 Analyzed: 12/22/14 13:43 | | | | | |
| Total Kjeldahl Nitrogen | 1.83 | 0.20 | 0.05 | mg/L | 1.0 | 0.841 | 99 | 90-110 | 1 | 20 |
| Phosphorous - Total as P | 1.38 | 0.040 | 0.010 | mg/L | 1.0 | 0.357 | 102 | 90-110 | 8 | 25 |
| Batch BL41916 - Nitrate 353.2 by seal | | | | | | | | | | |
| Blank (BL41916-BLK1) | | | | | Prepared & Analyzed: 12/19/14 12:35 | | | | | |
| Nitrate+Nitrite (N) | 0.0160 I | 0.04 | 0.01 | mg/L | | | | | | |
| LCS (BL41916-BS1) | | | | | Prepared & Analyzed: 12/19/14 12:37 | | | | | |
| Nitrate+Nitrite (N) | 0.833 | 0.04 | 0.01 | mg/L | 0.80 | | 104 | 90-110 | | |
| Matrix Spike (BL41916-MS1) | | Source: 1412942-05 | | | Prepared & Analyzed: 12/19/14 14:56 | | | | | |
| Nitrate+Nitrite (N) | 1.02 | 0.04 | 0.01 | mg/L | 1.0 | 0.0800 | 94 | 90-110 | | |
| Matrix Spike (BL41916-MS2) | | Source: 1412946-02 | | | Prepared & Analyzed: 12/19/14 13:04 | | | | | |
| Nitrate+Nitrite (N) | 1.00 | 0.04 | 0.01 | mg/L | 1.0 | 0.0410 | 96 | 90-110 | | |
| Matrix Spike Dup (BL41916-MSD1) | | Source: 1412942-05 | | | Prepared & Analyzed: 12/19/14 14:58 | | | | | |
| Nitrate+Nitrite (N) | 0.985 | 0.04 | 0.01 | mg/L | 1.0 | 0.0800 | 90 | 90-110 | 3 | 20 |
| Matrix Spike Dup (BL41916-MSD2) | | Source: 1412946-02 | | | Prepared & Analyzed: 12/19/14 13:06 | | | | | |
| Nitrate+Nitrite (N) | 0.951 | 0.04 | 0.01 | mg/L | 1.0 | 0.0410 | 91 | 90-110 | 6 | 20 |

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|--|--------|-----|-----|-------|--|---------------|------|-------------|-----|-----------|
| Batch BL42212 - COD prep | | | | | | | | | | |
| Blank (BL42212-BLK1) | | | | | Prepared & Analyzed: 12/22/14 12:39 | | | | | |
| Chemical Oxygen Demand | 10 U | 25 | 10 | mg/L | | | | | | |
| Blank (BL42212-BLK2) | | | | | Prepared & Analyzed: 12/22/14 12:39 | | | | | |
| Chemical Oxygen Demand | 10 U | 25 | 10 | mg/L | | | | | | |
| Blank (BL42212-BLK3) | | | | | Prepared & Analyzed: 12/22/14 12:39 | | | | | |
| Chemical Oxygen Demand | 10 U | 25 | 10 | mg/L | | | | | | |
| LCS (BL42212-BS1) | | | | | Prepared & Analyzed: 12/22/14 12:39 | | | | | |
| Chemical Oxygen Demand | 49 | 25 | 10 | mg/L | 50 | | 98 | 90-110 | | |
| LCS (BL42212-BS2) | | | | | Prepared & Analyzed: 12/22/14 12:39 | | | | | |
| Chemical Oxygen Demand | 47 | 25 | 10 | mg/L | 50 | | 94 | 90-110 | | |
| LCS (BL42212-BS3) | | | | | Prepared & Analyzed: 12/22/14 12:39 | | | | | |
| Chemical Oxygen Demand | 45 | 25 | 10 | mg/L | 50 | | 90 | 90-110 | | |
| Matrix Spike (BL42212-MS1) | | | | | Source: 1412942-19 Prepared & Analyzed: 12/22/14 12:39 | | | | | |
| Chemical Oxygen Demand | 45 | 25 | 10 | mg/L | 50 | ND | 90 | 85-115 | | |
| Matrix Spike (BL42212-MS2) | | | | | Source: 1412944-11 Prepared & Analyzed: 12/22/14 12:39 | | | | | |
| Chemical Oxygen Demand | 47 | 25 | 10 | mg/L | 50 | ND | 94 | 85-115 | | |
| Matrix Spike (BL42212-MS3) | | | | | Source: 1412946-21 Prepared & Analyzed: 12/22/14 12:39 | | | | | |
| Chemical Oxygen Demand | 45 | 25 | 10 | mg/L | 50 | ND | 90 | 85-115 | | |
| Matrix Spike Dup (BL42212-MSD1) | | | | | Source: 1412942-19 Prepared & Analyzed: 12/22/14 12:39 | | | | | |
| Chemical Oxygen Demand | 45 | 25 | 10 | mg/L | 50 | ND | 90 | 85-115 | 0 | 32 |

