



Florida Department of Environmental Protection

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Governor

Carlos Lopez-Cantera
Lt. Governor

Jonathan P. Steverson
Interim Secretary

October 17, 2016

Ms. Sallie Ford
Florida Department of Health
Environmental Health
135 NE Hernando Ave.
Lake City, FL 32055

RE: Quarterly monitoring report for Experimental Drainfield at
Ichetucknee Springs State Park, 12887 W S Hwy 27, Ft. White, FL 32308
(Permit 14-0156M)

Dear Sallie:

According to this project's study plan under the Memorandum of Understanding between the Department of Environmental Protection and the Department of Health, we would provide quarterly reports on the monitoring activities and results for the experimental drainfield study being conducted at the Park Manager's residence. This report provides findings for monthly and quarterly monitoring through 7/19/2016.

This project began with the construction of a new drainfield and installation of a reactive media layer composed of hardwood mulch in the backyard of the park manager's home. Installation occurred on 3/7/2014 and the system has now been in place for more than 2 years. When the system was constructed, 6 deep lysimeters were installed adjacent to the rows of infiltrators and an effluent sampling sump was installed in line between the septic tank and experimental drainfield. The new drainfield began receiving effluent on 3/18/2014. On 4/8/2014, the 2 drainfield monitoring wells, the piezometer, and the 6 shallow lysimeters were installed.

During the study, several of the lysimeters were replaced in February 2016, and two new deep lysimeters were installed along the outside edge of the mulch layer to evaluate lateral transport of nitrogen within the vadose zone above and within the mulch layer. The two additional deep lysimeters (L-7D and L-8D) are adjacent to the edge of the mulch layer in line with the westernmost row of lysimeters that are closest to the header.

Ms. Sallie Ford, October 17, 2016

The purpose of these new lysimeters is to evaluate the potential for lateral movement of effluent along the top of the mulch layer.

There have been 16 sampling events since this project began. The year 1 monitoring report provided the results from monthly sampling that occurred during the first year of operation. Since then, monitoring frequency has been reduced to quarterly sampling, and this report includes data for the monthly sampling plus three events to collect samples from the two new deep lysimeters. Figure 1 shows the experimental drainfield and monitoring stations and Table 1 provides a summary of the monitoring results.

Depths to ground water in the monitoring wells on 10/12/2016 were approximately 27 feet below land surface. In the piezometer (P1) placed below the drainfield at depth just above the mulch layer there continued to be no water, so mounding has not occurred.

Upon recent inspection of the land surface during the 10/12/2016 inspection, there appears to be minor settling and formation of slight depressions in the area underlain by the mulch. Additional mulch samples will be taken and any additional settling will be documented. We will continue to inspect the condition of the mulch on an ongoing basis.

As mentioned in the last report, the previous park manager has taken another job and vacated the house in mid-April. The new manager and his wife took residence in mid-May, thus the septic system will have been idle for approximately one month.

Please let me know if you have any questions.

Sincerely,



Michael Dalsis
Environmental Specialist III
Groundwater Management Section

cc: Dr. Eberhard Roeder
Erin Rasnake
Richard Hicks

Figure 1. Drainfield diagram and monitoring stations.

