



City of Birmingham, 2017  
Alabama  
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MUNICIPAL SEPARATE STORM SEWER SYSTEM

NPDES PERMIT NUMBER: AL000001

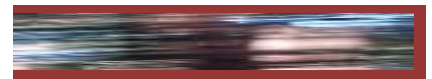
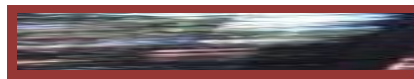
**FISCAL YEAR 2016-2017**

# **MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) 2017 ANNUAL REPORT**

PERMIT YEAR (ADMINISTRATIVE EXTENSION)

OCTOBER 1, 2016-SEPTEMBER 30, 2017

**DECEMBER 2017**





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### **Appendices (See attached disc)**

Appendix A- Major Findings

Appendix B- Major Accomplishments

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## CERTIFICATION STATEMENT

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

Signature: \_\_\_\_\_

Name: Thomas H. Miller

Title: Stormwater Administrator

Date: December 15, 2017



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## Stormwater Management Program Evaluation

**PROGRAM OBJECTIVE:** The Clean Water Act is a comprehensive set of programs and requirements designed to address the complex problems caused by a wide variety of pollution sources. A cornerstone of the Act is the National Pollutant Discharge Elimination System (NPDES), regulating the discharge of pollutants into waters of the U.S. The City of Birmingham has been issued a NPDES Phase I Municipal Separate Storm Sewer System (MS4) Permit (No. ALS000001), dated October 12, 2001, for the operation of its MS4. That permit, which became effective on November 1, 2001, outlines a number of controls and activities to effectively prohibit the discharge of non-stormwater into the MS4 and reduce the discharge of pollutants from the MS4 to the maximum extent practicable. Today within the City of Birmingham are several water resource segments that presently do not meet beneficial use requirements. As a result, they have been placed on the State's Section 303(d) list of impaired water bodies and either have or are scheduled to have total maximum daily loads (TMDLs) established to further control pollutants from being discharged into City waterbodies. To achieve overall water quality improvement for those water resources within watersheds of the City of Birmingham, the following objectives are foundational:

1. *Development of a strong partnership with the State of Alabama, Department of Environmental Management.*
2. *Facilitate achievement of established TMDLs for streams and creeks within the jurisdictional purview of the City of Birmingham that will ultimately lead to removal of these resources from the impaired waters list.*
3. *Reduce discharge weighted total suspended solids concentration during a 5-year permit cycle.*
4. *By combination of both pollution control and preventative approaches, reduce or remove pollutants to the maximum extent practicable from both the MS4 and Birmingham's creeks and streams.*
5. *Development and implementation of watershed basin-wide strategies to address water quality and quantity problems in City of Birmingham watersheds, initiating a watershed management plan for Village Creek in 2014 and Valley Creek by 2017.*
6. *Ensure legal authority exists to control discharges to and from the City's MS4 by the establishment of a stormwater protection ordinance.*

## MAJOR FINDINGS

During NPDES Stormwater Permit reporting year 2016-2017, the City of Birmingham identified several major findings, which either did or could have far reaching implications on the City's Stormwater Management programs, which are described below. Some of the below listed items may be further discussed in later sections of this report, if so noted.



**STREAM SEDIMENTATION:** Sedimentation throughout City streams is becoming a concern to City maintenance crews and to the public, as shown above in a picture of Village Creek taken in July 2017 by the Village Creek Human & Environmental Justice Society, Inc. The concern stems from an important finding in last year's report in Shades Creek after the City received a Notice of Violation (NOV) in 2015, noting:

1. Best Management Practices (BMP's) had not been implemented or maintained to the maximum extent practicable resulting in uncontrolled discharges of sediment and other pollutants to a water of the State.
2. Dredged material was placed on the stream bank without effective BMP's controls in place.

As a result of the NOV, the City maintenance crews stopped all creek and creek bank maintenance operations for fear of regulatory intervention. Although "Incidental Material" dredging does not require a permit, at ADEM's request, a "Notice of Intent" and a Construction Best Management Practice Plan was prepared and submitted by the City of Birmingham Planning and Engineering Department with a final permit becoming effective on September 23, 2016 for Shades Creek.

Added to the Department of Public Works concerns about dredging, City maintenance equipment is also in a serious state of disrepair (i.e. long-arm excavator, slash-buster, bulldozer, etc.) as a result of equipment reassignment to address dilapidated housing removal and the mowing of abandoned, private property throughout the City. There is not funding available to either replace equipment that is not serviceable or to repair the equipment due to its age.

Ongoing, as will be discussed later in the ***Watershed Management*** section under ***Planning Controls*** of this report, Stormwater Management is working to address sediment loading in portions of the Village Creek Watershed and with the U.S. Army Corps of Engineers to develop flood control alternatives in the Village Creek Watershed that could potentially address stream sedimentation.



**AVONDALE LAKE FISH KILL:** On July 27, 2017 Stormwater Management became aware of a fish kill in Avondale Lake during a routine structural control inventory and inspection. The fish kill was limited only to large Grass Carp (*Ctenopharyngodon sp.*) as other more desirable fish species were evident and not seemingly in distress as were the Grass Carp. Further research of an apparent cause discovered recent applications of aquatic herbicides (i.e. Captain XTR, Littora, Stingray, and Clipper) by a City contractor to control the excessive growth of algae in the Lake. See Appendix A for algaecide label information. As a result of the application of algae control pesticides, it would appear that the Grass Carp were selectively euthanized by algal grazing. At this time, the City is considering replacing the aquatic spray control program in its lakes with a new control technology that does not rely on the application of chemical products. The technology is called, “SonicSolutions”. It is an electric powered, ultrasonic algae control system created by SonicSolutions, LLC and is in use in other areas of the Country. According to the manufacturer’s marketing materials, the technology is not only 100% effective in the control of most algal species, but also reduces pH and total suspended solids in the water column. Both of these latter parameters are of interest to control in the Village Creek watershed. The City is

considering using this technology in Avondale Lake first to determine its effectiveness in controlling algae. If successful, the same technology may be considered for use in other wet ponds and aquatic systems where algae control is also needed. More information about SonicSolutions may be found at their website. (<http://www.sonicsolutionsllc.com/>)



**GREENWOOD PARK STRUCTURAL CONTROLS:** City Stormwater Management staff inspected the structural controls at Greenwood Park on September 1, 2017 as a part of the City’s routine, annual structural controls inspection. This park maintains a sophisticated complex of structural and non-structural flood control and water quality components before discharging directly into Village Creek. The structural flood control component includes diversion weirs and electric pumps to divert water to adjacent bioswales before discharging directly into Village Creek. At the time of inspection however, the structural flood control components (i.e. weirs, pumps, electrical component main board, etc.) was not functioning at all. Additionally, the bioswales were observed to not having been maintained since last inspection. During this past year the Department of Public Works had transitioned the operation and maintenance of this facility to the Parks and Recreation Department, although the maintenance and operations manuals were not included in that transfer, so Parks and Recreation

was unaware of the facility maintenance requirements. That knowledge has now also been transferred to Parks and Recreation, and the facility's structural components are being repaired. All bioswales will be cleared of all noxious, non-native plant species and all woody plant materials will be removed and the stumps treated to prevent regrowth. All sedimentation will also be removed and properly disposed of in a City landfill. See Appendix A for a copy of the maintenance and operations manual.



**WATER QUALITY MONITORING:** This reporting period now includes four-full years of water quality monitoring in Birmingham's creeks. The foundation of the City's instream water quality monitoring program has been to identify instream peak concentrations of specific conductivity that would lead one to conclude that at least in that flowing stream segment(s) there is an influence from another dissimilar water source, whether from an incoming tributary, an outfall discharge, or from a groundwater seepage influence.

Many Major Findings points were listed in the **Highlights** section of **Water Quality**. Rainfall data played an essential roll this year, due to the

drought. The drought caused different readings in flow and water quality that was not characteristic of the watersheds in earlier reports. To demonstrate this the City compared each Birmingham watersheds for particular parameters in the form of "Bar-Whisker" charts. The comparison was made for a four year period. This is found in the **Results and Discussion** section of Water Quality. **Antidegradation Analysis** is also depicted and reviewed in the Water Quality section for each watershed with the parameters selected from state law. Each creek was broken down and charted, parameter specific, allowing staff to discuss in detail parameter trends. Additional evaluations on the Village Creek watershed, such as the **Village Creek Loading Analysis** and the **Village Creek TMDL analysis** can be also found in the **Water Quality** section.

The pH of surface water generally ranged from 6 to 9 over the entire study period. ADEM established a pH range of 6 to 8.5 to reduce the effects of highly acidic or highly basic water on fish and wildlife. The pH levels in all Birmingham Creeks did not exceed 8.5 during the 2016-2017 fiscal year at all monitoring sites. USGS studies of ground water in the area indicate pH levels of 7.9 in the ground water at subsurface.

Village, Shades, Valley, Five Mile Creek and Cahaba River have either had improvement or no change in any the State's Anti-degradation level requirements when comparing historical data over the sampling period to the most recent sampling results for FY 2016-2017. Dissolved oxygen and temperature levels did not exceed state anti-degradation policy at any time during the past three reporting cycles for any stream within Birmingham.

Overall, the intent of changes to the City's water quality monitoring program was to broadly determine if a given stream was improving, remaining constant or becoming more polluted



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with respect to TSS over time and given the preponderance of established BMP controls. Compared with last year's data, the flow-weighted data for TSS was considerably lower for both the City and for Industry. Furthermore, flow weighted TSS concentration for the City was also lower this year when compared with industry.

The considerable changes observed during this reporting period by the City seem implicated to the considerable differences in the water quality and flow response to a significant drought condition unlike any previous reporting year.

## MAJOR ACCOMPLISHMENTS

### ADMINISTRATION:

During NPDES Stormwater Permit reporting year 2016-2017, personnel changes occurred. Ms. Angela Moss and Ms. Alexcia Moore were promoted from Water Pollution Control Technician positions to Stormwater Specialist Positions. These promotions were in large part the result of exceptional work being done by both employees to address Illicit Discharge Detection and Elimination Program needs. Ms. Moss developed an amendment to the current Stormwater Protection Ordinance to fully create a new Appeals Board and Ms. Moore developed a strategy to address and resolve a long-standing illicit discharge into Shades Creek. Both of these will be discussed in more detail later in this section.

Additionally, a new Principal Engineering Inspector has been added to the team and is funded by the Stormwater Utility Fee. This position assumes a leadership role to help Stormwater Management with the Erosion and Sediment Control Program at the City.

Direcus Cooper was promoted from Water Pollution Control Technician to Storm Water Specialist. Mr. Direcus Cooper has A.S. and B.S. degrees in Environmental Science of Engineering, M.S. in Occupational Health and Safety/ Environmental Management, and is currently working on a dual master's Engineering degree in Sustainable Smart Cities. Mr. Cooper directs the instream water quality and stormwater education programs.

Also, GIS summer intern Deavon Thompson was added to the team to assist with stormwater fee assessment, GIS mapping and data collection for the final report. Deavon is a senior at the

University of North Alabama and will be graduating in May 2018, with a degree in GIS application.



### DEVELOPMENT CONTROLS:

The City of Birmingham continues to accomplish significant programmatic efforts related to development controls. These include efforts associated with:

- ◆ **Planning Controls**
- ◆ **Policy Controls**
- ◆ **Structural Controls**
- ◆ **Regulatory Controls**

The federal Water Pollution Control Act P.L. 107-303, November 27, 2002 established requirements to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods, and such other provisions as the Administrator or the State determines appropriate for the control of such pollutants.<sup>i</sup> Consistent with the provision of federal law the Storm Water Regulations (40 CFR Part 122.26) further delineated the need for large



municipal separate storm sewer system dischargers to have a comprehensive planning process, which involves public participation and where necessary intergovernmental coordination, to reduce the discharge of pollutants to the maximum extent practicable using appropriate and delineated controls.<sup>ii</sup>

The original NPDES MS4 Permit (ALS000001), effective November 1, 2001, required in Part II.A.2. that for areas of new development and significant redevelopment a comprehensive master planning process (or equivalent) to develop, implement, and enforce controls to minimize the discharge of pollutants from areas of new development and significant redevelopment after construction be completed. In order to accomplish the permitted development objectives four development controls are used by the City for new development and significant redevelopment. These controls span *planning*, *project*, *policy*, and *regulatory controls* and are applied to the aforementioned areas based on environmental classification.

Planning controls for example are employed in Birmingham through implementation of comprehensive planning policies and objectives that are consistent with the goals of the Phase I NPDES MS4 program. Generally, they are applied to all areas regardless of environmental classification. Project controls are generally corrective as well as restorative in application, and are primarily applied to environmentally impaired and sensitive areas. Primary project controls include brownfields reclamation, floodplain property acquisition, parkland and open space creation, environmental/stream restoration, and drainage infrastructure repair and replacement projects. Policy controls are generally preventive in intent and are primarily applied to environmentally sensitive and impaired areas. An example of a City policy control is best

represented by the City's Engineering Design Guidelines for Subdivisions or Commercial Developments. Regulatory controls used by the City include subdivision regulations, sediment and soil erosion control regulations, the zoning ordinance, and the City's new stormwater protection ordinance, which was approved by the City Council in December 2014. Regulatory controls are applied across all environmental classifications (i.e. in all areas of new development or significant redevelopment) and will be discussed in more detail later in this report.

## PLANNING CONTROLS



Stormwater Management reported on the status of previous efforts to complete and implement the City's first Comprehensive Plan in more than 50-years. Since then, the City has taken significant steps going forward to capitalize on that effort in further significant planning refinements that will prove to be equally foundational in making Birmingham a more sustainable metropolis.

During this annual report year, four significant efforts continued in the development of Citywide planning controls. Those included continuation of Framework Plans, which are intended to encourage wiser patterns of real estate development and City growth while reducing the demand on existing infrastructure. Secondly, Planning Staff is continuing to develop a "sustainable plan" scope-of-work to assist in preparing development guidelines and standards that will assist the City in its efforts to become more sustainable. This latter effort also requires funding for implementation. The fact that

funding has been elusive has contributed to project delay. Finally, the City has fully completed final development of the Village Creek Watershed Improvement Strategy and has begun similar development of a Valley Creek Flood Management and Water Quality Master Plan.

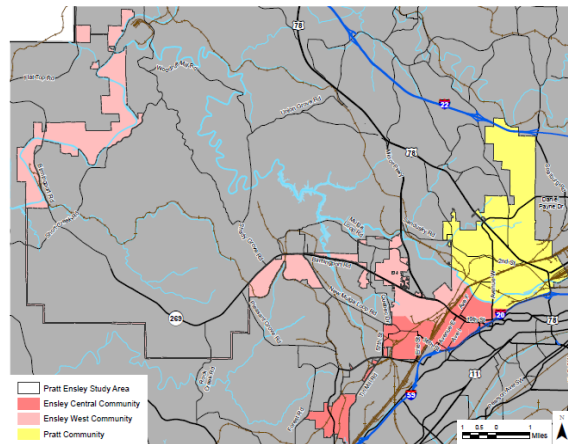
### FRAMEWORK PLANS

The Framework Plans for the City of Birmingham were initiated after the adoption of the 2013 City Comprehensive Plan. The Framework Plans were established as a means to:

- ❖ Identify areas of substandard housing and urban decline that would require City intervention;
- ❖ Examine existing land uses and propose revisions that would align with the new Future Land Use Map from the Comprehensive Plan;
- ❖ Register deficient quality of life issues (public safety, sanitation, recreation, commerce) that were identified by local stakeholders and provide possible solutions to bring about civic improvement; and
- ❖ Create an implementation committee that would drive continued public involvement in making positive change within their communities.

Working in concert with the Regional Planning Commission of Greater Birmingham, five framework plans have been completed: North Birmingham Community (2015), Titusville Community (2015), Western Area Communities [Smithfield, West End, Five Points West] (2015), Southwest Communities [Southwest, Grasselli, Brownville] (2016) and Northeast Communities (Cahaba, Roebuck-South East Lake, Huffman, East Pinson Valley] (2016). These five Framework Plans have been annually reported and currently have progressed to the establishment of

Implementation Committees that meet on a regular basis to discuss with City officials, local businesses and other stakeholders how they can best work together on the actions and strategies that have been developed within the existing framework plans. By the Fall of 2017, two Framework Plans are in the process of being completed: Pratt / Ensley Communities and Eastern Communities [Woodlawn, East Birmingham, East Lake, Airport Hills] Framework Plans. These Framework Plans are currently receiving input from Stakeholder Committees, which are comprised of neighborhood leaders, local entrepreneurs, religious leaders and concerned residents, which will in time become established as the Implementation Committees that will act as the driving force for these plans when adopted in 2018.



### ***Pratt/Ensley Communities Framework Plan:***

The Pratt/Ensley Communities area (See Figure above) consists of intermittent creeks, which are tributaries to Village Creek and Locust Fork. These creeks often cause flash-flooding during heavy rains. The areas that are prone to inundation by 1% annual-chance flood hazard are referred to as 100-year flood zones and are so designated by the Federal Emergency Management Agency (FEMA). Lands susceptible to inundation by 0.2%

annual-chance flood hazard are referred to as 500-year flood zones.

Residential areas along Village Creek, particularly in the Ensley and South Pratt neighborhoods, have been identified as areas containing clusters of hotspots with repetitive loss of properties. With funding support from the U.S. Army Corps of Engineers and the Federal Emergency Management Agency (FEMA), many flood prone properties were purchased and the flood plain area restored. However, not all flood prone properties have been purchased and as a result have been abandoned, which has encouraged the area to be used as a dumping ground for debris and waste continuously creating a challenge to keep the floodplain clean and clear.

The results of Framework Planning for the Pratt/Ensley Area has established three goals, including:

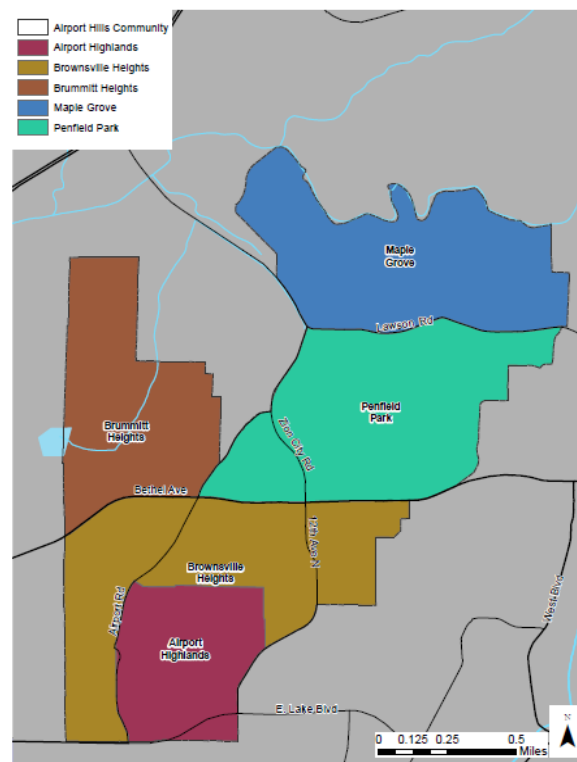
- ❖ Establish more recreational opportunities
- ❖ Ensure natural water systems are valued and restored to improve habitat watershed health, especially near Village Creek
- ❖ Establishment of a flood recovery and long-term resiliency plan

The following key stormwater related actions were recommended by community leaders:

- ❖ Acquire blighted and flood-prone properties to expand recreational opportunities for residents
- ❖ Continue working with the Village Creek Society to increase access to recreational facilities for residents
- ❖ Provide incentives and education to homeowners for green design
- ❖ Encourage the use of Best Management Practices (BMPs) on all new developments

during post-construction to control soil erosion and minimize sediment run off.

- ❖ Install green systems on blighted or vacant properties to reduce stormwater run-off and flooding in flood prone areas

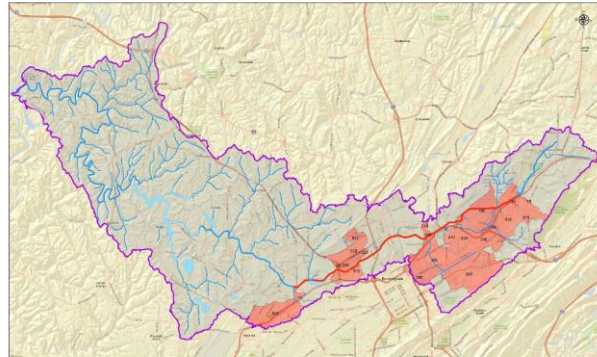


**Eastern Communities Framework Plan:** The Eastern Area Framework Plan includes 19 neighborhoods, and more specifically includes the communities of Airport Hills, East Birmingham, East Lake and Woodlawn. See the figure above. The geographic area encompassed by this Framework Plan is 14.6 square miles and includes nearly 14,000 land parcels. The same three goals established for the Pratt/Ensley Framework Planning area were also identified for the Eastern Communities Framework Planning area.

The following key stormwater related actions were recommended by community leaders:

- ❖ Install green systems on blighted or vacant properties to reduce stormwater run-off and flooding in flood prone areas
- ❖ Develop a system of green systems
- ❖ Consider the feasibility of using large blocks of vacant land in Airport Hills, Brummit Heights, and Zion City to plant pine trees to replenish the City of Birmingham’s urban forest
- ❖ Address issues at East Lake Park
- ❖ Prioritize the construction of pocket parks and other green spaces in Woodlawn, Airport Highlands, Zion City, Brownsville Heights, Penfield Park, and Maple Grove

Many of the planning elements related to stormwater management recommended or proposed by these communities were included in and validated through the watershed management planning effort by City staff for Village Creek. That includes also for the previously completed framework plans. Therefore, community action has been verified to provide a measure of improvement in flood protection and water quality improvement in Village Creek, reinforcing the community’s recommendations and leading to the incorporation into the final frameworks plans, implementation.

