Big Creek Research and Extension Team

University of Arkansas System Division of Agriculture

Quarterly Report – April 1 to June 30, 2016

MONITORING THE SUSTAINABLE MANAGEMENT OF NUTRIENTS ON C&H FARM IN BIG CREEK WATERSHED

Mission of the University of Arkansas System Division of Agriculture

The mission of the **Division of Agriculture** is to advance the stewardship of natural resources and the environment, cultivate the improvement of agriculture and agribusiness, develop leadership skills and productive citizenship among youth and adults, enhance economic security and financial responsibility among the citizens of the state, ensure a safe, nutritious food supply, improve the quality of life in communities across Arkansas, and strengthen Arkansas families.

Dr. Mark J. Cochran
Vice President for Agriculture

Executive Summary

This is the second Quarterly Report of 2016 for the Big Creek Research and Extension Team that details progress made from April 1 through June 30, 2016.

1. The BCRET serves interests of all people who live, work, and visit the Big Creek Watershed and the larger Buffalo River Watershed, as mandated by the University of Arkansas System Division of Agriculture guidelines. A key component of our mission is "to advance the stewardship of natural resources and the environment, …., improve the quality of life in communities across Arkansas, and strengthen Arkansas families."

2. The nutrient management plan for the C&H Farm is based on using the Phosphorus (P) Loss Risk Assessment Tool, the Phosphorus Index, to determine rates of manure application that will not increase the risk of P runoff to Big Creek. The Arkansas P Index was developed by several members of BCRET. Independent research shows the Arkansas P Index to be one of the most restrictive in terms of determining environmentally acceptable mineral fertilizer and manure applications.

3. We continue to collect weekly base flow and periodic storm flow water samples from Big Creek above and below the C&H Farm, along with water from a spring, ephemeral stream, surface runoff sites on Fields 1, 5a, and 12, two interceptor trenches below the slurry holding ponds, and reconfigured house well for chemical and bacterial analysis.

4. Chemical analysis of water samples collected from the house well, trenches, and ephemeral gully provide three direct methods to determine if manure is leaking from the holding ponds. To date, these analyses do not provide a scientific, weight-of-evidence that there is any massive leakage of material from the manure holding ponds adjacent to the house barns. Concentrations of P, N, chloride (a conservative and effective tracer), and electrical conductivity do not show any elevated values compared with baseline or background values. We will continue to monitor these sites.

5. The Electrical Resistivity Imaging Analysis indicates a differences in electrical resistivity below the surface to a depth of approximately 75 feet, which may result from natural and site properties. BCRET is committed to working with ADEQ in its decision to drill a bore-hole in an agreed location adjacent to the holding ponds to provide information, which will aid defining the cause of the shifts in resistivity.

6. Recent results of BCRET were presented to the Arkansas Pollution Control and Ecology Commission (APC&EC) meeting on June 24th. That presentation is available on the BCRET website at http://www.bigcreekresearch.org/press_release_presentations/Sharpley%20PC-E%20Mtg%206-24-2016.pdf .

Big Creek Research Team

Andrew Sharpley, Ph.D., TEAM LEADER – Distinguished Professor - Soil science, water quality, soil phosphorus chemistry, agricultural management

Brian Breaker, M.Sc., Surface-Water Specialist, stream flow and constituent collection, analysis, and statistical evaluation of trends.

Kris Brye, Ph.D., Professor - Effects of land application of poultry litter on in-situ nutrient leaching, effects of land use and management practices on soil physical, chemical, and biological properties related to soil quality and sustainability

Mike Daniels, Ph.D., Professor – Extension water quality and nutrient management specialist

Ed Gbur, Ph.D., Professor and Director, Agricultural Statistics Laboratory - Experimental design, linear and generalized linear mixed models, regression, agricultural applications of statistics.

Brian Haggard, Ph.D., Professor - Ecological engineering, environmental soil and water sciences, water quality chemistry, water quality monitoring and modeling, algal nutrient limitation, pollutant transport in aquatic systems

Phil Hays, Ph.D. Ground Water Specialist, U.S. Geological Survey and Research Professor with Geosciences Dept., University of Arkansas, application of stable isotopes and other geochemical indicators in delineating movement and behavior of contaminants in ground-water systems

Tim Kresse, M.Sc., Water Quality Specialist, U.S. Geological Survey, natural geochemical evolution of groundwater and separating these processes from anthropogenic sources of contamination

Morteza Mozaffari, Ph.D. – Director, Univ. of Arkansas Soil Testing and Research Laboratory, Marianna.

Mary Savin, Ph.D. - Structure and function of microbial communities in natural and managed ecosystems, microorganisms in nutrient cycling, contaminant degradation

Thad Scott, Ph.D., Professor - Water quality, transport of contaminants to and within water bodies

Karl VanDevender, Ph.D. and P.E., Professor - Extension Engineer, Livestock and poultry manure and mortality management, nutrient management planning

Jun Zhu, PhD., Professor - Biological and agricultural engineering, agricultural sustainability, manure treatment technologies

Adam Willis, M.Sc., Newton County Extension Agent - Agriculture

Field Technicians - The Big Creek Research and Extension Team are ably supported by several outstanding and dedicated Program Technicians based in Fayetteville and Little Rock.

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Nutrient Management Planning Development for the C&H Farm

Development of the Comprehensive Nutrient Management Plan for the C&H Farm is based on the use of the Phosphorus (P) Loss Risk Assessment Tool, the Arkansas Phosphorus Index (API) for pastures (Sharpley et al., 2010 and b). Several members of BCRET were involved in the development, validation, and implementation of the API, which was adopted by the Arkansas Natural Resources Commission in 2010.

As part of the nutrient management planning process, the API is used to determine the rate of manure that can be applied to any given field without an unacceptable risk of P runoff to Big Creek. The API assesses the risk of P loss in runoff from pastures and hayland as a function of source potential (i.e., P from the soil and manure application), transport potential (i.e., risk P movement offsite as affected by runoff and erosion, field slope, grazing intensity and proximity to streams), and any additional conservation practices (CPs) implemented between the application site and potential receiving waters. As a result, for a specific set of field conditions, the API associates a P runoff risk value to a specific manure application rate and determines if the application is environmentally acceptable. If acceptable, the nutrient management plan specifies this application rate as the maximum rate for that field. Lower rates of manure application are generally considered to be associated with lower environmental P runoff risk and, therefore, also acceptable.

Sharpley et al. (2001 and 2003) was instrumental in developing the original framework of the P Index for use in NRCS 590 Nutrient Management Planning (U.S. Department of Agriculture, Natural Resources Conservation Service, 2011). Independent research shows the API to be one of the most restrictive in terms of limiting manure applications. Osmond et al., (2006 and 2012) showed that of 12 P Indices for Southern U.S. States, the Arkansas Index was consistently the most restrictive in terms determining environmentally acceptable manure application.

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Water Sampling and Analytical Methods

Sampling Locations

Water quality monitoring sites are;

Site 1. Edge-of-field monitoring on Field 1 permitted to receive slurry.

Site 2. Edge-of-field monitoring on Field 5a excluded from receiving slurry.

Site 3. Edge-of-field monitoring on Field 12 permitted to receive slurry.

Site 4. Ephemeral stream flow draining a subwatershed containing the production facilities.

Site 5. Spring below Field 1.

Site 6. Big Creek upstream of the C&H Farm operation.

Site 7. Big Creak downstream of the C&H Farm operation.

Site 8. Left Fork downstream of the C&H Farm operation.

Site 9. North interceptor trench below the manure holding ponds.

Site 10. South interceptor trench below the manure holding ponds.

Site 11. House well at animal facility.

Table 1. Location of sampling sites on the Big Creek Research and Extension Team project.

Site description	Latitude	Longitude	Elevation, ft
Field 1	35 55’ 06.42”	93 03’ 38.34”	984
Field 5a	35 56’03.01”	93 04’ 25.85”	778
Field 12	35 54’ 13.57”	93 04’ 04.76”	838
Ephemeral stream	35 55’ 25.89”	93 04’ 14.94”	824
Spring	35 54’ 57.06”	90 03’ 34.64”	977
Big Creek upstream of farm	35 53’ 32.28”	93 04’ 06.38”	857

Big Creek downstream of farm	35 56’ 18.98”	93 04’ 21.81”	769
Left Fork	35 5’”48.04”	93 04” 02.02”	760
Trench 1 (south)	35 55’ 19.24”	93 04’ 23.04”	896
Trench 2 (north)	35 55’ 21.39”	93 04’ 19.93”	883
House well	35 55’ 27.02”	93 04’ 22.71”	915

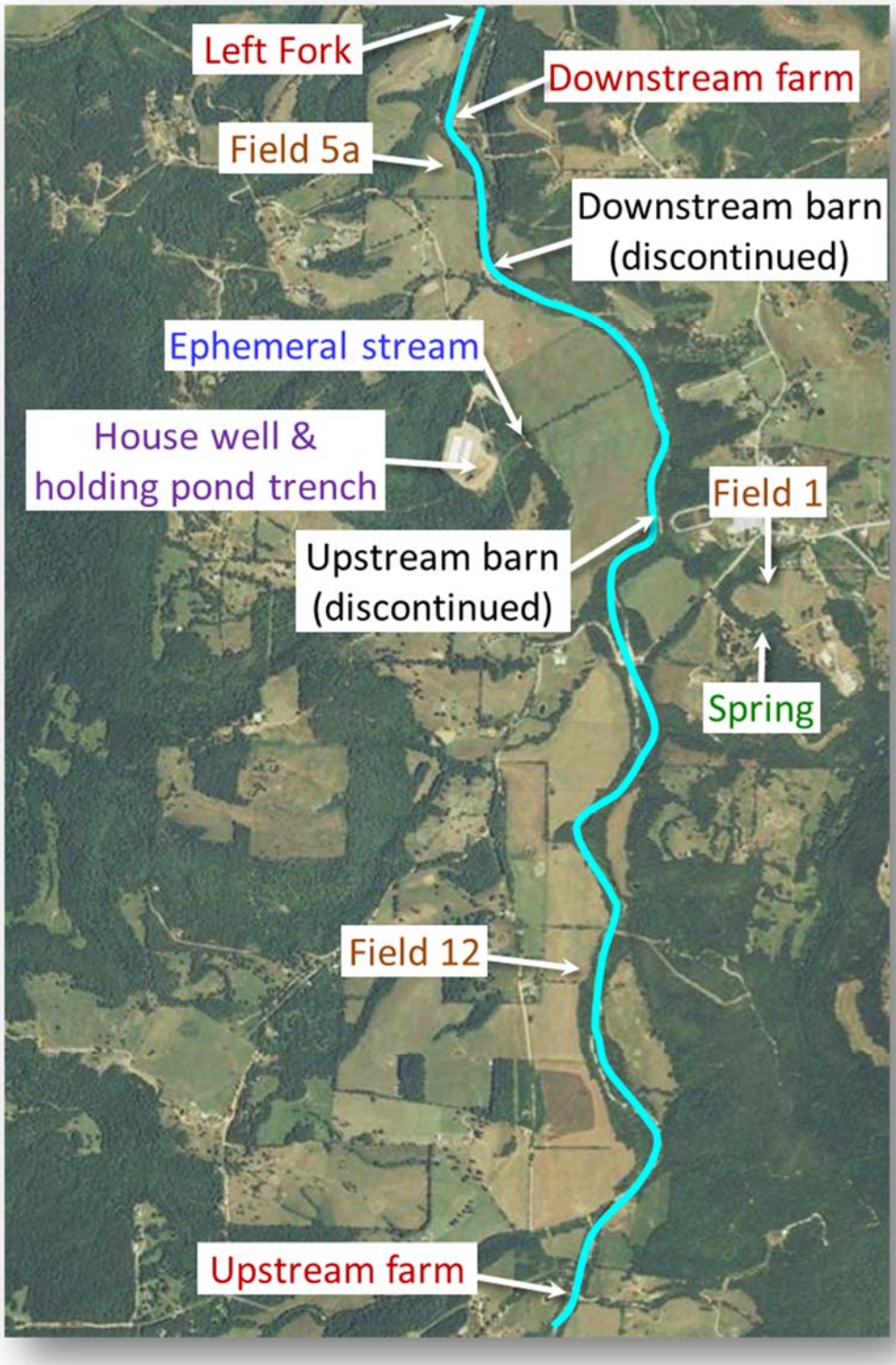

Figure 1. Location of sampling sites for the Big Creek Research and Extension Team project.

Sampling Protocols and Analyses

The following protocols were used to collect, prepare, and analyze all water samples:

1. One-liter acid-washed bottles were used to collect the stream samples for nutrient analyses.
2. Water was collected from just beneath the surface, where the stream was actively moving and well-mixed.
3. The bottle was rinsed with stream water before collecting the sample.
4. Sterilized specimen cups were used to collect samples for bacterial evaluation.
5. Time of collection was noted, and samples placed in a cooler on ice to preserve them until processed and were submitted to the Arkansas Water Resources Center Water Quality Lab on the day of collection for analyses.
6. Analyses included Alkalinity (APHA 2320-B), Ammonia (EPA 351.2), Chloride (EPA 300.0), Dissolved Phosphorus (EPA 365.2), E. coli (APHA 9223-B), Electrical Conductivity (EPA 120.1), Nitrate (EPA 300.0), pH (EPA 150.1), Total Coliforms (APHA 9223-B), Total Dissolved Solids (EPA 160.1), Total Nitrogen (APHA 4500-P J), Total Phosphorus (APHA 4500-P J), and Total Suspended Solids (EPA 160.2). APHA is American Public Health Association from the Wadeable Streams Assessment, Water Chemistry Laboratory Manual http://www.epa.gov/owow/monitoring/wsa/WRS_lab_manual.pdf
7. Prior to collection of a house well water sample, the well is purged and water temperature, pH, and electrical conductivity measured on-site every 30 seconds until all values stabilize (primarily water temperature). At that point a sample of water is collected in a 1-L acid-washed bottle. This method is taken from USGS and EPA well-water sampling protocols. See USGS methods for sampling at https://water.usgs.gov/owq/FieldManual/chapter4/pdf/Chap4_v2.pdf. Specific and detailed guidance on the collected of water quality data can be found in the USGS National Field Manual at file:///U:/Words/C&H%20Farm/Publications/Planning/USGS%20National%20Field%20Mannual_complete%202015.pdf

   The U.S. EPA also recommend that selected water quality parameters can be monitored during low-rate purging, with stabilization of these parameters indicating when the discharge water represents aquifer water or source well water. See: http://www.csus.edu/indiv/h/hornert/Geol_210_Summer_2012/Week%202%20readings/Puls%20and%20Barcelona%201996%20Low%20flow%20sampling.pdf and https://in-situ.com/wp-content/uploads/2015/01/Low-Flow-Groundwater-Sampling-Techniques-Improve-Sample-Quality-and-Reduce-Monitoring-Program-Costs-Case-Study.pdf
8. Minimum detection limits (MDLs) for each chemical and biological constituent are listed in Table 1. Some constituent concentrations were reported by the laboratory as less than the MDL but greater than zero. Those values are given in subsequent tables but have less confidence in their accuracy than concentrations above the MDL.
9. Chemical and biological analyses of samples collected from the beginning of 2015 to March 31, 2016 are given in Tables 2, 3, and 4.

Table 2. Minimum detection limits (MDLs) for each chemical and biological constituent.

Constituent	Minimum detection limit [1]
Alkalinity, mg/L as $CaCO_3$	2
Chloride, mg/L	0.093
Dissolved P, mg/L	0.002
Conductivity, uS/cm	1
Ammonia-N, mg/L	0.03
Dissolved organic carbon, mg/L	0.18
E. coli, MPN/100 mL	1
Nitrate-N, mg/L	0.004
pH	0.1
Total coliform, MPN/100 mL	1
Total dissolved solids, mg/L	15.22
Total N, mg/L	0.006
Total P, mg/L	0.012
Total suspended solids, mg/L	6.58

[1] MDL the Minimum Detection Limit of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. Further information is available at http://water.usgs.gov/owq/OFR_99-193/detection.html

USGS Stations

Big Creek Continuous Flow

We are collaborating with USGS at Big Creek near Mt. Judea (USGS 705579; downstream of the C&H Farm operation) and at Left Fork Big Creek near Vendor (USGS 07055792), to collect base and storm water flows for N, P, and bacteria analysis. The USGS Big Creek site is instrumented with continuous flow gaging equipment and a nitrate sensor, which provides real-time flow, water temperature, nitrate-N, and precipitation data. These data are available on line at the USGS website below.

USGS 07055790 Big Creek near Mt. Judea, AR

http://nwis.waterdata.usgs.gov/ar/nwis/uv/?site_no=07055790&agency_cd=USGS

Big Creek Research and Extension Team Monitoring Data

Nutrients, Sediment, and Bacteria by Date of Sampling

Table 3. Water quality analyses at each sample site since 2015, with those collected since the last report noted. Coliform units are Most Probable Number (MPN) per 100 mL of water.

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
			mg/L							MPN/100 mL	
1/8/2015	**1/8/2015**	**Base flow**									
11:05	15:05	Spring	0.010	0.014	<0.03 ¶	0.376	0.56	2.0	3.80	14.8	686.7
11:25	15:05	Upstream farm	0.009	0.022	<0.03	0.187	0.21	2.3	1.41	30.9	547.5
10:53	15:05	Downstream farm	0.011	0.024	<0.03	0.376	0.39	2.5	1.22	42.6	980.4
11:40	15:05	Ephemeral stream	0.008	0.022	<0.03	0.448	0.59	2.4	1.73	25.6	1203.3
12:00	15:05	Trench 1	0.005	0.022	<0.03	0.769	0.75	4.7	0.88	1.0	13130.0
1/14/2015	**1/14/2015**	**Base flow**									
11:30	15:20	Spring	0.010	0.028	<0.03	0.473	0.66	1.1	10.20	21.6	613.1
11:45	15:20	Upstream farm	0.012	0.032	<0.03	0.135	0.19	1.1	3.02	88.2	727.0
11:15	15:20	Downstream farm	0.011	0.020	<0.03	0.388	0.34	1.0	2.03	25.6	613.1
12:00	15:20	Ephemeral stream	0.007	0.028	<0.03	0.469	0.55	1.9	0.55	7.4	1413.6

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
1/21/2015	**1/21/2015**	**Base flow**									
11:15	15:28	Spring	0.009	0.020	<0.03	0.552	0.69	1.5	2.29	9.8	461.1
11:52	15:28	Upstream farm	0.008	0.018	<0.03	0.089	0.12	1.1	0.95	70.3	579.4
11:05	15:28	Downstream farm	0.010	0.026	0.06	0.197	0.30	1.1	1.60	37.4	613.1
11:25	15:28	Ephemeral stream	0.005	0.016	<0.03	0.370	0.46	1.0	2.34	155.3	2419.2
1/29/2015	**1/29/2015**	**Base flow**									
10:40	15:28	Spring	0.010	0.018	0.03	0.886	0.74	2.3	4.27	1.0	2850.0
11:45	15:28	Upstream farm	0.006	0.060	<0.03	0.065	0.21	47.8	1.71	727.0	1413.6
1:20	15:28	Downstream farm	0.009	0.020	0.04	0.168	0.27	1.3	1.50	19.9	1046.2
2/3/2015	**2/3/2015**	**Base flow**									
11:05	15:40	Spring	0.008	0.018	<0.03	0.691	0.77	3.8	7.64	1.0	461.1
11:40	15:40	Upstream farm	0.006	0.022	<0.03	0.051	0.28	1.1	2.69	4.1	1203.3
10:50	15:40	Downstream farm	0.009	0.018	<0.03	0.140	0.29	4.1	2.66	1.0	547.5
2/10/2015	**2/10/2015**	**Base flow**									
10:38	15:08	Spring	0.010	0.010	<0.03	0.544	0.64	1.9	0.76	2.0	686.7
11:05	15:08	Upstream farm	0.009	0.012	<0.03	0.056	0.09	0.7	1.04	1119.1	2419.2

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
10:25	15:08	Downstream farm	0.011	0.012	<0.03	0.143	0.23	1.0	1.15	7.4	1553.1
2/26/2015	**2/26/2015**	**Base flow**									
10:45	15:30	Spring	0.009	0.042	0.02	0.237	0.38	5.0	3.97	37.3	2419.2
11:36	15:30	Upstream farm	0.006	0.024	<0.03	0.100	0.13	0.6	1.20	47.9	686.7
10:34	15:30	Downstream farm	0.008	0.026	0.02	0.200	0.25	0.8	1.17	48.7	866.4
10:55	15:30	Ephemeral stream	0.006	0.022	<0.03	0.530	0.57	1.3	1.38	16.1	4790.0
11:15	15:30	Trench 1	0.004	0.028	0.01	0.712	0.76	46.0	0.60	1.0	41063.0
3/3/2015	**3/3/2015**	**Base flow**									
11:07	15:33	Spring	0.008	0.052	<0.03	0.124	0.35	13.5	4.90	N.S. §	N.S.
11:50	15:33	Upstream farm	0.006	0.026	0.02	0.048	0.11	2.3	1.50	N.S.	N.S.
10:55	15:33	Downstream farm	0.007	0.028	<0.03	0.138	0.23	1.3	1.50	N.S.	N.S.
11:18	15:33	Ephemeral stream	0.006	0.020	<0.03	0.477	0.52	2.0	1.84	N.S.	N.S.
11:30	15:33	Trench 1	0.003	0.024	<0.03	0.867	0.89	14.9	0.95	N.S.	N.S.
3/11/2015	**3/11/2015**	**Storm Flow**									
11:30	14:58	Spring	0.009	0.030	<0.03	0.242	2.37	5.5	14.79	19.5	111.9

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:30	14:58	Upstream farm	0.005	0.026	0.02	0.118	0.16	2.1	3.38	34.5	579.4
11:20	14:58	Downstream farm	0.007	0.030	0.02	0.209	0.27	1.8	1.44	66.3	770.1
11:45	14:58	Ephemeral stream	0.006	0.022	0.04	0.567	0.60	0.5	2.20	6.3	410.0
12:10	14:58	Trench 1	0.003	0.014	0.07	0.989	0.97	0.3	2.00	<1.0	2419.2
12:15	14:58	Trench 2	0.003	0.056	0.04	1.443	1.59	1.2	3.51	<1.0	2419.2
3/19/2015	**3/19/2015**	**Base flow**									
10:59	15:10	Spring	0.010	0.028	0.03	0.184	0.29	10.6	7.37	38.9	79.4
12:00	15:10	Upstream farm	0.007	0.024	0.04	0.111	0.20	1.7	2.53	42.6	866.4
11:13	15:10	Downstream farm	0.009	0.028	0.04	0.234	0.35	2.8	2.87	71.7	1119.9
11:08	15:10	Ephemeral stream	0.007	0.018	0.01	0.529	0.63	1.0	4.31	14.6	866.4
11:13	15:10	House well	0.009	0.020	0.02	0.467	0.55	1.2	4.93	1.0	31.3
11:30	15:10	Trench 1	0.003	0.012	0.01	0.849	0.93	<6.58	3.11	1.0	275.5
11:35	15:10	Trench 2	0.004	0.062	0.09	1.036	1.42	1.9	5.12	5.2	2419.2
3/25/2015	**3/25/2015**	**Base flow**									

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:45	15:20	Spring	0.006	0.014	0.02	0.197	0.39	1.6	1.45	23.1	275.5
13:30	15:20	Upstream farm	0.006	0.028	0.02	0.056	0.16	2.9	1.36	125.9	2419.2
11:30	15:20	Downstream farm	0.008	0.036	0.04	0.162	0.29	5.0	1.41	547.5	3410.0
12:00	15:20	Ephemeral stream	0.007	0.014	0.02	0.462	0.53	1.1	0.64	8.6	344.8
12:20	15:20	House well	0.007	0.016	<0.03	0.450	0.52	1.9	0.03	18.5	30.1
12:30	15:20	Trench 1	0.003	0.008	<0.03	0.838	0.88	0.2	0.59	<1.0	410.6
3/26/2015	**3/26/2015**	**Storm flow**									
13:10	15:25	Upstream farm	0.013	0.064	0.06	0.090	0.30	11.4	3.71	547.5	5200.0
13:35	15:25	Downstream farm	0.013	0.076	0.06	0.144	0.41	14.1	3.94	816.4	4960.0
12:55	15:25	Trench 1	0.004	0.026	0.02	0.904	1.00	15.4	0.69	<1.0	1553.1
12:50	15:25	Trench 2	0.004	0.126	0.13	0.873	1.44	22.2	4.63	105.4	6950.0
13:20	15:25	Field 1	0.143	0.346	0.41	0.216	2.68	65.5	15.65	N.S.	N.S.
12:30	15:25	Field 5a	0.813	1.330	0.39	0.225	2.59	72.3	15.95	N.S.	N.S.
4/2/2015	**4/2/2015**	**Base flow**									

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:50	15:25	Spring	0.008	0.042	0.04	0.173	0.35	3.5	10.47	248.1	1299.7
12:15	15:25	Upstream farm	0.007	0.040	0.02	0.045	0.14	3.1	3.61	166.9	2419.2
1:30	15:25	Downstream farm	0.007	0.042	0.02	0.139	0.22	2.5	2.71	121.1	1986.3
12:30	15:25	Ephemeral stream	0.006	0.032	0.02	0.467	0.46	1.8	4.41	5.2	547.5
12:48	15:25	House well	0.008	0.030	<0.03	0.477	0.50	0.7	6.05	39.3	9060.0
12:54	15:25	Trench 1	0.003	0.028	0.02	0.865	0.87	0.3	3.34	1.1	308.6
4/9/2015	**4/9/2015**	**Base flow**									
11:45	15:30	Spring	0.011	0.034	0.01	0.257	0.42	4.9	9.11	7380.0	9040.0
12:30	15:30	Upstream farm	0.011	0.042	0.04	0.066	0.18	13.1	2.13	86.0	2650.0
12:50	15:30	Downstream farm	0.010	0.048	0.03	0.157	0.25	19.7	1.82	47.2	1986.3
12:00	15:30	House well	0.011	0.026	<0.03	0.499	0.50	1.5	0.74	4.1	325.5
12:10	15:30	Trench 1	0.006	0.018	<0.03	0.790	0.83	0.8	2.99	<1.0	187.2
4/15/2015	**4/15/2015**	**Storm Flow**									
11:38	14:55	Spring	0.007	0.034	<0.03	0.210	0.39	7.7	4.70	275.5	2280.0

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:23	14:55	Upstream farm	0.007	0.040	0.03	0.090	0.16	3.5	3.24	648.8	4040.0
12:40	14:55	Downstream farm	0.009	0.048	0.03	0.166	0.26	4.4	2.67	344.8	2920.0
11:48	14:55	Ephemeral stream	0.005	0.026	0.03	0.472	0.56	0.8	1.26	305.0	2430.0
11:58	14:55	House well	0.008	0.022	0.02	0.475	0.60	1.2	3.72	9.6	80.9
12:10	14:55	Trench 1	0.003	0.020	<0.03	0.857	0.93	1.3	4.29	<1.0	3180.0
4/23/2015	**4/23/2015**	**Base Flow**									
12:23	15:30	Spring	0.008	0.034	<0.03	0.264	0.36	7.4	3.64	71.7	648.8
13:00	15:30	Upstream farm	0.007	0.032	0.03	0.083	0.18	4.0	5.11	104.6	2419.2
12:15	15:30	Downstream farm	0.007	0.032	0.03	0.162	0.25	2.6	2.51	65.7	2419.2
11:55	15:30	Ephemeral stream	0.008	0.026	0.03	0.520	0.56	2.0	1.78	12.0	3270.0
11:35	15:30	House well	0.008	0.082	<0.03	0.496	0.53	1.4	1.69	18.5	35.0
11:48	15:30	Trench 1	0.003	0.034	<0.03	0.877	0.97	1.2	1.18	3.1	2690.0
4/29/2015	**4/29/2015**	**Base flow**									
11:25	14:05	Spring	0.010	0.028	<0.03	0.419	0.59	9.0	4.28	25.6	1732.9

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:53	14:05	Upstream farm	0.010	0.020	0.03	0.082	0.13	2.7	1.58	58.3	1732.4
12:13	14:05	Downstream farm	0.012	0.018	0.03	0.189	0.82	2.1	1.64	58.6	1986.3
11:30	14:05	Ephemeral stream	0.012	0.018	0.02	0.569	0.61	3.5	1.98	14.3	4080.0
11:35	14:05	House well	0.010	0.006	<0.03	0.517	0.51	0.7	2.26	248.1	5040.0
5/7/2015	**5/7/2015**	**Base flow**									
11:10	14:10	Spring	0.011	0.036	0.02	0.499	0.58	9.9	44.04	135.4	980.4
11:43	14:10	Upstream farm	0.008	0.032	0.01	0.110	0.16	7.5	10.16	77.6	3280.0
12:05	14:10	Downstream farm	0.009	0.034	<0.03	0.267	0.36	4.5	7.70	27.8	2280.0
11:18	14:10	Ephemeral stream	0.013	0.066	0.02	0.628	0.71	3.2	16.41	71.7	7170.0
11:23	14:10	House well	0.008	0.022	0.01	0.512	0.49	<6.58	28.63	3.1	59.4
5/8/2015	**5/8/2015**	**Storm flow**									
13:25	15:32	Upstream farm	0.134	0.354	0.16	0.340	1.12	51.4	9.30	N.S.	N.S.
13:25	15:32	Downstream farm	0.195	0.544	0.27	0.292	1.20	113.2	7.47	N.S.	N.S.

