Final
Green Stormwater Infrastructure Feasibility Assessment for the Core Area of the Turner Field Stadium Neighborhoods Livable Centers Initiative

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Executive Summary

The forthcoming redevelopment of the Turner Field Stadium and associated parking lots (the Core Area) in downtown Atlanta, Georgia presents an opportunity to reduce stormwater runoff and flooding in neighboring communities. As part of the Turner Field Stadium Neighborhoods Livable Centers Initiative (LCI), a planning effort to address redevelopment of the Core Area as well as surrounding neighborhoods, American Rivers conducted an assessment of the potential for green stormwater infrastructure (GSI) to provide stormwater runoff reduction to both alleviate flooding downstream and provide additional quality of life benefits associated with GSI. Based on the watershed assessment, American Rivers recommends within the Core Area capturing and infiltrating the 95th percentile storm on site using GSI, which in Atlanta equates to 1.8 inches of rainfall in 24 hours (hereafter referred to as a 1.8" storm). This report demonstrates the feasibility of capturing and infiltrating the 1.8" storm on site within the Core Area using the three preliminary concept plans prepared by Perkins+Will for the LCI. Turner Field stadium itself was not assessed for the feasibility to capture the target volume onsite, due in part to the likelihood that it will not be significantly redeveloped.

An assessment of the three concept plans for redevelopment of the Core Area indicates that all three plans would generate similar volumes of runoff during a 1.8" storm. Projected volumes are all approximately 2.3 million gallons for the site. The results indicate that capturing this volume is feasible. While there are many ways of achieving this goal, one approach to capturing and infiltrating the 1.8" storm evenly across the whole site would entail the following approaches:

- Capture 1.8" of rainfall or more from rooftops and store the volume in cisterns for reuse.
- Dedicate 5.5% of all landscaped areas outside of buildings for bioretention.
- Dedicate 0.7% of all park areas to bioretention.
- Pave new streets with permeable pavers wherever possible throughout the site.
- Treat runoff from sidewalks and non-permeable streets with bump-out bioretention cells, which would comprise 6.6 % of all non-permeable streetscape.

Taking an approach such as this to the redevelopment of the Core Area will help reduce the burden of recurring floods on downstream communities, while simultaneously improving the overall livability of the community using GSI.

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Background

The history of development in the neighborhoods around Turner Field has rarely, if ever, served neighborhood residents well. In the early 20th century, the region was a booming industrial center. However, urban renewal efforts of the 1950s and 1960s led to significant displacement of residents and damage to the urban fabric of the community. From the construction of the highways, to the first stadium in the 1960s, to the construction of the Olympic stadium development has not served the needs and desires of the community in the vicinity. The residential population has plummeted, jobs and urban amenities have disappeared[i], and intensive development means impervious surface now dominates the landscape, causing major flooding problems for residential neighborhoods (see Appendix 1).[ii] With this in mind, it is clear that the forthcoming redevelopment of the Turner Field Stadium area is an important opportunity to redesign the neighborhoods in the area for the benefit of the residents of the neighborhoods for the first time in decades.

Turner Field Stadium, located immediately south of downtown Atlanta, Georgia, is the soon-to-be former home of the Atlanta Braves baseball team. The City of Atlanta is currently in the process of selling the stadium and associated parking lots (Figure 1), presenting a rare opportunity for a major redevelopment of a highly visible section of the downtown area. Simultaneously, there is a planning effort underway funded through the Atlanta Regional Commission with the intent to enhance communities by supporting increased use of all transportation modes, paired with a collaborative process of community and stakeholders engagement[iii]. The Turner Field Stadium Neighborhoods Livable Centers Initiative (LCI), led by Perkins+Will, released three draft concept diagrams in March, 2016 for the redevelopment of the Turner Field Stadium and associated parking lots (the Core Area) which can be seen in Appendix 2. The concept diagrams are preliminaries to master plans for the redevelopment of the full site. As such, they explore potential land use combinations for buildings, parks, and streets without significant detail.

Overview

American Rivers recommends that the redevelopment capture and infiltrate or reuse the 95th percentile storm, which equates to 1.8" of rain in 24 hours (hereafter referred to as a 1.8" storm). In this assessment, American Rivers analyzed each of the three concept plans to assess the feasibility of capturing the 1.8" storm for the entire site using green stormwater infrastructure (GSI). The preferred GSI practices considered in this assessment were rainwater harvesting for buildings; bioretention for parks, landscape areas, and some roadways; and permeable pavers for any new roads.

The target volume for GSI was determined to be the 1.8" storm because it would manage 95% of the rain that falls in a year. Management for this type of storm event is a common engineering benchmark as it is considered to be the level of management that replicates predevelopment hydrology.[iv] Replicating predevelopment hydrology is not only important to reduce runoff and transport of pollutants, but also to recharge aquifers which contribute to baseflow in streams during drought.