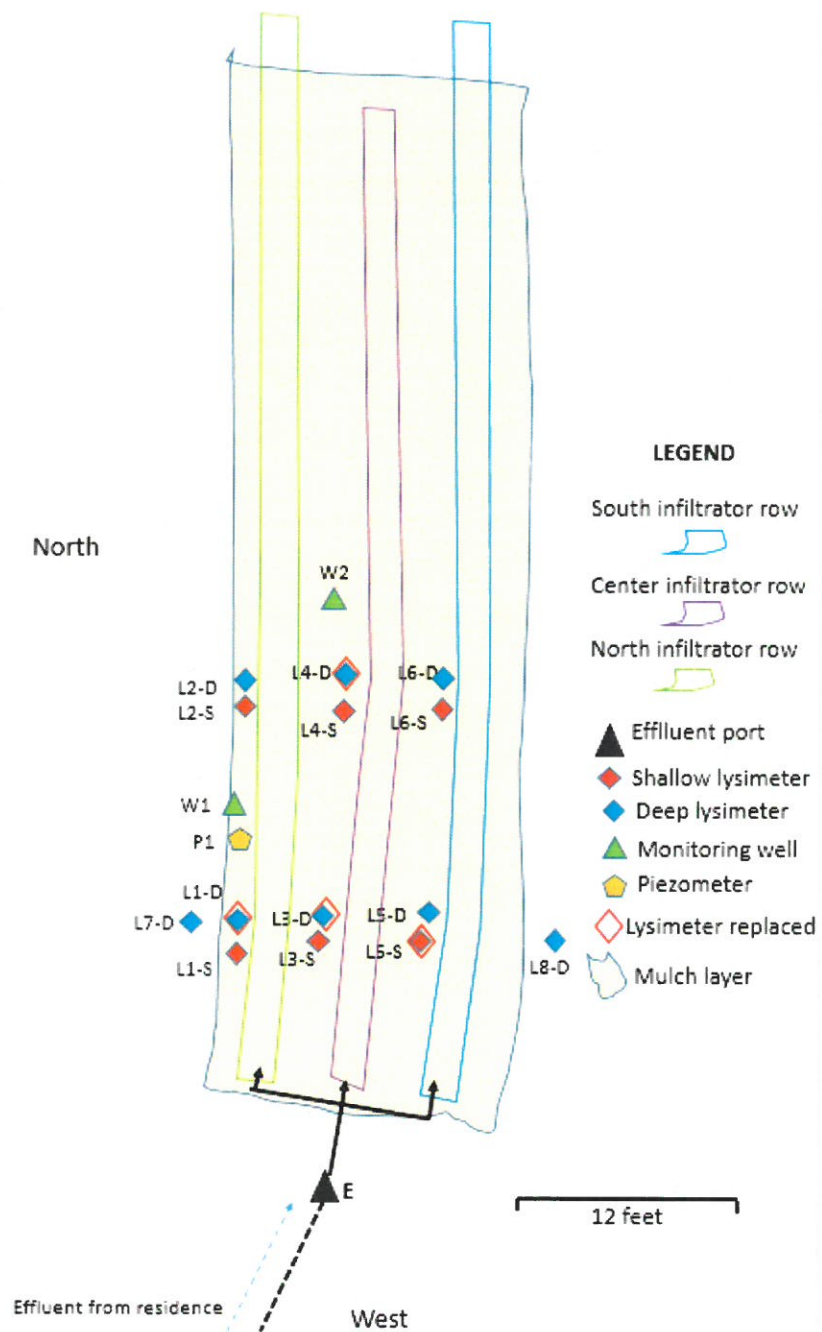


Table 1. Summary of monitoring results (see notes at end of table)

Station	Sample Date	Cl	NH4	TKN	Org N	NO3+NO2	TN	TP
E	4/17/2014	93		89		0.014	89	9.9
	6/4/2014	160	96	100	4	BDL	100	13
	6/25/2014	130	85	100	15	0.008	100	13
	8/19/2014	54	64	65	1	0.006	65	7.7
	9/17/2014	90	87	110	23	BDL	110	9.9
	10/15/2014	110	74	81	7	BDL	81	8.1
	12/17/2015	170	67	260	193	0.032	260	44
	1/27/2015	100	84	87	3	BDL	87	9.5
	2/26/2015	99	60	81	21	BDL	81	8.8
	3/25/2015	95	72	81	9	BDL	81	8.3
	4/30/2015	97	83	99	16	BDL	99	11
	8/20/2015	130	72	87	15	0.005	87	8.5
	11/17/2015	98	70	75	5	BDL	75	9.0
	2/10/2016	82	68	90	22	BDL	90	10
	5/3/2016	160	62	71	9	0.059	71	9.4
	7/19/2016	42	52	60	8	0.008	71	6.9
L-1S	4/17/2014	87		8.4		91	99	0.18
	6/4/2014	110	0.069	1.7	1.6	74	76	2.1
	6/25/2014	100	0.039	1.6	1.6	57	59	3.2
	8/19/2014	62	0.036	0.8	0.76	56	57	4.1
	9/17/2014	67	0.064	1.2	1.1	42	43	5.9
	10/15/2014	77	0.019	1.0	0.98	68	69	2.7
	12/17/2014	140	0.020	1.1	1.1	59	60	6.1
	1/27/2015	71	0.013	1.1	1.1	57	58	5.5
	2/26/2015	110	0.014	1.4	1.4	50	51	5.6
	3/25/2015	92	0.009	0.6	0.63	47	48	5.7
	4/30/2015	76	0.001	BDL	0.00	60	60	3.8
	8/20/2015	100	0.011	1.5	1.5	67	69	6.3
	11/17/2015	81	0.004	1.0	0.95	50	51	5.2
	2/10/2016	25	0.008	1.6	1.5	28	30	6.2
	5/3/2016	92	0.007	0.9	0.9	3.5	4.4	3.8
	7/14/2016	33	0.018	1.3	1.3	42	43	4.5
L-1D	4/17/2014	94		15		9	24	0.26
	6/4/2014	120	0.13	2	1.9	36	38	0.18
	6/25/2014	140	0.054	1.6	1.5	37	39	0.16
	8/19/2014	64	0.20	1.7	1.5	34	36	0.17
	9/17/2014	58	0.17	1.3	1.1	19	20	0.12
	10/15/2014	71	0.09	1.2	1.1	43	44	0.10

