1315 Peachtree Street – Perkins + Will

Case Study Brief Prepared by:
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Methodology for Landscape Performance Benefits

During our time evaluating the 1315 Peachtree St. property we visited the site twice. Our first visit included an in-depth meeting with Alexander Stewart, Sr. Landscape Arch, Senior Associate. Mr. Stewart served as the landscape architect for the 1315 Peachtree St. design. He and Micah Lipscomb, Landscape Architect, Associate, were our liaisons from Perkins + Will during the Case Study Investigation period. During this meeting we reviewed previously developed presentations and conducted a full site visit to prepare us for future investigations and familiarize our University of Tennessee LAF team members with the site and all of its design features. We visited the site for a second time after coming to understand the project's design objectives and the principle ways in which the project was performing. Time was spent on site to verify the as-built condition against design drawings, conduct measurements of site temperatures, the DBH of trees, collect model data, and a variety of other tasks. It was established that the project's social dimensions would be a significant part of the case study story line. In order to better understand these aspects of the project and how it was performing at a social level, we developed a survey that was distributed to Perkins + Will and MODA (Museum of Design Atlanta) employees which collected information about site features, employee perceptions and transportation habits. We distributed questions via Survey Monkey to both offices and used survey monkey analytics to quantify our data. Another primary source of design and construction information was supplied by Perkins + Will and authored by numerous groups (Kimley-Horn Associates, Inc., Perkins + Will, etc.) for LEED and SITES certification. This data was then checked against the as-built site condition. If there were discrepancies, efforts were made to generate accurate data, however this was not always possible. To ensure the highest degree of accuracy and be certain that provided documentation was properly interpreted, we frequently contacted Perkins+Will while also reaching out to numerous other sources of required data, including local utilities and project suppliers.

Environmental Landscape Performance Benefits

Performance Benefit: Reduces stormwater runoff during a 1-in storm event by 60% compared to the site's condition, preventing 18,036 gallons of stormwater from entering the city's combined sewer system. This avoids a projected $63,126 in future capital costs for upgrades to the city's stormwater infrastructure.

With the increase of impervious surfaces in Atlanta Midtown, greater quantities of stormwater are entering combined sewer systems, increasing the likelihood of overflow and raw sewage

discharge into streams within the Atlanta area. This increased volume of stormwater results in the need for more infrastructure maintenance as well as additional storage capacity. Reducing site runoff from 1315 Peachtree's pre-redevelopment condition became a priority for the design team in order to decrease stormwater discharge to CSS, to reduce associated civic infrastructure maintenance expenses, as well as to steward natural systems.

In order to quantify the project's runoff reduction from its pre-redevelopment condition, the project's SITES documentation was thoroughly reviewed. A summary of the research team's findings follow.

As the project site for 1315 was a greyfield redevelopment located in the Southeast United States, the following stormwater volumes are utilized to evaluate this credit based upon SITES certification standards.

Water Storage Capacity Description	Hydrograph No.	Volume (cuft)
Target (CN=70)	16	1,339
Initial	3	4,023
Final	14	2,411

Volume table

Note on reading table:
The SITES goal for credit 3.5 is to improve the water storage capacity by 90%. "Percentage improvement is based on the difference between initial water storage capacity and target water storage capacity". The water storage capacity for this location has been set as CN70 (similar to Humid East Coast i.e. Raleigh).[3]

Before the site was redeveloped, 4,023 cu ft of stormwater runoff was leaving the site.[4] The design accomplished an additional storage volume of 2,411 cu ft of stormwater, a 60% improvement from pre-development stormwater storage capacity using a variety of runoff avoidance and management methods.[3]

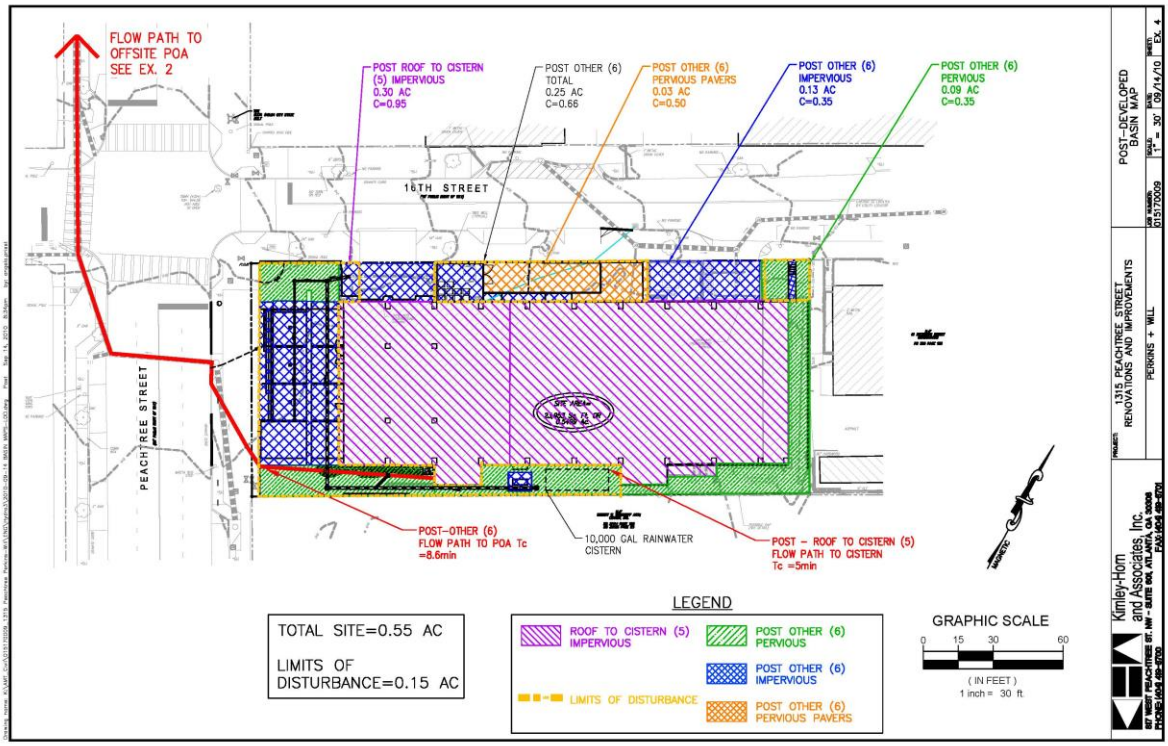


Image 1: Material Permeability Diagram[1]

The stormwater management system includes a 10,000 gallon rainwater cistern[2] to collect runoff from the roof of the building. This water is reused mainly for flush fixtures within the building, site irrigation, and a site water feature.[5] The cistern aids in the management of stormwater on site by capturing runoff for reuse that would otherwise be discharged to the municipal stormwater system. The site also includes pervious and permeable hardscape materials with stone recharge beds, rain gardens, and new pervious planting areas.[6] (Image 1-7)

Image 2 (Left): Pervious Concrete – Water spreading and infiltrating (Credit: Cameron Rodman)
Image 3 (Right): Pervious Concrete – Water has infiltrated (Credit: Cameron Rodman)


Image 4 (Left): Permeable Pavers – Some water was observed to infiltrate through paver joints (Credit: Cameron Rodman)
Image 5 (Right): Plaza – Paver and Decking (Credit: Cameron Rodman)

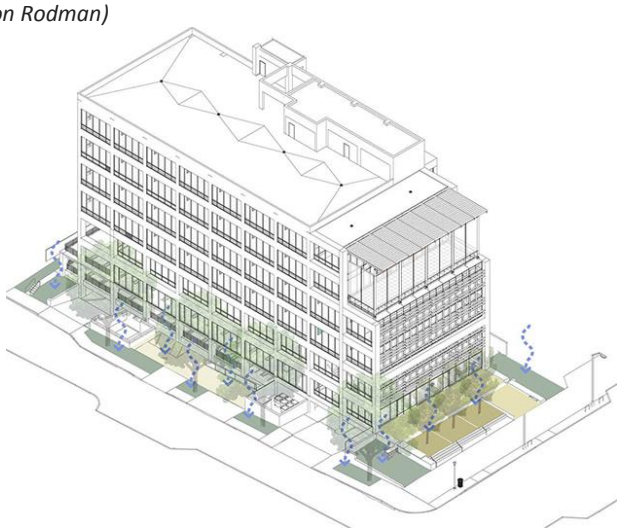



Image 6 (Left): Rain Garden (Credit: Cameron Rodman)
Image 7 (Right): Storm Water Infiltration Diagram (Credit: Perkins + Will)

To calculate the gallons not entering the CSS and the total dollars saved, the additional storage value of 2,411 cu ft. was used.[2] This was then converted to gallons by multiplying by 7.48051948 gal/cu ft.[7] This equates to 18,035.53 gls. (rounded up to 18,036 gls.).