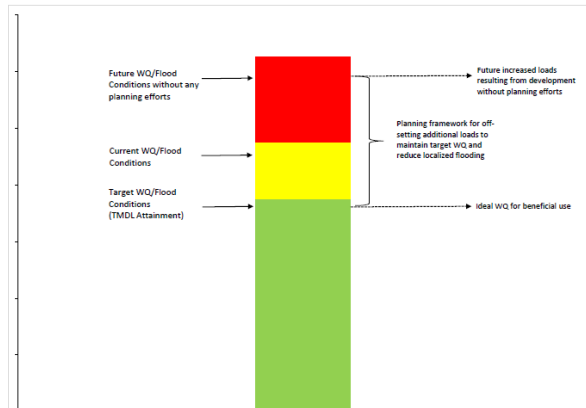


#### **WATERSHED MANAGEMENT PLANS**

***Village Creek Watershed Improvement Strategy:*** Building upon existing plans and framework plan development throughout the City in Village Creek, the City completed its first ***Village Creek Watershed Improvement Strategy*** in August 2017. The objectives of the strategy were to improve and protect water quality so that standards for designated uses would be attained, as well as to reduce flooding impacts within Village Creek through implementation of all strategy recommendations. The approach used was to develop an analysis of existing conditions in the watershed using available models (i.e. HEC-RAS, SWMM) that could be modified to give an analysis of a future condition with improvement strategies in place. The project delivery team also worked with many stakeholders in the development of the final plan. The report further identified key areas within the Village Creek Watershed where water quality problems would be expected and project controls to address contributing pollutant loads would be needed. See the Figure, above. This figure depicts the area upstream and to the southeast of the stream contributes to the TSS, TN, and eColi pollutant loadings at a comparatively high level in the watershed. The area immediately west of I-65 contributes to the TSS and eColi pollutant loads,

also at a comparatively high level in the watershed. Generally the per acre loading for all pollutants, except TP is higher in the middle and upper sections of the watershed where there is a significant, obvious development. The area downstream and south of the stream contributes to the TP and eColi pollutant loads at a comparatively high level. Each of these identified areas are also subject to localized and flash flooding.

Furthermore, the stream channel itself represents an area of concern for zinc. Zinc in the stream segment is more of a concern in the bed sediments than it otherwise might be in the water column. Zinc is a heavy metal and tends to settle and be associated with stream sediments.



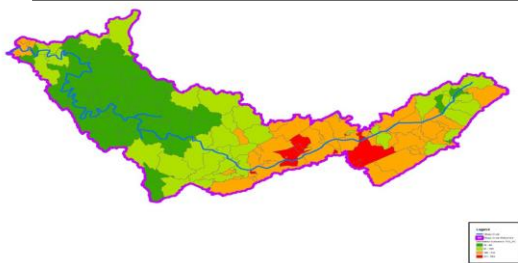
As was stated earlier in this section, the primary objective of the **Village Creek Watershed Improvement Strategy** was to develop projects and other management control strategies to assist the City in attaining reasonable beneficial use in Village Creek. This would be reflective of the green bar depicted in the figure above. One of the ways to measure this is by reducing the pollutant loads that have been identified to cause this water body to be on the non-attainment list for the State of Alabama, as represented by the yellow bar in the same figure. Up to this point, ADEM has

focused on addressing point source pollutant loadings through industrial permits. Now it is up to the City to focus more on the non-point controls needed to achieve attainment. Obviously and given the current level of nonattainment in Village Creek, which is based on the current land-use, for the City to do nothing it could be expected to see continuous impairment from yellow to red, as future land use conditions would be anticipated. This report therefore, when fully implemented will offset the additional pollutant loadings and help the City to achieve the target water quality conditions for attainment while also reducing localized flooding. The report addressed the following controls to achieving attainment:

- ★ Development of a more robust asset management system
- ★ Development of an LID policy and ordinance
- ★ Continued maintenance dredging in accordance with ADEM requirements and turbidity BMP controls in place, in conjunction with sediment monitoring of zinc.
- ★ Continued implementation of trash controls and a more aggressive campaign to eliminate littering throughout the City.
- ★ Mitigation of Repetitive Losses
- ★ Encourage partnerships with other entities to reduce pollutant loading in key sub-basins
- ★ Consider modified riverine flood condition strategies like the reestablishment of bank full benches to better contain flood flows
- ★ Implement key capital improvement project controls to address flooding and water quality
- ★ Develop an Adaptive Management Plan to continuously evaluate the effectiveness of plans, policies, projects, and regulations to make necessary improvements and adjust capital and operating budgets accordingly.
- ★ Develop a SMART storm drainage maintenance program through collaboration

with DWP and PEP, including the adjustment in street sweeping frequency.

Subbasin TSS Loading (lbs/lbs./ac-yr)



A real-time example of the use of this planning strategy effort is depicted in the figure above. The figure depicts the heat map of total suspended solids (TSS) loading throughout the Village Creek Watershed. The red/orange highlighted areas are expected to have higher TSS pollutant loadings than other areas of the watershed depicted in green. The watershed management plan for Village Creek therefore predicts where supplemental project investments might be considered to further address elevated TSS concentrations. A portion of the red area in the north central portion of the area is in Ensley where it was earlier described erosion at Avenue W has been identified. The City is considering a new

technology to address this through the incorporation of a “Living Wall” bank stabilization system similar to that established by Filtrexx®. See figure below, left.

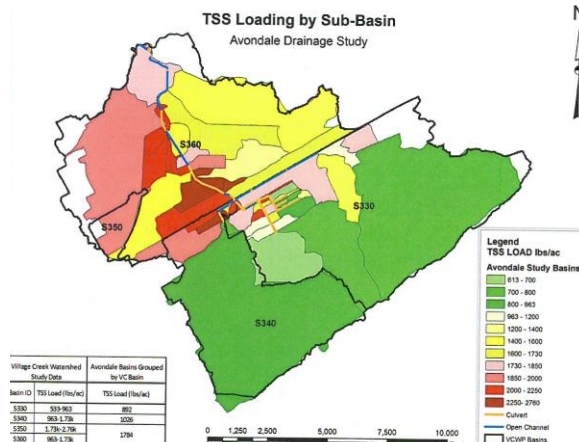
Finally, the report was also designed to address the nine-planning requirements for Section 319(h) funding and included recommendations for 17 capital improvement projects to be constructed.

From the results of the *Village Creek Watershed Improvement Strategy* the City retained the services of Schoel Consulting Engineers to further evaluate the Cotton Mill Branch of Village Creek, which is represented by the large red area on the map above, left and south of Village Creek in the eastern watershed basin. This drainage basin area is 3,286 acre’s that drains the Avondale, Crestwood, Forest Park, and Highland communities directly into Village Creek near Vanderbilt Road and Interstate 20/59. Not only has this area been determined to contribute higher than otherwise expected TSS pollutant loadings in Village Creek, but has also been recorded as an area of substantial flooding. Based on this study, the area experiences flooding from storm events as small as a 2-year return period. Using models already developed for the City in the Village Creek Watershed Management planning efforts, several drainage alternatives have been further recommended, including:

- ❖ 41<sup>st</sup> Street South Culvert Bypass Structure
- ❖ Railroad Convergence Bypass Structure
- ❖ Avondale Park Pond Detention



Furthermore and as pictured below, the consultant has been directed to consider also a TSS project reduction strategy that could be added in the lower drainage basin areas to intercept TSS loadings before discharging into Village Creek, which is located at the top of the map, from sub-basin areas depicted in brown, reds and yellow.



As can be seen, the areas in red and brown above can contribute as much as 2,000 to 2,700 pounds of TSS per acre while the areas in yellow and green can contribute less than 1,800 pounds per acre to as little as 613 pounds per acre.

Now that this study is completed, the City anticipates meeting with ADEM to convey the results of the final improvement strategy for Village Creek and to seek funding in support for significant water quality improvement projects as may be applicable to meeting those funding objectives. The final report is expected to go before the Greater Birmingham Planning Commission and City Council for adoption this calendar year.

#### ***U.S. Army Corps of Engineers Feasibility Study:***

In addition to the completion of the Village Creek Watershed Improvement Strategy, the City of Birmingham has also entered into an interagency agreement on June 9, 2016 with the **U.S. Army**

**Corps of Engineers** to restart the feasibility phase study of Village Creek, which was earlier authorized by the U.S. Congress in 1996. Ongoing at the present time are six alternatives for Village Creek to address long-standing flood control improvements, including:

1. High Flow Diversion at the airport
2. Upstream Detention at Municipal Golf Course
3. Modifications to Bridges and Culverts
4. Flood Prone Area Buy-Outs
5. Pocket Detention Areas with Recreation
6. Combination of Alternatives

Many of these alternatives are also planned to incorporate water quality benefits, among other benefits, to reduce project costs and improve the benefit/cost ratio needed for final project alternative selection. Work progress is ongoing at present and is on schedule for release of the draft Tentatively Selected Plan in October 2017.

#### ***Valley Creek Watershed Management Planning:***

The City of Birmingham retained the services of ARCADIS-US on September 27, 2016 to develop and implement refinement of its non-regulatory stormwater management program through the development of a new watershed management plan for **Valley Creek**. The effort will focus on project management, data collection, surveying, data processing, hydrology and hydraulic modeling for FEMA floodplain mapping, water quality modeling, and preparation of an existing conditions watershed management report. The work scope is broken down into 2-phases, with phase I being completed by May 2018. In association with this added watershed planning effort the City added two new U.S. Geological Survey discharge and flow recorders and water quality monitoring stations in Valley Creek at Avenue "W" (USGS 02461192) and at Center Street. (USGS 02461130) The addition of these



two gaging stations will be discussed further in the pollutant loading section of this report.

#### **FLOODPLAIN MANAGEMENT**

Floodplain Management continues to be a City strength with numerous ongoing projects during this reporting year, as follows:

**VILLAGE CREEK FEMA ASSESSMENT STUDY–ROEBUCK TO PLEASANT HILL ROAD – COLLEGEVILLE NEIGHBORHOOD BENEFITS (LOCUST FORK RISK MAP EFFORT):** The City received preliminary D-FIRM data for the Locust Fork Watershed Risk Map effort in March 2017. As a result of this restudy and remapping effort, a total of 454 structures were removed from the Special Flood Hazard Area of the Locust Fork Watershed which includes all of Village Creek, a very small portion of Valley and all of Five Mile Creek within the City’s Corporate Limits. With this reduction of properties in the floodplain, property owners will potentially be able to benefit from eliminated or reduced cost in flood insurance premiums and will potentially be able to complete renovation or construction projects without the additional time and costs associated with developing in a floodplain. More specifically, these property owners will reap an estimated combined annual savings in flood insurance premiums of approximately \$50,000 to \$100,000 which over the life of a typical 30-year mortgage equates to an estimated \$1.5 to \$3 million in flood insurance premiums savings.

**FEMA’S COMMUNITY RATING SYSTEM (CLASS 5 DESIGNATION):** Starting October 2017, the City will be a Community Rating System’s Class 5 Community. The City is the only Class 5 Community in the State of Alabama; ranks in the top 8% of CRS Communities in Region 4; and ranks in the top 7% of CRS Communities in the nation. Being the highest rated Community in Alabama, our flood policyholders will now see a

total savings of \$15,000 per property over a 30-year mortgage regardless of their individual risk. The City has been a participant in this program since 1993. This program rewards communities for going above and beyond the National Flood Insurance Program’s minimum standards. These rewards are provided in the form of flood insurance premium discounts.

**VILLAGE CREEK STREAM MONITORING SYSTEM ASSESSMENT & FLOOD FORECAST IMPLEMENTATION SYSTEM:** The Stream Monitoring System Assessment and Flood Forecast Implementation System for Village Creek Project is currently underway as part of the Silver Jackets Pilot Project in cooperation with the State Office of Water Resources, US Army Corps of Engineers, USGS, and the National Weather Service. “Silver Jackets teams in states across the United States bring together multiple state, federal, and sometimes tribal and local agencies to learn from one another in reducing flood risk and other natural disasters”. Through this team effort, the City of Birmingham is currently in the process of evaluating its existing stream monitoring system along Village Creek throughout Jefferson County and implementing a Flood Forecast System for Village Creek. This assessment will aid in the development and evaluation of the City’s water quality monitoring needs and in the development of a plan for the repair, rehabilitation, and addition of new equipment to make the system fully operational and beneficial to the communities it serves along Village Creek. The funding appropriated for this project is \$33,500 and the benefits of protecting life and property by preparing residents for a flood far outweigh the costs. The flood inundation mapping will be available to the public by December 2017.

**POST DISASTER RECOVERY PLAN:** The Post Disaster Recovery Plan will fulfill the City of Birmingham’s commitment to effectively and



efficiently implement recovery programs while maximizing Federal financial participation. It will incorporate the National Disaster Response Framework (NDRF) as the City standard for emergency recovery operations and establish the overall roles and responsibilities for emergency recovery operations, as well as the concept of operations for the City. The Plan is intended to be used in conjunction with established operational procedures, plans, protocols and planning processes that will allow the City to implement a more efficient recovery program while maximizing federal financial participation for future events. The funding obligation for this project is \$95,000; however, our Post Disaster Recovery Plan gives us an opportunity to achieve a more sustainable and resilient community after a disaster, a benefit which can save millions of dollars in long term recovery efforts.

**VALLEY CREEK INUNDATION MAPPING:** The Inundation Mapping efforts for Valley Creek Project is currently underway as part of the Silver Jackets Pilot Project in cooperation with the State Office of Water Resources, US Army Corps of Engineers, USGS, and the National Weather Service. Through this team effort, the City of Birmingham will use existing flood warning system to construct a rainfall runoff forecasting model. The model developed through this effort will be used to generate inundation mapping to provide a visual aid for making flood emergency response decisions during flood events. The funding appropriated for this project is \$100,000 and the benefits of protecting life and property by preparing residents for a flood far outweigh the costs. The flood inundation mapping should be available to the public early 2019.

**PROGRAM FOR PUBLIC INFORMATION:** The City of Birmingham participates in the National Flood Insurance Program (NFIP) Community Rating System which allows development of a floodplain

management program tailored to hazards, character, and goals. Under the CRS, a Program for Public Information (PPI) was created to continuously inform Birmingham residents about flooding and ways to address potential flood damage to their property. This plan included map information, tailored outreach projects including website changes and information distribution practices the City utilized for floodplain properties. The ultimate goal is to continue to educate and promote community resilience which is necessary to minimize flood damage. We understand that well-informed people make better decisions and will take steps to protect themselves and their property and are more likely to support local floodplain management efforts to protect the natural functions of their Birmingham's floodplain. This PPI plan helped increase our community class rating in the CRS, which will yield greater savings to flood insurance policyholders.

**VILLAGE CREEK PROPERTY FLOOD RISK REDUCTION ASSESSMENT:** The City is funding through the US Army Corps of Engineers Silver Jackets Program. The Silver Jackets program has been a key component to accomplishing the USACE Flood Risk Management Program mission, which emphasizes integration and synchronization of flood risk programs, projects and authorities, internally and in partnership with all flood risk management stakeholders. Responsibility for flood risk management in the United States is a shared responsibility among multiple federal, state and local government agencies, each with a complex set of programs and authorities. These agencies have many programs to assist states and communities in reducing flood damages and promoting sound flood risk management. Silver Jackets teams have demonstrated the effectiveness of a shared responsibility partnership for managing the flood risk life cycle and leveraging available resources at

the state level. The USACE proposes to collect structure inventory data to update the City's existing structure inventory for the Village Creek Watershed Master Planning and modeling efforts and for floodplain non-structural mitigation solutions and alternatives and for regulatory purposes.

**REPETITIVE LOSS AREA ANALYSIS:** Late 2016, City Council adopted the Repetitive Loss Area Analysis which is a City performed detailed analysis centered on the Insurance Service Office identified repetitive loss properties. The process included analyzing repetitive loss properties, topographic features, existing drainage projects, and other efforts across the City near repetitive loss structures to determine the root cause of flooding for these properties. This analysis resulted in the City designated a total of 32 repetitive loss areas. The identification and designation of repetitive loss areas will provide the source of flooding and possible techniques to reduce future flood damage on an area wide basis. The City is now considering up to 3 permanent Risk Reduction grant projects for Village Creek and Five Mile Creek as a result of this effort.

### **POLICY CONTROLS**

During this calendar year no existing policy control issues became evident and no new policy controls were either initiated or implemented. For example, the stream maintenance policy controls anticipated last year, after holding discussions with the ACOE and ADEM, have not been formally implemented. No progress toward new policy controls in this area was implemented, although this matter is being discussed during the Core Leadership Training conferences being held quarterly with the Department of Public Works.

### **REGULATORY CONTROLS**



### **ILLICIT DISCHARGE DETECTION & ELIMINATION (IDD&E)**

The City of Birmingham is required by the Federal Clean Water Act (Section 402(p)) through the National Pollutant Discharge Elimination System (NPDES), Municipal Separate Storm Sewer System (MS4) Phase I permit to implement an ongoing program to detect and eliminate illicit discharges into the MS4, to the maximum extent practicable (MEP). This program, at a minimum, consists of procedures for: (1) dry weather screening to identify IDD&E sources, (2) tracing and eliminating the suspected source of illicit discharge, (3) notifying the Alabama Department of Environmental Management (ADEM) of suspicious discharges from permitted facilities and/or other MS4 facilities, (4) public notification mechanism for reporting illicit discharges, and (5) a training program for training city staff in the administration of the program element.

Please recall, during last year's Annual Report; the City stated the receipt of a number of complaints about a potential illicit discharge that had a blue-green appearance and sewage smell that apparently had been originating from an outfall to Shades Creek near Elder Street (Water Quality Station SC05.5s). Stormwater Management began a pilot project, which consisted of surveying and



mapping of the sub-basin area near the problem to determine the possible location of an illicit discharge. In conjunction with the Alabama Department of Environmental Management (ADEM) and Jefferson County Environmental Services, the area for the illicit discharge was narrowed down to the Goo Goo Carwash site located at 7641 Crestwood Blvd. Birmingham, AL 35210. On November 10, 2016, Stormwater Management staff dye tested the facility's drain trap and sanitary connections which confirmed a direct connection to the City MS4 from the facility's drain trap. A letter of non-compliance was sent out on June 28, 2017 notifying the facility of the following:

- Complaints due to high levels of E.coli from a City outfall located near the bridge at Elder's Street
- Dye test confirming that the facility is discharging into a City MS4 near the facility which discharges near the bridge on Elder's Street (Water Quality Station SC05.5s).
- Discrepancies in the Notice of Intent submitted by the facility to ADEM

The City did not receive a response, within the required 30 days, from the facility detailing how they would address and eliminate the illicit connection leaving the facility's property and entering the City's MS4. Subsequently, a warning letter was sent on August 25, 2017 that stated the facility's non-compliance. On September 29, 2017, a response letter from the facility was received explaining how the facility no longer discharges to the City's MS4 and is now fully connected to the Jefferson County Sanitary Sewer System.

During this year's reporting period, city staff addressed a total of 25 new illicit discharges: 7-were detected and eliminated; 18-are on-going and 0-were turned over to ADEM.

Since adoption of the Stormwater Protection Ordinance (SPO), the City has begun program implementation. The process of the City's Stormwater Protection Ordinance (Ordinance No. 14-198) is to focus on preventing, locating, and correcting illicit discharges on Non-NPDES facilities while working alongside ADEM and the USEPA for NPDES permitted facilities. In the event that an illicit discharge is from a facility without an NPDES permit discharging into the City's MS4, the facility Owner/Operator will receive a verbal and written warning followed by a notice of Violation (NOV) if levels of compliance are not achieved. Any person receiving a NOV may appeal to the Appeal's Board within ten (10) days of receiving the violation to the City clerk's office. The Appeals Board will hold a hearing and issue a decision in writing no later than thirty (30) days following the close of the hearing. If the Owner/Operator continues to remain non-compliant, the City may seek to recover in a civil suit authorized by State law. In the event that the illicit discharge is from a facility with an NPDES permit discharging into a Water of the State, the City will notify and work with ADEM to achieve compliance. Because efforts made to establish an Appeals Board were unsuccessful during the last report year due to insufficient number of volunteers to serve on the appeals board, the City did not yet have a required appeals board in place by ordinance. The Law Department, however, was able to modify/amend Ordinance No. 14-198 (See Appendix B) and until the Stormwater Appeals Board has been created, they have advised staff to not process any further actions beyond a warning letter.



### **Post-Development Water Quality Treatment Controls Ordinance**

City Stormwater Management has recognized that management of stormwater citywide needs greater development controls. All new NPDES permits being issued to MS4 agencies are including a requirement that within 1-year from effective permit date a program to address the discharge of pollutants in post-construction water runoff to the MS4 from new development and re-development is required.<sup>iii</sup>

The City has retained the services of AMEC Foster Wheeler (May 31, 2016) to begin the process of developing a new post-construction treatment control ordinance. The first phase of the project began to frame a new post-construction ordinance for the City using City Staff guidance, which led to a first report that was included in last year's annual report. The final report for Phase I and summary of next steps, which included also a draft ordinance outline for City consideration, recommended in Phase II that the City:

- ◆ Implement a program development stakeholder engagement process
- ◆ Develop several ordinances drafts & a final ordinance

- ◆ Develop a draft & final stormwater management manual
- ◆ Develop & implement appropriate manual's & program supporting tools
- ◆ Develop & implement a long-term stakeholder engagement plan
- ◆ Develop & implement a stormwater facility management & tracking process

The City entered into a new contract with AMEC Foster Wheeler on October 4, 2016 to commence the final phase to develop a new Post-Construction Water Quality Treatment Control Ordinance and Program for the City. This phase of the project will fully develop the final post-construction storm water ordinance and related policies, processes, and procedures with integration of watershed master planning and GI/LID program strategies. Development of post-construction storm water design criteria and specifications, focusing first on GI/LID, then on traditional storm water methods, and including supporting design and plan submittal/site inspection tools. This process is being fully developed with two distinct stakeholder groups representing the technical team, which includes representatives from regional MS4 entities (e.g. SWMA) and leaders of the local development industry (e.g. Birmingham Alliance for Responsible Development). The final stakeholder meeting is anticipated for October 2017 and a final draft ordinance and draft technical manual in December 2017. The final ordinance and technical manual, representing Stormwater Management's final Stormwater Management Program Plan is expected for distribution to ADEM early in 2018.



### **Stormwater Construction Program (SEC)**

The management of the Construction Stormwater management program is within the Planning, Engineering and Permit Department, Watershed Division. The soil erosion program is mandated by the NPDES MS4 Permit issued by the State of Alabama and City Ordinance number 99-131. Permit applications, plans reviews and site inspections are tracked using the Tidemark permitting system.

The review of the soil erosion control best management construction plans (BMP) and the inspection of the construction sites for erosion control are under the supervision George Putman a professional engineer. Mr. Tommy Goss, QCI assists in the applications, BMP Construction Plan reviews, and the scheduling of site inspections. Mr. Chris Clayton, QCI and Eddie Fowler, QCI provide plan review support and the site inspections for the larger sites and for priority sites throughout the City of Birmingham. Other engineering inspectors assist with residential project inspections during peak construction periods. All site inspection reviews are performed in accordance with the “Alabama Manual for Soil Erosion and Sediment Controls”. Site inspections and Enforcements standards are in accordance

with the City of Birmingham “Construction Stormwater Inspection and Enforcement Standard Operating Procedures Manual”

During this reporting year FY17, the staff training has been a priority. Between October 1, 2016 and September 30, 2017 all of the Construction Stormwater staff have received erosion control continuing education training. Three have renewed certifications as qualified credentialed inspectors (QCI). Other Stormwater staff have also received erosion and sediment control training to provide cross-training and backup as may be needed.