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:43	15:32	Ephemeral stream	0.005	0.254	0.41	2.287	3.23	127.1	6.45	N.S.	N.S.
13:00	15:32	Field 1	0.525	0.714	0.16	0.475	2.19	16.9	13.28	N.S.	N.S.
12:38	15:32	Field 12	0.675	0.956	0.14	0.303	1.82	57.0	16.00	N.S.	N.S.
5/11/2015	**5/12/2015**	**Storm Flow**									
11:35	8:30	Spring	0.008	0.058	0.01	0.339	0.49	8.7	3.67	N.S.	N.S.
11:28	8:30	Upstream farm	0.004	0.074	0.04	0.004	0.24	4.5	4.31	N.S.	N.S.
12:47	8:30	Downstream farm	0.031	0.530	0.11	0.071	1.12	277.5	8.48	N.S.	N.S.
12:05	8:30	Ephemeral stream	0.008	0.146	0.15	0.941	1.80	22.0	8.09	N.S.	N.S.
12:15	8:30	House well	0.009	0.038	0.02	0.541	0.55	4.2	0.89	N.S.	N.S.
12:25	8:30	Trench 1	0.003	0.060	0.02	0.916	0.97	27.6	1.78	N.S.	N.S.
12:35	8:30	Trench 2	0.003	0.042	0.05	0.553	0.76	8.8	3.44	N.S.	N.S.
11:25	8:30	Field 1	0.251	0.386	0.09	0.055	0.86	44.4	6.31	N.S.	N.S.

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:40	8:30	Field 5a	0.248	0.968	0.26	0.127	1.50	320.1	8.58	N.S.	N.S.
1:05	8:30	Field 12	0.194	0.364	0.09	0.135	0.83	36.7	7.03	N.S.	N.S.
5/14/2015	**5/14/2015**	**Base flow**									
12:35	15:12	Spring	0.009	0.062	0.02	0.222	0.35	41.5	2.84	121.1	2419.2
12:28	15:12	Upstream farm	0.011	0.046	0.02	0.177	0.23	2.8	1.35	145.5	2470.0
12:47	15:12	Downstream farm	0.015	0.050	0.02	0.326	0.39	6.1	1.16	128.1	4370.0
12:57	15:12	Left Fork	0.015	0.038	0.02	0.321	0.38	3.3	1.36	83.3	2690.0
12:15	15:12	Ephemeral stream	0.010	0.022	0.01	0.527	0.50	1.7	0.73	41.3	1986.3
12:05	15:12	Trench 1	0.005	0.042	0.02	0.904	0.94	29.9	1.20	81.6	1732.9
5/18/2015	**5/18/2015**	**Storm Flow**									
10:45	14:43	Spring	0.005	0.084	0.05	0.209	0.56	114.2	2.79	98.7	1413.6
11:57	14:43	Upstream farm	0.007	0.034	0.02	0.110	0.15	5.2	1.29	137.6	2419.2

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:17	14:43	Downstream farm	0.009	0.040	0.03	0.201	0.25	6.1	1.47	185.0	6770.0
12:29	14:43	Left Fork	0.011	0.040	0.04	0.209	0.29	4.1	1.90	167.4	8300.0
11:14	14:43	Ephemeral stream	0.007	0.028	0.03	0.525	0.55	0.7	1.18	90.7	7630.0
11:20	14:43	House well	0.008	0.018	<0.03	0.529	0.53	0.9	0.90	5.2	13.4
12:55	14:43	Trench 1	0.002	0.020	<0.03	0.897	0.93	0.3	1.28	32.3	1732.9
10:58	14:43	Field 1	0.208	0.512	0.54	0.410	3.59	53.7	26.12	N.S.	N.S.
5/26/2015	**5/26/2015**	**Base flow**									
11:49	15:48	Spring	0.021	0.020	<0.03	0.205	0.29	1.2	2.66	N.S.	N.S.
13:20	15:48	Upstream farm	0.012	0.044	0.04	0.080	0.19	6.4	1.50	N.S.	N.S.
13:32	15:48	Downstream farm	0.045	0.200	0.11	0.096	0.56	94.7	4.57	N.S.	N.S.
13:45	15:48	Left Fork	0.014	0.048	0.04	0.139	0.29	6.1	2.41	N.S.	N.S.
13:11	15:48	Ephemeral stream	0.017	0.030	0.03	0.514	0.60	0.9	1.12	N.S.	N.S.
12:43	15:48	House well	0.013	0.020	<0.03	0.514	0.54	2.7	0.87	N.S.	N.S.

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:55	15:48	Trench 1	0.007	0.012	0.01	0.752	0.80	1.0	0.78	N.S.	N.S.
1:00	15:48	Trench 2	0.007	0.112	0.04	1.190	1.44	131.9	1.23	N.S.	N.S.
12:09	15:48	Field 1	0.245	0.432	0.20	0.174	1.66	37.8	11.28	N.S.	N.S.
6/1/2015	**6/1/2015**	**Storm Flow**									
13:15	15:20	Downstream farm	0.006	0.050	0.05	0.109	0.25	13.7	1.80	N.S.	N.S.
12:00	15:20	Ephemeral stream	0.002	0.056	0.01	0.851	1.05	18.3	2.46	N.S.	N.S.
6/4/2015	**6/4/2015**	**Base Flow**									
12:50	15:20	Spring	0.010	0.028	<0.03	0.239	0.3	6.2	9.54	44.3	1413.8
12:00	15:20	Upstream farm	0.008	0.026	0.03	0.083	0.11	2.3	2.93	38.6	>2419.2
13:05	15:20	Downstream farm	0.009	0.034	<0.03	0.184	0.23	1.7	2.64	24.7	2419.2
13:13	15:20	Left Fork	0.008	0.022	<0.03	0.145	0.19	2.1	3.15	38.9	2560.0
11:40	15:20	Ephemeral stream	0.010	0.024	0.02	0.572	0.58	0.8	5.35	21.6	3890.0
11:35	15:20	House well	0.012	0.022	0.02	0.561	0.52	1.3	6.07	<1.0	14.6
6/8/2015	**6/8/2015**	**Base flow**									
11:36	15:30	House well	0.008	0.018	0.27	0.475	0.82	0.7	6.67	<1.0	<1.0

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
10:45	15:30	Spring	0.011	0.046	0.03	0.322	0.53	12.7	11.18	20.1	1986.3
12:26	15:30	Upstream farm	0.010	0.030	0.06	0.058	0.24	4.5	3.63	866.4	2780.0
13:12	15:30	Downstream farm	0.009	0.022	0.05	0.185	0.27	0.9	2.66	57.4	4640.0
13:25	15:30	Left Fork	0.006	0.024	0.02	0.102	0.23	1.1	2.78	32.7	4550.0
11:51	15:30	Ephemeral stream	0.009	0.020	0.03	0.560	0.62	0.6	2.81	65.7	9870.0
6/17/2015	**6/17/2015**	**Base flow**									
12:08	15:40	Spring	0.009	0.046	0.07	0.224	0.47	9.4	8.92	517.2	24890.0
10:10	15:40	Upstream farm	0.009	0.036	0.03	0.050	0.16	3.5	2.83	435.2	13130.0
12:49	15:40	Downstream farm	0.007	0.034	0.03	0.106	0.23	2.3	2.92	344.8	20980.0
13:01	15:40	Left Fork	0.005	0.026	0.04	0.112	0.22	2.8	1.62	26.2	8550.0
11:50	15:40	Ephemeral stream	0.009	0.032	0.04	0.948	1.04	6.7	0.97	770.1	8840.0
11:47	15:40	House well	0.010	0.028	0.03	0.466	0.52	0.06	3.08	488.4	15390.0
6/22/2015	**6/22/15**	**Storm flow**									

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:30	15:55	Spring	0.009	0.032	0.03	0.218	0.26	5.3	3.01	61.3	1413.6
12:15	15:55	Upstream farm	0.010	0.030	0.01	0.042	0.05	2.9	0.99	78.0	4960.0
12:55	15:55	Downstream farm	0.009	0.032	0.04	0.136	0.16	2.9	1.15	36.8	5040.0
13:10	15:55	Left Fork	0.011	0.030	0.02	0.147	0.18	2.5	1.59	35.4	5910.0
10:50	15:55	Ephemeral stream	0.011	0.026	0.05	0.563	0.61	1.3	1.21	37.9	2419.2
10:45	15:55	House well	0.010	0.032	0.02	0.459	0.43	0.4	1.85	27.2	1732.9
10:30	15:55	Trench 1	0.005	0.048	0.07	0.653	0.76	47.3	1.86	21.1	1986.3
6/29/2015	**6/29/2015**	**Storm flow**									
10:47	15:32	Spring	0.013	0.018	0.03	0.235	0.30	1.7	5.26	93.3	2419.2
12:30	15:32	Upstream farm	0.010	0.028	0.14	0.055	0.13	2.7	2.49	117.8	4710
13:22	15:32	Downstream farm	0.068	0.748	0.17	0.147	1.88	571	6.57	135.4	7540
13:30	15:32	Left Fork	0.010	0.026	0.02	0.189	0.26	2.9	2.80	53.6	10170
12:20	15:32	Ephemeral stream	0.067	1.268	0.34	0.580	3.42	1366.8	11.04	69.7	4040
12:15	15:32	Trench 1	0.008	0.022	0.05	0.394	0.42	56.8	4.17	82.3	11450

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
10:48	15:32	Field 1	0.354	0.524	0.37	0.226	1.64	11	11.32	N.S.	N.S.
7/6/2015	**7/7/2015**	**Storm flow**									
19:45	14:58	Downstream farm	0.275	0.380	0.22	0.204	1.03	19.1	7.91	N.S.	N.S.
17:10	14:58	Ephemeral stream	0.063	0.658	0.37	0.717	2.75	567.3	8.52	N.S	N.S.
13:25	14:58	Field 1	0.387	0.444	0.23	0.345	1.30	4.9	8.32	N.S.	N.S.
16:45	14:58	Field 12	0.796	0.910	0.13	0.567	1.58	29.0	7.67	N.S.	N.S.
18:25	14:58	Field 5a	0.094	0.448	0.13	0.172	1.01	261.3	4.38	N.S.	N.S.
7/9/2015	**7/9/2015**	**Base flow**									
13:37	15:15	Spring	0.011	0.048	0.09	0.144	0.41	4.3	6.47	77.1	3050.0
12:25	15:15	Upstream farm	0.013	0.048	0.02	0.087	0.18	6.8	2.75	201.4	10140.0
12:55	15:15	Downstream farm	0.014	0.050	0.03	0.117	0.24	8.8	2.32	275.5	10760.0
13:15	15:15	Left Fork	0.015	0.058	0.04	0.138	0.31	11.4	2.67	387.3	12670.0
12:12	15:15	Ephemeral stream	0.010	0.034	<0.03	0.569	0.71	4.9	2.56	78.9	5560.0
12:07	15:15	House well	0.011	0.024	0.01	0.423	0.48	2.0	1.69	9.8	4160.0
12:00	15:15	Trench 1	0.007	0.030	<0.03	0.520	0.62	7.1	2.52	63.7	12330.0

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
7/16/2015	**7/16/2015**	**Base flow**									
12:15	15:10	Upstream farm	0.010	0.024	0.02	0.065	0.15	0.5	1.91	41.3	52.0
12:54	15:10	Downstream farm	0.011	0.030	<0.03	0.195	0.33	0.5	1.35	11.8	6310.0
13:03	15:10	Left Fork	0.010	0.042	0.01	0.181	0.28	0.9	1.64	21.6	9330.0
12:33	15:10	Ephemeral stream	0.011	0.046	0.01	0.517	0.61	0.4	2.16	45.7	14830.0
12:28	15:10	House well	0.012	0.024	0.01	0.471	0.47	0.0	4.00	2.0	727.0
12:42	15:10	Spring	0.010	0.024	0.01	0.303	0.41	5.7	5.54	22.8	1413.6
7/23/2015	**7/23/2015**	**Storm flow**									
10:55	15:20	Spring	0.010	0.026	<0.03	0.436	0.60	2.7	1.12	61.3	1046.2
11:15	15:20	Upstream farm	0.009	0.026	0.02	0.096	0.18	1.3	0.97	93.3	7490.0
12:40	15:20	Downstream farm	0.011	0.028	0.02	0.198	0.31	0.8	1.06	16.8	4870.0
13:02	15:20	Left Fork	0.009	0.028	0.04	0.239	0.40	1.4	1.21	35.4	8360.0
12:00	15:20	Ephemeral stream	0.011	0.034	<0.03	0.511	0.68	11.3	0.33	201.4	24950.0
12:23	15:20	House well	0.015	0.030	<0.03	0.442	0.52	1.0	0.89	8.5	35.0
7/30/2015	**7/30/2015**	**Base flow**									

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:28	15:20	Spring	0.011	0.026	0.03	0.479	0.65	6.3	4.73	6.3	920.8
12:17	15:20	Upstream farm	0.014	0.024	<0.03	0.101	0.15	0.9	1.61	27.2	2880.0
12:50	15:20	Downstream farm	0.012	0.022	0.02	0.268	0.38	1.9	2.16	11.9	6500.0
13:00	15:20	Left Fork	0.008	0.020	0.04	0.221	0.37	2.3	2.60	30.3	8160.0
11:58	15:20	House well	0.013	0.014	0.02	0.466	0.51	0.3	0.90	1.0	7.4
8/6/2015	**8/6/2015**	**Storm flow**									
12:05	14:50	Spring	0.008	0.240	0.07	0.265	0.97	<6.58	7.10	23.1	48840.0
11:36	14:50	Upstream farm	0.009	0.028	<0.03	0.147	0.24	1.8	3.37	488.4	13540.0
12:22	14:50	Downstream farm	0.010	0.028	0.03	0.406	0.52	1.7	3.06	40.2	10390.0
12:37	14:50	Left Fork	0.007	0.026	0.04	0.310	0.47	1.2	3.16	217.8	8130.0
10:37	14:50	House well	0.010	0.018	0.04	0.482	0.52	0.5	3.33	920.8	21870.0
8/13/2015	**8/13/2015**	**Base flow**									
11:40	15:30	Spring	0.009	0.360	0.15	0.735	1.12	254.9	7.29	21.6	3360.0
12:06	15:30	Upstream farm	0.013	0.018	0.04	0.124	0.16	0.3	4.32	13.4	2460.0
13:01	15:30	Downstream farm	0.011	0.024	<0.03	0.384	0.50	4.0	3.74	24.0	3310.0
13:12	15:30	Left Fork	0.007	0.016	0.03	0.192	0.52	1.4	4.50	13.2	4810.0
11:53	15:30	House well	0.025	0.012	0.03	0.498	0.58	0.5	6.15	4.1	228.2

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
8/20/2015	**8/20/2015**	**Storm flow**									
11:32	14:05	Spring	0.009	0.276	0.07	0.337	0.89	223.6	17.88	148.3	3270.0
11:49	14:05	Downstream farm	0.015	0.022	0.03	0.491	0.53	2.2	5.94	39.3	66.3
12:04	14:05	Left Fork	0.009	0.028	0.04	0.306	0.42	2.3	5.12	48.8	3930.0
10:52	14:05	House well	0.012	0.018	<0.03	0.545	0.56	0.9	6.63	1.0	29.5
8/27/2015	**8/27/2015**	**Base flow**									
12:48	15:35	Spring	0.007	0.158	0.04	0.329	0.69	103.7	9.07	27.2	7540.0
12:37	15:35	Upstream farm	0.005	0.028	0.04	0.084	0.28	2.9	4.30	104.6	7710.0
1:20	15:35	Downstream farm	0.013	0.024	<0.03	0.450	0.54	2.5	4.43	137.4	5730.0
1:30	15:35	Left Fork	0.008	0.024	0.02	0.218	0.33	2.0	3.79	7.4	3010.0
12:20	15:35	House well	0.012	0.018	<0.03	0.599	0.61	1.6	3.66	1.0	61.3
9/2/2015	**9/2/2015**	**Base flow**									
12:06	14:45	Spring	0.007	0.620	0.10	0.304	1.27	2.47	402.7	155.3	15530.0
11:50	14:45	Upstream farm	0.007	0.042	0.07	0.047	0.39	3.37	5.5	46.4	9070.0
12:19	14:45	Downstream farm	0.010	0.020	0.01	0.449	0.55	3.2	4.80	20.3	6630.0
12:30	14:45	Left Fork	0.010	0.020	0.01	0.449	0.55	3.19	4.8	20.3	6630.0
11:30	14:45	House well	0.007	0.020	0.03	0.109	0.33	1.67	3.8	26.9	5290.0

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
9/10/2015	**9/10/2015**	**Base flow**									
12:45	15:15	Spring	0.004	0.026	0.02	0.197	0.39	6.50	3.5	980.4	38730.0
12:59	15:15	Downstream farm	0.008	0.028	0.02	0.464	0.58	3.96	2.9	66.3	5470.0
13:10	15:15	Left Fork	0.006	0.026	<0.03	0.198	0.34	4.09	2.5	21.6	7230.0
11:56	15:15	House well	0.010	0.018	<0.03	0.576	0.60	3.21	0.3	8.6	727.0
9/16/2015	**9/16/2015**	**Base flow**									
11:41	14:40	Spring	0.004	0.176	<0.03	0.260	0.70	5.84	111.2	130.9	8330.0
12:06	14:40	Upstream farm	0.004	0.024	<0.03	0.104	0.30	4.62	2.1	50.4	3590.0
12:24	14:40	Downstream farm	0.009	0.030	0.01	0.404	0.62	4.59	1.4	6.2	4800.0
12:36	14:40	Left Fork	0.006	0.032	<0.03	0.146	0.48	2.49	1.3	38.2	6333.0
11:52	14:40	House well	0.009	0.020	<0.03	0.559	0.60	2.58	0.2	1.0	148.3
9/24/2015	**9/24/2015**	**Base flow**									
11:40	14:30	Spring	0.006	0.024	<0.03	0.216	0.42	10.59	12.3	8.6	1119.9
11:30	14:30	Upstream farm	0.006	0.078	<0.03	0.200	0.41	5.92	14.8	17.1	4570.0
12:07	14:30	Downstream farm	0.009	0.018	<0.03	0.449	0.56	5.58	1.2	29.9	7540.0
12:18	14:30	Left Fork	0.007	0.016	0.01	0.098	0.20	3.08	0.6	31.3	3410.0
11:19	14:30	House well	0.009	0.012	<0.03	0.543	0.58	7.72	0.3	<1.0	24.6

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
9/30/2015	**9/30/2015**	**Base flow**									
12:00	15:15	Spring	0.005	0.630	0.11	0.178	1.15	15.88	450.3	137.6	36540.0
11:50	15:15	Downstream farm	0.008	0.022	0.01	0.472	0.66	5.43	4.5	31.7	5290.0
11:42	15:15	Left Fork	0.007	0.018	<0.03	0.082	0.20	4.98	1.2	18.3	5940.0
12:43	15:15	House well	0.009	0.016	<0.03	0.499	0.60	4.20	0.5	<1.0	2.0
10/8/2015	**10/8/2015**	**Base flow**									
11:32	14:05	Spring	0.003	0.018	0.02	0.176	0.27	4.5	2.43	<1.0	686.7
11:20	14:05	Downstream farm	0.005	0.020	0.02	0.517	0.60	1.5	1.62	21.3	12360.0
11:10	14:05	Left Fork	0.003	0.020	0.02	0.069	0.15	1.5	1.58	59.8	3640.0
12:15	14:05	House well	0.008	0.020	0.02	0.518	0.53	0.5	1.54	<1.0	<1
10/14/2015	**10/14/2015**	**Base flow**									
11:42	14:40	Spring	0.008	0.056	0.03	0.193	0.36	27.5	1.50	<1.0	248.1
11:28	14:40	Downstream farm	0.010	0.056	0.03	0.603	0.76	12.4	1.33	7.3	8164.0
11:17	14:40	Left Fork	0.009	0.022	0.01	0.078	0.16	2.2	1.28	9.8	1986.3
12:10	14:40	House well	0.012	0.020	<0.03	0.490	0.63	0.3	0.94	<1.0	<1
10/22/2015	**10/22/2015**	**Base flow**									
12:35	13:45	Spring	0.005	0.028	0.03	0.173	0.33	11.4	6.99	<1.0	307.6

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:15	13:45	Downstream farm	0.008	0.018	0.07	0.548	0.69	2.3	3.64	17.8	3140.0
12:05	13:45	Left Fork	0.008	0.018	<0.03	0.069	0.13	1.9	3.57	3.1	1732.9
13:10	13:45	House well	0.010	0.014	0.04	0.478	0.50	0.4	1.93	<1.0	2.0
10/28/2015	**10/28/2015**	**Base flow**									
12:10	14:25	Spring	0.005	0.112	0.05	0.247	0.55	66.2	4.89	179.3	3950.0
11:56	14:25	Downstream farm	0.009	0.032	0.03	0.544	0.78	1.7	3.91	35.0	6700.0
11:46	14:25	Left Fork	0.007	0.024	0.02	0.060	0.24	1.9	2.90	61.3	3410.0
12:55	14:25	House well	0.008	0.016	0.01	0.391	0.54	<6.58	2.40	<1.0	<1
11/4/2015	**11/4/2015**	**Base flow**									
12:14	14:50	Spring	0.007	0.026	0.07	0.139	0.33	0.7	5.44	8.4	920.8
12:03	14:50	Downstream farm	0.010	0.038	<0.03	0.607	0.76	1.7	3.79	23.1	2880.0
11:54	14:50	Left Fork	0.007	0.018	<0.03	0.072	0.18	0.7	3.98	77.6	>2419.2
12:41	14:50	House well	0.010	0.016	<0.03	0.468	0.54	<6.58	2.62	<1.0	<1
11/12/2015	**11/12/2015**	**Base flow**									
12:15	15:00	Spring	0.007	0.064	<0.03	0.187	0.43	33.6	5.46	72.7	>2419.2
12:26	15:00	Upstream farm	0.015	0.022	<0.03	0.127	0.22	0.9	2.51	117.8	2620.0
12:03	15:00	Downstream farm	0.013	0.044	<0.03	0.439	0.64	6.9	2.14	75.9	>2419.2

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:54	15:00	Left Fork	0.005	0.016	<0.03	0.215	0.34	1.1	2.50	25.6	3360.0
12:42	15:00	House well	0.009	0.012	<0.03	0.501	0.55	0.3	3.71	<1.0	<1
11/18/2015	**11/18/2015**	**Base flow**									
11:37	15:05	Spring	0.011	0.030	0.01	0.168	0.43	1.8	5.47	461.1	13130.0
11:50	15:05	Upstream farm	0.013	0.046	0.06	0.229	0.41	4.0	2.55	517.2	5810.0
11:25	15:05	Downstream farm	0.017	0.050	0.09	0.334	0.56	4.5	2.88	435.2	14550.0
11:15	15:05	Left Fork	0.020	0.062	0.08	0.432	0.73	7.4	3.72	686.7	23590.0
12:15	15:05	Ephemeral stream	0.012	0.040	0.07	1.262	1.57	2.7	3.23	325.5	10710.0
12:28	15:05	Trench 1	0.005	0.030	0.02	0.264	0.52	1.9	1.74	65.7	17930.0
12:50	15:05	House well	0.009	0.014	<0.03	0.464	0.59	0.4	0.48	<1.0	<1
12/2/2015	**12/2/2015**	**Base flow**									
12:15	15:35	Spring	0.011	0.014	<0.03	1.262	1.63	1.9	2.51	109.2	2419.2
13:22	15:35	Upstream farm	0.010	0.020	0.03	0.135	0.22	1.4	0.98	55.6	1986.3
11:57	15:35	Downstream farm	0.012	0.022	0.02	0.266	0.39	1.6	0.94	48.0	9600.0
11:40	15:35	Left Fork	0.014	0.024	0.01	0.302	0.43	1.6	1.36	66.9	1986.3
12:27	15:35	Ephemeral stream	0.011	0.024	<0.03	0.613	0.89	1.0	1.01	145.0	1986.3

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:48	15:35	Trench 1	0.006	0.008	<0.03	0.218	0.33	1.3	1.10	6.3	5810.0
13:38	15:35	House well	0.011	0.014	0.02	0.480	0.60	0.9	1.38	1.0	1.0
12/14/2015	**12/14/2015**	**Base flow**									
12:45	16:00	Spring	0.007	0.024	<0.03	0.744	0.94	0.5	3.86	No Data	3230.0
13:00	16:00	Upstream farm	0.009	0.030	<0.03	0.364	0.58	3.4	11.89	118.7	2810.0
12:30	16:00	Downstream farm	0.009	0.034	0.05	0.181	0.27	4.1	4.10	410.6	4080.0
12:20	16:00	Left Fork	0.012	0.048	0.07	0.235	0.38	11.2	3.24	325.5	4520.0
15:15	16:00	Ephemeral stream	0.014	0.056	0.06	0.298	0.50	10.8	3.92	410.6	6010.0
13:30	16:00	Trench 1	0.004	0.012	<0.03	0.299	0.36	1.1	3.44	8.4	10460.0
13:38	16:00	House well	0.011	0.010	<0.03	0.545	0.57	0.1	10.15	<1.0	1.0
12/22/2015	**12/22/2015**	**Base flow**									
11:35	14:45	Spring	0.008	0.018	<0.03	0.531	0.58	0.7	1.23	146.7	1203.3
12:38	14:45	Upstream	0.010	0.020	<0.03	0.092	0.14	0.4	0.94	50.4	648.8
11:02	14:45	Downstream	0.011	0.020	<0.03	0.245	0.32	1.0	1.12	31.8	980.4
10:48	14:45	Left Fork	0.013	0.020	<0.03	0.267	0.35	0.1	1.36	26.5	1299.7
11:46	14:45	Ephemeral	0.010	0.016	<0.03	1.452	1.68	0.7	2.41	52.9	1299.7
12:14	14:45	Trench 1	0.005	0.010	<0.03	0.157	0.20	0.3	0.89	1.0	435.2

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:25	14:45	House well	0.010	0.016	<0.03	0.534	0.59	0.3	1.40	<1.0	<1.0
1/5/2016	**1/25/2016**	**Base flow**									
11:52	15:29	Spring	0.007	0.024	<0.03	0.584	0.63	0.7	1.39	16.0	816.4
13:00	15:29	Upstream	0.008	0.026	<0.03	0.158	0.20	0.5	0.95	67.7	648.8
11:40	15:29	Downstream	0.011	0.026	<0.03	0.419	0.46	0.1	1.13	40.8	648.8
11:30	15:29	Left Fork	0.013	0.028	<0.03	0.427	0.48	0.7	1.51	34.1	686.7
12:02	15:29	Ephemeral	0.007	0.018	<0.03	0.883	1.00	1.2	2.15	32.7	686.7
12:13	15:29	Trench 1	0.003	0.016	<0.03	0.243	0.29	0.9	1.11	1.0	209.8
12:44	15:29	House well	0.008	0.020	<0.03	0.528	0.57	0.9	1.08	<1.0	1.0
1/25/2016	**1/25/2016**	**Base flow**									
11:16	15:25	Spring	0.010	0.022	<0.03	0.565	0.60	0.3	1.27	34.5	1732.9
12:10	15:25	Upstream	0.010	0.022	<0.03	0.068	0.09	1.1	1.52	16.9	290.9
11:00	15:25	Downstream	0.011	0.022	<0.03	0.213	0.24	0.7	1.29	8.6	365.4
10:48	15:25	Left Fork	0.010	0.024	<0.03	0.198	0.25	1.0	1.30	21.1	435.2
11:28	15:25	Ephemeral	0.011	0.030	<0.03	0.762	0.87	9.8	3.10	1.0	816.4
11:42	15:25	House well	0.012	0.020	<0.03	0.602	0.55	0.5	2.36	<1.0	<1
2/10/2016	**2/10/2016**	**Base flow**									
12:25	15:26	Spring	0.007	0.040	<0.03	0.634	0.80	17.7	2.70	1.0	325.5

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:15	15:26	Upstream	0.005	0.016	<0.03	0.048	0.11	0.5	1.11	14.5	178.5
11:04	15:26	Downstream	0.005	0.016	<0.03	0.198	0.24	0.9	0.99	4.1	218.7
11:29	15:26	Left Fork	0.003	0.012	<0.03	0.175	0.24	0.8	1.15	7.4	209.8
12:03	15:26	House well	0.007	0.014	<0.03	0.542	0.56	0.1	0.63	<1.0	<1.0
2/24/2016	**2/24/2016**	**Base flow**									
11:05	14:45	Spring	0.010	0.052	<0.03	1.102	1.46	2.8	N.S.	209.8	3930.0
12:16	14:45	Upstream	0.014	0.052	<0.03	0.099	0.28	6.1	N.S.	1203.3	7330.0
10:52	14:45	Downstream	0.015	0.058	<0.03	0.142	0.37	8.3	N.S.	1986.3	6500.0
10:38	14:45	Left Fork	0.015	0.088	<0.03	0.249	0.63	15.6	N.S.	2780.0	14390.0
11:15	14:45	Ephemeral	0.010	0.056	<0.03	0.195	0.40	12.8	N.S.	387.3	4870.0
11:36	14:45	Trench 1	0.005	0.014	<0.03	0.345	0.39	2.1	N.S.	<1.0	9070.0
11:53	14:45	House well	0.010	0.010	<0.03	0.582	0.55	1.3	N.S.	<1.0	<1.0
Samples analyzed since the last quarterly report											
3/10/2016	**3/10/2016**	**Base flow**									
11:04	15:45	Spring	0.012	0.064	0.11	0.104	0.34	9.5	5.38	285.1	3230.0
13:13	15:45	Upstream	0.012	0.048	0.13	0.082	0.20	8.6	2.66	770.1	>2419.2
10:51	15:45	Downstream	0.010	0.044	0.11	0.118	0.25	6.2	2.28	298.7	>2419.2

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:32	15:45	Ephemeral stream	0.006	0.050	0.13	0.918	1.22	26.7	3.12	648.8	8840.0
10:38	15:45	Left Fork	0.013	0.046	0.01	0.154	0.38	8.7	2.64	367.3	2750.0
12:03	15:45	House well	0.011	0.020	0.02	0.562	0.59	0.9	1.19	<1.0	<1.0
11:50	15:45	Trench 1	0.005	0.036	0.10	0.264	0.45	3.5	2.87	2419.2	16690.0
11:46	15:45	Trench 2	0.005	0.054	0.14	1.716	2.35	6.8	6.77	613.1	34480.0
12:41	15:45	Field 12	0.411	0.522	1.17	0.852	4.49	621.5	12.58	410.6	>241920
3/16/2016	**3/16/2016**	**Base flow**									
11:35	15:05	Spring	0.009	0.036	0.01	0.340	0.44	5.7	3.36	75.4	461.1
12:35	15:05	Upstream	0.008	0.034	<0.03	0.060	0.13	0.4	1.10	52.9	579.4
11:23	15:05	Downstream	0.006	0.028	0.01	0.170	0.24	0.9	1.17	81.3	>2419.2
11:50	15:05	Ephemeral stream	0.006	0.022	0.01	0.520	0.54	0.0	1.75	88.0	461.1
11:13	15:05	Left Fork	0.009	0.032	<0.03	0.190	0.26	0.3	1.45	35.9	980.4
12:22	15:05	House well	0.009	0.022	<0.03	0.550	0.55	0.0	1.55	<1.0	<1
12:01	15:05	Trench 1	0.003	0.032	0.02	0.331	0.37	0.0	1.23	101.7	290.9
3/24/2016	**3/24/2016**	**Storm flow**									
11:50	15:10	Spring	0.015	0.046	0.06	0.172	0.42	13.1	4.95	N.S.	N.S.
12:50	15:10	Upstream	0.011	0.032	0.06	0.040	0.14	4.5	1.60	N.S.	N.S.