City of Atlanta – Dept. of Watershed Management[8]
$3 - $4/gal capital cost for gray/green (we averaged the cost at $3.50)
$3.50[8] x 18,036 gls. = $63,126.00 savings in future infrastructure upgrades.

Sources:

[1]Perkins + Will. – Basin Map – Post Developed.pdf
[2]Perkins + Will – Credit 3.5 Narrative REV.pdf
[3]Perkins + Will – 3.5 Form KHA REV.pdf
[4]Kimley – Horn Associate, Inc. – HydraflowHydrographsExtension.pdf
[5]Kimley Horn and Associates, Inc. – Rainwater Harvest Sizing_P+W_Peachtree-with MODA-2[5]
[6]Perkins + Will – 1315Peachtree-MATERIALS-PLANTINGPLAN_GroundLevel.dwg
[7]http://www.asknumbers.com/CubicFeetToGallon.aspx - 7.48 number 7.48051948
[8]City of Atlanta – Dept. of Watershed Management

Limitations

- This performance benefit is based on the thorough review of information provided and calculations performed by the project's consulting team. Sufficient information was not provided to verify the accuracy of these calculations. Calculations were part of the projects SITES Design Submittal.
- A small portion of the site does not drain into bioswales as indicated by previous documentation. Further calculations are needed to determine a more accurate volume leaving the site and thus performance based on as-built site conditions. Furthermore, the voids in the pervious concrete are beginning to clog with debris. This is reducing the performance of the material. (Image 2 & 3)
- Hydrographs named in Volume Table were not available for this study.

Performance Benefit: Reduces the project's total potable water demand by over 225,470 gallons per year, saving over $1,841 by using harvested rainwater for irrigation, the site's water feature, and wastewater conveyance.

Reducing the use of potable water by significant amounts was a primary focus for the Perkins + Will design team in order to minimize the size of the requisite cistern. The use of low flow fixtures, efficient building and irrigation systems use, and drought tolerant plant species all contribute to lower potable water usage. The inclusion of a 10,000 gal underground cistern provides additional storage for stormwater which is used to supply the previously mentioned features.

The availability of potable water resources is an ongoing concern in the Atlanta metropolitan area as is evident by the water scarcity and subsequent rationing requirements implemented during the drought of 2007. In Atlanta where groundwater is a principle water resource for drinking supply, this scarcity is due in part to the increase of impervious surfaces that causes precipitation that would otherwise infiltrate back into the underground water supply to runoff into the sewer system. Atlanta's water shortage places a high value on water-use efficiency in buildings and landscapes and identifying alternative water sources. Methods were employed on this site to reduce the level of potable water used on site and stormwater was captured to ensure the maximum use of water that falls on the site.

Water Use Efficiency – Waste Conveyance

Per provided LEED WE c1.1 credit documentation, the total calculated flush fixture use annual volume, baseline is 225.47 kGal. The total calculated flush fixture water use annual volume, performance case is 144.14 kGal, which represents only the Perkins + Will usage. Additionally, the cistern is set to capture 305 kGal of water throughout the year. This is a 171% reduction of potable water use for sewage conveyance.[1]

In this project's water network, the flush fixtures are the only feature to receive potable water. These numbers indicate that there should always be plenty of water available for use in the cistern as well as a reservoir of water which would carry the systems water usage between storm events. This translates to an average annual savings of **225.47** kGal per year.[1]

The City of Atlanta has a tiered rate for their water/sewage fees based on each 100 cu ft (CCF's) used. One CCF = about 749 gallons of water.[2]

City of Atlanta Department of Watershed Management - 2013 Tiered Rate CCF[2, 3]

Tier	*CCF*	*rate*
1	0-3	2.58
2	3-6	5.34
3	6-37	6.16

225.47 kGal conserved per year = **301 CCF** conserved annually

3 CCF x $2.58 =	$7.74
3 CCF x $5.34 =	$16.02
295 CCF x $6.16 =	$1817.20
Total=	**$1,840.96**

*Water demand for flush fixtures figures is the only volume used to calculate potable water demand reduction quantity and savings. See limitations for more information.

Water Use Efficiency - Irrigation

Site Irrigation calculations were conducted by Site Development Consultants, Inc. to plan for site irrigation.[4]

Reduction in irrigation water use was achieved by the selection of regionally appropriate, drought tolerant plants materials and ensuring proper watering schedule in order to establish the plants. Furthermore, the irrigation system is not connected to the potable water system, thus eliminating the use of potable water.[5, 6] In times of drought, plantings which require watering are watered by hand.

Reduction in water use is also ensured through the irrigation system and controller efficiencies, including the use of the following:[7, 4]

- Rain Bird – Smt. Smart Modular Control System
- Rain Bird ESP – SMT Smart Modular control System
- Drip and sprinkler irrigation
- The designation of 7 water demand-based irrigation zones
- Excluding of turfgrass from the plant palette

The projective calculations provided by Site Development Consultants, Inc. were only figured for the month of July give that this month represents the region's highest average evapotranspiration factor. The data took the following into account: species factor, density factor, microclimate factor, and irrigation efficiency. The July evapotranspiration rate was set at 7.33 inches. A baseline Total Water Applied (TWA) of 13,557 gal. for the month of July was determined. The design case TWA was figured to 4,089 gal. This is a **69.8%** reduction of

irrigation water demand when compared to the baseline case. For the month of July, a projected **9,468** gal. of water will be saved.[4]

Alternative Water Sources - Fountain

The fountain is fed from a separate reservoir which is filled only with cistern water. The water used to supply the fountain, is controlled by a valve that is enabled when the cistern is acting as the system's water source. The valve is disabled when potable water is feeding into the system. The fountain serves as a visual reminder of the preciousness and availability of water for our many uses. When the water fountain is not flowing the viewer is reminded that all of the flush fixtures in the building are utilizing potable water. [6, 8]

Alternative Water Sources - Cistern Capacity and overflow

The cistern was sized to accommodate the water demand of Perkins + Will and the sub-leased tenant spaces presently occupied by MODA and the Fulton County Library. [9]

Calculations that informed the sizing of the project's cistern also included miscellaneous uses such as fountain loss/evaporation, hose bibb use, and miscellaneous water needs.[9]

Sources:

[1]Perkins + Will – BDC WEc2 Submitted Form.pdf
[2] http://www.atlantawatershed.org/customer-service/rates/
[3]Perkins + Will – Utility Billing 2010 - 2013
[4]Perkins + Will – 2012-6-2 1315 _TSSI.pdf
[5]Perkins + will – 1315 Peachtree Plant List.pdf
[6]Perkins + Will – Dashboard Monitoring System
[7]Perkins + Will – 2010-9-24_1315 IRRIGATION.pdf
[8]Perkins + Will – 3.8 Form Submit
[9]Perkins + Will – 3.2v2 Form_SDC

Limitations

- The performance benefit only includes the gallons and costs associated with the flush fixture calculations and does not include the harvested rainwater quantity used by the irrigation system or the water feature at the entrance. (Image 10)

