City of Johnston Surface Water Monitoring

2014 Water Quality Monitoring Summary

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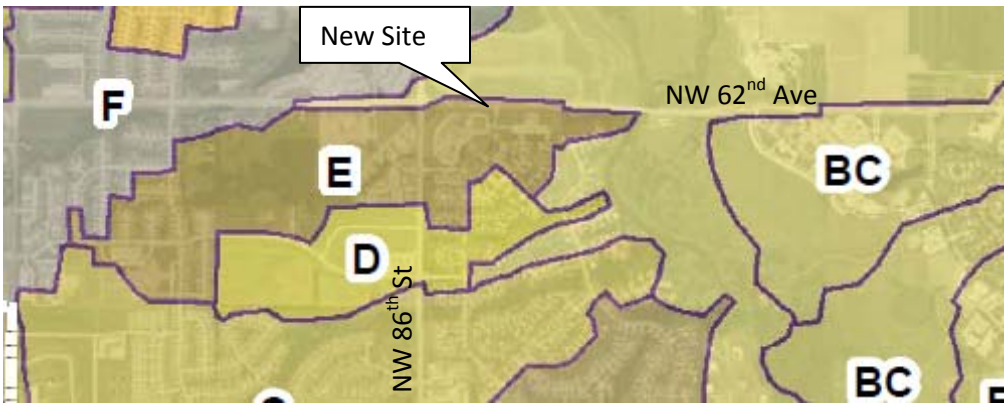
2014 was the second year of collection and analysis of water samples from surface waters at selected locations in Johnston by the University of Iowa Hygienic Laboratory. This report discusses the results of that effort. This report includes text and data from prior reports as well as new data from the October 7th sampling.

After reviewing the results of the monitoring data collected in 2013, some modifications were made in the sites and tests for 2014. Total Chlorine was dropped from the suite of tests being performed. In 2013, only one instance of detectable levels of chlorine occurred and was most likely due to a combination of very low stream flows and local irrigation runoff into the target stream near the sampling location.

Two sampling sites were removed from the list of monitored sites, and one new site was added. The sites removed from the list were located immediately upstream and downstream of the Storm-ceptor on NW Beaver Drive. In 2013 no flowing water was detected at these locations during the three site visits, even during the sampling done in April 2013 when the site was visited a few hours after a rain event. If water quality data is desired from that site, it will be necessary to plan for wet-weather monitoring and pull samples during a rain event.

One new site was added at the intersection of Crescent Chase and NW 62nd Avenue. This location is near the lower end of subwatershed "E" as illustrated in the City of Johnston Watershed Assessment (page 17, see illustration below) and is part of the Western Hills Character District as described in the same document (pages 18-19). This particular subwatershed receives drainage from a mix of land uses including the commercial areas south of NW 62nd Avenue on either side of NW 86th Street in the vicinity of Crescent Chase, large acreage residential lots to the west of the commercial properties, parts of the Century Woods and Green Meadows West residential subdivisions, part of the undeveloped properties in Windsor Office Park, and part of the Summit Middle School site.



April 8 Monitoring

April 2014 continued a dry weather trend from late 2013, with only .22 inches of precipitation recorded from April 1st to the monitoring date of April 8th. The last measurable precipitation prior to the monitoring occurred on April 6th but measured only 0.08" of rainfall.

The sampling by UHL in April was also timed to coincide with sampling done during the Spring 2014 Polk County Water Quality Snapshot, an event organized by the Des Moines Izaak Walton League and Des Moines Water Works. Two sites monitored by UHL coincide with sites monitored during the snapshot event, and the snapshot event also acquires samples from additional sites.

July 2, 2014 Monitoring

June 2014 proved to be a wet month for central Iowa. Statewide, June 2014 was the third wettest month on record. The Schoolnet8 Weather Station at Grimes Elementary recorded 9.34 inches during the month of June.

Samples were collected by UHL staff during the morning of July 2nd. The Grimes Elementary station recorded 0.03" of precipitation on July 1st and 1.52" on June 30th. While very little rain had fallen in the previous 24 hours, water tables were high as a result of the substantial rains during the previous weeks.