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:35	15:10	Downstream	0.011	0.024	<0.03	0.106	0.20	3.9	1.29	N.S.	N.S.
12:10	15:10	Ephemeral stream	0.010	0.012	<0.03	0.531	0.64	1.3	1.44	N.S.	N.S.
11:25	15:10	Left Fork	0.013	0.048	0.09	0.186	0.39	10.7	2.65	N.S.	N.S.
12:34	15:10	House well	0.012	0.014	<0.03	0.565	0.65	0.2	2.72	N.S.	N.S.
12:20	15:10	Trench 1	0.008	0.016	<0.03	0.208	0.20	2.8	1.33	N.S.	N.S.
3/31/2016	**3/31/3016**	**Base Flow**									
11:06	15:10	Spring	0.011	0.034	<0.03	0.319	0.52	7.4	25.32	71.7	1553.1
12:45	15:10	Upstream	0.008	0.042	0.08	0.100	0.22	6.1	2.49	186.0	>2419.2
10:45	15:10	Downstream	0.011	0.056	0.08	0.156	0.33	12.4	2.67	365.0	>2419.2
11:16	15:10	Ephemeral stream	0.013	0.656	0.68	1.211	3.05	375.0	12.14	16160.0	198630.0
10:33	15:10	Left Fork	0.013	0.056	0.09	0.199	0.40	11.9	2.59	172.0	3640.0
11:49	15:10	House well	0.010	0.018	<0.03	0.556	0.62	0.2	3.93	1.0	26.2
11:40	15:10	Trench 1	0.004	0.018	<0.03	0.347	0.49	5.5	4.76	4.1	2419.2
11:35	15:10	Trench 2	0.006	0.040	0.06	2.800	3.54	20.9	9.29	7.4	10810.0
12:02	15:10	Field 5a	1.154	1.352	0.27	0.302	1.67	26.5	32.74	24890.0	>241920
4/4/2016	**4/4/2016**	**Base Flow**									
11:58	15:20	Spring	0.009	0.028	<0.03	0.324	0.42	7.5	1.57	104.7	866.4

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:50	15:20	Upstream	0.008	0.026	<0.03	0.065	0.08	1.7	0.71	8.3	648.8
11:48	15:20	Downstream	0.010	0.026	<0.03	0.176	0.20	1.9	0.98	77.6	1046.2
12:08	15:20	Ephemeral stream	0.008	0.018	<0.03	0.462	0.48	1.3	1.79	12.0	727.0
11:38	15:20	Left Fork	0.009	0.022	<0.03	0.131	0.17	1.5	0.87	44.8	1119.9
12:35	15:20	House well	0.011	0.018	<0.03	0.466	0.48	0.0	0.94	<1.0	1.0
12:26	15:20	Trench 2	0.004	0.012	<0.03	0.236	0.25	0.0	0.85	1.0	>2419.2
4/20/2016	**4/20/2016**	**Base Flow**									
12:02	15:52	Spring	0.005	0.042	<0.03	0.410	0.55	22.4	1.04	3.1	195.6
13:20	15:52	Upstream	0.003	0.020	<0.03	0.047	0.06	1.9	0.61	185.0	1299.7
11:42	15:52	Downstream	0.004	0.018	<0.03	0.152	0.20	1.2	0.74	38.4	2920.0
12:11	15:52	Ephemeral stream	0.008	0.020	<0.03	0.517	0.66	4.1	0.68	44.3	21430.0
11:30	15:52	Left Fork	0.005	0.020	<0.03	0.157	0.21	2.1	0.84	35.0	6160.0
12:52	15:52	House well	0.005	0.014	<0.03	0.598	0.50	0.5	0.47	1.0	1.0
4/28/2016	**4/28/2016**	**Base Flow**									
11:55	15:17	Spring	0.010	0.024	<0.03	0.455	0.63	12.0	N.S.	25.6	>2419.2
13:00	15:17	Upstream	0.009	0.012	<0.03	0.035	0.12	1.2	N.S.	58.6	648.8
11:30	15:17	Downstream	0.010	0.012	<0.03	0.154	0.27	1.5	N.S.	36.4	2149.2

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:31	15:17	House well	0.011	0.008	<0.03	0.481	0.57	0.3	N.S.	<1.0	<1.0
11:25	15:17	Dry Creek	0.010	0.012	<0.03	0.152	0.27	1.0	N.S.	14.8	3050.0
5/2/2016	**5/3/2016**	**Base Flow**									
12:25	08:55	Spring	0.008	0.012	<0.03	0.338	0.36	2.2	5.08	88.2	>2419.2
14:29	08:55	Upstream	0.006	0.018	<0.03	0.039	0.10	6.7	1.76	185.0	2419.2
11:43	08:55	Downstream	0.008	0.016	<0.03	0.075	0.16	2.0	1.50	178.9	4720.0
12:38	08:55	Ephemeral stream	0.007	0.016	<0.03	0.468	0.59	1.7	2.56	118.7	5380.0
12:38	08:55	Ephemeral stream	0.008	0.112	0.15	1.794	2.62	61.8	4.07	1046.2	23590.0
11:24	08:55	Left Fork	0.009	0.020	<0.03	0.095	0.20	1.9	2.30	172.6	3640.0
13:27	08:55	House well	0.009	0.016	<0.03	0.551	0.56	0.1	1.94	<1.0	<1
5/10/2016	**5/10/2016**	**Base Flow**									
11:15	15:40	Spring	0.008	0.026	<0.03	0.281	0.45	2.9	7.58	410.6	2780.0
12:50	15:40	Upstream	0.007	0.044	0.01	0.070	0.20	6.1	3.10	613.1	4480.0
10:58	15:40	Downstream	0.011	0.060	0.01	0.101	0.31	11.6	2.95	1203.3	7490.0
11:28	15:40	Ephemeral stream	0.195	0.560	0.32	0.649	4.01	1346.7	11.94	579.4	>2419.2
10:35	15:40	Left Fork	0.011	0.072	0.02	0.121	0.37	17.2	3.35	980.4	8230.0
12:08	15:40	House well	0.009	0.008	<0.03	0.533	0.56	0.5	4.39	<1.0	24.9

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:55	15:40	Trench 1	0.002	0.016	<0.03	0.228	0.30	3.9	2.91	13.9	>2419.2
11:45	15:40	Trench 2	0.002	0.038	<0.03	1.706	2.18	5.2	3.72	38.7	>2419.2
12:26	15:40	Field 5a	1.114	1.458	1.69	2.894	6.35	79.9	12.82	22820.0	>2419.2
13:08	15:40	Field 12	0.370	0.666	0.12	0.062	1.03	96.7	6.92	663.0	>2419.2
5/18/2016	**5/18/2016**	**Base Flow**									
11:29	15:20	Spring	0.009	0.024	0.01	0.320	0.51	8.7	2.20	45.7	1413.6
13:08	15:20	Upstream	0.007	0.016	<0.03	0.043	0.13	1.4	1.00	85.5	1299.7
11:10	15:20	Downstream	0.009	0.020	0.02	0.117	0.25	1.2	0.98	107.1	>2419.2
11:43	15:20	Ephemeral stream	0.008	0.014	<0.03	0.479	0.63	3.0	0.84	34.1	2419.2
10:57	15:20	Left Fork	0.010	0.016	0.01	0.139	0.27	1.4	1.54	60.1	2620.0
12:50	15:20	House well	0.009	0.010	<0.03	0.488	0.64	0.4	0.95	<1.0	<1.0
12:05	15:20	Trench 1	0.006	0.006	<0.03	0.169	0.22	0.1	0.54	2.0	5200.0
5/26/2016	**5/26/2016**	**Base Flow**									
11:45	15:30	Spring	0.008	0.020	<0.03	0.219	0.35	6.2	4.15	344.8	3730.0
13:08	15:30	Upstream	0.007	0.030	<0.03	0.056	0.12	4.2	1.56	238.2	5290.0
11:30	15:30	Downstream	0.009	0.036	<0.03	0.094	0.20	4.6	1.75	547.5	3640.0
12:05	15:30	Ephemeral stream	0.052	0.424	0.39	0.858	2.20	350.6	8.58	22470.0	>2419.2

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:20	15:30	Left Fork	0.010	0.048	0.02	0.123	0.24	10.6	2.66	461.1	6890.0
12:51	15:30	House well	0.009	0.012	<0.03	0.564	0.57	0.7	0.93	1.0	7.4
12:38	15:30	Trench 1	0.008	0.006	<0.03	0.217	0.23	1.4	1.29	1.0	4260.0

¶ Values proceeded by '<' were reported by the analytical laboratory as zero and the minimum detection limit is given.
§ N.S. is No Sample.

Nutrients, Sediment, and Bacteria by Date Spring, Upstream, and Downstream Sites

Table 4. Water quality analyses in Big Creek upstream and downstream of the C&H Farm boundary of permitted land application since January 2015, with those collected since the last report noted.

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
	---------- mg/L ----------							--- MPN/100 mL ---	
1/8/2015									
Upstream	0.009	0.022	<0.03	0.187	0.21	2.3	1.41	30.9	547.5
Downstream	0.011	0.024	<0.03	0.376	0.39	2.5	1.22	42.6	980.4
1/14/2015									
Upstream	0.012	0.032	<0.03	0.135	0.19	1.1	3.02	88.2	727.0
Downstream	0.011	0.020	<0.03	0.388	0.34	1.0	2.03	25.6	613.1
1/21/2015									
Upstream	0.008	0.018	<0.03	0.089	0.12	1.1	0.95	70.3	579.4
Downstream	0.010	0.026	0.06	0.197	0.30	1.1	1.60	37.4	613.1
1/29/2015									
Upstream	0.006	0.060	<0.03	0.065	0.21	47.8	1.71	727.0	1413.6
Downstream	0.009	0.020	0.04	0.168	0.27	1.3	1.50	19.9	1046.2

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
2/3/2015									
Upstream	0.006	0.022	<0.03	0.051	0.28	1.1	2.69	4.1	1203.3
Downstream	0.009	0.018	<0.03	0.140	0.29	4.1	2.66	1.0	547.5
2/10/2015									
Upstream	0.009	0.012	<0.03	0.056	0.09	0.7	1.04	1119.1	2419.2
Downstream	0.011	0.012	<0.03	0.143	0.23	1.0	1.15	7.4	1553.1
2/26/2015									
Upstream	0.006	0.024	<0.03	0.100	0.13	0.6	1.20	47.9	686.7
Downstream	0.008	0.026	0.02	0.200	0.25	0.8	1.17	48.7	866.4
3/3/2015									
Upstream	0.006	0.026	0.02	0.048	0.11	N.D.	1.50	N.S.	N.S.
Downstream	0.007	0.028	<0.03	0.138	0.23	N.D.	1.50	N.S.	N.S.
3/11/2015									
Upstream	0.005	0.026	0.02	0.118	0.16	2.1	3.38	34.5	579.4
Downstream	0.007	0.030	0.02	0.209	0.27	1.8	1.44	66.3	770.1
3/19/2015									

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Upstream	0.007	0.024	0.04	0.111	0.20	1.7	2.53	42.6	866.4
Downstream	0.009	0.028	0.04	0.234	0.35	2.8	2.87	71.7	1119.9
3/25/2015									
Upstream	0.006	0.028	0.02	0.056	0.16	2.9	1.36	125.9	2419.2
Downstream	0.008	0.036	0.04	0.162	0.29	5.0	1.41	547.5	3410.0
3/26/2015									
Upstream	0.013	0.076	0.06	0.144	0.41	14.1	3.94	816.4	4960.0
Downstream	0.004	0.026	0.02	0.904	1.00	15.4	0.69	<1.0	1553.1
4/2/2015									
Upstream	0.007	0.040	0.02	0.045	0.14	3.1	3.61	166.9	2419.2
Downstream	0.007	0.042	0.02	0.139	0.22	2.5	2.71	121.1	1986.3
4/9/2015									
Upstream	0.011	0.042	0.04	0.066	0.18	13.1	2.13	86.0	2650.0
Downstream	0.010	0.048	0.03	0.157	0.25	19.7	1.82	47.2	1986.3
4/15/2015									
Upstream	0.007	0.040	0.03	0.090	0.16	3.5	3.24	648.8	4040.0

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Downstream	0.009	0.048	0.03	0.166	0.26	4.4	2.67	344.8	2920.0
4/23/2015									
Upstream	0.007	0.032	0.03	0.083	0.18	4.0	5.11	104.6	2419.2
Downstream	0.007	0.032	0.03	0.162	0.25	2.6	2.51	65.7	2419.2
4/29/2015									
Upstream	0.010	0.020	0.03	0.082	0.13	2.7	1.58	58.3	1732.4
Downstream	0.012	0.018	0.03	0.189	0.82	2.1	1.64	58.6	1986.3
5/7/2015									
Upstream	0.008	0.032	0.01	0.110	0.16	7.5	10.16	77.6	3280.0
Downstream	0.009	0.034	<0.03	0.267	0.36	4.5	7.70	27.8	2280.0
5/8/2015									
Upstream	0.195	0.544	0.27	0.292	1.20	113.2	7.47	N.S.	N.S.
Downstream	0.005	0.254	0.41	2.287	3.23	127.1	6.45	N.S.	N.S.
5/11/2015									
Upstream	0.004	0.074	0.04	0.004	0.24	4.5	4.31	N.S.	N.S.
Downstream	0.031	0.530	0.11	0.071	1.12	277.5	8.48	N.S.	N.S.

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
5/14/2015									
Upstream	0.011	0.046	0.02	0.177	0.23	2.8	1.35	145.5	2470.0
Downstream	0.015	0.050	0.02	0.326	0.39	6.1	1.16	128.1	4370.0
5/18/2015									
Upstream	0.007	0.034	0.02	0.110	0.15	5.2	1.29	137.6	2419.2
Downstream	0.009	0.040	0.03	0.201	0.25	6.1	1.47	185.0	6770.0
5/26/2015									
Upstream	0.012	0.044	0.04	0.080	0.19	6.4	1.50	N.S.	N.S.
Downstream	0.045	0.200	0.11	0.096	0.56	94.7	4.57	N.S.	N.S.
6/1/2015									
Downstream	0.006	0.050	0.05	0.109	0.25	13.7	1.80	N.S.	N.S.
6/4/2015									
Upstream	0.008	0.026	0.03	0.083	0.11	2.3	2.93	38.6	>2419.2
Downstream	0.009	0.034	<0.03	0.184	0.23	1.7	2.64	24.7	2419.2
6/8/2015									
Upstream	0.010	0.030	0.06	0.058	0.24	4.5	3.63	866.4	2780.0

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Downstream	0.009	0.022	0.05	0.185	0.27	0.9	2.66	57.4	4640.0
6/17/2015									
Upstream farm	0.009	0.036	0.03	0.050	0.16	3.5	2.83	435.2	13130.0
Downstream	0.007	0.034	0.03	0.106	0.23	2.3	2.92	344.8	20980.0
6/22/2015									
Upstream	0.010	0.030	0.01	0.042	0.05	2.9	0.99	78.0	4960.0
Downstream	0.009	0.032	0.04	0.136	0.16	2.9	1.15	36.8	5040.0
6/29/2015									
Upstream	0.010	0.028	0.14	0.055	0.13	2.7	2.49	117.8	4710
Downstream	0.068	0.748	0.17	0.147	1.88	571	6.57	N.S.	N.S.
7/6/2015									
Downstream	0.275	0.380	0.22	0.204	1.03	19.1	7.91	N.S.	N.S.
7/9/2015									
Upstream	0.013	0.048	0.02	0.087	0.18	6.8	2.75	201.4	10140.0
Downstream	0.014	0.050	0.03	0.117	0.24	8.8	2.32	275.5	10760.0
7/16/2015									

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Downstream	0.011	0.030	<0.03	0.195	0.33	0.5	1.35	11.8	6310.0
7/23/2015									
Upstream	0.009	0.026	0.02	0.096	0.18	1.3	0.97	93.3	7490.0
Downstream	0.011	0.028	0.02	0.198	0.31	0.8	1.06	16.8	4870.0
7/30/2015									
Upstream	0.014	0.024	<0.03	0.101	0.15	0.9	1.61	27.2	2880.0
Downstream	0.012	0.022	0.02	0.268	0.38	1.9	2.16	11.9	6500.0
8/6/2015									
Upstream	0.009	0.028	<0.03	0.147	0.24	1.8	3.37	488.4	13540.0
Downstream	0.010	0.028	0.03	0.406	0.52	1.7	3.06	40.2	10390.0
8/13/2015									
Upstream	0.013	0.018	0.04	0.124	0.16	0.3	4.32	13.4	2460.0
Downstream	0.011	0.024	<0.03	0.384	0.50	4.0	3.74	24.0	3310.0
8/20/2015									
Downstream	0.015	0.022	0.03	0.491	0.53	2.2	5.94	39.3	66.3
8/27/2015									

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Upstream	0.005	0.028	0.04	0.084	0.28	2.9	4.30	104.6	7710.0
Downstream	0.013	0.024	<0.03	0.450	0.54	2.5	4.43	137.4	5730.0
9/2/2015									
Upstream	0.007	0.042	0.07	0.047	0.39	3.37	5.5	46.4	9070.0
Downstream	0.010	0.020	0.01	0.449	0.55	3.2	4.80	20.3	6630.0
9/10/2015									
Downstream	0.008	0.028	0.02	0.464	0.58	3.96	2.9	66.3	5470.0
9/16/2015									
Upstream	0.004	0.024	<0.03	0.104	0.30	4.62	2.1	50.4	3590.0
Downstream	0.009	0.030	0.01	0.404	0.62	4.59	1.4	6.2	4800.0
9/24/2015									
Upstream	0.006	0.078	<0.03	0.200	0.41	5.92	14.8	17.1	4570.0
Downstream	0.009	0.018	<0.03	0.449	0.56	5.58	1.2	29.9	7540.0
9/30/2015									
Downstream	0.008	0.022	0.01	0.472	0.66	5.43	4.5	31.7	5290.0
10/8/2015									

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Downstream	0.005	0.020	0.02	0.517	0.60	1.5	1.62	21.3	12360.0
10/14/2015									
Downstream	0.005	0.020	0.02	0.517	0.60	1.5	1.62	21.3	12360.0
10/14/2015									
Downstream	0.010	0.056	0.03	0.603	0.76	12.4	1.33	7.3	8164.0
10/22/2015									
Downstream	0.008	0.018	0.07	0.548	0.69	2.3	3.64	17.8	3140.0
10/28/2015									
Downstream	0.009	0.032	0.03	0.544	0.78	1.7	3.91	35.0	6700.0
11/4/2015									
Downstream	0.010	0.038	<0.03	0.607	0.76	1.7	3.79	23.1	2880.0
11/12/2015									
Upstream	0.015	0.022	<0.03	0.127	0.22	0.9	2.51	117.8	2620.0
Downstream	0.013	0.044	<0.03	0.439	0.64	6.9	2.14	75.9	>2419.2
11/18/2015									
Upstream	0.013	0.046	0.06	0.229	0.41	4.0	2.55	517.2	5810.0

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Downstream	0.017	0.050	0.09	0.334	0.56	4.5	2.88	435.2	14550.0
12/2/2015									
Upstream	0.010	0.020	0.03	0.135	0.22	1.4	0.98	55.6	1986.3
Downstream	0.012	0.022	0.02	0.266	0.39	1.6	0.94	48.0	9600.0
12/14/2015									
Upstream	0.009	0.034	0.05	0.181	0.27	4.1	4.10	410.6	4080.0
Downstream	0.012	0.048	0.07	0.235	0.38	11.2	3.24	325.5	4520.0
12/22/2015									
Upstream	0.010	0.020	<0.03	0.092	0.14	0.4	0.94	50.4	648.8
Downstream	0.011	0.020	<0.03	0.245	0.32	1.0	1.12	31.8	980.4
1/5/2016									
Upstream	0.008	0.026	<0.03	0.158	0.20	0.5	0.95	67.7	648.8
Downstream	0.011	0.026	<0.03	0.419	0.46	0.1	1.13	40.8	648.8
1/25/2016									
Upstream	0.010	0.022	<0.03	0.068	0.09	1.1	1.52	16.9	290.9
Downstream	0.011	0.022	<0.03	0.213	0.24	0.7	1.29	8.6	365.4

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
2/10/2016									
Upstream	0.005	0.016	<0.03	0.048	0.11	0.5	1.11	14.5	178.5
Downstream	0.005	0.016	<0.03	0.198	0.24	0.9	0.99	4.1	218.7
2/24/2016									
Upstream	0.014	0.052	<0.03	0.099	0.28	6.1		1203.3	7330.0
Downstream	0.015	0.058	<0.03	0.142	0.37	8.3		1986.3	6500.0
Samples analyzed since the last quarterly report									
3/10/2016									
Upstream	0.012	0.048	0.13	0.082	0.20	8.6	2.66	770.1	>2419.2
Downstream	0.010	0.044	0.11	0.118	0.25	6.2	2.28	298.7	>2419.2
3/16/2016									
Upstream	0.008	0.034	0.00	0.060	0.13	0.4	1.10	52.9	579.4
Downstream	0.006	0.028	0.01	0.170	0.24	0.9	1.17	81.3	>2419.2
3/24/2016									
Upstream	0.011	0.032	0.06	0.04	0.14	4.5	1.60	N.S.	N.S.
Downstream	0.011	0.024	0.00	0.106	0.20	3.9	1.29	N.S.	N.S.

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
3/31/2016									
Upstream	0.008	0.042	0.08	0.100	0.22	6.1	2.49	186.0	>2419.2
Downstream	0.011	0.056	0.08	0.156	0.33	12.4	2.67	365.0	>2419.2
4/4/2016									
Upstream	0.008	0.026	<0.03	0.065	0.08	1.7	0.71	8.3	648.8
Downstream	0.010	0.026	<0.03	0.176	0.20	1.9	0.98	77.6	1046.2
4/20/2016									
Upstream	0.003	0.020	<0.03	0.047	0.06	1.9	0.61	185.0	1299.7
Downstream	0.004	0.018	<0.03	0.152	0.20	1.2	0.74	38.4	2920.0
4/28/2016									
Upstream	0.009	0.012	<0.03	0.035	0.12	1.2	N.D.	58.6	648.8
Downstream	0.010	0.012	<0.03	0.154	0.27	1.5	N.D.	36.4	2149.2
5/2/2016									
Upstream	0.006	0.018	<0.03	0.039	0.10	6.7	1.76	185.0	2419.2
Downstream	0.008	0.016	<0.03	0.075	0.16	2.0	1.50	178.9	4720.0
5/10/2016									

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Upstream	0.007	0.044	0.01	0.070	0.20	6.1	3.10	613.1	4480.0
Downstream	0.011	0.060	0.01	0.101	0.31	11.6	2.95	1203.3	7490.0
5/18/2016									
Upstream	0.007	0.016	<0.03	0.043	0.13	1.4	1.00	85.5	1299.7
Downstream	0.009	0.020	0.02	0.117	0.25	1.2	0.98	107.1	>2419.2
5/26/2016									
Upstream	0.007	0.030	<0.03	0.056	0.12	4.2	1.56	238.2	5290.0
Downstream	0.009	0.036	<0.03	0.094	0.20	4.6	1.75	547.5	3640.0

¶ Values proceeded by '<' were reported by the analytical laboratory as zero and the Minimum detection limit is given.

§ N.S. is No Sample.

† N.D. is No Data.

Nutrients, Sediment, and Bacteria by Site for Ephemeral Stream, Trenches, Left Fork and Field Runoff

Table 5. Water quality analyses at the ephemeral stream draining the subwatershed containing the production houses and manure holding ponds, and surface runoff from Fields 1, 5a, and 12 since January, 2015, with those collected since the last report noted.