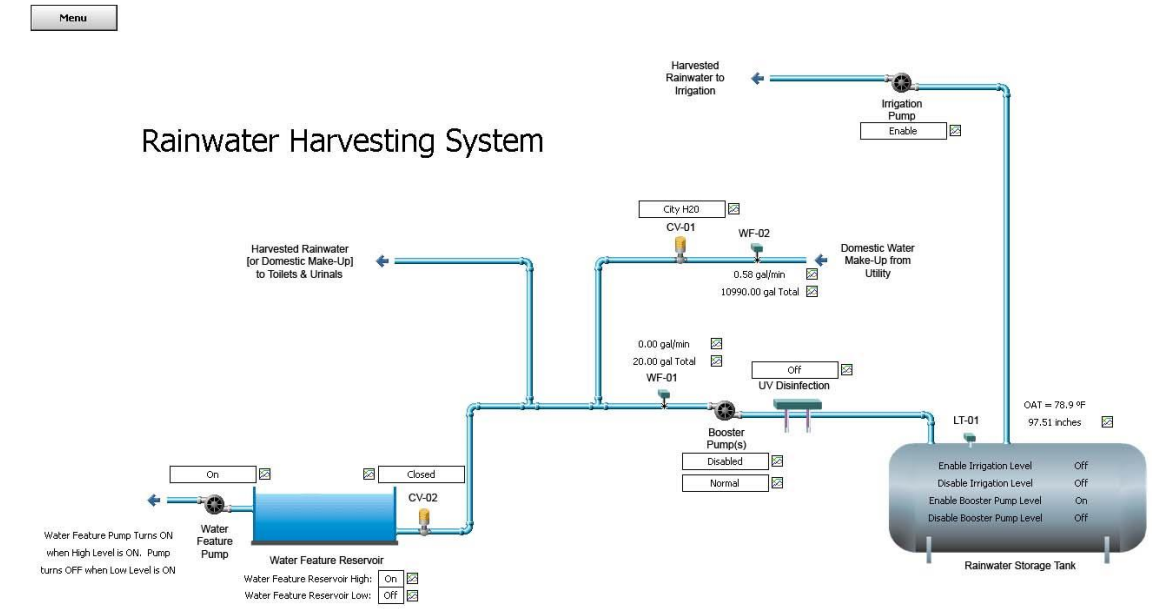


Image 8: Rainwater Harvesting System Dashboard [7]

- This performance benefit is based on the thorough review of information provided and calculations performed by the project's consulting team. Sufficient information was not provided to verify the accuracy of these calculations. Calculations were conducted before development took place.
- Irrigation information from the building systems' dashboard (image 9) is limited to a switch which only shows when the booster pump from the cistern is enabled or disabled. Last year's records indicated that the irrigation pump was enabled numerous times throughout the year. Peak times of use were the months of Feb, March, June, August, and September.

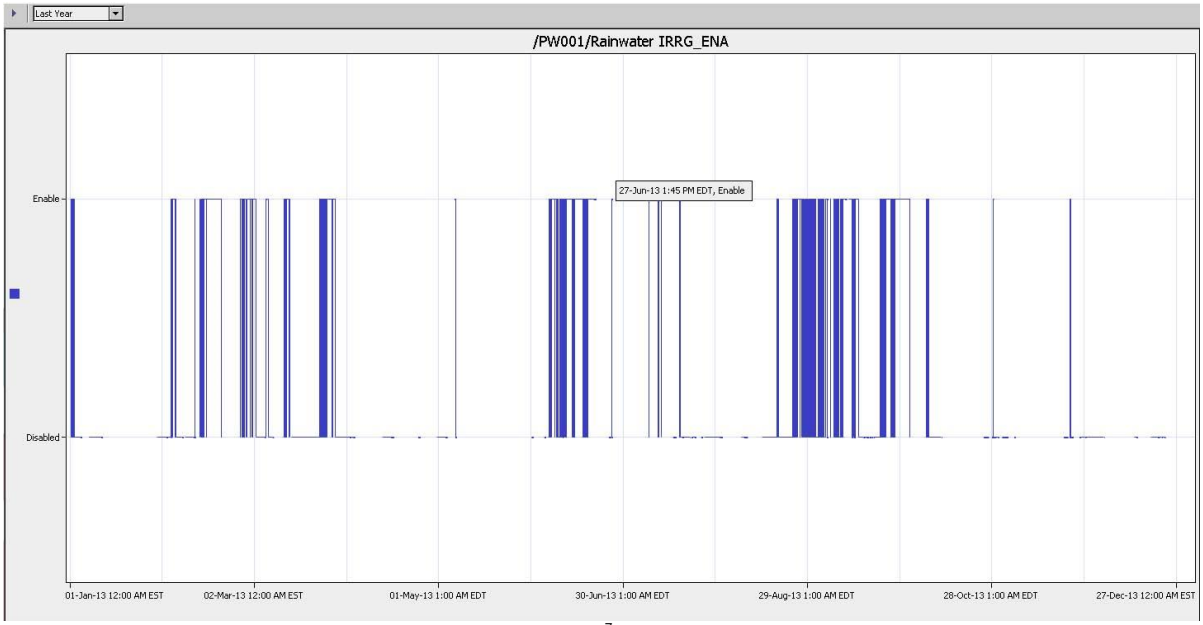


Image 9: Irrigation setting (enabled or disabled) for year 2013[7]

- Numerous calculations take into account the water captured from the roof and into the cistern. In order to more accurately determine water usage, these should all be figured into one sum use to ensure that enough water is being captured to support all projected figures.
- The amount of cistern water used for the fountain is unknown as it does not have a dedicated meter. Also, fountain water was observed to be lost during high winds and due to deflection from decorative pebbles (Image 10). For more info see the “Lessons Learned” section.

Image 10: splash over due to insufficiently sized basin and blow out due to high winds. (Credit: Cameron Rodman)

- The rainwater harvesting system dashboard does not consistently track water usage. Gaps exist throughout the year in the water usage from the cistern and in the volume of the cistern making it not possible to base cost savings on actual performance data.

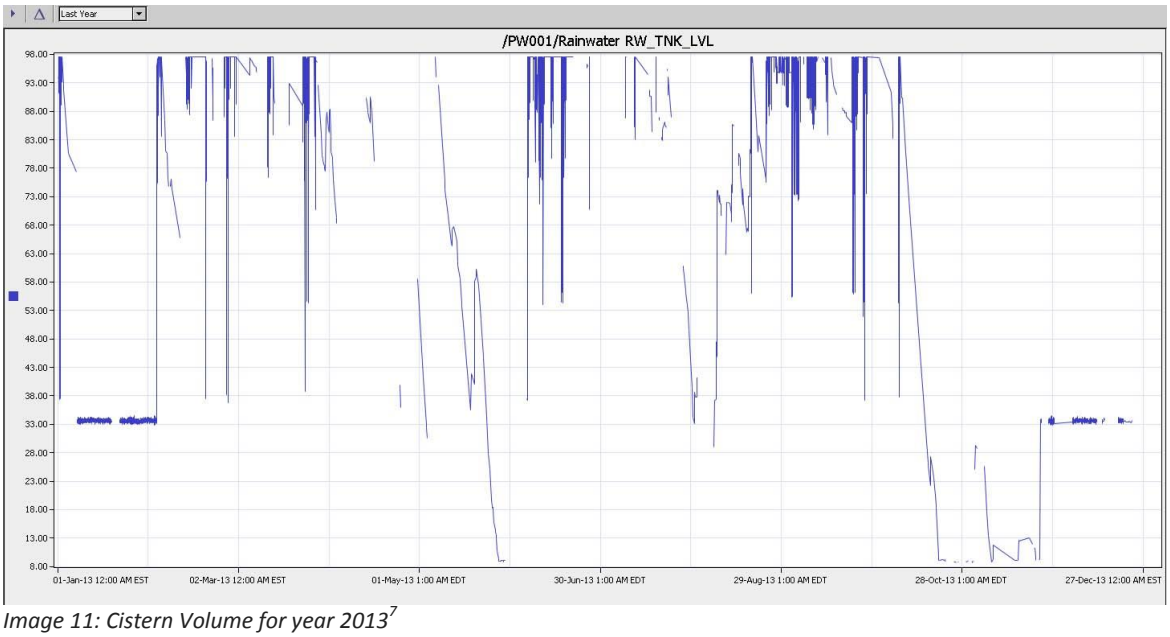


Image 11: Cistern Volume for year 2013[7]

Performance Benefit: Sequesters 655 lbs. of atmospheric carbon and intercepts over 2,251 gallons of stormwater annually in the project's 11 new trees.

Trees can play an integral role to improving the environmental health of a site. Their unique ability to cleanse the air of pollutants, reduce ambient air temperatures and ground surface temperatures through shading, as well as their ability to intercept precipitation on their leaf surfaces and uptake stormwater runoff make for a convincing argument for planting and preserving trees in urban landscapes. Demonstrating these benefits was part of Perkins+Will's motivation for including 11 new trees on this small urban site. These 11 new trees included three Trident Maples, 1 Sweetbay Magnolia, three Yaupon Hollies, and 4 Armstrong Red Maples, the benefits of which are as follows.

