



PERMIT NO. ALS000032

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# Structural Controls

*Permit Part II B.1.*



# STRUCTURAL CONTROLS

## PERMIT PART II B.1.

Structural controls are defined in the City's NPDES MS4 Permit as, "...engineered BMPs constructed with rigid walls and/or weirs and piped drainage that utilize active or passive treatment and/or mechanical systems for the purpose of treating storm water runoff."

### POLLUTANT LOAD REDUCTION SUMMARY

FACILITY	TSS (Tons)	TN (Tons)	TP (Tons)
1801 14th St. SW	14.2	0.19	0.015
Avondale Park	0.004	0.002	0.00002
Birmingham Botanical Gardens	0.13	0.03	0.0008
Birmingham Zoo	50	0.23	0.04
Bradford Park	2.3	0.04	0.004
Fair Park/CrossPlex	74	0.3	0.07
Eastern Area Land Fill	11.1	0.09	0.01
East Lake Park	0.7	0.04	0.001
Greenwood Park			
Highland/Boswell Golf Course	4.8	0.05	0.006
New Georgia Landfill	0.3	0.06	0.002
Oxmoor			
Community Center	0.7	0.007	0.0008
Patton Park Lake	6.3	0.07	0.0008
Roebuck Springs	0.7	0.004	0.0007

### STRUCTURAL CONTROL SUMMARY

Wet ponds are developed to serve two functions in Birmingham, flood control and pollutant removal thereby bringing both stormwater quantity and quality benefits. These ponds fill with stormwater and release most of it over a period of a few days, slowly returning to its normal depth of

### Birmingham's Structural Controls:

- ❖ 1801 14<sup>th</sup> St. SW Detention Pond
- ❖ Avondale Lake
- ❖ Birmingham Botanical Gardens
- ❖ Birmingham Zoo Detention Pond
- ❖ Bradford Park
- ❖ CrossPlex Detention Pond
- ❖ Eastern Area Landfill Dry Detention Pond "A/D"
- ❖ Eastern Area Landfill Retention Pond "A/R"
- ❖ Eastern Area Landfill Pond "B"
- ❖ Eastern Area Landfill Pond "C"
- ❖ Eastern Area Landfill Pond "D/E"
- ❖ East Lake Park
- ❖ Greenwood Park
- ❖ Highland/Boswell Golf Course Pond
- ❖ New Georgia Landfill
- ❖ Oxmoor Community Center Lake
- ❖ Patton Park Lake
- ❖ Railroad Park
- ❖ Roebuck Springs



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water. Some stormwater infiltrates into underlying soils. Some is evaporated back into the atmosphere. These latter processes mark a reduction in stormwater quantity to the City's MS4. Wet ponds provide stormwater quality benefits through several mechanisms, including:

- ✓ Gravitational settling of suspended particulates
- ✓ Biological uptake of pollutants by plants, algae, and bacteria
- ✓ Pollutant decomposition

When pollutants enter the pond during a rain event, the pond slows the water movement, allowing heavier pollutants such as suspended solids, sediments, and metals to settle out of the water column and come to rest at the bottom of the pond. This greatly improves overall turbidity, or water clarity. Many of the nutrients are also removed from the water by plant growth. Bacteria can also be depleted within the ponds biological processes.



The City of Birmingham maintains 15 facilities with wet ponds like the one shown in the figure to the left of Railroad Park that it owns on a semi-annual basis or as necessary. These ponds are depicted on maps, which may be found in Appendix A. These ponds were constructed primarily for flood control and are not designed to achieve maximum pollutant removal efficiencies. However, the ponds are expected to provide pollutant reduction to an extent based on unit process and operational principles mentioned earlier. Load reduction estimates presented herein are based on the assumption that the City owned wet ponds resemble the design appropriate for

stormwater quality control and how each would be expected to respond to the environmental conditions present during each reporting year. The Structural Controls will be inspected semi-annually by Stormwater Management personnel. The wet ponds owned and maintained by the City of Birmingham include:

**1801 14<sup>th</sup> Street, SW:** (Lat 33.47795N, Long 86.84743W) This facility is located in the South-



West portion of Birmingham adjacent to a residential area behind a church with a large impermeable parking lot. This was designed as a detention pond but has become a retention area due to accumulation of organic matter over a period of time. Birmingham Public Work Department is responsible for the maintenance of this site. The structure accepts drainage from approximately 0.005 square miles and discharges into an old abandoned commercial site that has become a wetland.