Station	Sample Date	Cl	NH4	TKN	Org N	NO3+NO2	TN	TP
L-1D	12/17/2014	120	0.02	0.8	0.78	56	57	0.19
	1/27/2015	86	0.01	1.1	1.1	60	61	0.97
	2/26/2015	98	0.00	BDL	BDL	50	50	1.6
L-1D(2)	1/27/2015	80	0.07	1.0	0.93	66	67	6.5
	2/26/2015	110	0.04	1.0	0.97	56	57	5.0
	3/25/2015	79	0.07	1.0	0.88	32	33	5.1
	4/30/2015	70	0.11	0.9	0.76	44	45	3.8
	8/20/2015	96	0.07	1.5	1.4	27	29	2.0
	11/17/2015	110	0.03	1.0	0.97	40	41	2.0
	2/10/2016	41	0.01	0.9	0.85	47	48	1.8
	5/3/2016							
	7/14/2016	53	0.01	0.7	0.65	5.8	6.5	2.5
L-2S	4/17/2014	6.5		1.6		12	14	0.13
	6/4/2014	17	0.092	1.1	1.0	24	25	0.13
	6/25/2014	2.3	0.028	1.1	1.1	21	22	0.21
	8/19/2014	0.6	0.032	1.3	1.3	1.3	2.6	0.86
	9/17/2014	24	0.029	1.1	1.1	12	13	0.16
	10/15/2014	81	0.160	1.2	1.0	48	49	0.13
	12/17/2014	130	0.034	1.0	0.97	58	59	0.26
	1/27/2015	5	0.010	0.5	0.44	7.8	8.3	0.10
	2/26/2015	22	0.130	0.9	0.74	16	17	0.001
	3/25/2015	33	0.150	0.8	0.65	22	23	0.009
	4/30/2015	76	0.013	BDL	BDL	53	53	0.12
	8/20/2015	90	0.560	2.2	1.6	54	56	0.38
	11/17/2016	84	0.004	1.2	1.2	60	61	0.59
	2/10/2016	5	0.130	1.0	0.8	7	8	0.16
	5/3/2016	2.3	0.089	0.8	0.68	2.4	3.2	0.08
	7/19/2016	4.9	0.320	1.0	0.65	17	18	0.024
L-2D	4/17/2014	13		0.43		0.18	0.61	0.18
	6/4/2014	66	0.018	1.5	1.5	0.21	1.7	0.29
	6/25/2014							
	8/19/2014		0.26	4.2	3.9	BDL	4.2	0.41
	9/17/2014							
	10/15/2014							
	12/17/2014							
	2/26/2015		0.008	1.4	1.4	4.0	4.2	0.29
	3/25/2015							
	4/30/2015							
	8/20/2015	85						
	11/17/2015		0.005	1.4	1.4	4.3	5.7	0.03

Station	Sample Date	Cl	NH4	TKN	Org N	NO3+NO2	TN	TP
L-2D	2/10/2016	NA	0.028	2.6	2.6	9.2	11.8	0.17
	5/3/2016		0.019	2.3	2.3	2.4	4.7	0.18
	7/19/2016	32	0.017	2.2	2.2	4.2	6.4	0.30
L-3S	4/17/2014	69		16		29	45	0.44
	6/4/2014	74	0.10	1.5	1.4	52	54	2.6
	6/25/2014	82	0.031	1.4	1.4	65	66	4.8
	8/19/2014							
	9/17/2014	64	0.034	1.2	1.2	53	54	3.5
	10/15/2014	78	0.005	0.8	0.80	70	71	3.0
	12/17/2014	140	0.015	0.8	0.78	59	60	4.0
	1/27/2015	61	0.012	1.4	1.4	50	51	6.1
	2/26/2015			0.9	0.89	39	40	4.7
	3/25/2015	63	0.008	0.9	0.89	25	26	3.6
	4/30/2015	76	0.010	1.6	1.6	50	52	3.6
	8/20/2015	94	0.009	1.2	1.2	61	62	4.9
	11/17/2015	82	0.004	1.0	1.0	54	55	5.6
	2/10/2016	25	0.010	1.1	1.1	30	31	7.5
	5/3/2016	66	0.009	1.1	1.1	6.9	8.0	3.9
	7/14/2016	45	0.010	1.1	1.1	51	52	4.1
L-3D	4/17/2014							
	6/4/2014							
	6/25/2014							
	8/19/2014							
	9/17/2014							
	10/15/2014							
	12/17/2014							
	2/26/2015							
L-3D(2)	1/27/2015	85	0.018	0.87	0.85	42	43	3.5
	2/26/2015	94	0.038	1.0	0.96	14	15	3.9
	3/25/2015	90	0.053	0.75	0.70	0.26	1.0	2.6
	4/30/2015							
	8/20/2015	120						
	11/17/2015							
	2/10/2016							
	7/14/2016	54	0.077	0.84	0.76	0.07	0.91	0.57
L-4S	4/17/2014	3.9		0.63		11	12	0.11
	6/4/2014	1.2	0.013	0.93	0.92	12	13	0.18
	6/25/2014	0.43	0.007	0.87	0.86	6.0	6.9	0.11
	8/19/2014	0.25	0.047	0.87	0.82	3.2	4.1	0.12
	9/17/2014	0.32	0.045	0.57	0.53	2.7	3.3	0.07

Station	Sample Date	Cl	NH4	TKN	Org N	NO3+NO2	TN	TP
L-4S	10/15/2014	0.91	0.030	0.53	0.50	13	14	0.05
	12/17/2014	4.2	0.028	0.47	0.44	15	15	0.03
	1/27/2015	2.7	2.000	2.20	0.20	6.7	8.9	0.03
	2/26/2015	96	13.000	15.00	2.00	36	51	0.27
	3/25/2015	88	2.200	3.10	0.90	54	57	2.2
	4/30/2015	64	0.008	0.84	0.83	46	47	1.1
	8/20/2015	2.7	0.008	0.97	0.96	5.0	6.0	0.39
	11/17/2015	75	0.004	BDL	0.004	53	53	0.30
	2/10/2016	5	0.004	0.60	0.60	3.6	4.2	1.40
	5/3/2016	18	0.005	0.99	0.99	33	34.0	0.77
	7/19/2016	2.8	0.004	0.55	0.55	2.90	3.5	0.40
L-4D	4/17/2014	12		0.70		0.09	0.79	0.02
	6/4/2014		0.046	2.50	2.45	0.31	2.8	0.15
	6/25/2014							
	8/19/2014							
	9/17/2014							
	10/15/2014							
	12/17/2014							
	2/26/2015		0.120					
	5/3/2016							
	7/19/2016	80	0.007	0.73	0.72	2.10	2.83	0.24
L-4D(2)	1/27/2015	80	0.370	1.70	1.33	62	64	2.20
	2/26/2015	69	0.120	1.50	1.38	20	22	1.70
	3/25/2015	83	0.031	1.00	0.97	6.9	7.9	1.10
	4/30/2015	70	0.011	0.74	0.73	7.3	8.0	0.49
	8/20/2015	110	0.030	1.00	0.97	2.8	3.8	0.47
	11/17/2015	120	0.033	0.55	0.52	15	16	0.29
	2/10/2016	46	0.023	0.69	0.67	38.0	39	0.16
	5/3/2016		0.011	0.51	0.50	5.0	5.5	0.18
	7/19/2016							
L-5S	4/17/2014							
	6/4/2014	2	0.11	1.50	1.39	18	20	0.20
	6/25/2014							
	8/19/2014		0.16	1.80	1.64	34	36	0.21
	9/17/2014							
	10/15/2014	0.34	0.014	1.20	1.19	6.5	7.7	0.17
	12/17/2014	13	0.025	0.96	0.94	17	18	0.08
	1/27/2015	2.0	0.025	0.89	0.87	8.9	9.8	0.08
	2/26/2015	4.7	0.011	0.71	0.70	4.9	5.6	0.07
L-5S(2)	1/27/2015	40	0.023	1.40	1.38	40	41	2.90