All from treebenefits.com[1] – Below totals represent 1 tree each.

3 – Trident Maples (Acer buergeruanum 'ABMTF')

Current DBH: 5.75"

- intercepts **348 gallons** of stormwater runoff this year
  - Rain intercepted by leaves, branches, and bark evaporates instead of falling through to impervious
  - surfaces and running off
  - Increases infiltration and storage of rainwater in the tree's root system
  - 'Reduces soil erosion by slowing rainfall before it strikes the soil'
- will reduce atmospheric carbon by **94 lbs.** this year.
  - How significant is this number? Most owners of an "average" car (mid-sized sedan) drive 12,000 miles generating about 11,000 pounds of CO2 every year. A flight from New York to Los Angeles adds 1,400 pounds of CO2 per passenger. Trees can have an impact by reducing atmospheric carbon in two primary ways (see figure at left):
  - Trees sequester CO2 in their roots, trunks, stems, and leaves while they grow.
  - Trees near buildings can reduce heating and air conditioning demands, thereby reducing emissions associated with power production.

1 – Sweetbay Magnolia (Magnolia Virginia) (used Star Magnolia {Magnolia stellate})

Current DBH 5"

- intercepts **291 gallons** of stormwater runoff this year
- will reduce atmospheric carbon by **77 lbs**. this year

3 – Yaupon Holly (Ilex vomitoria) – (used American Holly {Ilex opaca})

Current DBH 3"

- intercept **80 gallons** of stormwater runoff this year
- will reduce atmospheric carbon by **20 lbs**. this year

4 – Armstrong Red Maple (Acer rubrum 'Karpick')

Current DBH: 4" DBH

- intercept **169 gallons** of stormwater runoff this year
- will reduce atmospheric carbon by **59 lbs**. this year

Notes:

- Actual figures have potential to be greater as trees grow in biomass. Increased biomass enhances the performative benefits of a tree to sequester carbon, intercept rain, conserve kWh, and raise the value of a property.

Sources:

[1]http://www.treebenefits.com/calculator/index.cfm (accessed: 6.13.2014)

- The National Tree Benefit Calculator was conceived and developed by Casey Trees and Davey Tree Expert Co.
- This tool is powered by i-Tree; the data generating the results comes from the i-Tree Tools CD ROM: http://www.itreetools.org/
- Significant text and graphical content was originally published by the USDA Forest Service's Center for Urban Forest Research through their Tree Guide series of publications. Credit should be given to authors of these publications.
- Facts about personal carbon production based on driving and flying courtesy of Conservation International
- For questions about this tool, contact Scott Maco (Davey Tree Expert Co.)

Limitations:

- Due to the limitations of Tree Benefit Calculator certain tree species were substituted with similar tree species.[1]
- In additional studies one could calculate the savings produced by tree shading. This could lead to a result in lower energy use and reduced spending for heating and cooling. The metrics used by the treebenefits[1] calculator were not deemed entirely appropriate for our site so they were not included.

Performance Benefit: Saves an average of 7,118 kWh and $1,090 per year by reducing site lighting power density (LPD) to 85% below ASHRAE's allowable LPD.

Site lighting is a primary consumer of electricity in the design of a site. To demonstrate the potential for energy efficiency in site design, Perkins+Will first minimized the number of light fixtures necessary to provide a safe environment and satisfy site programmatic requirements, and then specified high-efficiency light fixtures.

The aggregate lighting power density (LPD) of all light fixtures installed on site is below the allowable LPD per ANSI/ASHRAE/IESNA Standard 90.1-2007 with Addenda I for the LZ4 Zone. Exterior lighting is designed so that all site and building-mounted luminaries produce a

maximum initial luminance value no greater than 0.60 horizontal and vertical foot-candles (6.5 horizontal and vertical lux) at the LEED project boundary and no greater than 0.01 horizontal foot-candles (0.1 horizontal lux) 15 feet (4.5 meters) beyond the site.

Georgia Power -Tiered Billing Rate Kwh[1]

Tier	kWh	Rate per kWh
1	1 - 3,000	$0.108754
2	next 7,000	$0.099605
3	next 190,000	$0.085880
4.	over 200,000	$0.066624

Watts to kWh calculation[2]

The energy E in kilowatt-hours (kWh) is equal to the power P in watts (W), times the time period t in hours (hr.) divided by 1000 $\mathbf{E_{(kWh)} = P_{(W)} \times t_{(hr)} / 1000}$

Current Site Lighting Fixtures:[3, 4]	**Watt**	**modified to watt**	**qty.**
1. BEGA F21	39 W	22	4
2. BEGA H5 (8534MH/895A)	39 W	20	8
3. Cooper Lighting model HVOB-15-G-170CT-DT-WH	70 W	x	2
Total Fixtures			**14**

Actual[5, 6]		**Total**
Total Watts to kWh in fixtures	388 W = 4.656 kWh per 12 hr. day	
Total per day X year	4.656 x 365 days p/yr.	**=1699.44 kWh**

ASHRAE Allowable LPD[7]		**Total**
Total Watts to kWh in fixtures	2013.01 W = 24.15612 kWh per 12 hr. day	
Total per day X year	24.15612 x 365 days p/yr.	**=8816.98 kWh**

ASHRAE Allowable LPD	**8816.98 kWh**
Actual LPD	**1699.44 kWh**
Difference in kWh	**7,117.54 kWh** annually – 85% reduction from ASHRAE allowable

Type	**kwh annual**	**Tier**	**Rate**[1]	**Total**
ASHRAE Allowable	3,000	1	$0.108754 per kWh	
	5816.98	2	$0.099605 per kWh	$905.6623
Actual	1699.44	1	$0.108754 per kWh	$184.8209
Annual Cost Difference Between Actual Design and ASHRAE Allowable				**$1,090.48**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max Temperature °C (°F)	10 (50)	13 (55)	18 (64)	23 (73)	26 (80)	30 (86)	31 (88)	31 (87)	28 (82)	23 (73)	17 (63)	12 (54)	22 (71)
Average Temperature °C (°F)	5 (41)	7 (45)	12 (53)	16 (62)	21 (69)	24 (76)	26 (79)	26 (78)	23 (73)	17 (62)	12 (53)	7 (44)	16 (61)
Average Min Temperature °C (°F)	0 (31)	1 (35)	6 (42)	10 (50)	15 (59)	19 (66)	21 (69)	21 (69)	18 (64)	11 (52)	6 (43)	2 (35)	11 (51)
Average Precipitation mm (in)	121 (5)	122 (5)	147 (6)	108 (4)	109 (4)	90 (4)	127 (5)	93 (4)	87 (3)	78 (3)	98 (4)	110 (4)	1290 (51)
Number of Wet Days (probability of rain on a day)	11 (35%)	11 (39%)	12 (39%)	10 (33%)	9 (29%)	10 (33%)	12 (39%)	10 (32%)	7 (23%)	7 (23%)	8 (27%)	11 (35%)	118 (32%)
Average Sunlight Hours/ Day	04:34	05:29	06:19	08:24	08:50	09:50	08:56	09:01	07:36	07:15	06:00	05:07	07:17
Average Daylight Hours & Minutes/ Day	10:10	10:55	11:55	12:59	13:52	14:20	14:08	13:21	12:20	11:16	10:22	09:56	12:00
Percentage of Sunny (Cloudy) Daylight Hours	46 (54)	51 (49)	54 (46)	65 (35)	64 (36)	69 (31)	64 (36)	68 (32)	62 (38)	65 (35)	59 (41)	52 (48)	61 (39)

Image 27: Climate Chart showing average daylight hours & minutes for Atlanta[8]

SOURCES

[1]Georgia Power 888.655.5888, Atlanta, GA

[4]Watts to kWh calculator http://www.rapidtables.com/calc/electric/watt-to-kwh-calculator.htm

[6]Perkins + Will – SITES 6-9_E-903 (Schedule) .pdf

[7]Perkins + Will – SITES 6-9_E-100 (SitePlan).pdf

[2]Lumen Control 865.688.3233 Knoxville, TN

[3]BEGA Factory Sales Agency 865.546.1434, Knoxville, TN

[8]Perkins + Will – LEED SS Credit 8 Exterior Lighting Calculation Worksheet Revised.pdf

[5]http://www.atlanta.climatemps.com/

Notes

In order to further reduce the watts used in each fixture, high watt ballasts were replaced with low watt ballasts in all BEGA lighting. This was not confirmed in the two Cooper Models.

