

City of Johnston Surface Water Monitoring

April 8th and July 2nd, 2014

Steven Witmer

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On the mornings of Tuesday, April 8, and Wednesday, July 2, 2014, the University of Iowa Hygienic Laboratory performed surface water sample collection at selected sites in Johnston and the samples then analyzed by UHL Labs. This report will discuss the results of this monitoring event.

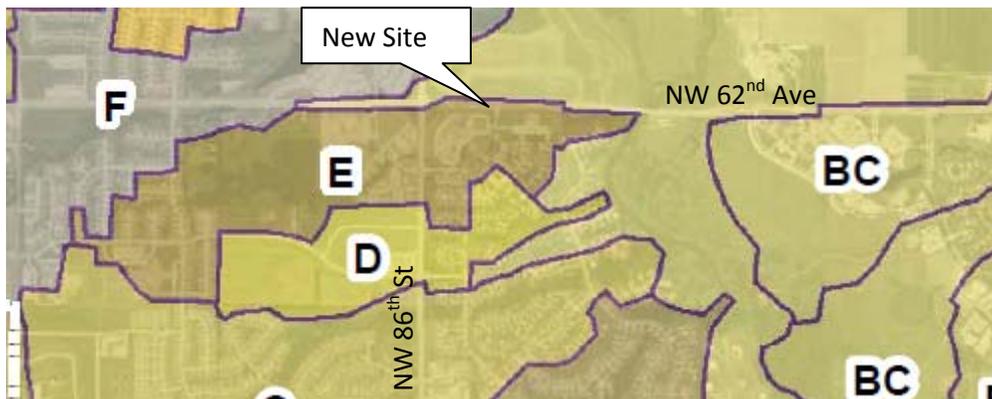
April 8 Monitoring

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.

After reviewing the results of the monitoring data collected in 2013, some modifications were made in the sites and tests. 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 Stormceptor 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.



The sampling by UHL 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.

Analytes

E.coli Bacteria

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

April E. Coli Results

Two out of the nine sites that were sampled had *e.coli* bacteria levels be higher than the 235 MPN/100 ml standard applied to A1 and A3 streams. However, this standard only applies to the site on Beaver Creek as the other segments are unclassified by the Iowa DNR at this time (these standards apply from March 15 through November 15th, no standards are applicable from November 16 to March 14th). A1 designates a stream as Primary Contact Recreational Use (swimming, canoeing, etc), A3 designates a stream as Children's Recreational Use (urban/suburban areas where "recreational uses by children are common").

The highest site was at Johnston Drive at Prairie Pointe Crossing Park (see illustration at right). This site is the recipient of the flow from the 72" storm sewer pipe that runs along the old railroad right-of-way (now the location of city recreation trails) on a northwesterly course from the monitoring site up to the vicinity of Maurice's. This area drains a substantial part of Johnston between Merle Hay Road and NW Beaver Drive and on either side of Merle Hay Road north of NW 62nd Avenue, including the older residential neighborhoods along NW 55th and NW 57th Avenues and the Johnston Commons and Northglenn neighborhoods.

July E. Coli Results

E. coli results for July were generally higher than most previous results, most likely due to the influence of the rains throughout June. All samples collected at all sites exceeded the A1 and A3 bacteria standards (again, this standard only applies to Beaver Creek at present, but provides a reference point for the other streams for comparison).

Nitrate + Nitrite Nitrogen as N

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

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.

In April, The Little Beaver Creek site displayed the highest nitrate levels of the sites sampled. This has been typical of this site, as Little Beaver Creek is the receiving stream for the Grimes Wastewater Treatment Plant. The second highest nitrate level was present at site #8 at Johnston

Drive. This site has displayed relatively high levels of nitrate over the course of the four sample collection taken to date. As previously noted, this site also displayed the highest e.coli bacteria levels during the April sampling event.

In July, Little Beaver Creek continued to display the highest nitrate levels of the sites monitored with 10 mg/l, and Beaver Creek at Merle Hay was second highest at 8.0 mg/l. Nitrate levels were elevated at nearly every site compared to previous monitoring.

pH

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

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

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.

