



Florida Onsite Sewage Nitrogen Reduction Strategies Study

Task A.25

PNRS II Test Facility Sample Event Report No. 7

Progress Report

September 2011

44237.001

HAZEN AND SAWYER
Environmental Engineers & Scientists

In association with



AET
Applied Environmental Technology

**OTIS
ENVIRONMENTAL
CONSULTANTS, LLC**

Florida Onsite Sewage Nitrogen Reduction Strategies Study

TASK A.25 PROGRESS REPORT

PNRS II Test Facility Sample Event Report No. 7

Prepared for:

Florida Department of Health
Division of Environmental Health
Bureau of Onsite Sewage Programs
4042 Bald Cypress Way Bin #A-08
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FDOH Contract CORCL

September 2011

Prepared by:

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1.0 Background

Task A of the Florida Onsite Sewage Nitrogen Reduction Strategies Study includes the evaluation of passive treatment systems to remove nitrogen from septic tank effluent. The Passive Nitrogen Removal Study II (PNRS II) is a follow-up to the previous experimental evaluations of passive nitrogen removal technologies conducted in Passive Nitrogen Removal Study I. The objective of the PNRS II study is to extend the field pilot testing of the two-stage biofiltration process that was initiated in PNRS I. A unique test facility was constructed for the purpose of this evaluation. The Task A.15 PNRS II Quality Assurance Project Plan (QAPP) documents the objectives, experimental biofiltration systems, monitoring framework, sample frequency and duration, and analytical methods to be used at the PNRS II Test Facility.

2.0 Purpose

This sample event report documents data collected from the seventh PNRS II monitoring and sampling event which was conducted September 15, 2011. This monitoring event consisted of an assessment and evaluation of PNRS II operation, measurement of flowrates for all systems and flowrate adjustment if warranted, measurement of field parameters, and collection of biofilter influent, intermediate and effluent samples and their analyses in a NELAC certified laboratory.

3.0 Materials and Methods

3.1 Project Site

The PNRS II Test Facility is located at the University of Florida Gulf Coast Research and Education Center (GCREC) in southeast Hillsborough County, Florida. The specially designed facility enables the simultaneous operation and performance testing of numerous biofilter treatment trains in parallel using the same wastewater source. The source of the influent wastewater is the septic tank effluent from the existing onsite wastewater system serving the GCREC. Details of the design and construction of the PNRS II test facility were presented previously in Task A.17, A.18, A.19, and A.24 documents.

3.2 Modifications of PNRS II Systems Monitoring

The results of Sample Event No. 1 through 6 and careful observation of PNRS II systems were used to formulate recommendations for modifications to the test systems at the GCREC pilot facility. The modifications that were made following Sample Event No. 6 are presented in this section. All recommendations were based on the overall goal of PNRS II: to provide functional specifications for modular biofiltration components for passive onsite nitrogen reducing wastewater treatment systems.

3.2.1 Modify Operation

Following Sample Event No. 6, a track record of acceptable performance had been established for many PNRS II systems and increasing the flowrates was recommended. The following modifications were made:

Stage 1 Biofilters

- Expanded clay and clinoptilolite media
 - increase loading rates:
 - Single pass: 3 gal/ft²-day to 5 gal/ft²-day STE on June 28, 2011
 - Recycle: 3 gal/ft²-day to 6 gal/ft²-day STE on May 31, 2011

Stage 2 Biofilters

- Sulfur
 - increase loading rates:
 - Single pass coupled: single pass Stage 1 effluent
5.6 to 9.3 gal/ft²-day; 25.7 to 15.4 hour mean pore water residence time (MPWRT) on June 28, 2011
 - Horizontal: Stage 1 w/recycle combined effluent
10 to 20 gal/ft²-day; 43 to 21.5 hour MPWRT on June 28, 2011
- Glycerol
 - increase loading rate:
 - 10 to 20 gal/ft²-day; 43 to 21.5 hour MPWRT on June 28, 2011

3.3 Monitoring and Sampling Locations and Identification

A schematic of the PNRS II test facility is shown in Figure 1. Septic tank effluent (STE) from GCREC is pumped from PNRS II-STE-T1 into the PNRS II systems through five points of entry: Hydro-1, Hydro-2, UNSAT-IS-1, UNSAT-IS2 and UNSAT-IS3. PNRS II biofilters are grouped into the four types of systems shown in Figure 1, Group I, II, III and IV systems. The nomenclature and reactor/sample identification used for the PNRS II test facility sampling events are listed in Table 1. The sample designations listed in Table 1 also largely correspond to the locations at which flow volumes are measured in each sample event.