During the FY17 period, there have been 219 Land Disturbance Permits issued by the City of Birmingham and 43 cases have been closed. 1146 site inspections were conducted of which 312 were in impaired watersheds. One hundred and eight (108) site inspections failed and corrective actions taken by the permittees to bring the site into compliance. One Notice of Violation was issued with the contractor bringing the site into compliance prior to formal actions taken.

All stormwater personnel routinely follow up on complaints through the City 311 complaint reporting system. This year six (6) soil erosion citizen complaints were received. All sites were brought into compliance and the citizens notified.

## STRUCTURAL CONTROLS



### Bertram A. Hudson K-8 School Bio-Retention System Project

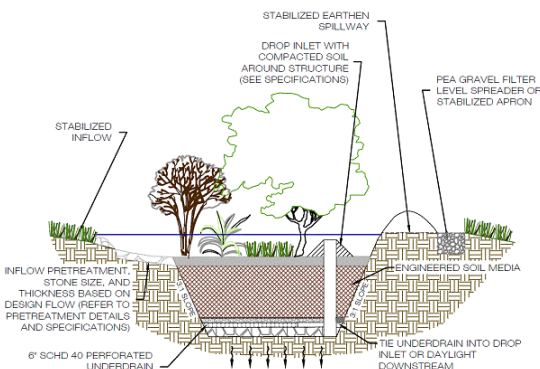
As stated in last year's report, the City of Birmingham Stormwater Management Unit applied for and was awarded a Five Star and Urban Waters Program National Fish and Wildlife Foundation Grant during this reporting cycle.

The Five Star and Urban Waters Program seeks to develop community capacity to sustain local natural resources for future generations by providing modest financial assistance to diverse local partnerships focused on improving water quality, watersheds and the species and habitats they support. The City of Birmingham and

partners submitted a project grant application to retrofit a portion of Bertram A. Hudson K-8 School with a bio-retention basin and pervious pavers in an associated parking area. Project activities include restoration planning and design, site maintenance, monitoring, outdoor learning, and community outreach. The project will provide a reduction in pollution to Village Creek, help control the volume runoff exiting the site, and create learning opportunities for the Birmingham City School System about stormwater management. The Project partners include Bertram A. Hudson K-8 School, UAB School of Engineering, George Washington Carver High School, Birmingham Department of Public Works, and Belgard Hardcastle, Inc.

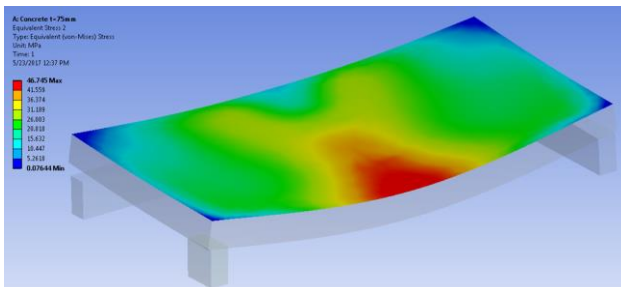
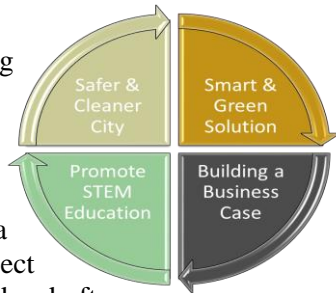


The total project cost is estimated to be \$84,548; the federal match, including funds from the Southern Company, total \$36,781. The project is expected to be completed in two phases. The first phase will consist of the construction of the retention basin and it will begin December 2017. The second phase will consist of the installation of pervious pavers in a section of the parking area of the project site. This phase is expected to commence in Summer 2018.



## PUT A LID ON IT

During last reporting period staff has worked through a preliminary portion of the pilot project and has completed a draft pilot project scoping document and a draft interlocal agreement for final execution. The City has also budgeted approximately \$600,000 over the next three-years until pilot project completion.



During this reporting period UAB has studied and tested many different composite material combinations and designs to be considered as the final product. There was also a study done on the current material and process used to make the standard concrete tops used today. Initiation of the video study in four frequently damaged areas process has begun.

Year	Main Tasks	Sub-Tasks	Months											
			1	2	3	4	5	6	7	8	9	10	11	12
Year 1	Damage Evaluation	Monitoring												
		Analysis												
		Evaluation												
		Selection												
	Materials Design	Sample Generation/Testing												
		Environmental Characterization												
		Preliminary design concepts												
		Scaled prototype/site evaluation												
		Material supplier chain investigation												

The chart above visualize year one of the project. Please see phase schedule below:

### Phase I

- ◆ Collect data on loading and operational conditions experienced by storm inlets

- ◆ Develop a process for the recycled composite materials

### Phase II

- ◆ Redesign the storm sewer inlet cover to provide superior durability
- ◆ Design an attachment to limit trash and debris entering the storm drain system
- ◆ Create a prototype for a QR reader code

### Phase III

- ◆ Finalize the material development and redesign of the inlet cover and attachment system in a cost-effective manner
- ◆ Complete a business plan

## DRAINAGE IMPROVEMENT PROJECTS



The City of Birmingham Engineering Department is responsible for the budgeting, design, engineering, and construction of the MS4 system. During this reporting period, the City designed 11 new drainage improvement projects, bid and awarded 1 drainage improvement project, and either implemented ROW research or constructed 13 new drainage improvements projects, Citywide. Project details are provided in Appendix B. The projects range in scope but are limited to within City rights-of-way and typically include curb and gutter work or associated storm sewer piping or ditch work as may be required. None of these projects were being constructed to address a water



quality problem within the City or an associated permit consent order.

### **WATER QUALITY MONITORING:**

**Highlights:** This reporting year represents the fourth full year of monitoring water quality using the new water quality monitoring strategy that was implemented by Stormwater Management on November 20, 2013. That water quality monitoring strategy was intended to identify existing pollution sources, the variability of the pollutant or pollutants being discharged into waters of the state, and where appropriate, the effect of effluent on receiving waters that may have an opportunity to cause there to be an exceedance of a narrative or numerical water quality standard as defined in Alabama code. The location of the City's monitoring stations in each watershed, both instream and screening sites, outfall locations, and the certified data collected to date since ADEM approved the new water quality monitoring strategy is provided with this report in Appendix C. During this period several overarching activities have dominated Stormwater Management's water quality monitoring program, including:

- ★ During this reporting period, Stormwater Management contracted with Birmingham Water Works Board to continue to provide analytical services.
- ★ Orthophosphate (mg/L-P) analytical measurements have been discontinued because the methodology being used provided unreliable results and for the City to alter field collection methods to better accommodate BWB methodology would have been too expensive for the city to adhere to.
- ★ pH discrepancies were apparent during the sampling event on June 13, 2017, which required an alternative sampling device be

used throughout the remainder of that sampling week.

- ★ USGS stream gaging stations have been installed in Village Creek and Valley Creek, which include variable combinations of stream elevation discharge water quality and rainfall. These stations can be found on the USGS Website as:
  - ✓ Station 02458148; Village Creek @ 86<sup>th</sup> Street
  - ✓ Station 02458502; Village Creek Near Pratt City
  - ✓ Station 02458190; Village Creek @ 50<sup>th</sup> Street
  - ✓ Station 02458350; Village Creek @ 24<sup>th</sup> Street
  - ✓ Station 02458450; Village Creek @ Avenue W, Ensley
  - ✓ Station 02461130; Valley Creek @ Center Street
  - ✓ Station 02461192; Valley Creek @ Avenue W, Ensley
  - ✓ Furthermore, a new USGS gaging station has been added at Shades Creek (SC05.5) at Elder Street Bridge. This effort is being done in conjunction with SWMA. (See Map on next page, bottom)
- ★ Field reconnaissance of the Shades Creek outfall continues during this period at SC05.5s as an IDDE evaluation and mapping (*see Major Findings* section)
- ★ Added a new screening site for Cotton Mill Branch on Village Creek at VIC07.0s. This screening site headwater is located at Avondale Lake. Stormwater Management suspects this location as the source of elevated TSS readings based on dry weather screening at that instream peaking location within the receiving



## City of Birmingham, 2017 Alabama

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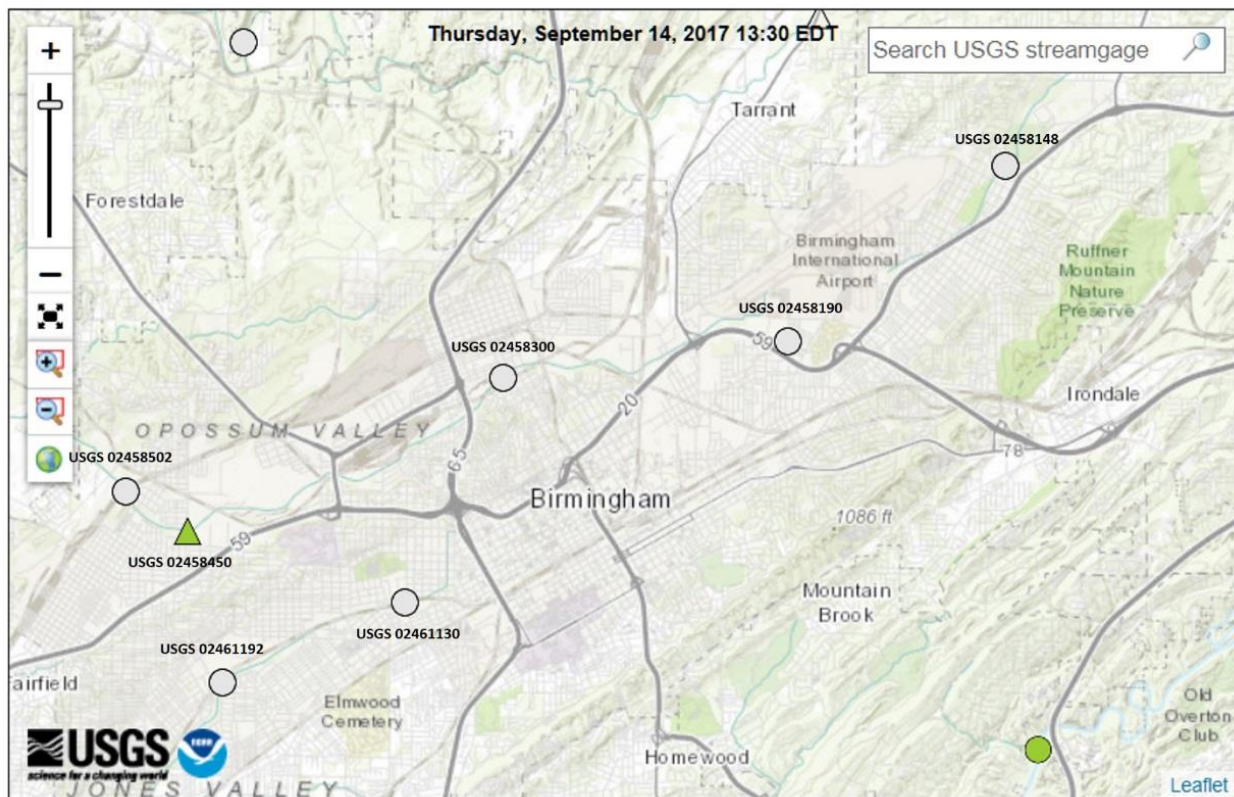
stream segment. This site will continue to be monitored into the future.

- ★ 2016-2017 *Summary of Unpermitted Discharges* report prepared by Jefferson County Environmental Services for Birmingham (See Appendix C), more than 12.8 million gallons of sanitary waste was discharged into Birmingham creeks and streams. The City continues to work with Jefferson County Environmental Services to address sanitary sewer overflows when discovered.

Finally, for purposes of reporting water quality data in this year's report, a longer period than what is required annually by the permit is included to provide a better understanding of trends and water

quality developments being observed. A decision has been made by Stormwater Management to average the previous year's data and compare it to the current permit year's data for individual streams, as has been done before. Therefore, whenever possible, a longer period of water quality analysis is provided along with water quality data observed during this reporting year. Overarching data review and reporting will be done for all streams, excluding screening sites, for all dates.

The City of Birmingham is located in the lower Appalachian Mountains in Jefferson County in central Alabama. Its corporate limits are bisected by the Appalachian Plateau (Cumberland Plateau) and the Valley and Ridge. The Valley and Ridge province in this area is characterized by limestone



valleys and resistant sandstone ridges that run parallel from northeast to southwest. Birmingham is located in Jones Valley, which is dominated by limestone derived carboniferous soils and karst topography having numerous natural springs. Village Creek, as well as other creeks and tributaries, originate from naturally occurring springs. Village Creek originates in the Roebuck area of Birmingham. The western part of Birmingham is partially located in the Appalachian Plateau and is characterized by hard sandstone shale and limestone at depth.

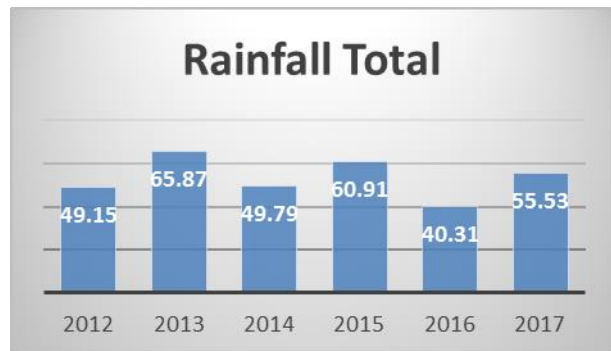


Soils in the Valley and Village Creek drainage basins in Jones Valley are in large part associated with limestone derived soils. Many of these carbonate soils have higher percentages of chert such as Bodine and Fullerton type soils (See USDA, NRCS. Web Soil Survey). The carbonate soils of this type have a higher percentage of chert

and the soils lack structure and are not very well consolidated. Erodible soils such as these wash more readily during a rain event and are more difficult for vegetation to become established on hard siliceous cherty soils.

On slopes, these soils wash down into the tributaries, drainage-ways and creeks to deposit silt and chert into the MS4 and on, into the creeks. See the picture, left of Village Creek at VIC01.6s (Roebuck Golf Course) for examples of the sedimentation occurring as a result of erosive velocities in association with rainfall.

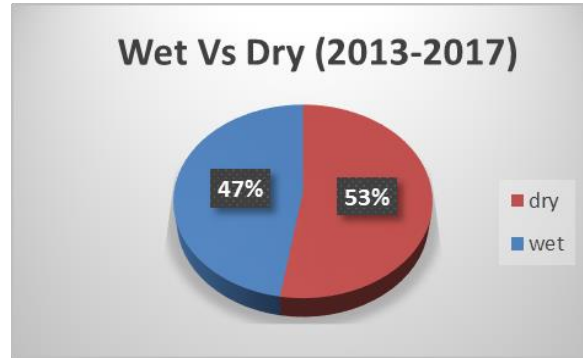
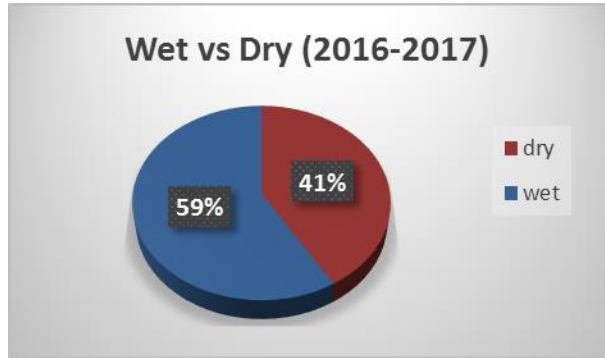
Even though carbonate soils of this nature can be found throughout the Greater Birmingham area they are more prevalent in the eastern part of Birmingham.



**Rainfall:** Rainfall ranged between an annual low of 40.3” in 2016 to a high of 65.9” in 2013. The average annual rainfall during the 6-year period was 53.6” year. See figure above.



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During this reporting period (2016-2017) Alabama and portions of the southeast was in a serious drought condition. The red/brown highlights on the maps at the bottom of the page demonstrate that the drought condition prevailed, peaking in October 2016 and ending in June 2017.

Recalling the *City of Birmingham Water Quality Monitoring Strategy for Alabama Department of Environmental Management (October 4, 2013; Pg. 14)* the sampling focus was intended to be during periods of dry weather flow, especially where stream segments had known impairments and outfalls greater than 36". For the purpose of water quality monitoring by the Stormwater Management instream team, dry weather reporting is represented as less than 0.10" of rainfall preceded by 72 hours of antecedent dry conditions.

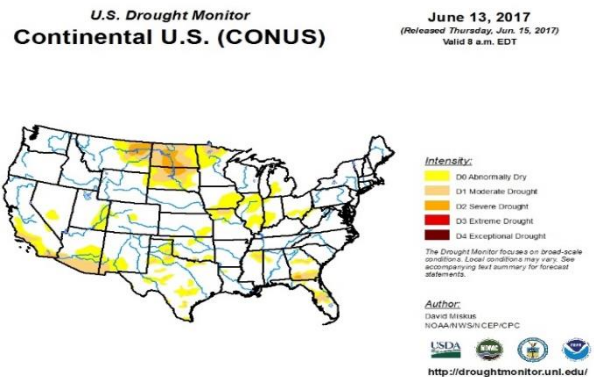
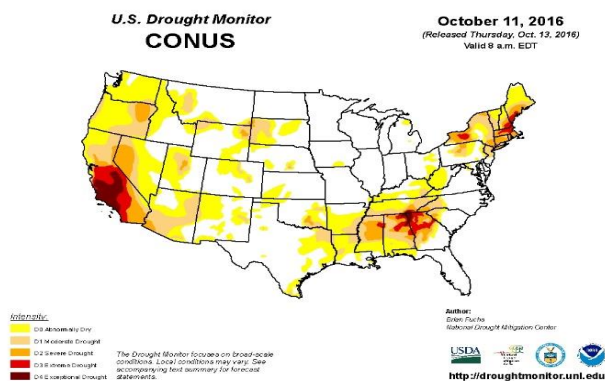
All other rainfall Conditions greater than 0.10" by

definition are considered wet.

In spite of the overwhelming drought conditions in 2016-2017, water samples were more often collected during wet weather conditions than during dry period conditions. See figure on the top left.

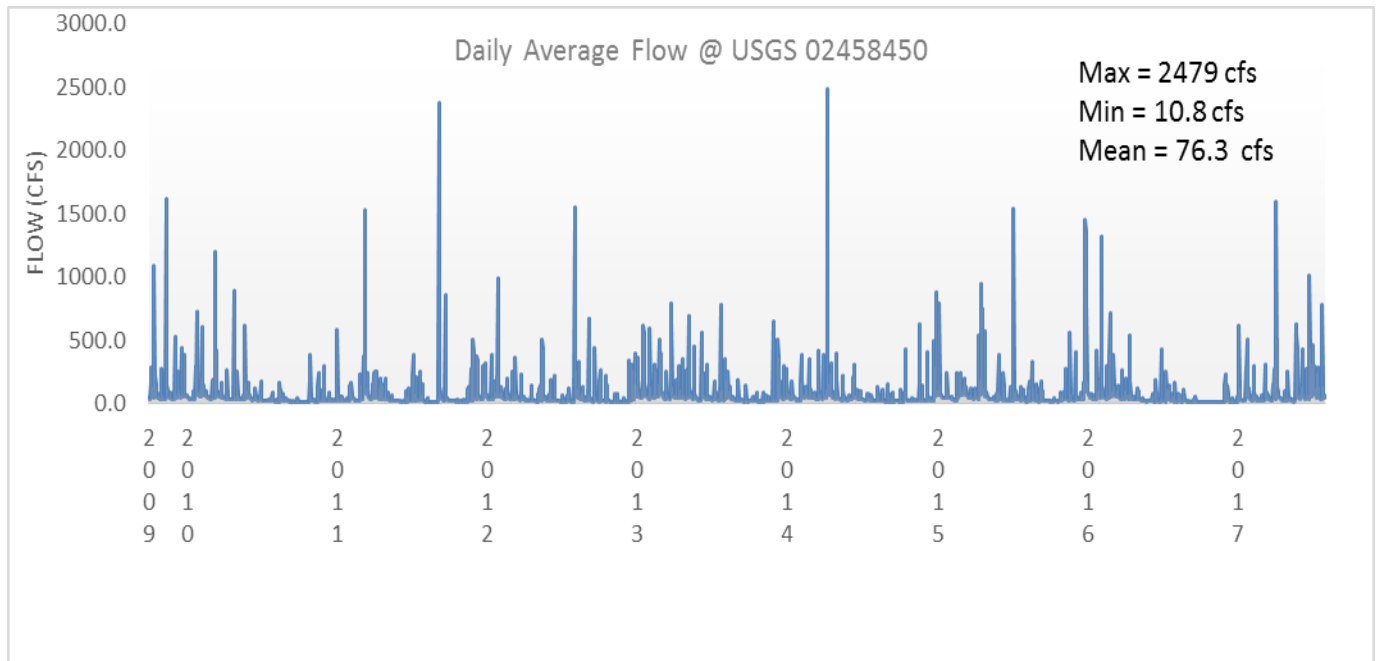
By contrast rainfall during the entire 4-year study period more often represented sampling during dry conditions than wet conditions. See figure on the top right.

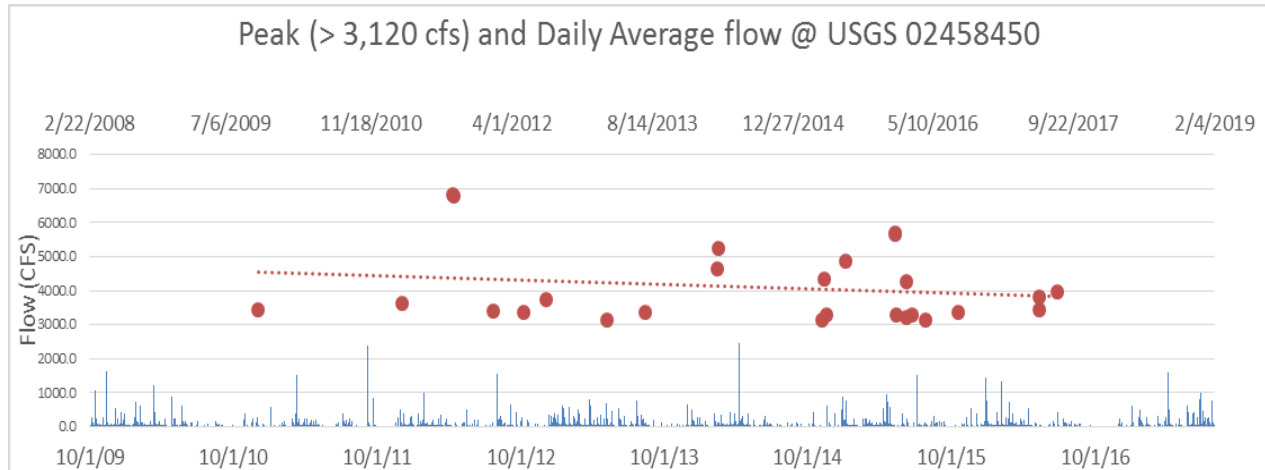
**Flow:** The Alabama Department of Environmental Management, Water Quality Branch, published in 2005 its Final Total Maximum Daily Loads (TMDL) for Village Creekiv. That document reported Maximum Daily average flows at Avenue "W" to be 3,040 cfs. Minimum daily flows were 9.3 cfs and average daily flows were 79.2 cfs.