The 95th Percentile Storm

The target volume for GSI was determined to be the 95th percentile storm event, which in Atlanta equates to 1.8 inches of rainfall in 24 hours (hereafter referred to as a 1.8" storm). This size storm was chosen because it would manage 95% of the storm events in an average year. The 95th percentile storm event is a common engineering benchmark as it is considered to be the level of management that replicates predevelopment hydrology,* thereby recharging aquifers and contributing to baseflow in streams during drought.

*United States Environmental Protection Agency, 2009, *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act*

The Benefits of Green Stormwater Infrastructure

This feasibility assessment demonstrate how approximately 2.3 million gallons of stormwater could be kept out of the combined sewer system during each 1.8" storm, but the benefits of GSI to go far beyond the reduction of flooding. Studies around the country have demonstrated that GSI often brings local jobs to the area, increases property values, reduces crime and violence, provides opportunities to urban gardening and public education, lowers the urban heat island effect, reduces energy use, improves air quality, improves aesthetics, reduces noise pollution, fosters community cohesion, provides wildlife habitat, and helps communities adapt to climate change. Some forms of GSI also provide new recreational opportunities, which contribute to the overall health of the community. Additional benefits to the city include reduced cost of grey infrastructure and reduced cost of water treatment.[v]

Green Stormwater Infrastructure

GSI is a form of wet weather management that uses vegetation, soils, natural systems, and/or engineered systems that mimic natural processes to infiltrate, evapotranspire, or recycle stormwater runoff.

Methods

To perform this feasibility assessment, each of the three concept diagrams prepared by Perkins+Will for the LCI was scaled using AutoCAD. The development boundary was established for each site. This consisted of the outer limits of any modification to parcels or roadways specified in the plan. This boundary varied slightly between concepts. Only areas north of Ralph David Abernathy Boulevard/Georgia Avenue were included in this analysis due to a lack of clarity on the concept for the current stadium. Areas were measured for each of three land uses: "Buildings," "Parks," and "Streetscapes". On the concept diagrams provided by Perkins + Will (Appendix 2), buildings are defined as the blue areas on the concept plans, parks are the solid green areas, and streetscapes are the remaining area within the development boundary, outside of the Buildings and Parks. Streetscapes are subdivided into two categories: existing streets are light grey and new streets are dark grey.

Each concept was modeled using HydroCAD so that overall runoff volumes could be compared between concepts. For each concept, a composite curve number was generated by inputting fields for impervious and permeable areas. Parks were classified as permeable, and Buildings and Streetscapes were impervious. It is anticipated that additional runoff from pervious surfaces may occur due to urban soils with poor drainage; however, this runoff was not accounted for per the Georgia Stormwater Management Manual (GSMM). If runoff from parks and other pervious surface were to be infiltrated, additional GSI would be necessary. Each land use category of each concept was analyzed to determine the runoff generated in a 1.8" storm and the minimum footprint for GSI practices to detain that volume.

The building areas in the concept diagrams were assumed to consist of 75% rooftop and 25% exterior landscape. It was determined that the optimal GSI treatment for runoff from the building rooftops would be capture and reuse for cooling towers, irrigation, and toilet flushing. Runoff volumes for the 1.8" storm were calculated for each rooftop area. These are the minimum cistern volumes which would be necessary for each building. Tables 1, 2, and 3 in Appendix 3 display the building rooftop areas in Concepts 1, 2, and 3 and their corresponding minimum cistern volumes to capture the 1.8" storm. Tables 4, 5, and 6 detail the total landscape area and minimum GSI footprint for the building-related exterior landscapes. Runoff volumes were calculated with the assumption that the building-related exterior landscape areas are 75% impervious and 25% permeable.

The park areas in the concept diagrams were assumed to consist of 95% permeable landscape and 5% impervious hardscape. Bioretention footprint requirements were calculated using the same methods as the building landscape areas detailed above. Tables 7, 8, and 9 in Appendix 3 display the park areas in Concepts 1, 2, and 3 and their corresponding minimum GSI footprints to capture the 1.8" storm.

Streetscapes were divided into two subcategories, to be treated by two different types of GSI. New streets were determined to be suited for treatment with permeable pavers. Because permeable pavers treat the area on which they are constructed, the minimum permeable paver footprint for the new streets is equal to the total area of the new streets. The depth of the gravel base layer was calculated using the methods outlined in the GSMM. In order to explore the feasibility of curbside bioretention cells as an alternative option, calculations were also done to determine the minimum bioretention footprint for treating the new streets. For existing streets, curbside bioretention cells were assumed to be the most suitable retrofit. Bioretention footprints were calculated using the methods detailed above. For all bioretention calculations, the imperviousness of the contributing drainage area was assumed to be 90% to account for tree wells and roadside planting strips. Tables 10, 11, and 12 in Appendix 3 display the street areas in Concepts 1, 2, and 3 and their corresponding minimum GSI footprints to capture the 1.8" storm. Minimum volumes were calculated for all best management practices (BMPs) using the sizing methods outlined in the GSMM.