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
	mg/L							MPN/100 mL	
Ephemeral stream									
1/8/2015	0.008	0.022	<0.03 ¶	0.448	0.59	2.4	1.73	25.6	1203.3
1/15/2015	0.007	0.028	<0.03	0.469	0.55	1.9	0.55	7.4	1413.6
1/21/2015	0.005	0.016	<0.03	0.370	0.46	1.0	2.34	155.3	2419.2
2/26/2015	0.006	0.022	<0.03	0.530	0.57	1.3	1.38	16.1	4790.0
3/3/2015	0.006	0.020	<0.03	0.477	0.52	ND	1.84	N.S. §	N.S.
3/11//2015	0.006	0.022	0.04	0.567	0.60	0.5	2.20	6.3	410.0
3/19/2015	0.007	0.018	0.01	0.529	0.63	1.0	4.31	14.6	866.4
3/25/2015	0.007	0.014	0.02	0.462	0.53	1.1	0.64	8.6	344.8
4/2/2015	0.006	0.032	0.02	0.467	0.46	1.8	4.41	5.2	547.5
4/15/2015	0.005	0.026	0.03	0.472	0.56	0.8	1.26	305.0	2430.0
4/23/2015	0.008	0.026	0.03	0.520	0.56	2.0	1.78	12.0	3270.0
4/29/2015	0.012	0.018	0.02	0.569	0.61	3.5	1.98	14.3	4080.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
5/7/2015	0.013	0.066	0.02	0.628	0.71	3.2	16.41	71.7	7170.0
5/8/2015	0.005	0.254	0.41	2.287	3.23	127.1	6.45	5200.0	241920
5/11/2015	0.008	0.146	0.15	0.941	1.80	22.0	8.09	N.S.	N.S.
5/14/2015	0.010	0.022	0.01	0.527	0.50	1.7	0.73	41.3	1986.3
5/18/2015	0.007	0.028	0.03	0.525	0.55	0.7	1.18	90.7	7630.0
5/26/2015	0.017	0.030	0.03	0.514	0.60	0.9	1.12	N.S.	N.S.
6/1/2015	0.002	0.056	0.01	0.851	1.05	18.3	2.46	N.S.	N.S.
6/4/2015	0.010	0.024	0.02	0.572	0.58	0.8	5.35	21.6	3890.0
6/8/2015	0.009	0.020	0.03	0.560	0.62	0.6	2.81	65.7	9870.0
6/17/2015	0.009	0.032	0.04	0.948	1.04	6.7	0.97	770.1	8840.0
6/22/2015	0.011	0.026	0.05	0.563	0.61	1.3	1.21	37.9	2419.2
6/29/2015	0.067	1.268	0.34	0.580	3.42	1366.8	11.04	N.S.	N.S.
7/6/2015	0.063	0.658	0.37	0.717	2.75	567.3	8.52	N.S	N.S.
7/9/2015	0.010	0.034	<0.03	0.569	0.71	4.9	2.56	78.9	5560.0
7/16/2015	0.011	0.046	0.01	0.517	0.61	0.4	2.16	45.7	14830.0
7/23/2015	0.011	0.034	<0.03	0.511	0.68	11.3	0.33	201.4	24950.0
11/18/2015	0.012	0.040	0.07	1.262	1.57	2.7	3.23	325.5	10710

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
12/2/2015	0.011	0.024	<0.03	0.613	0.89	1.0	1.01	145.0	1986.3
12/14/2015	0.009	0.030	<0.03	0.364	0.58	3.4	11.89	118.7	2810.0
12/22/2015	0.010	0.016	<0.03	1.452	1.68	0.7	2.41	52.9	1299.7
1/5/2016	0.007	0.018	<0.03	0.883	1.00	1.2	2.15	32.7	686.7
1/25/2016	0.011	0.030	<0.03	0.762	0.87	9.8	3.10	1.0	816.4
2/24/2016	0.010	0.056	<0.03	0.195	0.40	12.8		387.3	4870.0
Samples analyzed since the last quarterly report									
3/10/2016	0.006	0.050	0.13	0.918	1.22	26.7	3.12	648.8	8840.0
3/16/2016	0.006	0.022	0.01	0.520	0.54	0.0	1.75	88.0	461.1
3/24/2016	0.010	0.012	<0.03	0.531	0.64	1.3	1.44	N.S.	N.S.
3/31/2016	0.013	0.656	0.68	1.211	3.05	375.0	12.14	16160.0	198630.0
4/4/2016	0.008	0.018	<0.03	0.462	0.48	1.3	1.79	12.0	727.0
4/20/2016	0.008	0.020	<0.03	0.517	0.66	4.1	0.68	44.3	21430.0
5/2/2016	0.007	0.016	<0.03	0.468	0.59	1.7	2.56	118.7	5380.0
5/10/2016	0.195	0.560	0.32	0.649	4.01	1346.7	11.94	579.4	241920.0
5/18/2016	0.008	0.014	<0.03	0.479	0.63	3.0	0.84	34.1	2419.2
5/26/2016	0.052	0.424	0.39	0.858	2.20	350.6	8.58	22470.0	241920..0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Interceptor Trench 1 (South)									
1/8/2015	0.005	0.022	<0.03	0.769	0.75	4.7	0.88	1.0	13130.0
1/14/2015	0.007	0.028	<0.03	0.469	0.55	1.9	0.55	7.4	1413.6
2/26/2015	0.004	0.028	0.01	0.712	0.76	46.0	0.60	1.0	41063.0
3/3/2015	0.003	0.024	<0.03	0.867	0.89	N.D. †	0.95	N.S.	N.S.
3/11/2015	0.003	0.014	0.07	0.989	0.97	0.3	2.00	<1.0	2419.2
3/19/2015	0.003	0.012	0.01	0.849	0.93	<6.58	3.11	1.0	275.5
3/25/2015	0.003	0.008	<0.03	0.838	0.88	0.2	0.59	<1.0	410.6
3/26/2015	0.004	0.026	0.02	0.904	1.00	15.4	0.69	<1.0	1553.1
4/2/2015	0.003	0.028	0.02	0.865	0.87	0.3	3.34	1.1	308.6
4/9/2015	0.006	0.018	<0.03	0.790	0.83	0.8	2.99	<1.0	187.2
4/15/2015	0.003	0.020	<0.03	0.857	0.93	1.3	4.29	<1.0	3180.0
4/23/2015	0.003	0.034	<0.03	0.877	0.97	1.2	1.18	3.1	2690.0
5/11/2015	0.003	0.060	0.02	0.916	0.97	27.6	1.78	N.S.	N.S.
5/14/2015	0.005	0.042	0.02	0.904	0.94	29.9	1.20	81.6	1732.9

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
5/18/2015	0.002	0.020	<0.03	0.897	0.93	0.3	1.28	32.3	1732.9
5/26/2015	0.007	0.012	0.01	0.752	0.80	1.0	0.78	N.S.	N.S.
6/22/2015	0.005	0.048	0.07	0.653	0.76	47.3	1.86	21.1	1986.3
6/29/2015	0.008	0.022	0.05	0.394	0.42	56.8	4.17	82.3	11450
7/9/2015	0.007	0.030	<0.03	0.520	0.62	7.1	2.52	63.7	12330.0
11/18/2015	0.005	0.030	0.02	0.264	0.52	1.9	1.74	65.7	17930.0
12/2/2015	0.006	0.008	<0.03	0.218	0.33	1.3	1.10	6.3	5810.0
12/14/2015	0.004	0.012	<0.03	0.299	0.36	1.1	3.44	8.4	10460.0
12/22/2015	0.005	0.010	<0.03	0.157	0.20	0.3	0.89	1.0	435.2
1/5/2016	0.003	0.016	<0.03	0.243	0.29	0.9	1.11	1.0	209.8
2/24/2016	0.005	0.014	<0.03	0.345	0.39	2.1		<1.0	9070.0
Samples analyzed since the last quarterly report									
3/10/2016	0.005	0.036	0.10	0.264	0.45	3.5	2.87	2419.2	16690.0
3/16/2016	0.003	0.032	0.02	0.331	0.37	0.0	1.23	101.7	290.9
3/24/2016	0.008	0.016	<0.03	0.208	0.20	2.8	1.33	N.S.	N.S.
3/31/2016	0.004	0.018	<0.03	0.347	0.49	5.5	4.76	4.1	2419.2

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
5/10/2016	0.002	0.016	<0.03	0.228	0.30	3.9	2.91	13.9	2419.2
5/18/2016	0.006	0.006	<0.03	0.169	0.22	0.1	0.54	2.0	5200.0
5/26/2016	0.008	0.006	<0.03	0.217	0.23	1.4	1.29	1.0	4260.0
Interceptor Trench 2 (North)									
3/11/2015	0.003	0.056	0.04	1.443	1.59	1.2	3.51	<1.0	2419.2
3/19/2015	0.004	0.062	0.09	1.036	1.42	1.9	5.12	5.2	2419.2
3/26/2015	0.004	0.126	0.13	0.873	1.44	22.2	4.63	105.4	6950.0
5/11/2015	0.003	0.042	0.05	0.553	0.76	8.8	3.44	N.S.	N.S.
5/14/2015	0.005	0.042	0.02	0.904	0.94	29.9	1.20	81.6	1732.9
5/18/2015	0.002	0.020	<0.03	0.897	0.93	0.3	1.28	32.3	1732.9
5/26/2015	0.007	0.112	0.04	1.190	1.44	131.9	1.23	N.S.	N.S.
12/14/2016	0.003	0.026	0.10	6.473	7.40	1.6	5.56	33.6	29090.0
2/24/2016	0.005	0.066	0.13	6.298	7.02	9.7	4.27	30.1	18720.0
Samples analyzed since the last quarterly report									
3/10/2016	0.005	0.054	0.14	1.716	2.35	6.8	6.77	613.1	34480.0
3/31/2016	0.006	0.040	0.06	2.800	3.54	20.9	9.29	7.4	10810.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
4/4/2016	0.004	0.012	<0.03	0.236	0.25	0.0	0.85	1.0	2419.2
5/10/2016	0.002	0.038	<0.03	1.706	2.18	5.2	3.72	38.7	1553.0
Left Fork									
5/14/2015	0.015	0.038	0.02	0.321	0.38	3.3	1.36	83.3	2690.0
5/18/2015	0.011	0.040	0.04	0.209	0.29	4.1	1.90	167.4	8300.0
5/26/2015	0.014	0.048	0.04	0.139	0.29	6.1	2.41	N.S.	N.S.
6/4/2015	0.008	0.022	<0.03	0.145	0.19	2.1	3.15	38.9	2560.0
6/8/2015	0.006	0.024	0.02	0.102	0.23	1.1	2.78	32.7	4550.0
6/17/2015	0.005	0.026	0.04	0.112	0.22	2.8	1.62	26.2	8550.0
6/22/2015	0.011	0.030	0.02	0.147	0.18	2.5	1.59	35.4	5910.0
6/29/2015	0.010	0.026	0.02	0.189	0.26	2.9	2.80	53.6	10170
7/9/2015	0.015	0.058	0.04	0.138	0.31	11.4	2.67	387.3	12670.0
7/16/2015	0.010	0.042	0.01	0.181	0.28	0.9	1.64	21.6	9330.0
7/23/2015	0.009	0.028	0.04	0.239	0.40	1.4	1.21	35.4	8360.0
7/30/2015	0.008	0.020	0.04	0.221	0.37	2.3	2.60	30.3	8160.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
8/6/2015	0.007	0.026	0.04	0.310	0.47	1.2	3.16	217.8	8130.0
8/13/2015	0.007	0.016	0.03	0.192	0.52	1.4	4.50	13.2	4810.0
8/20/2015	0.009	0.028	0.04	0.306	0.42	2.3	5.12	48.8	3930.0
8/27/2015	0.008	0.024	0.02	0.218	0.33	2.0	3.79	7.4	3010.0
9/2/2015	0.007	0.020	0.03	0.109	0.33	1.67	3.8	26.9	5290.0
9/10/2015	0.006	0.026	<0.03	0.198	0.34	4.09	2.5	21.6	7230.0
9/16/2015	0.006	0.032	<0.03	0.146	0.48	2.49	1.3	38.2	6333.0
9/24/2015	0.007	0.016	0.01	0.098	0.20	3.08	0.6	31.3	3410.0
9/30/2015	0.007	0.018	<0.03	0.082	0.20	4.98	1.2	18.3	5940.0
10/8/2015	0.003	0.020	0.02	0.069	0.15	1.5	1.58	59.8	3640.0
10/14/2015	0.009	0.022	0.01	0.078	0.16	2.2	1.28	9.8	1986.3
10/22/2015	0.008	0.018	<0.03	0.069	0.13	1.9	3.57	3.1	1732.9
10/28/2015	0.007	0.024	0.02	0.060	0.24	1.9	2.90	61.3	3410.0
11/4/2015	0.007	0.018	<0.03	0.072	0.18	0.7	3.98	77.6	>2419.2
11/12/2015	0.005	0.016	<0.03	0.215	0.34	1.1	2.50	25.6	3360.0
11/18/2015	0.020	0.062	0.08	0.432	0.73	7.4	3.72	686.7	23590.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
12/2/2015	0.014	0.024	0.01	0.302	0.43	1.6	1.36	66.9	1986.3
2/14/2015	0.014	0.056	0.06	0.298	0.50	10.8	3.92	410.6	6010.0
12/22/2015	0.013	0.020	<0.03	0.267	0.35	0.1	1.36	26.5	1299.7
1/5/2016	0.013	0.028	<0.03	0.427	0.48	0.7	1.51	34.1	686.7
1/25/2016	0.010	0.024	<0.03	0.198	0.25	1.0	1.30	21.1	435.2
2/10/2016	0.003	0.012	<0.03	0.175	0.24	0.8	1.15	7.4	209.8
2/24/2016	0.015	0.088	<0.03	0.249	0.63	15.6		2780.0	14390.0
Samples analyzed since the last quarterly report									
3/10/2016	0.013	0.046	0.01	0.154	0.38	8.7	2.64	367.3	2750.0
3/16/2016	0.009	0.032	<0.03	0.190	0.26	0.3	1.45	35.9	980.4
3/24/2016	0.013	0.048	0.09	0.186	0.39	10.7	2.65		
3/31/2016	0.013	0.056	0.09	0.199	0.40	11.9	2.59	172.0	3640.0
4/4/2016	0.009	0.022	<0.03	0.131	0.17	1.5	0.87	44.8	1119.9
4/20/2016	0.005	0.020	<0.03	0.157	0.21	2.1	0.84	35.0	6160.0
5/2/2016	0.009	0.020	<0.03	0.095	0.20	1.9	2.30	172.6	3640.0
5/10/2016	0.011	0.072	0.02	0.121	0.37	17.2	3.35	980.4	8230.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
5/18/2016	0.010	0.016	0.01	0.139	0.27	1.4	1.54	60.1	2620.0
5/26/2016	0.010	0.048	0.02	0.123	0.24	10.6	2.66	461.1	6890.0
Field 1									
3/26/2015	0.143	0.346	0.41	0.216	2.68	65.5	15.65	N.S.	N.S.
5/8/2015	0.525	0.714	0.16	0.475	2.19	16.9	13.28	N.S.	N.S.
5/11/2015	0.251	0.386	0.09	0.055	0.86	44.4	6.31	N.S.	N.S.
5/18/2015	0.208	0.512	0.54	0.410	3.59	53.7	26.12	N.S.	N.S.
5/26/2015	0.245	0.432	0.20	0.174	1.66	37.8	11.28	N.S.	N.S.
6/29/2015	0.354	0.524	0.37	0.226	1.64	11	11.32	N.S.	N.S.
7/6/2015	0.387	0.444	0.23	0.345	1.30	4.9	8.32	N.S.	N.S.
Field 5a									
3/26/2015	0.813	1.330	0.39	0.225	2.59	72.3	15.95	N.S.	N.S.
5/8/2015	0.248	0.968	0.26	0.127	1.50	320.1	8.58	N.S.	N.S.
7/6/2015	0.796	0.910	0.13	0.567	1.58	29.0	7.67	N.S.	N.S.
Samples analyzed since the last quarterly report									

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
3/31/2016	1.154	1.352	0.27	0.302	1.67	26.5	32.74	N.S.	N.S.
5/10/2016	1.114	1.458	1.69	2.894	6.35	79.9	12.82	N.S.	N.S.
Field 12									
5/8/2015	0.675	0.956	0.14	0.303	1.82	57.0	16.00	N.S.	N.S.
5/11/2015	0.194	0.364	0.09	0.135	0.83	36.7	7.03	N.S.	N.S.
7/6/2015	0.094	0.448	0.13	0.172	1.01	261.3	4.38	N.S.	N.S.
Samples analyzed since the last quarterly report									
3/10/2016	0.411	0.522	1.17	0.852	4.49	621.5	12.58	N.S.	N.S.
5/10/2016	0.370	0.666	0.12	0.062	1.03	96.7	6.92	N.S.	N.S.

¶ Values proceeded by '<' were reported by the analytical laboratory as zero and the minimum detection limit is given.

§ N.S. is No Sample. E. coli and total coliform were not measured on surface runoff samples collected by ISCO samplers when sample holding time exceeded the required 8-hour threshold.

† N.D. is No Data.

Temporal Trends in Phosphorus, Nitrogen and Bacteria in Big Creek Above and Below the C&H Farm

The concentration of P, N and bacteria forms in Big Creek above and below the C&H Farm are presented in subsequent figures to show the season / temporal trends in measured concentrations (Figures 2, 3, 4, 5, 6, and 7).