October 7, 2014 Monitoring

The final round of sampling was performed on the morning of Tuesday, October 7th. The Ankeny airport reported that the last measurable rainfall prior to sampling occurred on 5 days previously, when 0.17 inches of precipitation was recorded on October 2nd. Total precipitation since the beginning of the month was 1.11 inches due to an additional 0.91 inches falling on October 1st.

Note that the location of the precipitation records changed from the Schoolnet8 weather station at Grimes Elementary. This is due to that station going offline in late July 2014; no weather data has been archived for that location since that time. From this point forward, data from the Ankeny airport will be used unless the Grimes site begins data collection again.

Data Summary

The data tables below include the results of all six datasets collected to date: April 9, 2013; July 15, 2013; October 9, 2013; April 8, 2014; July 2, 2014; and October 7, 2014. The two sites dropped after 2013 are not included in this data because no flow was detected at those sites during the 2013 sample collections. Total Chlorine is also not included as it was dropped as an analyte after 2013.

Analytes

***E.coli* Bacteria**

Site	Site Description	Analyte	4/09/13	7/15/13	10/09/13	4/08/14	7/2/14	10/7/14
#1	Beaver Creek @ Merle Hay Rd	E.coli	330	380	570	41	1200	710
#2	Green Meadows West @ Foxboro Rd	E.coli	3300	1400	480	31	930	370
#3	"Waterford Creek" @ NW 86th St	E.coli	210	<10	180	20	1400	340
#4	Beaver Creek Elementary @ NW 86th St	E.coli	460	1500	130	52	630	120
#5	NW 86th Street south of NW 70th Ave	E.coli	530	570	31	<10	390	600
#6	Little Beaver Creek @ NW 86th Street	E.coli	420	250	400	<10	4900	500
#7	NW 59th St near Maurice's	E.coli	1600	220	NF	470	630	86
#8	Johnston Dr @ Prairie Point Crossing	E.coli	2500	610	340	5500	620	190
#11	Crescent Chase @ NW 62nd Avenue	E.coli	--	--	--	210	1300	270

***E. Coli* Results**

The table above highlights how variable bacteria levels can be from one sample collection to the next. Site #6 located on Little Beaver Creek, for example, includes one of the lowest levels of bacteria detected and also the highest level detected. Weather is a major factor for bacteria levels, which usually spike sharply immediately after precipitation events and then decline over the following day or two.

Of the sites monitored, only Beaver Creek has a stream classification established by the DNR. Beaver Creek is classified as an A3 Children's Recreational Use, which reflects the fact that the creek flows adjacent to residential lots and through public park areas where access is possible. The bacteria standard for A3 streams is a maximum of 235 MPN/100 ml (Most Probable Number per 100 milliliters) of *E.coli* bacteria.

As the installation of sanitary sewer progresses on the east side of Merle Hay Road and properties are taken off of septic systems and connected to the new sewer, it will be an interesting exercise to see if there is any noticeable impact on the bacteria data collected at Site #8 in Prairie Pointe Crossing, which includes the discharge of the 72" storm sewer that extends northwest through the city to Site #7.

Nitrate + Nitrite Nitrogen as N

Site	Site Description	Analyte	4/09/13	7/15/13	10/09/13	4/8/14	7/2/14	10/7/14
#1	Beaver Creek @ Merle Hay Rd	Nitrate + Nitrite nitrogen as N	0.48	15	1.9	0.26	8.0	14
#2	Green Meadows West @ Foxboro Rd	Nitrate + Nitrite nitrogen as N	0.86	1.8	1.1	0.46	3.2	1.8
#3	"Waterford Creek" @ NW 86th St	Nitrate + Nitrite nitrogen as N	0.21	8.7	0.84	0.19	1.7	2.0
#4	Beaver Creek Elementary @ NW 86th	Nitrate + Nitrite nitrogen as N	1.6	2.8	2.9	1.3	4.6	3.0
#5	NW 86th Street south of NW 70th Ave	Nitrate + Nitrite nitrogen as N	<0.10	5.6	1.9	0.48	4.5	2.7
#6	Little Beaver Creek @ NW 86th Street	Nitrate + Nitrite nitrogen as N	3.4	9.6	12	7.2	10.0	11
#7	NW 59th St near Maurice's	Nitrate + Nitrite nitrogen as N	0.62	0.26	NF	1.2	2.1	0.60
#8	Johnston Dr @ Prairie Point Crossing	Nitrate + Nitrite nitrogen as N	1.9	5.2	6.0	4.7	3.2	3.7
#11	Crescent Chase @ NW 62nd Avenue	Nitrate + Nitrite nitrogen as N	--	--	--	<0.10	2.4	0.98