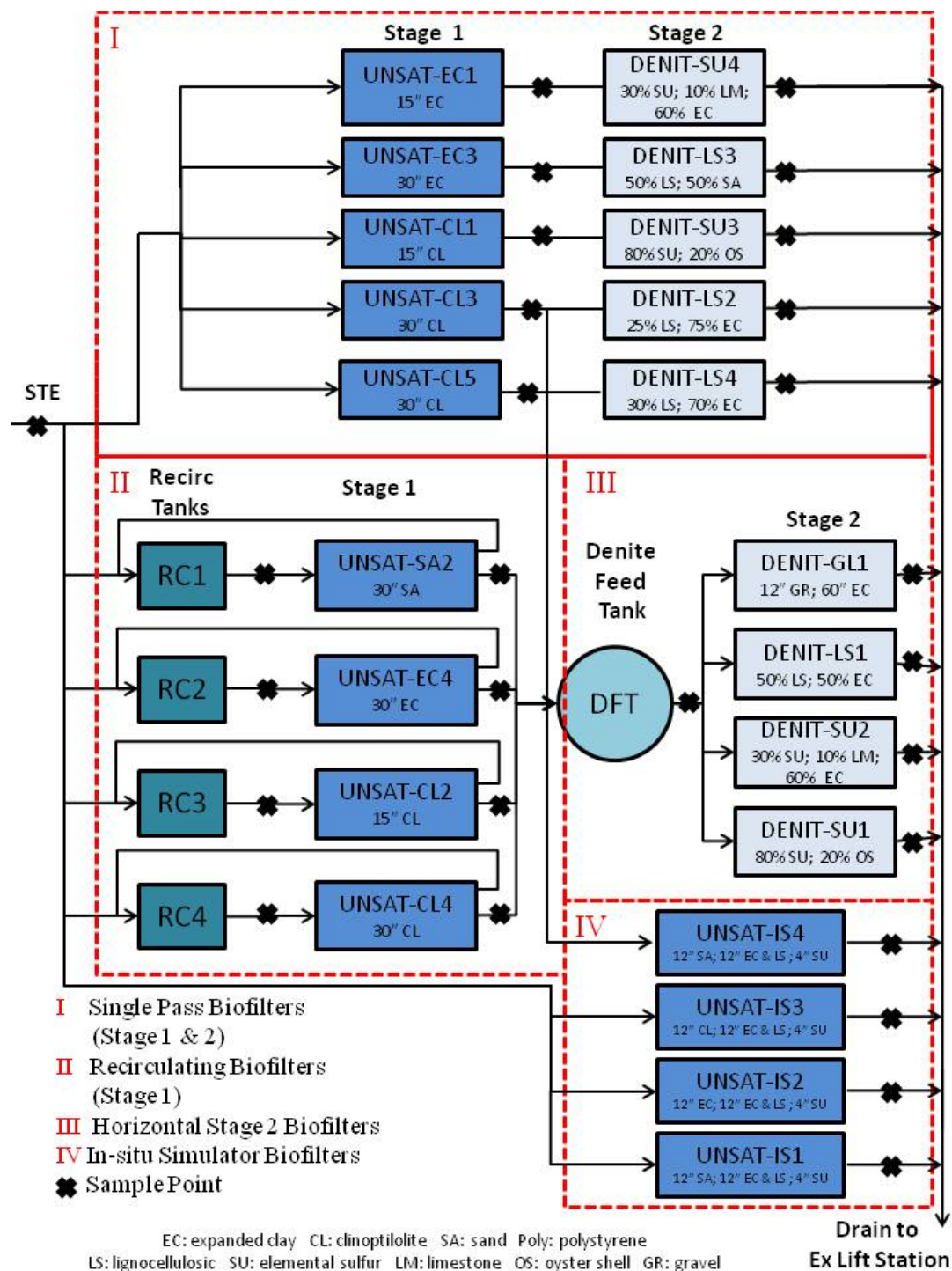


Figure 1
PNRS II Test Facility System Schematic

Table 1
PNRS II Sample Identification

Group (Figure 1)	Sample Location	Sample Identification
	STE PNRS II Storage Tank 1	PNRS II-STE-T1
I	Stage 1 Single Pass Biofilters	UNSAT-EC1
		UNSAT-EC3
		UNSAT-CL1
		UNSAT-CL3
		UNSAT-CL5
	Stage 2 Single Pass Upflow Biofilters	DENIT-SU4
		DENIT-LS3
		DENIT-SU3
		DENIT-LS2
		DENIT-LS4
II	Recirculation Tanks	RC1
		RC2
		RC3
		RC4
	Stage 1 Recirculating Biofilters	UNSAT-SA2
		UNSAT-EC4
		UNSAT-CL2
		UNSAT-CL4
III	Denite Feed Collection Tank	DFT
	Stage 2 Horizontal Biofilters	UNSAT-SU1
		UNSAT-SU2
		UNSAT-LS1
		UNSAT-GL1
IV	In-Situ In-Tank Simulator Single Pass Biofilter	UNSAT-IS1
		UNSAT-IS2
		UNSAT-IS3
		UNSAT-IS4
	In-Situ In-Tank Simulator Single Pass Biofilter Sample Port (below EC & LS mixture and above SU layer)	UNSAT-IS1-SP
		UNSAT-IS2-SP
		UNSAT-IS3-SP
		UNSAT-IS4-SP

3.4 Operational Monitoring

Start-up of the PNRS II test facility occurred on May 17th, 2010 and all systems have operated continually since that time. However, August 11-15, 2011 the programmable logic controller (PLC) was not operating likely because of a lightning storm. The entire facility operation is checked at least once per week and a detailed log of operational observations and activities is maintained. In addition, the programmable logic controller (PLC) which controls many of the dosing and pump controls also records pump run times and

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flow data from flow meters at the facility, and these data can provide useful insight into facility operations. Appendix A provides summary tables of the PLC recorded data of daily runtimes and flows for the test facility between May 19th and September 14th (Day 367 through Day 485 since start-up) used to check general pump operation and performance.

3.5 Water Quality Sample Collection and Analyses

Influent and effluent water quality samples from the PNRS II test systems for Sample Event 7 were collected September 15, 2011. A sample of STE was collected from the feed line connecting STE Storage Tank 1 (PNRS II-STE-T1) to Hydrosplitter 1 which supplies STE to the single pass Stage 1 biofilters (Figure 1). A manual dose event was initiated on the control panel until sufficient STE sample volume was collected in a clean sample container. Stage 1, 2, and in-situ simulator biofilter and recirculation tank effluents were each sampled by directing the entire flow from the biofilter into a large, clean sample container over a period of time sufficient to obtain the desired sample volume (approximately 3.5 liters). Sample containers were immediately placed in coolers on ice prior to subdivision of the composited sample.