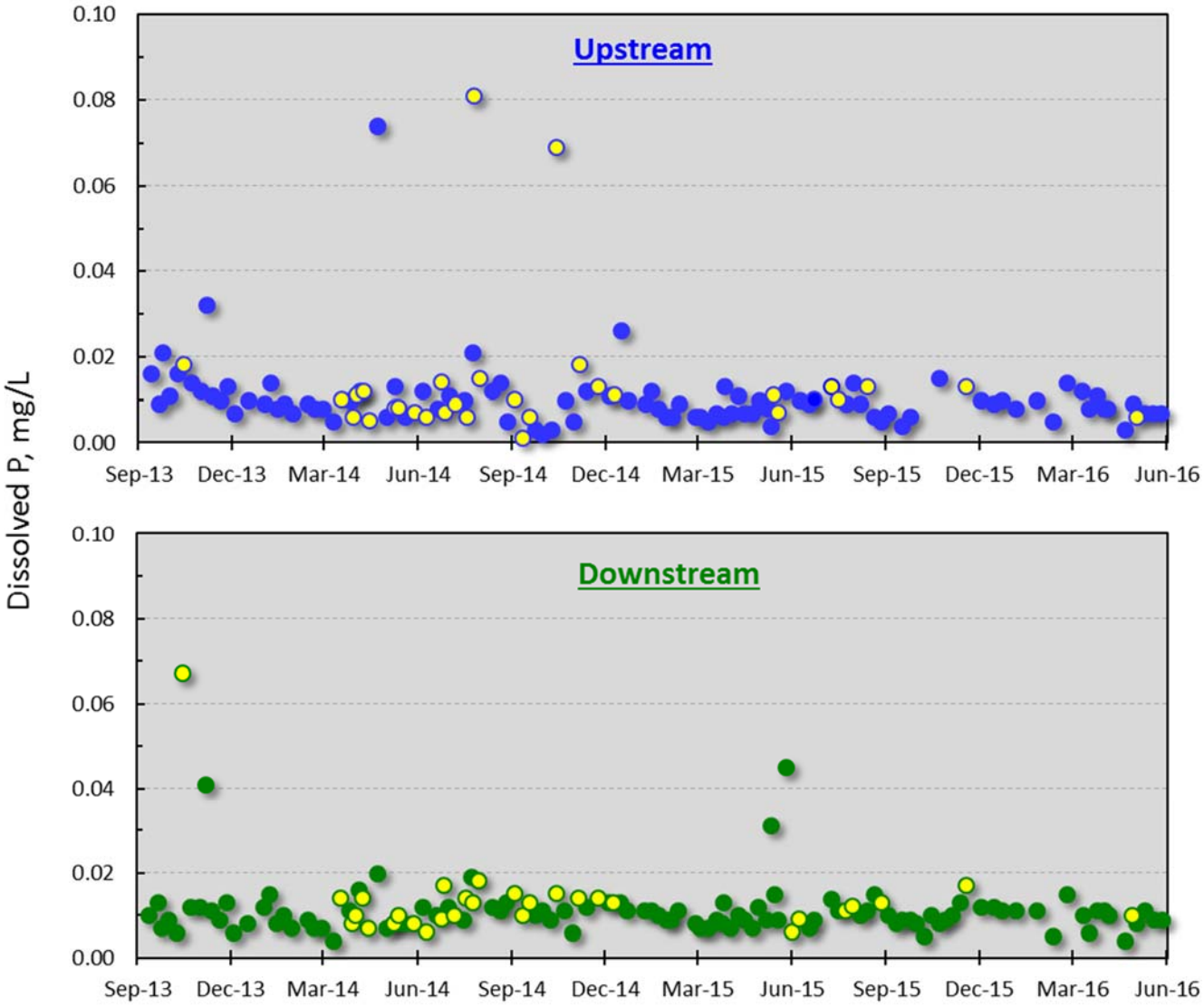

Figure 2. Dissolved P concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

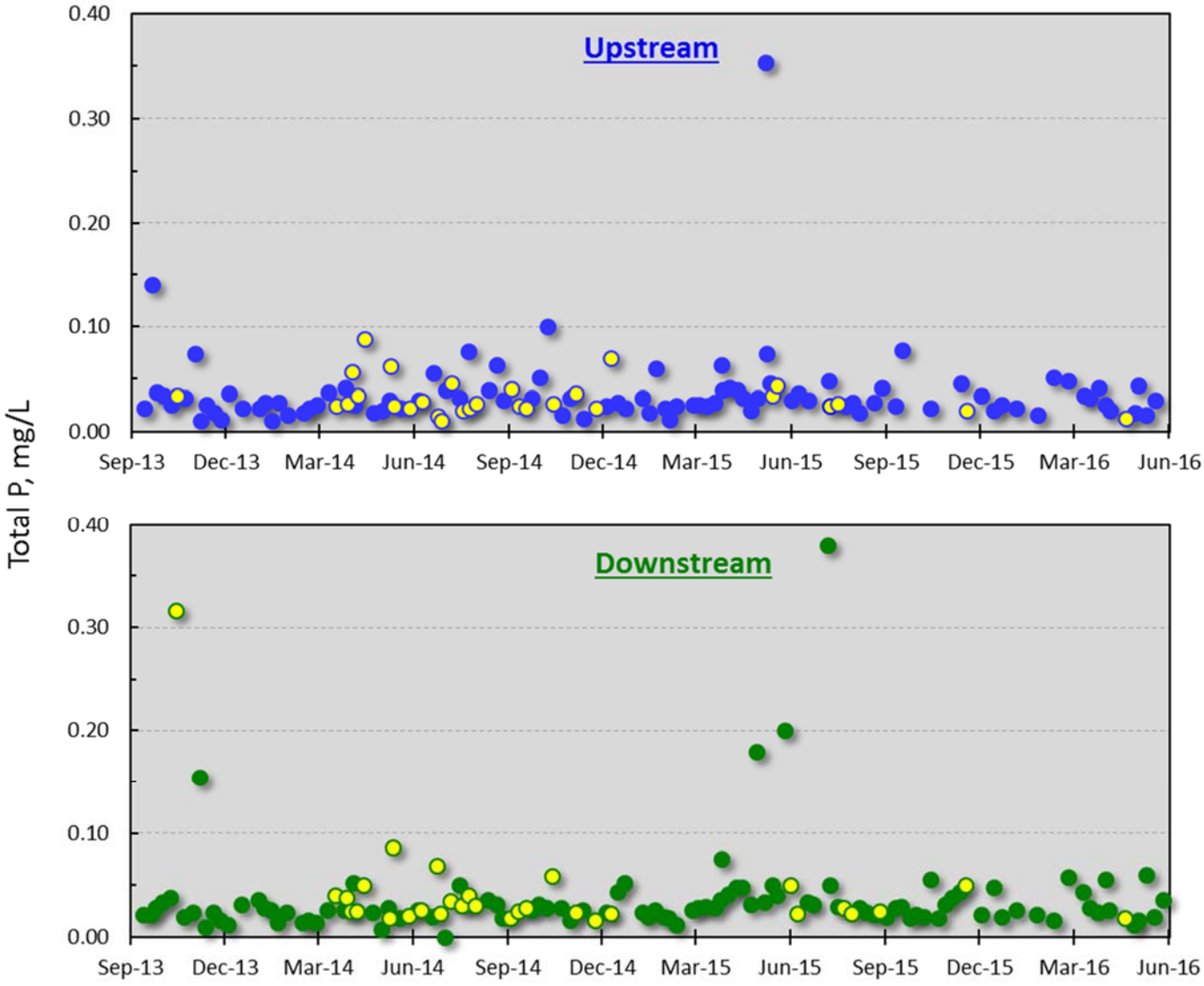

Figure 3. Total P concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

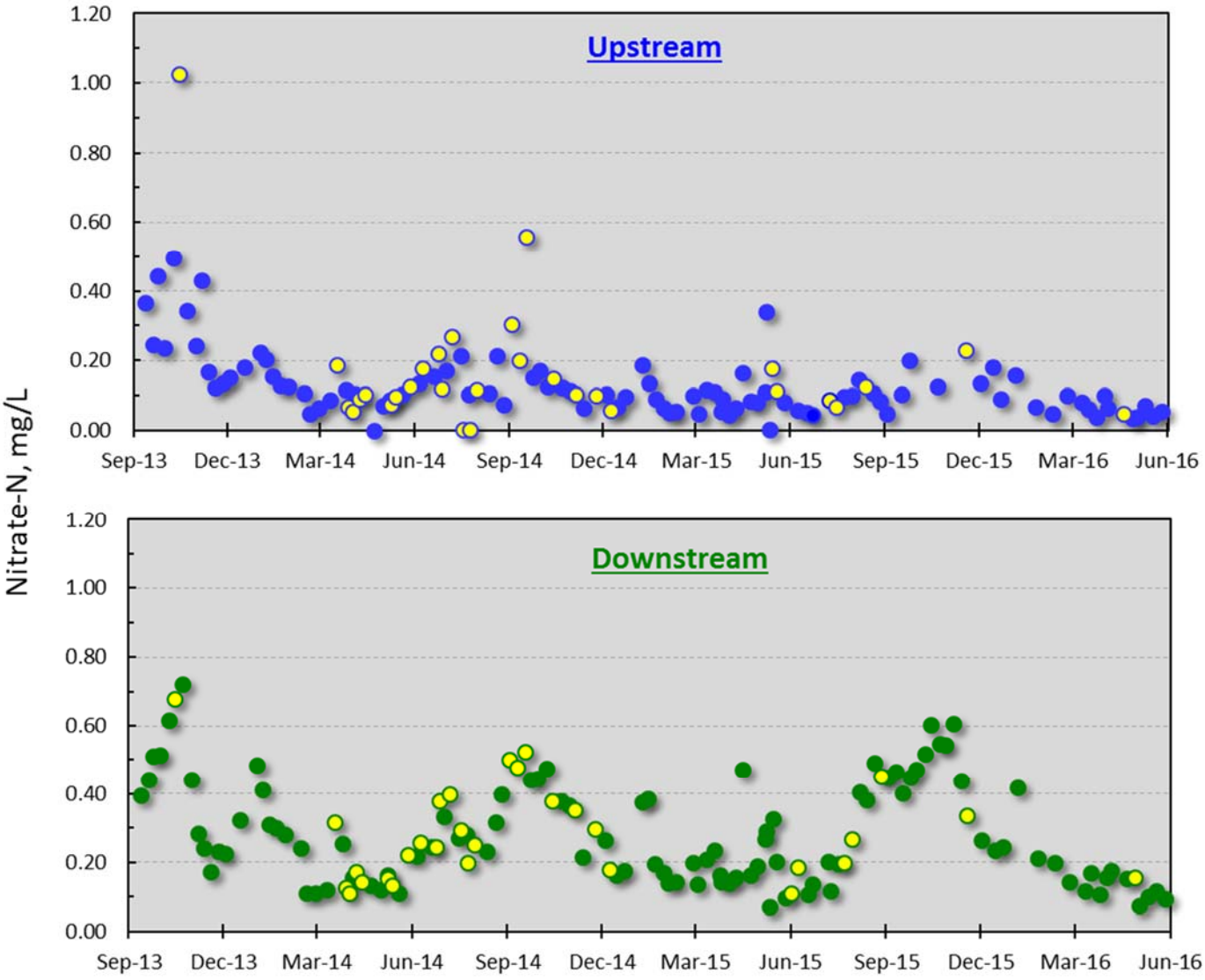

Figure 4. Nitrate-N concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

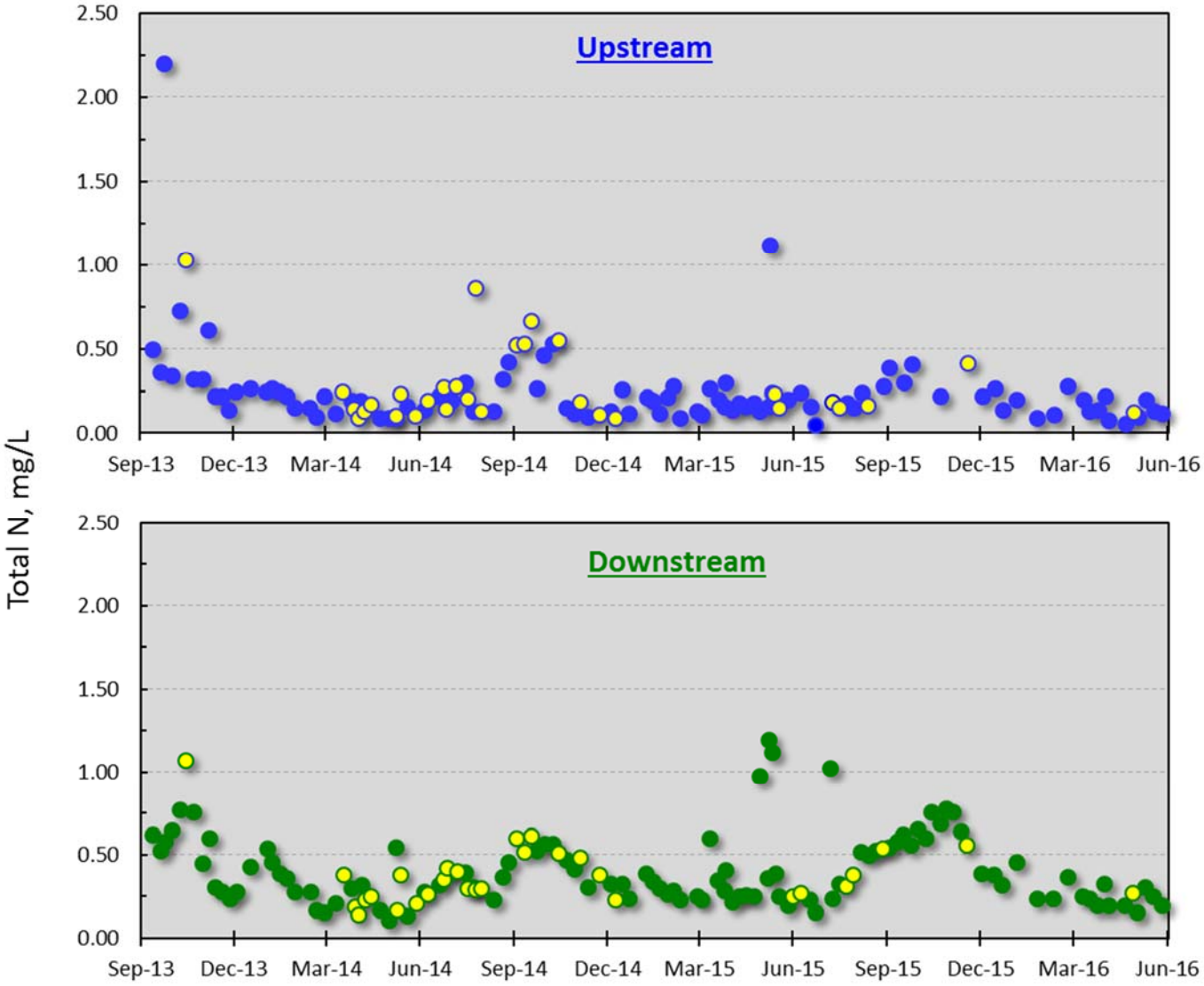

Figure 5. Total N concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

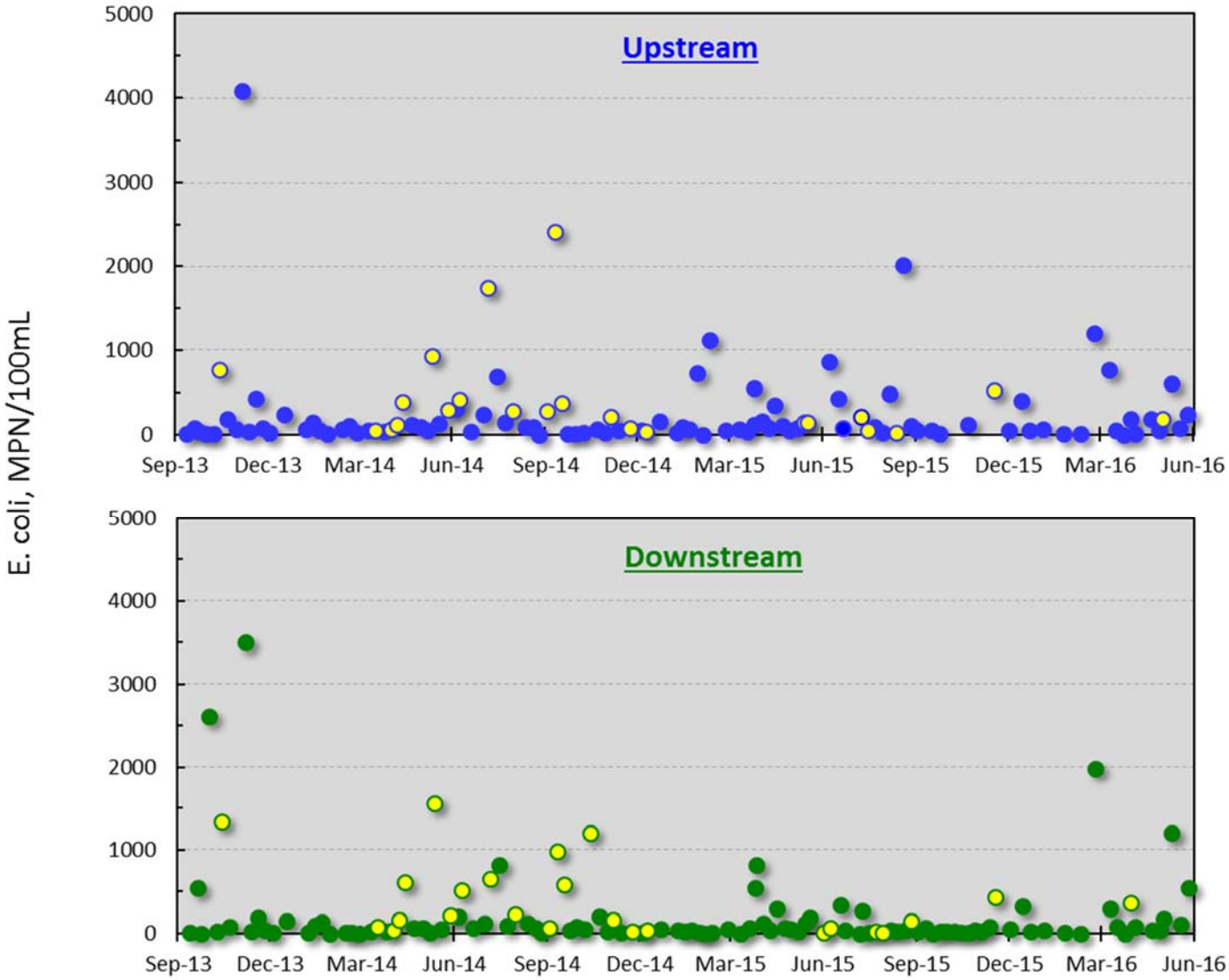

Figure 6. E. coli numbers at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

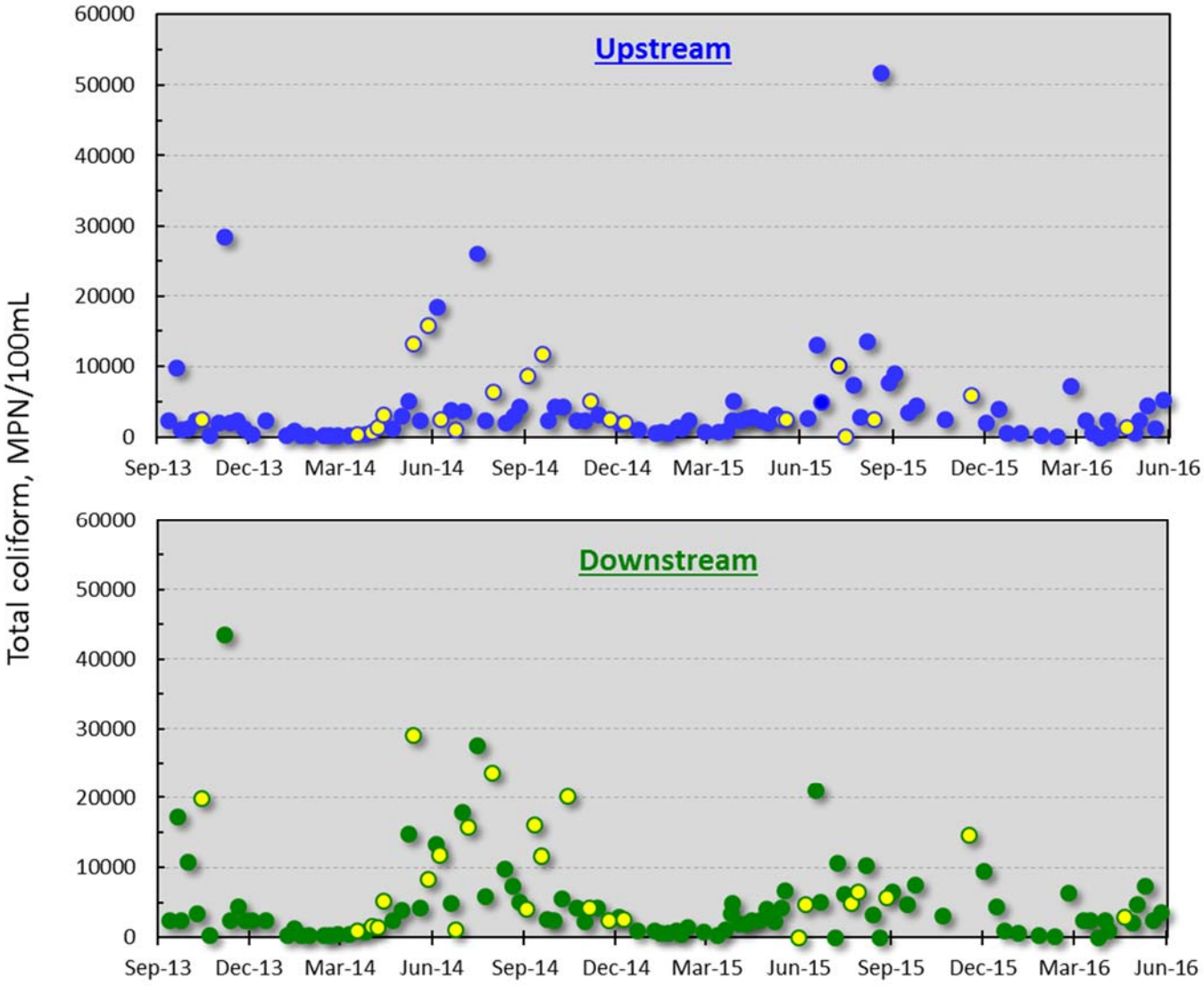

Figure 7. Total coliform numbers at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

Differences in dissolved P, total P, nitrate-N, total P, E. coli, and total coliform concentrations between upstream and downstream sites from the beginning of monitoring (September 2013) to the present time are given in Figures 8, 9, 10, 11, 12, and 13.

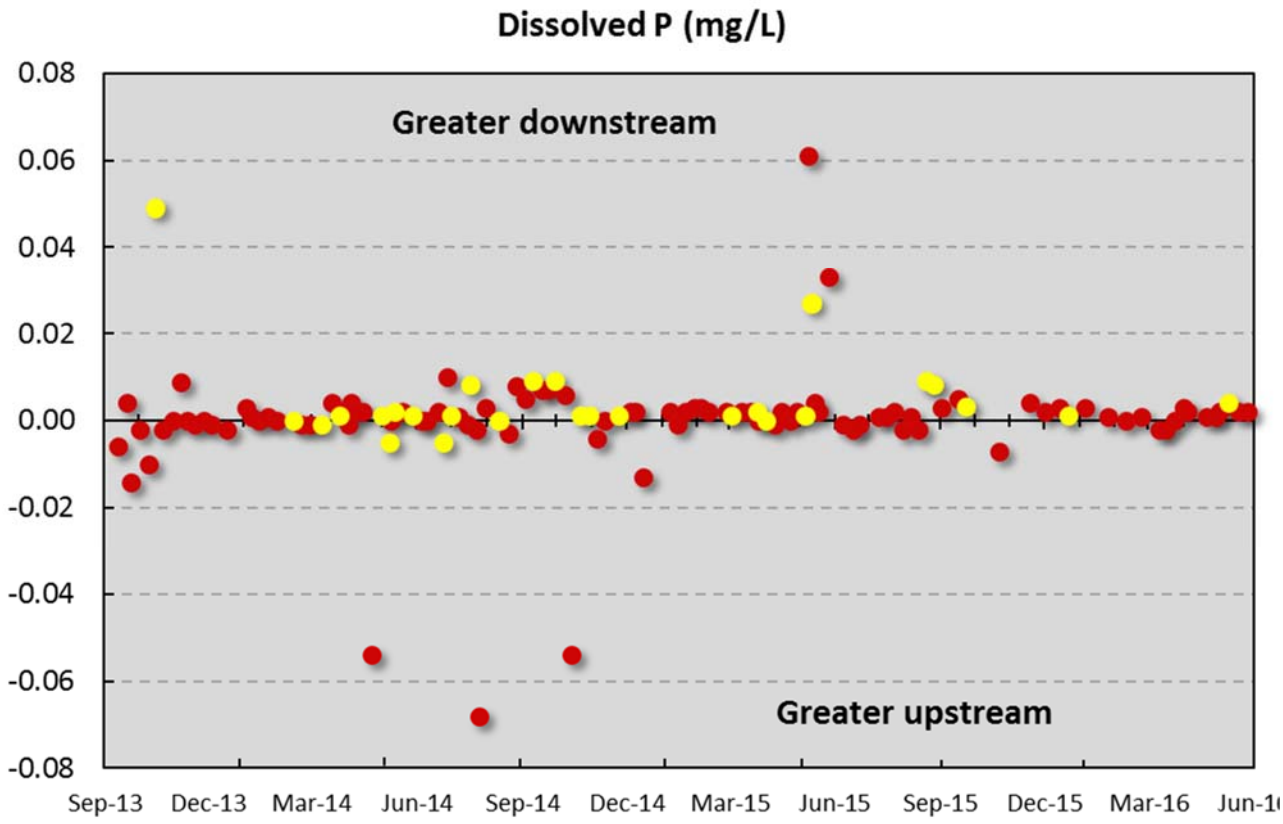

Figure 8. Difference in dissolved P concentrations in Big Creek up- and downstream of the C&H Farm, Newton County, AR.

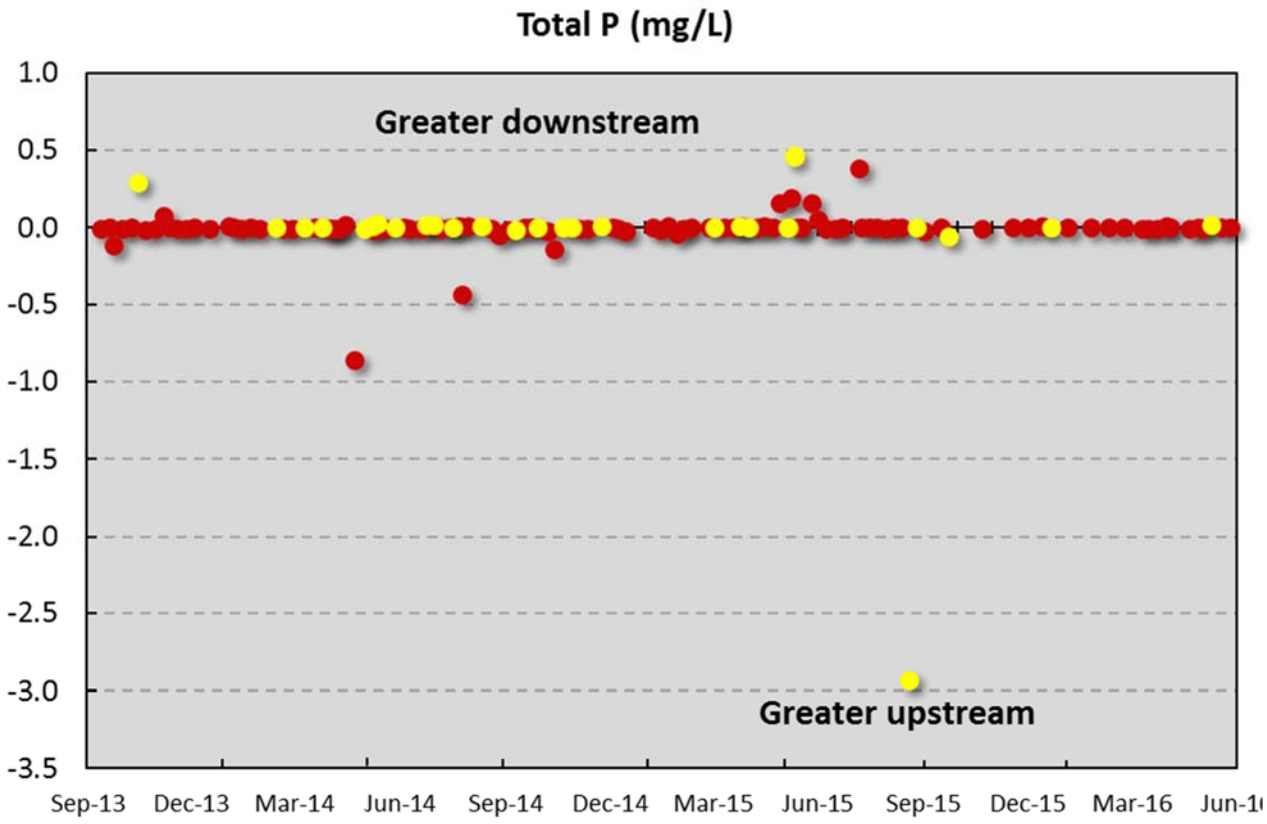

Figure 9. Difference in total P concentrations in Big Creek up- and downstream of the C&H Farm, Newton County, AR.

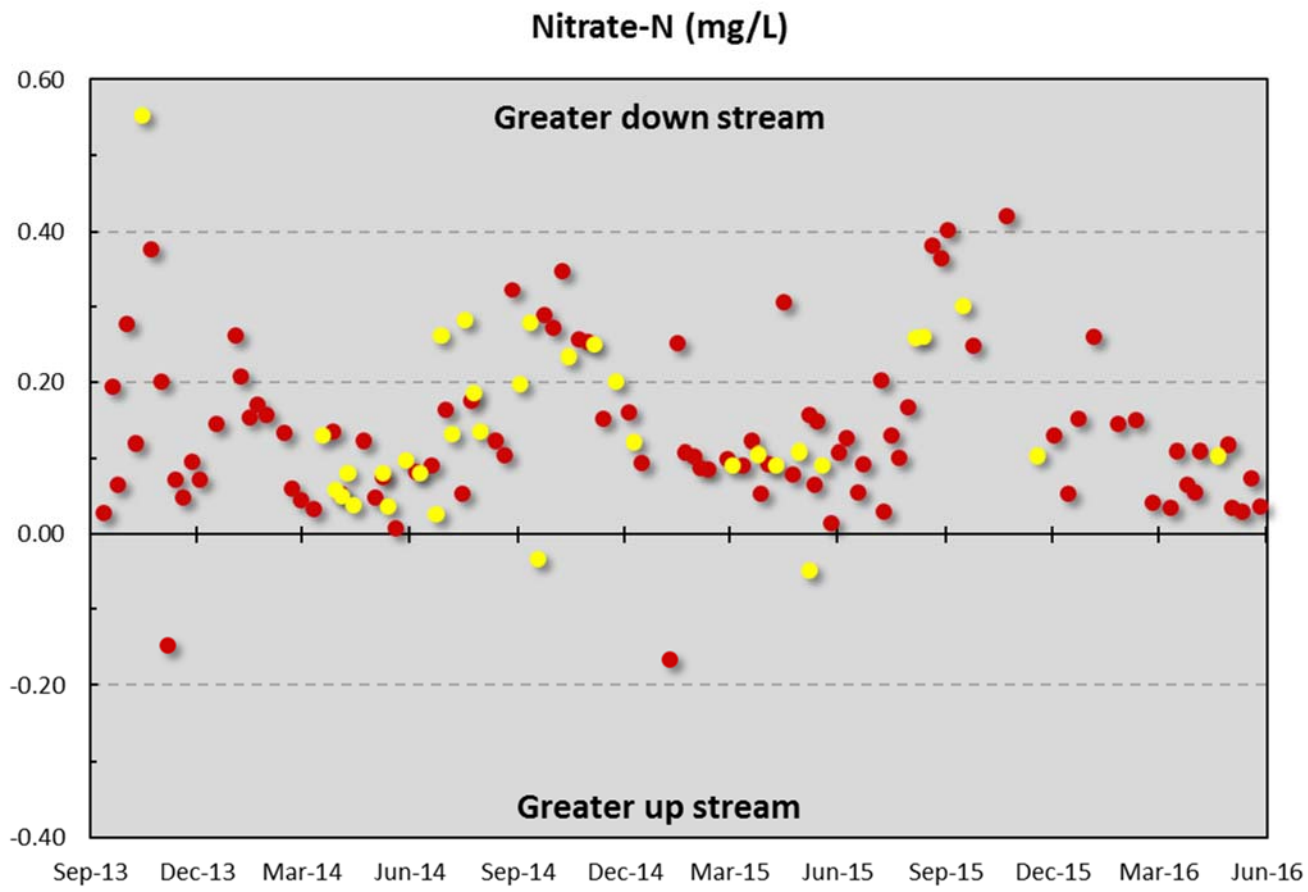

Figure 10. Difference in nitrate-N concentrations in Big Creek up- and downstream of the C&H Farm, Newton County, AR.

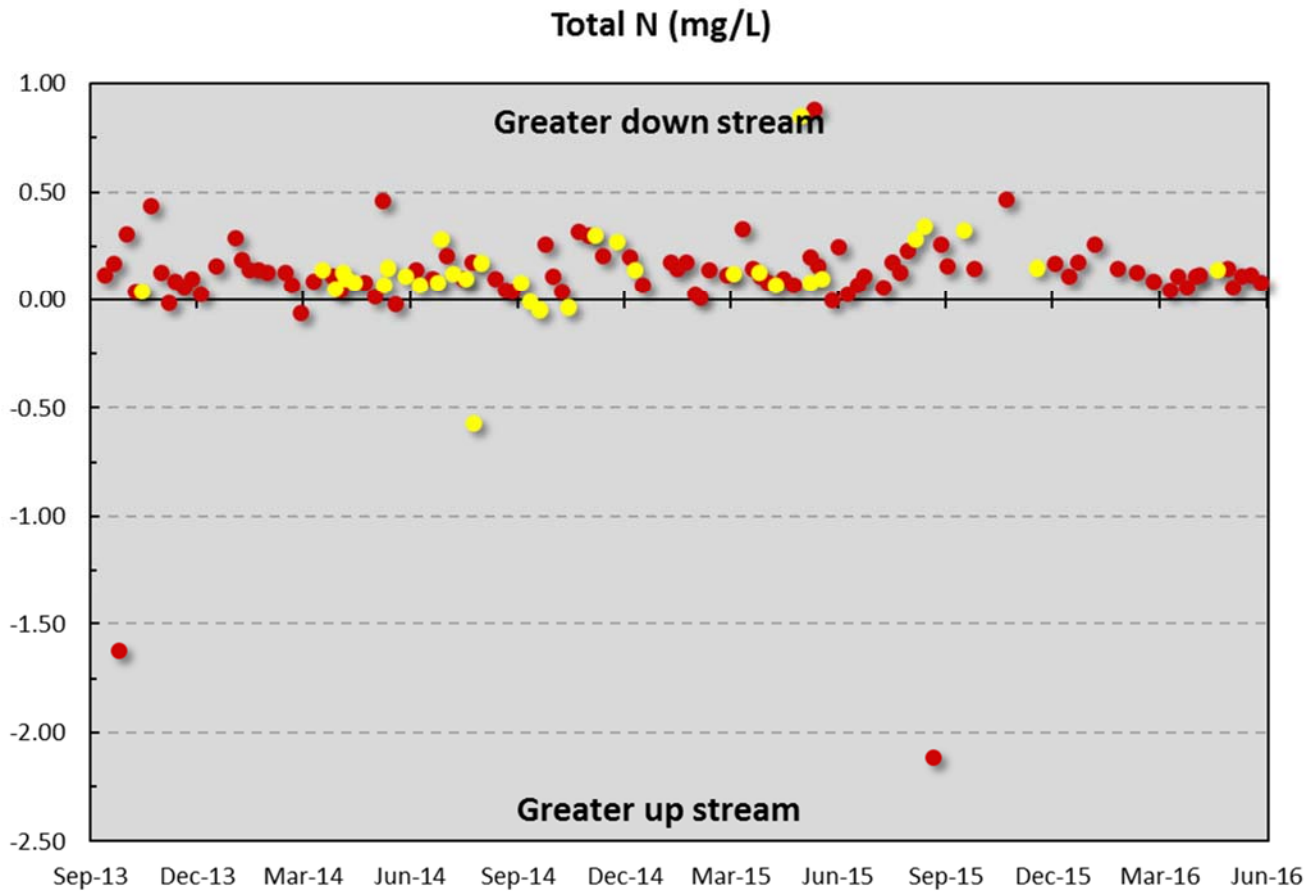

Figure 11. Difference in total N concentrations in Big Creek up- and downstream of the C&H Farm, Newton County, AR.

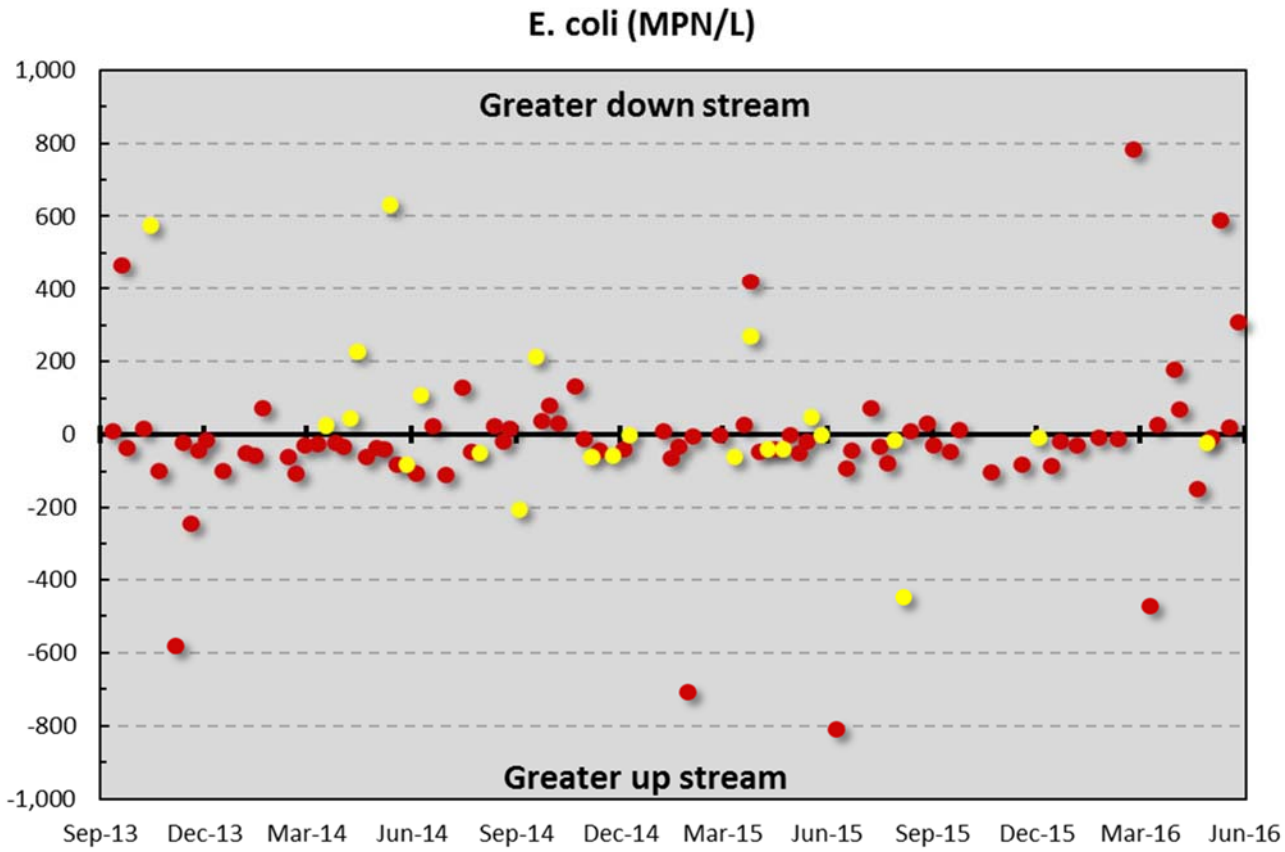

Figure 12. Difference in E. coli concentrations in Big Creek up- and downstream of the C&H Farm, Newton County, AR.

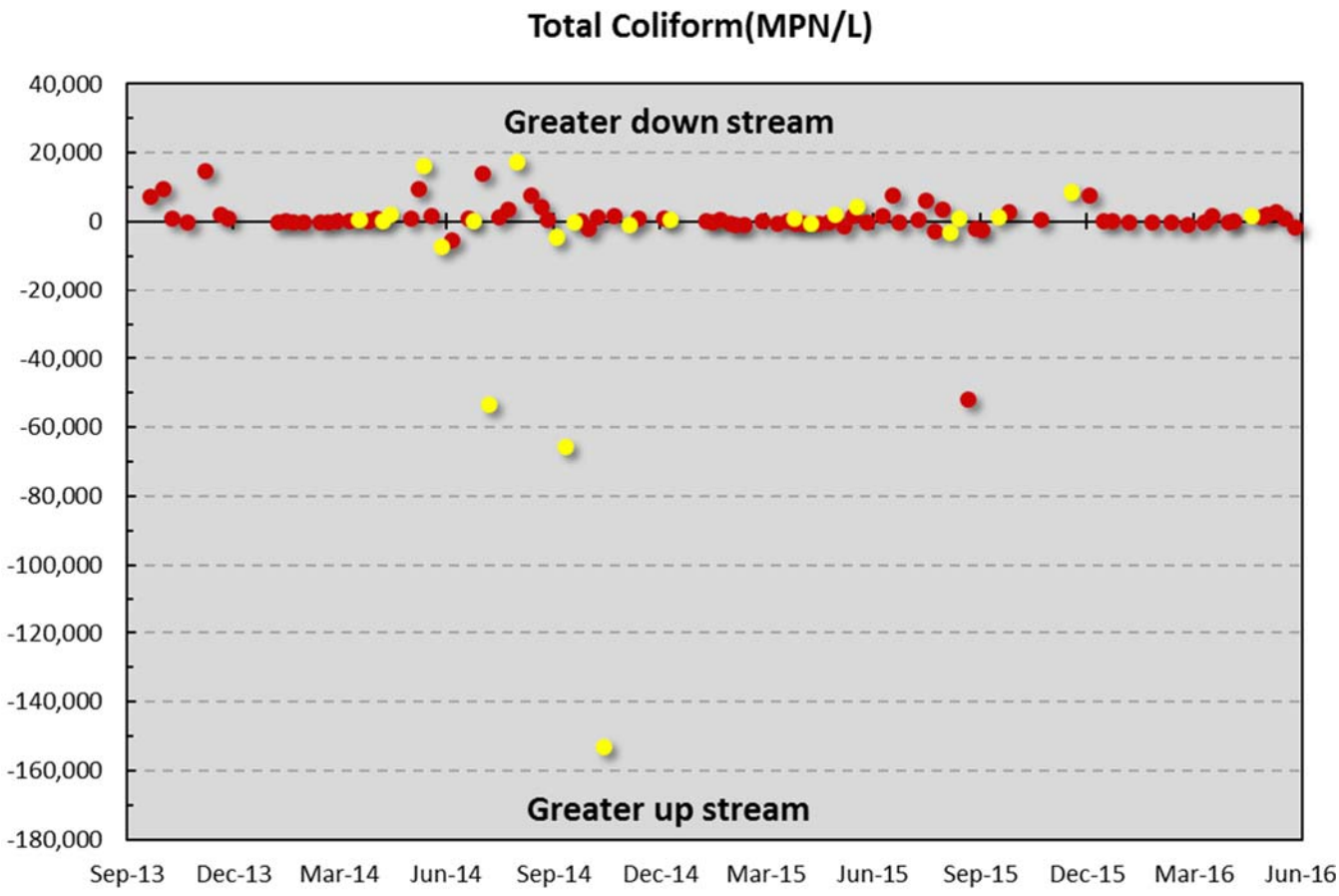

Figure 13. Difference in total coliform concentrations in Big Creek up- and downstream of the C&H Farm, Newton County, AR.

