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March 31, 2015

Mr. Chris Daigle
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16-143369-501

Subject: Quarterly Report (January through March 2015) for Tanyard Creek, Lilly Branch, and MS4 Water Quality Monitoring
University of Georgia, WO #1510248-010/H8001394

Dear Mr. Daigle:

In accordance with our October 2014 scope of work, Brown and Caldwell (BC) is providing this letter report to the University of Georgia (UGA) Facilities Management Division that summarizes water quality monitoring services for Tanyard Creek, Lilly Branch, and the MS4 sites for the 1st quarter of 2015 (January 1, 2015 through March 31, 2015). This report contains sections describing the sampling events, results and a brief discussion. The annual report, to be submitted after the 3rd quarter of 2015, will contain more detailed discussion, including sampling methodology, and will contain an analysis of results from current and past sampling efforts.

Water Quality Sampling

The scope of work for this project includes a continuation of the Tanyard Creek, Lilly Branch, and MS4 monitoring programs. During the 1st quarter of 2015, one dry weather sampling event was performed on January 29, 2015, and one wet weather sampling event was performed on February 9, 2015.

Four bacteria sampling events were performed. The first and second bacteria sampling events were performed on January 15, 2015 and January 22, 2015. The third bacteria sampling event was combined with the dry weather sampling event from the 1st quarter on January 29, 2015. The fourth bacteria sampling event was performed on February 5, 2015. Figure 1 presents a map showing the sampling locations.

Tanyard Creek Monitoring Program

One dry-weather sample and one wet-weather sample were collected at the three Tanyard Creek sampling locations (MP-1, MP-3 and MP-6). Samples were analyzed for total suspended solids (TSS), total phosphorus (TP), total nitrogen (TN), fecal coliform, *Escherichia coli (E. coli)*, hardness, and dissolved metals (lead, zinc, copper, and arsenic). Insitu field parameters such as pH, dissolved oxygen (DO), temperature, and conductivity were recorded at each site. Table 1 summarizes the laboratory results of the first quarter sampling.

Table 1. Wet and Dry Weather Sampling Results for Tanyard Creek Sites						
Q1 2015	**Site MP-1**		**Site MP-3**		**Site MP-6**	
	Dry	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**
	1/29/2015	**2/9/2015**	**1/29/2015**	**2/9/2015**	**1/29/2015**	**2/9/2015**
Total Suspended Solids (mg/L)	19.5	15.0	BRL	14.0	BRL	52.0
Dissolved Metals						
Arsenic (µg/L)	BRL	0.408[J]	BRL	0.330[J]	BRL	0.291[J]
Copper (µg/L)	1.32[J]	7.14	BRL	3.02[J]	1.29[J]	8.27
Lead (µg/L)	BRL	0.721[J]	BRL	0.687[J]	BRL	0.416[J]
Zinc (µg/L)	18.7	24.8	3.83[J]	12.0	8.19[J]	26.5
Nutrients						
Total Phosphorus (mg/L)	0.038[J]	0.077	0.025[J]	0.070	0.012[J]	0.153
Total Nitrogen (mg/L)	2.8	BRL	1.4	BRL	2.8	BRL
Hardness						
Calcium/ Magnesium as $CaCO_3$ (mg/L $CaCO_3$)	63.9	15.8	32.0	14.8	58.4	13.2
Bacteria						
Fecal Coliform (Colonies/100 ml)	17,000	5,900	180	1,200	2,900	3,300
E. coli (MPN/100 ml)	16,000	5,500	160	1,100	2,600	2,900

[J] – Analyte detected below reporting limit but above method detection limit
BRL – Analyte detected below method detection limit

A detailed analysis of the 2015 first quarter sampling event will be presented in the annual report later this year. A brief overview of general trends is provided below.

Baseflow sampling results were generally similar to historical values. Fecal coliform and *E. coli* values for MP-1 were higher than the historical values during the dry weather sampling event. All other values were similar to or lower than historical values.