The composite samples in the 3.5 liter sample containers were then subdivided into analysis-specific sample containers. 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 laboratory. 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 D, were used to document the transfer of samples from field personnel to the analytical laboratory. One chain of custody form was filled out for each set of samples and placed inside the cooler.

Equipment blank, field blank, and field sample duplicates were taken. The equipment blank was collected using a previously cleaned STE sample collection bottle. The bottle was filled with distilled water provided by the laboratory and allowed to sit for eight minutes. The sample containers were then analyzed for the same parameters as the samples. The field blank was collected by filling sample containers with distilled water that had been transported from the laboratory into the field along with other sample containers. The field sample duplicates were collected immediately subsequent to the regular samples from the same composite sample. The duplicate sample containers for this event were filled with PNRS II T1-STE effluent, DENIT-LS3, DENIT-SU3 effluent, and DENIT-LS4 effluent. Additionally, laboratory split samples were collected immediately subsequent to the regular samples from the same composite samples. The laboratory

split sample containers for this event were filled with PNRS II T1-STE effluent and UN-SAT-IS1 effluent.

Field parameters were measured using portable electronic probes and included temperature (Temp), dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, and specific conductance. Temperature (Temp), dissolved oxygen (DO), and oxidation-reduction potential (ORP) were measured with probe tips placed in flow through samplers located directly in the outlet pipe at each sample location. Specific conductance and pH were measured using external sample collection reservoirs. Field parameter results are listed in Appendix B. The influent and effluent samples were analyzed by the laboratory for: total alkalinity, total Kjeldahl nitrogen (TKN-N), ammonia nitrogen (NH₃-N), nitrate nitrogen, (NO₃-N), nitrite nitrogen (NO₂-N), carbonaceous biochemical oxygen demand (CBOD₅), total suspended solids (TSS), and fecal coliform (fecal). For some of the denitrification biofilters containing elemental sulfur media, influent and effluent sample analyses were also conducted for sulfate (SO₄) and hydrogen sulfide (H₂S). Table 2 lists the analytical parameters, analytical methods, and detection limits for these analyses.

Table 2
Analytical Parameters, Method of Analysis, and Detection Limits

Analytical Parameter	Method of Analysis	Laboratory Detection Limit (mg/L)
Total Alkalinity as CaCO ₃	SM 2320B	2 mg/L
Total Kjeldahl Nitrogen (TKN-N)	EPA351.2	0.05 mg/L
Ammonia Nitrogen (NH ₃ -N)	EPA350.1	0.01 mg/L
Nitrite (NO ₂ -N)	EPA300.0	0.01 mg/L
Nitrate (NO ₃ -N)	EPA300.0	0.01 mg/L
Carbonaceous BOD (CBOD ₅)	SM 5210B	2 mg/L
Total Dissolved Solids (TDS)	SM 2540C	10 mg/L
Total Suspended Solids (TSS)	SM 2540D	1 mg/L
Chemical Oxygen Demand (COD)	EPA 410.4	10 mg/L
Orthophosphate as P	EPA 300.0	0.01 mg/L
Total Phosphorus (TP)	SM 4500PE	0.01 mg/L
Fecal Coliform (fecal)	SM9222D	1 ct/100mL
Sulfate (SO ₄)	EPA300.0	0.2 mg/L
Hydrogen Sulfide Unionized (H ₂ S)	SM4500S F	0.01 mg/L
Sulfide	SM4500S F	0.1 mg/L

3.5 Flow Monitoring

Flow rates for all PNRS II systems were calibrated at initial start-up and when the hydraulic loading rate was increased. The flow rates are measured at each sampling event and adjusted as necessary to maintain flow rates consistent with the experimental de-

sign. Flow measurements and adjustments are made after collection of liquid samples and field parameter analyses.

A flow test was conducted September 16, 2011. These flow measurements are considered to represent those in effect leading up to and during Sample Event 7. The measured volumes and relative errors between measured and target flow rates are presented in Appendix C, Table 1. For the Group I systems, the measured STE inputs to the five Stage 1 biofilters were within 15% of the target volume. Measured effluent volumes for Stage 1 single pass biofilters (Stage 2 influent) for the five biofilters were within 17% of the target volume for four of the five systems (Table C.1). The UNSAT-SU3 biofilter influent was 24% higher than the target volume indicating that there may be a plug in the influent line.

For the Group II systems, all measured STE volumes to the Stage 1 recirculation tanks were within 9% of target volumes. The four recycle flow volumes as recorded by the PLC were within 5% of target volumes based on the increased experimental design recycle ratio of 5.0. The calculated recycle ratios (i.e. recycle flow volume divided by the STE flow volume) for the four recirculation systems were within 15% of the target recycle ratio of 5.0.

For Group III systems, the measured influent volumes to the Stage 2 horizontal denitrification biofilters were all within 2% of target.

For Group IV biofilters, the UNSAT-IS1 measured influent volume was within 36% of the target volume. The UNSAT-IS2 measured influent volume was within 65% of the target volume. Both of these biofilters are dosed using the same pump and were not within the target volume. The UNSAT-IS3 and UNSAT-IS4 measured influent volumes were within 5% of target volumes.