The wetland discharges through a culvert into Valley Creek.



**Avondale Springs:** (Lat 33.43352N, Long -86.77222W) This facility is located at 5<sup>th</sup> Avenue South and 41<sup>st</sup> Street. The City of Birmingham Park and Recreation is tasked with the maintenance responsibilities at this location. The lake is approximately 1.5 acres and is stocked with fish and provides an environment for water fowl and various aquatic species. Avondale lake is feed by a natural spring and has been sampled for water quality. The overflow of

Avondale Lake feeds into Cotton Mill Branch a tributary to Village Creek.

**Birmingham Botanical Gardens:** (Lat 33.48661N, Long -86.77519W) This facility is located at 2612 Lane Park Road in Birmingham and has multiple small retention ponds incorporated into the landscape as small water features. Botanical Garden staff maintains these water features and is responsible for upkeep and repairs. The Water features drains approximately 0.3 square miles' upland from the Gardens. The majority of the drainage basin is considered residential and open space. The drainage in this area drains through a system of culverts and open ditches to Shades Creek.



**Birmingham Zoo:** (Lat 33.48492N, Long -86.78181W) This facility is located at 2630 Cahaba Road, Birmingham and has numerous small water features along with open space and permeable areas for rain water absorption. The property drains to a large retention pond south of the Zoo and collects surface drainage from surrounding neighborhoods as well. The retention pond, during heavy rainfall events, discharges into Shades Creek. Animal waste is collected in a separate area and is not allowed to discharge into the watershed. The facility is maintained by

Zoo personnel and Public Works.

**Tom Bradford Park:** (Lat 33.66180N, Long -86.65486W) This facility is located at 1701 Edwards Lake Road, Birmingham. The park has a large retention pond, approximately 1.0 acre, at the south end of the park that accepts surface drainage from the open area of the park and the surrounding forested area that is approximately 0.001 square miles. The City of Birmingham Park and Recreation staff is responsible for maintenance on the park structures. The retention pond discharges through a gated spillway into a tributary that feeds the Cahaba River.

**CrossPlex:** (Lat 33.49647N, Long -86.86900W) This facility is located at 2331 Bessemer Road, Birmingham. This area has a large retention pond that was under construction during the time of inspection on July 27, 2017 and April 10, 2018. This new retention pond replaces an older retention structure and will discharge into Valley Creek when completed. Large amounts of concrete surface area have been removed from this facility in order to promote pervious areas for rain water to infiltrate. Approximately 0.43 square miles of residential, commercial and open area will drain to this retention pond. Birmingham Park and Recreation staff is responsible for maintaining this structure once the contractor is completed and all contractual obligations have been met. Follow up inspection will be conducted by Stormwater Management staff.





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**Eastern Area Landfill:** (Lat 33.59426N, -86.63446W) This facility has four separate



retention ponds located south and south-west of the landfill and one detention pond on the northern section of the landfill that drains to a fifth large retention pond. The drainage from the landfill moves in two different directions, with the retention ponds to the south and west draining into the Stinking Creek water shed. The remaining northern most retention and detention area releases water into the Pinchgut Creek watershed. The western most retention pond (inset photo) is equipped with a sand

filter system that is replaced when necessary (approximately every 5 years). Maintenance at this facility is the responsibility of City of Birmingham Public Works Department. This facility drains approximately 3.9 square miles total of open area consisting of reclaimed landfill. The two aforementioned watersheds were combined for calculation purposes. Stormwater Management staff conducted inspections on all structures on a semi-annual basis. For the purpose of calculation and areas of retention were combined into two smaller drainage basins and area was calculated on that basis.

**Eastlake Park:** (Lat 33.57050N, Long -86.72592W) This facility is a 27-acre retention lake created by damming part of the tributary to Village Creek at Roebuck Springs. Eastlake Park is located at 4<sup>th</sup> Avenue North and 82<sup>nd</sup> Street North, Birmingham. Eastlake Park is maintained by Birmingham Park and Recreation and is home to numerous aquatic species along with an island that is a protected nesting site water fowl. The water collected in the pond discharges directly into Village Creek. This facility accepts drainage from an area dominated by residential, commercial and open space approximately 6.0 square miles in area.



**Greenwood Park:** (Lat 33.55037N, Long -86.78373W) The facility was designed to control local area flooding and along Village Creek directly west-southwest of the Birmingham International Airport at 1632 Tallapoosa Street, Birmingham. The area consists of a large detention/retention area with gates that will automatically lift or close based on the water level flowing into the structure. When the water level reaches a high level, pumps are used to pump the excess water into pre detention which then flows into three separate bio-swale structures that discharge into Village Creek (please see operational

information in Appendix-A). Birmingham Park and Recreation staff is responsible for maintenance of the structural controls.

**Highland Golf Course:** (33.51141N, -86.77778W) This facility has a retention pond associated as a water feature (water hazard) approaching the green on the 10<sup>th</sup> hole of Highland Golf Course at 3300 Highland Avenue, Birmingham. The Lake is approximately 3 acres in size and accepts drainage from approximately 0.3 square miles from the golf course and surrounding residential neighborhoods. The pond discharges into the City of Birmingham's MS4 and finds its way to Village Creek. Highland Golf Course is maintained by City of Birmingham Park and Recreation staff.



**New Georgia Landfill:** (Lat 33.59399N, Long -86.81027W) This facility is the primary solid waste disposal site for the City of Birmingham and is located at 47<sup>th</sup> Avenue and Lewisburg Road, directly north of Birmingham. The facility uses a 0.5 acre retention pond to control drainage from the landfill on the north end of the facility. The retention pond then discharges into a smaller approximately 0.1-acre retention pond before entering Five Mile Creek. Heavy siltation in the first retention area occurs because of the lack of vegetation due to active landfill operations. The silt is continually removed from the retention pond to increase capacity and the material is hauled away for approved disposal. The retention pond accepts approximately 0.1 square miles of runoff from the landfill. City of Birmingham Public Works staff is responsible for Maintenance and siltation removal.

**Oxmoor Community Center:** (Lat: 33.42220N, Long -86.85373W) This facility is located at 1992 Wenonah Oxmoor Road, Birmingham. The Community Center sits on a hill above a large retention pond that accepts water from surrounding commercial properties and forested areas with some open space. The drainage sub-basin has an area of approximately 0.1 miles and the lake outfalls towards Shades Creek. The lake is approximately 1.0 and is maintained by City of Birmingham Public Works staff.

**Patton Park Lake:** (Lat 33.54505N, Long -86.78214W) This facility is located at 3969 14<sup>th</sup> Avenue North, Birmingham. A large 7.1-acre retention lake is used to maintain water quality at this location. The lake discharges into the City of Birmingham MS4 close to Village Creek and accepts storm runoff from surrounding areas including residential, commercial, industrial and open space. The facility is maintained by Birmingham Park and Recreation staff.

**Railroad Park:** (Lat 33.51017N, Long -86.80895) This facility is located at 1700 1<sup>st</sup> Avenue South, Birmingham. Railroad Park is a 19-acre park with several water features scatter across the area flowing to the west at 14<sup>th</sup> street was a pump system recirculates the water back to the east of the park. Irrigation is also used to maintain plants through dry periods. The water features discharge into the City of Birmingham's MS4 at the 14<sup>th</sup> street point and continues to Valley Creek. The facility is maintained by Birmingham Park and Recreation staff along with Railroad Park organization that manages events at this location.

**Roebuck Springs:** (Lat 33.58378 N, Long -86.71044 W) This location is perhaps most notably known as the location where the endangered Darter species are located in the City limits of Birmingham. This facility is located at 8920 Roebuck Boulevard, Birmingham, and is next to the parking area for the Roebuck Recreation Center and Don Hawkins Golf Course. This location is part of the headwaters for Village Creek and is spring feed into a retention area approximately 1.0 acre in area. City of Birmingham Park and Recreation staff maintain the area. The surface drainage in this area is .037 square miles comes from commercial, institutional, residential and open space surrounding land use categories.

**APPROACH:** Estimating pollutant load reduction for wet ponds requires the delineation of the drainage basin area that contributes to the individual Structural Control. This is accomplished by the use of USGS Stream stats and City of Birmingham GIS applications. Following delineation of the drainage basins and total area is determined, the land use is estimated for

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each individual structural control drainage basin including impervious areas and is broken down into the amount of pollutant that contributes by each land use category for each individual Structural Control from a particular land use condition and the annual pollutant load to the ponds is estimated. Once these estimates are determined, the weight in tons/year is determined.

***RAINFALL:*** The NPDES Phase I Permit requires that the City maintain rainfall measurements and estimate runoff discharge. The City imports the daily weather data including precipitation from USGS monitoring stations and the Alabama Office of the State Climatology (AOSC), University of Alabama at Huntsville, who publishes the data monitored by the precipitation gauge located at the Birmingham International Airport. Since this gauge is located within the City limits, its monitored data, including precipitation data, should represent the City MS4 area reasonably well. If more specific rainfall data can be obtained by using individual USGS monitoring sites, then that information can be obtained and utilized if a variation of rainfall data is different from the Airport data. Daily rainfall data for each year is imported from AOSC or USGS and analyzed for average annual rainfall.

As a general practice, individual rainfall events with a depth less than 0.1 inch are not considered to produce any runoff from a ponds drainage basins and hence the sum of the rainfall events that are equal to or greater than 0.1 inch are used in calculating effective annual rainfall depth. Hence, the calculated average effective annual rainfall for the period between 2005/2006 through 2015/2017, inclusive was 53.7 inches/year. Each annual report will use the effective annual rainfall depth representative of that annual rainfall period as the total rainfall.

***LAND USE AREAS AND IMPERVIOUS VALUES:*** The City of Birmingham land use area is approximately 81,236.4 acres in size. Major land uses within the drainage basins of the structural controls are identified using the GIS land use coverage layer. Major land uses identified within the structural controls drainage basins include residential, commercial, industrial, open space and major roads. Forest and agriculture land uses in the GIS layer within the basins are consolidated into open space for calculation purposes.

**Table 1. Percent Impervious Cover by Land Use**

**Type with Calculated Runoff Coefficients**

Land Use Category	Percent Impervious Area	Runoff Coefficient (Rv)
Residential	24%	0.24
Commercial	46%	0.44
Industrial	27%	0.26
Open Space	1%	0.02
Roads	94%	0.88



**SOURCE AREAS:** Major land uses associated with each wet pond facility was determined using Geographical Information System (GIS) land use layers and is shown below in Table 2. Appendix A presents the aerial photographs with delineated drainage basins of individual wet ponds.

**Table 2. Wet Ponds Source Area Land Uses**

Facility Name	Land Use Type	Area (Acres)
1801 14 <sup>th</sup> Street, SW	Residential	76.7
	Roads	21.9
	Water	1.4
Avondale Lake	Open Space	2.9
	Water	1.8
Birmingham Botanical Gardens	Open Space	106.7





Facility Name	Land Use Type	Area (Acres)
Birmingham Zoo	Open Land	1.4
	Forest	19.1
	Residential	88.9
	Agricultural	1.3
	Roads	48.5
	Commercial	58.6
	Water	5.7
Tom Bradford Park	Forest	70.7
	Residential	28.6
	Open Space	11.9
	Water	0.6
CrossPlex	Commercial	115.0
	Residential	119.4
	Roads	43.7
	Water	0.4
Eastern Area Landfill 1	Forest	33.7
	Residential	21.5
	Open Space	59.7
	Water	2.4
	Industrial	2.7
	Commercial	9.0

Facility Name	Land Use Type	Area (Acres)
	Agricultural	17.8
Eastern Area Landfill 2	Residential	16.5
	Forest	36.5
	Commercial	0.8
	Agricultural	0.2
	Water	1.7
	Open Space	17.8
	Roads	7.5
East Lake Park <sup>1</sup>	Commercial	1.5
	Water	45.1
	Open Space	55
Greenwood Park	Commercial	5.4
	Roads	3.4
	Residential	1.4
	Open Space	26.5
Highland Park Golf Course	Residential	35.4
	Roads	5.1
	Open Space	94.8
	Water	1.2
New Georgia Landfill	Open Space	230.2
	Water	1.3

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Facility Name	Land Use Type	Area (Acres)
Oxmoor Community Center	Open Space	15.2
	Water	7.7
	Industrial	1.9
	Forested	4.9
Patton Park Lake	Open Space	25.0
	Industrial	29.9
	Residential	65.1
	Water	5.3
Railroad Park	Open Space	18.9
	Commercial	50.4
	Residential	3.5
	Water	0.72
	Industrial	1.1
Roebuck Hawkins Golf Course	Open Space	1.8
	Residential	1.1
	Commercial	1.39
	Water	1.26
	Institutional	2.0

**Notes:**

<sup>1</sup> Includes Roebuck Springs & Run

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**SELECTION OF EMCs:** EMCs represent the average concentration of a pollutant in stormwater runoff and are usually reported in mass per unit volume (mg/L). Many factors can affect EMC values including land use, annual rainfall, percent impervious cover, season, sample collection method, watershed size, and storm event magnitude. Appropriate selection of EMC values is an important step in predicting pollutant loads from the source areas.

A review of available literature related to EMC data was performed to develop reasonable EMC values for one or more commonly found pollutants in urban areas, which include total suspended solids (TSS), total nitrogen (TN), and total phosphorus (TP). The EMC values used for the purpose of this section of the SWMPP are presented in Table 3. Agricultural land use within the source basins was relatively small and mostly associated with open lands or forests, hence common EMCs are used for open space, forest, and agricultural land uses.

**Table 3. Pollutant Loadings from Runoff by Land Use Type**

Land Use	TSS (lbs/acre-yr)	TN (lbs/acre-yr)	TP (lbs/acre-yr)
Residential	190	3.9	0.50
Open Land, Agricultural & Forest	3	1.8	0.03
Commercial	1,000	9.8	1.5
Industrial	860	5.1	1.3
Roads	880	12.1	0.9

[US EPA STORM WATER MANAGEMENT MODEL REFERENCE MANUAL. 2016. PG. 28](#)

**POLLUTANT LOADS TO WET PONDS:** Annual pollutant loads to City wet ponds, calculated as the sum of each land use source area in the drainage basin, are presented in Table 4.





<b>Table 4. Estimated Annual Pollutants Load to City Wet Ponds Facility Name</b>	<b>TSS (lbs)</b>	<b>TN (lbs)</b>	<b>TP (lbs)</b>
1801 14 <sup>th</sup> Street, SW	<b>33,845</b>	<b>564.1</b>	<b>58.1</b>
Avondale Lake	<b>8.7</b>	<b>5.2</b>	<b>0.09</b>
Birmingham Botanical Gardens	<b>320.1</b>	<b>192.1</b>	<b>3.2</b>
Birmingham Zoo	<b>118,236.4</b>	<b>1,547</b>	<b>176.6</b>
Tom Bradford Park	<b>5,681.8</b>	<b>260.2</b>	<b>16.8</b>
CrossPlex	<b>176,142</b>	<b>2,121.5</b>	<b>271.5</b>
Eastern Area Landfill 1	<b>15,687.2</b>	<b>353.9</b>	<b>30.6</b>
Eastern Area Landfill 2	<b>10,698.5</b>	<b>261.1</b>	<b>17.8</b>
East Lake Park	<b>1665</b>	<b>246</b>	<b>3.9</b>
Greenwood Park	<b>8738</b>	<b>110</b>	<b>12.7</b>
Highland/Boswell Golf Course	<b>11,498.4</b>	<b>370.4</b>	<b>25.13</b>
New Georgia Landfill	<b>690.6</b>	<b>414.4</b>	<b>6.9</b>
Oxmoor Community Center	<b>1,695.3</b>	<b>45.9</b>	<b>3.1</b>
Patton Park Lake	<b>15,015.4</b>	<b>452</b>	<b>72.3</b>
Railroad Park	<b>52,068</b>	<b>547.2</b>	<b>79.4</b>
Roebuck Springs/Hawkins Park	<b>1610.4</b>	<b>25.8</b>	<b>2.7</b>

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Pollutant loads from each pond itself was assumed to be negligible and therefore was ignored in estimating the total load to the ponds. When ponds are in series like Roebuck Springs and Roebuck Springs Run and each Zoo pond, they are considered as one single pond and a cumulative pollutant load to the pond was calculated.

**ASSESSING WET POND PERFORMANCE:** There is more than one pond at the Zoo and Roebuck Golf Course that treats runoff from the same drainage area. These multiple ponds work together in series to remove pollutants. For purposes of this analysis, individual ponds drainage areas were initially delineated and for those areas in which the ponds drainage areas overlapped, only one pond is considered for pollutant load reduction calculations. This method does not give credit for additional load removal likely achieved with ponds performing in series, which results in a more conservative load reduction estimate.

Since there are no field measured removal efficiencies specific to City wet ponds available, pollutant load reduction benefits are estimated based on literature published performance criteria for wet ponds. For example, Table 5 below summarizes studies of wet pond pollutant removal efficiencies. It is important to note however that efficiency of any structural control depends on its design, maintenance, and other local conditions and can vary significantly from one study to another and one region of the Country or world to another. Hence the assigned performance level to the City owned ponds is only an estimate. Median performance levels of all studies included in the results below were employed in calculating the estimated pollutant load reduction by City owned ponds. Furthermore, the City ponds may or may not be performing at the level assumed for the purpose of this section of the SWMPP, but at least the City ponds should be capable of achieving these performance levels if the ponds are retrofitted with appropriate structural design controls.

**Table 5. Wet Ponds Pollutant Removal Efficiencies**

<b>TSS (% Reduction)</b>	<b>TN (% Reduction)</b>	<b>TP (% Reduction)</b>
<b>84</b>	<b>30</b>	<b>50</b>

[DOCUMENT DISPLAY | NEPIS | US EPA. 2016. PG. 91](#)

**POLLUTANT LOAD REDUCTION:** Post treatment annual pollutant loads leaving the City wet ponds and the calculated pollutant load reduction based on the median performance levels from published literature are presented in Table 6. The difference in the pollutant load to and from the wet ponds are illustrated in Figures 1 through 3.



Facility Name	TSS		TN		TP	
	Annual Load Reduction (lbs.)	Annual Load Out of Pond (lbs.)	Annual Load Reduction (lbs.)	Annual Load Out of Pond (lbs.)	Annual Load Reduction (lbs.)	Annual Load Out of Pond (lbs.)
1801 14 <sup>th</sup> Street, SW	28,430	5,415	395	169	29	29
Avondale Spring	7.3	1.4	3.64	1.56	0.045	0.045
Birmingham Botanical Gardens	269	51.2	57.6	134	1.6	1.6
Birmingham Zoo	99,319	18,917.4	464	1083	88	88
Tom Bradford Park	4773	909	78	182.2	8.4	8.4
CrossPlex	147,959	2,818	636	1486	136	136
Eastern Area Landfill No. 1	13,177.2	2,510	106	247.9	15.3	15.3
Eastern Area Landfill No. 2	8,987	1711.5	78.3	182.8	8.9	8.9
Eastlake Park	1399	266	74	172	2.0	2.0
Greenwood Park	7340	1398	33.1	77.1	6.35	6.35
Highland Golf Course	9,659	1,839.4	111.1	259.3	12.6	12.6
New Georgia Landfill	580	110.6	124.3	290.1	3.5	3.5
Oxmoor Community Center	1,424.1	271.2	13.8	32.1	1.5	1.5

Facility Name	TSS		TN		TP	
	Annual Load Reduction (lbs.)	Annual Load Out of Pond (lbs.)	Annual Load Reduction (lbs.)	Annual Load Out of Pond (lbs.)	Annual Load Reduction (lbs.)	Annual Load Out of Pond (lbs.)
Patton Park Lake	12,613	240.3	136	316	36	36
Railroad Park	43,737	8331	164	383	39.5	39.5
Roebuck Springs	1353	257.4	7.7	18.1	1.4	1.4

**STRUCTURAL CONTROLS ANNUAL OPERATING PROCEDURES:** All structural controls shall be:

- ❖ *Inspected on a semi-annual basis unless more frequent inspections may be warranted;*
- ❖ *Recorded on a “Structural Controls Inspection Checklist” for structural control inspection and maintenance procedures; Attachment A*
- ❖ *Noted with irregularities related to bank stabilization and erosion should be followed up with the Department of Public Works for stabilization solutions;*
- ❖ *Noted with irregularities related to floatables, litter, sediment and debris in the structural controls on the Structural Controls Inspection Checklist and DPW/Parks & Recreation shall be requested to clean up the site post-inspection.*
- ❖ *Maintained as an inventory of structural controls and a tracking system for inspections and maintenance of the control structures; and*
- ❖ *Reported each year in the annual report the following structural control information included:*
  - ✓ The number and date of structural control inspections performed, including follow up inspections;
  - ✓ A summarization of maintenance activities performed on structural controls;
  - ✓ The estimated amount of floatable, litter, sediment and debris that was removed;
  - ✓ Copies of any contractual agreements for maintenance activities if not performed by the Permittee;
  - ✓ Updated structural controls map of Permittee-owned structural controls added during the preceding year with geographic coordinates.
- ❖ *A copy of the “Structural Controls Inspection Checklist” may be found in Appendix A.*





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**MAJOR FINDINGS:** Overall impact of structural controls predominately using wet ponds for water quality purposes, that are on properties controlled or owned by the City of Birmingham, have had a positive effect to reduce the overall annual levels of total suspended solids by 191 tons, Total Nitrogen by 1.2 tons and total phosphorus by 0.2 tons.

**MAJOR ACCOMPLISHMENTS:** Providing annual inspections on all structural controls at City of Birmingham facilities has allowed for another layer of oversight at facilities that are sometimes the responsibilities of more than one City Department. This oversight helps to foster communication between Departments and allows the City to coordinate and utilize resources to better maintain these control structures. Inspections allow the City of Birmingham to better meet Permit conditions related to the MS4 and stormwater management.

**PROGRAM STRENGTHS/WEAKNESSES:** The strengths of providing these annual inspections allows the City of Birmingham to estimate the reduction of pollutant loads by using properly designed Structural Controls. The pollutant load reduction in the overall watersheds may not be as significant as the overall pollutant load, but it does help to see the need for more structural controls to reduce the pollutant load on the various Creeks and Rivers in the City of Birmingham's watersheds. Additional Structural Controls whenever possible should be utilized more frequently.

**FUTURE DIRECTION:** A significant amount of pollutant load from respective drainage basins was estimated to be reduced by the City owned wet ponds, assuming the ponds resemble a wet pond design. Literature has published a wide range of performance levels for pollutants controlled by wet ponds; literature published median performance levels were employed in estimating pollutant load reduction by City owned wet ponds. It may be expected that a well-designed or retrofitted wet pond for water quality protection will further reduce pollutant loads beyond the reductions estimated and presented in this Section of the SWMPP, meeting even higher performance levels than otherwise found in published literature. For more information, please see *Post Construction Stormwater Management Control Measure* in this SWMPP.

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***Appendix A***  
***Structural Control Inspection Checklist***





## Retention/Detention Basin Inspection Form

Site:	Inspector:	Date:
Basin I.D.:	Responsible Party:	Date Delivered:

CRITERIA	SAT/UNSAT/NA	COMMENTS
1. <b>FOREBAY:</b> >50% filled with sediment = UNSAT and note ATTN REQUIRED		
2. <b>INLETS:</b> Note signs of erosion and/or low spots		
3. <b>OUTLET:</b> Note signs of erosion and/or low spots		
4. <b>PRINCIPAL SPILLWAY:</b> Note signs of erosion, obstructions, seeping.		
5. <b>EMERGENCY SPILLWAY:</b> Note signs of erosion, obstruction.		
6. <b>BASIN BOTTOM AND SIDE SLOPES:</b> Note erosion, ground cover woody vegetation.		
7. <b>SAFETY DEVICES:</b> Fences, gates, locks, etc.		
8. <b>EMBANKMENTS:</b> Note adequate ground cover, signs of erosion, woody vegetation, low spots, cracking, animal burrows, signs of instability.		
9. <b>STRUCTURAL COMPONENTS:</b> Note signs of settling, cracking, bulging, misalignment, or deterioration.		
10. <b>ROUTINE MAINTENANCE:</b> Does facility require mowing, trash pickup?		
11. <b>CONDITION OF AQUATIC ENVIRONMENT:</b> Note excessive algae, dominance of one vegetative type, evidence of non-storm water discharges of fish kill.		
12. <b>VEGETATION:</b> Is vegetation healthy and providing appropriate cover? Note presence of unwanted vegetation.		
13. <b>STORAGE VOLUME:</b> Note evidence of conditions that significantly reduce storage volume.		
14. <b>DEBRIS / SEDIMENT ACCUMULATION:</b> Note evidence of trash, floating/floatable debris, or sediment accumulation not otherwise noted. Note location.		
15. <b>STANDING WATER:</b> Is there standing water in appropriate areas? Inappropriate areas?		

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16. SAFETY AND AQUATIC BENCH		
17. SIDE SLOPE VEGETATION		
18. OTHER		
<b>PHOTOGRAPHIC LOG</b>		
Project: City of Birmingham MS4 Program Structural Controls Inspections:	Location: Creek	

**ADDITIONAL NOTES**


(If needed attach additional pages to properly document the inspection.)

<b>RE-INSPECTION REQUIRED</b>	<b>YES</b>	<b>NO</b>
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Signature and Date of Person Completing the Inspection

**All repairs to be completed within 30 days of notification.**

Responsible Party:	NAME:	DATE:
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***Appendix B***  
***Maps of Structural Controls by Drainage Basin***