Water pH, Alkalinity, Chloride, Electrical Conductivity, and Total Dissolved Solids for Several Big Creek Sites

At the beginning of 2015, the pH, alkalinity, chloride concentration, electrical conductivity and total dissolved solids were determined on water samples collected at the upstream and downstream sites, spring, house well, and trenches, to build a data base that will enable to eventually source track the major water source pathways at these sites. These values are given below in Table 6.

Table 6. The pH, Chloride concentration, electrical conducting, and total solids concentration of water samples collected at upstream, downstream, spring, ephemeral stream, house well and trench sites, initiated at the beginning of 2015, with those collected since the last report noted.

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
		------- mg/L ------		µS/cm	mg/L
Upstream					
1/8/2015	7.3	36	1.80	90	71.6
1/14/2015			2.09	105	49.1
1/21/2015	7.6	48	1.85	121	71.1
1/29/2015			2.09	140	71.3
2/3/2015	7.7	54	2.40	129	71.1
2/10/2015			2.51	132	67.6
2/26/2015	7.6	40	1.98	107	56.4
3/3/2015			2.08	112	58.9
3/11/2015	7.8	30	1.88	85	269.3
3/19/2015			1.55	98	58.0
3/25/2015	8.0	42	1.77	110	67.6
3/26/2015			1.33	115	64.4
4/2/2015	8.0	42	1.57	110	76.0
4/9/2015			1.73	116	74.9
4/15/2015	7.7	36	1.38	91	63.8
4/23/2015			1.65	95	60.4
4/29/2015	8.1	50	1.56	85	54.3

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
5/7/2015			1.40	123	70.7
5/8/2015			1.80	157	88.4
5/11/2015	7.5	24	1.63	131	110.0
5/14/2015			1.55	143	79.3
5/18/2015			1.20	107	56.2
5/26/2015	7.7	28	1.10	90	58.4
6/4/2015			1.08	78	55.3
6/8/2015	8.2	60	2.03	149	111.3
6/17/2015			1.51	128	70.2
6/22/2015	8.2	40	1.36	114	64.9
6/29/2015			1.74	55	49.8
7/9/2015	7.7	32	1.53	90	64.7
7/16/2015			1.33	161	78.9
7/23/2015	7.9	78	1.63	180	50.2
7/30/2015			1.75	224	113.3
8/6/2015	7.7	100	1.84	218	75.3
8/13/2015			1.91	210	121.6
8/20/2015	7.3	108	2.15	219	120.0
8/27/2015			2.11	240	131.3
9/2/2015	7.1	122	2.50	262	129.3
9/16/2015	7.6	132	3.05	272	151.3
9/24/2015			2.74	271	149.3
11/12/2015	8.0	104	2.13	228	115.0
11/18/2015			1.36	84	55.6
12/2/2015			1.52	83	100.0
12/14/2015	7.5	26	1.21	63	50.0
12/22/2015	8.3	56	1.78	107	50.0

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
1/5/2016	7.5	40	1.34	102	62.5
1/25/2016	8.2	46	1.50	115	65.0
2/10/2016	8.6	54	1.69	141	60.0
2/24/2016	7.2	66	1.20	102	97.5
Samples analyzed since the last quarterly report					
3/10/2016	7.6	38.0	1.268	84.5	60.0
3/16/2016	6.7	38.0	1.252	88.3	52.5
3/24/2016	7.7	46.0	1.825	103.3	56.5
3/31/2016	7.3	30.0	0.933	65.8	235.0
4/4/2016	7.4	40.0	1.163	86.9	55.0
4/20/2016	8.0	58.0	1.405	125.7	65.0
4/29/2016	8.1	66.0	1.373	134.8	72.5
5/3/2016	7.7	38.0	1.150	83.7	52.5
5/10/2016	7.6	32.0	0.914	67.6	57.5
518/2016	8.0	48.0	1.228	102.8	57.5
5/26/2016	7.8	76.0	1.045	78.4	50.0
Downstream					
1/8/2015	7.6	64	2.02	144	89.3
1/14/2015			2.76	166	79.8
1/21/2015	7.6	84	2.44	191	91.1
1/29/2015			2.51	205	109.1
2/3/2015	7.7	88	2.82	196	103.3
2/10/2015			3.01	204	105.5
2/26/2015	7.8	66	2.27	162	88.0
3/3/2015			2.39	170	80.0
3/11/2015	7.8	52	2.02	128	77.3

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
3/19/2015			1.75	148	84.9
3/25/2015	7.8	64	2.07	158	88.7
3/26/2015			1.46	83	78.7
4/2/2015	8.1	68	1.95	163	103.0
4/9/2015			2.08	168	100.4
4/15/2015	7.8	56	1.54	130	82.0
4/23/2015			1.81	142	81.0
4/29/2015	8.0	80	2.15	150	97.3
5/7/2015			1.84	185	101.1
5/8/2015			2.50	225	125.8
5/11/2015	7.5	36	1.73	149	130.9
5/14/2015			1.06	103	80.2
5/18/2015			1.55	150	58.7
5/26/2015	7.7	46	1.25	137	89.1
6/1/2015			1.20	125	93.3
6/8/2015	8.0	94	1.44	163	86.9
6/17/2015			2.14	216	141.3
6/22/2015	7.9	76	1.76	204	106.5
7/7/2015			1.55	177	79.3
7/9/2015	7.7	50	1.63	116	77.6
7/16/2015			1.50	124	72.2
7/23/2015	7.8	108	1.84	223	111.8
7/30/2015			2.18	248	122.0
8/6/2015	7.6	154	2.31	286	142.9
8/13/2015			2.78	283	159.1
8/20/2015	7.2	142	2.83	287	156.0
8/27/2015			3.01	300	153.3

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
9/2/2015	7.5	146	3.13	322	159.6
9/10/2015			3.47	309	172.7
9/16/2015	7.4	152	3.87	310	169.3
9/24/201			3.46	308	168.3
9/30/2015	7.6	148	3.98	322	174.5
10/8/2015			3.42	344	179.8
10/14/2015	7.8	16	3.72	362	181.0
10/22/2015			3.45	362	168.8
10/28/2015	7.8	164	3.40	351	168.3
11/4/2015			4.05	358	181.0
11/12/2015	7.9	128	2.80	281	152.0
11/18/2015			1.55	120	77.8
12/2/2015			1.86	127	68.9
12/14/2015	7.7	38	1.26	93	70.0
12/22/2015	7.7	70	1.99	157	82.5
1/5/2016	7.5	60	2.17	158	92.5
1/25/2016	8.0	80	2.00	191	95.0
2/10/2016	8.0	94	2.36	214	102.5
2/22/2016	7.5	80	1.48	156	110.0
Samples analyzed since the last quarterly report					
3/10/2016	7.3	54.0	1.481	126.1	80.0
3/16/2016	7.1	60.0	1.500	137.6	75.0
3/24/2016	7.3	68.0	1.827	156.8	79.0
3/31/2016	7.3	48.0	1.043	95.9	50.0
4/4/2016	7.4	66.0	1.563	138.6	80.0
4/20/2016	7.3	92.0	1.903	187.0	105.0

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
4/29/2016	7.7	100.0	2.052	199.1	107.5
5/3/2016	7.8	60.0	1.197	130.5	87.5
5/10/2016	7.6	44.0	0.856	93.5	75.0
518/2016	7.8	74.0	1.482	154.5	82.5
5/26/2016	7.7	34.0	0.941	114.1	72.5
Spring					
1/8/2015			2.27	534	321.1
1/14/2015			2.79	517	310.0
1/21/2015			2.27	553	324.0
2/3/2015			2.20	562	321.8
2/10/2015			2.44	581	314.2
2/26/2015			1.74	491	266.4
3/3/2015			1.57	430	234.9
3/11/2015			1.63	495	54.7
3/19/2015			1.54	474	220.0
3/25/2015			2.08	544	277.6
4/2/2015			1.78	515	289.8
4/9/2015			2.03	509	305.8
4/15/2015			1.76	480	276.9
4/23/2015			1.93	512	297.3
4/29/2015			2.55	564	294.9
5/4/2015			1.57	554	251.8
5/7/2015			2.29	623	318.9
5/11/2015			1.11	408	202.0
5/14/2015			1.35	507	259.6
5/18/2015			1.17	508	265.8

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
5/26/2015			1.08	516	250.4
6/8/2015			1.95	615	341.8
6/17/2015			1.65	532	276.0
6/22/2015			1.79	601	301.1
7/9/2015			1.43	542	266.9
7/16/2015			2.02	629	309.3
7/23/2015			2.17	656	312.0
7/30/2015			2.26	648	334.9
8/6/2015			0.92	606	330.7
8/13/2015			2.71	522	328.0
8/20/2015			2.09	554	330.9
8/27/2015			2.01	575	318.2
9/2/2015			2.08	581	311.1
9/10/2015			1.99	485	254.8
9/16/2015			0.00	557	294.9
9/24/2015			1.95	574	311.5
9/30/2015			2.00	573	321.3
10/8/2015			1.92	581	333.8
10/14/2015			1.94	610	313.0
10/22/2015			1.86	581	273.8
10/28/201			1.81	537	292.3
11/4/2015			2.11	572	299.0
11/12/2015			2.20	565	294.5
11/18/2015			1.80	395	215.6
12/2/2015			4.14	487	302.2
Samples analyzed since the last quarterly report					

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
3/10/2016			1.109	359.0	210.0
3/16/2016			2.038	516.0	250.0
3/24/2016			1.939	446.0	214.0
3/31/2016			1.324	414.0	45.0
4/4/2016			1.971	506.0	272.5
4/20/2016			2.111	554.0	300.0
4/29/2016			2.234	522.0	285.0
5/3/2016			1.879	486.0	275.0
5/10/2016			1.190	417.0	245.0
518/2016			2.206	493.0	275.0
5/26/2016			1.370	450.0	250.0
Ephemeral Stream					
1/5/2016			2.908	368.0	
1/25/2016			3.454	392.0	
2/24/2016			2.427	264.0	
3/10/2016			2.530	288.0	
3/16/2016			2.427	356.0	
3/24/2016			3.467	399.0	
3/31/2016			3.366	153.2	
4/4/2016			2.544	330.0	
4/20/2016			2.758	380.0	
5/2/2016			2.068	329.0	
5/2/2016			2.571	241.0	
5/10/2016			1.617	143.3	
5/18/2016			2.726	360.0	
5/26/2016			2.031	194.5	

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
Trench 1					
1/8/2015			2.01	154	103.6
1/14/2015			2.81	166	81.8
2/26/2015			2.08	171	78.4
3/3/2015			2.11	177	86.7
3/11/2015			1.95	193	114.0
3/19/2015			1.70	209	109.3
3/25/2015			2.13	238	105.1
3/26/2015			1.64	209	120.2
4/2/2015			1.94	261	151.3
4/9/2015			1.99	260	154.0
4/15/2015			1.80	260	146.7
4/23/2015			2.06	231	132.7
5/11/2015			2.09	262	126.5
5/14/2015			1.86	299	156.5
5/18/2015			1.57	346	173.1
5/26/2015			1.65	297	146.0
6/22/2015			1.99	341	169.8
6/29/2015			2.63	342	167.8
7/9/2015			2.08	171	78.4
11/18/2015			1.15	152	86.7
12/2/2015			1.47	162	108.9
12/14/2015			1.59	157	92.5
12/22/2015			1.70	180	95.0
1/5/2016			1.61	161	82.5
2/24/2016			1.16	162	102.5

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
Samples analyzed since the last quarterly report					
3/10/2016			1.019	173.7	117.5
3/16/2016			1.451	226.0	120.0
3/24/2016			1.732	229.0	99.0
3/31/2016			1.280	167.9	100.0
5/10/2016			1.122	226.0	130.0
5/19/2016			0.405	196.5	115.0
5/18/2016			1.653	234.0	125.0
5/262016			1.421	262.0	142.5
Trench 2					
3/11/2015			1.77	159	140.8
3/19/2015			1.04	168	104.9
3/26/2015			0.78	135	160.9
5/11/2015			0.41	165	88.5
5/26/2015			0.93	284	141.3
12/14/2016			1.00	148	110.0
2/24/2016			0.99	144	122.5
Sample analyses since the last quarterly report					
3/10/2016			0.349	106.8	80.0
3/31/2016			0.424	134.5	87.5
4/4/2016			1.4	192.1	107.5

Direct Measurements as Indicators of Potential Holding Pond Leakage

Three direct measurements to monitor possible leakage of manure from the holding ponds are; (a) the interceptor trenches down slope of the ponds, (b) the house well, and (c) the ephemeral stream capturing surface runoff and shallow seepage water from the area around the animal houses and holding ponds. These sites are located on Figure 14.

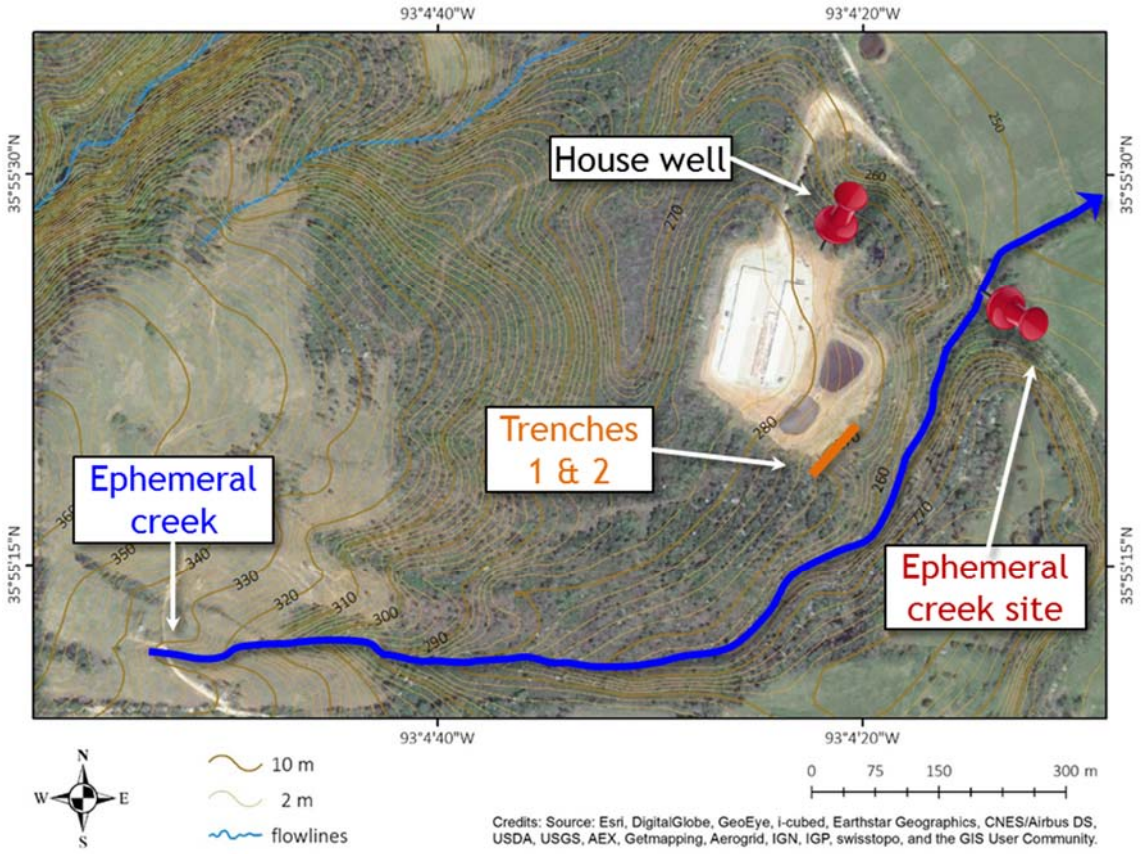

Figure 14. Location of direct measurement sites in the vicinity of the manure holding ponds; the interceptor trenches, house well, and ephemeral stream.

The BCRET are confident that at least one of these direct measurements will capture any potential leakage from the holding ponds where occurring. While these direct measurements are not designed to quantify leakage, they will indicate by increases in indicator constituents any leakage of manure from the storage ponds. This is particularly the case for conservative tracers, such as chloride and electrical conductivity. Chloride is not commonly involved in geochemical reactions nor is it affected by pH and changes in redox and, thus, behaves as a conservative tracer (see http://www.gwadi.org/tools/tracers/chloride). Nitrate is an additional useful tracer, although it can be affected by changes in redox conditions and subject to denitrification. Together, these and other constituents aid in identifying potential leakage from the manure storage ponds.

Manure slurry holding ponds

The physical and chemical properties measurement of slurry composition in the holding ponds have been determined at various times and reported in prior Quarterly Reports. Here, the mean values of constituents measured are given in Table 7 for samples collected on September 24th, 2013; April 10th, 2014; October 28th, 2014; April 16th, 2015; January 15th, 2016; and May 27th, 2016.

Table 7. Mean concentration of constituent property of manure sampled from the top 6 inches, bottom layer, and profile of holding ponds 1 and 2 on the C&H Farm between September, 2013 and May, 2016.

Property	Pond 1			Pond 2		
	Top 6 inches	Bottom layer	Profile	Top 6 inches	Bottom layer	Profile
pH	7.9	7.5	7.7	8.1	7.9	8.0
Conductivity, µS/cm	12610.0	10433.3	12653.3	10275.0	10475.0	8884.0
Solids, %	0.7	9.0	3.7	0.5	4.3	1.8
Chloride	120.0	136.3	65.2	169.0	204.5	74.4
Total N	1382.3	3906.7	2726.7	1212.5	2980.0	1309.8
Ammonium-N	1125.7	1210.3	1172.5	858.5	937.5	703.2
Nitrate-N	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
Total P	164.6	3759.8	1191.6	113.5	457.5	258.0
Water extractable P	81.1	371.7	172.3	79.4	161.5	78.7
TOTAL K	1281.7	1448.3	1333.5	1108.5	1179.5	1032.2
Total Ca	80.1	4355.0	994.8	45.3	409.0	215.7
Total Mg	14.1	974.8	99.0	2.9	88.5	5.9
Total S	31.8	430.2	46.0	11.5	66.5	8.2
Total Fe	8.8	879.0	67.4	6.2	668.0	94.2

Property	Pond 1			Pond 2		
	Top 6 inches	Bottom layer	Profile	Top 6 inches	Bottom layer	Profile
Total Mn	2.4	42.1	3.6	0.0	4.9	0.4
Total Zn	1.5	88.3	8.8	0.1	9.3	0.7
Total Cu	0.3	10.9	1.1	0.0	1.5	0.1
Total Na	113.3	122.7	56.5	123.0	125.0	50.6

Interceptor trenches

The trench approach was selected over a three-dimensional network of shallow observation and sampling wells located below the holding ponds due to the greater probability of the trench intercepting any seepage from the ponds along discrete and preferred pathways. The continuous interception provided by the trench offers a greater probability of capturing any subsurface seepage as compared to a three dimensional grid of discontinuous point observations. Thus, the trench reduces the probability of by-pass flow of any seepage down slope of the ponds (Figure 14). A detailed description of trench construction was provided in the July to September, 2014 Quarterly Report.

Interceptor trenches have been widely used in the Ozark Mountains region to assess if manure holding ponds were leaking and worldwide as a preferred method to determine subsurface lateral flows in hillslopes along areas of differing or contrasting permeabilities. References to some of the relevant studies are given at the end of this section.

House well

The sample collection point for the house well adjacent to the animal house facilities and slurry holding ponds was reconfigured to exclude any potential sources of sample contamination (Figure 14). It was determined that the risk of contamination was a result of factors such as well-head pump and in-house maintenance. In addition to installing a new well-water sampling site, USGS water quality sampling guidelines were used, which involved collection of a well sample when in-situ field measurement of well water temperature, pH, and electrical conductivity had stabilized. Details are given in the October to December, 2015 Quarterly Report. The house well serves to track any potential water-quality changes in the deeper groundwater table.

Ephemeral stream

The ephemeral stream site, where monitoring was initiated in March, 2014, drains a small sub-watershed containing the house barns, manure holding ponds, and interflow partially captured by the

interceptor trenches (Figure 14). The stream will capture surface runoff and shallow interflow, seepage, and spring water from adjacent to and encompassing the animal house barns and holding ponds.

Findings to date from direct measurements

Concentrations of nutrients, bacteria, chloride, and electrical conductivity in samples collected from the direct measurement sites have not shown any consistent elevation or increasing trends over the sampling periods to date (Figures 15, 16, and 17). Sampling of the inceptor trenches was initiated in August 2014, the secure house well in September 2015, and the ephemeral creek in March 2014. For samples collected from Trench 1, nitrate-N and chloride concentrations actually decreased slightly with time, although not significant, and this decrease likely reflects a stabilization of the profile after trench construction.

The mean concentration of nutrients, coliform, chloride, and electrical conductivity are provided in Table 8, along with respective concentrations for manure slurry collected from holding ponds 1 and 2 over the last two years, in addition to concentrations reported in published data for other swine manure holding ponds in Kansas and Manitoba. While there is a wide range in concentrations reported in the literature, the mean values are similar to those of manure collected from holding pond 1 (Table 8). Holding pond 2 has lower nutrient and conductivity values that reflect the accumulation of slurry from which solids of higher nutrient content have settled out in holding pond 1. The mean concentration of dissolved P, total P, total N, chloride, and electrical conductivity are appreciably lower than values measured in manure from holding pond 1 (Table 8).

These findings indicate that at the present time, there is no evidence of major leakage of manure from holding pond 1 or 2. However, we will continue to sample these sites and measure nutrient, bacteria, and conservative tracer concentrations to determine if this situation remains as the same. To provide additional information on interceptor trench flows and chemistry, we are in the process of installing secure sampling sites at trench 1 and 2, which will be equipped with flow monitoring equipment and an ISCO sampler to collected periodic higher flows from the trenches.

Table 8. Mean concentrations of water quality analyses for samples collected from the manure holding ponds, interceptor trenches, house well, ephemeral creek, upstream of farm and downstream of farm.

Source	#	Diss. P	Total P	Nitrate-N	Total N	E. coli	Total Coliform	Chloride	Conductivity
		mg/L				MPN/100 mL		mg/L	µS/cm
Manure pond 1	7	151.8	932.8	N.D.	2,349.6	N.D.	N.D.	391.0	12,780
Manure pond 2	5	78.4	235.7	N.D.	1,297.3	N.D.	N.D.	372.0	8,100
Trench 1 ¶	37	0.004	0.021	0.67	0.74	586.6	9,581	1.75	223
Trench 2 ¶	15	0.004	0.055	2.15	2.70	209.5	13,728	0.82	171
House well §	42	0.010	0.041	0.52	0.57	40.5	1,546	5.29	453
Ephemeral creek †	67	0.014	0.112	0.74	1.20	567.0	16,049	2.61	304
Upstream ‡	129	0.015	0.050	0.14	0.26	439.7	6,831	1.64	126
Downstream ‡	136	0.015	0.047	0.28	0.40	245.9	6,055	2.17	195
Manure from literature - mean *	162	363	579	N.D.	2,460	N.D.	15,280	390	N.D.
Manure from literature – range *	162	50 – 3,810	60 – 1,209	N.D.	610 – 10,140	N.D.	6,840 – 27,200	73 – 1,149	N.D.

N.D. Not determined.
¶ Samples collected since August, 2014.
§ Samples collected from September, 2015.
† Samples collected from March, 2014.
‡ Samples collected from September, 2013.
* Values from published data; DeRouchey et al., 2002 and Malley et al., 2001.

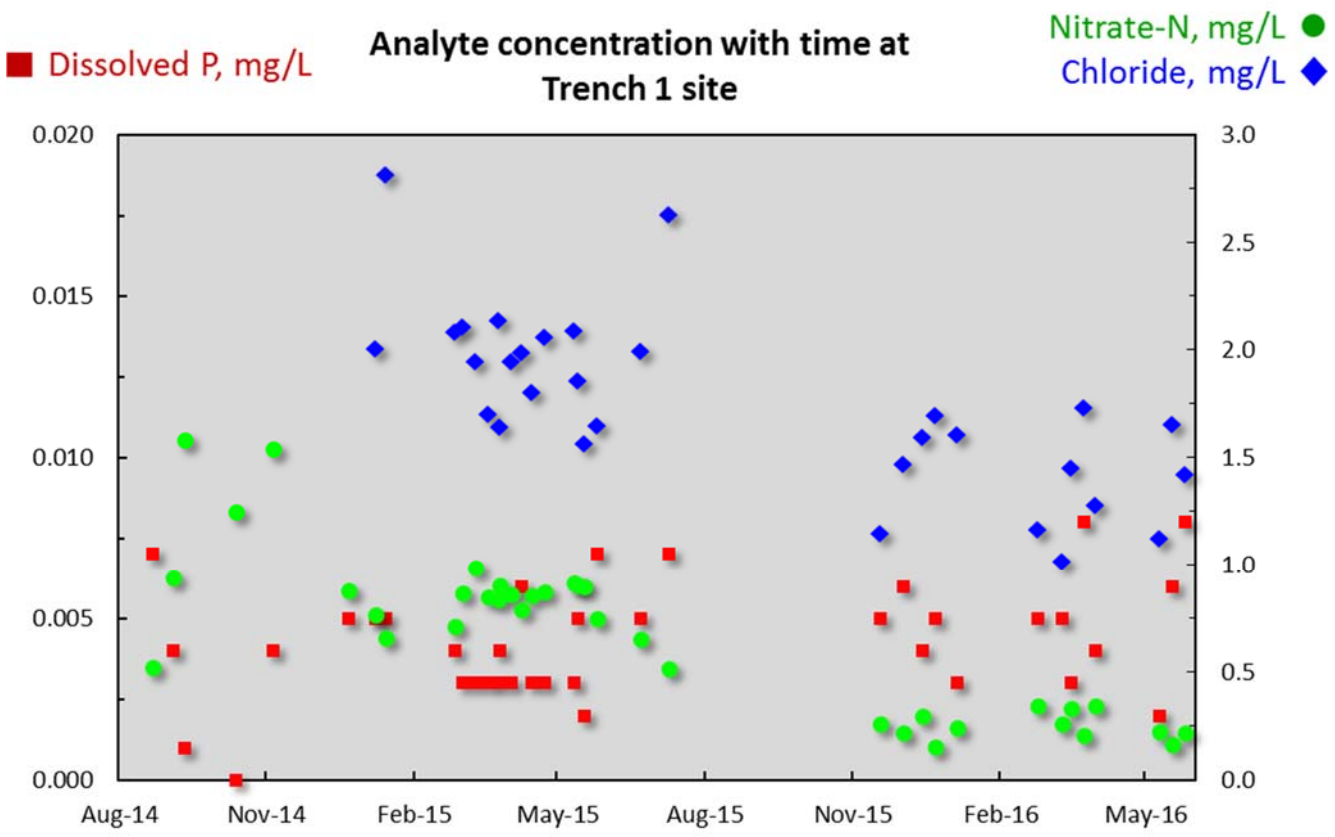

Figure 15. Dissolved P, nitrate-N, and chloride concentrations in Trench 1, since the inception of monitoring in August, 2014.