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.

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

Total Suspended Solids (TSS) is a measure of the amount of solid 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
#1	Beaver Creek @ Merle Hay Rd	Turbidity	25	7.1	12	4.0	51
#2	Green Meadows West @ Foxboro Rd	Turbidity	38	1.4	1.2	2.6	4.0
#3	"Waterford Creek" @ NW 86th St	Turbidity	10	<1.0	2.5	2.0	16
#4	Beaver Creek Elementary @ NW 86th St	Turbidity	19	<1.0	<1.0	2.1	1.4
#5	NW 86th Street south of NW 70th Ave	Turbidity	5.2	<1.0	<1.0	<1.0	8.0
#6	Little Beaver Creek @ NW 86th Street	Turbidity	7.8	1.5	3.5	1.9	27
#7	NW 59th St near Maurice's	Turbidity	11	1.5	NF	8.1	9.2
#8	Johnston Dr @ Prairie Point Crossing	Turbidity	20	<1.0	<1.0	8.5	5.4
#11	Crescent Chase @ NW 62 nd Avenue	Turbidity	--	--	--	14	17

Turbidity is a measure of water clarity and is measured in NTU's (Nephelometric Turbidity Units). In this measurement of clarity, lower numbers indicate higher water clarity (as a reference, treated drinking water in 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 7, 2014 IOWATER Polk County Snapshot

The Polk County water quality snapshot occurred on May 7^h, 2014 approximate a month after UHL's monitoring and was sponsored by the Izaak Walton League and Des Moines Water Works. The Polk County Snapshot has traditionally been also been supported by the IOWATER program; however this spring organizers were informed that the program would not directly support any snapshot events in the spring although it may possibly support events later in the year. In the absence of direct support from IOWATER, volunteers and DMWW staff were able to coordinate the event and IOWATER staff were able to provide field equipment for the event, although no IOWATER staff participated.

63 sites in Polk County and 2 sites in Dallas County were monitored during the event with IOWATER field kits. Samples were also collected for lab analysis from 30 of these sites.

No measurable rain was recorded in the area since April 30th.

The results shown below are from the laboratory analysis done by DMWW Labs for sites located on Beaver Creek and Little Beaver Creek. 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.



May 7th Snapshot Locations in the Johnston area.

	Total Coliforms	E. coli	Chloride	Nitrate as N	Sulfate	Phosphorus-O as P	Nitrite as N
BC1 (at NW 128 th St)	410	100	39.75	5.35	44.41	0.09	0.09
BC2 (at NW 70 th Ave)	860	100	45	5.05	49.31	0.12	0.07
BC3 (at Merle Hay Rd)	1100	0	49.34	4.65	50.52	0.09	0.07
LBC1 (at 121 st St)	2750	0	26.84	12.6	30.26	<0.1	0.06
LBC3 (at NW 86 th St)	6770	520	100.3	5.69	30.26	<0.1	0.06
NWC1 (at NW 54 th Ave)	1340	100	175.81	4.49	35.76	<0.1	<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 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 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 LBC, which is several miles below the plant).

The North Walnut Creek site (located at NW 54th Avenue west of the indoor driving range) was unusually high in chloride (175.81 mg/l), though the Walnut Creek watershed typically exhibits somewhat higher chloride levels than Beaver Creek. Results for this site were acquired going back to 2004 and a noticeable increase in chloride levels has occurred since October 2012. Results previous to October 2012 were in the 30-60 mg/l range except for one result of 81.3 mg/l in October 2009. However, results for October 2012, May 2013, October 2013, and May 2014 were 67.92, 80.88, 185 and 176 mg/l, respectively. The watershed for this site includes some of the westernmost areas of Johnston, primarily parts of the Providence Pointe, Adam Ridge and Glenstone areas, but a substantial portion is within Grimes. At this time, a definite cause of the increase in chloride levels is unknown but could be related to the road salt containment facility constructed west of Highway 141 several years ago.

Sulfate is a naturally occurring substance that can add a bitter taste to drinking water and at higher 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 degraded 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 by 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.

Site Photos

Photos were taken by UHL staff at each site 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 from April 8th are on the left, photos from July 2nd are on the right.



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, 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, 7/2/14, Panoramic View from north bank



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



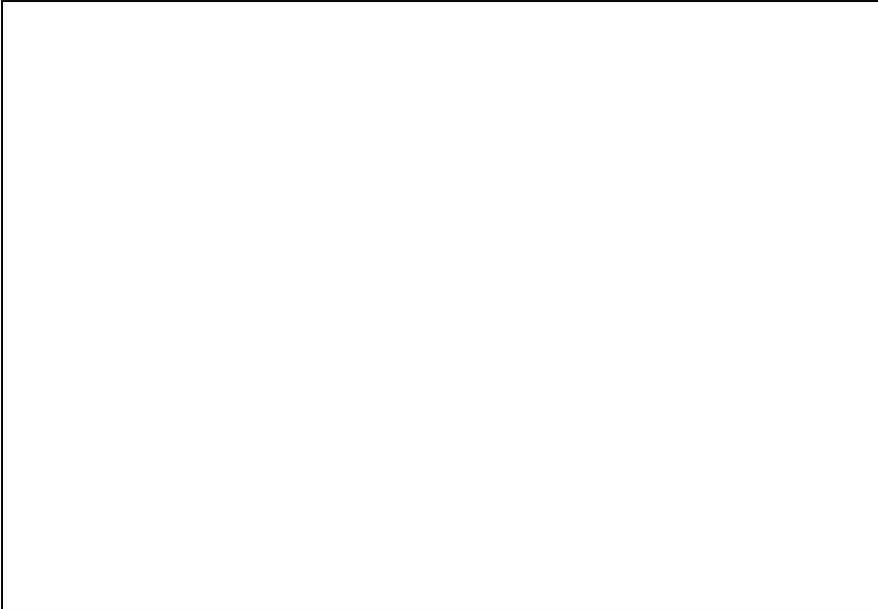
Site #2, Green Meadows West at Foxboro, 7/2/14, Downstream



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, 7/2/14



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., 4/8/14, Downstream



Site #4, Beaver Creek Elementary at NW 86th St., 7/2/14, 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., 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., 4/8/14, Flow & Algae



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



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



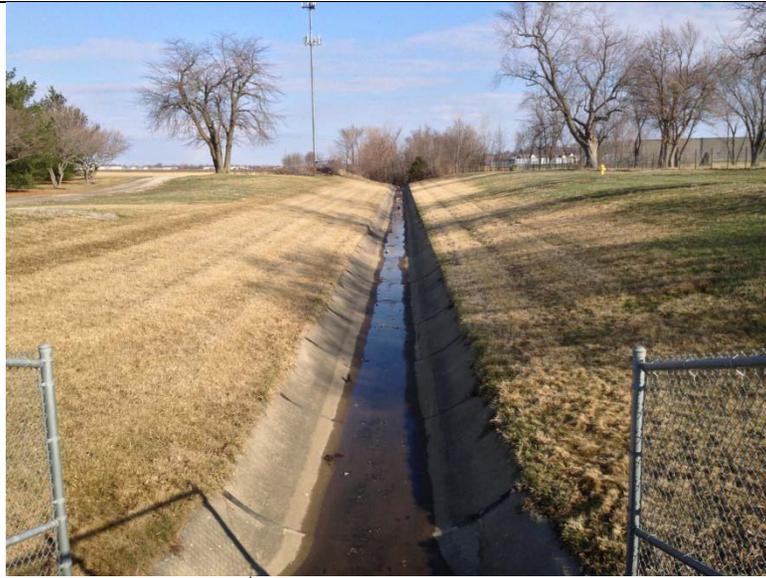
Site #6, Little Beaver Creek at NW 86th Street, 4/8/14, Downstream



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



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



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



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 Flow



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., 4/8/14, Downstream



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



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