This analyte is the total amount of nitrogen present as nitrate and nitrite in the sample. Since nitrite relatively quickly converts into nitrate, this is for practical purposes a measurement of the amount of nitrate in the sample. Nitrate is a nutrient commonly found in fertilizer and human and animal waste. Nitrate is regulated only for water bodies that are designated as drinking water sources, such as the Des Moines and Raccoon Rivers in the Des Moines area. For reference, the regulatory limit for drinking water sources is 10 mg/l and Des Moines Water Works activates its nitrate removal equipment when levels at their intakes exceed 9 mg/l.

As with the bacteria results, it will be interesting to see if the sanitary sewer installation east of Merle Hay will have any impact on nitrate levels at Site #8. With the exception of the Little Beaver Creek site, which is influenced by the Grimes Wastewater Treatment Plan, Site #8 has had the highest nitrate levels of the sites monitored in 4 of the 6 datasets.

pH

Site	Site Description	Analyte	4/9/13	7/15/13	10/9/13	4/8/14	7/2/14	10/7/14
#1	Beaver Creek @ Merle Hay Rd	pH	8.1	8.1	8.0	8.5	7.5	8.3
#2	Green Meadows West @ Foxboro Rd	pH	7.8	7.7	7.8	8.0	7.9	7.9
#3	"Waterford Creek" @ NW 86th St	pH	7.7	7.6	7.4	7.3	7.6	7.6
#4	Beaver Creek Elementary @ NW 86th St	pH	8.0	8.0	8.1	8.2	8.1	8.2
#5	NW 86th Street south of NW 70th Ave	pH	8.0	7.0	6.9	7.0	7.8	8.0
#6	Little Beaver Creek @ NW 86th Street	pH	8.3	8.2	8.2	8.9	7.6	8.3
#7	NW 59th St near Maurice's	pH	7.6	7.7	NF	7.7	7.6	8.2
#8	Johnston Dr @ Prairie Point Crossing	pH	7.6	7.6	7.8	7.5	7.8	7.7
#11	Crescent Chase @ NW 62nd Avenue	pH	--	--	--	8.1	8.1	8.2

pH is a measure of how acidic or basic a substance is, with 7 being neutral and lower levels than that indicating increasing acidity and higher numbers indicating how alkaline something is. For reference, baking soda has a pH of 8, ammonia 11, bleach 13. Concrete washout has a pH of about 12. On the acidic side of the scale, orange or tomato juice is 4 and vinegar is 3. The pH of rainfall can be very variable but is typically acidic in the range of 5 to 6 on the pH scale. Most drinking water is adjusted during treatment to be approximately neutral (close to 7).

Most Iowa surface waters are slightly basic due to the effect of the local limestone geology and have a pH of in the range of 8.0 to 8.5; however several of the streams monitored in Johnston have shown averages between 7 and 8. None of the results thus far are far outside normal ranges but it is important to note trends so that any atypical results from future sampling will be more easily spotted.