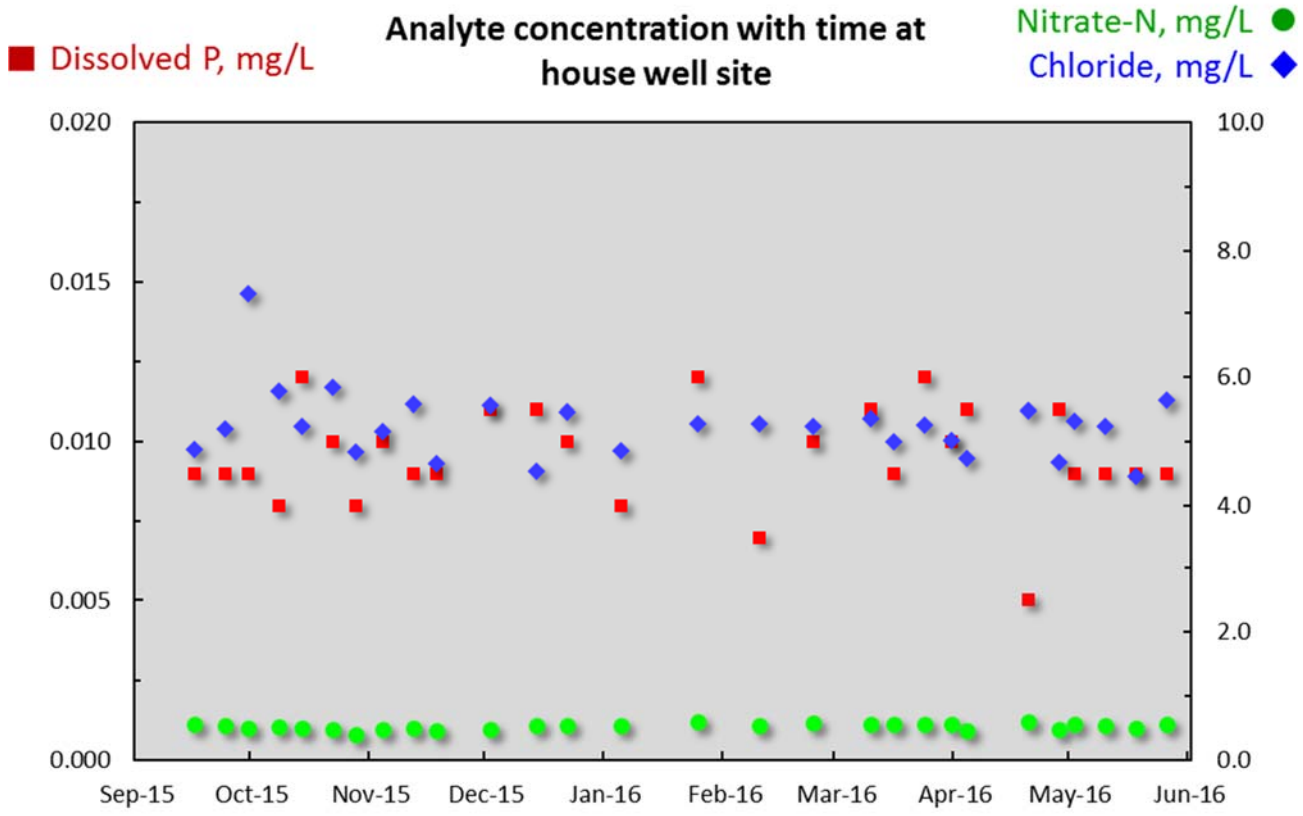

Figure 16. Dissolved P, nitrate-N, and chloride concentrations in the house well, since the inception of protected monitoring port in September, 2015.

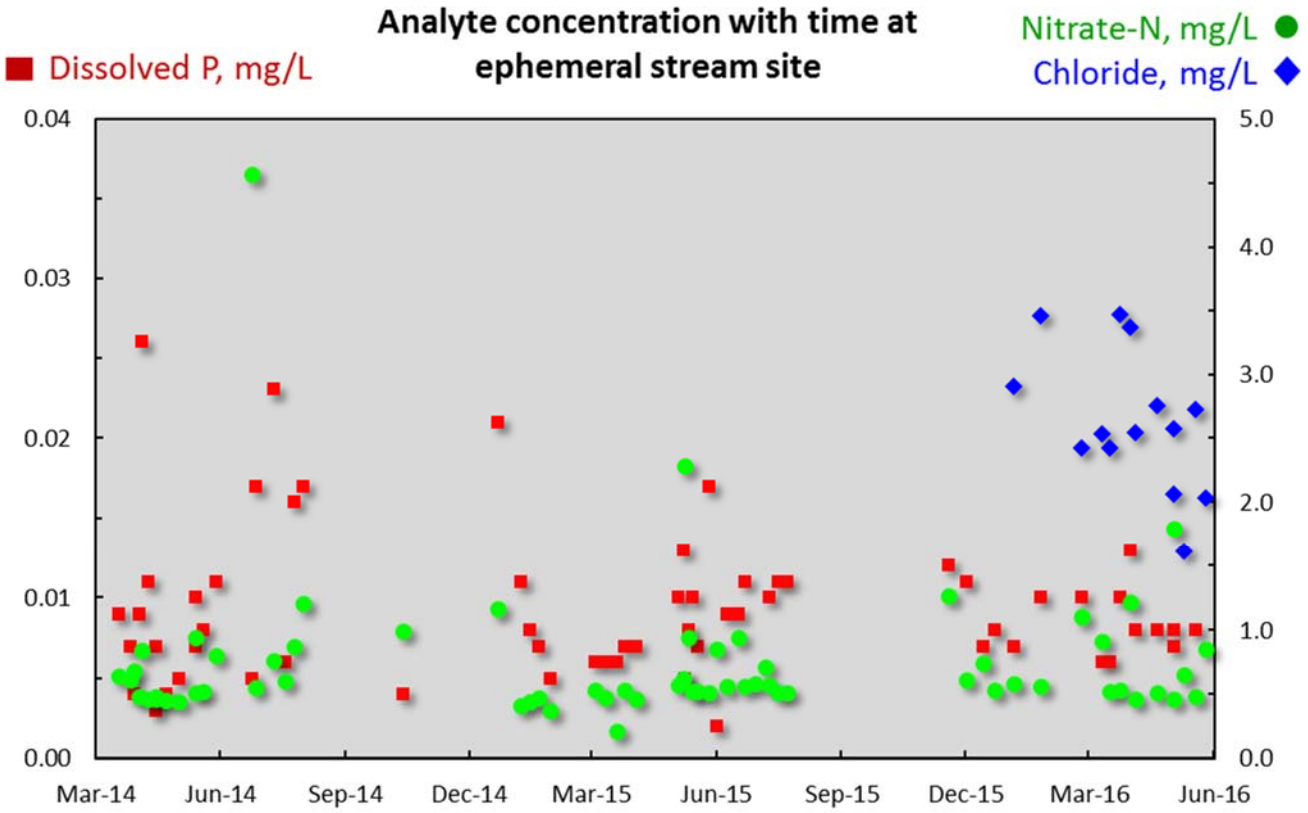

Figure 17. Dissolved P, nitrate-N concentrations in ephemeral stream, since the inception of monitoring in March, 2014.

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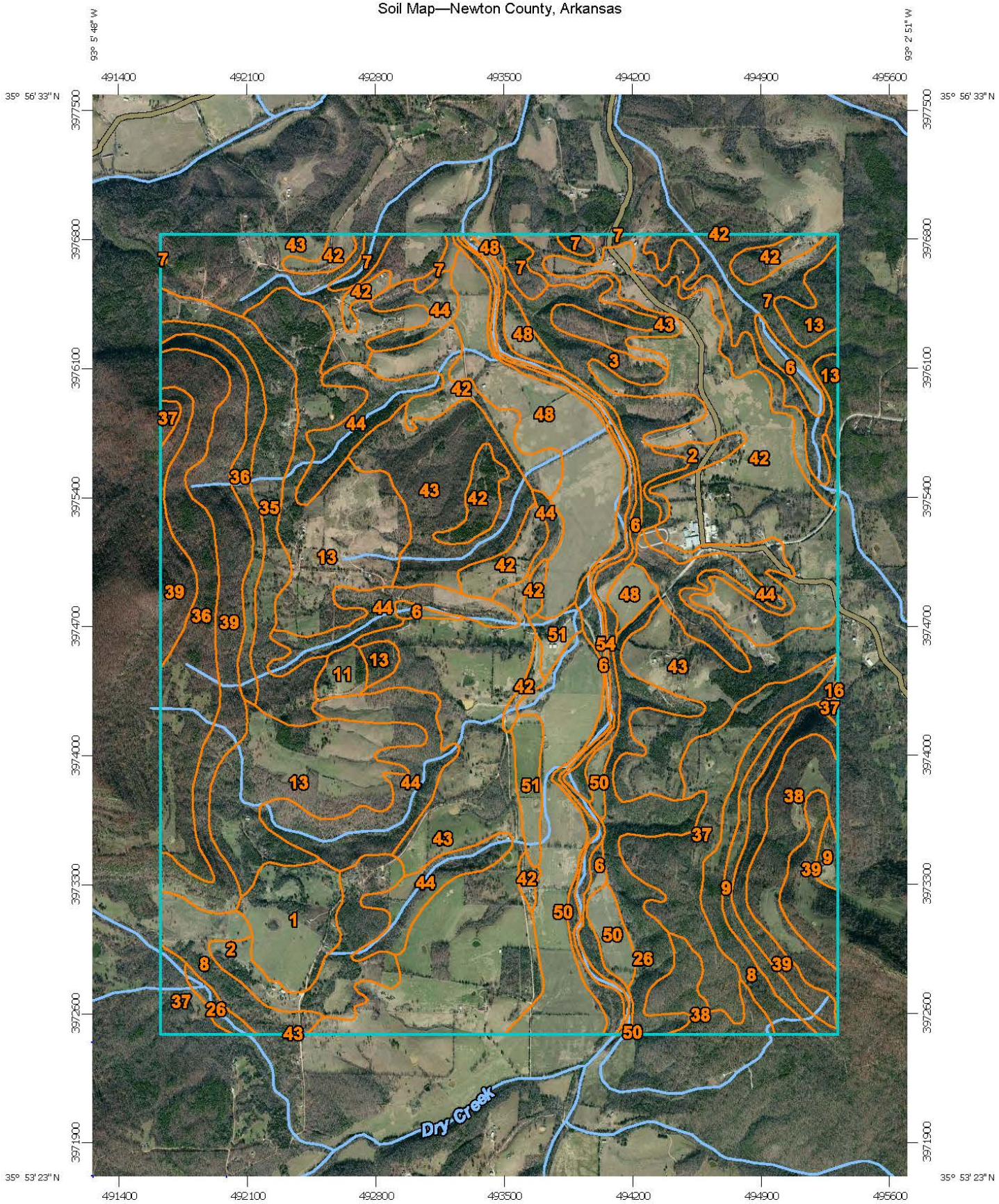
Soil Series Map and NRCS Description for Holding Pond Area

Following is the soils map and NRCS official soil series description for the soils in the vicinity of the holding pond area.

Soil Map—Newton County, Arkansas



Map Scale: 1:28,600 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 400 800 1600 2400

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Newton County, Arkansas
Survey Area Data: Version 12, Dec 19, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 5, 2010—Jun 30, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Newton County, Arkansas (AR101)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Arkana very cherty silt loam, 3 to 8 percent slopes	73.5	1.8%
2	Arkana-Moko complex, 8 to 20 percent slopes	97.5	2.5%
3	Arkana-Moko complex, 20 to 40 percent slopes	90.0	2.3%
6	Ceda-Kenn complex, frequently flooded	121.8	3.1%
7	Clarksville very cherty silt loam, 20 to 50 percent slopes	118.8	3.0%
8	Eden-Newnata complex, 8 to 20 percent slopes	105.7	2.7%
9	Eden-Newnata complex, 20 to 40 percent slopes	40.1	1.0%
11	Enders gravelly loam, 3 to 8 percent slopes	15.5	0.4%
13	Enders stony loam, 3 to 15 percent slopes	368.5	9.3%
16	Enders-Leesburg complex, 20 to 40 percent slopes	0.6	0.0%
26	Moko-Rock outcrop complex, 15 to 50 percent slopes	113.9	2.9%
35	Nella-Enders stony loams, 8 to 20 percent slopes	108.7	2.7%
36	Nella-Enders stony loams, 20 to 40 percent slopes	190.8	4.8%
37	Nella-Steprock complex, 8 to 20 percent slopes	154.0	3.9%
38	Nella-Steprock-Mountainburg very stony loams, 20 to 40 percent slopes	114.3	2.9%
39	Nella-Steprock-Mountainburg very stony loams, 40 to 60 percent slopes	255.4	6.4%
42	Noark very cherty silt loam, 3 to 8 percent slopes	430.4	10.8%
43	Noark very cherty silt loam, 8 to 20 percent slopes	854.8	21.5%
44	Noark very cherty silt loam, 20 to 40 percent slopes	315.1	7.9%
48	Razort loam, occasionally flooded	173.2	4.4%
50	Spadra loam, occasionally flooded	160.4	4.0%

Newton County, Arkansas (AR101)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
51	Spadra loam, 2 to 5 percent slopes	38.0	1.0%
54	Water	35.0	0.9%
Totals for Area of Interest		**3,976.2**	**100.0%**

LOCATION NOARK AR+MO

Established Series
Rev. LBW/RLT
03/2006

NOARK SERIES

The Noark series consists of very deep, well drained, moderately permeable soils that formed in colluvium and clayey residuum from cherty limestones. These soils are on nearly level to very steep uplands of the Ozarks. Slopes range from 1 to 45 percent. The mean annual temperature is about 56 degrees F., and the mean annual precipitation is about 42 inches.

TAXONOMIC CLASS: Clayey-skeletal, mixed, semiactive, mesic Typic Paleudults

TYPICAL PEDON: Noark very gravelly silt loam, forested. (Colors are for moist soil unless otherwise stated.)

A--0 to 3 inches; dark grayish brown (10YR 4/2) very gravelly silt loam; moderate medium granular structure; friable; many medium roots; about 40 percent by volume angular chert fragments less than 3 inches in diameter; very strongly acid; abrupt smooth boundary. (1 to 7 inches thick)

E--3 to 12 inches; brown (10YR 5/3) very gravelly silt loam; weak medium subangular blocky structure; friable; many fine roots; about 40 percent by volume angular chert fragments less than 3 inches in diameter; extremely acid; clear wavy boundary. (6 to 14 inches thick)

BE--12 to 19 inches; yellowish red (5YR 4/6) very gravelly silty clay loam; pockets and streaks of brown (10YR 5/3) silt loam; moderate medium subangular blocky structure; firm; many fine roots; about 40 percent by volume angular chert fragments less than 3 inches in diameter; very strongly acid; clear wavy boundary. (0 to 11 inches thick)

2Bt1--19 to 26 inches; red (2.5YR 4/6) very gravelly clay; strong medium blocky structure; very firm; common fine roots; common fine pores; many thin patchy clay films on ped faces and chert fragments; about 40 percent by volume angular chert fragments less than 3 inches in diameter; extremely acid; gradual wavy boundary.

2Bt2--26 to 37 inches; dark red (2.5YR 3/6) very gravelly clay; strong medium blocky structure; very firm; few fine roots; common fine pores; thick continuous clay films on ped faces and chert fragments; about 50 percent by volume chert fragments less than 3 inches in diameter; extremely acid; gradual wavy boundary.

2Bt3--37 to 80 inches; dark red (2.5YR 3/6) extremely gravelly clay; strong medium blocky structure; very firm; thick continuous clay films on ped faces and chert fragments; about 70 percent by volume angular chert fragments less than 3 inches in diameter; extremely acid. (Combined thickness of the 2Bt horizon ranges from 31 to 73 inches or more.)

TYPE LOCATION: Benton County, Arkansas; south of Highway 12, at road fork to War Eagle; 14 miles from Rogers; SE1/4SE1/4SW1/4 sec. 27, T. 19 N., R. 28 W.

RANGE IN CHARACTERISTICS:
Depth to Bedrock: greater than 80 inches
Note: Some pedons have clay depletions of 2 chroma or less at depths greater than 40 inches.

A or Ap horizon
Hue: 10YR
Value: 3 to 5
Chroma: 2 to 4
Fine earth: silt loam
Total rock fragments: 15 to 60 percent; 15 to 60 percent gravel and 0 to 15 percent cobbles
Reaction: very strongly acid to slightly acid
Note: Where the color value is 3 or less, the thickness is less than 6 inches

E horizon
Hue: 10YR
Value: 5 or 6
Chroma: 3 or 4
Fine earth: silt loam
Total rock fragments: 15 to 60 percent; 15 to 60 percent gravel and 0 to 10 percent cobbles
Reaction: very strongly acid to slightly acid

BE or Bt horizon
Hue: 5YR to 10YR
Value: 4 or 5
Chroma: 4 or 6
Fine-earth: silt loam or silty clay loam
Total rock fragments: 35 to 65 percent; 20 to 65 percent gravel and 0 to 20 percent cobbles
Reaction: extremely acid to medium acid

2Bt horizon
Hue: 10R to 7.5YR
Value: 3 to 5
Chroma: 4 to 8
Fine-earth: silty clay or clay
Total rock fragments: 25 to 80 percent, 15 to 80 percent gravel and 0 to 50 percent cobbles
Reaction: extremely acid to strongly acid

COMPETING SERIES: There no other series in this family.

GEOGRAPHIC SETTING: Noark soils are on nearly level to very steep uplands of the Ozark Highlands. These soils formed in colluvium and clayey residuum weathered from cherty limestone. Slopes range from 1 to 45 percent. Near the type location, the average annual temperature is about 56 degrees F., and the average annual precipitation is about 45 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Arkana, Clarksville, Captina, Moko, Nixa and Tonti series. Arkana soils are near limestone outcrops, have a very-fine control section, a 20 to 40 inch solum, and higher base saturation. Clarksville soils occur on similar sideslope positions as Noark soils and have a loamy-skeletal control section. Captina soils occur on broad flats, have a fine-silty control section, and a fragipan. Moko soils are near limestone outcrops, have a loamy-skeletal control section, a 10 to 20 inch sola and higher base saturation. Nixa soils are on narrow ridgetops, have a loamy-skeletal control section, and a fragipan. Tonti soils are on broad flats, have a fine-loamy control

section and a fragipan.

DRAINAGE AND PERMEABILITY: Well drained; medium to very high runoff; moderate permeability.

USE AND VEGETATION: Most areas are in mixed hardwood forest of red, white, post and blackjack oaks, hickory, with some black walnut and shortleaf pine. Cleared areas are used mainly for pasture.

DISTRIBUTION AND EXTENT: The Ozarks region (MLRA's 116A and 116B) of northwestern Arkansas, southwestern Missouri and northeastern Oklahoma. The series is extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Benton County, Arkansas; 1973.

REMARKS: Diagnostic horizons recognized in this pedon are:
Ochric epipedon- the zone from the surface to a depth of 19 inches (A, E, and BE horizons).
Argillic horizon- the zone from 19 to 80 inches (Bt horizons).

The Noark series was formerly included in the Baxter and Clarksville series.

In Arkansas, these soils are mapped primarily in the Boone limestone geologic formation. In Missouri they are mapped mainly in the Mississippian age Burlington and Kinderhook limestone formations.

National Cooperative Soil Survey
U.S.A.

Well Log and Geologic Investigations of Holding Pond Area for CNMP

Below in Table 1 is the drilling log for the house well located to the north of the barns, which documents the presence of red clays to a depth of 54 feet below the surface.

Table 9. Drilling log for water well on the C&H Farm.

A

1. Contractor Name & Number: 1077 ARNOLD WELL DRILLING & PUMP SE
2. Driller Name & Number: 2819 JOSHUA ARNOLD
3. Pump Installer Name & Number:
4. Date Well Completed: 02/15/2013 New Well

5. COUNTY : NEWTON (101)
6 FRACTION ¼ of ¼
7 SECTION:
8 TOWNSHIP
9 RANGE

11. LONGITUDE 93-04-23 12. LATITUDE 35-55-27

B

DESCRIPTION OF FORMATION	DEPTHS IN FEET FROM	TO	WATER BEARING	IF YES.. DEPTH
Red Clay	0	54	No	
Gray Limestone	54	310	Yes	145
White Limestone	310	320	No	
Gray Limestone	320	325	No	
			Yes	285
			No	
			Yes	265
			No	

2. TOTAL DEPTH OF WELL 325
3. STATIC WATER LEVEL 138 Ft. below land surface
4. YIELD 30 gallons per
5. DIAMETER OF BORE HOLE 6.06 IN

C PUMP REPORT

1 TYPE PUMP
2 SETTING DEPTH FEET
3 BRAND NAME AND SERIAL NUMBERS:
4 RATED CAPACITY gallons per minute
5 TYPE LUBRICATION
6 DROP PIPE OR COLUMN PIPE SIZE
7 WIRE SIZE
8 PRESSURE TANK:
SIZE: MAKE: MODEL:
9 DATE OF INSTALLATION OR REPAIR
10 Is there an abandoned water well on the property?

FT TO: FT

D 1 LAND OWNER OR OTHER CONTACT PERSON
NAME JASON HENSON (C & H FARM)
STREET ADDRESS HC 72 BOX 10
CITY MT JUDEA

CASING FROM 0 TO 74 W/ 6.25 Inner Diameter
CASING FROM TO W/ Inner Diameter
TYPE CASING STEEL

3. SCREEN
TYPE: DIA SLOT/GA
SET FROM FT TO FT
TYPE: DIA SLOT/GA
SET FROM FT TO FT

4. GRAVEL PACK FROM: FT TO: FT

5. BACK FILLED WITH: CUTTINGS
FROM: 0 FT TO: 69 FT

6. SEALED WITH: BENTONITE
FROM: 69 FT TO: 74 FT
FROM: FT TO: FT

7. DISINFECTED WITH: CHLORINE

8. USE OF WELL:
COMMERCIAL
OTHER

A/C HEATPUMP TYPE WELLS

(For A/C only)Will system also be used for purposes other than Heating and Air Conditioning?
If yes, name use:

(For A/C open-loop only) Into what medium is water returned?

11. REMARKS

12. SIGNED DATE

Below is the drilling log for the second well south of the initial house well, which provides supplemental water for the house operation and documents red clays to a depth of 45 feet below the surface.

Table 10. Drilling log for supplemental water well on the C&H Farm.

A

1. Contractor Name & Number: 1077 ARNOLD WELL DRILLING & PUMP SE
2. Driller Name & Number: 2819 JOSHUA ARNOLD
3. Pump Installer Name & Number:
4. Date Well Completed: 06/12/2015 New Well
5. COUNTY : NEWTON (101)
6 FRACTION ¼ of ¼
7 SECTION:
8 TOWNSHIP
9 RANGE
11. LONGITUDE 93-04-25 12. LATITUDE 35-55-23

B

DESCRIPTION OF FORMATION	DEPTHS IN FEET FROM	TO	WATER BEARING	IF YES.. DEPTH
Red Clay	0	45	No	
Gray Limestone	45	320	Yes	180
White Limestone	320	345	Yes	345
Gray Limestone	345	355	No	
Gray Limestone	355	488	No	
Gray Sand	488	665	Yes	660
			Yes	230
			No	
			No	
			Yes	320

2. TOTAL DEPTH OF WELL 665
3. STATIC WATER LEVEL 120 Ft. below land surface
4. YIELD 30 gallons per
5. DIAMETER OF BORE HOLE 6 IN

C PUMP REPORT

1 TYPE PUMP
2 SETTING DEPTH FEET
3 BRAND NAME AND SERIAL NUMBERS:
4 RATED CAPACITY gallons per minute
5 TYPE LUBRICATION
6 DROP PIPE OR COLUMN PIPE SIZE
7 WIRE SIZE
8 PRESSURE T.
SIZE: MAKE: MODEL:

FT TO: FT

D

1 LAND OWNER OR OTHER CONTACT PERSON
NAME C & H FARMS
STREET ADDRESS HC 72 BOX 10
CITY MT. JUDEA

CASING FROM 0 TO 85 W/ 6.25 Inner Diameter
CASING FROM TO W/ Inner Diameter
TYPE CASING STEEL

3. SCREEN
TYPE: DIA SLOT/GA
SET FROM FT TO FT
TYPE: DIA SLOT/GA
SET FROM FT TO FT

4. GRAVEL PACK FROM: FT TO: FT

5. BACK FILLED WITH: CUTTINGS
FROM: 0 FT TO: 80 FT

6. SEALED WITH: BENTONITE
FROM: 80 FT TO: 85 FT
FROM: FT TO: FT

7. DISINFECTED WITH: CHLORINE

8. USE OF WELL:
COMMERCIAL
OTHER

A/C HEATPUMP TYPE WELLS

(For A/C only)Will system also be used for purposes other than Heating and Air Conditio
If yes, name use:

(For A/C open-loop only) Into what medium is water returned?

11. REMARKS

12. SIGNED

9 DATE OF INSTALLATION OR REPAIR	
10 Is there an abandoned water well on the property?	

3. Geologic Investigation

The USDA Soil Survey predicts that the soil in the location of the storage structures is primarily a Noark very cherty silt loam, 3 to 8% slopes, (42). The soil profile for 42 from 0 to 14 inches is very gravelly silt loam, from 14-43 inches is very gravelly silty clay, and from 43-72 inches is very gravelly clay.

The holding ponds will be constructed with an 18-inch thick liner.

Geotechnical & Testing Services conducted laboratory tests on some of the samples. Atterburg limits were run on the soil samples for the sandy lean clay. The results were as follows:

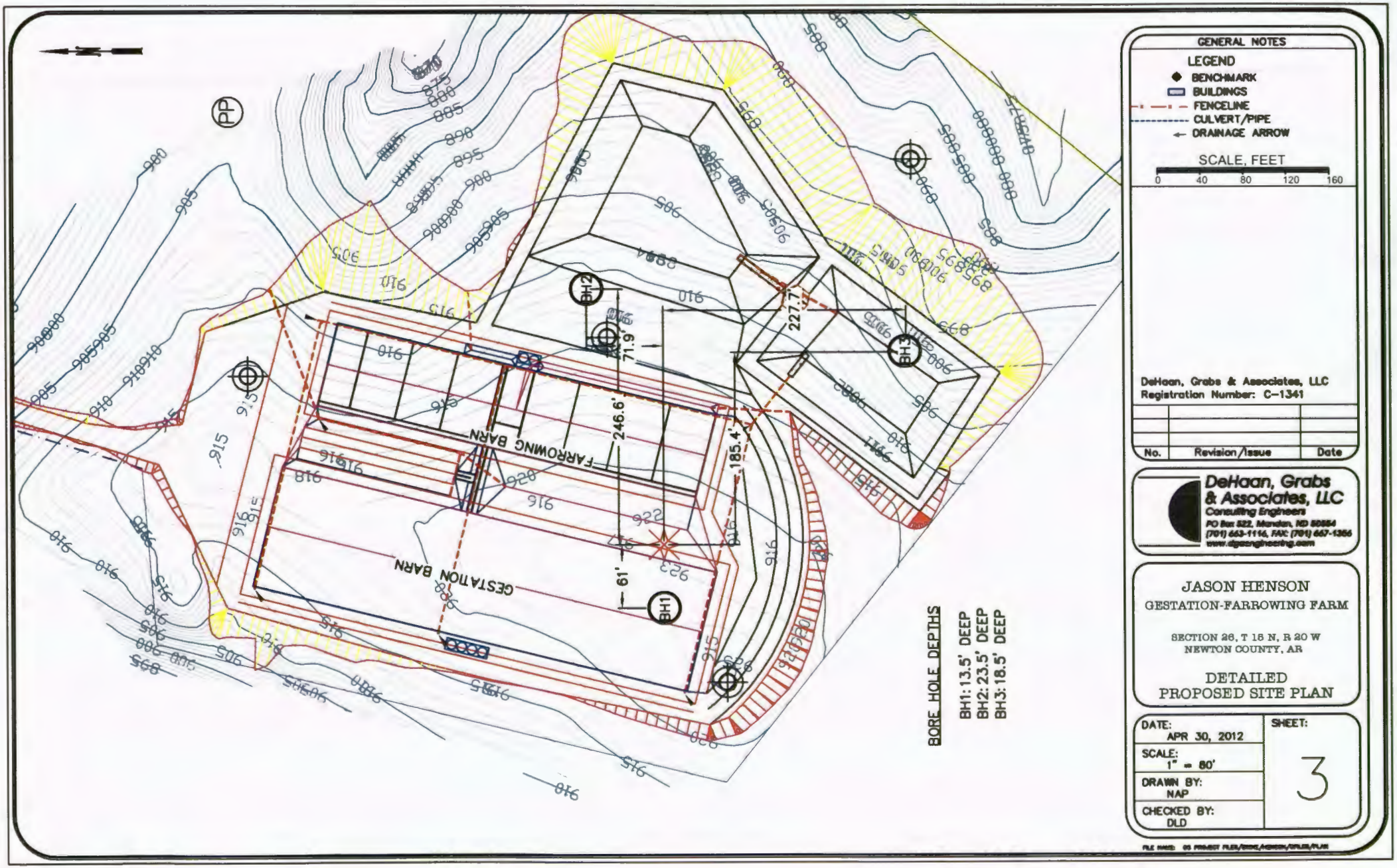
Boring #	Depth (ft)	Description	LL	PL	PI
2	3.0– 4.5'	Silty Lean Clay	38	22	16
2	4.5 – 6.0'	Sandy Lean Clay	44	24	20
2	7.0 – 8.5'	Fat Clay w/sand	93	38	55
2	9.5-11'	Sandy Fat Clay	64	23	41
3	7-8.5'	Fat Clay w/sand	58	36	22
3	9.5-11'	Clayey Gravel with Sand	81	44	37

The soil proposed for the holding pond liner is Fat Clay w/sand and Fat Clay w/sand (CL) identified in the soils report at the depths of 7-11' feet in boring numbers 2-3.

Recompacted soil test are currently being run to determine the Coefficient of Permeability using Darcy's Law. Results will be forwarded on once they are completed by the testing lab.