Results

Site Runoff Analysis

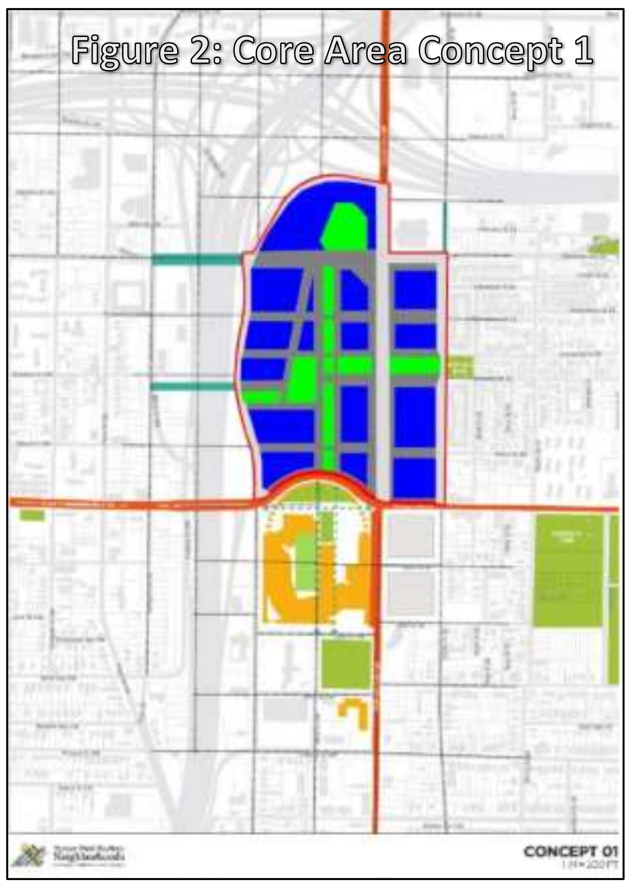
Impervious percentages for the entire site ranged from 87.75% to 92.61%. The three concepts are all fairly comparable in terms of land use, with Concept 2 having slightly more building area and less parks and streetscape. Projected runoff does not differ substantially between the three. HydroCAD indicates 1.8” stormwater runoff volumes to be approximately 2.3 million gallons. The results of this analysis are shown in the following table:

Table 1: Core Area Land Use Details

	Concept 1	Concept 2	Concept 3
Buildings (sqft)	1,286,627	1,697,905	1,353,258
Parks (sqft)	370,718	215,725	381,160
Streetscape (sqft)	1,409,713	1,006,022	1,376,470
Total Area (sqft)	3,067,060	2,919,547	3,110,895
Site Area (Ac)	70.4	67	71.4
Permeable Area (Ac)	8.5	5	8.8
Impervious Area (Ac)	61.9	62.1	62.7
% Impervious	87.91	92.61	87.75
1.8" Storm Volume (Gal)	2,297,249	2,345,475	2,333,093

Concept 1

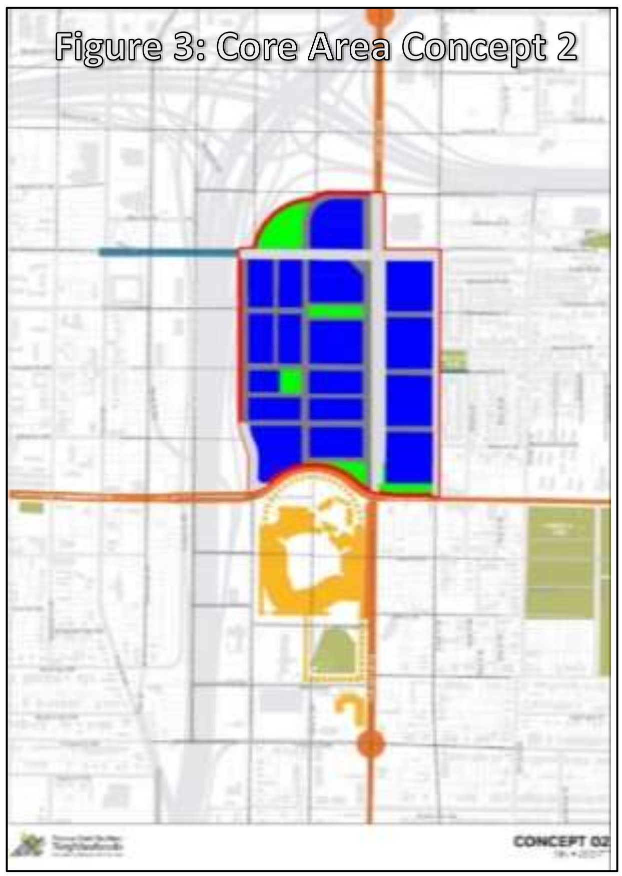
- **16 building areas (blue)**
  - Total rooftop area would be 964,964 sqft and would require 1,082,765 gallons of storage volume in cisterns.
  - Table 1 in Appendix 3 displays the rooftop areas for the 16 buildings and their corresponding minimum cistern volumes to capture the 1.8” storm.
- **16 building-related exterior landscapes (blue)**
  - Total building-related exterior landscapes would take up 321,655 sqft and would require 17,938 sqft of bioretention.
  - Table 4 in Appendix 3 displays the landscape areas for the 16 buildings and their corresponding minimum bioretention footprints to capture the 1.8” storm.



- **10 park areas (green)**
  - Total park area would take up 370,716 sqft and would require 2,709 sqft of bioretention.
  - Table 7 in Appendix 3 displays the areas of the 10 parks and their corresponding minimum GSI footprints to capture the 1.8” storm.
- **Streetscape (grey)**
  - Total area: 1,409,713 sqft
  - Existing streets would take up 473,460 sqft and would require 31,321 sqft of bioretention
  - New streets would take up 936,253 sqft, which could be constructed from permeable pavers, or be treated with 61,937 sqft of bioretention.
  - Table 10 in Appendix 3 displays the streetscape areas and corresponding minimum GSI footprints.

Concept 2

- **17 building areas (blue)**
  - Total rooftop area would be 1,273,321 sqft and would require 1,428,765 gallons of storage volume in cisterns.
  - Table 2 in Appendix 3 displays the rooftop areas for the 17 buildings and their corresponding minimum cistern volumes to capture the 1.8” storm.
- **17 building-related exterior landscapes (blue)**
  - Total building-related exterior landscapes would take up 424,440 sqft and would require 23,671 sqft of bioretention
  - Table 5 in Appendix 3 displays the landscape areas for the 17 buildings and their corresponding minimum bioretention footprints to capture the 1.8” storm.
- **5 park areas (green)**
  - Total park area would take up 215,898 sqft and would require 1,578 sqft of bioretention.
  - Table 8 in Appendix 3 displays the areas of the 5 parks and their corresponding minimum GSI footprints to capture the 1.8” storm.



- **Streetscape (grey)**
  - Total area: 1,006,022 sqft
  - Existing streets would take up 439,433 sqft and would require 29,070 sqft of bioretention.
  - New streets would take up 566,589, which could be constructed from permeable pavers, or be treated with 37,482 sqft of bioretention.

- Table 11 in Appendix 3 displays the streetscape areas and corresponding minimum GSI footprints.

Concept 3

- **19 building areas (blue)**
    - Total rooftop area would be 1,014,937 sqft and would require 1,138,838 gallons of storage volume in cisterns.
    - Table 3 displays the rooftop areas for the 19 buildings and their corresponding minimum cistern volumes to capture the 1.8” storm.
- **19 building-related exterior landscapes (blue)**
    - Total building-related exterior landscapes would take up 338,312 sqft and would require 18,867 sqft of bioretention.
    - Table 6 in Appendix 3 displays the landscape areas for the 19 buildings and their corresponding minimum bioretention footprints to capture the 1.8” storm.

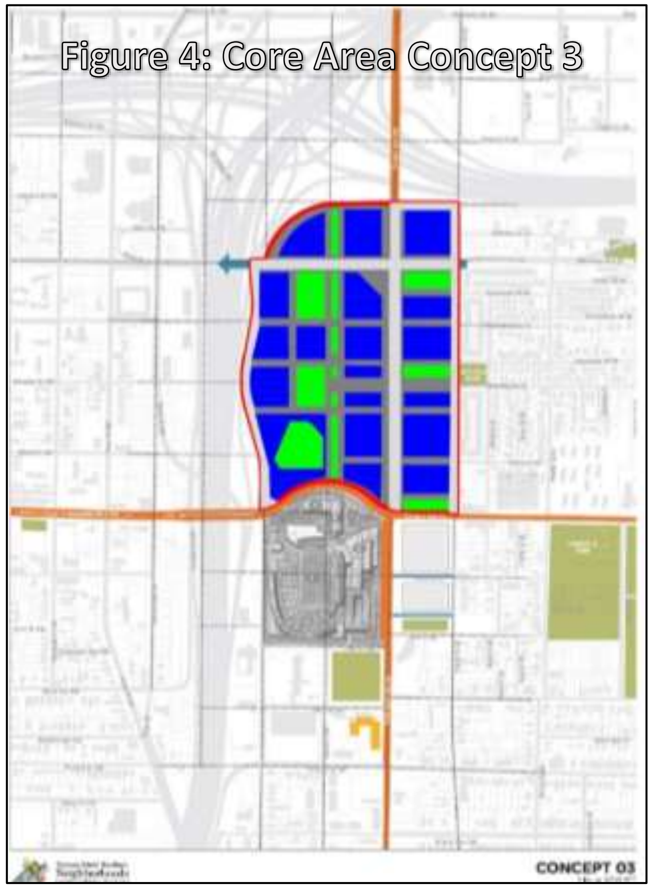


Figure 4: Core Area Concept 3

- **12 park areas (green)**
    - Total park area would take up 381,156 sqft and would require 2,785 sqft of bioretention.
    - Table 9 in Appendix 3 displays the areas of the 12 parks and their corresponding minimum GSI footprints to capture the 1.8” storm.
- **Streetscape (grey)**
    - Total area: 1,376,470 sqft
    - Existing streets would take up 362,153 sqft and would require 23,957 sqft of bioretention.
    - New streets would take up 1,014,317 sqft, which could be constructed from permeable pavers, or be treated with 67,100 sqft of bioretention.
    - Table 12 in Appendix 3 displays the streetscape areas and corresponding minimum GSI footprints.