Limitations:

Usage for actual and ASHRAE are based on the tiered system implying that these are the only fixtures contributing to the overall energy usage. Rates will likely be higher since additional energy consumption is taking place on site by additional fixtures located in the building.

Social Landscape Performance Benefits

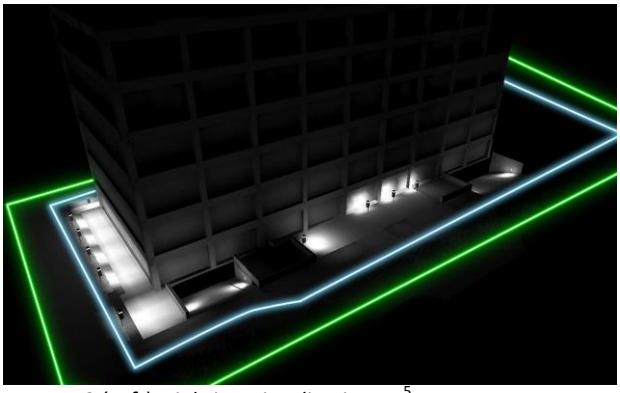
Performance Benefit: Reduces light trespass to 0.01 horizontal foot candles or less at 15 feet beyond the site boundary.

Urban landscapes often include lighting for safety and aesthetic purposes at night. This lighting often trespasses horizontally into adjacent properties and upward into the sky, reducing the visibility of the night sky and stars. This trespass can be a nuisance to adjacent property owners, especially in residential areas, and dark skies are vanishing across the world as urban

areas grow in density and size. Demonstrating responsible lighting distribution was part of Perkins+Will's sustainable design objectives at 1315 Peachtree. This benefit measures their efforts to reduce lighting pollution into adjacent sites and the night sky.

Per LEED and ASHRAE standards, 1315 Peachtree is located in LZ4 – High[1] (Major city centers, entertainment districts). Projected modeling of the site's lighting scheme establishes that 100% of lighting fixtures do not project light above 90 degrees.

For LZ4 LEED project boundaries that abut public rights-of-way, light trespass requirements may be met relative to the curb line instead of the LEED project boundary. This project abuts public rights-of-way, thus the property line serves as the LEED project boundary (Images 12 - 14).



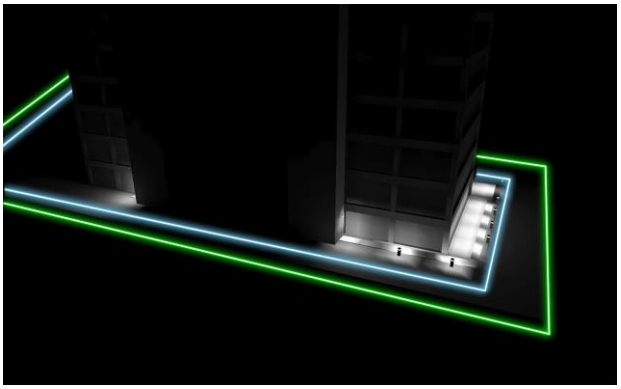


Image 12 (Left): Lighting Visualization NE[5]
Image 13 (Right): Lighting Visualization SE (For representational purposes only. Actual lighting not this bright)[6]
Note: Blue lines represent LZ4 Classification 15 Foot Limit; Green lines represent LZ$ Classification LEED Boundary Limit
(Credit: Base Image Perkins + Will, Boundary Alterations Cameron Rodman)

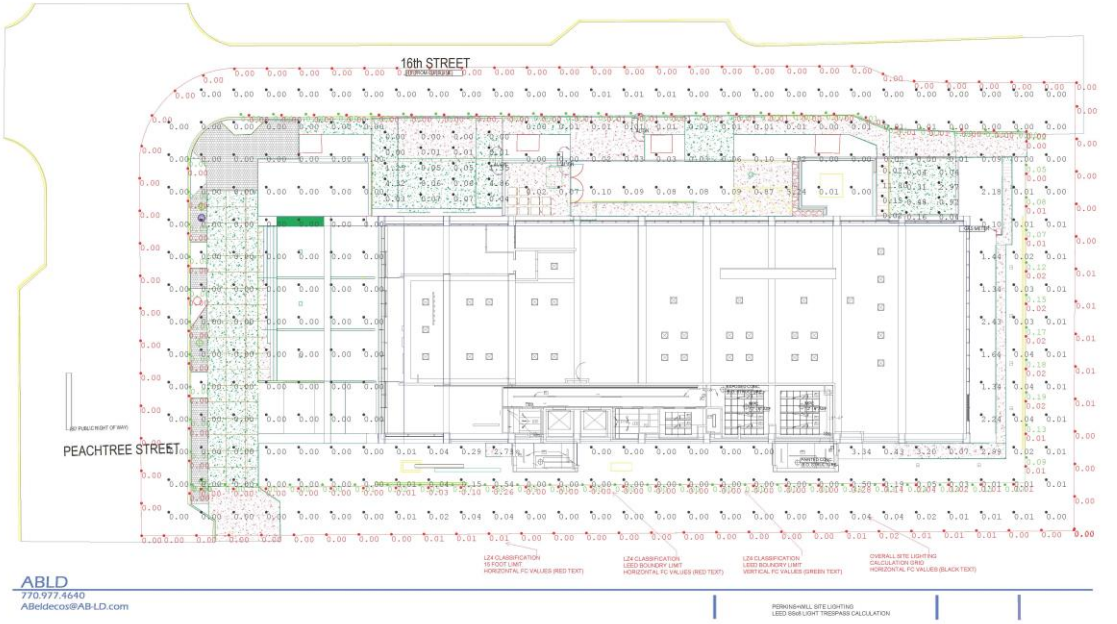


Image 14: Site Photometric Model Illustrating Level of Light Trespass at Boundary (Credit: Perkins + Will)

The metrics studied show that site lighting has been kept at a very low output to ensure a reduction in the Midtown lighting pollution.

Sources:

[1]Perkins + Will – SITES 6.9 Form Submit.pdf
[2]Perkins + Will – SITES 6-9_E-903 (Schedule) .pdf
[3]Perkins + Will – SITES 6-9_E-100 (SitePlan).pdf
[4]Perkins + Will - VR_HVO_15_Oval_042175_SSSx .pdf

Limitations

- This performance benefit is based on the thorough review of information provided and calculations performed by the project's consulting team. Sufficient information was not provided to verify the accuracy of these calculations.
- The site lighting scheduled has a total of 17 lights. (11 bollards and 6 wall mounted lights) Since installation, three bollards have been removed due to damage caused by maintenance vehicles.[2, 3]
- Lighting design documents that are the basis for LEED calculations show the site as having six BEGA model F21 fixtures. On-site inspections indicate that only four of these F21 models are installed while the remaining two fixtures are Cooper Lighting model HVOB-15-G-170CT-DT-WH. This variation from projected models alters the final percentage which does not contribute to light pollution above 90 degrees. [4]

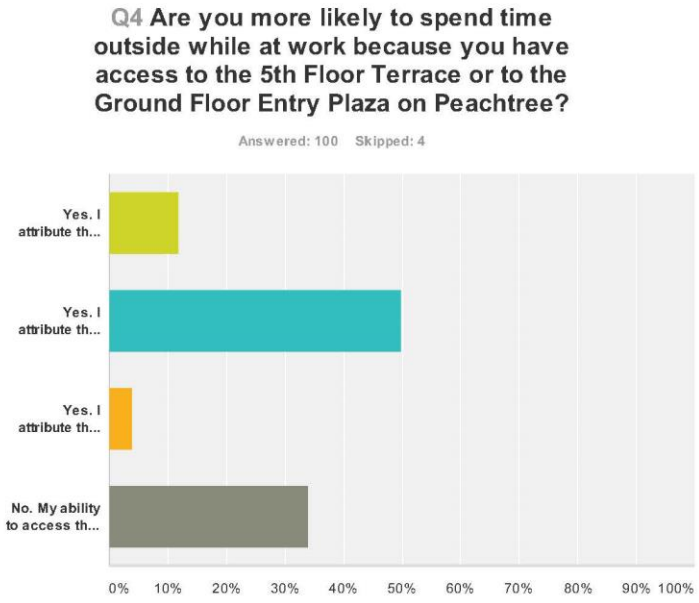
Performance Benefit: Improves the mood of employees and increases social interaction among coworkers. 89% of the respondents believe the provision of outdoor space has had a positive impact on the quality of their working environment.