Bacteriological Monitoring at Tanyard Stations

Tanyard Creek and Cloverhurst Branch (a tributary to Tanyard Creek) are included on the EPD's 2014 305(b)/303(d) list for not supporting their designated use. The designated use for both streams are fishing, and the criterion violated is fecal coliform. The EPD rule 391-3-6 outlines the state standard for fecal coliform. The numeric guideline is based on the geometric mean of four samples taken within a 30-day time frame. The standard specifies a limit for the May-October time frame and one for the November-April time frame. For the months of November through April, when water contact recreation activities are not expected to occur, fecal coliform is not to exceed a geometric mean of 1,000 per 100 ml based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours.

For comparison to the EPD fecal coliform standards, four fecal coliform samples were taken at the three Tanyard Creek monitoring sites within a 30-day time frame. The samples were also analyzed for *E. coli,* which is an indicator of human waste. No state limit has yet been established *for E. coli*; however, these standards are expected to be developed at a later date. Table 2 below presents a summary of the fecal coliform and *E. coli* sampling at the Tanyard Creek locations.

Table 2. Fecal Coliform and *E. coli* Results for Tanyard Creek Sites

	Site MP-1		Site MP-3		Site MP-6		
Date	Fecal coliform Col/ 100 ml	*E. coli* MPN/ 100 ml	Fecal coliform Col/ 100 ml	*E. coli* MPN/ 100 ml	Fecal coliform Col/ 100 ml	*E. coli* MPN/ 100 ml	Weather Conditions
1/15/2015	24,000	20,000	120	98	900	660	cool, cloudy, 58.1°F
1/22/2015	12,000	9,200	1,700	1,400	1,400	1,200	cool, cloudy, 57°F
1/29/2015	17,000	16,000	180	160	2,900	2,600	cool, clear, 58.1°F
2/5/2015	2,600	2,000	150	140	2,900	2,400	cool, partly cloudy, 54.1°F
Geometric Mean	**10,622**	**8,760**	**272.4**	**235.5**	**1,804**	**1,491**	

All samples, except for MP-3 and MP-6 on January 15, 2015 and MP-3 on both January 29, 2015 and February 5, 2015, exceeded the state's established limit for fecal coliform. As shown in Table 2, the geometric mean for sites MP-1 and MP-6 exceeded the geometric mean limit of 1,000 col/100 ml for fecal coliform. Bacteria concentrations measured for samples collected at MP-1 were greater than those typically measured, with the exception of samples collected during the February 5 event. Historical geometric means are available in the Annual Report from 2014. The geometric mean from MP-1 was significantly higher than the historical geometric mean. Bacteria levels at MP-3 were consistent with historical values, except for January 22, which was considerably higher. Levels and the geometric mean at MP-6 were higher than historical levels.

MS4 Monitoring Program

The MS4 sample locations are indicated on Figure 1. Samples were analyzed for TSS, TP, TN, fecal coliform, *E. coli*, hardness, and dissolved metals (lead, zinc, copper, and arsenic). In addition to the analysis above, location MS4-2 was lab analyzed for pH and oil and grease. In-situ field parameters such as pH, DO, temperature, and conductivity were recorded at each site. Table 3 summarizes the results of the first quarter dry weather sampling and Table 4 summarizes the results of the wet weather sampling event.

Results from baseflow sampling were generally consistent with historical values. Fecal coliform and *E. coli* values at all the sites were slightly lower than usual. Total nitrogen at MS4-8 was higher than the historical dry mean. Nutrient results at all other sites were lower than most of the historical baseflow sampling. Hardness at MS4-2 was slightly higher than the historical mean for this site. Zinc continues to be elevated at MS4-8.

Storm flow sampling results were also consistent with historical values. Bacteria (fecal coliform and *E. coli*) values were lower than historical means. Nutrient (total phosphorus and total nitrogen) values were lower than historical means and total nitrogen levels for all five MS-4 sites were below the method detection limit.

Table 3. Dry Weather Sampling Results for MS4 Sites

Q1 2015	Site MS4-2	Site MS4-3	Site MS4-4b	Site MS4-4c	Site MS4-8
	Dry	Dry	Dry	Dry	Dry
	1/29/2015	1/29/2015	1/29/2015	1/29/2015	1/29/2015
Lab pH	6.92[J]	---	---	---	---
Total Suspended Solids (mg/L)	12.5	3.0[J]	2.5	21.5	2.5[J]
Oil and Grease (mg/L)	1.8[J]	---	---	---	---
Dissolved Metals					
Arsenic (µg/L)	0.268[J]	BRL	0.353[J]	BRL	0.328[J]
Copper (µg/L)	5.39	0.822[J]	1.05[J]	BRL	16.9
Lead (µg/L)	BRL	BRL	BRL	BRL	BRL
Nickel (µg/L)	4.94[J]	---	---	---	---
Zinc (µg/L)	10.2	13.7	BRL	BRL	49.8
Nutrients					
Total Phosphorus (mg/L)	0.345	0.035[J]	0.036[J]	0.062	1.92
Total Nitrogen (mg/L)	1.5	2.3	BRL	BRL	9.0
Hardness					
Calcium/ Magnesium as $CaCO_3$ ($mg/L\ CaCO_3$)	162	77.5	19.8	15.2	55.9
Bacteria					
Fecal coliform (Colonies/100 ml)	110	320	40	80	20
E. coli (MPN/100 ml)	97	290	31	63	20

[J] – Analyte detected below reporting limit but above method detection limit
BRL – Analyte detected below method detection limit
--- Not analyzed

Table 4. Wet Weather Sampling Results for MS4 Sites					
Q1 2015	**Site MS4-2**	**Site MS4-3**	**Site MS4-4b**	**Site MS4-4c**	**Site MS4-8**
	Wet	**Wet**	**Wet**	**Wet**	**Wet**
	2/9/2015	**2/9/2015**	**2/9/2015**	**2/9/2015**	**2/9/2015**
Lab pH	6.04[J]	---	---	---	---
Total Suspended Solids (mg/L)	79.0	25.5	2.5[J]	116.0	7.0
Oil and Grease (mg/L)	2.1[J]	---	---	---	---
Dissolved Metals					
Arsenic (µg/L)	0.356[J]	0.345[J]	0.341[J]	0.198[J]	0.949[J]
Copper (µg/L)	8.28	10.5	1.27[J]	BRL	2.64[J]
Lead (µg/L)	0.298[J]	0.363[J]	BRL	BRL	BRL
Nickel (µg/L)	1.71[J]	---	---	---	---
Zinc (µg/L)	63.4	27.8	3.59[J]	BRL	50.7
Nutrients					
Total Phosphorus (mg/L)	0.131	0.113	0.034[J]	0.104	0.158
Total Nitrogen (mg/L)	BRL	BRL	BRL	BRL	BRL
Hardness					
Calcium/ Magnesium as $CaCO_3$ (mg/L $CaCO_3$)	25.1	17.7	17.5	15.6	7.20
Bacteria					
Fecal coliform (Colonies/100 ml)	3,100	3,600	BRL	12	70
E. coli (MPN/100 ml)	2,900	3,300	BRL	11	64

[J] – Analyte detected below reporting limit but above method detection limit
BRL – Analyte detected below method detection limit
--- Not analyzed

Lilly Branch Monitoring

Lilly Branch is a small tributary of the North Oconee River and flows east through the eastern portion of the UGA campus. It begins in the Five Points area of Athens and enters campus at Foley Baseball Field. It then flows through pipes and culverts through campus until it daylights downstream of East Campus Road.

One baseflow (dry weather) and one stormflow (wet weather) sample was collected during the 1st quarter at sites MP-8 and MS4-3 on Lilly Branch. MP-8 represents water quality of Lilly Branch as it enters the UGA campus, and MS4-3 is located downstream just before the confluence with the North Oconee River. Samples were analyzed for TSS, TP, TN, fecal coliform and *E. coli*, hardness, dissolved metals (lead, zinc, copper, and arsenic), and field parameters such as pH, DO, temperature, and conductivity. Also, fecal coliform and *E. coli* were sampled during the quarterly event at MP-9 and MP-10.

Tables 5 and 6 summarize the laboratory results of the sampling events at sites MP-8, MP-9, MP-10 and MS4-3 on Lilly Branch.

Bacteria results for both dry weather and wet weather events at all of the Lilly Branch locations were lower than historical values. During the dry weather event on January 29, hardness at MS4-3 was slightly higher than the historical dry weather mean.

Table 5. Dry Weather Sampling Results for Lilly Branch Sites				
Q1 2015	**Site MP-8**	**Site MP-9**	**Site MP-10**	**Site MS4-3**
	Dry	**Dry**	**Dry**	**Dry**
	1/29/2015	**1/29/2015**	**1/29/2015**	**1/29/2015**
Total Suspended Solids (mg/L)	23.5	---	---	3.0[J]
Dissolved Metals				
Arsenic (µg/L)	0.157[J]	---	---	BRL
Copper (µg/L)	BRL	---	---	0.822[J]
Lead (µg/L)	BRL	---	---	BRL
Zinc (µg/L)	BRL	---	---	13.7
Nutrients				
Total Phosphorus (mg/L)	0.201	---	---	0.035[J]
Total Nitrogen (mg/L)	2.4	---	---	2.3
Hardness				
Calcium/ Magnesium as $CaCO_3$ (mg/L $CaCO_3$)	30.5			77.5
Bacteria				
Fecal Coliform (Colonies/100 ml)	1,300	280	250	320
E. coli (MPN/100 ml)	910	240	230	290

[J] – Analyte detected below reporting limit but above method detection limit
BRL – Analyte detected below method detection limit
--- Not measured

Table 6. Dry Weather Sampling Results for Lilly Branch Sites				
Q1 2015	**Site MP-8**	**Site MP-9**	**Site MP-10**	**Site MS4-3**
	Wet	**Wet**	**Wet**	**Wet**
	2/9/2015	**2/9/2015**	**2/9/2015**	**2/9/2015**
Total Suspended Solids (mg/L)	17.5	---	---	25.5
Dissolved Metals				
Arsenic (µg/L)	0.209[J]	---	---	0.345[J]
Copper (µg/L)	3.47[J]	---	---	10.5
Lead (µg/L)	0.427[J]	---	---	0.363[J]
Zinc (µg/L)	13.1	---	---	27.8
Nutrients				
Total Phosphorus (mg/L)	0.074	---	---	0.113
Total Nitrogen (mg/L)	BRL	---	---	BRL
Hardness				
Calcium/ Magnesium as $CaCO_3$ (mg/L $CaCO_3$)	16.6	---	---	17.7
Bacteria				
Fecal Coliform (Colonies/100 ml)	1,900	2,200	5,500	3,600
E. coli (MPN/100 ml)	1,900	2,000	5,200	3,300

[J] – Analyte detected below reporting limit but above method detection limit
BRL – Analyte detected below method detection limit
--- Not measured

Bacteriological Monitoring at Lilly Branch Stations

Lilly Branch is a direct tributary to the North Oconee River. The North Oconee River is included on the EPD's 2014 305(b)/303(d) list for not supporting its designated use. The designated use is fishing, and the criterion violated is fecal coliform. For comparison to the EPD fecal coliform standards, four fecal coliform samples were taken at the four Lilly Branch monitoring sites within a 30-day time frame. The samples were also analyzed for *E. coli,* which is an indicator of human waste. Table 7 below presents a summary of the fecal coliform and *E. coli* sampling at the Lilly Branch locations.

Table 7. Fecal Coliform and *E. coli* Results for Lilly Branch Sites

	Site MP-8		Site MP-9		Site MP-10		Site MS4-3		
	Fecal coliform	*E. coli*	Fecal coliform	*E. coli*	Fecal coliform	*E. coli*	Fecal coliform	*E. coli*	
Date	Col/ 100 ml	MPN/ 100 ml	Col/ 100 ml	MPN/ 100 ml	Col/ 100ml	MPN/ 100 ml	Col/ 100 ml	MPN/ 100 ml	Weather Conditions
1/15/2015	1,900	1,600	170	130	1,000	740	2,400	1,800	cool, cloudy, 58.1°F
1/22/2015	1,000	750	150	110	380	300	1,300	930	cool, cloudy, 57°F
1/29/2015	1,300	910	280	240	250	230	320	290	cool, clear, 58.1°F
2/5/2015	1,900	1,700	200	180	900	770	700	580	cool, partly cloudy, 54.1°F
Geometric Mean	**1,525**	**1,240**	**200**	**165**	**632.5**	**510**	**1,180**	**900**	

As shown in the table, geometric means for MP-8 and MS4-3 exceeded the geometric mean limit of 1,000 col/100 ml for fecal coliform. Levels at all four Lilly Branch sites are generally typical of historical levels.

BC appreciates the opportunity to perform this sampling and reporting for UGA. If you have any questions regarding this letter report, please contact me at (770) 673-3679.