These measurements were taken during the period between 1988 and 2001.

Please note the figure below on this page. During the period between 2012 and 2017 daily average flow measurements reported by the USGS at Avenue “W”, Ensley were strikingly similar to the daily average flow data earlier reported by ADEM. Referencing the figure below from data provided by the USGS for the same location, maximum daily flows averaged 2,479 cfs. Minimum flows were 10.8 cfs and the average daily flow measurement was 76.3 cfs. The minimum daily average flow of 10.8 cfs occurred on October 4, 2010 and the maximum flow of 2,479 cfs occurred on April 8, 2014. As can be seen, Village Creek flows have been mostly consistent with other observations by ADEM and by the USGS.



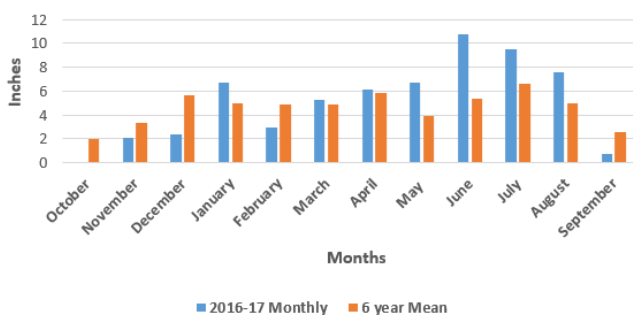


Depicted in the chart above is daily average flow data provided by the USGS at gage #02458450 – Village Creek @ Avenue W, Ensley. The flow record begins approximately on October 1, 2009 and ends on July 31, 2017. Included on this chart in RED dots are peak flows greater than 3,120 cfs, which in reference to the TMDL for siltation (ADEM, 2005) represents the 1.5-year recurrence interval for peak discharge.<sup>v</sup> All recurrent flow events that exceeded a peak discharge of 3,120 cfs are also included in the chart above along with its associated trend line. The downward trend line depicts a reduction in extreme flows during the period 2010-2017. This reduction in the peak flows during this study period is in response to the

lower rainfall conditions throughout much of 2016 and into early 2017. Had the drought recovery near the end of the year not have been as wet as it was, the drought recovery could have been even lower than what it was. The annual rainfall that occurred in June, July, and August helped considerably to recover from the very significant drought period. See figure at lower left.

**Water Quality:** Data collection methods used during this study for water quality were based on the approved 2013 Water Quality Monitoring Strategy. Surface-Water samples have been collected since 2013 bimonthly (i.e. 2-month intervals) at water quality monitoring stations described earlier. See Appendix C. An additional water quality station was added at VIC07.0s (Cotton Mill Branch) due to instream peaking conditions observed at VIC07.0 and VIC08.1 during periods of dry weather screening. All water quality stations conform to a nomenclature requirement with screening sites adding an “s” to the mileage destination with upstream being the smallest number and downstream being the largest. Each surface-water grab sample was measured in the field by either a Hydrolab® or YSI Multimeter, which measured: Temperature, pH, Dissolved Oxygen, Barometric pressure,

Mean Monthly Precipitation (2012-2017) vs  
 Monthly Precipitation (2016-2017)





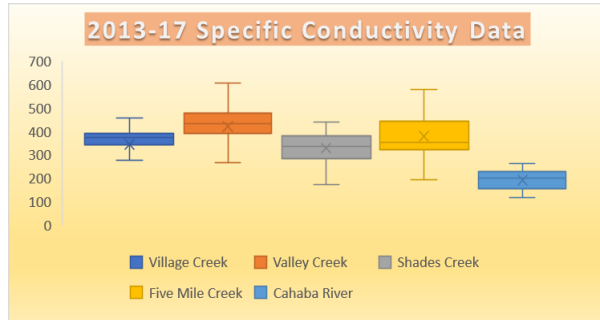
conductivity, and ORP. All other parameters were measured by the Birmingham Water Works Board or other field devices (e.g. turbidity meter, Stormwater Test Kit, and test strips).

This section also includes data analysis and review for water quality found in Results and Discussion. Specific methods used to interpret the data include graphical tools and statistical methods. Graphical tools include bar, scatter, and line charts, which depict the total analytical period of history since 2013 and the most recent data period (i.e. 2016-2017) in contrast. Bar -whisker plots are used to display the variability of select constituents over time. Included on each bar-whisker plot is a median line, the mean depicted as an “x”, the 1st and 3rd quartile data range, and a maximum and minimum reasonable value. Reasonable values are generally accepted as the statistical 50% of the data set when the 3rd quartile is subtracted from the 1st quartile and the difference is multiplied by 1.5 to establish the upper and lower reasonable value fencesvi for considered stream constituents. The data includes both instream and ORI data collected during the study. This data does not include outlier data beyond the statistical data fence boundaries. The data also does not reflect discrete flow or rainfall conditions. Organic Nitrogen was computed as the difference between TKN and Ammonia. Inorganic Nitrogen was computed as the sum of Ammonia, Nitrate, and

Nitrite. Metals data were computed based on the states antidegradation code and associated with measured hardness taken at the time of sample collection.

The chemistry of surface waters is based on the interactions between rainfalls, groundwater, rock and soil conditions within each watershed. For the most part concentrations are reported in mg/L. Stream water chemistry varies with flow and rainfall conditions, which can vary in each watershed and under differing stream flow conditions. Stream water base flow is predominately from ground water flows and active industrial process during low flow periods. During and after a storm event stream water is a mixture of rain water and nonpoint source surface runoff, shallow subsurface flow, industrial discharge water, and groundwater discharge. Precipitation tends to dilute the major ion composition while human activity can further alter a streams water chemistry, including elevated levels above background.

**Results and Discussion:** The entire certified data record of Birmingham’s Monitoring program is included in Appendix C. This section will describe the overarching water quality in all City watersheds, followed by individual creek analysis.

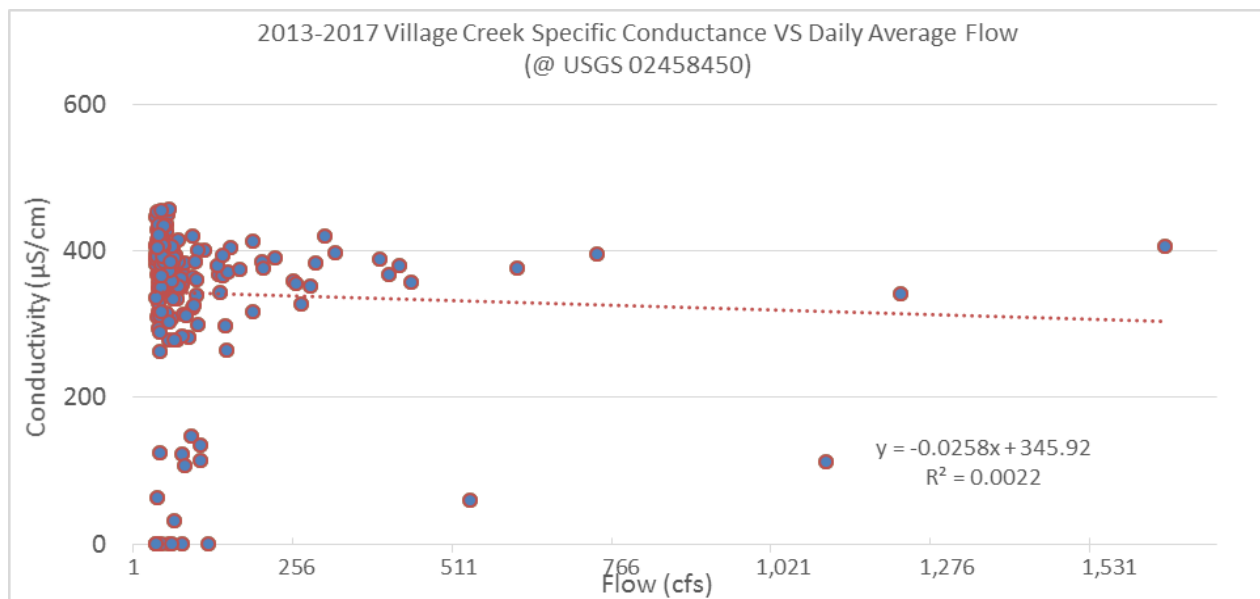


During the nearly four-year study the City of Birmingham Stormwater Management Section has relied upon specific conductivity as a measure of stream variability and potential sources for impact. The figure above depicts individual stream variability, which includes the maximum reasonable value, median, mean, minimum reasonable value, and the 1<sup>st</sup> and 3<sup>rd</sup> quartile data. The overall specific conductivity mean concentration for all five creeks is within the range of 200 to 500 ( $\mu\text{S}/\text{cm}$ ), with the Cahaba River having lower specific conductivity than the other four creeks. Valley Creek appeared to have the greatest mean concentration. Village Creek

appeared to have the least data variability among all City watersheds.

Based on the figure below, the overall specific conductivity dataset demonstrated a slight inverse correlation and having an  $R^2$  value of 0.0022. The data included here represents flow and specific conductivity data collected at USGS 02458450 @ Avenue W, Ensley. The water quality data includes only the instream water quality data at VIC13.0 during the four-years since 2013. This graph represents only instream data; no screening sites were included.

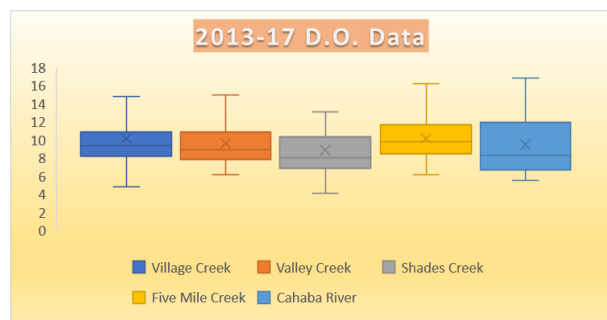
From the rainfall data presented earlier, during the dry period, which is represented as rain codes 1-3 in the City's data record, the mean specific conductance during those low rainfall conditions was only slightly higher at 348.9  $\mu\text{S}/\text{cm}$  than during wet periods, which is represented by rain codes 4-7 and was 328.2  $\mu\text{S}/\text{cm}$ . The maximum conductivity recorded during the dry period was 449.0  $\mu\text{S}/\text{cm}$ , which was only approximately 2  $\mu\text{S}/\text{cm}$  higher than the maximum specific conductivity measured during the wet period



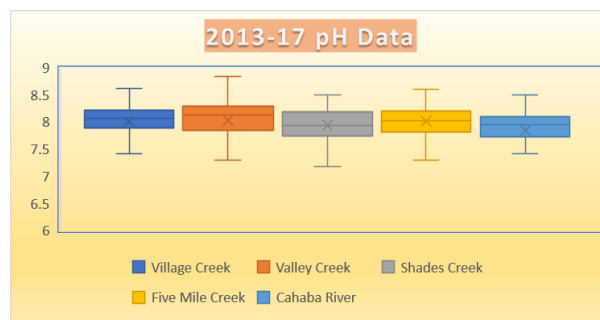
(447.1  $\mu\text{S}/\text{cm}$ ).

Therefore, and based on the period of record since 2013, instream specific conductivity appears stable and only slightly lower as flow conditions increase due largely to rainfall conditions. Therefore, inflow deviations from the instream condition should be considered as an illicit discharge when concentrations of specific conductivity in the illicit discharge are increased or decreased beyond background levels in each creek.

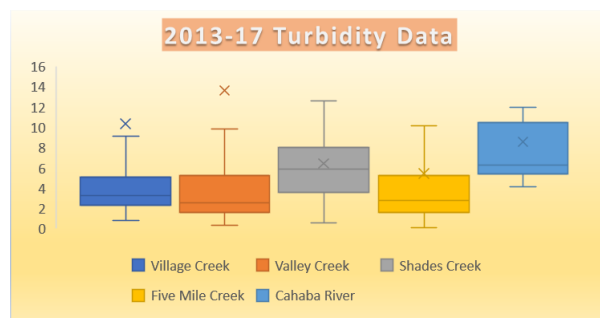
The following bar-whisker graphs represent field parameter conditions for each watershed within the City of Birmingham.



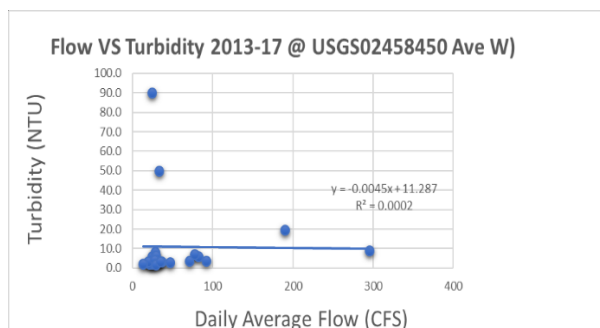
The figure above depicts dissolved oxygen for each creek since 2013. As was described earlier in this section each line within the box plot represents the median of each box plot while the “x” represents the mean. This figure documents that the Dissolved Oxygen concentrations for each watershed tended to be elevated. With the exception of the Cahaba River, the difference between the 1st and 3rd quartile appeared similar and tightly grouped around the median, whereas the Cahaba River demonstrated a greater variability.



As will be discussed later in the anti-degradation section all pH concentrations did at some point exceed the state standard of 8.5 pH units. The highest pH concentration for the Cahaba River did not exceed 8.5 pH units but did reach 8.5 pH units on at least one occasion. This is likely related to higher concentrations of calcium carbonate associated with karst topography in the Birmingham region.

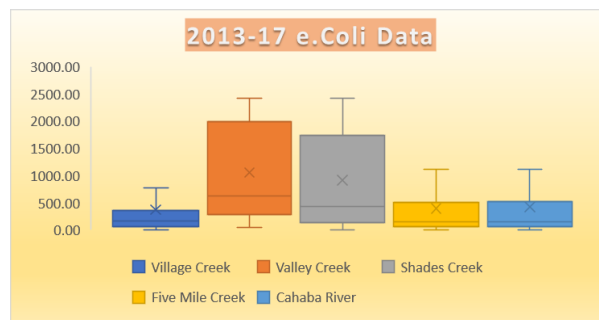


Consistently through this sampling period mean concentrations of Turbidity (NTU) exceeded median concentrations and in 3 cases even exceeded the third quartile. In the case of Village and Valley Creeks the mean concentrations even exceeded the maximum reasonable value fence, which indicates a considerable number of turbidity values exceeded the statistical 50% of the data.



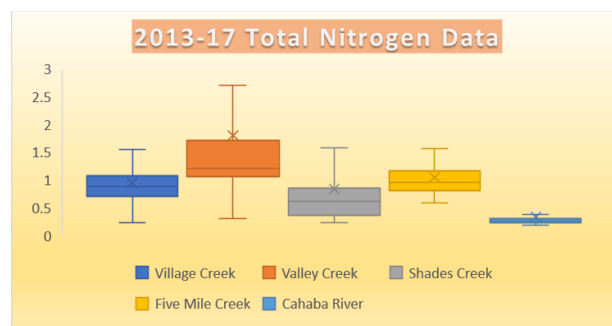
The chart above reflects mean daily flow obtained from the USGS at dates concurrent with stream sampling dates in Village Creek. Turbidity data is measured in the field with a Oakton Turbidity Meter. The period of record shown above represents 23 data points. For this study duration turbidity was weakly correlated with daily average flow. Most of the data fell within a range bounded by < 100 cfs flow and < 10 NTU turbidity. This trend though has not been observed in the field as the picture below of high flows in Valley Creek at station VC04.9 documents. This suggests that insufficient data presently exists to adequately describe what is being observed in the field under high flow conditions.

The Birmingham Water Works Board (BWVB), Envirolab reports high E.coli concentrations as



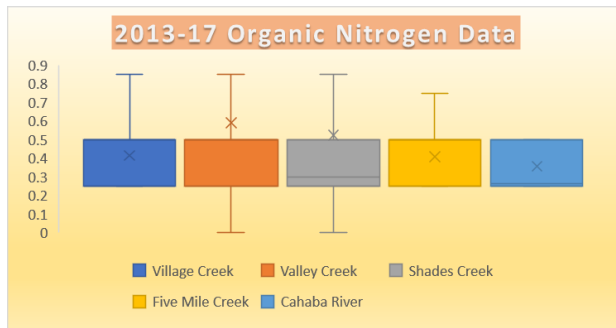
>2,419.6 under the current analytical methodology. The reader is reminded that high values greater than the maximum reasonable fence are not shown on this chart when E.coli values exceeded the statistical 50% of the data.

Overall E.coli data shows a greater range of values and high concentrations in Valley and Shades Creeks and the lowest in Village Creek. The values reported are in cfu/100mL units and are not reported as the geometric mean. The average concentrations for each stream is reported as greater than the median concentration suggesting that each stream has generally high E.coli concentrations.

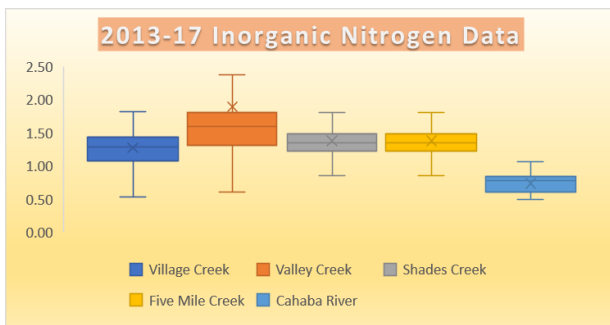


The reader is reminded that Total Nitrogen includes both inorganic and organic constituents. Inorganic Nitrogen is the sum of Ammonia, Nitrite, and Nitrate concentrations. Organic Nitrogen is the difference between Total Nitrogen and Ammonia concentrations. From the figures

above it appears that all watershed streams throughout Birmingham can be considered largely inorganic.

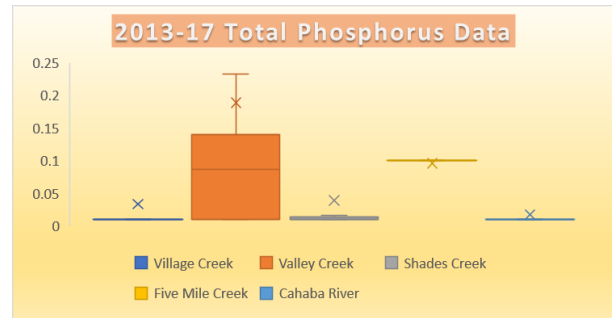


Valley Creek has the greatest Total Nitrogen variability while the Cahaba not only has the least variability but also has the lowest Total Nitrogen concentrations.

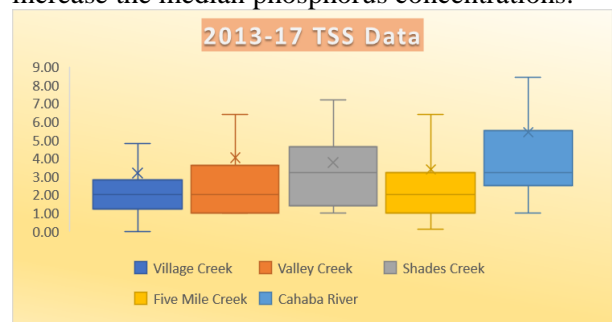


Considering the Organic Nitrogen chart above, all 5 watersheds show a consistency with the 1<sup>st</sup> and 3<sup>rd</sup> quartile while having a low range difference.

Based on comparison of the 3 Nitrogen graphs the Inorganic Nitrogen is reflective of the Total Nitrogen while the Organic Nitrogen remains consistent among all 5 watersheds. The Inorganic Nitrogen concentrations appeared proportional and largely the major component of Total Nitrogen.

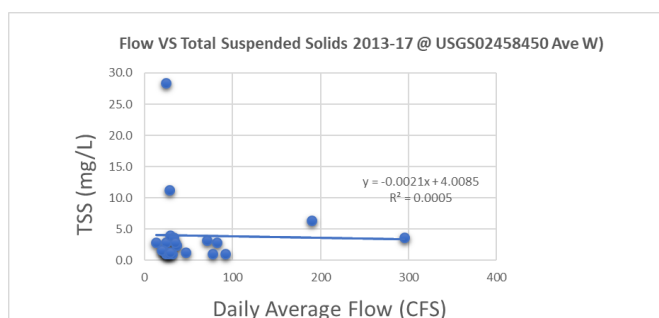


With respect to Total Phosphorus in Valley Creek, the figure above demonstrates the greatest variability and highest concentrations reported. Although Five Mile Creek has higher median and average concentrations of Total Phosphorus than Village, Shades, and the Cahaba River, it has low variability; of all watershed streams in Birmingham its Total Phosphorus average concentration was less than the mean, suggesting either many low phosphorus concentrations or very few high concentrations but sufficient to increase the median phosphorus concentrations.

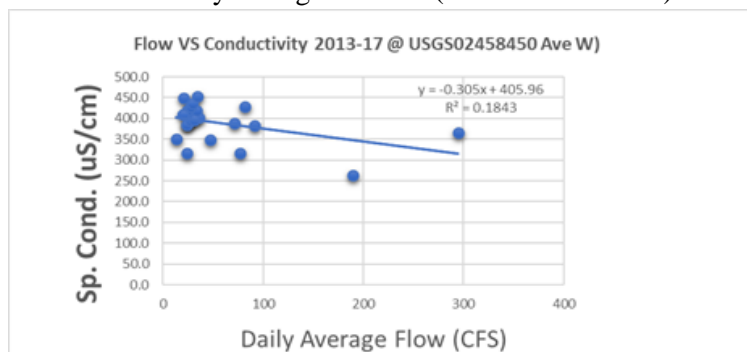


The figure above documents Total Suspended Solids concentrations (TSS) (mg/L) for all streams in Birmingham. Interestingly, the Cahaba River shows the highest reasonable value fence. It is particularly notable that the TSS concentration at the upper end of the reasonable value fence was still < 10.0 mg/L with all City streams having low TSS levels.

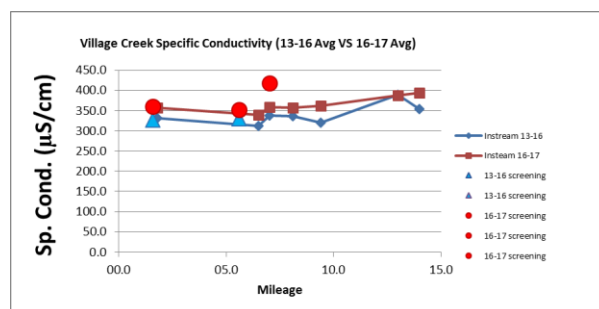
Again, as was seen earlier with Turbidity, TSS was poorly correlated with daily average flow. This similarly suggests that insufficient data exists to document a stronger correlation.



**Village Creek:** This reporting period now provides the opportunity to consider four-full years of water quality monitoring in Birmingham's creeks, starting specifically in Village Creek. The foundation of the City's instream water quality monitoring program has been to identify instream peak concentrations of specific conductivity that would lead one to conclude that at least in that flowing stream segment(s) there is an influence from another dissimilar water source, whether from an incoming tributary, an outfall discharge, or from a groundwater seepage influence. The reason for that continues to be foundational to the program since flow and specific conductance are inversely correlated, although weakly so, as evident by the figure below ( $R^2$  value of 0.1843).



During this four-year period, specific conductivity has consistently averaged 345  $\mu\text{S}/\text{cm}$ . The highest specific conductance recorded to date was 457  $\mu\text{S}/\text{cm}$  and was recorded on July 22, 2014 at station VIC05.6s during a moderately high rainfall period. Average annual rainfall between November 2013 and 2016, inclusive was 53.6". By comparison, during this study period, average annual rainfall was 47.9". As was stated earlier in the rainfall discussion section, this study year was dryer than previous years and as was depicted earlier also was equally distributed between wet and dry sampling conditions.



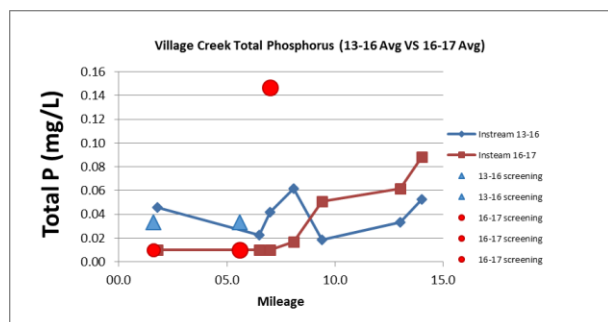
Specific Conductivity during the current period of this study had a low of 60.7  $\mu\text{S}/\text{cm}$  on January 8, 2017 at VIC14.0. The highest Specific Conductivity during the same reporting year was 456  $\mu\text{S}/\text{cm}$  recorded on June 14, 2017 also at VIC14.0. However, unlike last year report wherein it appeared as though lower Specific Conductivity indicated, "a measure of diluted major ion composition as a result of significant rainfall" and this year just the opposite was observed. Although the highest Specific Conductivity was recorded during a low rainfall day in June of 2017, the City was coming out of a significant period of drought wherein it is believed high concentrations of Specific Conductance would have been the result of groundwater inflows, which are presumably higher in dissolved major ions. According to the USGS in 1990, specific conductance from 24 wells and 1-spring in Jefferson County ranged

from a low of 40  $\mu\text{mhos/cm}$  to a high of 1,225  $\mu\text{mhos/cm}$  with a median value of 211  $\mu\text{mhos/cm}$ .<sup>vii</sup> Sampling in January 2017 occurred during a significant rainfall event and although Jefferson County was in the middle of a significant drought period, it would appear that rainfall event was sufficient to have contributed to the lowest specific conductance of the year (60.7  $\mu\text{S/cm}$ ). With the exception of the drought condition and the apparent influence of groundwater, it continues to appear that conductivity and rainfall are similarly proportional as was described last year.

During this reporting period, Specific Conductivity was essentially the same as has been since monitoring in accordance with the new methods begun in 2013. That is not only true relative to time but also for each in stream station along Village Creek from the headwaters to the downstream most station in the City of Birmingham. That same trend was also similar for two of the three screening sites in the first six miles of stream inflows. Only at a new screening site (VIC7.0s) at the confluence of Cotton Mill Branch with Village Creek has the inflow to Village Creek displayed higher Specific Conductivity levels.

This increased inflow of Specific Conductivity appears to have led to the slightly elevated Specific Conductivity level at stream segment VIC7.0 and immediately downstream. As a result of this inflow, which continues even during dry weather conditions, the City has elected to add this station (VIC7.0s) to its sampling regime on a permanent basis. The new VIC7.0s at Cotton Mill Branch was sampled for Specific Conductivity first on June 14, 2017 and at that time had a Specific Conductivity level of 418.3  $\mu\text{S/cm}$ . A sample was also taken at the headwaters of Cotton Mill Branch, approximately 2-miles upstream at Avondale Lake on the same day. Specific

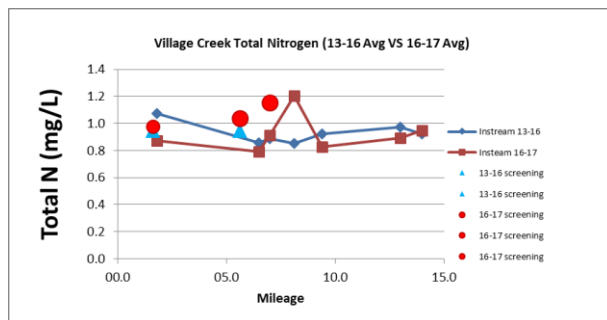
Conductivity at Avondale Lake was 414.3  $\mu\text{S/cm}$ , which was only slightly lower than the outfall at Village Creek. Since Avondale Lake is primarily spring-fed, it is presumed that the water quality in the Cotton Mill Branch as it courses to Village Creek will largely resemble a ground water influence from the spring at Avondale Lake. However, with time and continued monitoring, that may change, particularly for zinc as this sub-basin has a number of electro-plating industries within the sub-basin.



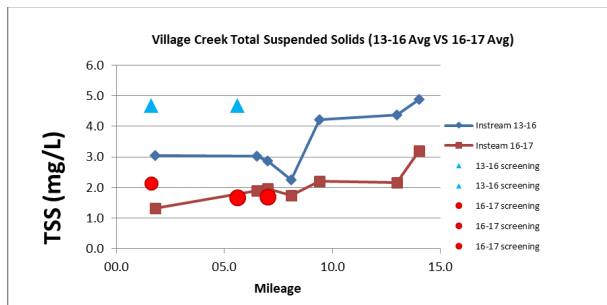
Average annual Total Phosphorus (T.P.) for 2016 - 2017 (In **RED**) and for 2013-2016 (In **BLUE**) is shown in the figure above. During the period 2013 to 2017 the average annual phosphorus was 0.06 mg/L, including Screening Sites. During the period 2013-2016 and even during the period 2016-2017 the stream tended to increase in total phosphorus midway between flow into and out of the city apparently as it resulted from the influence of Cotton Mill Branch (VIC07.0s). To date, Cotton Mill Branch has averaged more than double the T.P. concentrations recorded. See figure above. This topic was discussed earlier in this document, resulting in the Screening Site addition of Cotton Mill Branch.

Of particular interest, this year though is the fact that the data collected during this year's reporting cycle demonstrated average T.P. levels downstream from VIC08.1 being greater than the average of previous years. It is believed that

drought conditions and persistent flows from the Avondale Spring/Lake source influenced those levels.



Annual average Nitrogen was essentially the same leaving the city this year as the combined three-year averages. The major spike noted at instream station VIC07.0 appears to be influenced by VIC07.0s for this years reported data. See figure above.



Total Suspended Solids (TSS) in Village Creek this year were lower in concentration than the previous four-year average of monitoring. Interestingly enough, TSS levels at Cotton Mill Branch (VIC07.0s) were also low and appears to have influenced the downstream stations at VIC07.0 and VIC08.1. During 2016-2017 VIC07.0 had an average TSS concentration of 2.0 mg/L. Flowing into Village Creek at this intersection with the creek was Cotton Mill Branch having an average TSS concentration of 1.7 mg/L. It has been observed that full mixing of

Cotton Mill Branch and Village Creek does not occur until VIC08.1. At VIC08.1 during 2016-2017 the average TSS concentration was the same as Cotton Mill Branch at 1.7 mg/L. Assuming this same condition is typical that could explain the previous year's results while sampling at VIC07.0s did not occur.

**Village Creek Loading Analysis:** Total suspended solids (TSS) mass concentrations were measured from grab samples within Village Creek, placed on ice, and returned to the Birmingham Water Works Board laboratory for analysis. No flow measurements were made during this reporting period in the field; rather City Stormwater Management staff relied on continuous flow measurements afforded by two U.S. Geological Survey gages. One gage is located at 86th Street (USGS #02458148) near Roebuck Springs, the headwaters of Village Creek in Birmingham. The other is located at a railroad trestle near Pratt City (USGS #02458502). The real-time USGS data can be found on the USGS website; [USGS Water Watch](#) using the station ID's provided above. The difference between the load analyses from the two sites represents the net TSS load generated by the City's MS4 and contribution from private point source contributions.

Industrial point source information is included in this report only to illustrate better the contribution of the City's MS4 on the water quality in Village Creek. Therefore, industry loadings are combined into one measure. Industrial nonpoint stormwater sources may have been included this year as a point source and is delineated also as a point source of water for this report. Otherwise, those industries nonpoint stormwater sources, which may otherwise not be reported would be represented in the public MS4 system data.

Among the numerous NPDES permitted facilities in the Village Creek watershed only those listed earlier in this report were considered for further



loading consideration. Industry loading analysis was obtained from the monthly discharge monitoring reports provided to ADEM and assembled from the ADEM e-file website. Those industries included:

- ◆ Nucor (Permit #AL0003735)
- ◆ ACIPCO (Permit #AL0029378)
- ◆ SMI (Permit #AL0001554)
- ◆ Wade Sand & Gravel (Permit #AL0025194)
- ◆ Birmingham Airport (Permit #ALG140453)

Industries such as McWane, Industrial Chemicals, and Sloss Industries are not included because their discharge either no longer exists or they discharge to a different watershed.

In the City of Birmingham's Water Quality Monitoring Strategy for ADEM, October 2013, the City established a strategy to measure performance. That strategy had its basis in the ability of the City to demonstrate the reduction of annual total suspended solids loadings.<sup>viii</sup> The total suspended solids constituent was selected as the measure of performance due to the fact that sediment loading in Birmingham is a particular stream impairment problem. To focus on reducing instream peak concentrations of total suspended solids was anticipated to result in a load reduction of solids leaving the City of Birmingham and an overall improvement of stream water quality. Similarly, to last year, the following equation represents the formula used to compute the daily load this year:

$$Li = Qi \times Ci \times K$$

Where for the MS4:

Li = Average load in metric Tonnes per day based on USGS reported average daily discharge (cfs) and average daily mass concentration (mg/L) of a measured constituent.

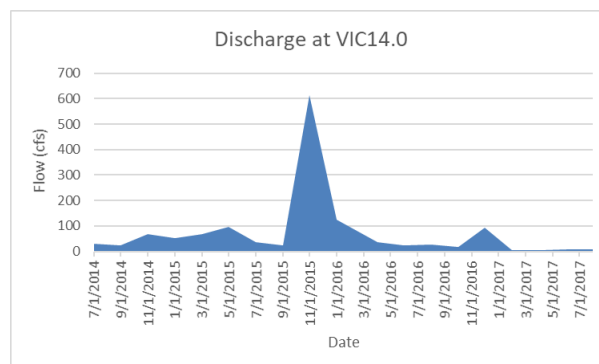
Qi = Average discharge in Cubic Feet per Second (cfs) for discharges occurring concurrent with all sampling dates

Ci = Average TSS mass concentration in mg/L for all sampling dates

K = 0.002 correction factor for unit conversion from (ft<sup>3</sup> – mg)/ (sec – L) to metric Tonnes per day

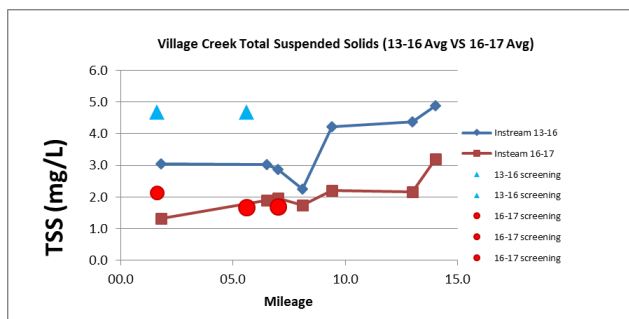
Given the period of record now extends well beyond one-year, the decision was made to report the data as it was captured, as daily data to improve the accuracy of reporting. Furthermore, data collected from State DMR results, when reported by industry in some cases reported their flow in million gallons per day (MGD) and constituent concentrations in pounds per day. In those cases, flow was converted to cfs and constituent concentrations to mg/L and the MS4 loading formula was used.

During this monitoring period flow increased substantially in late 2015 and early 2016 as a result of two large rainfall events. As was earlier discussed the period of drought is also noticeable throughout 2016-2017 See figure below.



As a result, this year it has been determined that there is not a strong correlation using either the Pearson product moment ( $r=0.21$ ) or the coefficient of correlation ( $r^2 = 0.21$ ) between stream flow and Total Suspended Solids at Station

VIC14.0 where stormwater exits the City of Birmingham.

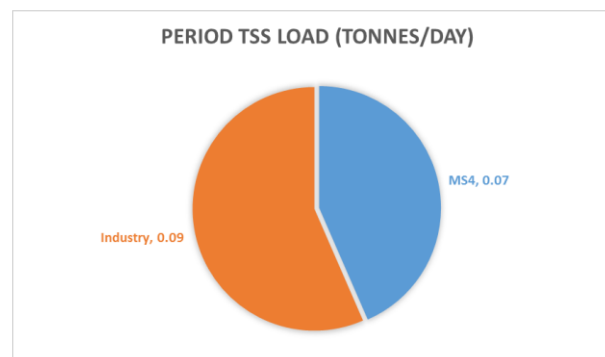


The previous year's TSS concentrations, demonstrated in the figure above, were less than the previous four-year average, which was predominantly the result of drought conditions and the corresponding low flows in Village Creek at station VIC14.0. Therefore, this reporting year can be considerably dryer than previous years.

The total volume of water leaving the City at Station VIC14.0 during the year between 2016 and 2017, inclusive, was 191 billion gallons. This volume is reportedly different from last year because it reports the daily data for the whole year where last year only totaled the mean daily flow at the time of sample collection. This figure represents the combination of water entering the City from the headwaters (0.59 billion gallons) at station VIC01.8 and the remainder of the nonpoint sources generated by the very large area of the watershed from Birmingham (30,292 acres). Overall, the TSS data ranged from a low of <0.1 mg/L (VIC14.0/December 2016 & April 2017) to a high of 9.6 mg/L (VIC14.0/October 12, 2016) during this reporting year.

Instream pollutant loadings were computed based on daily flow data collected at Stations VIC01.8 and VIC14.0 by the USGS during the same time period as water quality samples were collected. Water quality mass concentration data was also collected at the same sites bi-monthly (i.e. every

two months). As can be seen in the figure above, the City's nonpoint source contribution to the average daily TSS load into Village Creek is comparatively less than the Industry point source contribution.



Different from last year the net load of TSS, the difference between the load at VIC14.0 and VIC1.8, was approximately 0.07 Tonnes/day. The net TSS load is the contribution from the 30,292-acre drainage basin representing the City of Birmingham's nonpoint source contribution area within Village Creek. The load difference represented by this figure, when compared with last year's load is less than that of industry. The contribution from those industries considered in this report, which also provided discharge monitoring reports to ADEM, were combined together for the same time period to represent the total industry load.

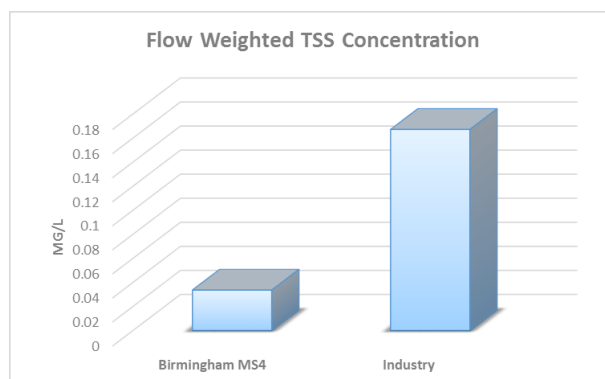
Individual contributions from industry are reported herein as the calculation of either average daily flow reported or calculated, and average daily TSS concentrations either reported or calculated from available DMR data. The represented industry contribution contained in this report does not presume these to be the only industries discharging into Village Creek. The contribution from the MS4 was considerably lower than last year while the Industry contribution was higher. Again, it is believed the drought played a

considerable role in these differences, among other observations.

Considering the difference from last year's report wherein it was demonstrated that the MS4 was significantly different and greater than industry, the difference this year may be due to the following suggested reasons:

- ★ Industry calculations had reported unit differences, which were carefully incorporated in this year's report.
- ★ Additional data was added to last year's data set and the final units were reported as daily average rather than the annual average, which would necessarily require that data to otherwise be normalized as annual data.
- ★ Total flow from the MS4 was 1,030 cfs while industry was comparatively low at 77 cfs. However, the TSS average concentration for the MS4 was low (0.65 mg/L) while the concentration of TSS contributed by industry was reportedly higher at 71.8 mg/L. The City's TSS concentration was approximately an order of magnitude lower than industry.
- ★ The TSS concentration leaving the city at VIC14.0 on average (3.43 mg/L) was very similar that entering the City at VIC1.8, which averaged 2.78 mg/L. Therefore the combination of low annual rainfall and high TSS concentrations in industry inflows, may have contributed to higher TSS levels by as much as an order of magnitude likely contributing to the apparent lower MS4 contribution.

Another way to consider comparative impacts on TSS load is to consider the discharge weighted load. It was demonstrated earlier that there is a relationship, albeit low, now with four years of data, between TSS and flow. The figure on top right represents a comparison of flow-weighted



TSS concentrations between Birmingham and industry.

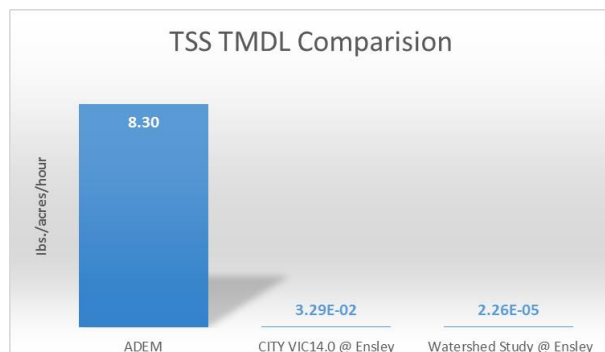
Flow-weighted TSS concentration for the Birmingham MS4 and Industry overall is lower this year than previous years for the flow-weighted concentrations. As discussed earlier, the data included another year of sampling and additional year of DMR data having been included. The Birmingham flow-weighted concentration for TSS is approximately 0.03 mg/L. The TSS flow-weighted concentration represented for industry is 0.2 mg/L. The difference between the City's MS4 and Industry point sources is approximately an order of magnitude difference, although both are quite low. Recall from last year the TSS flow weighted concentration for industry was 3.2 mg/L while for Birmingham the flow weighted concentration was 7.3 mg/L. The difference appears the combination of drought conditions and associated TSS response for industry and the City's MS4, which is manifested in overall low TSS, flow levels, and the inverted flow weighted concentrations.

Similarly, the City of Birmingham has also found a relationship, although weak with this year's additional data, between flow and TSS and agrees with ADEM that monitoring over the course of a significant rainfall event would produce useful results, if not also a demonstrable improvement in



a better understanding of TSS loadings for Village Creek. The City attempted on one occasion to do this although the rainfall event failed to adequately meet sampling protocols for sampling. In the four years that the City has been sampling for TSS, Stormwater Management staff has not seen the high levels of TSS similar to those levels reported earlier by ADEM. The highest level of TSS recorded by the City had been 30 mg/L. Note that high and low levels of TSS were reported by ADEM when flows were mostly less than 100 cfs.

**Village Creek TMDL Analysis:** ADEM has established a TMDL for siltation in Village Creek. That document reported the allowable loading for Village Creek by NPDES regulated stormwater discharges, including MS4 discharges, to not exceed 8.3 lbs./acre/hr. This was recorded for Village Creek at Avenue “W” and was based on an area found within the ADEM TMDL of 21,440 acres. During this full period of study, The City observed a stormwater load allocation near Avenue “W: at the Pratt City Railroad Trestle (VIC14.0), just one-mile away from VIC13.0, of 0.0329 lbs./acre/hr. or nearly 38 times less than the state’s allocation allowance. This figure is based on the same area as was computed for ADEM’s TMDL allocation allowance. For comparison sake, the City also compared the observed waste load allocation to that reported in the City’s Village Creek Watershed Improvement Strategy for the Village Creek Watershed data reported near Ensley. Please recall that data was generated by a calibrated and verified SWMM Model. That data was more than 500 times less than ADEM’s TMDL waste load allocation at approximately 2.3E-5 lbs./acre/hr. See results in the figure on the top right. Decidedly though, ADEM recognizes the difficulty in coming up with one relationship of flow and TSS for Village Creek. The TMDL report contends that the events are so dynamic that it would entail wet weather sampling through an entire hydrograph period to make any defensible



correlation. ADEM recognized that there was evidence from a few samples, which exhibited high TSS concentrations during high peak flow. For the TMDL analysis and in the absence of TSS at peak flows, there was an attempt made to use the available data and derive a relationship between daily average and peak flow.<sup>ix</sup>

In ADEM’s “*Final Total Maximum Daily Loads (TMDL) For Metals (Zinc), pH, and Siltation in the Village Creek Watershed*” report, ADEM reported a waste load allocation (WLA) requirement for Village Creek to not exceed 8.3 lbs./acre/hr.<sup>x</sup> During this annual report period, the WLA demonstrated by Birmingham was approximately 0.026 lbs./acre/hr., which is considerably lower than the WLA requirement established by ADEM.

In August 2015 ADEM established a total maximum daily load for pathogens in Village Creek. The load allocation for MS4s was identified a 2.35E+11 colonies per day and a reduction requirement of 26%. The single mass loading was established from measurements taken at VLGJ-2, which coincidentally is the same location that the City samples in Village Creek at VIC07.0.

The City computed the geometric mean concentration of E.coli.at VIC07.0. The City does not collect flow data from VIC07.0, but does collect flow data near Pratt City at VIC14.0. See

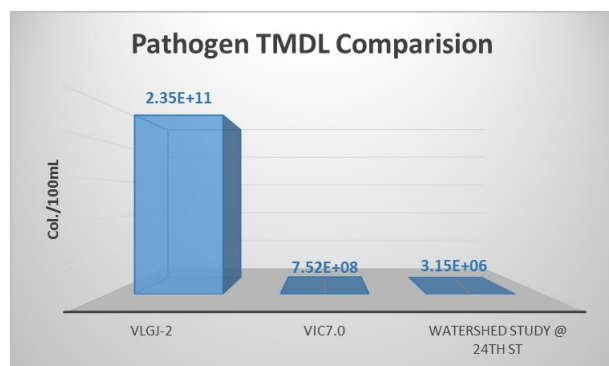


figure above. Therefore to compute the load for TMDL for comparative purposes, the flow was taken from VIC14.0 and multiplied by the area behind VIC07.0, which was computed by GIS to be 54.7%, and is assumed for this measure to be a draining basin to VIC07.0. Again for comparison, the numbers used were discrete and not the difference between the tail water flows and the headwater flows thereby matching how the TMDL was prepared by ADEM.