Methodology:

Perkins + Will has added to the current discussion in contemporary workplace design not only in word but in action. Trends are showing that generation X and Millennials in the workforce are looking to work in a different workplace. Work settings which are well lit from natural light and have access to the outdoors with open space are highly desired. Employees are seeking to have a closer connection to the spaces around them and not find themselves boxed away in a cubicle or confining office. Our questions sought to understand the relationship of the Perkins + Will employees to the surrounding environments as well as how these environments facilitated positive socializing environments.

A survey[1] was developed and released to the occupants of 1315 Peachtree (Perkins+Will and MODA employees) via email by research partners within each office. Select survey results are attached.

Landscape Architecture Foundation Case Study Investigation1315 User Survey (P+W)

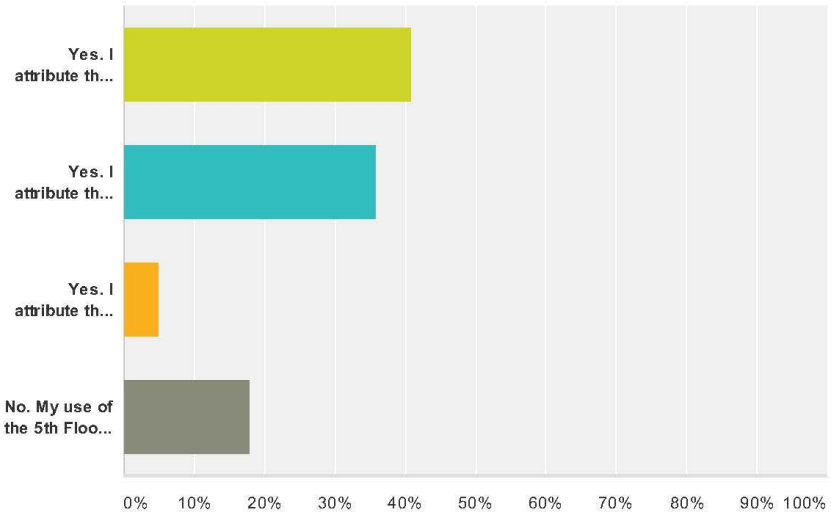


Answer Choices	Responses
Yes. I attribute this to both spaces	12.00% 12
Yes. I attribute this primarily to the 5th Floor Terrace	50.00% 50
Yes. I attribute this primarily to the Entry Level Plaza on Peachtree	4.00% 4
No. My ability to access these spaces has not had an impact on the likelyhood that I spend time outside while at work	34.00% 34
Total	100

Image 15: 1315 Peachtree Employee Survey, Question 4[1]

Q5 Do you belive that your use of the 5th Floor Terrace or the Ground Floor Entry Plaza on Peachtree has a positive impact on your subsequent mood/attitude while at work?

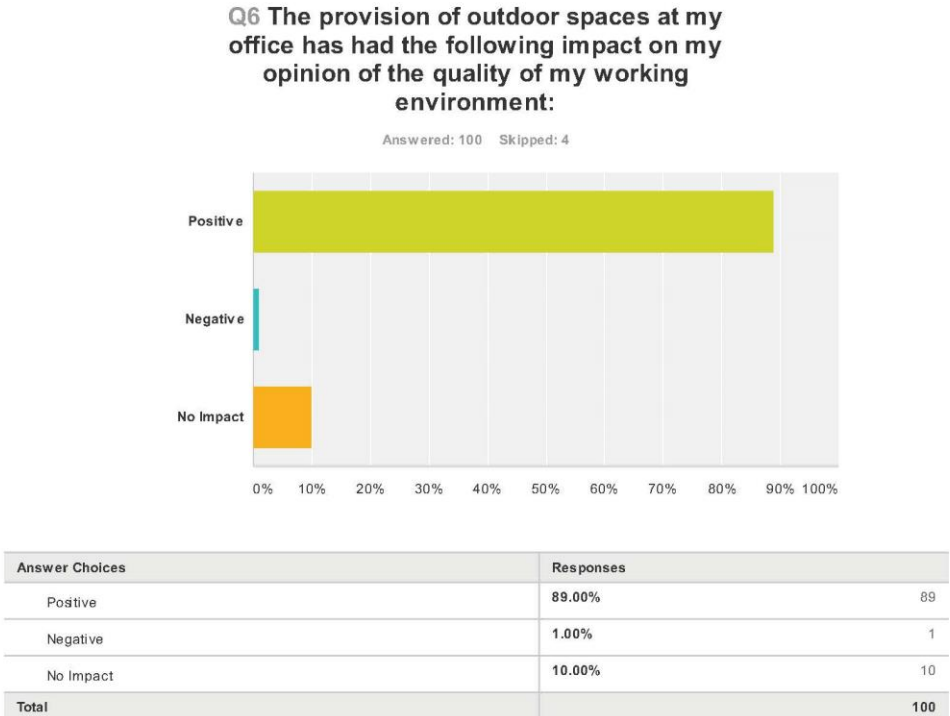
Answered: 100 Skipped: 4



Answer Choices	Responses
Yes. I attribute this to my use of both spaces	41.00% 41
Yes. I attribute this primarily to access to the 5th Floor Terrace	36.00% 36
Yes. I attribute this primarily to access to the Entry Level Plaza on Peachtree	5.00% 5
No. My use of the 5th Floor Terrace or the Ground Floor Entry Plaza on Peachtree does not have a positive impact on my subsequent mood/attitude at work	18.00% 18
Total	**100**

Image 16: 1315 Peachtree Employee Survey, Question 5[1]

Landscape Architecture Foundation Case Study Investigation1315 User Survey (P+W)



Answer Choices	Responses	
Positive	89.00%	89
Negative	1.00%	1
No Impact	10.00%	10
Total		100

Image 17: 1315 Peachtree Employee Survey, Question 6[1]

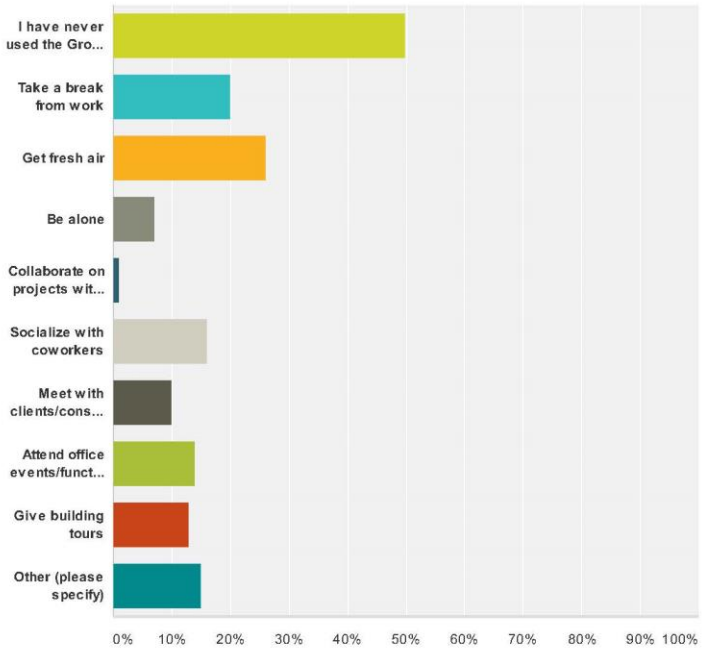
In summary, the provision of outdoor space has led to a more enjoyable working environment where 82% of respondents believe that their use of the 5th Floor Terrace or the Ground Floor Entry Plaza has a positive impact on their subsequent mood/attitude while at work and 90% of respondents believe that the provision of outdoor space at the office has a positive impact on the quality of the working environment. This can lead one to believe that people now look for different qualities in a work setting which are more holistic.

The following three survey results show how the newly created plaza and fifth floor terrace have provided spaces for social interaction and various activities.