Currently it is recommended that the liner be constructed at 95% compaction +-2% Optimum Moisture to meet seepage requirements. This may change based off results from the Recompacted Permeability.

The seepage rate of any compacted liner that will be used will be less than the maximum allowable seepage rate of 5,000 Gallons/acre/per day as required by Arkansas Department of environment Quality.



GENERAL NOTES

LEGEND

- BENCHMARK
- BUILDINGS
- FENCELINE
- CULVERT/PIPE
- DRAINAGE ARROW

SCALE, FEET

0 40 80 120 160

DeHaan, Grabs & Associates, LLC
Registration Number: C-1341

No.	Revision/Issue	Date

DeHaan, Grabs & Associates, LLC
Consulting Engineers
PO Box 522, Minden, NE 68959
(701) 663-1116, FAX: (701) 667-1356
www.dgaengineering.com

JASON HENSON
GESTATION-FARROWING FARM

SECTION 26, T 16 N, R 20 W
NEWTON COUNTY, AR

DETAILED
PROPOSED SITE PLAN

DATE: APR 30, 2012	SHEET: 3
SCALE: 1" = 80'	
DRAWN BY: NAP	
CHECKED BY: DLD	

FILE NAME: 05 PROJECT FILES/DWG/ADMIN/SITE/SP.DWG

LOG OF BORING NO.B-1

Proposed Pond and Building Pads
Mt. Judea, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 12-15049 Location: Shown on Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4 0.8 1.2 1.6) / WATER CONTENT, % ● (PL 20 40 60 80 LL)	BLOWS PER FT
0					Surface Description=Grass Cover Rootmat = 4"				
			1	12	SILTY SAND medium dense, brown with organics	SM			17
					SILTY CLAY very stiff, tan and orange with organics	CL-ML			
2.5			2	16	LEAN CLAY, with sand very stiff, gray, red and tan	CL			18
			3	18	SANDY LEAN CLAY, with gravel very stiff, orangish brown and red with sandstone fragments	CL			21
5			4	16	SANDY LEAN CLAY, with trace gravel very stiff, brown, tan and red with rootlets and sandstone fragments	CL			30
7.5			5	18	SANDY LEAN CLAY, with gravel very stiff, orange, brown and light gray with chert and sandstone fragments	CL			48
10			6	18					47
12.5			7	18					50
					BOTTOM OF BORING AT 13½ FEET				
15									
17.5									

COMPLETION DEPTH: 13.5 ft.
DATE: 5/14/2012
RIG: Diedrich D-50

DEPTH TO WATER: DURING DRILLING: DRY
AT COMPLETION: DRY
AT 24 HOURS: N/A

LOG OF BORING NO.B-2

Proposed Pond and Building Pads
Mt. Judea, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 12-15049 Location: Shown on Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL; 20, 40, 60, 80)	BLOWS PER FT
0			1	13	SILT, with sand medium dense, brown with organics	SM			25
2.5			2	15	CLAYEY GRAVEL, with sand dense, red and tan with chert fragments	GC			30
			3	18	CLAYEY SAND / SANDY LEAN CLAY dense, very stiff, red and tan with extremely weathered sandstone fragments and chert fragments	CL			30
5			4	18		SC			26
7.5			5	18	FAT CLAY, with sand very stiff, light gray, red and orangish tan	CH			22
10			6	17	SANDY FAT CLAY very stiff, light gray, red and orangish tan	CH			25
12.5			7	15	GRAVELLY FAT CLAY very stiff, light gray, red and orangish tan with chert fragments	CH			65
15			8	18	FAT CLAY, with gravel very stiff, light gray and tan with chert fragments	CH			34
17.5					FAT CLAY very stiff, tan with ferrous nodules	CH			

COMPLETION DEPTH: 18.5 ft.
DATE: 5/15/2012
RIG: Diedrich D-50

DEPTH TO WATER: DURING DRILLING: DRY
AT COMPLETION: DRY
AT 24 HOURS: N/A

LOG OF BORING NO.B-2

Proposed Pond and Building Pads
Mt. Judea, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 12-15049 Location: Shown on Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL; 20, 40, 60, 80)	BLOWS PER FT
			9	18					20
					BOTTOM OF BORING AT 18½ FEET				
20									
22.5									
25									
27.5									
30									
32.5									
35									

LOG OF BORING NO.B-3

Proposed Pond and Building Pads
Mt. Judea, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 12-15049 Location: Shown on Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4 0.8 1.2 1.6) / WATER CONTENT, % ● (PL 20 40 60 80 LL)	BLOWS PER FT
0			1	10	SILT, with sand and trace gravel medium dense, orangish brown with organics and chert fragments	ML			13
2.5			2	18	CLAYEY SAND, with gravel medium dense, orangish tan and brown with chert fragments	SC			29
			3	16	CLAYEY GRAVEL, with sand dense, red and brown with sandstone and chert fragments	GC			38
5			4	16					72
					CHERT SEAM = 6"				
7.5			5	18	FAT CLAY, with sand very stiff, light gray, brown and orangish tan, blocky	CH			24
10			6	11	CLAYEY GRAVEL, with sand very dense, brown and tan with chert fragments	GC			50/5"
12.5					AUGER REFUSAL AT 11½ FEET				
15									
17.5									

COMPLETION DEPTH: 11.5 ft.
DATE: 5/14/2012
RIG: Diedrich D-50

DEPTH TO WATER: DURING DRILLING: DRY
AT COMPLETION: DRY
AT 24 HOURS: N/A

GTS, Inc.
Geotechnical & Testing Services

1915 N. Shiloh Dr, Suite 1
Fayetteville, Arkansas 72704

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Fax: (479) 521-6232

Office Locations
Fayetteville, Arkansas
Van Buren, Arkansas
Tulsa, Oklahoma

PROJECT Proposed Pond and Building Pads

JOB NO. 12-15049 **DATE** 5/22/2012

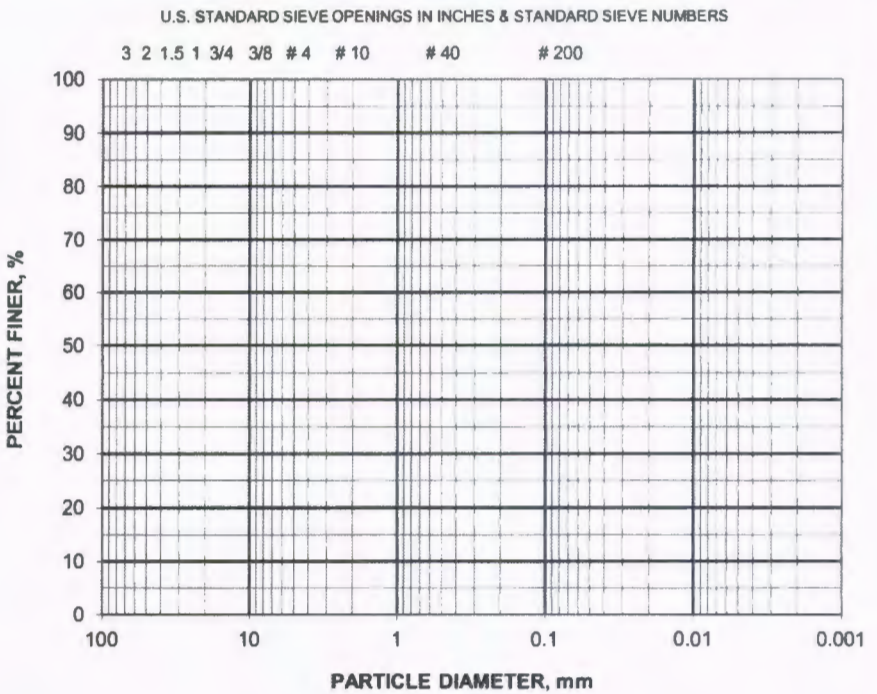
BORING NO.	B-2
SAMPLE NO.	S-3
DEPTH (FT)	3-4.5
PLASTIC LIMIT	22
LIQUID LIMIT	38
PLASTICITY INDEX	16

SIEVE SIZE	PERCENT PASSING
3.00"	N/A
1.50"	N/A
1.00"	N/A
3/4"	N/A
3/8"	N/A
No. 4	N/A
No. 10	N/A
No. 40	N/A
No. 200	N/A

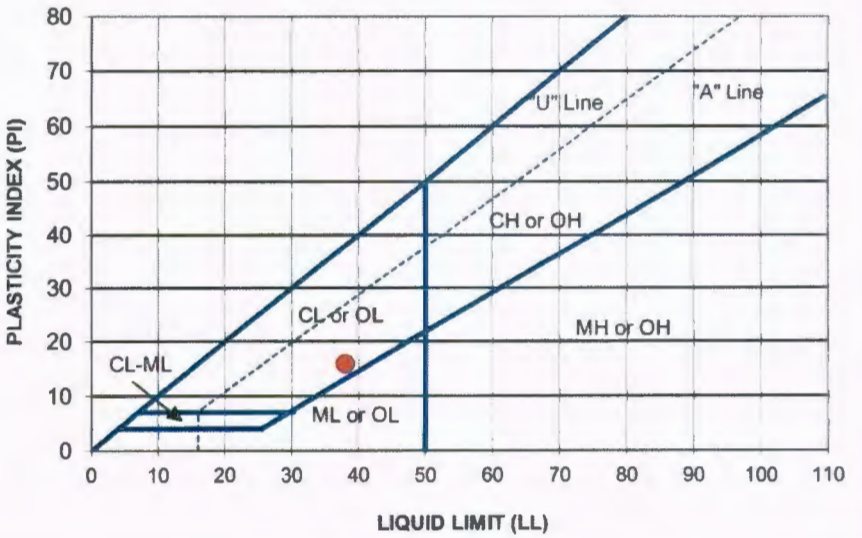
VISUAL CLASSIFICATION	Red and Tan Clayey Sand / Sandy Lean Clay with Extremely Weathered Sandstone Fragments and Chert

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
N/A	N/A	N/A

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



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PROJECT Proposed Pond and Building Pads

JOB NO. 12-15049 **DATE** 5/22/2012

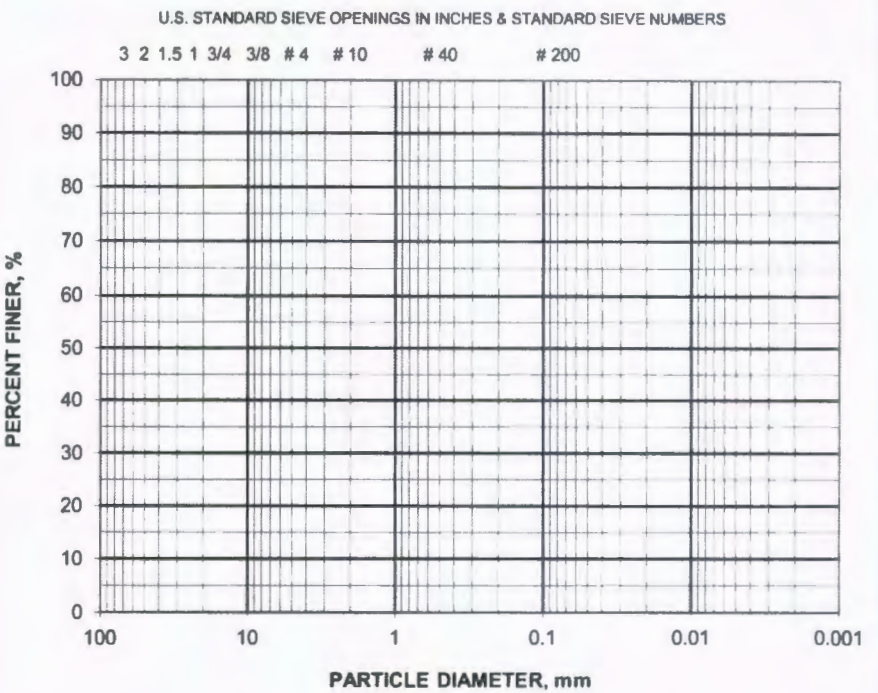
BORING NO.	B-2
SAMPLE NO.	S-4
DEPTH (FT)	4.5-6
PLASTIC LIMIT	24
LIQUID LIMIT	44
PLASTICITY INDEX	20

SIEVE SIZE	PERCENT PASSING
3.00"	N/A
1.50"	N/A
1.00"	N/A
3/4"	N/A
3/8"	N/A
No. 4	N/A
No. 10	N/A
No. 40	N/A
No. 200	N/A

VISUAL CLASSIFICATION	Red and Tan Clayey Sand / Sandy Lean Clay with Extremely Weathered Sandstone Fragments and Chert

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
N/A	N/A	N/A

GRAIN SIZE DISTRIBUTION CURVE



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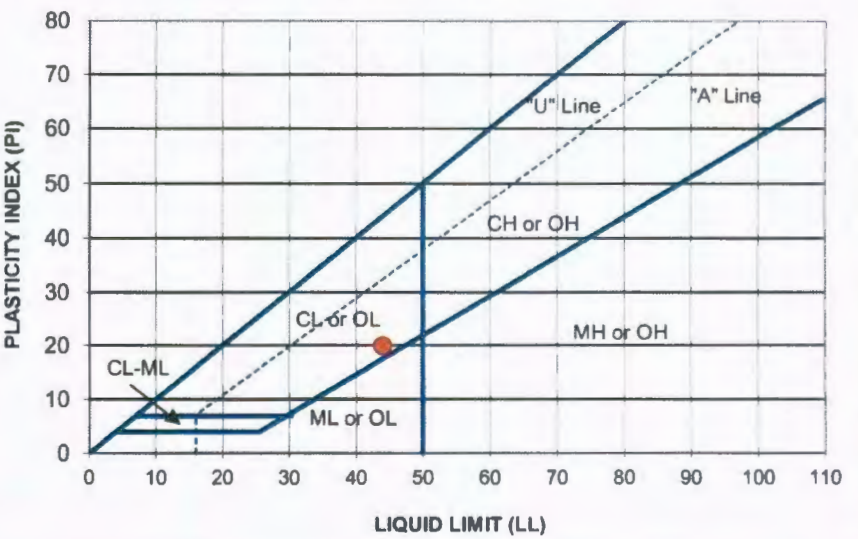

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JOB NO. 12-15049 **DATE** 5/22/2012

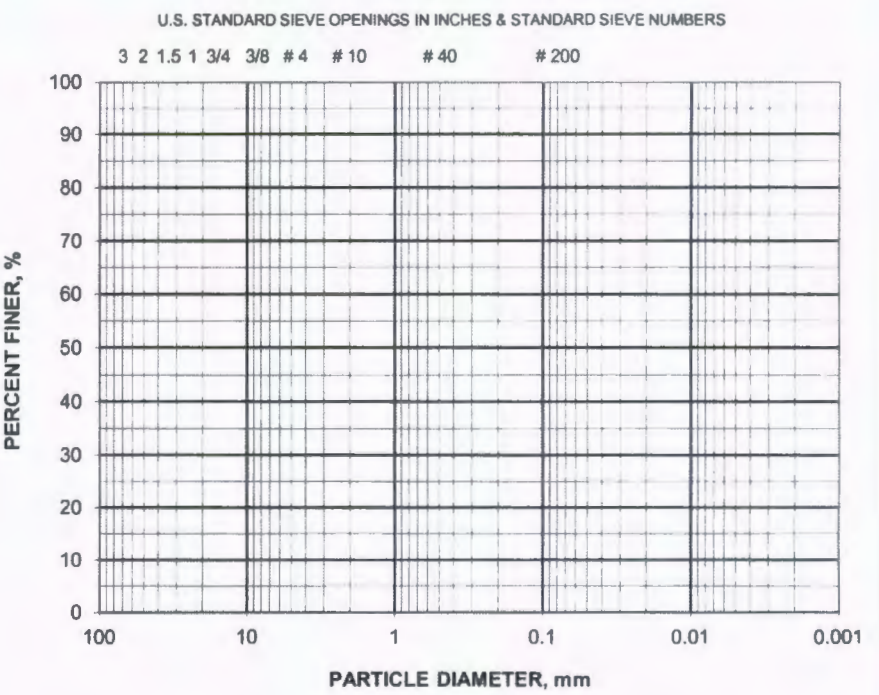
BORING NO.	B-2
SAMPLE NO.	S-5
DEPTH (FT)	7-8.5
PLASTIC LIMIT	38
LIQUID LIMIT	93
PLASTICITY INDEX	55

SIEVE SIZE	PERCENT PASSING
3.00"	N/A
1.50"	N/A
1.00"	N/A
3/4"	N/A
3/8"	N/A
No. 4	N/A
No. 10	N/A
No. 40	N/A
No. 200	N/A

VISUAL CLASSIFICATION	Light Gray, Red and Orangish Tan Fat Clay with Sand

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
N/A	N/A	N/A

GRAIN SIZE DISTRIBUTION CURVE



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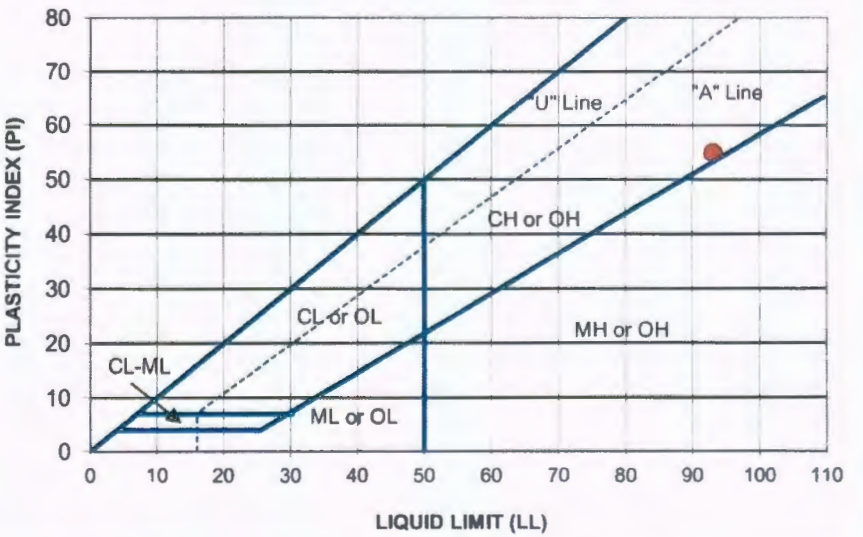

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JOB NO. 12-15049 **DATE** 5/22/2012

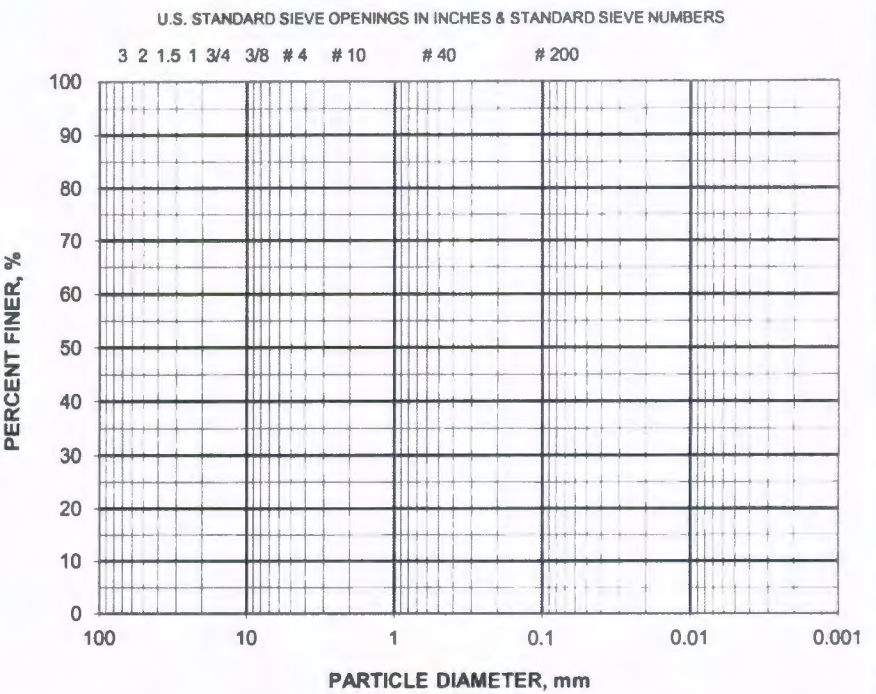
BORING NO.	B-2
SAMPLE NO.	S-6
DEPTH (FT)	9.5-11
PLASTIC LIMIT	23
LIQUID LIMIT	64
PLASTICITY INDEX	41

SIEVE SIZE	PERCENT PASSING
3.00"	N/A
1.50"	N/A
1.00"	N/A
3/4"	N/A
3/8"	N/A
No. 4	N/A
No. 10	N/A
No. 40	N/A
No. 200	N/A

VISUAL CLASSIFICATION	Light Gray, Red and Orangish Tan Sandy Fat Clay

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
N/A	N/A	N/A

GRAIN SIZE DISTRIBUTION CURVE



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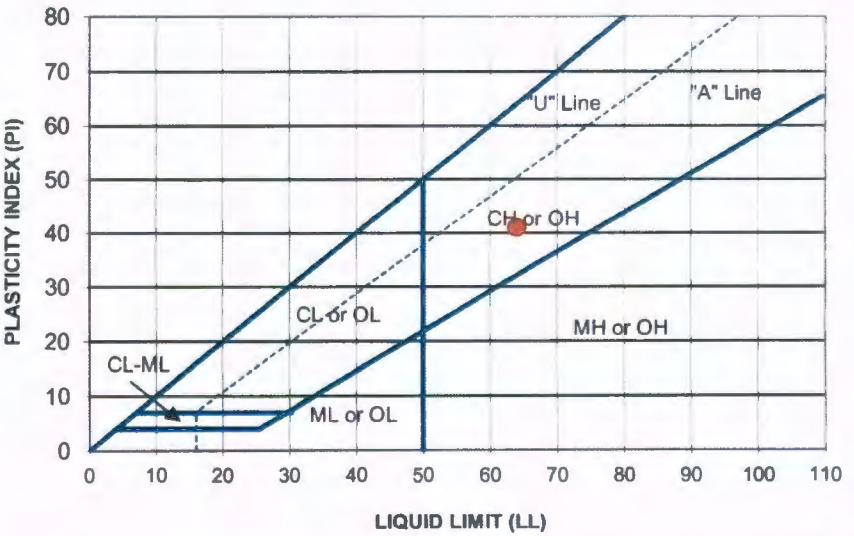

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JOB NO. 12-15049 **DATE** 5/22/2012

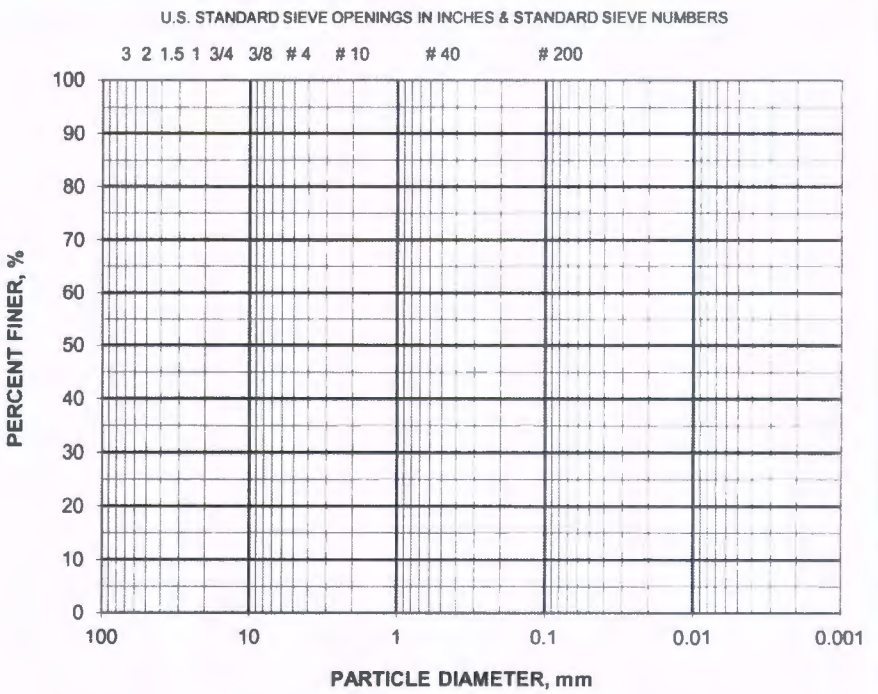
BORING NO.	B-3
SAMPLE NO.	S-5
DEPTH (FT)	7-8.5
PLASTIC LIMIT	36
LIQUID LIMIT	58
PLASTICITY INDEX	22

SIEVE SIZE	PERCENT PASSING
3.00"	N/A
1.50"	N/A
1.00"	N/A
3/4"	N/A
3/8"	N/A
No. 4	N/A
No. 10	N/A
No. 40	N/A
No. 200	N/A

VISUAL CLASSIFICATION	Light Gray, Brown and Orangish Tan, Blocky, Fat Clay with Sand

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
N/A	N/A	N/A

GRAIN SIZE DISTRIBUTION CURVE



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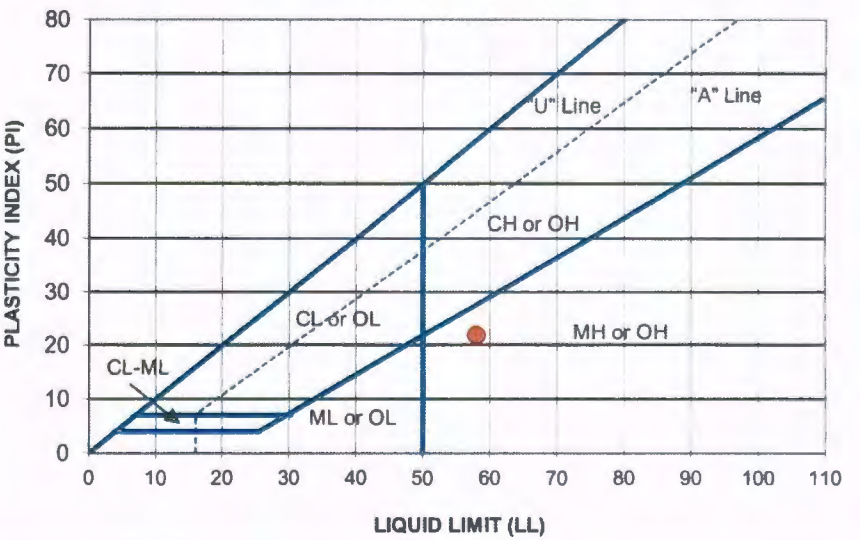

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JOB NO. 12-15049 **DATE** 5/22/2012

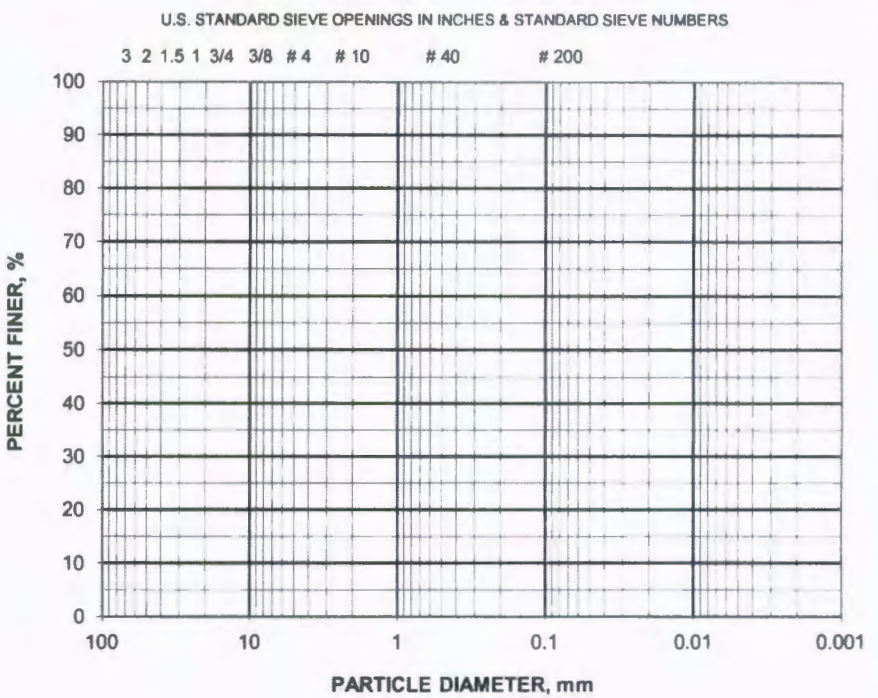
BORING NO.	B-3
SAMPLE NO.	S-6
DEPTH (FT)	9.5-11
PLASTIC LIMIT	44
LIQUID LIMIT	81
PLASTICITY INDEX	37

SIEVE SIZE	PERCENT PASSING
3.00"	N/A
1.50"	N/A
1.00"	N/A
3/4"	N/A
3/8"	N/A
No. 4	N/A
No. 10	N/A
No. 40	N/A
No. 200	N/A

VISUAL CLASSIFICATION	Brown and Tan Clayey Gravel with Sand and Chert Fragments

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
N/A	N/A	N/A

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART