

**Water Quality Sampling  
April 9, 2013**

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On April 9, 2013, the University of Iowa Hygienic Laboratory performed the first round of scheduled water quality monitoring for the City of Johnston. This document is a summary of the results.

**Notes and Comments**

The UHL field report notes that rain fell the evening and morning previous to the sampling and continued during the sampling. Despite the rain, measurable flow was not present at two sites (the upstream and downstream sites at the Storm-ceptor on NW Beaver Drive) and so those two locations were visited and photographed but otherwise were not sampled. Sufficient flow was present at the remaining ten sites to allow for samples to be collected.

“Value” in the table refers to the measurement used. In the case of bacteria, the measurement is in MPN/100 ml, or Most Probably Number per 100 milliliters. For pH, the measurement is in pH units, for turbidity the measurement is in NTU’s or Nephelometric Turbidity Units. For all other tests the units are provided on a milligrams per liter basis (mg/l).

The summary of the results for each analyte is provided below. A map is also attached showing the locations of each sampling site.

**Analytes**

**E.coli Bacteria**

Location	Site Description	Analyte	Value	Quant Limit
Site BC#1	Beaver Creek @ Merle Hay Rd	E.coli	330	10
Site C#2	Green Meadows West @ Foxboro Rd	E.coli	3300	10
Site F#3	"Waterford Creek" @ NW 86th St	E.coli	210	10
Site G#4	Beaver Creek Elementary @ NW 86th St	E.coli	460	10
Site I#5	NW 86th Street south of NW 70th Ave	E.coli	530	10
Site LB#6	Little Beaver Creek @ NW 86th Street	E.coli	420	10
Site S#7	NW 59th St near Maurice's	E.coli	1600	10
Site S#8	Johnston Dr @ Prairie Point Crossing	E.coli	2500	10

*E.coli* bacteria are present in the digestive system of warm-blooded animals (birds and mammals, including humans). Most strains are not harmful, but *E.coli* bacteria are used as an indicator to gauge the level of potential pollution of a stream. Higher *E.coli* levels indicate a greater possibility of the presence of other, more harmful bacteria.

Although we have no prior data to compare to for most of the sampled sites, bacteria levels appeared to be elevated. This is most probably due to the rain event prior to and during the sample collection –

bacteria levels typically spike during the “first flush” of a rain event as runoff reaches streams. The spike in bacteria levels is usually brief and then levels of pollutants drop over time as rain events continue. In the case of the sampling on April 9<sup>th</sup>, rain had fallen overnight and into the morning and so the initial flush was well past.

To provide comparison for the bacteria levels found, Beaver Creek is considered an A3 “Children’s Recreational Use,” a common designation for streams flowing through suburban areas where adjacent public parks, back yards and trails allow for relatively easy stream access. The established criteria for A3 streams for *E.coli* is that between March 15 and November 15, the maximum bacteria limit is 235 organisms/100 ml for any single sample (no bacteria limits apply between November 16 and March 14). The highest level detected on April 9<sup>th</sup> was 3,300 MPN/100 ml, the lowest detected was 210 MPH/100ml.

**Nitrate + Nitrite Nitrogen as N**

Location	Site Description	Analyte	Value	Quant Limit
Site BC#1	Beaver Creek @ Merle Hay Rd	Nitrate + Nitrite nitrogen as N	0.48	0.1
Site C#2	Green Meadows West @ Foxboro Rd	Nitrate + Nitrite nitrogen as N	0.86	0.1
Site F#3	"Waterford Creek" @ NW 86th St	Nitrate + Nitrite nitrogen as N	0.21	0.1
Site G#4	Beaver Creek Elementary @ NW 86th St	Nitrate + Nitrite nitrogen as N	1.6	0.1
Site I#5	NW 86th Street south of NW 70th Ave	Nitrate + Nitrite nitrogen as N	<0.10	0.1
Site LB#6	Little Beaver Creek @ NW 86th Street	Nitrate + Nitrite nitrogen as N	3.4	0.1
Site S#7	NW 59th St near Maurice's	Nitrate + Nitrite nitrogen as N	0.62	0.1
Site S#8	Johnston Dr @ Prairie Point Crossing	Nitrate + Nitrite nitrogen as N	1.9	0.1

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 levels were generally low, with five sites registering less than 1 mg/l. The highest level found was in Little Beaver Creek at NW 86<sup>th</sup> Street, and this higher level is probably reflective of the fact that Little Beaver Creek is a receiving stream for the discharge from the Grimes wastewater treatment plan.