Landscape Architecture Foundation Case Study Investigation1315 User Survey (P+W)

Q7 I have used the Ground Floor Entry Plaza on Peachtree to (check all that apply):

Answered: 100 Skipped: 4



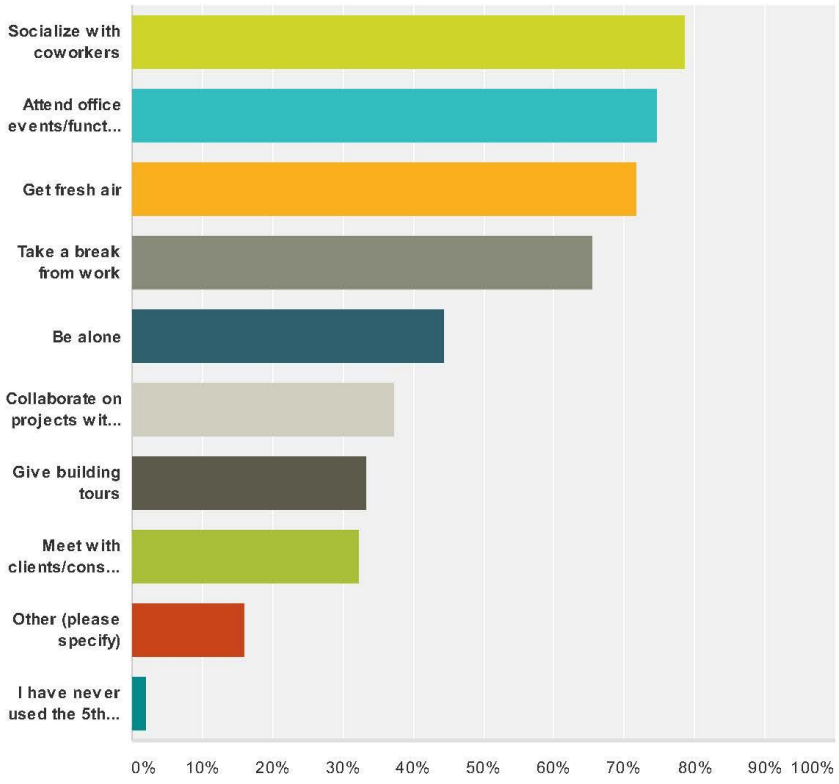
Answer Choices	Responses	
I have never used the Ground Floor Entry Plaza on Peachtree other than coming to or leaving work	50.00%	50
Take a break from work	20.00%	20
Get fresh air	26.00%	26
Be alone	7.00%	7
Collaborate on projects with coworkers	1.00%	1
Socialize with coworkers	16.00%	16
Meet with clients/consultants	10.00%	10
Attend office events/functions	14.00%	14
Give building tours	13.00%	13

8 / 36

Image 18: 1315 Peachtree Employee Survey, Question 7[1]

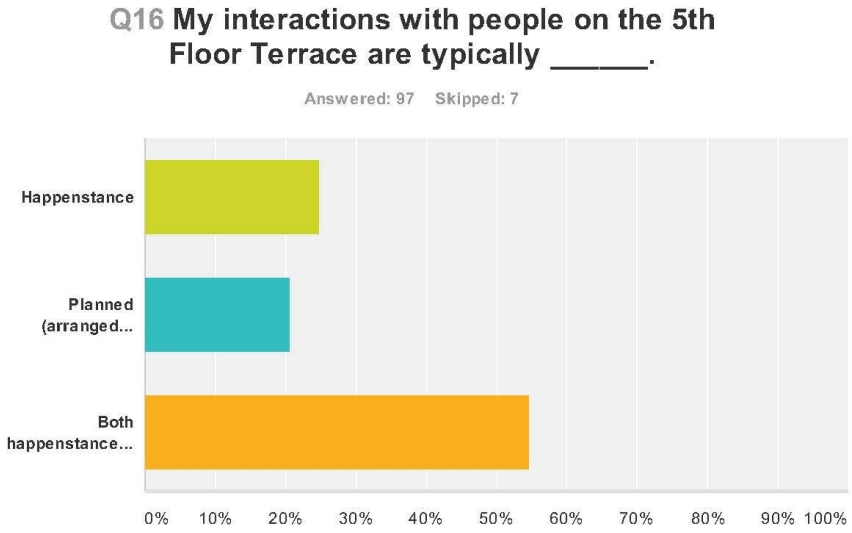
Q13 I have used the 5th Floor Terrace to (check all that apply)

Answered: 99 Skipped: 5



Answer Choices	Responses	
Socialize with coworkers	78.79%	78
Attend office events/functions	74.75%	74
Get fresh air	71.72%	71
Take a break from work	65.66%	65
Be alone	44.44%	44
Collaborate on projects with coworkers	37.37%	37
Give building tours	33.33%	33
Meet with clients/consultants	32.32%	32
Other (please specify)	16.16%	16
I have never used the 5th Floor Terrace	2.02%	2

Image 19: 1315 Peachtree Employee Survey, Question 13[1]



Answer Choices	Responses	
Happenstance	24.74%	24
Planned (arranged meetings, special events)	20.62%	20
Both happenstance and planned	54.64%	53
Total		97

Image 20: 1315 Peachtree Employee Survey, Question 16[1]

Image 21: Perkins + Will Social on Fifth Floor Terrace (Credit: Perkins + Will)

Image 22: View from the 5th Floor terrace into museum grounds and towards city (Credit: Cameron Rodman)

The redesigned façade of the building projects outward beyond its previous extents, creating an outdoor terrace space on the fifth floor. This terrace is used frequently for social events, personal relaxation during breaks, and business meetings. It overlooks the adjacent museum grounds and offers a panoramic view of part of Midtown Atlanta. More importantly, the panoramic views it affords help users feel connected to nature and the outdoors. These views are enhanced by its two-story height. Shade screens are also provided to maintain views from interior space while minimizing glare and solar heat gain (Image 21 & 22).

Sources:

[1]Online Survey Developed by UT Research Team
Survey Administrated through Survey Monkey
Survey Results and Analysis through Survey Monkey Analytics

[2]Perkins + Will – Self Publication on 1315 Peachtree St.

Limitations

- Survey response includes 104 respondents from Perkins + Will and 8 respondents from MODA, a total population of 227. For our survey, n=110, yielding an approximate confidence level of 95% and a confidence interval of 6.7%. Greater participation would allow researchers to report these responses as an accurate representation of the opinions of the entire population with greater confidence (33 additional responses needed for confidence interval of 5).
- Survey respondent pool may have been biased towards those associated with our internal research partner. Issuing survey through an anonymous or other party may or may not have mitigated the potential for such bias, though may have also reduced the total number of respondents in the absence of a credible advocate for employee participation.
- The survey results and performance benefits above only reflect the results of the Perkins + Will survey results. The participation from MODA employees did not account for a substantial number of participants.

Benefit: Educates an estimated 720 – 1200 visitors annually about high-performance design. Tour groups include national conference attendees, local professional organizations, university students, and high school students.

Methodology:

Perkins + Will uses 1315 Peachtree as an educational and outreach tool to teach visitors about the benefits of sustainable, high performance building and site design. Educational tours (Image 23) and conference sessions are the primary way of accomplishing this goal.

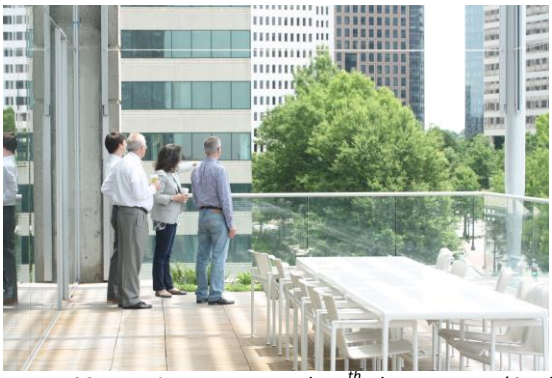


Image 23: Tour in Progress on the 5th Floor Terrace (Credit: Cameron Rodman)

Number of visitors annually was derived from data collected and historic averages generated by Perkins + Will. Estimates were cross checked against event totals which were documented by Perkins + Will.[1, 2]

An estimate of 30 – 50 attendees accompany each tour, and tours are given approximately two times each month.[3] Annual tours take place each year and one-time tours such as those with visiting schools and conferences take place throughout the year. Tours provide an array of educational experiences which demonstrate sustainable design in practice. Features such as the water fountain (which connects to the underground cistern), medicinal and edible plants (Image 24, 25, & 26), and plaza and terrace open space. Permeable wood decking, pavers and pervious concrete do as well. Each highlights varying aspects of how a site can solve numerous issues of sustainability.