The TMDL number of 2.35E+11 was not to be exceeded. The City waste load for E.coli. was computed to be 7.5 E+8 and the results of the City's Watershed Management Plan computed the pathogen load at 24<sup>th</sup> Street (Approximately 1-Mile Downstream of VIC07.0) to be 3.1E+6. Again, as with the TSS TMDL, the City appears to also be meeting the TMDL requirements for pathogens in Village Creek.

**Valley Creek:** Valley Creek extends a distance of approximately 8.8 miles from the City of Birmingham through another jurisdiction until the Bessemer Super Highway, just outside of the City of Bessemer. The City now monitors between stream segments 0.7 and 2.9. With the exception of the screening sites at station 0.1s and 4.9s the remainder of the creek is monitored by the

Valley Creek Average Concentrations				
Year	Milage	Sp.Cond.	TSS	e. Coli
13-14	4.9s	400.4	1.4	361
	0.1s	521	3.3	1076
	2.9	479.8	1.5	159
	0	445.1	1.3	2098
14-15	4.9s	395	2.4	280
	0.1s	502.2	15.3	1433
	2.9	450	1.9	666
	0	434	4.2	2333
15-16	4.9s	389.6	1.2	289
	0.1s	502.1	5.2	1535
	2.9	469.6	1.4	556
	0	405.1	0.8	1937
16-17	0.07	529.5	2.8	778
	4.9s	310.4	6.3	854.2
	0.1s	352.3	10.1	1873.1
	2.9	333.2	4.7	794.6
16-17	0.07	364.1	4.3	1119.4

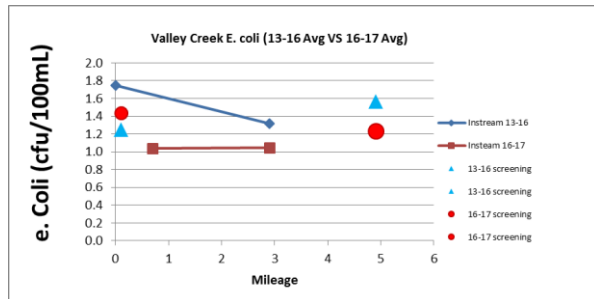
Stormwater Management Authority, Inc. in the downstream portions of Valley Creek.

Monitoring results for select key parameters in Valley Creek, both instream and screening sites, are depicted in the table above for each of the last four-years.

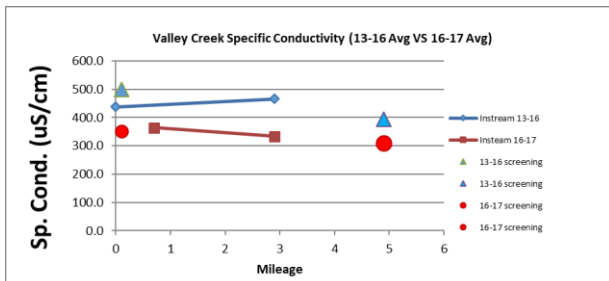
The parameter of much concern for Stormwater Management in Valley Creek continues to be *Escherichia coli* (*E.coli*) levels. The highest levels of *E.coli* were frequently measured at Station VC 0.0, the headwaters monitoring station in Valley Creek at the point where the Creek daylight out from under the downtown City of Birmingham. However, the City has since discontinued sampling at VC0.0 due to concerns related to mixing and to improve data consistency, and has relocated the headwater station to VC0.7 at Center Street, which is downstream from the 1<sup>st</sup> tributary inflow at VC0.1s.



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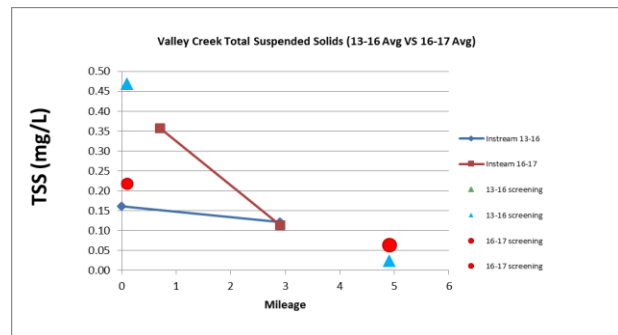


While monitoring VC0.0 it was noticed as having the highest concentrations of E.coli each year between 2013 and 16 inclusive, averaging 2,123.0 cfu/100mL. VC0.1s was usually the second highest concentration of E.coli, averaging 1,348.0 cfu/100mL. In 2016-2017 VC0.1s averaged 1,873.1 cfu/100mL. Discharges from downtown City of Birmingham and VC0.1s continue to have high concentrations of E.coli discharging to Valley Creek without a specific known source. The City has attempted to address the illicit discharge impacts of the homeless population and animal shelters as waste contributors to certain areas of City's MS4 in the Valley Creek watershed. The City has also worked with Jefferson County Environmental Services to address sanitary sewer overflows and will continue to work with Jefferson County to identify opportunities to further reduce E.coli when discovered.

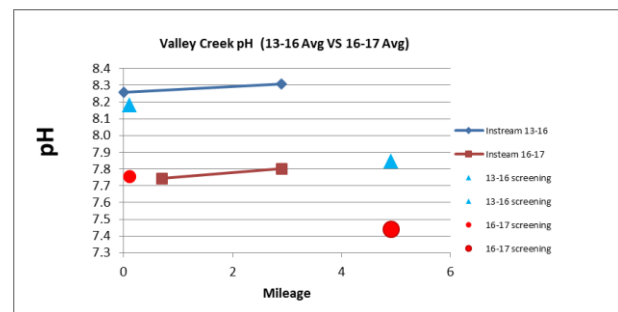


The figure above demonstrates that during the previous sampling years average Specific Conductivity demonstrated a slight increase although this reporting year it yielded a decreasing trend across the watershed within the City of

Birmingham. The City is aware of a dry weather flow just downstream of VC02.9 and is working with City Survey Crew to identify and map the MS4 in that specific drainage basin.



Average Total Suspended Solids concentrations, above, were consistently low in Valley Creek, having concentrations less than 0.50 mg/L. The highest concentration reported was 36.8 mg/L at VC01.s on February 7, 2017 during a rain event.

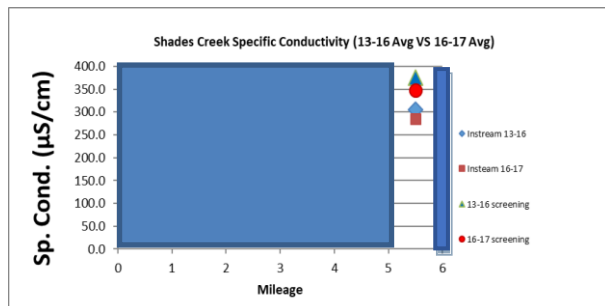


During this study period pH levels were approximately 0.5 units less than the previous three-year average, both instream and screening site respectively. The median concentration during the 2013-2017, inclusive was 8.13 units. In 2016-17, which earlier described in this document as having drought conditions the median pH was 7.77 units. Comparatively, the USGS found pH in surface waters at VAL-1 to have a median value of 7.9 units.<sup>xi</sup> Analysis of groundwater wells in Jefferson County identified pH as having a median value of 6.8 units in the more westerly portions of Jefferson County and from the Pottsville

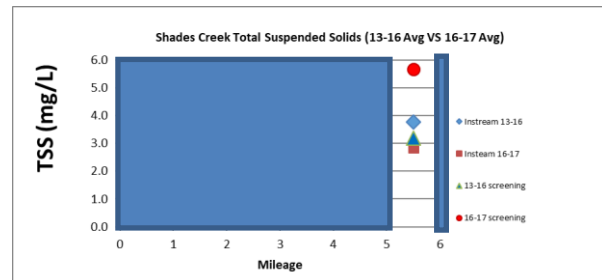


Formation, which tends to be more acidic due to mining activity. However, samples taken from the Bangor Formation (Limestone) would tend to have more basic groundwater pH levels reflective of the eastern portions of the City and in Valley Creek.<sup>xii</sup>

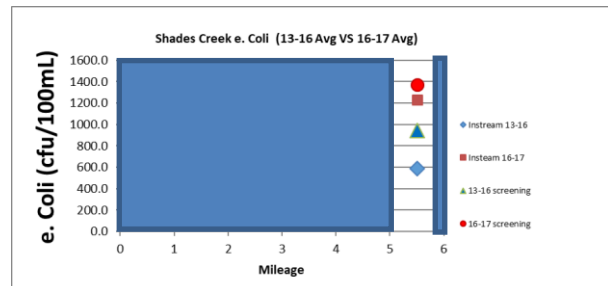
**Shades Creek:** Shades Creek within the City of Birmingham extends approximately 4.5 miles. Shades Creek enters the City of Birmingham at mile 5.0 from Irondale, becoming a shared stream with the Stormwater Management Authority by mile 5.8. Ultimately, Shades Creek leaves the City of Birmingham at mile 7.2.



The City of Birmingham only samples Shades Creek at instream mile 5.5 and at a screening site at the same location (5.5s). Average specific conductance at this monitoring site during the past three years is shown above. The three-year average of Specific Conductance is 375.4 µS/cm at screening site SC05.5s and 305.1 µS/cm at instream site SC05.5. This year the average specific conductance was 347.9 µS/cm at screening site SC05.5s and 284.7 µS/cm at instream site SC05.5.



Total suspended solids at both instream and screening site did not exceed 5.7 mg/L.



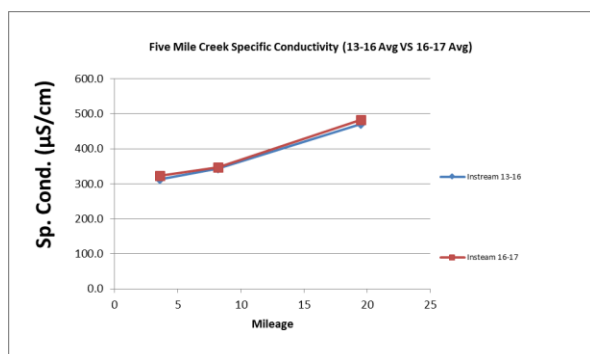
*E.coli* continued to be high this year as it was in previous years. As will be discussed later in the **Illicit Discharge** section of this report, discharges from screening site SC05.5s had elevated pathogens that was a result of Goo-Goo Car Wash discharges into the MS4. That condition has been eliminated and it is anticipated to reduce pathogens at this site.

**Five Mile Creek:** Five Mile Creek runs discontinuously through Birmingham's city limits over the course of 8.4 miles. Monitoring Five Mile Creek is difficult due to the creek locations within the City of Birmingham relative to the points of safe access. The table below identifies those entrance and exit points. This table shows that most of the stream segments within the City of Birmingham are less than one mile in length and of the two that are greater than one mile in length, Birmingham Stormwater Management samples one of them at station 8.2 miles. As a result, there are perhaps multiple opportunities for the water quality in Five Mile Creek to be influenced by

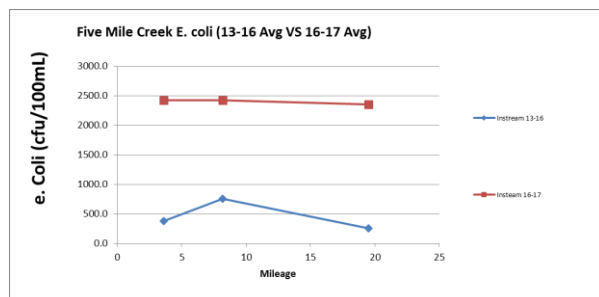


Enters City (Mile Mark)	Exits City (Mile Mark)	Sample Station
3.02	3.32	-
3.59	3.85	3.60
3.91	4.83	-
5.12	5.18	-
5.26	5.29	-
5.73	5.77	-
6.03	8.44	8.20
13.46	14.01	-
14.25	15.13	-
17.21	17.43	-
17.50	19.28	-
19.30	20.64	19.50
21.14	21.19	-

other jurisdictional inflows into the creek but cannot be safely accessed for monitoring purposes.

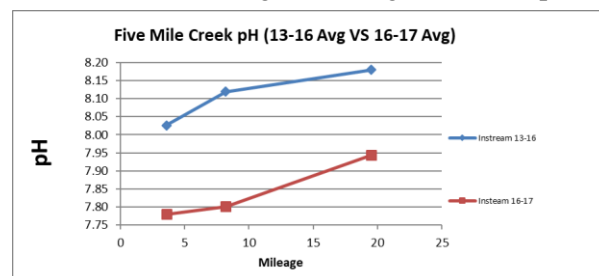


The figure above demonstrates the four-year reporting period for average Specific Conductivity. The average specific conductivity during the current reporting period in Five Mile Creek is consistent with the prior three-years prior. The trend displayed a greater specific conductivity as it exits City of Birmingham during this reporting period.



Monitoring for pathogens this year demonstrated a considerable increase over the preceding four-year period. In the figure above, the average concentrations between 2013 and 2016 were in the 500 cfu/100mL range and the concentrations this past year were consistently near the 2500 cfu/100mL range, resulting in a five-fold increase. Of particular interest is the fact that coliform levels, although high, are consistently high throughout the City as they were entering the City. This suggest, given that drought conditions were prevalent during this year, there was either or both illicit/septic system discharge(s) into Five Mile Creek at (0.3 miles after entering the City) or before entering the City.

According to the Birmingham Water Works Board (CCR) report pH ranged in 2016 between 7.52 and 8.06 units. According to the figure above, pH in



2016-2017 was considerably lower than the previous three-years. If the water source to Five Mile Creek was due to the influence of septic systems that could explain in part the lower pH conditions during this drought period.



**Cahaba River:** The City of Birmingham only samples the Cahaba River just downstream of the confluence of the Cahaba and Little Cahaba Rivers at County Road 280. The rationale for this was reported in the Water Quality Monitoring Strategy report submitted in October 2013. In that report was mentioned that former City monitoring stations in the Little Cahaba River and Lake Purdy were being monitored by the Birmingham Water Works Board (BWVB). The table below provides a summary of that data, provided to the City by the BWVB, comparing the average concentrations of select parameters shared in common during the 2015 reporting period.





















































For the most part, concentrations of representative data being collected by the City at CR.280 is similar to that being collected by the BWVB at 6-sites located throughout the Cahaba and Little Cahaba River systems. The BWVB monitoring locations contained herein include:

- ◆ CR 280
- ◆ Cahaba Beach Road
- ◆ I-20 East
- ◆ Shepherds Branch
- ◆ Sunshine Creek
- ◆ Watson Branch

For as City of Birmingham and BWVB selected water quality sampling location for the Cahaba River it appears that for Nitrate, Nitrite, and Orthophosphate they are comparably the same. As seen in the table below. During this same period TSS concentrations collected by the City of Birmingham was more than 10 times lower than BWVB. Recent discussion with the Cahaba River Society noted significant erosion in portions of the Cahaba River which, could be responsible for the higher TSS levels. E.coli. although measured higher by the City than from corresponding sites measured by BWVB, the levels are not excessive and is suggestive of site conditions; developed City versus rural areas.

Parameter	2016-2017 Geometric Mean Concentration	
	City of Birmingham	Birmingham Water Works Board
Nitrate (mg/L –N)	0.32	0.38
Nitrite (mg/L – N)	<0.3	<0.3
Orthophosphate (mg.L – P)	<0.01	<0.66
TSS (mg/L)	3.52	53.3
E.coli (CFU/100mls)	218.5	53.3



Stream	D.O. (mg/L) Min/Max	pH Units Min/Max	Temp. F° Geomean/Max	<i>E. coli</i> CFU/100 mL/s Geomean/Max	Turbidity NTU Geomean/Max	Zinc µg/L Geomean/Max
Cahaba	5.7/9.7  	7.4/8.1  	64.9/77.9  	218/>2,420  	8.7/23.5  	
Five Mile	7.4/11.1  	7.2/8.5  	63.0/74.8  	214/1,050  	3.9/33.0  	
Village	7.2/11.0  	6.9/8.4  	65.8/76.8  	236/1,990  	2.8/9.1  	<5.0/<5.0  
Valley	7.7/12.1  	7.7/8.4  	67.4/74.5  	421/1,986  	7.2/208  	
Shades	4.1/13.0  	7.2/8.3  	63.1/75.7  	527/1,120  	7.0/12.6  	

**Antidegradation Analysis:** The State of Alabama has established use classifications throughout many of the City of Birmingham’s stream segments. According to the EPA, a key concept in assigning designated uses is “attainability,” or the ability to achieve water quality goals under a given set of natural, anthropogenic, and economic conditions with the overall success of pollution control efforts being dependent on the reliability of the underlying designated uses in water quality standards.<sup>xiii</sup>

The table below provides the results of Birmingham’s sampling efforts this year for five key state Antidegradation parameters and for zinc in Village Creek alone, including:

- Dissolved Oxygen (D.O.; mg/L)
- pH (Units)
- Temperature (F°)
- *Escherichia coli* (*E.coli*; CFU/100mL)

➤ Turbidity (NTU)

➤ Zinc (µg/L) – Village Creek Only

This table represents compliance with the State’s Antidegradation Policy for all streams within the City of Birmingham. The chart has been color coded to represent stream designated uses. In blue represents a designated use as an Outstanding Alabama Water; the tan shaded stream represents a swimming/bodily contact use; in green, those streams represent limited warm water fishery use; Valley Creek is not shaded, which is indicative of a stream with no defined designated use (e.g. §303(d) list or in Chapter 335-6-11). However, for reporting purposes the agriculture and industrial water supply designation is used to document compliance with state law. Where two numbers are shown, the first number is the geometric mean concentration of all instream site values while the second number represents the highest concentration reported during the

bimonthly (every two months) sampling period this year.

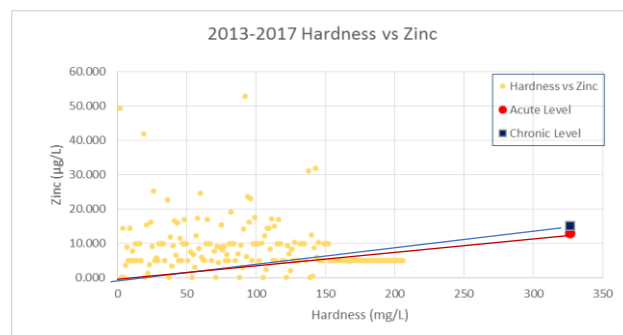
For each stream: red, green, and yellow color-coded boxes and circles have been added. The color-coded boxes represent the results of sampling during 2016-2017, inclusive. The color-coated circles represent the results of sampling during the period 2013-2017, inclusive. The circles and squares are colored to represent the status of adherence to select parameters defined in Chapter 335-6-10, which represents the regulatory standard condition for each stream use classification. For example, if a green box has been added the regulatory standard condition for that parameter, for that time period, was completely met for that stream designated use. A yellow box or circle means that at least a portion of the standard condition was not met for that stream designation and during that representative time period. A red box or circle added means the standard condition for that parameter was not met during the course of the reporting period for which monitoring was done. The mean for each parameter represents the geometric mean as required by the Antidegradation Policy. Zinc levels in Village Creek are represented as the geometric mean and maximum concentration. A green box or circle represents that zinc concentrations did not exceed either the chronic or acute aquatic life criteria during that period. A yellow box or circle represents a chronic aquatic life exceedance; the red box or circle represents an acute aquatic life criteria exceedance.

This year the City has attempted to compare and contrast zinc with the pre-established Administrative Code in Village Creek; other obvious concerns appear needing further discussion. For example:

- ◆ City zinc data is collected and reported as total zinc, not recoverable as further defined in Section 335-6-x.xx

- ◆ Hardness is routinely analyzed by the City using test strips, which have obvious sensitivity limitations
- ◆ Hardness data reported by the City using test strips appears higher on average then that reported in literature for Village Creek. For example, the Geomean for City hardness was 295.8mg/L for the period between 2013 –2017, inclusive. According to the Water-Resources Investigations Report 02-4182 for Village Creek, the Geomean for hardness was calculated as being 149.8mg/L.
- ◆ City is unaware if whether or not Equation #14 of the State Antidegradation Code, which is reported as recoverable, can even be used for total zinc.

For comparative purposes, antidegradation policy equation #14 is used to define the freshwater acute aquatic life criteria and equation #15 is used to define the freshwater chronic aquatic life criteria in Village Creek. As these equations are hardness dependent, a geometric mean for hardness of 295.8 mg/L was used to represent the data collected between 2013 and 2017, inclusive. The geometric mean for hardness representing the period between 2016 and 2017, inclusive was 326.4 mg/L.



Concentrations of zinc detected from samples obtained from Village Creek instream sites are plotted to illustrate hardness and toxicity. See



figure on previous page. Values above acute and chronic toxicity lines indicate that zinc concentrations can be acutely and/or chronically toxic to fish and other aquatic organisms.

Zinc was detected in 100% of the study samples, albeit the majority <5.0µg/L for the period 2013 – 2017. The maximum concentration of zinc was 52.9 µg/L at VIC13.0 on November 18, 2014. Concentrations of zinc exceeded the acute and chronic aquatic life criteria in 23 of 196 samples (11.7%), which was slightly less than the percentage exceeding acute and chronic aquatic life criteria reported by the USGS in 2001 (17%).

Overall the pH of surface water generally ranges from 6 to 9. ADEM established a pH range of 6 to 8.5 to reduce the effects of highly acidic or highly basic water on fish and wildlife. With the exception of the Cahaba River all other streams in Birmingham had exceedances on pH greater than 8.5 units at sometime between 2013 and 2017. There were no pH values less than 6.0 units at any time in any creek. However, the 2016 to 2017 data demonstrated no exceedances for any creek.

*Eschericia. coli. (E.coli)* in the Cahaba River and Five Mile Creek, both geometric mean and the maximum concentration, were exceeded during the study period between 2013 and 2017. Valley Creek did not exceed the geometric mean or the maximum concentration for its reasonable use classification at any time.

Village Creek and Shades Creek exceeded either the geometric mean or the maximum concentration at some time during the period 2013-2015. During the period between 2016 and 2017, *E.coli.* concentrations did not exceed either the geometric mean or maximum criteria for their reasonable use classifications.

Temperature levels for all creeks, at all locations in Birmingham, did not exceed state

antidegradation regulations at any time during the study period from 2013 to 2017.

Dissolved Oxygen levels met or exceeded all minimum concentrations during reporting cycles from 2013 to 2017 for all streams within Birmingham, with the exception of Shades Creek which during the October 2016 sampling event exhibited a low dissolved oxygen reading of 4.1mg/L. This low dissolved oxygen level was recorded during extreme drought conditions and low flow conditions, as well as, a contributing illicit discharge, that has since been eliminated, emanating in close proximity to the instream sampling site.

Turbidity levels also demonstrated improvement during the entire 2013 to 2017 reporting cycle with Cahaba River and Shades Creek showing no high turbidity readings. Five Mile, Village and Valley Creeks all exhibited high turbidity readings during the 2013 to 2017 study period. With only Valley Creek displaying a high turbidity reading during a substantial rainfall event with high velocity flow for the more recent 2016 to 2017 period.

It is worthy of note that hardness, pH, and recoverable zinc were not dissimilar to the findings reported by the USGS in 2000-2001 study.<sup>1</sup> Higher pH levels studied during 2000 - 2001 along Village Creek by the USGS (USGS 2002) noted that higher pH was indicative of carbonate-based geology in the area. Valley, Village, and Five Mile Creeks originate from limestone and dolomite karst springs, which could explain some higher pH readings when the City of Birmingham conducts its water quality analysis. Sampling at the creek sources should be conducted to determine pH of the karst springs to set a bench mark to determine the amount of pH change as the creeks mix with rain, industrial sources, various soils and other conditions that effect pH.

Many natural conditions including the karst geology and carboniferous soils can affect the

surface water parameters such as TSS, pH, and zinc and have a major influence on such parameters in the Valley, Village and Five Mile Creeks drainage basins. Studies on how much influence erosion and karst ground water have on TSS, pH, and zinc and the effect on the drainage basins in the Birmingham area is needed.

#### **CREEK AND NEIGHBORHOOD CLEANUPS:**

During this annual reporting period the City received many public comments from numerous “Town-Hall” meetings held around the City by Mayor Bell, which as a result the Mayor created the City’s “**Operation Green Wave**” Program and assigned it to the Department of Public Works.



The objective of the Program is to remove blight from every area of the City where it can be found starting in the western areas of the City and migrating throughout to the eastern areas. (See Public Newsletter in Appendix B) Program implementation begun on September 12, 2016 with the Department of Public Works cutting and removing deposited trash and abandoned materials from rights-of-ways, paved alleyways, vacant lots, abandoned properties, and even from roadside ditches. All large ditches and creeks are assigned to the Creek maintenance crew for cleanup.

There are twenty-three communities throughout Birmingham, which represent ninety-nine neighborhoods. A list of the communities and neighborhoods, and the most current report of daily and total activity can be found in Appendix B. As of October 3, 2017 the City has removed a total of **144,743 tons of trash and debris**, issued **301 citations**, removed **19 abandoned and nonfunctioning automobiles**, captured **22,454 stray animals**, cleaned **2,122 blocks of ditches**, removed litter from **3,847 blocks of neighborhoods**, demolished **45 homes**, cut **21,566 overgrown lots**, cleaned **3,377 blocks of alleyways**, and cut **40,084 blocks of street rights-of-way**.



This program will continue until all community areas of the City have been cleaned up, after which this program’s cost effectiveness will be reassessed to determine whether or not the program will continue. Concurrent with this effort, the City of Birmingham Stormwater Management continues to reach out to elementary, middle school, and high school students with a message that focuses on trash and why it is important to dispose of trash in more appropriate ways than into the environment. Find more about this program in the **Public Education** section.



## City of Birmingham, 2017 Alabama

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In addition to this Program the Mayor of Birmingham has invited all City Departments to “Adopt-a-Neighborhood” to implement services specific to those adopted areas. The Mayor’s staffs have adopted the North Birmingham area of the City and are monthly volunteering their time for a day to pick up trash in the North Birmingham Community. Together these programs are anticipated to overcome much of the trash and floatable materials that make way to the streams and rivers throughout the City. **The Village Creek Fall Cleanup was held on September 14-16, 2017. 204 volunteers** along with the Birmingham Fire and Rescue Service, Vulcan Materials Company, City of Birmingham and Jefferson County Commission participated in a cleanup in Village Creek conducted by the Village Creek Society and the Alabama Power Company on **September 14-15, 2017**. As part of this event, a community wide cleanup was also promoted to have local residents pick up trash and debris along roadsides on **September 16, 2017**. The local community, various schools and supporting partners removed **9.16 tons** of debris and trash. Additional cleanups on Village Creek were held on **March 25 and May 6, 2016**. The **March 25** event was in partnership with the University of Alabama Birmingham (UAB), Village Creek Human and Environmental Justice Society, Jefferson County Commission, Jefferson County Department of Health Watershed Protection



Program, Unincorporated communities of Mulga Mines and Minor Heights and the Town of Mulga. UAB students along with volunteers from neighboring communities participated in a cleanup along Mulga Loop Road as part of UAB’s *Into the Streets* program whose mission is to encourage partnerships that improve education, health, economic prosperity and quality of life through service at home and around the globe. A total of **6.0 tons** of material was picked up and properly disposed as a result of this event. **113 volunteers** removed **2.05 tons** of the total debris on the day of the event and the City of Birmingham Public Works picked up **3.95 tons** of heavier material the week after this event as a follow up to identified items too large for volunteers to safely remove. Reports show that **96 volunteers** from local schools removed **3.56 tons** of debris during the **May 6** cleanup.



**The Valley Creek Cleanup was held on August 19, 2017** with two prior work days to remove the heavier items from 5 various locations on August 16 and 17, 2017. This cleanup focused on public awareness and trash removal throughout the Valley Creek Watershed. The cleanup was coordinated by the municipalities throughout the watershed, various agencies, and a coalition of local citizens and businesses. There were 7 **volunteer site registration locations** for the volunteers this year. More than **250 volunteers** removed **13.35 tons** of debris.

Church of the Highlands, located along Grants Mill Road, held both a roadside and a river cleanup as part of its *Day of Service* project to prevent litter and trash from entering the Cahaba River. On **July 15, 2017, 60 volunteers removed .467 tons** of trash and tires from along Grants Mill Road and **40 volunteers removed 0.35 tons** of trash and tires from the Cahaba River and its riverbanks at Highway 280.



As the chart below documents 70.59 tons of litter and debris was eliminated from the environment, a nearly 48% increase in that collected last year. That figure, while greater than last year's figure, was collected with 65% more volunteers and fewer clean-up events.

All cleanups within the City of Birmingham for this reporting period is listed on the chart below with volunteer and tonnage totals.

NEIGHBORHOOD	DATE OF CLEANUP	TONS	VOLUNTEERS
GRANTS MILL ROAD	7/15/2017	.467	60
CAHABA RIVER CLEANUP	7/15/2017	0.35	40
VALLEY CREEK WATERSHED CLEANUP	8/18/2017	12.74	231
	8/20/2017		
VILLAGE CREEK-FALL CLEANUP	9/14/2017	9.16	204
	9/16/2017		
VILLEGE CREEK-SPRING CLEANUP	5/6/2017	3.56	60
BUSH HILLS NEIGHBORHOOD CLEANUP	4/29/17	26.07	105
MULGA LOOP ROAD CLEANUP	3/25/17	2.05	113
DISTRICT 9 DAY OF SERVICE NEIGHBORHOOD CLEANUP	3/4/2017	16.19	320
<b>TOTAL</b>		<b>70.59</b>	<b>1133</b>

## **PUBLIC EDUCATION:**



**Jefferson County EMA “Be Ready Day”:** (formally known as Community Awareness Day) was scheduled for September 28, 2017 at McLendon Park-Legion Field. This annual event allows the City of Birmingham Stormwater Management and Floodplain Management and Disaster Mitigation Services staff along with other municipalities within Jefferson County, emergency workers, volunteers and faith-based organizations to share and distribute information to youths and adults on how to prepare for disasters and other environmentally related issues. This year’s event was cancelled due to EMA members being called to support neighboring disasters.

**Paddle Boat Launch:** The **Annual Fishing Rodeo** is an Annual Event held on the 1<sup>st</sup> Saturday in June at Eastlake Park. This event allows citizens of Birmingham to enjoy a day of fishing and fun. During this reporting period, we decided not to do the fishing rodeo and host an instillation day for paddle boating at Eastlake Park. **Saturday, May 27, 2017** paddle boating was reintroduced to East Lake Park during this event **over 250 citizens** attended. It also provides the City of Birmingham staff along with other companies, municipalities, industries, residents, and others from across the

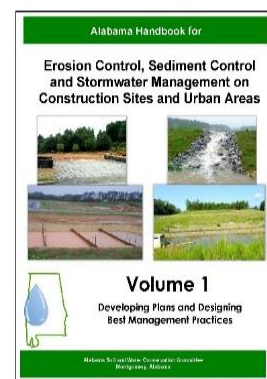


State of Alabama and surrounding States to share and distribute information to thousands of people on how to prepare for disasters, developing in environmentally sensitive areas, and the importance of water resources and its protection. Stormwater Management participated by giving out information as well as introducing: **Stormwater 102**, which will be discussed later in this section.

## **Homebuilders of Alabama Association bi-Annual**

**Workshop:** The City of Birmingham Stormwater Management assumes responsibility for hosting and coordinating an Erosion and Sedimentation Control (ESC) workshop on an alternating basis with Jefferson County Department of Health, Jefferson County

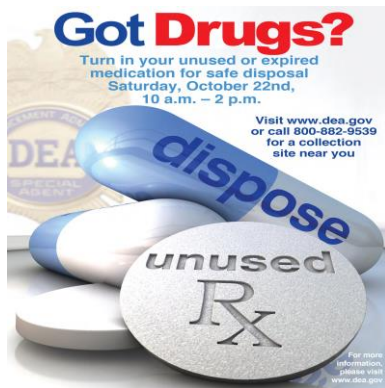
Stormwater Program, and the City of Bessemer Stormwater Program. Jurisdictions entered into a preliminary partnership with the Homebuilders Association of Alabama (HBAA) to provide its ESC workshops and maintain a database of attendees. A total of **60 people** attended the 2





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**HBAA ESC Workshops** held on **October 18, 2016** and **April 27, 2017**. The purpose of these workshops was to provide appropriate education and training measures for construction site operators and municipal staff as required in ALS000001 and to reduce the impact of erosion and sedimentation in waterways. Educational materials were distributed at the workshops. The Field Guide for Erosion and Sediment Control on Construction Sites in Alabama is distributed to attendees of the Erosion and Sediment Control Workshops for single family homebuilders. Field Guides in Spanish are available and will be distributed to Spanish speaking attendees as needed.



**Prescription Drug Take-Back Events:** Stormwater Management staff promoted 2 **National Prescription Drug Take-Back Events** held in the Jefferson County

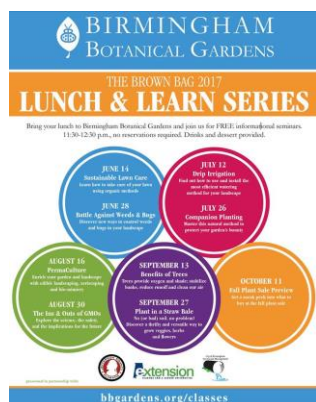
area on **October 22, 2016** and **April 29, 2017**. These events are designed to promote safe and proper disposal of unwanted or expired medications, and to prevent drugs from being flushed down toilets and ending up in waterways. Over **815 tons** of medication were collected during these events according to the Drug Enforcement Administration. Materials to promote this program were available in both English and Spanish and in various formats (posters, handouts, etc.). The Drug Enforcement Administration (DEA) published its Notice of Proposed Rulemaking for the Disposal of Controlled Substances in the Federal Register Dec 21, 2012. The proposed regulations seek to implement the Secure and Responsible Drug Disposal Act of 2010.



**Keep Birmingham Beautiful Commission:** The mission of the Keep Birmingham Beautiful Commission is to serve the citizens of Birmingham by developing and implementing effective public education and community involvement programs, which enhance the quality of life in beautification and environmental concerns. The objective of the Commission is to affect positive change in attitude and behavior regarding natural conservation, littering, recycling and beautification. KBBC and the City of Birmingham collaborated in numerous events within this reporting period. As an ongoing effort to promote the proper disposal of cigarette butts, the Stormwater Program in partnership with Keep Birmingham Beautiful Commission (KBBC) and City Action Partnership (CAP) created a sticker which was placed on **59 cigarette receptacles**.

**Household Hazardous Waste Recycle:** This bi-annual event allowed residents of Jefferson County to safely dispose of electronics, appliances, motor oil, small engines, batteries, CFC container devices, paint, ammunition and paper for shredding free of charge. This event is coordinated by the Jefferson County Household Hazardous Waste Day Committee made up of several local agencies to include the Alabama Cooperative Extension System, Alabama

Environmental Council, City of Bessemer, City of Birmingham, Jefferson County Commission, Jefferson County Department of Health, Keep Birmingham Beautiful, and the Storm Water Management Authority, Inc. This year was used for planning this event and will reconvene next reporting period.



**Brown Bag Lunch and Learn Seminars:** Stormwater Program staff, in partnership with the Friends of the Birmingham Botanical Garden, Alabama Cooperative Extension System, and the Jefferson County Stormwater Program, to create a series of **free**

**informational seminars** called *The Brown Bag Series*, 11 of which were held during this reporting period. The seminars were held at the Birmingham Botanical Gardens; were open to all residents of Jefferson County; were promoted in the **City of Birmingham Stormwater Management Facebook page**, JeffCo H2O Newsletters, blogs, and partner's websites; and flyers were distributed at community events and meetings. Instructors from various organizations were chosen for each topic. The topics are intended for practical application for homeowners which include the stormwater benefits through low impact landscape designs, proper planting and gardening techniques, and prudent use of fertilizers and pesticides. There were **321 participants** during this reporting period. The topics were: “Ask an Expert”, October 12; “They’re So Wicked”, October 26; “Home Invaders”, May 24; “Sustainable Lawn Care”, June 14; “Battle Against Weeds and Bugs”, June 28; “Drip Irrigation”, July 12; “Companion Planting”, July 26;

“PermaCulture for the Home”, August 16; “Ins and Outs of GMO’s”, August 30; “Benefits of Trees”, September 13; and “Plant in a Straw Bale”, September 27.



**Jefferson County Water Festival:** Stormwater Management staff serve on the festival committee that planned and implemented the **13th Annual** Jefferson County Water Festival held on May 4, 2017, at University of Alabama Birmingham (UAB). The Water Festival educated **804 fourth grade students**, teachers and parents from various schools from across Jefferson County. The purpose of the Water Festival is to educate students about where drinking water comes from and how to protect and keep it clean for themselves and future generations. Students participate in three hands-on activities and experiments and attended the Fishing Magicians magic show. All the hands-on activities directly correlate with the Alabama Course of Study Science and SAT Objectives for fourth grade. Prior to the festival, students from participating schools submitted artwork depicting the Water Festival theme, “Where Does Your WaterShed”, chosen for this year. The festival committee selected one winner whose artwork was used as the Water Festival logo on t-shirts distributed free to participating students, teachers and volunteers.



**Rain Barrel Workshop:** During this reporting period **2 Rain Barrel Workshops** were held. On June 17, 2017, **42 people** participated in a Rain Barrel Workshop that was held at the Birmingham Botanical Gardens. Through a working Rain Barrel Workshop Committee, the Alabama Cooperative Extension System (ACES), Alabama Environmental Council (AEC), Friends of Birmingham Botanical Gardens, City of Birmingham, City of Bessemer, Clean Water Partnership, Jefferson County Department of Health, Jefferson County Soil and Water Conservation District, Jefferson county Storm Water Management, Keep Birmingham Beautiful and Storm Water Management Authority hosted the event and provided instruction, materials, and rain barrel assembly assistance for participants. Participants learned the benefits of capturing and storing rain water from their roof and how best to reapply the water in their yard. *Fight the Bite* mosquito prevention kits were distributed to all class participants and door prizes were awarded. The Committee publicized this event through flyers and social media. The Committee members plan to offer more frequent Rain Barrel Workshops to the public in 2018 at various venues. On July 8, 2017, Alabama Environmental Council held a Rain Barrel Workshop at their

Community Recycling Center. It was reported that **14 people** participated in the event.

**Alabama Environmental Council:** To promote proper disposal of various household items, the Jefferson County Commission partnered with Alabama Environmental Council (AEC) on its recycling program, **Recycle Alabama**. The Stormwater Program staff promotes Recycle Alabama through its Jefferson County Clean Water Awareness Campaign posters, newsletters, presentations and events. The AEC runs a nonprofit recycling center in downtown Birmingham which accepts textiles, plastics, glass, metal, cardboard, paper and other items. AEC created and promotes Recycle Alabama through its website ([www.recycAL.com](http://www.recycAL.com)) and printed materials. Under the Recycle Alabama campaign, AEC in partnership with Jefferson County Department of Health, the University of Alabama at Birmingham, Jefferson County Commission and several municipalities organized the purchase and distribution of recycling drop-off trailers. There were **10 trailers** distributed to various outlying communities in Jefferson County that do not have recycling opportunities. The recycling trailers have a modified version of the **Trash Blows! Tarp and Tie Your Load** poster prominently displayed to remind those dropping off materials that even recycled materials can become litter that can pollute our waterways. This past April, the AEC moved the downtown recycling center to a new location just outside the downtown area that would allow more room to expand the items they collect such as glass. During this reporting period AEC collected over **19.3 tons of plastic, 224 tons of paper, 88.2 tons of cardboard, and 35.8 tons of metals**. Jefferson County Commission has a formal partnership through an ongoing Memorandum of Understanding with the Alabama Environmental Council and its recycling campaign known as Recycle Alabama in an effort to reduce expenses by sharing knowledge and resources,

minimizing duplication of effort, and enhancing the efficiency of stormwater pollution prevention outreach efforts.



**Urban Forestry Fair:** On February 22, 2017, Stormwater Management staff provided an educational game for **281 fifth grade students** from various schools within Jefferson County at the annual Urban Forestry Fair. The interactive and engaging game is designed to reinforce the idea of conserving natural resources and improving water quality.

**Do Dah Day:** On May 20, 2017, Stormwater Management staff partnered with Jefferson County Stormwater Management to display Clean Water Awareness Campaign posters at a booth during the event, as well distributed materials during the event. In addition, Jefferson County Stormwater Program staff reached out to residents from the surrounding community to assist with placing *In a Perfect World* and *It's Your "Doody"* posters on over **40 port-a-potties** set up for the event. The *It's Your "Doody"* flyer along with free pet waste bags were distributed to attendees. The purpose of Stormwater Program staff participation in this event was to bring about awareness of the impacts of pet waste on local water quality and the benefits of pet friendly landscaping to reduce PHF as well as erosion and sedimentation. A fun and interactive poo toss game was offered to teach people the proper behavior for pet waste disposal. In addition, approximately **20 Fight the Bite**



**mosquito prevention dunks** with information about the proper use, storage and disposal of yard chemicals and other household products as well as information regarding other resources available to residents were distributed. Approximately **150 pet waste bags** and flyers were distributed. The Do Dah Day Board estimated that **7,000 people** attended this event.



### **Cooking Grease Campaign:**

The County's Environmental Services Department (ESD) administers a county-wide household cooking oil and grease recycling program to reduce the amount of

cooking oil that enters the sanitary sewer system, thereby reducing sewer overflows. This is a free service to all of the citizens of Jefferson County. Collection bins are located at several sites around the county with free plastic containers for residents to take home. Once a container is filled,



it can be returned to the collection bin and exchanged for a clean container. The containers are collected weekly by the Grease Control Program inspectors and the oil is picked up at the Shades Valley Wastewater Treatment Plant by local rendering companies. Grease and oil accumulate in the sewer system and require diligent maintenance to prevent sanitary sewer overflows. ESD developed this program in the ongoing effort to the prevent overflows and protect the water resources. The bins were constructed by the County's General Services shop and are 4' wide by 4' tall and 2' deep and sit on legs 6" off the ground. The bins sit in a hard, durable plastic tray which provides a liquid retention barrier should a container leak or spill. There are currently **20 drop-off points** that accept filled containers for recycling, which is an increase of one new site from last year. A total of **2,830 gallons** was collected between October 1, 2016, and September 30, 2017. The County's Environmental Services Department (ESD) distributed over **2,500 flyers** within apartment complexes, made **12 presentations**, provided **bilingual program materials** that were both displayed throughout the complexes and distributed to residents. In addition, a form letter which can be sent to the residents as a reminder of the cooking Oil and Grease Recycling Program was made available to the apartment complex management. The Stormwater Program staff promotes this program and distributes materials, containers and scrapers at various events.

**Plant Dig:** Plant Dig, hosted by Keep Birmingham Beautiful Commission, the Birmingham Department of Public Works, and

Alabama Forestry Commission, was held on February 25, 2017. This event was free to the public allowing citizens to dig up trees and shrubs at a Birmingham facility and replant them in their own yards. On February 18, 2017, **15 people attended** a free orientation workshop held at the Birmingham Botanical Gardens lead by local Master Gardeners. Information on species identification, the proper harvesting of plants and re-planting procedures were discussed and materials were distributed.

**Seedlings Give-a-way:** The City of Birmingham Urban Forestry Division in conjunction with the Alabama Forestry Commission and the Jefferson County Conservation District conducted an **Arbor Day program** in Linn Park on February 22, 2017 as a means to distribute free tree seedlings to the public. It was reported that **1,750 tree seedlings** were given away during this event.

**Centennial Tree Program:** The Centennial Tree Program founded at the Birmingham Botanical Gardens has planted **more than 2,500** native trees throughout the Birmingham area since 2009. More than **100 trees were planted** in North Smithfield Greenleaf Heights, a Jefferson County Community that took a direct hit from the April 2011 tornado outbreak. It was reported that only an additional **700 tree seedlings** were planted during this reporting period, a significant reduction to what was planned because of the drought.



**Stormwater Calendar:** A 12-month printed 2017 calendar was created in partnership with Jefferson County Stormwater Program, Alabama Rain Barrel Project and Alabama Water Watch to provide a cost-effective way to support the Clean Water Awareness posters and related components of the Clean Water Awareness Campaign. Complaint reporting of pollution and sanitary sewer overflow reporting information was made available along with other local information. The graphic chosen for the 2017 Stormwater Calendar promotes sustainable stormwater friendly practices such as capturing and storing rainwater from the roof to reapply in the yard. Each month the calendar highlights a pollutant and the negative effects that pollutant has on local water quality along with simple prevention strategies people can incorporate in their everyday life. The helpful tips will assist people to become better stewards of their communities and watersheds. The calendar also featured Alabama Water Watch’s new infographic, *America’s Amazon*, which promotes Alabama’s aquatic biodiversity. A total of **1600** calendars were printed and distributed, with **700** of those distributed in unincorporated Jefferson County communities.



**Stormwater 101: Only Rain Down the Drain Presentations:** During the reporting period City of Birmingham Stormwater Management Staff Presented “Only Rain Down the Drain” to over **360 Birmingham City Students** ranging from k-12th graders over several different events. Staff also presented “Only Rain Down the Drain” to over **400 adults** at several different events during this reporting period. “Only Rain Down the Drain” presentation concept was developed by staff to explain Stormwater Management to all ages. Instilling and providing City residents with good environmental qualities and stewardship will help to keep Birmingham beautiful, reaching out to our children will help to guide the next generation of Birmingham residents with the need to continue to improve City water resources into the future.



**Stormwater 102: Field Water Quality Analysis:** During the reporting period City of Birmingham Stormwater Management Staff developed



“Stormwater 102.” We use this program to teach and train citizens about the importance of clean water. We allow them to use our equipment to perform water quality analysis in the field. We use this technique to encourage scientific reasoning as well as teach basic stormwater management techniques.

**“Only Rain Down the Drain Street Signs”:** During the summer of 2016, The City of Birmingham Stormwater Management, in collaboration with Keep Birmingham Beautiful Commission, designed twenty-one “Do Not Litter” and “Only Rain Down the Drain” signs around high traffic areas within the Birmingham city limits. In addition to the “Only Rain Down the Drain” message, the signs included the individual watersheds for sign locations, making the public aware of the impact of littering in the affected watersheds. This program was indorsed and



supported by Birmingham City Council and Mayor William A. Bell Sr., who is seen in the photo at the sign unveiling. Plans are in progress to complete the instillation of the 21 signs and place them in the upcoming reporting period.

**Public Outreach Materials:** The Birmingham Stormwater Management program developed and distributed many Educational Items to help get the message out to our citizens. The goal was to make a brand for Stormwater Management. “Only Rain Down the Drain” pencils, cups, frisbees, bumper stickers and wristbands were distributed throughout the City with the message, as well as, Stormwater Calendars. A City of Birmingham Stormwater Banner was also purchased to advertise the message. Plans to increase the stormwater awareness and advocacy through public education are expected to expand throughout upcoming years.

**Stormwater Management Website:** During the annual report year, Stormwater Management has a fully functional working website for stormwater in place. The website can be found at: [www.birminghamal.gov/stormwatermanagement](http://www.birminghamal.gov/stormwatermanagement).

The website contains a Home, Public Education, Annual Report, FAQs, Contact, and Related Link sections. The Home Page gives a brief description about stormwater and how citizens can help reduce pollution in their community. It also helps inform the citizens about watersheds in Birmingham, native plants for stormwater management practices, recreational uses, the City of Birmingham Soil Erosion Control Program, & etc.



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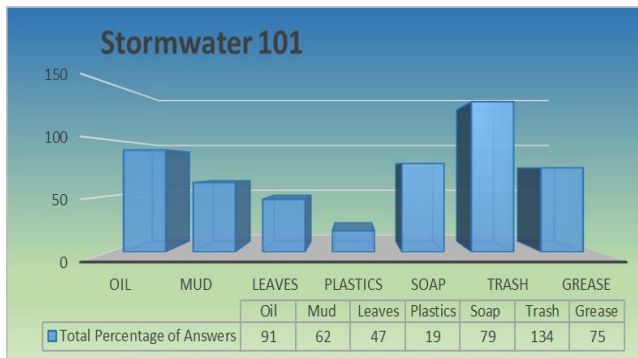
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**Birmingham Stormwater Facebook Page:** During this reporting period City of Birmingham Stormwater Management created the “**COB Stormwater Management**” Facebook page. This Facebook page can be located at <https://www.facebook.com/COBStormwater/>.

Stormwater Management made its 1<sup>st</sup> post on **July 12, 2017**. During this reporting period we managed to: make **17 posts**, reached **814 people**, received **109 likes**, and achieved **110 followers**. This Facebook page will allow us to gain easy access to citizens, publicize upcoming events, and help educate citizens in environmental stewardship and stormwater management techniques.



**Stormwater 101 Surveys:** During this reporting period Stormwater Management Staff developed a survey to go along with the Stormwater 101 education to quantify knowledge and information retained. The figure below shows the responses from two events with high school students that were asked, “What are some of the items we discussed today that are not allowed in the storm drain?”



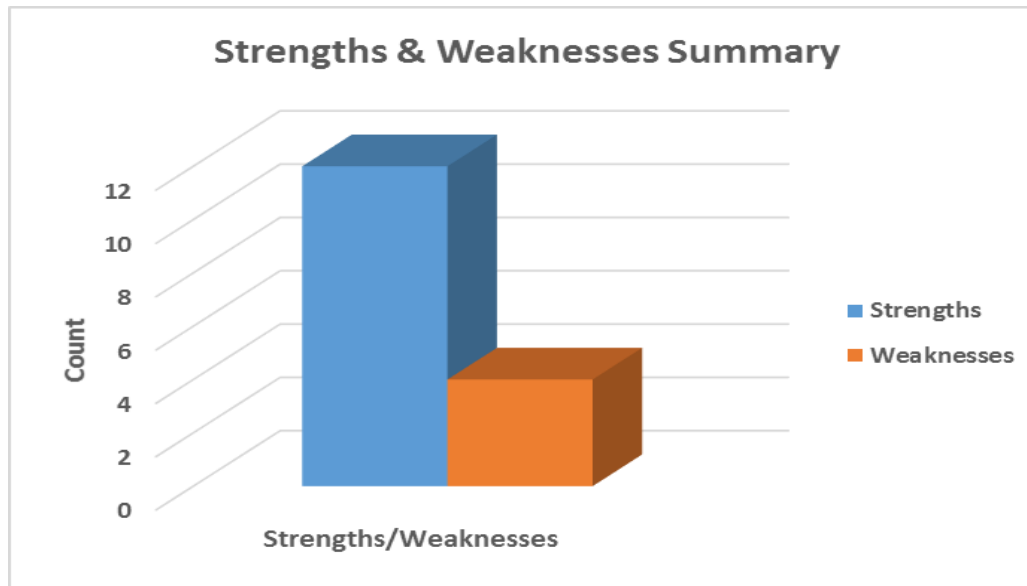
<b>STORMWATER OPERATING BUDGET</b> <b>FISCAL YEAR 2017</b>	
<b>Stormwater Management</b> <b>Fund 048</b>	
<b><u>Estimated Revenues</u></b>	
Stormwater Fees	<b><u>\$1,251,135</u></b>
Funds Available	<b><u>\$480,078</u></b>
<b>Total Estimated Revenues</b>	<b><u>\$1,731,213</u></b>
<b><u>Appropriations</u></b>	
<b>Planning, Engineering &amp; Permits:</b>	
Stormwater Administrator	<b>\$140,035</b>
Water Pollution Control Technician (3)	<b>\$189,037</b>
Storm Water Specialist	<b>\$56,858</b>
Senior Civil Engineer	<b>\$94,148</b>
General & Administrative Expenses	<b>\$1,251,135</b>
<b>Total Appropriations</b>	<b><u>\$1,731,213</u></b>

The table above depicts the Mayor's FY 2017 budget for Stormwater Management. This represents the total cost for maintenance of the NPDES Phase I MS4 Permit. All remaining basic levels of service for the routine operation and maintenance of the City's separate storm sewer system are funded by the general fund and have not been itemized.



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### Comparative Summary of Strengths and Weaknesses

BMP Controls	Strength	Weakness	Why a Weakness?	Future Direction
Structural Maintenance		X	Found numerous examples of failure to adequately maintain detention/retention systems and the MS4 by the Departments of Public Works and/or Parks & Recreation.	Perform monthly inspections of installed systems and meet quarterly with Leadership to address problems and better coordinate resolution. The City is also considering a SMART Maintenance System through Asset Management.



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### Comparative Summary of Strengths and Weaknesses

BMP Controls	Strength	Weakness	Why a Weakness?	Future Direction
Development Planning	X			
Roadway Maintenance		X	Truck wash storm drain pollutant inserts have been designed and are awaiting funding approvals.	Use Public Works crews to limit project costs. Engineering has completed a design. Funding approval by Fleet is anticipated. Eastern Landfill truck wash is still being further considered.
Flood Management	X			
Municipal Facilities	X			
PHF	X			
IDDE		X	City continues to be unable to establish an appeals process.	City has modified the existing ordinance to reduce the number of members on the Board and further reduced the qualifications of Members. City has advertised for volunteers and continues to lack volunteer support. Additionally, implementation of the IDD&E Pilot Project has begun to add structural controls to the existing GIS to supplement mapping details. GIS mapping and Stormwater Data are continuing to be integrated.
Spill	X			
Oil & Hazardous Waste	X			
Sanitary Sewer		X	Although the City does not have a sanitary	Continue to seek better collaboration with Jefferson County



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### Comparative Summary of Strengths and Weaknesses

BMP Controls	Strength	Weakness	Why a Weakness?	Future Direction
Seepage			sewer system, coordination with Jefferson County to obtain annual reports has been difficult although support with IDD&E requests have been good.	Environmental Services.
Industrial Inspection	X			
Construction Planning	X			
Construction Inspection	X			
Education	X			
Monitoring & Screening	X			
TMDL Response	X			



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# PROGRAM ACTIVITIES SUMMARY TABLES



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**2017**

PROGRAM ELEMENT	Description of BMP	ACTIVITY SCHEDULE				COMMENTS
		Measurable Goal	Complied With	Activities Accomplished		
				2016	2017	
(1) Structural Controls	Storm Drain Inlets Cleaned (#)	3,500 annually	Yes	3,386 inlets	5,998 inlets	
	Storm Sewer Lines Cleaned (Lin Ft)	90,000 annually	Yes	109, 197 ft	305,223 ft	
	Litter Cleared (Blks)	30,000 annually	Yes	492,672 blocks	92,465 blocks	During this period DPW staff were reassigned to the Green Wave Initiative and there was a lack of funding to fill vacant positions.
	Pipe Repaired / Replaced (Lin Ft)	1,000 annually	No	950 ft	371 ft	During this period DPW staff was reassigned and this area of operation no longer exists. City considering privatizing this service
	Inlet Const (#)	100 annually	Yes	121 inlets	23 inlets	During this period DPW was short staffed due to the Green Wave Initiative and the equipment was out of commission





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PROGRAM ELEMENT	Description of BMP	ACTIVITY SCHEDULE				COMMENTS
		Measurable Goal	Complied With	Activities Accomplished		
				2016	2017	
	Curb & Gutter Const (Lin Ft)	900 annually	Yes	472 ft	1,673 ft	
	Storm Sewer Tops Made (#)	350 annually	Yes	1,171 made	654 made	During this period DPW staff was short staffed and the equipment was out of commission
	Storm Sewer Tops Set (#)	4, 000 annually	Yes	4,894 set	5,065 set	
	Inventory of Storm Sewer System	Complete by Sept 2015	Yes	806 outfalls total. No new outfalls have been discovered	806 outfalls total. No new outfalls have been discovered	
(2) Areas of New Development / Redevelopment	Review Subdivision Ordinance and Update	Complete by Sept 2012	Yes			
	Review and Revise the City’s Engineering Guidelines for Stormwater Management	Complete by Sept 2017	No			City has engaged the services of Wood. (formerly AMEC Foster Wheeler) & anticipates this being completed in FY 2018





PROGRAM ELEMENT	Description of BMP	ACTIVITY SCHEDULE				COMMENTS
		Measurable Goal	Complied With	Activities Accomplished		
				2016	2017	
	Continued Implementation of City Flood Mitigation/ SWM Plan, adopted October 2004.	Annually	Yes	Yes	Yes	Silver Jacket’s project underway and remapping of Village Creek floodplain. Similarly, Valley Creek is being investigated.
(3) Roadway Maintenance	Streets Swept (Curb miles)	100,000 annually	Yes	33,816 curb miles	158,407 curb miles	
	Estimate Pollutant Load Reduction from Street Sweeping Practice	Complete by Sept 2014	Yes	9,353.65 tons	8,171.80 tons	
(5) Pesticide, Herbicide, and Fertilizer Application	Inventory the City PHF Storage Facilities	Complete by Sept 2010	Yes			Available Upon Request
	Map the City PHF Storage Facilities	Complete by Sept 2010	Yes			Available Upon Request
	Develop PHF Program Documentation to Include Chemical Application Protocols	Complete by Sept 2013	Yes			Available Upon Request





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PROGRAM ELEMENT	Description of BMP	ACTIVITY SCHEDULE				COMMENTS
		Measurable Goal	Complied With	Activities Accomplished		
				2016	2017	
	Track Inventory of PHF Materials	Monthly	Yes			Available Upon Request
	Track Quantity of PHF Materials Applied	Annually	Yes			Available Upon Request
	Document Training for Staff	Annually	Yes	See PHF Section in Major Findings Section of Report	Yes	Available Upon Request





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PROGRAM ELEMENT	Description of BMP	ACTIVITY SCHEDULE				COMMENTS
		Measurable Goal	Complied With	Activities Accomplished		
				2016	2017	
	Develop and distribute public education materials	Annually	Yes	See <i>Public Education &amp; Outreach Future Program Direction</i>	See <i>Public Education &amp; Outreach Future Program Direction</i>	
(6) Illicit Discharge Detection and Elimination	Map the City Outfalls	Complete by Sept 2010	Yes			
	Develop IDD&E Program Documentation	Complete by Sept 2010	Yes	<ul style="list-style-type: none"><li>• City staff is preparing draft IDDE-SWMPP</li><li>• City staff has begun investigations for non-compliance</li><li>• City staff began development of a tracking system</li><li>• Anticipate staffing of SPO</li></ul>	<ul style="list-style-type: none"><li>• City staff is preparing draft IDDE-SWMPP</li><li>• City staff began development of a tracking system</li><li>• Anticipate staffing of SPO Appeals Board</li></ul>	





**City of Birmingham, 2017**  
**Alabama**  
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PROGRAM ELEMENT	Description of BMP	ACTIVITY SCHEDULE				COMMENTS
		Measurable Goal	Complied With	Activities Accomplished		
				2016	2017	
				Appeals Board		
	Track Public Complaints	Annually	Yes	1,708	1,800	
	Track Illicit Discharge Investigations and Resolution	Annually	Yes	19 illicit discharges were reported	25 illicit discharges were reported	
	Update the City Outfall Inventory	Annually	Yes	No new outfalls added	No new outfalls added	





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PROGRAM ELEMENT	Description of BMP	ACTIVITY SCHEDULE				COMMENTS
		Measurable Goal	Complied With	Activities Accomplished		
				2016	2017	
	Inspect Instream Peak Outfalls Bimonthly		Yes	Yes	Yes	See <i>Major Accomplishments</i>
	Maintain Hotline	Annually	Yes	Street sweeping: <b>367</b> MS4 cleaned: <b>563</b> Reset inlet covers: <b>279</b> Street flooding: <b>72</b> Missing/broken inlet covers: <b>177</b> Catch basins repair: <b>187</b> Catch basin clogged: <b>63</b>	Street sweeping: <b>425</b> MS4 cleaned: <b>686</b> Reset inlet covers: <b>215</b> Street flooding: <b>126</b> Missing/broken inlet covers: <b>155</b> Catch basins repair: <b>165</b> Catch basin clogged: <b>28</b>	
	Track Reported Spills and Investigate Findings	Annually	Yes	EMA: <b>58</b> reported spills  ADEM: <b>22</b> reported spills  SWM: <b>13</b> reported spills	EMA: <b>40</b> reported spills  ADEM: <b>7</b> reported spills  SWM: <b>7</b> reported spills	





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PROGRAM ELEMENT	Description of BMP	ACTIVITY SCHEDULE				COMMENTS
		Measurable Goal	Complied With	Activities Accomplished		
				2016	2017	
	Maintain Stormwater Webpage for Existing City Website	Annually	Yes			
	Map the City Storm Sewer System	Complete by Sept 2015		No additional storm sewer infrastructure was surveyed or added to the existing maps during this reporting period	This is now being done in concurrence with IDD&E inspections	
(8) Industrial and High Risk Runoff	Review SWPPP for Landfills	Complete by Sept 2013	Yes			Both the New Georgia and Eastern Area Landfill SWPPPs/SPCCs have been updated. Documents available upon request
	Continue Inventory and Map ADEM Permitted	Annually	Yes	No new facilities mapped	No new facilities mapped	





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PROGRAM ELEMENT	Description of BMP	ACTIVITY SCHEDULE				COMMENTS
		Measurable Goal	Complied With	Activities Accomplished		
				2016	2017	
	Sites					
	Maintain Map of SARA Title III Sites and Update New Sites	Annually	Yes	144 facilities	237 facilities	Available upon request
	Implement/continue BFD PIP Inspections of Tier II Sites	Annually	Yes	Pre-incident inspections: 94	Pre-incident inspections: 121	Available upon request
	Train Municipal Staff	Annually	No	No training provided this year	135 City staff trained	
	Stormwater Monitoring at City Landfills	Annually	Yes	Eastern Area & New Georgia Landfill DMR's	Eastern Area & New Georgia Landfill DMR's	
	Create Inventory of Municipal Facilities and Review Stormwater Management at the facilities	Complete by Sept 2015	Yes (Ongoing)	List of City facilities & properties complete	List of City facilities & properties complete	





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PROGRAM ELEMENT	Description of BMP	ACTIVITY SCHEDULE				COMMENTS
		Measurable Goal	Complied With	Activities Accomplished		
				2016	2017	
	Industrial & High Risk Facilities & Runoff Inspections & Enforcement Activities	Annually	Yes	Inspections: <b>24</b> Rechecks: <b>164</b> Enforcement: <b>4</b> Corrective actions: <b>12</b>	Inspections: <b>84</b> Rechecks: <b>122</b> Enforcement: <b>12</b> Corrective actions: <b>6</b>	
	Review ESC Ordinance	Complete by Sept 2015	Yes	Ongoing	Ongoing	Staff is considering further changes in 2018 to establish a permit deadline for completion and assignment of long-term O&M of detention/retention facilities
	Modify Tidemark to Track All Construction Runoff Permitting Activities (Permits Issued; Permits Closed; Site Inspections; Non-Compliance Incidents; Enforcement Actions; Complaints; Bonds and Letters of Credit Received)	Annually	Yes	Inspected: <b>623</b> Checked job sites: <b>623</b> Final inspection: <b>50</b> Inspections passed: <b>623</b> Inspections failed: <b>0</b> Violation notices: <b>0</b>	Inspected: <b>1146</b> Inspected in impaired watershed: <b>312</b> Checked job sites: <b>1146</b> Final inspection: <b>43</b> Inspections passed: <b>1038</b> Inspections failed: <b>108</b>	





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**2017**

PROGRAM ELEMENT	Description of BMP	ACTIVITY SCHEDULE				COMMENTS
		Measurable Goal	Complied With	Activities Accomplished		
				2016	2017	
				Compliance orders: <b>0</b> Contractor in Default: <b>0</b> Bonds collected: <b>0</b> Bonds released: <b>12</b> Permits issued: <b>213</b> Permits closed: <b>0</b>	Violation notices: <b>1</b> <b>Formal Enforcement Action: 0</b> Compliance orders: <b>1</b> Contractor in Default: <b>0</b> Bonds collected: <b>0</b> Bonds released: <b>43</b> Permits issued: <b>219</b> Permits closed: <b>43</b>	
	Land Disturbance Permits Issued in Impaired Watersheds	Annually	Yes	Permits issued in impaired watersheds: <b>153</b> Permits closed in impaired watersheds: <b>12</b>	Permits issued in impaired watersheds: <b>110</b> Permits closed in impaired watersheds: <b>21</b>	
	Conduct at least one Erosion and Sediment Control Workshop for Developers, Builders and	Annually	Yes	Fall 2015 & Spring 2016: <b>55</b>	Fall 2016 & Spring 2017: <b>60</b>	





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PROGRAM ELEMENT	Description of BMP	ACTIVITY SCHEDULE				COMMENTS
		Measurable Goal	Complied With	Activities Accomplished		
				2016	2017	
	Engineers					
	Develop and Distribute Public Education Brochures	Annually	Yes			Distributed 1600 calendars. Available upon request
(10) Public Education	Participate in Creek & Neighborhood Clean Up	Annually	Yes	SWM staff planned, trained, supported and participated in 15 cleanups	SWM staff planned, trained, supported and participated in 8 cleanups	City removed & disposed of more than 70 tons of debris during the cleanup
	Public Education Program Documentation	Complete by June 2013	No	During this reporting year, the City published and distributed 1,500 stormwater calendars. (Appendix D)	During this reporting year, the City published and distributed 1,600 stormwater calendars. (Appendix D)	Available upon request





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PROGRAM ELEMENT	Description of BMP	ACTIVITY SCHEDULE				COMMENTS
		Measurable Goal	Complied With	Activities Accomplished		
				2016	2017	
	Bimonthly Instream & Screening Site Monitoring	19 Sites Bimonthly	Yes	100%	100%	One new site added at Cotton Mill Branch (VIC07.0s)
(11) Monitoring	Bimonthly Instream & Screening Site Monitoring	19 Sites bimonthly	Yes	100%	100%	
	Outfall Reconnaissance when Instream Peak Segments are identified	6-Outfall reconnaissance per year	No	18	1	
	Develop Inter-Jurisdictional Agreement for Monitoring	Complete by Sept 2014	No			



## ANNUAL REPORT END NOTES

<sup>i</sup> *Federal Water Pollution Control Act. Sect. 402.(p)(3)(B)(iii).2002. Page 195*

<sup>ii</sup> 40 CFR Part 122.26(d)(2)(iv). Page 217

<sup>iii</sup> Shelby County NPDES-MS4 Final Permit

<sup>iv</sup> [Final Village Creek, Zinc, pH, and Siltation TMDL](#)

<sup>v</sup> IBID. Page 81.

<sup>vi</sup> [www.dummies.com/software/microsoft-office/excel/how-to-highlight-statistical-outlier-in-excel](http://www.dummies.com/software/microsoft-office/excel/how-to-highlight-statistical-outlier-in-excel)

<sup>vii</sup> [Geological Survey - Ground Water Availability, Jefferson County. 1990.](#)Page 15

<sup>viii</sup> City of Birmingham. October 4, 2013. *Water Quality Monitoring Strategy for Alabama Department of Environmental Management*. Pg. 13.

<sup>ix</sup> [Final Village Creek, Zinc, pH, and Siltation TMDL, Page 18](#)

<sup>x</sup> IBID, Page 38

<sup>xi</sup> [U.S.G.S. Water Resources Investigations Report 02-4182. 2002, Pg 101-102](#)

<sup>xii</sup> [Geological Survey - Ground Water Availability, Jefferson County. 1990.](#)Page 14-15

<sup>xiii</sup> [Basic Information: Introduction to UAAs | Use Attainability Analysis | US EPA](#)