Several recent articles in the Des Moines Register have noted that nitrate levels in the Des Moines and Raccoon Rivers have spiked significantly in recent weeks with the spring rains and that the Des Moines Water Works has been required to activate its nitrate removal plant for the first time in many years. The maximum nitrate level allowed for drinking water sources (the Des Moines and Raccoon Rivers at Des Moines, for example) is 10 mg/l. None of the streams sampled on April 9<sup>th</sup> are considered drinking water sources, so the 10 mg/l does not directly apply to them (although all the sites ultimately drain to the Des Moines River, for which the standard does apply).

## **pH**

Location	Site Description	Analyte	Value	Quant Limit
Site BC#1	Beaver Creek @ Merle Hay Rd	pH	8.1	
Site C#2	Green Meadows West @ Foxboro Rd	pH	7.8	
Site F#3	"Waterford Creek" @ NW 86th St	pH	7.7	
Site G#4	Beaver Creek Elementary @ NW 86th St	pH	8.0	
Site I#5	NW 86th Street south of NW 70th Ave	pH	8.0	
Site LB#6	Little Beaver Creek @ NW 86th Street	pH	8.3	
Site S#7	NW 59th St near Maurice's	pH	7.6	
Site S#8	Johnston Dr @ Prairie Point Crossing	pH	7.6	

pH is a measure of how acid or alkaline a substance is, with 7 being neutral and lower levels than that indicating increasing acidity and higher numbers indicating how alkaline something is.

Iowa's surface waters typically register in the 8 to 8.5 range for pH, and so is slightly alkaline. Unusually high or low numbers can be an indicator of pollution – for example, concrete washout from a concrete truck can have a pH over 12 and is very caustic (comparable to bleach and drain cleaner).

The monitoring results show pH values in the 7.6 to 8.3 range. Some of these are slightly lower than what would normally be expected of a groundwater-fed stream, but rainfall is normally in a pH range of 5 to 7 and so the lower values found may be due to the influence of rainfall and runoff.

## **Total Phosphorus as P**

Location	Site Description	Analyte	Value	Quant Limit
Site BC#1	Beaver Creek @ Merle Hay Rd	Total Phosphorus as P	0.18	0.05
Site C#2	Green Meadows West @ Foxboro Rd	Total Phosphorus as P	0.15	0.05
Site F#3	"Waterford Creek" @ NW 86th St	Total Phosphorus as P	0.070	0.05
Site G#4	Beaver Creek Elementary @ NW 86th St	Total Phosphorus as P	0.090	0.05
Site I#5	NW 86th Street south of NW 70th Ave	Total Phosphorus as P	0.060	0.05
Site LB#6	Little Beaver Creek @ NW 86th Street	Total Phosphorus as P	0.54	0.05
Site S#7	NW 59th St near Maurice's	Total Phosphorus as P	0.13	0.02
Site S#8	Johnston Dr @ Prairie Point Crossing	Total Phosphorus as P	0.17	0.02

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 and so high levels of phosphorus can also be an indirect indicator of possible soil erosion.

Total P ranged as low as 0.060 mg/l and as high as 5.4 mg/l. The highest level was present at Little Beaver Creek at NW 86<sup>th</sup> Street. This, like the high nitrate readings at the same location, is likely due to the influence of the Grimes wastewater treatment plant upstream.

There are currently no regulatory levels of phosphorus in Iowa, although the EPA recommended maximum levels for phosphorus is about 0.08 mg/l for flowing streams and 0.04 mg/l for standing waters and reservoirs.

**Total Residual Chlorine**

Location	Site Description	Analyte	Value	Quant Limit
Site BC#1	Beaver Creek @ Merle Hay Rd	Total Residual Chlorine	<0.1	0.1
Site C#2	Green Meadows West @ Foxboro Rd	Total Residual Chlorine	<0.1	0.1
Site F#3	"Waterford Creek" @ NW 86th St	Total Residual Chlorine	<0.1	0.1
Site G#4	Beaver Creek Elementary @ NW 86th St	Total Residual Chlorine	<0.1	0.1
Site I#5	NW 86th Street south of NW 70th Ave	Total Residual Chlorine	<0.1	0.1
Site LB#6	Little Beaver Creek @ NW 86th Street	Total Residual Chlorine	<0.1	0.1
Site S#7	NW 59th St near Maurice's	Total Residual Chlorine	<0.1	0.1
Site S#8	Johnston Dr @ Prairie Point Crossing	Total Residual Chlorine	<0.1	0.1

This analyte was chosen to provide information on the presence of fresh treated water in the water sample. Chlorinated water in a stream or drainage area during a time when little or no lawn irrigation is occurring could be an indicator of a water line leak. During times when lawn irrigation is occurring, it can provide a measure of how much of a stream's flow is coming from irrigation compared to natural groundwater sources.

Residual chlorine should not be confused with chloride (salts), another commonly measured water quality analyte. Chloride was not one of the selected analytes for the April 9<sup>th</sup> sample collection.

During this round of sampling, no measurable levels of chlorine were detected at any of the sites.

**Total Suspended Solids**

Location	Site Description	Analyte	Value	Quant Limit
Site BC#1	Beaver Creek @ Merle Hay Rd	Total Suspended Solids	50	1
Site C#2	Green Meadows West @ Foxboro Rd	Total Suspended Solids	88	1
Site F#3	"Waterford Creek" @ NW 86th St	Total Suspended Solids	10	1
Site G#4	Beaver Creek Elementary @ NW 86th St	Total Suspended Solids	35	1
Site I#5	NW 86th Street south of NW 70th Ave	Total Suspended Solids	7	1
Site LB#6	Little Beaver Creek @ NW 86th Street	Total Suspended Solids	18	1
Site S#7	NW 59th St near Maurice's	Total Suspended Solids	10	1
Site S#8	Johnston Dr @ Prairie Point Crossing	Total Suspended Solids	26	1

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. The samples collected on April 9<sup>th</sup> show fairly low amounts of TSS. The range among the sample collected was from as low as 7 mg/l to as high as 88 mg/l.

## Turbidity

Location	Site Description	Analyte	Value	Quant Limit
Site BC#1	Beaver Creek @ Merle Hay Rd	Turbidity	25	1
Site C#2	Green Meadows West @ Foxboro Rd	Turbidity	38	1
Site F#3	"Waterford Creek" @ NW 86th St	Turbidity	10	1
Site G#4	Beaver Creek Elementary @ NW 86th St	Turbidity	19	1
Site I#5	NW 86th Street south of NW 70th Ave	Turbidity	5.2	1
Site LB#6	Little Beaver Creek @ NW 86th Street	Turbidity	7.8	1
Site S#7	NW 59th St near Maurice's	Turbidity	11	1
Site S#8	Johnston Dr @ Prairie Point Crossing	Turbidity	20	1

Turbidity is a measure of water clarity. The measurement is in NTU's (Nephelometric Turbidity Units) and in this measurement of clarity, the lower the number the higher the 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.

Turbidity levels were low and generally corresponded well to the Total Suspended Solids levels found.

Below is a photo from the USGS providing a visual reference for turbidity levels.



## **Spring 2013 Polk County Water Quality Snapshot**

IOWATER (Iowa's volunteer water quality monitoring program) has been supporting a "snapshot" sampling event for Polk County that has occurred since 2004 in partnership with the Des Moines Water Works and other organizations. Typically over 70 sites are monitored twice annually using IOWATER field test kits, and a number of sites also have water samples collected for lab analysis at the DMWW laboratory. Seven of the sites monitored usually monitored are in the Beaver Creek watershed and several correspond with sites sampled by UHL on April 9<sup>th</sup>.

The Spring 2013 snapshot occurred on May 8, 2013. At this time the results are still being processed, but field tests showed very high nitrate levels present at many sites county-wide. It is typical for nitrate levels to rise in the spring, but the field test results indicate that nitrate levels are unusually high this year. It is speculated that the reason for this is at least partly due to the drought conditions last year which allowed a build-up of nitrate in the soil which is now being released into streams with this year's

spring rains and rising water table. It is interesting to note the difference one month can make when looking at the nitrate data collected by UHL for the several sites that overlap. For example, Beaver Creek at Merle Hay Road had just 0.48 mg/l detected by UHL in April, while the field test used in May showed a result of approximately 20 mg/l (the field test strips provide only an approximation, especially at levels of more than a few mg/l – a much more accurate comparison will be available once the lab analysis for nitrate is completed).

### Summary

This is the first set of data ever collected at many of these sites, so it is difficult to draw many conclusions. One positive item of note is that there are no samples that were far outside the expected results and no indicator in this dataset of any illicit discharges. Little Beaver Creek had high nitrate and phosphorus levels when compared to the other sites, however this is attributable to the influence of the Grimes Wastewater Treatment Plant upstream and is consistent with data collected on Little Beaver Creek in the past.

As more data is collected in the future, we will be better able to characterize the streams and make comparisons, but this data will provide a baseline to begin that effort. The next scheduled sampling will take place for these sites in July 2013.

Attached to this report is a brief field report of monitoring and site conditions submitted by UHL staff.