Discussion

The following sections describe additional considerations for the three land use categories that were analyzed and the BMPs that were considered for this feasibility assessment.

Buildings

We propose that stormwater from buildings should be harvested with cisterns and reused to offset potable water demand for cooling towers, toilets, and/or landscape irrigation. It is important to note that the cistern volumes calculated in this report function as a bare minimum to capture the 1.8" storm. In practice, cisterns may need excess capacity because if they are not entirely empty at the commencement of a rain event, then they will be unable to contain the full volume. Alternately, software applications exist for automatically regulating cistern levels in conjunction with weather forecasts, so that a cistern can be programmed to drain in anticipation of an approaching storm. Another possible approach is that the development can be designed to have larger cisterns capturing water from multiple adjacent buildings. In this case, each building would not need its own cistern. While such large cisterns may be expensive, local case studies such as the Grand Hyatt demonstrate that the ROI for such an investment is sound.

For all three concepts, about 5.5% of the total building-related landscape area would need to function as bioretention in order to infiltrate the 1.8" storm.

Parks

We propose bioretention as the method of managing stormwater in the parks. For all three concepts, about 0.7% of the total park land use area would need to function as bioretention in order to infiltrate the 1.8" storm. Additionally, more bioretention may be required to manage runoff from the pervious portions of the park due to the likelihood of highly compacted soils.

Streetscape

We propose bioretention to manage stormwater from existing streets, and permeable pavers for new streets. The recommendation for pavers would also create an aesthetic consistent with the six miles of permeable pavers that are currently being installed,[vi] fostering a greater sense of connectivity with the adjacent neighborhoods. For all streetscape areas which are treated with bioretention, about 6.6% of the total area would need to be dedicated as such in order to infiltrate the 1.8" storm.

Even when installed with a minimum base course depth, permeable pavers have storage capacity in excess of the 1.8" storm. Permeable pavers with a minimal 12" base course technically have the capacity to retain 5.58" of rainfall. In practice, storage may be limited when storm intensity exceeds the infiltration rate of the paver. However, it is clear that any area outfitted with permeable pavers will be capable of retaining substantially more than the 1.8" storm. This excess capacity can be thought of as a bonus. This "bonus" volume would be approximately 328,781 gallons for Concept 1, 198,967 gallons for Concept 2, and 356,194 gallons for Concept 3 during a 5-year, 24 hour storm (4.9").

Case Studies

The following case studies were selected because they demonstrate cost effective examples of local developers voluntarily going above and beyond the requirements for GSI, using similar approaches as those recommended in this report.

Georgia Institute of Technology (Atlanta, Georgia)

Georgia Tech has a Stormwater Master Plan covering 180 acres. Key goals include: water capture and reuse, runoff volume reduction, mimicking the natural process, a campus "regional" approach, and exceeding regulatory requirements. Georgia Tech is aiming for 1.2" runoff reduction from the entire area, when only 1.0" is required. The result is a four-fold reduction in flow to combined sewers. The estimated cost of this plan is $2 million less than basic compliance, due to savings primarily from reduction in demand for potable water.[vii]

The G. Wayne Clough Undergraduate Learning Commons is a highlight of the Stormwater Master Plan. Its 1,400,000 gallon cistern is the largest on a U.S. campus, and the designers received the National Recognition Award from the American Council of Engineering Companies for this project.[viii]

Grand Hyatt Atlanta (Buckhead, Georgia)

The Grand Hyatt Atlanta in Buckhead captures 100% of the rain that falls on the building, as well as condensate from ice machines and the HVAC system. The initial plan included a $100,000 investment in rainwater harvesting, was expanded in 2013, and has a final return on investment of 2.36 years—an annual savings of $42,331. For this effort, the Grand Hyatt received national attention and was featured in five industry publications. No water from the building enters storm drains.[ix] In 2014 and 2015, they were awarded TripAdvisor's GreenLeader Platinum Level for their rainwater reuse, which tops 30,000 gallons per day.[x]

Mercedes Benz Stadium (Atlanta, Georgia)

While the feasibility of capturing the 1.8" storm from Turner Field Stadium was not assessed, the stadium is still a source of significant runoff. The new stadium for the Atlanta Falcons has several stormwater features to manage water quality and quantity. The stadium is designed to surpass the City's requirement to capture 1.0" of rainfall onsite; opting instead to capture 1.2" (~750,000 gallons) using the GSI practices of bioretention and rainwater cisterns. Grey infrastructure, in the form of a vault, was also installed to detain the 100-year storm event onsite (1.2 million gallons). The project is targeting LEED Certification. The rainwater captured in the cistern will be reused to offset potable water demand for irrigation and cooling towers.[xi]

Conclusion

This assessment of the three concept plans for redevelopment of Turner Field Stadium and associated parking lots demonstrates that capturing and infiltrating the 95th percentile storm (1.8” of rainfall in 24 hours) with GSI is feasible, and would be a reasonable goal for all three of the preliminary site designs prepared by the LCI. Such an effort would reduce the amount of runoff from the site by approximately 2.3 million gallons during a storm of 1.8” or greater, with a bonus volume of up to 350,000 gallons captured during a 4.9” storm from the permeable pavers. (Beyond this, if the Turner Field Stadium were to capture the 1.8” storm, another several hundred thousand gallons would be retained.) The most comprehensive way of capturing the 1.8” storm evenly across the whole site would entail:

- Capturing 1.8” of rainfall or more from every rooftop, and storing the volume in cisterns for reuse.
- Dedicating 5.5% of all building-related exterior landscapes for bioretention.
- Dedicating 0.7% of all park areas to bioretention.
- Paving new streets with permeable pavers wherever possible throughout the site.
- Treating sidewalks and non-permeable streets with bioretention—6.6 % of all impervious streetscape.

By redeveloping the Core Area using green stormwater infrastructure to infiltrate or reuse the runoff from the 1.8” storm, the redevelopment of Turner Field Stadium and associated parking lots can significantly reduce the volume of stormwater runoff and flooding in downstream communities.

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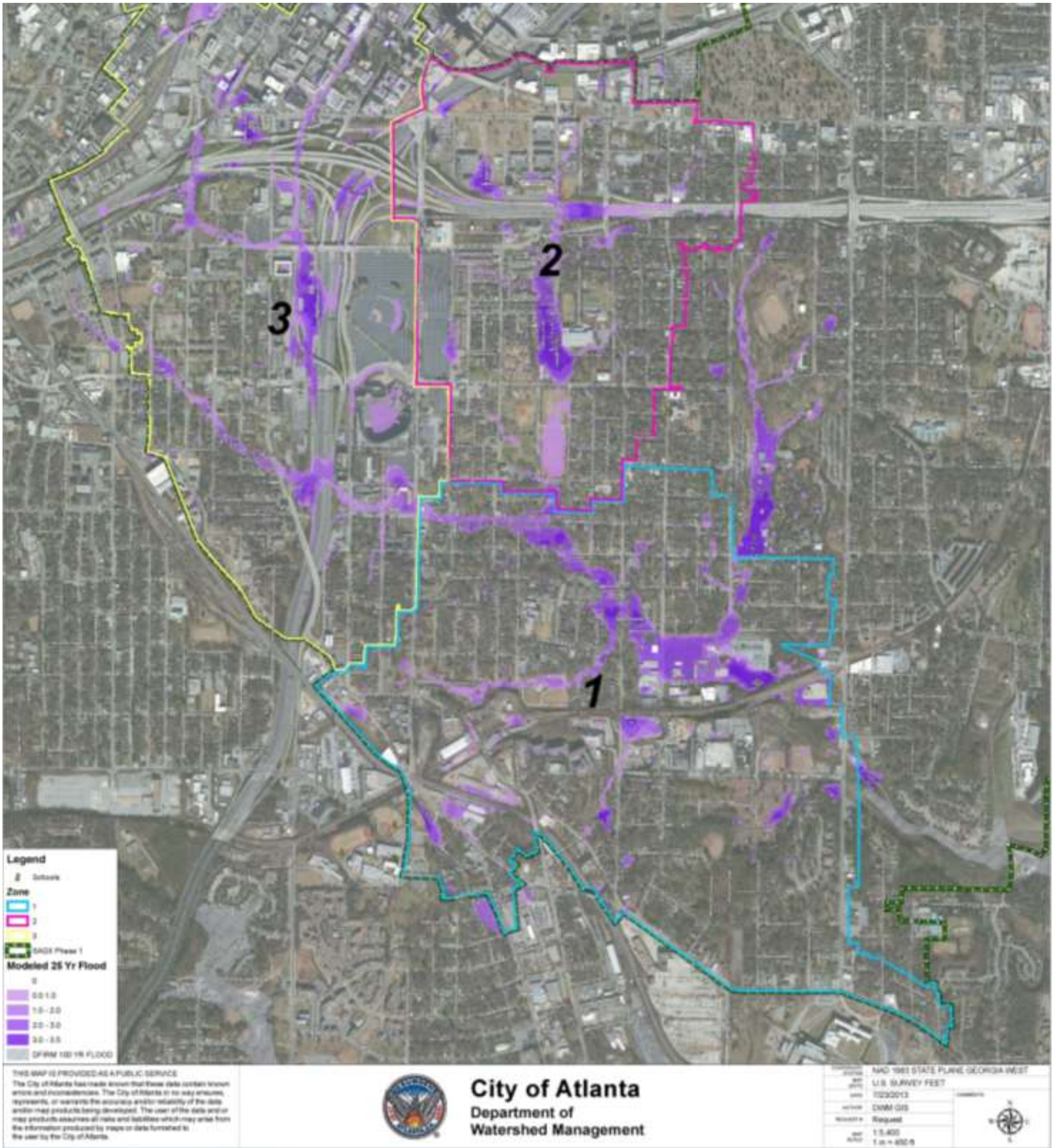
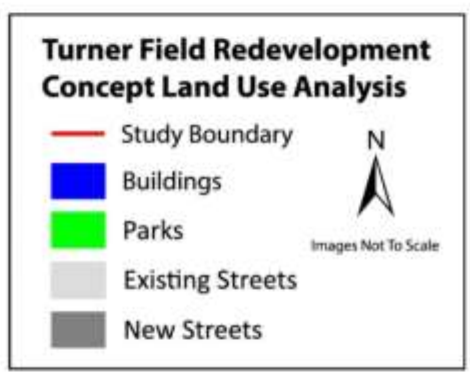
[i] Turner Field Community Benefits Coalition, 2016, http://www.turnerfieldcoalition.org/?page_id=264
[ii] MyAJC, 2014, *In Peoplestown, proposal to fix flooding leads to displacement,* http://www.myajc.com/news/news/in-peoplestown-proposal-to-fix-flooding-leads-to-d/nhbnJ/
[iii] Perkins+Will, 2015, *The LCI Study,* http://www.stadiumneighborhoodslci.org/thelcistudy/
[iv] Environmental Protection Agency, *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act* 2009
[v] Center for Neighborhood Technology and American Rivers, 2010. *The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Environmental and Social Benefits*. http://www.cnt.org/sites/default/files/publications/CNT_Value-of-Green-Infrastructure.pdf
[vi] WABE, 2015, *Atlanta is Home to the Largest Permeable Pavers Project in US*, http://news.wabe.org/post/atlanta-home-largest-permeable-pavers-project-us
[vii] Georgia Institute of Technology, 2013, *Stormwater Master Plan: Basin A*, http://www.space.gatech.edu/sites/default/files/images/stormwatermasterplan-basina.pdf
[viii] Department of Watershed Management, 2013, *From Rain to Resource: Rainwater Harvesting for Drought Planning and Stormwater Management*, https://www.atlantawatershed.org/greeninfrastructure/rainwater-harvesting-workshop-9162013/?showMeta=2&ext=.pdf
[ix] ibid
[x] Grand Hyatt Atlanta, 2015, *Grand Hyatt Atlanta in Buckhead Again Awarded Highest Tripadvisor Greenleader Status*, http://grandatlanta.hyatt.com/en/hotel/news-and-events/news-listing/grand-hyatt-atlanta-in-buckhead-again-awarded-highest-tripadviso.html
[xi] Kimley Horn, 2015, *Atlanta New Stadium Project—Stormwater Fact Sheet.*

Appendix 1: Southeast Atlanta Flood Model



Appendix 2: Concept Land Use Areas



Appendix 3: Green Stormwater Infrastructure Requirements

Table 1: Concept 1 Building Rooftop Areas and Cistern Volumes		
Building	**Rooftop Areas (sqft):**	**Minimum Cistern Volume for 1.8" Capture (gallons)**
1	190,067	213,270
2	87,458	98,135
3	5,615	6,301
4	51,770	58,089
5	15,708	17,626
6	39,618	44,454
7	38,509	43,210
8	67,571	75,820
9	29,972	33,631
10	41,686	46,775
11	61,547	69,061
12	26,357	29,574
13	102,086	114,549
14	71,809	80,575
15	84,103	94,370
16	51,089	57,325
Total	**964,964**	**1,082,765**

Table 2: Concept 2 Building Rooftop Areas and Cistern Volumes		
Building	**Rooftop Areas (sqft):**	**Minimum Cistern Volume for 1.8" Capture (gallons)**
1	107,028	120,094
2	52,748	59,188
3	49,603	55,658
4	53,315	59,823
5	50,312	56,453
6	30,227	33,917
7	50,922	57,138
8	99,195	111,305
9	93,760	105,206
10	100,084	112,302
11	53,816	60,386
12	51,744	58,061
13	70,482	79,086
14	101,446	113,830
15	102,980	115,551
16	101,764	114,187
17	103,897	116,580
Total	**1,273,321**	**1,428,765**

Table 3: Concept 3 Building Rooftop Areas and Cistern Volumes		
Building	**Rooftop Areas (sqft):**	**Minimum Cistern Volume for 1.8" Capture (gallons)**
1	54,058	60,657
2	69,262	77,717
3	81,657	91,626
4	53,040	59,515
5	57,554	64,580
6	42,881	48,116
7	42,572	47,769
8	37,900	42,526
9	47,953	53,807
10	64,181	72,016
11	59,465	66,725
12	17,362	19,481
13	20,199	22,665
14	26,359	29,577
15	109,844	123,253
16	62,723	70,380
17	35,643	39,994
18	79,511	89,217
19	52,775	59,217
Total	**1,014,937**	**1,138,838**

Table 4: Concept 1 Building-related Exterior Landscape Areas and GSI Footprints		
Building	**Landscape Areas (sqft)**	**Minimum GSI Footprint for 1.8" Capture (sqft)**
1	63,356	3,533
2	29,153	1,626
3	1,872	104
4	17,257	962
5	5,236	292
6	13,206	736
7	12,836	716
8	22,524	1,256
9	9,991	557
10	13,895	775
11	20,516	1,144
12	8,786	490
13	34,029	1,898
14	23,936	1,335
15	28,034	1,563
16	17,030	950
Total	**321,655**	**17,938**

Table 5: Concept 2 Building-related Exterior Landscape Areas and GSI Footprints		
Building	Landscape Areas (sqft)	Minimum GSI Footprint for 1.8" Capture (sqft)
1	35,676	1,990
2	17,583	981
3	16,534	922
4	17,772	991
5	16,771	935
6	10,076	562
7	16,974	947
8	33,065	1,844
9	31,253	1,743
10	33,361	1,861
11	17,939	1,000
12	17,248	962
13	23,494	1,310
14	33,815	1,886
15	34,327	1,914
16	33,921	1,892
17	34,632	1,931
Total	**424,440**	**23,671**

Table 6: Concept 3 Building-related Exterior Landscape Areas and GSI Footprints		
Building	Landscape Areas (sqft)	Minimum GSI Footprint for 1.8" Capture (sqft)
1	18,019	1,005
2	23,087	1,288
3	27,219	1,518
4	17,680	986
5	19,185	1,070
6	14,294	797
7	14,191	791
8	12,633	705
9	15,984	891
10	21,394	1,193
11	19,822	1,105
12	5,787	323
13	6,733	375
14	8,786	490
15	36,615	2,042
16	20,908	1,166
17	11,881	663
18	26,504	1,478
19	17,592	981
Total	**338,312**	**18,867**

Table 7: Concept 1 Park Areas and GSI Footprints		
Park	Area (sqft)	Minimum GSI Footprint for 1.8" Capture (sqft)
1	101,208	740
2	27,392	200
3	19,889	145
4	9,881	72
5	30,532	223
6	45,779	335
7	64,952	475
8	23,367	171
9	35,492	259
10	12,224	89
Total	**370,716**	**2,709**

Table 8: Concept 2 Park Areas and GSI Footprints		
Park	Area (sqft)	Minimum GSI Footprint for 1.8" Capture (sqft)
1	91,729	670
2	31,575	231
3	27,061	198
4	31,389	229
5	34,144	250
Total	**215,898**	**1,578**

Table 9: Concept 3 Park Areas and GSI Footprints		
Park	Area (sqft)	Minimum GSI Footprint for 1.8" Capture (sqft)
1	15,595	114
2	68,131	498
3	14,078	103
4	40,722	298
5	7,667	56
6	58,641	429
7	3,140	23
8	3,972	29
9	28,008	205
10	97,069	709
11	19,575	143
12	24,558	179
Total	**381,156**	**2,785**

Table 10: Concept 1 Streetscape Areas and GSI Footprints		
Streetscape Category	**Area (sqft)**	**Minimum GSI Footprint for 1.8" Capture (sqft)**
Existing Streets	473,460	31,321 (Bioretention)
New Streets	936,253	936,253 (Permeable Pavers) or 61,937 (Bioretention)
Total Streetscape	**1,409,713**	**93,258** (bioretention only) or 936,253 sqft of permeable pavers and 31,321 sqft bioretention

Table 11: Concept 2 Streetscape Areas and GSI Footprints		
Streetscape Category	**Area (sqft)**	**Minimum GSI Footprint for 1.8" Capture (sqft)**
Existing Streets	439,433	29,070 (Bioretention)
New Streets	566,589	566,589 (Permeable Pavers) or 37,482 (Bioretention)
Total Streetscape	**1,006,022**	**66,552** (bioretention only) or 566,589 sqft of permeable pavers and 29,070 sqft bioretention

Table 12: Concept 3 Streetscape Areas and GSI Footprints		
Streetscape Category	**Area (sqft)**	**Minimum GSI Footprint for 1.8" Capture (sqft)**
Existing Streets	362,153	23,957 (Bioretention)
New Streets	1,014,317	1,014,317 (Permeable Pavers) or 67,100 (Bioretention)
Total Streetscape	**1,376,470**	**91,059** (bioretention only) or 1,014,317 sqft of permeable pavers and 23,957 sqft bioretention