Total Phosphorus as P

Site	Site Description	Analyte	4/9/13	7/15/13	10/9/13	4/8/14	7/2/14	10/7/14
#1	Beaver Creek @ Merle Hay Rd	Total Phosphorus as P	0.18	0.12	0.25	0.17	0.49	0.19
#2	Green Meadows West @ Foxboro Rd	Total Phosphorus as P	0.15	0.03	0.05	0.040	0.10	0.040
#3	"Waterford Creek" @ NW 86th St	Total Phosphorus as P	0.07	0.10	0.07	0.040	0.14	0.080
#4	Beaver Creek Elementary @ NW 86th St	Total Phosphorus as P	0.09	0.04	0.04	0.50	0.05	0.040
#5	NW 86th Street south of NW 70th Ave	Total Phosphorus as P	0.06	0.02	<0.02	0.020	0.07	0.060
#6	Little Beaver Creek @ NW 86th Street	Total Phosphorus as P	0.54	0.37	1.0	0.72	0.30	0.28
#7	NW 59th St near Maurice's	Total Phosphorus as P	0.13	0.11	ND	0.18	0.20	0.080
#8	Johnston Dr @ Prairie Point Crossing	Total Phosphorus as P	0.17	0.05	0.06	0.10	0.17	0.070
#11	Crescent Chase @ NW 62nd Avenue	Total Phosphorus as P	--	--	--	0.050	0.13	0.050

Phosphorus is an unregulated nutrient that is present in animal waste, decomposing organic matter and many commercial fertilizers. High levels can lead to algae blooms and undesirable levels of plant growth, especially in standing water such as ponds and lakes. Phosphorus attaches to soil particles, meaning that high levels of phosphorus can also be an indirect indicator of possible soil erosion. There are currently no regulatory levels for phosphorus in Iowa but for reference when considering the data, the EPA recommended maximum levels for total phosphorus is approximately 0.08 mg/l for flowing streams and 0.04 mg/l for standing waters and reservoirs in this ecoregion.

Total P in the October samples ranged from 0.02 mg/l to as high as 0.72 mg/l. As with nitrate, Little Beaver Creek had the highest levels of Total P present, again largely due to the Grimes Wastewater Treatment Plant.

Total Suspended Solids

Site	Site Description	Analyte	4/9/13	7/15/13	10/9/13	4/8/14	7/2/14	
#1	Beaver Creek @ Merle Hay Rd	Total Suspended Solids	50	14	20	8	80	59
#2	Green Meadows West @ Foxboro Rd	Total Suspended Solids	88	1	1	3	8	2
#3	"Waterford Creek" @ NW 86th St	Total Suspended Solids	10	<1	2	2	14	2
#4	Beaver Creek Elementary @ NW 86th St	Total Suspended Solids	35	<1	<1	4	5	<1
#5	NW 86th Street south of NW 70th Ave	Total Suspended Solids	7	1	3	3	17	3
#6	Little Beaver Creek @ NW 86th Street	Total Suspended Solids	18	3	5	4	40	3
#7	NW 59th St near Maurice's	Total Suspended Solids	10	5	NF	6	7	2
#8	Johnston Dr @ Prairie Point Crossing	Total Suspended Solids	26	<1	<1	7	4	<1
#11	Crescent Chase @ NW 62nd Avenue	Total Suspended Solids	--	--	--	22	42	5

Total Suspended Solids (TSS) is a measure of the amount of solid (undissolved) particles present in water samples. High TSS levels are usually an indicator of active soil erosion upstream. There are no regulatory levels for surface waters in Iowa, but high TSS levels can silt in streams, ponds and lakes and increase the cost of drinking water treatment through the need for increased filtration and chlorination.

Turbidity

Site	Site Description	Analyte	4/9/13	7/15/13	10/9/13	4/8/14	7/2/14	10/7/14
#1	Beaver Creek @ Merle Hay Rd	Turbidity	25	7.1	12	4.0	51	28
#2	Green Meadows West @ Foxboro Rd	Turbidity	38	1.4	1.2	2.6	4.0	2.8
#3	"Waterford Creek" @ NW 86th St	Turbidity	10	<1.0	2.5	2.0	16	1.7
#4	Beaver Creek Elementary @ NW 86th St	Turbidity	19	<1.0	<1.0	2.1	1.4	<1.0
#5	NW 86th Street south of NW 70th Ave	Turbidity	5.2	<1.0	<1.0	<1.0	8.0	2.2
#6	Little Beaver Creek @ NW 86th Street	Turbidity	7.8	1.5	3.5	1.9	27	2.8
#7	NW 59th St near Maurice's	Turbidity	11	1.5	NF	8.1	9.2	4.2
#8	Johnston Dr @ Prairie Point Crossing	Turbidity	20	<1.0	<1.0	8.5	5.4	<1.0
#11	Crescent Chase @ NW 62nd Avenue	Turbidity	--	--	--	14	17	2.7