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| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|---------|-------------------------------------|-------|-------|-------------------------------------|---------------|------|-------------|-----|-----------|
| Batch BL42212 - COD prep | | | | | | | | | | |
| Matrix Spike Dup (BL42212-MSD2) | | Source: 1412944-11 | | | Prepared & Analyzed: 12/22/14 12:39 | | | | | |
| Chemical Oxygen Demand | 45 | 25 | 10 | mg/L | 50 | ND | 90 | 85-115 | 4 | 32 |
| Matrix Spike Dup (BL42212-MSD3) | | Source: 1412946-21 | | | Prepared & Analyzed: 12/22/14 12:39 | | | | | |
| Chemical Oxygen Demand | 43 | 25 | 10 | mg/L | 50 | ND | 86 | 85-115 | 5 | 32 |
| Batch BL42306 - Ion Chromatography 300.0 Prep | | | | | | | | | | |
| Blank (BL42306-BLK1) | | Prepared & Analyzed: 12/23/14 18:02 | | | | | | | | |
| Chloride | 0.050 U | 0.20 | 0.050 | mg/L | | | | | | |
| Sulfate | 0.20 U | 0.60 | 0.20 | mg/L | | | | | | |
| Surrogate: Dichloroacetate | 0.847 | | | mg/L | 1.0 | | 85 | 78-120 | | |
| Surrogate: Dichloroacetate | 0.847 | | | mg/L | 1.0 | | 85 | 78-120 | | |
| LCS (BL42306-BS1) | | Prepared & Analyzed: 12/23/14 18:13 | | | | | | | | |
| Chloride | 3.09 | 0.20 | 0.050 | mg/L | 3.0 | | 103 | 85-115 | | |
| Sulfate | 9.27 | 0.60 | 0.20 | mg/L | 9.0 | | 103 | 85-115 | | |
| Surrogate: Dichloroacetate | 0.979 | | | mg/L | 1.0 | | 98 | 78-120 | | |
| Surrogate: Dichloroacetate | 0.979 | | | mg/L | 1.0 | | 98 | 78-120 | | |
| LCS Dup (BL42306-BSD1) | | Prepared & Analyzed: 12/23/14 18:24 | | | | | | | | |
| Chloride | 3.23 | 0.20 | 0.050 | mg/L | 3.0 | | 108 | 85-115 | 4 | 200 |
| Sulfate | 9.56 | 0.60 | 0.20 | mg/L | 9.0 | | 106 | 85-115 | 3 | 200 |
| Surrogate: Dichloroacetate | 1.09 | | | mg/L | 1.0 | | 109 | 78-120 | | |
| Surrogate: Dichloroacetate | 1.09 | | | mg/L | 1.0 | | 109 | 78-120 | | |
| Matrix Spike (BL42306-MS1) | | Source: 1412942-06 | | | Prepared & Analyzed: 12/23/14 20:28 | | | | | |
| Chloride | 41.2 | 0.20 | 0.050 | mg/L | 3.0 | 38.7 | 83 | 80-120 | | |
| Sulfate | 269 L | 0.60 | 0.20 | mg/L | 9.0 | 253 | 180 | 85-115 | | |
| Surrogate: Dichloroacetate | 0.845 | | | mg/L | 1.0 | | 84 | 78-120 | | |
| Surrogate: Dichloroacetate | 0.845 | | | mg/L | 1.0 | | 84 | 78-120 | | |

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Work Order: 1412942

Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|--------|-------------------------------------|-------|-------|-------------------------------------|---------------|------|-------------|-----|-----------|
| Batch BL42306 - Ion Chromatography 300.0 Prep | | | | | | | | | | |
| Matrix Spike (BL42306-MS2) | | Source: 1412942-16 | | | Prepared & Analyzed: 12/23/14 22:31 | | | | | |
| Chloride | 23.5 | 0.20 | 0.050 | mg/L | 3.0 | 20.7 | 92 | 80-120 | | |
| Sulfate | 59.0 | 0.60 | 0.20 | mg/L | 9.0 | 51.2 | 87 | 85-115 | | |
| Surrogate: Dichloroacetate | 1.12 | | | mg/L | 1.0 | | 112 | 78-120 | | |
| Surrogate: Dichloroacetate | 1.12 | | | mg/L | 1.0 | | 112 | 78-120 | | |
| Batch BL42414 - Ion Chromatography 300.0 Prep | | | | | | | | | | |
| Blank (BL42414-BLK1) | | Prepared & Analyzed: 12/24/14 17:26 | | | | | | | | |
| Sulfate | 0.20 U | 0.60 | 0.20 | mg/L | | | | | | |
| Surrogate: Dichloroacetate | 0.966 | | | mg/L | 1.0 | | 97 | 78-120 | | |
| LCS (BL42414-BS1) | | Prepared & Analyzed: 12/24/14 17:35 | | | | | | | | |
| Sulfate | 8.76 | 0.60 | 0.20 | mg/L | 9.0 | | 97 | 85-115 | | |
| Surrogate: Dichloroacetate | 1.05 | | | mg/L | 1.0 | | 105 | 78-120 | | |
| LCS Dup (BL42414-BSD1) | | Prepared & Analyzed: 12/24/14 17:53 | | | | | | | | |
| Sulfate | 9.16 | 0.60 | 0.20 | mg/L | 9.0 | | 102 | 85-115 | 4 | 200 |
| Surrogate: Dichloroacetate | 1.04 | | | mg/L | 1.0 | | 104 | 78-120 | | |
| Matrix Spike (BL42414-MS1) | | Source: 1413401-01 | | | Prepared & Analyzed: 12/24/14 19:37 | | | | | |
| Sulfate | 453 | 6.0 | 2.0 | mg/L | 90 | 372 | 90 | 85-115 | | |
| Surrogate: Dichloroacetate | 1.10 | | | mg/L | 1.0 | | 110 | 78-120 | | |
| Matrix Spike (BL42414-MS2) | | Source: 1412944-10 | | | Prepared & Analyzed: 12/26/14 11:40 | | | | | |
| Sulfate | 395 | 6.0 | 2.0 | mg/L | 90 | 314 | 90 | 85-115 | | |
| Surrogate: Dichloroacetate | 1.07 | | | mg/L | 1.0 | | 107 | 78-120 | | |

SOUTHERN ANALYTICAL LABORATORIES, INC.

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



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

December 31, 2014
Work Order: 1412942

Microbiology - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---------------------------------|--------|-----|-----|------------|--|---------------|------|-------------|-----|-----------|
| Batch BL41721 - FC-MF | | | | | | | | | | |
| Blank (BL41721-BLK1) | | | | | Prepared: 12/17/14 Analyzed: 12/18/14 14:03 | | | | | |
| Fecal Coliforms | 1 U | 1 | 1 | CFU/100 ml | | | | | | |
| Duplicate (BL41721-DUP1) | | | | | Source: 1412942-20 Prepared: 12/17/14 Analyzed: 12/18/14 14:03 | | | | | |
| Fecal Coliforms | 1 U | 1 | 1 | CFU/100 ml | | ND | | | | 200 |

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

December 31, 2014
Work Order: 1412942

* Qualifiers, Notes and Definitions

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.

- L2 Analyte level in sample invalidated Matrix Spike.
- L Off-scale high. Result exceeded highest calibration standard.
- J5 Matrix spike of this sample was outside typical range. All other QC criteria were acceptable.
- J2 Quality control value for accuracy was outside control limits.

Questions regarding this report should be directed to :

Kathryn Nordmark
Telephone (813) 855-1844 FAX (813) 855-2218
Kathryn@southernanalyticalabs.com



| Client Name | | | | | | | | | | Contact / Phone: | | | | | | | | | |
|---|------------|--------------------|------------------------|--------------|---|-----------|------|---|--|---|---|-----------------|---|---|---|------|-------------|--------------|------|
| Project Name / Location | | | | | | | | | | Josefin Hirst 813-630-4498 | | | | | | | | | |
| BHS3 SE#12 | | | | | | | | | | | | | | | | | | | |
| Samplers: (Signature) <i>Josefin Hirst</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 | | | | | | | | | | | | | | | | | | | |
| SAL Use Only | Sample No. | Sample Description | Date | Time | Matrix | Composite | Grab | 125mLP, Sterile, Na ₂ S ₂ O ₃ FC-MF, FC-QT | 500mLP, Cool TSS, CBOD, NOx, SO ₄ | 125mLP, H ₂ SO ₄ COD, TKN, NH ₃ , TP | 500mLP, NaOH, Zn Acetate H ₂ S | 40mLaV, HCl TOC | 500mLP, Cool CBOD, NOx, SO ₄ | 125mLP, H ₂ SO ₄ TKN, NH ₃ | 500mLP, Cool TSS, CBOD, NOx, SO ₄ Cl | pH | Temperature | Conductivity | DO |
| | 01 | BHS3-STE | 12-17-14 | 9:26 | WW | | X | 4 | 2 | 1 | 1 | 2 | | | | 7.26 | 18.27 | 1055 | 0.19 |
| | 02 | BHS3-LY01 | | 9:05 | WW | | X | | 2 | 1 | | 2 | | | | 6.90 | 15.0 | 652 | 5.93 |
| | 03 | BHS3-LY02 | | 9:20 | WW | | X | | 2 | 1 | | 2 | | | | 6.41 | 16.2 | 727 | 6.23 |
| | 04 | BHS3-LINER | | 8:35 | WW | | X | 4 | 2 | 1 | | 2 | | | | 6.80 | 18.5 | 910 | 2.00 |
| | 05 | BHS3-SULFUR-6 | | 9:06 | WW | | X | | | | | | 1 | 1 | | 6.53 | 18.96 | 986 | 1.11 |
| | 06 | BHS3-ST2 | | 8:20 | WW | | X | 4 | | 1 | 1 | 2 | | | 2 | 6.59 | 18.49 | 1067 | 0.10 |
| | 07 | BHS3-ST2-DUP | | 8:40 | WW | | X | 4 | | 1 | 1 | 2 | | | 2 | 6.59 | 18.49 | 1067 | 0.10 |
| | 08 | BHS3-LY03 | | 11:10 | WW | | X | | | 1 | 1 | | | | 2 | 6.80 | 15.4 | 753 | 6.75 |
| | 09 | BHS3-LY04 | | 9:30 | WW | | X | | | 1 | 1 | | | | 2 | 6.64 | 18.3 | 760 | 6.05 |
| | 10 | BHS3-PZ07 | | 10:28 | WW | | X | 4 | | 1 | 1 | | | | 2 | 6.29 | 18.03 | 596 | 6.61 |
| | 11 | BHS3-PZ08 | | 10:04 | WW | | X | 4 | | 1 | 1 | | | | 2 | 6.56 | 18.54 | 658 | 4.01 |
| | 12 | BHS3-PZ09 | | 10:00 | WW | | X | 4 | | 1 | 1 | | | | 2 | 6.41 | 18.8 | 268 | 6.08 |
| Containers Prepared/Relinquished: | | Date/Time: | Received: | Date/Time: | Seal intact? <input checked="" type="checkbox"/> N NA | | | | | | | | | | | | | | |
| Relinquished: <i>MM</i> | | 120914 | <i>Josefin Hirst</i> | 121014 13:00 | Samples intact upon arrival? <input checked="" type="checkbox"/> N NA | | | | | | | | | | | | | | |
| Relinquished: <i>Josefin Hirst</i> | | 121714 | <i>Scott McCulloch</i> | 121714 11:43 | Received on ice? Temp _____ <input checked="" type="checkbox"/> N NA | | | | | | | | | | | | | | |
| Relinquished: <i>X</i> | | 121714 1350 | <i>Scott McCulloch</i> | | Proper preservatives indicated? <input checked="" type="checkbox"/> N NA | | | | | | | | | | | | | | |
| Relinquished: | | Date/Time: | Received: | Date/Time: | Rec'd within holding time? <input checked="" type="checkbox"/> N NA | | | | | | | | | | | | | | |
| Relinquished: | | Date/Time: | Received: | Date/Time: | Volatiles rec'd w/out headspace? Y N <input checked="" type="checkbox"/> NA | | | | | | | | | | | | | | |
| Relinquished: | | Date/Time: | Received: | Date/Time: | Proper containers used? <input checked="" type="checkbox"/> N NA | | | | | | | | | | | | | | |

1412942

| | | | | | | | | | | | | | | | | | | | |
|--|------------|---------------------------------|------------------------------|-------|---------------------------------|-----------|---|--|---|--|---|--------------------|--|--|--|------|-------------|--------------|------|
| Client Name Hazan and Sawyer | | | | | | | | | | Contact / Phone: Josefin Hirst 813-630-4498 | | | | | | | | | |
| Project Name / Location BHS3 SE#12 | | | | | | | | | | | | | | | | | | | |
| Samplers: (Signature) <i>[Signature]</i> | | | | | | | | | | PARAMETER / CONTAINER DESCRIPTION | | | | | | | | | |
| <p>Matrix Codes: DW-Drinking Water WW-Wastewater SW-Surface Water SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water</p> | | | | | | | | | | | | | | | | | | | |
| SAL Use Only | Sample No. | Sample Description | Date | Time | Matrix | Composite | Grab | 125mLP, Sterile, Na ₂ S ₂ O ₃ FC-MF, FC-QT | 500mLP, Cool TSS, CBOD, NOx, SO ₄ Cl | 125mLP, H ₂ SO ₄ COD, TKN, NH ₃ , TP | 500mLP, NaOH, Zn Acetate H ₂ S | 40mLaV, HCl TOC | 500mLP, Cool CBOD, NOx, SO ₄ | 125mLP, H ₂ SO ₄ TKN, NH ₃ | 500mLP, Cool Nox, Cl, SO ₄ | pH | Temperature | Conductivity | DO |
| | 13 | PZ-A7-6 | 12/17/14 | 11:22 | WW | | X | | | | | | | 1 | 1 | 6.45 | 20.14 | 702 | 2.39 |
| | 14 | PZ-A7-8 | 12/17/14 | 11:34 | WW | | X | | | | | | | 1 | 1 | 6.38 | 20.85 | 461 | 0.81 |
| | 15 | PZ-B8-5 | 12/17/14 | 11:25 | WW | | X | | | | | | | 1 | 1 | 6.19 | 19.7 | 507 | 1.22 |
| | 16 | PZ-B8-5-DUP | 12/17/14 | 11:30 | WW | | X | | | | | | | 1 | 1 | 6.19 | 19.7 | 507 | 1.22 |
| | 17 | PZ-C06-5 | | | WW | | X | | | | | | | 1 | 1 | | | | |
| | 18 | PZ-C10-6 | | | WW | | X | | | | | | | 1 | 1 | | | | |
| | 19 | EB | 12/17/14 | 10:40 | R | | X | 4 | 2 | 1 | 1 | 2 | | | | 6.00 | 17.5 | 194 | 8.41 |
| | 20 | FB | 12/17/14 | 10:50 | R | | X | 4 | 2 | 1 | 1 | 2 | | | | 6.01 | 18.4 | 217 | 8.29 |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| Containers Prepared/ Relinquished: <i>MTM</i> | | Date/Time: <i>120914</i> | Received: <i>[Signature]</i> | | Date/Time: <i>121014 13:00</i> | | Seal intact? <input checked="" type="radio"/> N <input type="radio"/> N/A | | | | Instructions / Remarks <div style="font-size: 2em; font-weight: bold;">1412942</div> | | | | | | | | |
| Relinquished: <i>[Signature]</i> | | Date/Time: <i>121714 11:43</i> | Received: <i>[Signature]</i> | | Date/Time: <i>121714 11:40</i> | | | | Samples intact upon arrival? <input checked="" type="radio"/> N <input type="radio"/> N/A | | | | | | | | | | |
| Relinquished: <i>X</i> | | Date/Time: <i>12-17-14 1350</i> | Received: <i>[Signature]</i> | | Date/Time: <i>12-17-14 1350</i> | | | | Received on ice? Temp _____ <input checked="" type="radio"/> N <input type="radio"/> N/A | | | | | | | | | | |
| Relinquished: | | Date/Time: | Received: | | Date/Time: | | | | Proper preservatives indicated? <input checked="" type="radio"/> N <input type="radio"/> N/A | | | | | | | | | | |
| Relinquished: | | Date/Time: | Received: | | Date/Time: | | | | Rec'd within holding time? <input checked="" type="radio"/> N <input type="radio"/> N/A | | | | | | | | | | |
| | | | | | | | | | Volatiles rec'd w/out headspace? <input checked="" type="radio"/> N <input type="radio"/> N/A | | | | | | | | | | |
| | | | | | | | | | Proper containers used? <input checked="" type="radio"/> N <input type="radio"/> N/A | | | | | | | | | | |



Appendix B: Operation & Maintenance Log

Table B.1
Operation and Maintenance Log

| Date | Description |
|------------|---|
| 7/25/2011 | C-HS2 Groundwater Sample Event 1 |
| 11/30/2011 | C-HS2 Groundwater Sample Event 2 |
| 3/13/2012 | C-HS2 Groundwater Sample Event 3 |
| 7/10/2012 | C-HS2 Groundwater Sample Event 4 |
| 6/14/2013 | PNRS Pre-construction sample event |
| 6/17/2013 | PNRS construction. Old septic tank removed, new septic tank installed |
| | Stage 2 biofilter installed |
| 6/18/2013 | PNRS construction - backfill to set tanks, anchor trench for liner area |
| 6/19/2013 | PNRS construction - liner installed by Comanco |
| | Ligno and sand 50/50 filled to toe of lined area, fill dirt to grade |
| 6/24/2013 | New piezometers PZ-07, PZ-08, and PZ-09 installed and developed |
| | 4 Lysimeters installed |
| 6/26/2013 | Both drip systems covered |
| 7/9/2013 | Electrician installed panel for system |
| 7/11/2013 | Electrician set up panel for hydraulic unit |
| | Dose times and volumes set |
| 7/12/2013 | System start-up |
| | Installed priming tee on pump. Installed treated effluent flowmeter |
| 7/17/2013 | Site visit. System ok. |
| 7/22/2013 | Repaired leaks in feed and return drip lines |
| | Installed new fittings for air release valves |
| 7/29/2013 | Site visit. System ok. |
| 7/31/2013 | Sod installation |
| 8/15/2013 | Preliminary SE#1 |
| 9/5/2013 | Site visit. System ok. |
| 9/8/2013 | Homeowner reported alarm went off at 9 pm |
| 9/9/2013 | System check - high water level in STE dose tank |
| | Both hydraulic unit disc filters severely clogged - not able to dose |
| 9/10/2013 | System check, still high alarm - high water level in STE dose tank |

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| Date | Description |
|------------|--|
| 9/10/2013 | Not able to fix system - need replacement part for hydraulic unit |
| | Septic tank was pumped at 4 pm |
| 9/11/2013 | Homeowner reported no alarms |
| 9/13/2013 | Site visit. System ok. |
| 9/17/2013 | Installed replacement solenoid coil on backwash filter valve #2 |
| | System operational again, septic tank very low volume still after pump-out |
| 9/27/2013 | SE#1 prep |
| | Applied vacuum to lysimeters |
| | Cleaned primary tank effluent screen |
| 9/30/2013 | Sample Event No. 1 |
| 10/11/2013 | Site visit. System ok. Uploaded new program |
| 10/17/2013 | System check |
| | Bio solenoid valve ahead of pump had sand under the diaphragm in valve |
| 11/8/2013 | Site visit. System ok. |
| 11/15/2013 | Site visit. System ok. |
| 11/27/2013 | Site visit. System ok. |
| 12/2/2013 | Sample Event No. 2 preparation |
| 12/4/2013 | Sample Event No. 2 |
| 12/23/2013 | Site visit. System ok. |
| 1/23/2014 | Site visit. System ok. |
| 1/30/2014 | Sample Event No. 3 preparation |
| 2/3/2014 | Sample Event No. 3 |
| 2/4/2014 | Sample Event No. 4 |
| 2/5/2014 | Sample Event No. 5 |
| 2/6/2014 | Sample Event No. 6 |
| 2/7/2014 | Sample Event No. 7 |
| 2/12/2014 | Site visit. System ok. |
| 3/14/2014 | Site visit. System ok. |
| 4/3/2014 | Sample Event No. 8 (formal No. 4) |
| 4/25/2014 | Site visit. System ok. |
| 4/29/2014 | Site visit. System ok. |
| 5/28/2014 | Sample Event No. 9 (formal No. 5) |
| 5/29/2014 | Sample Event No. 9 (formal No. 5) |
| | Collected additives testing samples. |
| 6/9/2014 | Re-sampled BHS3-STE for toxicity testing. |

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| Date | Description |
|------------|--|
| 7/11/2014 | Site visit. Primary tank water level elevated. |
| | Cleaned primary tank effluent screen; severely clogged. |
| | Pumped down STE dose tank to below high level float. |
| 7/29/2014 | Site visit. System ok. |
| 8/21/2014 | Sample Event No. 10 (formal No. 6) |
| 8/22/2014 | Sample Event No. 10 (formal No. 6) |
| 9/19/2014 | Site visit. System ok. |
| 10/21/2014 | Sample Event No. 11 (formal No. 7) preparation. |
| 10/23/2014 | Sample Event No. 11 (formal No. 7) |
| 10/24/2014 | Sample Event No. 11 (formal No. 7) |
| 11/21/2014 | Site visit. System ok. |
| 12/16/2014 | Sample Event No. 12 (formal No. 8) preparation. |
| 12/17/2014 | Sample Event No. 12 (formal No. 8) |
| | Cleaned primary tank and STE dose tank effluent screens. |
| | Replaced treated effluent drip feed air relief valve. |



Appendix C: Weather Station Data

Table C.1
Weather Station Data

| 2014 | Temp. (°F) | | | Dew Point (°F) | | | Humidity (%) | | | Sea Level Pressure (in) | | | Wind (mph) | | | Precip (in) |
|------------|------------|-----|-----|----------------|-----|-----|--------------|-----|-----|-------------------------|-------|-------|------------|-----|------|-------------|
| Oct | high | avg | low | high | avg | low | high | avg | low | high | avg | low | high | avg | gust | sum |
| 10/25/2014 | 81 | 68 | 56 | 61 | 58 | 54 | 93 | 73 | 45 | 30.04 | 30 | 29.95 | 7 | 0 | 7 | 0 |
| 10/26/2014 | 83 | 67 | 53 | 61 | 56 | 50 | 99 | 72 | 32 | 30.06 | 30.01 | 29.97 | 5 | 0 | 5 | 0 |
| 10/27/2014 | 85 | 68 | 54 | 67 | 61 | 53 | 99 | 80 | 44 | 30.14 | 30.09 | 30.04 | 11 | 1 | 11 | 0 |
| 10/28/2014 | 87 | 71 | 57 | 70 | 64 | 57 | 99 | 82 | 46 | 30.21 | 30.16 | 30.11 | 8 | 0 | 8 | 0 |
| 10/29/2014 | 88 | 72 | 61 | 71 | 64 | 59 | 99 | 79 | 40 | 30.15 | 30.08 | 30.01 | 5 | 0 | 5 | 0 |
| 10/30/2014 | 86 | 72 | 61 | 70 | 64 | 61 | 99 | 80 | 51 | 30.04 | 29.97 | 29.89 | 6 | 0 | 6 | 0 |
| 10/31/2014 | 80 | 69 | 57 | 66 | 58 | 45 | 97 | 70 | 33 | 29.92 | 29.86 | 29.81 | 8 | 0 | 9 | 0 |
| 2014 | Temp. (°F) | | | Dew Point (°F) | | | Humidity (%) | | | Sea Level Pressure (in) | | | Wind (mph) | | | Precip (in) |
| Nov | high | avg | low | high | avg | low | high | avg | low | high | avg | low | high | avg | gust | sum |
| 11/1/2014 | 62 | 56 | 43 | 53 | 39 | 26 | 90 | 58 | 27 | 30.2 | 30.05 | 29.89 | 15 | 1 | 15 | 0 |
| 11/2/2014 | 66 | 51 | 39 | 44 | 39 | 33 | 90 | 68 | 30 | 30.35 | 30.27 | 30.19 | 9 | 0 | 11 | 0 |
| 11/3/2014 | 74 | 58 | 42 | 56 | 50 | 40 | 92 | 74 | 48 | 30.41 | 30.36 | 30.31 | 12 | 1 | 14 | 0 |
| 11/4/2014 | 80 | 65 | 53 | 62 | 58 | 52 | 98 | 79 | 43 | 30.36 | 30.3 | 30.23 | 12 | 1 | 13 | 0 |
| 11/5/2014 | 82 | 69 | 59 | 68 | 61 | 58 | 98 | 80 | 47 | 30.29 | 30.23 | 30.16 | 13 | 1 | 13 | 0 |
| 11/6/2014 | 84 | 70 | 58 | 68 | 61 | 58 | 99 | 78 | 46 | 30.2 | 30.1 | 29.99 | 6 | 0 | 6 | 0 |
| 11/7/2014 | 76 | 66 | 52 | 66 | 55 | 48 | 98 | 72 | 42 | 30.04 | 30 | 29.95 | 8 | 0 | 8 | 0 |
| 11/8/2014 | 78 | 63 | 50 | 65 | 57 | 49 | 98 | 82 | 56 | 30.02 | 29.94 | 29.87 | 8 | 0 | 8 | 0.06 |
| 11/9/2014 | 69 | 63 | 58 | 63 | 60 | 57 | 98 | 91 | 75 | 29.98 | 29.93 | 29.88 | 7 | 0 | 7 | 0.25 |
| 11/10/2014 | 69 | 63 | 58 | 66 | 61 | 56 | 98 | 93 | 85 | 29.98 | 29.95 | 29.93 | 6 | 0 | 8 | 0.19 |
| 11/11/2014 | 80 | 66 | 56 | 67 | 60 | 53 | 95 | 81 | 57 | 30 | 29.95 | 29.9 | 10 | 0 | 10 | 0 |
| 11/12/2014 | 78 | 63 | 51 | 62 | 55 | 50 | 98 | 78 | 44 | 30.1 | 30.04 | 29.98 | 6 | 0 | 6 | 0 |
| 11/13/2014 | 81 | 67 | 55 | 64 | 58 | 49 | 98 | 77 | 34 | 30.11 | 30.05 | 29.99 | 4 | 0 | 4 | 0 |
| 11/14/2014 | 69 | 61 | 51 | 63 | 57 | 48 | 98 | 88 | 61 | 30.2 | 30.11 | 30.02 | 3 | 0 | 5 | 0 |
| 11/15/2014 | 75 | 60 | 46 | 62 | 55 | 44 | 96 | 84 | 62 | 30.28 | 30.22 | 30.16 | 9 | 0 | 9 | 0 |
| 11/16/2014 | 82 | 68 | 53 | 68 | 62 | 52 | 99 | 84 | 57 | 30.24 | 30.15 | 30.07 | 8 | 0 | 8 | 0.01 |
| 11/17/2014 | 84 | 72 | 67 | 74 | 69 | 66 | 99 | 92 | 69 | 30.07 | 29.99 | 29.9 | 13 | 1 | 13 | 1.1 |
| 11/18/2014 | 68 | 50 | 42 | 67 | 45 | 34 | 98 | 83 | 55 | 30.35 | 30.17 | 29.98 | 8 | 0 | 8 | 0.05 |
| 11/19/2014 | 59 | 48 | 38 | 50 | 40 | 31 | 93 | 77 | 63 | 30.41 | 30.35 | 30.29 | 9 | 1 | 10 | 0 |
| 11/20/2014 | 65 | 51 | 40 | 49 | 43 | 33 | 93 | 75 | 43 | 30.34 | 30.28 | 30.22 | 9 | 0 | 9 | 0 |
| 11/21/2014 | 73 | 61 | 49 | 58 | 52 | 42 | 89 | 72 | 51 | 30.34 | 30.29 | 30.24 | 14 | 1 | 15 | 0 |
| 11/22/2014 | 71 | 66 | 60 | 68 | 64 | 58 | 98 | 93 | 84 | 30.31 | 30.22 | 30.13 | 12 | 1 | 13 | 0.13 |
| 11/23/2014 | 84 | 76 | 69 | 75 | 72 | 67 | 98 | 89 | 67 | 30.13 | 30 | 29.88 | 13 | 2 | 13 | 0.11 |
| 11/24/2014 | 87 | 78 | 73 | 75 | 72 | 70 | 97 | 84 | 58 | 30.05 | 29.99 | 29.93 | 11 | 1 | 11 | 0 |
| 11/25/2014 | 75 | 72 | 68 | 73 | 71 | 68 | 99 | 97 | 89 | 30.04 | 29.97 | 29.89 | 15 | 0 | 15 | 4.61 |
| 11/26/2014 | 72 | 58 | 46 | 71 | 56 | 46 | 99 | 94 | 74 | 30.24 | 30.05 | 29.85 | 13 | 1 | 13 | 0.26 |
| 11/27/2014 | 70 | 54 | 41 | 54 | 45 | 39 | 99 | 73 | 40 | 30.32 | 30.26 | 30.19 | 9 | 0 | 11 | 0.01 |
| 11/28/2014 | 61 | 50 | 40 | 45 | 41 | 34 | 90 | 73 | 52 | 30.37 | 30.33 | 30.28 | 14 | 1 | 14 | 0 |
| 11/29/2014 | 71 | 55 | 42 | 57 | 50 | 41 | 98 | 83 | 55 | 30.36 | 30.32 | 30.28 | 10 | 0 | 10 | 0 |
| 11/30/2014 | 76 | 61 | 48 | 62 | 55 | 48 | 99 | 84 | 54 | 30.38 | 30.33 | 30.29 | 10 | 1 | 11 | 0 |

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Table C.1
Weather Station Data (continued)

| 2014 Dec | Temp. (°F) | | | Dew Point (°F) | | | Humidity (%) | | | Sea Level Pressure (in) | | | Wind (mph) | | | Precip (in) |
|-------------|------------|-----|-----|----------------|-----|-----|--------------|-----|-----|-------------------------|-------|-------|------------|-----|------|-------------|
| | high | avg | low | high | avg | low | high | avg | low | high | avg | low | high | avg | gust | sum |
| 12/1/2014 | 79 | 66 | 54 | 66 | 60 | 53 | 99 | 85 | 63 | 30.38 | 30.32 | 30.26 | 20 | 1 | 20 | 0 |
| 12/2/2014 | 78 | 68 | 58 | 68 | 64 | 58 | 99 | 88 | 70 | 30.29 | 30.24 | 30.18 | 14 | 1 | 15 | 0.01 |
| 12/3/2014 | 80 | 68 | 59 | 68 | 63 | 59 | 99 | 86 | 57 | 30.25 | 30.2 | 30.16 | 11 | 1 | 11 | 0 |
| 12/4/2014 | 81 | 70 | 62 | 67 | 65 | 62 | 99 | 84 | 57 | 30.26 | 30.22 | 30.17 | 8 | 1 | 12 | 0 |
| 12/5/2014 | 80 | 70 | 64 | 69 | 66 | 64 | 98 | 88 | 67 | 30.3 | 30.26 | 30.22 | 11 | 1 | 11 | 0.01 |
| 12/6/2014 | 81 | 71 | 65 | 70 | 67 | 64 | 99 | 89 | 64 | 30.26 | 30.19 | 30.12 | 5 | 0 | 5 | 0.01 |
| 12/7/2014 | 71 | 65 | 59 | 66 | 62 | 56 | 98 | 89 | 74 | 30.16 | 30.12 | 30.09 | 12 | 1 | 12 | 0.11 |
| 12/8/2014 | 66 | 60 | 54 | 65 | 59 | 52 | 98 | 96 | 91 | 30.15 | 30.11 | 30.07 | 11 | 1 | 11 | 0.11 |
| 12/9/2014 | 65 | 55 | 46 | 53 | 48 | 43 | 93 | 79 | 51 | 30.12 | 30.07 | 30.02 | 7 | 0 | 9 | 0 |
| 12/10/2014 | 63 | 50 | 38 | 46 | 42 | 37 | 98 | 78 | 41 | 30.18 | 30.13 | 30.08 | 6 | 0 | 6 | 0 |
| 12/11/2014 | 62 | 50 | 37 | 47 | 43 | 36 | 99 | 81 | 50 | 30.24 | 30.18 | 30.13 | 10 | 0 | 10 | 0 |
| 12/12/2014 | 64 | 49 | 40 | 46 | 42 | 33 | 98 | 80 | 34 | 30.31 | 30.26 | 30.21 | 2 | 0 | 4 | 0 |
| 12/13/2014 | 68 | 50 | 38 | 48 | 40 | 27 | 99 | 74 | 22 | 30.25 | 30.19 | 30.12 | 5 | 0 | 6 | 0.01 |
| 12/14/2014 | 70 | 52 | 38 | 46 | 40 | 36 | 98 | 72 | 29 | 30.15 | 30.1 | 30.06 | 5 | 0 | 5 | 0 |
| 12/15/2014 | 70 | 51 | 38 | 51 | 41 | 32 | 99 | 76 | 25 | 30.18 | 30.14 | 30.09 | 4 | 0 | 4 | 0 |
| 12/16/2014 | 74 | 56 | 40 | 58 | 47 | 40 | 99 | 77 | 32 | 30.24 | 30.18 | 30.13 | 4 | 0 | 7 | 0 |
| 12/17/2014 | 72 | 60 | 48 | 58 | 53 | 45 | 98 | 80 | 40 | 30.25 | 30.18 | 30.11 | 5 | 0 | 5 | 0 |