Appendix A: PLC Data

Table A.1
Summary of PLC Recorded Daily Flows
(5/19/11 – 9/14/11)

Date Range		Average Recorded Flow (gpd)	Std. Dev.	MIN (gpd)	MAX (gpd)	Target Flow (gpd)	Relative Error ¹ (%)
Before Hydraulic Loading Rate Increase							
5/19/11-6/28/11	Pump 4 to Hydro 1	72	8.1	36	79	73.7	-2.7%
5/19/11-5/30/11	Pump 14 to Hydro 2	61	0.7	60	62	58.9	3.5%
	Pump 6 to Recirc. System 1	43	0.5	43	44	44.2	-1.9%
	Pump 7 to Recirc. System 2	45	0.7	43	45	44.2	1.1%
	Pump 8 to Recirc. System 3	43	0.5	43	44	44.2	-1.9%
	Pump 9 to Recirc. System 4	44	0.5	43	44	44.2	-0.9%
Following Hydraulic Loading Rate Increase							
6/29/11-9/14/11	Pump 4 to Hydro 1	127	2.7	123	132	122.7	3.7%
5/31/11-9/14/11	Pump 14 to Hydro 2	114	33.6	0	141	117.8	-3.5%
	Pump 6 to Recirc. System 1	142	1.2	137	144	147.2	-3.6
	Pump 7 to Recirc. System 2	148	1.1	142	150	147.2	0.6
	Pump 8 to Recirc. System 3	146	0.8	141	147	147.2	-0.9
	Pump 9 to Recirc. System 4	140	18.7	17	145	147.2	-4.9

¹Relative Error = (Recorded Flow – Target Flow)/ Target Flow *100

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Table A.2
Summary of PLC Recorded Daily Runtimes
(5/19/11 – 9/14/11)

Date Range		Average Recorded Daily Runtime (min/day)	Std. Dev.	MIN (min)	MAX (min)	Target Daily Runtime (min)	Relative Error ¹ (%)
Before Hydraulic Loading Rate Increase							
5/19/11-6/28/11	Pump 4 to Hydro 1	17.6	0.5	17	18	17.2	2.2
5/19/11-5/30/11	Pump 14 to Hydro 2	12.3	0.9	12	15	11.6	5.6
	Pump 6 to Recirc. System 1	6.4	0.5	6	7	6	6.9
	Pump 7 to Recirc. System 2	6.4	0.5	6	7	6	6.9
	Pump 8 to Recirc. System 3	6.4	0.5	6	7	6	6.9
	Pump 9 to Recirc. System 4	6.3	0.5	6	7	6	5.6
Following Hydraulic Loading Rate Increase							
6/29/11-9/14/11	Pump 4 to Hydro 1	31.7	1.1	31	40	31.2	1.57
5/31/11-9/14/11	Pump 14 to Hydro 2	27.7	1	26	36	27.2	1.7
	Pump 6 to Recirc. System 1	21.2	0.7	20	27	20.8	2.1
	Pump 7 to Recirc. System 2	21.2	0.8	20	28	20.8	2.1
	Pump 8 to Recirc. System 3	21.6	0.8	21	28	21.2	2.1
	Pump 9 to Recirc. System 4	21.2	0.7	20	27	20.8	2.1

¹Relative Error = (Recorded Runtime – Target Runtime)/ Target Runtime *100

²Pump 4 Runtime was increased to increase UNSAT-PS1 STE influent volume to target level

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Appendix B: Field Parameter Analyses

Table B.1
Field Parameter Results
(September 15, 2011)

Sample Identification	pH	Temperature (°C)	Specific Conductance (µS)	Dissolved Oxygen (mg/L)	ORP (mV)
STE					
STE-Tank 1	7.4	28.4	820	4.00	-262.2
STE-Tank 1-D	7.4	28.4	820	4.00	-262.2
Stage 1 Single Pass Biofilter Effluent					
UNSAT-EC1	7.0	28.8	810	3.87	57.6
UNSAT-EC3	7.1	28.7	826	5.63	25.3
UNSAT-CL1	7.4	28.7	825	6.60	42.9
UNSAT-CL3	7.3	28.2	903	6.38	24.8
UNSAT-CL5	7.5	28.8	817	6.74	14.3
Stage 2 Single Pass Upflow Biofilter Effluent					
DENIT-SU4	7.2	26.8	1,004	0.1	-355.8
DENIT-LS3	7.4	27.2	739	2.29	-159.6
DENIT-LS3-D	7.4	27.2	739	2.29	-159.6
DENIT-SU3	7.4	27.0	1,126	0.1	-354.9
DENIT-SU3-D	7.4	27.0	1,126	0.1	-354.9
DENIT-LS2	7.5	26.8	862	3.14	19.1
DENIT-LS4	7.7	26.3	809	3.31	21.5
DENIT-LS4-D	7.7	26.3	809	3.31	21.5
Recirculation Tank Effluent					
RC1	7.3	6.8	706	0.34	-119.8
RC2	7.2	26.3	696	0.68	-123.4
RC3	7.3	25.8	713	0.1	-128.6
RC4	7.4	26.6	750	0.1	-129.3
Stage 1 Recirculating Biofilter Effluent					
UNSAT-CL4	7.4	26.3	767	7.20	28.7
UNSAT-CL2	7.2	26.1	697	6.16	29.9
UNSAT-EC4	7.0	26.0	693	7.09	51.7
UNSAT-SA2	7.0	26.0	687	6.67	8.0
Denite Feed Tank (Tank 3)					
DFT	7.4	25.8	711	6.84	6.2
DFT-D	7.4	25.8	711	6.84	6.2

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Sample Identification	pH	Temperature (°C)	Specific Conductance (µS)	Dissolved Oxygen (mg/L)	ORP (mV)
Stage 2 Horizontal Biofilters Effluent					
DENIT-SU1	7.0	22.0	1,004	0.25	-365.9
DENIT-SU2	7.0	22.5	961	0.13	-343.5
DENIT-LS1	7.2	22.2	644	0.27	-284.3
DENIT-GL1	6.6	22.5	794	0.1	-283.5
In-situ Simulator Biofilter Effluent					
UNSAT-IS1 (STE)	6.8	13.4	831	9.54	-158.3
UNSAT-IS2-SP	6.3	29.3	667	1.35	-130.9
UNSAT-IS2 (STE)	7.0	10.1	865	7.71	-59.6
UNSAT-IS3-SP (STE)	NR	NR	NR	NR	NR
UNSAT-IS3 (STE)	7.5	22.9	923	8.23	-13.9
UNSAT-IS4-SP (Nitrified STE)	NR	NR	NR	NR	NR
UNSAT-IS4 (Nitrified STE)	6.8	22.4	1,136	2.11	-222.7
Blanks					
Field Blank	8.2	26.0	35.7	7.86	11.2
Equipment Blank	7.8	25.9	31.7	7.94	7.7

¹NR = No reading was taken.



Appendix C: Flow Test Results

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**Table C.1
Flow Test Results**

Group (Figure 1)	Biofilter/Flow	Target Input			Measured Input		Recycle Ratio		
		Target Input Volume	Dose/day	Target Input Volume	Measured Input Volume	Relative Error (%)	Target Recycle Ratio (RR)	Calculated Recycle Ratio (RR)	Relative Error (%)
		(mL/day)	(Dose/day)	(mL/dose)	(mL/dose)	(Measured Input - Target Input) / Target Input * 100	Volume Recycle / Volume STE	Volume Recycle / Volume STE	Measured RR - Target RR / Measured RR * 100
1	Stage 1 Single Pass Biofilters (Hydrosplitter 1)								
	Date				9/16/11 2:00 PM				
	UNSAT-CL5	92,760	24	3,865	4,180	8.2%			
	UNSAT-CL3				3,460	-10.5%			
	UNSAT-CL1				3,160	-18.2%			
	UNSAT-EC3				4,350	12.5%			
	UNSAT-EC1				3,480	-10.0%			
	Mean				3,726	-3.6%			
	Stage 2 Single Pass Upflow Biofilters								
	Date				9/16/2011 1:00 2:00 pm				
	DENIT-LS4	92,760	24	3,865	3,480	-10.0%			
	DENIT-LS2				4,525	17.1%			
	DENIT-SU3				4,800	24.2%			
	DENIT-LS3				3,580	-7.4%			
	DENIT-SU4				4,060	5.0%			
	Mean				4,089	5.8%			
2	Stage 1 Recirculating Biofilters (Hydrosplitter 2)								
	Date				9/16/2011 STE 9:30 am				
	RC1 : UNSAT-SA2	111,312	24	4,638	5,040	8.7%			
	RC2 : UNSAT-EC4				4,930	6.3%			
	RC3 : UNSAT-CL2				4,660	0.5%			
	RC4 : UNSAT-CL4				4,870	5.0%			
	Mean				4,875	5.1%			
	Stage 1 Recirculating Biofilters (Recycle)				Flowmeter R 9/16/2011				
	RC1 : UNSAT-SA2	556,560	24	23,190	22,237	-4.1%	5:1	4.41	-13.3%
	RC2 : UNSAT-EC4				23,183	0.0%		4.70	-6.3%
	RC3 : UNSAT-CL2				23,025	-0.7%		4.94	-1.2%
	RC4 : UNSAT-CL4				22,710	-2.1%		4.66	-7.2%
	Mean				22,789	-1.7%		4.68	-7.0%
	Stage 1 Recirculating Biofilters (Hydrosplitter + Recycle)								
	RC1 : UNSAT-SA2	667,872	24	27,828	27,277	-2.0%			
	RC2 : UNSAT-EC4				28,113	1.0%			
	RC3 : UNSAT-CL2				27,685	-0.5%			
	RC4 : UNSAT-CL4				27,580	-0.9%			
	Mean				27,664	-0.6%			
3	Horizontal Denitrification Biofilters								
	Date				9/16/11 3:15 PM				
	DENIT-SU1	14,818	24	617.4	635	2.9%			
	DENIT-SU2				630	2.0%			
	DENIT-GL1				580	-6.1%			
	DENIT-LS1				601	-2.7%			
	Mean				612	-1.0%			
4	In-Situ Simulators								
	Date				9/16/11 1:00 PM				
	UNSAT-IS1 (STE)	20,160	24	840	540	-35.7%			
	UNSAT-IS2 (Nitrified STE)	20,640	24	860	302	-64.9%			
					9/16/11 2:00 PM				
	UNSAT-IS3 (STE)	893	24	37	36	-3.2%			
	UNSAT-IS4 (Nitrified STE)				39	4.8%			

Notes: Yellow-shaded cells are measured values; grey-shaded cells are calculated values

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Appendix D: Chain of Custody Forms

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SAL Project No. 1108117

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Chain of Custody

SOUTHERN ANALYTICAL LABORATORIES, INC.

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

SAL Project No.

1108118

Client Name		Hazan and Sawyer		Contact / Phone: Josephin Edeback-Hirst 813-630-4498 jedeback@hazanandsawyer.com	
Project Name / Location		PNRS II SE#7 Wastewater System Analyses			
Samplers: (Signature)					
Matrix Codes:					
Sample Description		Date	Time	Matrix	Grab
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.				
	01	09/15/11	1150	WW	X
	02		1155	WW	X
	03		1145	WW	X
	04		1140	WW	X
	05		1135	WW	X
	06		1130	WW	X
	07		1120	WW	X
	08		1000	WW	X
	09		0950	WW	X
	10		0955	WW	X
	11		0940	WW	X
	12		0945	WW	X
Containers Prepared/Relinquished:		Date/Time: 9-12-11	Received: 9/12/11	Date/Time: 1220	Seal intact?
Relinquished:		Date/Time: 1320	Received:	Date/Time: 9/12/11	Samples intact upon arrival?
Relinquished:		Date/Time: 9/15/11	Received:	Date/Time:	Received on ice? Temp:
Relinquished:		Date/Time:	Received:	Date/Time:	Proper preservatives indicated?
Relinquished:		Date/Time:	Received:	Date/Time:	Rec'd within holding time?
Relinquished:		Date/Time:	Received:	Date/Time:	Volatiles rec'd w/out headspace?
Relinquished:		Date/Time:	Received:	Date/Time:	Proper containers used?

Chain of Custody #48
Rev Date 11/19/01

Chain of Custody

1108118

Limited sample volume.

STE Tank DO Retained on 9/16/11. DO reading 0.87 Per Josephin

No. of Containers (Total per each location) 070

Field pH

Field Cond

Field Temp

Field DO

125ml P, sterile, Na₂S₂O₃
Fecal Coliforms (MF)

500ml P, NaOH/Zn Acetate
H₂S

500ml P, Cool
Alk, CBOD, TSS

500ml P, Cool
Alk, SO₄, CBOD, TSS

125ml P, H₂SO₄
TKN, NH₃, NO₃, COD

Composite

Grab

SOUTHERN ANALYTICAL LABORATORIES, INC.

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

SAL Project No.

1108118

Client Name		Hazan and Sawyer		Contact / Phone: Josephin Edeback-Hirst 813-630-4498 jedeback@hazanandsawyer.com														
Project Name / Location		PNRS II SE#7 Wastewater System Analyses																
Samplers: (Signature)																		
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	125mL P, H ₂ SO ₄ TKN, NH ₃ , NO _x , COD	500mL P, Cool Alk, SO ₄ , CBOD, TSS	500mL P, Cool Alk, CBOD, TSS	500mL P, NaOH/Zn Acetate H ₂ S	125mL P, sterile, Na ₂ S ₂ O ₃ Fecal Coliforms (MF)	Field DO	Field Temp	Field Cond	Field pH	No. of Containers (Total per each location)	
	13	DENIT-LS2-REV	09/15/11	0935	WW		X	1		1		1	3.14	26.8	862	7.5	19.1	
	14	DENIT-LS4-REV	09/15/11	0925	WW		X	1		1		1	3.31	26.3	809	7.7	21.5	
	15	DENIT-LS4-REV-D	09/15/11	0930	WW		X	1		1		1	3.31	26.3	809	7.7	21.5	
	16	RC1	09/15/11	1005	WW		X	1		1		1	0.34	26.8	706	7.3	119.8	
	17	RC2	09/15/11	1010	WW		X	1		1		1	0.68	26.3	696	7.2	123.4	
	18	RC3	09/15/11	1015	WW		X	1		1		1	0.06	25.8	713	7.3	128.6	
	19	RC4	09/15/11	1020	WW		X	1		1		1	0.09	26.6	750	7.4	129.3	
	20	UNSAT-CL4	09/16/11	0855	WW		X	1		1		1	7.20	26.3	767	7.4	28.7	
	21	UNSAT-CL2	09/15/11	0910	WW		X	1		1		1	6.16	26.1	697	7.2	29.9	
	22	UNSAT-EC4	09/15/11	0920	WW		X	1		1		1	7.09	26.0	673	7.0	51.7	
	23	UNSAT-SA2	09/15/11	0900	WW		X	1		1		1	6.67	26.0	687	7.0	8.0	
	24	DFT	09/15/11	0820	WW		X	1		1		1	6.84	25.8	711	7.4	6.2	
Containers Prepared/Relinquished:		Date/Time: 9-12-11	Received:															
Relinquished:		Date/Time: 1035	Received:															
Relinquished:		Date/Time: 09/15/11	Received:															
Relinquished:		Date/Time: 9-15-11	Received:															
Relinquished:		Date/Time: 11:50	Received:															
Relinquished:		Date/Time:	Received:															
Relinquished:		Date/Time:	Received:															

Instructions / Remarks
1108118
Limited sample volume.

Chain of Custody

Chain of Custody 246
Rev Date 11/19/01

1108118

SAL Project No.

1108118

[illegible]

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

Chain of Custody

SAL Project No.

1108119

Client Name		Hazen and Sawyer		PNRS II SE#7 Wastewater System Analyses		Contact / Phone:	
Project Name / Location		Hazen and Sawyer		PNRS II SE#7 Wastewater System Analyses		Josephin Edeback-Hirst 813-630-4498	
Samplers: (Signature)		[Signature]		PNRS II SE#7 Wastewater System Analyses		jedeback@hazanandsawyer.com	
Matrix Codes:		Matrix		PARAMETER / CONTAINER DESCRIPTION			
Sample Description		Date	Time	Matrix	Composite	Grab	
SAL Use Only Sample No.	Sample Description	Date	Time	Matrix	Composite	Grab	
01	DENIT-SU4-18	09/16/11	1115	WW		X	125mL P, H ₂ SO ₄ COD
02	DENIT-SU4-12	09/16/11	1110	WW		X	125mL P, Cool SO ₄ , NO ₂ , NO ₃
03	DENIT-SU4-7	09/16/11	1105	WW		X	125mL P, Cool NO ₃ , NO ₂
04	DENIT-SU4-3	09/16/11	1100	WW		X	125mL P, Cool NO ₃ , NO ₂
05	DENIT-LS3-18	09/16/11	1055	WW		X	125mL P, Cool NO ₃ , NO ₂
06	DENIT-LS3-12	09/16/11	1050	WW		X	125mL P, Cool NO ₃ , NO ₂
07	DENIT-LS3-7	09/16/11	1045	WW		X	125mL P, Cool NO ₃ , NO ₂
08	DENIT-LS3-3	09/16/11	1040	WW		X	125mL P, Cool NO ₃ , NO ₂
09	DENIT-SU3-18	09/16/11	1010	WW		X	125mL P, Cool NO ₃ , NO ₂
10	DENIT-SU3-12	09/16/11	1005	WW		X	125mL P, Cool NO ₃ , NO ₂
11	DENIT-SU3-7	09/16/11	1000	WW		X	125mL P, Cool NO ₃ , NO ₂
12	DENIT-SU3-3	09/16/11	0955	WW		X	125mL P, Cool NO ₃ , NO ₂
Containers Prepared/Relinquished:		Date/Time: 9/12/11	Received: [Signature]	Date/Time: 9/12/11	Received: [Signature]	Date/Time: 9/12/11	Received: [Signature]
Relinquished:		Date/Time: 9/12/11	Received: [Signature]	Date/Time: 9/12/11	Received: [Signature]	Date/Time: 9/12/11	Received: [Signature]
Relinquished:		Date/Time: 9/16/11	Received: [Signature]	Date/Time: 9/16/11	Received: [Signature]	Date/Time: 9/16/11	Received: [Signature]
Relinquished:		Date/Time: 9/16/11	Received: [Signature]	Date/Time: 9/16/11	Received: [Signature]	Date/Time: 9/16/11	Received: [Signature]
Relinquished:		Date/Time: 9/16/11	Received: [Signature]	Date/Time: 9/16/11	Received: [Signature]	Date/Time: 9/16/11	Received: [Signature]

Chain of Custody

SOUTHERN ANALYTICAL LABORATORIES, INC.

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

SAL Project No.

1108119

Client Name		Hazan and Sawyer		Contact / Phone: Josephin Edeback-Hirst 813-630-4498 jedeback@hazanandsawyer.com										
Project Name / Location		PNRS II SE#7 Wastewater System Analyses												
Samplers: (Signatures)		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.	Date	Time	Matrix	Grab	Composite	125mL P, H ₂ SO ₄ NO ₃ COD	125mL P, Cool SO ₄ , NO ₂ , NO ₃	125mL P, Cool NO ₂ , NO ₃	Field DO	Field Temp	Field Cond	Field pH	No. of Containers (Total per each location)
	13	09/16/11	0950	WW	X		1		1	1.03	26.3	859	7.1	-9.6
	14	09/16/11	0945	WW	X		1		1	1.07	26.3	892	7.2	-10.1
	15	09/16/11	0940	WW	X		1		1	1.34	26.3	860	7.2	-17.2
	16	09/16/11	0935	WW	X		1		1	1.85	26.7	887	7.2	-23.4
	17	09/16/11	0855	WW	X		1		1	1.95	26.9	740	7.3	-119.7
	18	09/16/11	0850	WW	X		1		1	1.39	26.8	770	7.3	-77.1
	19	09/16/11	0845	WW	X		1		1	1.82	26.7	802	7.3	-51.8
	20	09/16/11	0840	WW	X		1		1	1.56	26.0	822	7.2	-100.2
	21	09/16/11	0820	WW	X		1		1	1.21	24.8	910	6.9	-248.2
	22	09/16/11	1020	WW	X		1		1	1.35	26.2	930	6.9	-257.5
	23	09/16/11	1120	WW	X		1		1	0.59	28.2	961	6.9	-288.1
	24	09/16/11	1220	WW	X		1		1	0.97	29.7	1022	6.8	-265.7
Containers Prepared/Relinquished:		Date/Time: 9/12/11	1140	Date/Time: 9/12/11		1140	Seal intact?		Y N NA		Instructions / Remarks			
Relinquished:		Date/Time: 9/12/11	1600	Date/Time: 9/12/11		1140	Samples intact upon arrival?		Y N NA		1108119			
Relinquished:		Date/Time: 9/16/11		Date/Time: 9/16/11		1140	Received on ice? Temp		Y N NA		Limited sample volume.			
Relinquished:		Date/Time: 9/16/11		Date/Time: 9/16/11		1140	Proper preservatives indicated?		Y N NA		SUI-60 -1020			
Relinquished:		Date/Time: 9/16/11		Date/Time: 9/16/11		1140	Rec'd within holding time?		Y N NA		CO Temp Cond pH ORP			
Relinquished:		Date/Time: 9/16/11		Date/Time: 9/16/11		1140	Volatiles rec'd w/out headspace?		Y N NA		1.35 26.2 930 6.9 -257.5			
Relinquished:		Date/Time: 9/16/11		Date/Time: 9/16/11		1140	Proper containers used?		Y N NA		Chain of Custody			

SOUTHERN ANALYTICAL LABORATORIES, INC.

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

SAL Project No.

1108119

Client Name		Hazan and Sawyer		Contact / Phone:		Josephin Edeback-Hirst 813-630-4498		jedeback@hazanandsawyer.com								
Project Name / Location		PNRS II SE#7 Wastewater System Analyses														
Samplers: (Signature)		<div style="display: flex; justify-content: space-between;"> <div> <p>Matrix Codes:</p> <p>DW-Drinking Water WW-Wastewater</p> <p>SW-Surface Water SL-Sludge SO-Soil</p> <p>GW-Groundwater SA-Saline Water O-Other</p> <p>R-Reagent Water</p> </div> <div> <p>Sample Description</p> <p>DENIT-SU1-24</p> <p>DENIT-SU1-12</p> <p>DENIT-SU2-72</p> <p>DENIT-SU2-60</p> <p>DENIT-SU2-48</p> <p>DENIT-SU2-36</p> <p>DENIT-SU2-24</p> <p>DENIT-SU2-12</p> <p>DENIT-LS1-72</p> <p>DENIT-LS1-60</p> <p>DENIT-LS1-48</p> <p>DENIT-LS1-36</p> </div> </div>														
SAL Use Only	Sample No.	Date	Time	Matrix	Composite	Grab	125ml P, H ₂ SO ₄	125ml P, Cool	SO ₄ , NO ₂ , NO ₃	125ml P, Cool	NO ₂ , NO ₃	Field DO	Field Temp	Field Cond	Field pH	No. of Containers (Total per each location)
	25	09/16/11	1320	WW	X	X	1	1	1	1	1	0.97	30.5	1012	6.8	228.0
	26	09/16/11	1420	WW	X	X	1	1	1	1	1	1.31	33.1	758	6.9	111.4
	27	09/16/11	0920	WW	X	X	1	1	1	1	1	1.32	23.4	948	6.8	260.1
	28	09/16/11	1020	WW	X	X	1	1	1	1	1	0.93	25.9	932	6.6	264.1
	29	09/16/11	1120	WW	X	X	1	1	1	1	1	1.34	27.0	972	6.7	260.4
	30	09/16/11	1220	WW	X	X	1	1	1	1	1	0.60	29.4	948	6.6	270.6
	31	09/16/11	1320	WW	X	X	1	1	1	1	1	0.96	30.6	886	6.6	248.0
	32	09/16/11	1420	WW	X	X	1	1	1	1	1	1.37	32.7	789	6.6	209.2
	33	09/16/11	0920	WW	X	X	1	1	1	1	1	0.88	23.2	645	7.0	28.1
	34	09/16/11	1020	WW	X	X	1	1	1	1	1	0.93	25.9	932	6.6	261.1
	35	09/16/11	1120	WW	X	X	1	1	1	1	1	1.93	27.5	704	7.0	154.1
	36	09/16/11	1220	WW	X	X	1	1	1	1	1	0.48	29.5	775	7.0	159.1
Containers Prepared/Relinquished:		Date/Time: 9/12/11 1140	Received: 9/12/11 1140	Seal Intact? <input checked="" type="checkbox"/>				Samples Intact upon arrival? <input checked="" type="checkbox"/>				Instructions / Remarks				
Relinquished:		Date/Time: 9/12/11 1600	Received: 9/12/11 1600	Received on ice? Temp: _____				Proper preservatives indicated? <input checked="" type="checkbox"/>				1108119				
Relinquished:		Date/Time: 9/16/11	Received: 9/16/11	Proper containers used? <input checked="" type="checkbox"/>				Volatiles rec'd w/out headspace? <input checked="" type="checkbox"/>				Limited sample volume.				
Relinquished:		Date/Time: 9/16/11	Received: 9/16/11	Proper containers used? <input checked="" type="checkbox"/>				Volatiles rec'd w/out headspace? <input checked="" type="checkbox"/>				LS1-60				
Relinquished:		Date/Time: 9/16/11	Received: 9/16/11	Proper containers used? <input checked="" type="checkbox"/>				Volatiles rec'd w/out headspace? <input checked="" type="checkbox"/>				DO Tem con Ph ORP				
Relinquished:		Date/Time: 9/16/11	Received: 9/16/11	Proper containers used? <input checked="" type="checkbox"/>				Volatiles rec'd w/out headspace? <input checked="" type="checkbox"/>				1163 25.6 658 7.0 -178.4				

SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 B13-855-1844 fax B13-855-2218

SAL Project No. 1108119

Client Name		Hazen and Sawyer		Contact / Phone:		Josephin Edeback-Hirst 813-630-4498							
Project Name / Location		PNRS II SE#7 Wastewater System Analyses		jedeback@hazanandsawyer.com									
Samplers: (Signature)													
SAL Use Only Sample No.	Sample Description	Date	Time	Matrix	Composite	Grab	125mL P, H ₂ SO ₄ NOX COD	125mL P, Cool SO ₄ , NO ₃ , NO ₂	Field DO	Field Temp	Field Cond	Field pH	No. of Containers (Total per each location)
37	DENIT-LS1-24	091611	1320	WW		X	1	1	0.95	30.9	730	6.9	-139.7
38	DENIT-LS1-12	091611	1420	WW		X	1	1	1.06	32.1	723	6.9	-145.7
39	DENIT-GL1-72	091611	0920	WW		X	1	1	1.40	24.7	661	6.4	-214.8
40	DENIT-GL1-60	091611	1020	WW		X	1	1	1.28	26.3	693	6.3	-233.3
41	DENIT-GL1-48	091611	1120	WW		X	1	1	0.78	27.4	726	6.3	-267.5
42	DENIT-GL1-36	091611	1220	WW		X	1	1	0.51	29.2	808	6.3	-266.2
43	DENIT-GL1-24	091611	1320	WW		X	1	1	0.69	30.6	740	6.3	-245.0
44	DENIT-GL1-12	091611	1420	WW		X	1	1	0.52	31.7	726	6.2	-235.6
Containers Prepared/Relinquished:		Date/Time: 9/12/11 1140	Received: 9/12/11 1140	Date/Time: 9/12/11 1140	Date/Time: 9/12/11 1140	Seal intact?	Y	N/A	Y	N/A	Instructions / Remarks		
Relinquished:		Date/Time: 9/12/11 1600	Received: 9/12/11 1600	Date/Time: 9/12/11 1600	Date/Time: 9/12/11 1600	Samples intact upon arrival?	Y	N/A	Y	N/A	1108119		
Relinquished:		Date/Time: 9/16/11	Received: 9/16/11	Date/Time: 9/16/11	Date/Time: 9/16/11	Received on ice? Temp	Y	N/A	Y	N/A	Limited sample volume.		
Relinquished:		Date/Time:	Received:	Date/Time:	Date/Time:	Proper preservatives indicated?	Y	N/A	Y	N/A			
Relinquished:		Date/Time:	Received:	Date/Time:	Date/Time:	Rec'd within holding time?	Y	N/A	Y	N/A			
Relinquished:		Date/Time:	Received:	Date/Time:	Date/Time:	Volatiles rec'd w/out headspace?	Y	N/A	Y	N/A			
Relinquished:		Date/Time:	Received:	Date/Time:	Date/Time:	Proper containers used?	Y	N/A	Y	N/A			