Ms. Sallie Ford, October 17, 2016

Station	Sample Date	Cl	NH4	TKN	Org N	NO3+NO2	TN	TP
L-5S(2)	2/26/2015	42	0.015	1.20	1.19	52	53	6.80
	3/25/2015	92	0.049	1.00	0.95	40	41	7.80
	4/30/2015	22	0.001	0.81	0.81	21	22	0.05
	8/20/2015	7.2	0.028	1.30	1.27	8.6	9.9	0.05
	11/17/2015	49	0.016	0.77	0.75	33	34	0.03
	2/10/2016	6	0.013	0.72	0.71	3.60	4	0.03
	5/3/2016	120	0.032	1.10	1.07	28	29	4.90
	7/14/2016	44	0.014	1.00	0.99	41	42	5.90
L-5D	4/17/2014	16		2.2		BDL	2.2	0.48
	6/4/2014	79	0.068	1.4	1.33	0.30	1.7	0.55
	6/25/2014	140	0.048	1.2	1.15	0.36	1.6	0.54
	8/19/2014	110	0.072	1.1	1.03	0.36	1.5	0.64
	9/17/2014	24	0.100	1.2	1.10	1.1	2.3	0.65
	10/15/2014	9.1	0.038	1.3	1.26	3.0	4.3	0.52
	12/17/2014	79	0.014	0.7	0.64	38	39	0.53
	1/27/2015	100	0.010	0.9	0.84	14	15	0.43
	2/26/2015	97	0.012	0.7	0.67	8.9	9.6	0.40
	3/25/2015	100	0.011	0.6	0.60	11	12	0.33
	4/30/2015	99	0.016	0.7	0.64	20	21	0.32
	8/20/2015	87	0.040	1.1	1.06	1.8	2.9	0.55
	11/17/2016	95	0.005	1.6	1.60	110	112	0.31
	2/10/2016	110	0.008	1.1	1.09	97.0	98	0.26
	5/3/2016		0.006	0.8	0.78	23.0	24	0.31
	7/14/2016	52	0.009	0.9	0.92	2.4	3	0.30
L-6S	4/17/2014	3.9		0.87		9.3	10	0.16
	6/4/2014	2.8	0.012	1	0.99	27	28	0.16
	6/25/2014							
	8/19/2014	0.43	0.10	1.5	1.40	9.80	11.3	0.14
	9/17/2014	0.58	0.051	0.82	0.77	3.90	4.7	0.12
	10/15/2014							
	12/17/2014							
	1/27/2015	2.7	0.015	0.75	0.74	13	14	0.04
	2/26/2015							
	3/25/2015		0.008	0.54	0.53	5.1	5.6	0.03
	4/30/2015	28	0.006	0.74	0.73	32	33	0.01
	8/20/2016	0.57	0.017	0.84	0.82	2.1	2.9	0.01
	11/17/2016							
	2/10/2016							
	5/3/2016							
	7/14/2016		0.018	0.52	0.50	0.91	1.43	0.01

Station	Sample Date	Cl	NH4	TKN	Org N	NO3+NO2	TN	TP
L-6D	4/17/2014	17		1		0.004	1.0	0.34
	6/4/2014	21	0.073	2	1.93	0.49	2.5	0.53
	6/25/2014	23	0.028	1	1.37	0.15	1.6	0.34
	8/19/2014							
	9/17/2014	51	0.024	0.98	0.96	0.36	1.3	0.19
	10/15/2014	7.7	0.170	0.17	0.000	2.0	2.2	0.96
	12/17/2014	96	0.026	0.79	0.76	14	15	
	1/27/2015	94	0.019	0.79	0.77	8.2	9.0	0.35
	2/26/2015	110	5.2	6.5	1.3	25	32	0.08
	3/25/2015	92	0.010	0.76	0.75	3.1	3.9	0.06
	4/30/2015	72	0.005	0.70	0.70	5.4	6.1	0.06
	8/20/2015	120	0.023	1.1	1.1	11	12	0.90
	11/17/2015	100	0.010	0.74	0.73	14	15	1.90
	2/10/2016	52	0.021	0.77	0.75	42	43	2.60
	5/3/2016	120	0.005	0.83	0.83	14	15	3.40
	7/14/2016	43	0.014	0.81	0.80	4.3	5.1	3.90
L-7D	2/26/2016	19	0.01	1.0	0.99	17	18	0.15
	5/3/2016		0.061	1.1	1.04	9.2	10.3	1.60
	7/14/2016	26	0.014	1.6	1.59	1.6	3.2	0.13
L-8D	2/26/2016	23	0.007	1.20	1.19	17	18	0.49
	5/3/2016		0.066	1.40	1.33	0.83	2.2	1.60
	7/14/2016	10	0.028	1.60	1.57	7.6	9.2	1.90
W-1	4/17/2014	1.9		0.14		3.3	3.4	0.01
	6/4/2014	1.9	0.003	0.10	0.097	2.6	2.7	0.03
	6/25/2014	2.9	0.008			3.1	3.1	0.20
	8/19/2014							
	9/17/2014	55	0.002	0.23	0.23	5.2	5.4	0.05
	10/15/2014	68	BDL	0.54	0.54	15	16	0.14
	12/17/2014	49	0.013	0.26	0.25	7.2	7.5	0.02
	1/27/2015	74	BDL	0.24	0.24	15	15	0.01
	2/26/2015	67	BDL	0.19	0.24	13	13	0.06
	3/25/2015	89	BDL	BDL	BDL	12	12	0.01
	4/30/2015	78	BDL	BDL	BDL	22	22	0.01
	8/20/2015	71	0.002	0.26	0.26	18	18	0.05
	11/17/2015	93	BDL	2.4	2.4	25	27	0.04
	2/10/2016	80	BDL	BDL	BDL	25	25	0.003
	5/3/2016	85	0.002	0.44	0.44	32	32	0.060
	7/19/2016	72	0.006	0.40	0.39	25	32	0.017
W-2	4/17/2014							
	6/4/2014	1.8	0.003	2.5	2.5	0.18	2.7	0.62

Station	Sample Date	Cl	NH4	TKN	Org N	NO3+NO2	TN	TP
W-2	6/25/2014		0.005	12	12	0.11	12	3.6
	8/19/2014							
	9/17/2014	4.3	0.002	1.2	1.2	0.77	2.0	0.24
	10/15/2014	4.6	0.003	0.97	1.0	0.34	1.3	0.23
	12/17/2014	3.7	0.003	1.3	1.3	0.13	1.4	0.27
	1/27/2015	3.7	0.002	0.85	0.8	0.24	1.1	0.19
	2/26/2015	8.8	BDL	1.4	1.4	0.87	2.3	0.32
	3/25/2015	24	0.004	0.56	0.6	7.2	7.8	0.062
	4/30/2015	6.1	0.003	1.2	1.2	0.34	1.5	0.24
	8/20/2015	6	0.009	1.4	1.4	0.47	1.9	0.22
	11/17/2015	8.2	BDL	1.4	1.4	0.52	1.9	0.21
	2/10/2016	16	0.004	0.39	0.39	0.52	0.9	0.06
	5/3/2016	32	0.002	1.1	1.1	4.40	5.5	0.18
	7/19/2016	31	0.014	1.1	1.1	3.6	4.7	0.14

NOTES: E=effluent sample; L= lysimeter sample; W=monitoring well sample; BDL=below detection limit. Reported concentrations are in milligrams per liter. Empty field means that no sample was collected due to insufficient water sample.