Turbidity is a measure of water clarity and is measured in NTU's (Nepholometric Turbidity Units). In this measurement of clarity, lower numbers indicate higher water clarity (as a reference, treated drinking water is Iowa is required to meet a turbidity standard of 0.3 NTU's in at least 95% of samples, and no single sample can exceed 1 NTU). Turbidity, like TSS, is often an indicator of active erosion but can indicate the presence of other pollutants as well.

May 7th and October 15th, 2014 IOWATER Polk County Snapshots

The table below provides the data collected for six locations in and near Johnston that was collected during the Spring and Fall Polk County Water Quality Snapshot events that occurred in May and October. Lab analysis for the samples collected was done by the Des Moines Water Works laboratory.

Site BC3 in the snapshot date corresponds to Site #1 of the UHL monitored sites (Beaver Creek at Merle Hay Road), while LBC3 corresponds to UHL Site #3 (Little Beaver Creek at NW 86th Street). The other sites included here are BC1 (Beaver Creek at NW 128th Street north of Grimes), BC2 (Beaver Creek at NW 70th Avenue), LBC1 (Little Beaver Creek at NW 121st Street in Grimes), and NWC1 (North Walnut Creek at SE 37th St / NW 54th Ave). All except NWC1 are part of the Beaver Creek Watershed. NWC1 is part of the Walnut Creek Watershed but drains part of the western part of Johnston including parts of the West Park and Adam Ridge areas.

	Total Coliforms		E. coli		Chloride		Nitrate as N		Sulfate		Phosphorus-O as P		Nitrite as N	
	4/30	**10/15**	**4/30**	**10/15**	**4/30**	**10/15**	**4/30**	**10/15**	**4/30**	**10/15**	**4/30**	**10/15**	**4/30**	**10/15**
BC1 (at NW 128th St)	410	16,640	100	100	39.75	16.43	5.35	14.96	44.41	10.74	0.09	0.65	0.09	<0.05
BC2 (at NW 70th Ave)	860	>241,920	100	4,350	45	15.21	5.05	8.6	49.31	11.03	0.12	0.09	0.07	<0.05
BC3 (at Merle Hay Rd)	1100	>241,920	0	4,410	49.34	15.19	4.65	8.14	50.52	10.98	0.09	0.1	0.07	<0.05
LBC1 (at 121st St)	2750	18840	0	960	26.84	29.14	12.6	7.84	30.26	27.84	<0.1	0.23	0.06	<0.05
LBC3 (at NW 86th St)	6770	>241,920	520	4,570	100.3	15.67	5.69	9.84	30.26	11.21	<0.1	0.15	0.06	<0.05
NWC1 (at NW 54th Ave)	1340	29,090	100	520	175.81	40.12	4.49	5.55	35.76	15.61	<0.1	0.69	<0.05	<0.05

Total Coliforms refers to the total number of coliform bacteria in each sample. E.coli is the standard bacteria test used for state monitoring purposes, but Total Coliforms can be another way to gauge bacteria levels in a water body. Coliform bacteria are a less precise measure to use than E.coli because while E.coli typically only thrive in the gut of warm blooded animals, coliform bacteria can also be found in soil and many other places.

Chloride is a measure of the level of salts in the sample. High chloride levels can be an indicator of human or animal waste inputs, some types of industrial or commercial pollution, or contamination by road salts. Typically chloride levels for Beaver Creek are in the 30-50 mg/l range. The result of 100.3 mg/l for LBC3 can be attributed to the influence of the Grimes Wastewater Treatment Plant (compare the results of LBC1, just upstream from the plant, and LBC3, which is several miles below the treatment plant).

Sulfate is a naturally occurring substance that can add a bitter taste to drinking water and at high levels can have a laxative effect. Levels above 400 mg/l are not recommended for infants. The EPA recommended maximum level of sulfate for drinking water is 250 mg/l, though this is primarily for the impact on the taste of the water and is not a regulatory limit.

Nitrite is a substance that quickly degrades into nitrate and is often an intermediary between ammonia and nitrate (the less stable ammonia breaks down into nitrite, which in turn then breaks down into nitrate, which is a stable compound). High nitrite levels are often an indicator of

animal or human waste inputs, and because it quickly converts to nitrate any detectable levels of nitrite indicates that the source is either close to the sampling location or that the inputs are very large.

Phosphorus – O as P refers to orthophosphate, a phosphorus compound that is readily available for uptake by plants. This will usually provide a lower amount than Total Phosphorus, but many of the compounds in Total Phosphorus will eventually convert to orthophosphate.

The snapshot data further illustrates the effect weather can have on water quality. Fall 2014 was unusually wet and streamflow was much higher than normal for that time of year.

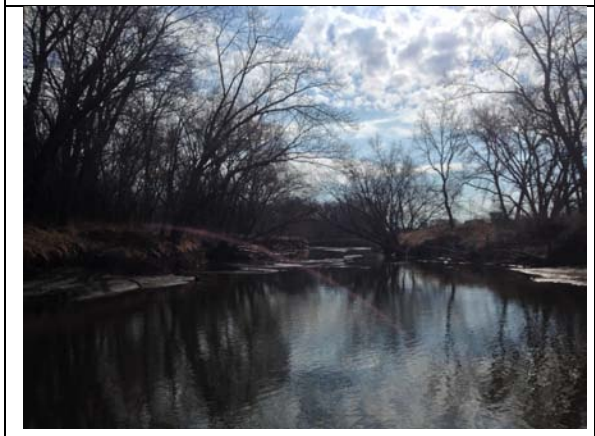
2014 Site Photo Summary

Many photos were taken by UHL staff during sample collection. On the following pages photos for each site are provided with comparable photos from each date and site displayed next to each other for comparison. A blank space indicates no comparable photo was available. Unless otherwise noted, photos for each site will be chronological from left to right (April 8, July 2, and October 7).

Site #1, Beaver Creek at Merle Hay Road, 4/8/14, Upstream

Site #1, Beaver Creek at Merle Hay Road, 7/2/14, from north bank

Site #1, Beaver Creek at Merle Hay Road, 10/7/14, Upstream



Site #1, Beaver Creek at Merle Hay Road, 4/8/14, Downstream

Site #1, Beaver Creek at Merle Hay Road, 7/2/14, from north bank

Site #1, Beaver Creek at Merle Hay Road, 10/7/14, Downstream

Site #1, Beaver Creek at Merle Hay Road, 7/2/14, Panoramic View from north bank

Site #2, Green Meadows West at Foxboro, 7/2/14, Upstream

Site #2, Green Meadows West at Foxboro, 10/7/14, Upstream

	 Site #2, Green Meadows West at Foxboro, 7/2/14, Downstream	 Site #2, Green Meadows West at Foxboro, 10/7/14, Downstream
 Site #3, Waterford Creek at NW 86th Street, 4/8/14, Upstream	 Site #3, Waterford Creek at NW 86th Street, 7/2/14, Upstream	 Site #3, Waterford Creek at NW 86th Street, 10/7/14, Upstream

	 Site #3, Waterford Creek at NW 86th Street, 7/2/14	 Site #3, Waterford Creek at NW 86th Street, 10/7/14
 Site #4, Beaver Creek Elementary at NW 86th St., 4/8/14, Upstream	 Site #4, Beaver Creek Elementary at NW 86th St., 7/2/14, Upstream	 Site #4, Beaver Creek Elementary at NW 86th St., 10/7/14, Upstream

 Site #4, Beaver Creek Elementary at NW 86th St., 4/8/14, Downstream	 Site #4, Beaver Creek Elementary at NW 86th St., 7/2/14, Downstream	 Site #4, Beaver Creek Elementary at NW 86th St., 10/7/14, Downstream
 Site #5, NW 86th St. South of NW 70th Ave., 4/8/14, Upstream	 Site #5, NW 86th St. South of NW 70th Ave., 7/2/14, Upstream	 Site #5, NW 86th St. South of NW 70th Ave., 10/7/14, Upstream

Site #5, NW 86th St. South of NW 70th Ave., 4/8/14, Downstream

Site #5, NW 86th St. South of NW 70th Ave., 7/2/14, Downstream

Site #5, NW 86th St. South of NW 70th Ave., 10/7/14, Downstream

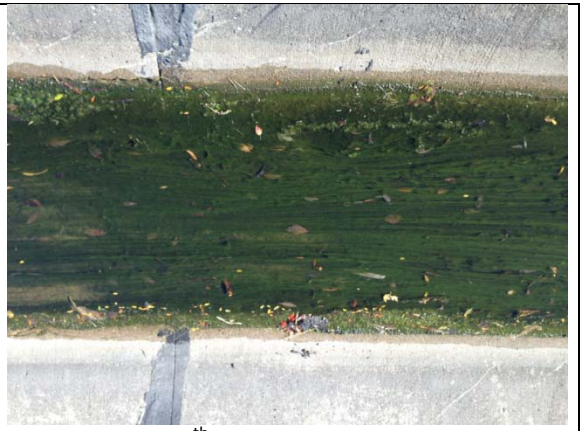
Site #5, NW 86th St. South of NW 70th Ave., 4/8/14, Flow & Algae

Site #5, NW 86th St. South of NW 70th Ave., 7/2/14, Flow

Site #5, NW 86th St. South of NW 70th Ave., 10/7/14, Flow

 Site #6, Little Beaver Creek at NW 86th Street, 4/8/14, Upstream	 Site #6, Little Beaver Creek at NW 86th Street, 7/2/14, Downstream	 Site #6, Little Beaver Creek at NW 86th Street, 10/7/14, Downstream
 Site #6, Little Beaver Creek at NW 86th Street, 4/8/14, Downstream	 Site #6, Little Beaver Creek at NW 86th Street, 7/2/14, Downstream	 Site #6, Little Beaver Creek at NW 86th Street, 10/7/14, Downstream

 Site #7, NW 59th St. near Maurice's, 4/8/14, Upstream	 Site #7, NW 59th St. near Maurice's, 7/2/14, Upstream	 Site #7, NW 59th St. near Maurice's, 10/7/14, Upstream
 Site #7, NW 59th St. near Maurice's, 4/8/14, Downstream	 Site #7, NW 59th St. near Maurice's, 7/2/14, Downstream	 Site #7, NW 59th St. near Maurice's, 10/7/14, Downstream

		 Site #7, NW 59th St. near Maurice's, 10/7/14, Flow & Algae
 Site #8, Prairie Pointe Crossing, 4/8/14, Downstream	 Site #8, Prairie Pointe Crossing, 7/2/14, Downstream	 Site #8, Prairie Pointe Crossing, 7/2/14, Downstream

	 Site #8, Prairie Pointe Crossing, 7/2/14, Downstream	 Site #8, Prairie Pointe Crossing, 10/7/14, Downstream
	 Site #8, Prairie Pointe Crossing, 7/2/14, Downstream	 Site #8, Prairie Pointe Crossing, 10/7/14, Upstream

 Site #11, Crescent Chase at NW 62nd Ave., 4/8/14, Upstream	 Site #11, Crescent Chase at NW 62nd Ave., 7/2/14, Upstream	 Site #11, Crescent Chase at NW 62nd Ave., 7/2/14, Upstream
 Site #11, Crescent Chase at NW 62nd Ave., 4/8/14, Downstream	 Site #11, Crescent Chase at NW 62nd Ave., 7/2/14, Upstream	 Site #11, Crescent Chase at NW 62nd Ave., 10/7/14, Upstream

	 Site #11, Crescent Chase at NW 62nd Ave., 7/2/14, Flow	 Site #11, Crescent Chase at NW 62nd Ave., 10/7/14, Flow