Very truly yours,

Brown and Caldwell

Jill O. Stachura
Project Manager

JOS:AA:ehs
Attachments (1): Figure 1. Water Quality Monitoring Locations

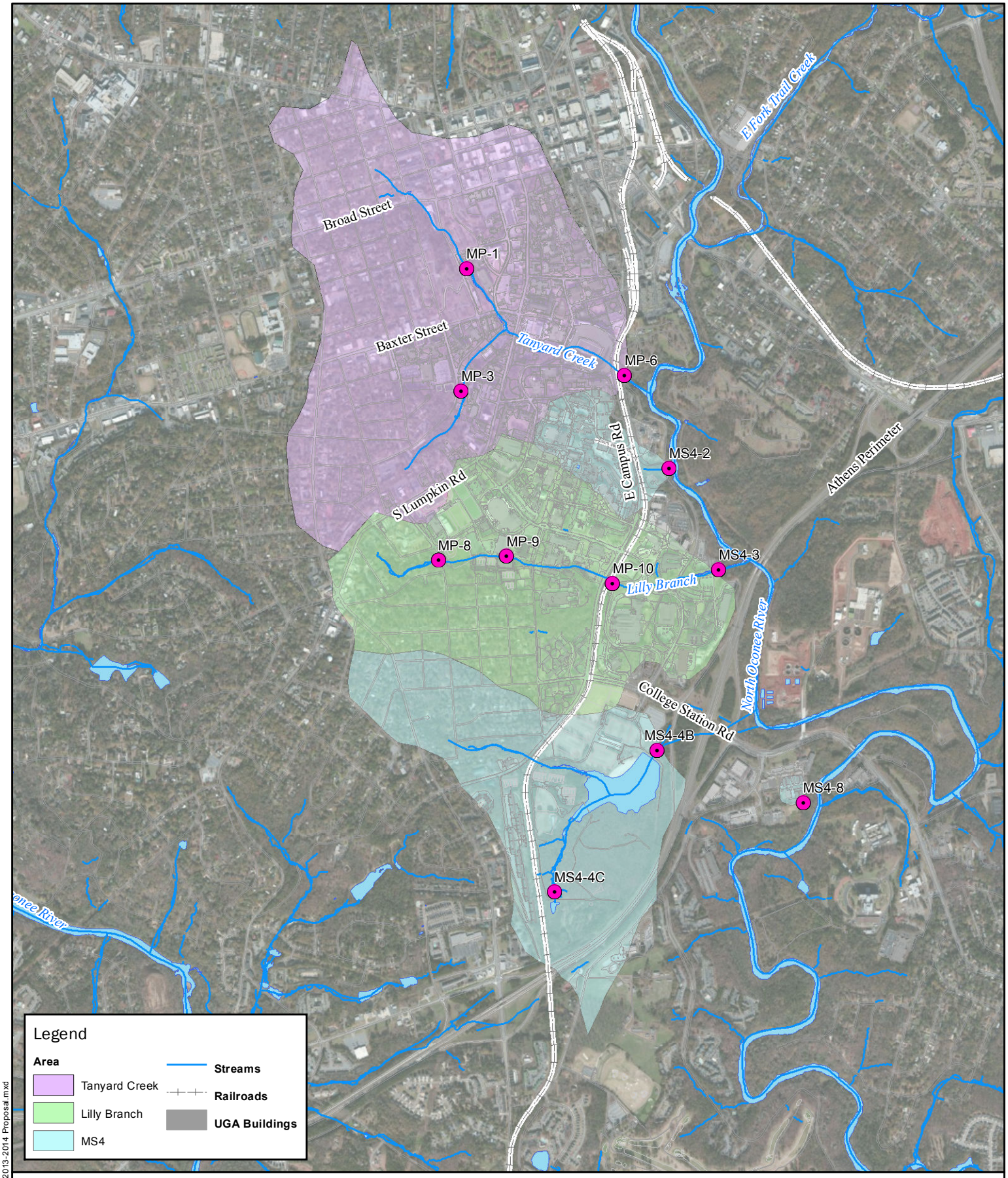

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Figure 1
Water Quality Monitoring Locations

Brown AND Caldwell

Basemap provided by UGA
Facilities Management Division and Athens-Clarke County

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