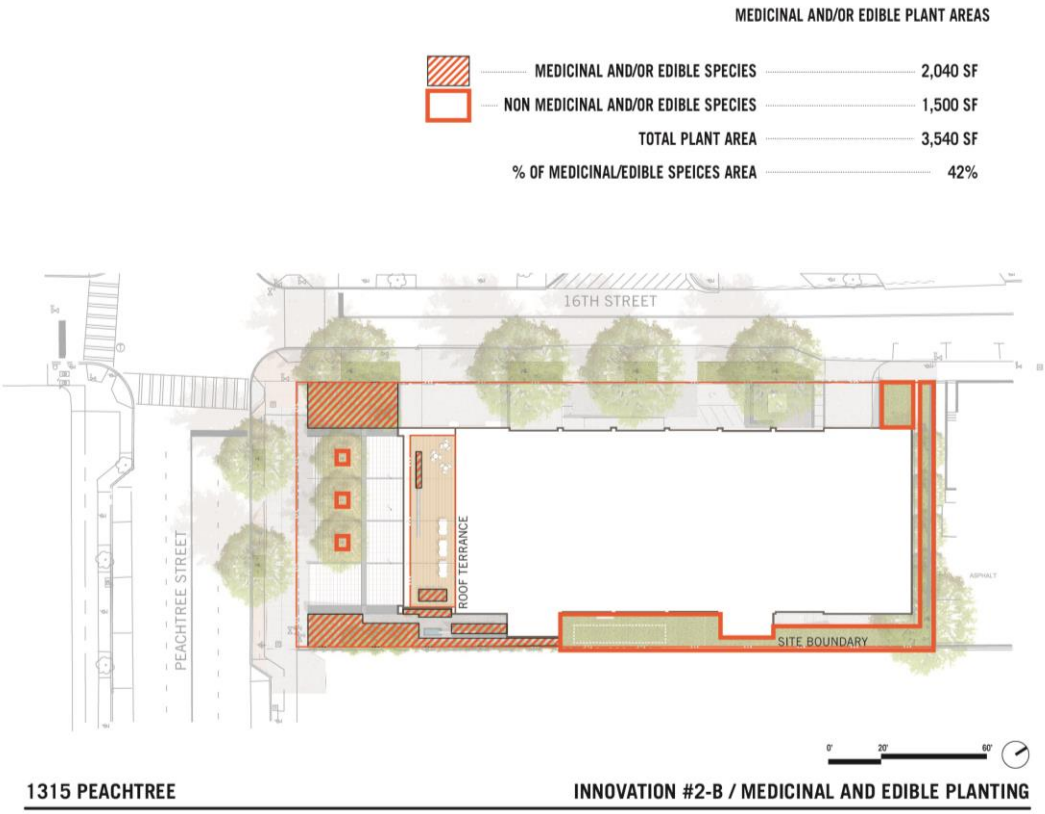


Image 24: Medicinal and Edible Plantings (Credit: Perkins + Will)

Image 25 (right): Blueberry Bush on South Side of Building (Credit: Cameron Rodman)
Image 26 (left): Medicinal/Edible Plantings along Peachtree Street (Credit: Cameron Rodman)

30 to 50 (guests) X 2 (tours per month) = 60 to 100 (guest each month) X 12 (months per year) = 720 to 1200 (guest per year)

A diverse range of interest groups and individuals tour the grounds throughout the year. An abbreviated list is found below.[1, 3]

<u>Local conferences</u>
AIA South Atlantic Region Conference (2011)
CoreNet Global Summit in Atlanta (2011)

Presented at local – regional – national – international conferences
AIA National Convention
Greenbuild
Greenprints
ULI

Annual tours include:
AIA Atlanta
AIA Georgia
USGBC Georgia Chapter
ULI Atlanta
Modern Atlanta tours held in 2012(300 attendees) & 2013 (250 Attendees)

Additional visitors
US General Services Administration (GSA)
Atlanta Botanical Garden
Atlanta Preservation Society
Visitors to Museum of Design Atlanta (MODA)
Metropolis Magazine Event
Environmental Protection Agency (EPA)
College and Universities

- Southern Polytechnic State University
- Georgia Institute of Technology
- Savannah College of Art & Design
- Virginia Polytechnic Institute and State University
- Auburn University
- University of Florida
- University of Tennessee
- High School Students (Local)

Sources:
[1]Perkins + Will – 1315 Tours.xls
[2]#2-B (Image showing location for Medicinal and Edible plants.)
[3]E-mail Communications with Perkins + Will

Limitations
Actual attendance was available for only a portion of the total events/tours hosted since occupancy, yielding an estimate-based figure with a wide potential range. Through participation in the LAF CSI program, Perkins+Will has recognized the need for a more vigilant approach to tracking the number of event/tour guests.

	A	B
1	Tour Group	Approximate Attendees
2	Fugees SRI Appreciation Lunch	30
3	AIA NetWorking Women	40
4	GSA Reception	24
5	CoreNet	40
6	IFMA	40
7	MA Modern Atlanta 2012	300
8	MA Modern Atlanta 2013	250
9	Georgia Chamber of Commerce	50
10	GT Tour - Paula Vaughan + Debbie Phillips	24
11	Being Mary Jane Film	NA
12	SMPS Seminar	20
13	GA Tech Summer Camp Student Tour	24
14	GA Tech Graduate Student Reception 2012	60
15	GA Tech Graduate Student Reception 2013	60
16	ULI Training	30
17	ULI Events	40
18	St.Joes Retreat	30
19	Antron| Primal Screen	24
20	Pivot	20
21	American Institute of Architects	50
22	AIA - COTE	25
23	ULI Center for Leadership	25
24	SAR Tour	35
25	CFO LFRT Reception	35
26	BET Channel	NA
27	MidTown Alliance	50
28	Museum of Design Atlanta (MODA)Lectures	50
29	PED Awards	32
30	Auburn University CADC Reception 2013	48
31	Auburn University CADC Reception 2013	24
32	SCAD Student Tour	20
33	IIDA 2014	20

Tour Tracking[1]

Methodology for Cost Comparison

Cost Comparison: Saved $64,155 by specifying Massaranduba wood decking tiles constructed from 'shorts'. Shorts are the leftover pieces from the fabrication of other wood products. Decking tiles constructed from traditional long decking would have increased the decking cost by 76%.

Bison Massaranduba Wood Tiles are Forest Stewardship Council (FSC) certified. Sourced from South America, the tiles are created from ‘shorts’. Shorts are the scrap pieces of wood that are remaining and would otherwise be unused after being cut from long boards during the fabrication of other products. These shorts are collected from numerous mills.[1, 2]

Each 2' x 2' wood tile has a MSRP of $44 (or $11 per square foot). Comparable decking tiles manufactured in the United States are typically produced from long boards. These average a MSRP value of $200 each (or $50 per square foot).[2]

The fifth floor terrace decking totals **970** square feet while the decking on ground level plaza totals **675** square feet. This comes to a total of **1,645** square feet of decking. [3, 4]

Bison Massaranduba wood tiles manufactured from shorts:
1,645 s/f x $11 s/f = **$18,095.00**

Comparable decking tiles manufactured from long boards:
1,645 s/f x $50 s/f = **$82,250.00**

$82,250.00 - $18,095 = $64,155.00

Additionally, the use of shorts has secondary ecological benefits. The use of short boards reduces the amount of trees which need to be cut down for manufacturing purposes and reduces the number of transportations runs which are required to move trees to mills, thus decreasing carbon output and fuel usage.

The optional supporting pedestal system contains 20% post-industrial recycled material and is 100% recyclable. [2]

Sources:

[1]Perkins + Will – BisonFSC.pdf
[2]Bison Innovative Products (Lisa von Gunten//President) – (Product cost and additional information)
[3]Perkins + Will – 1315Peachtree-MATERIALS-PLANTINGPLAN_TerraceLevel.dwg
[4]Perkins + Will – 1315Peachtree-MATERIALS-PLANTINGPLAN_GroundLevel.dwg

Limitations

Cost of comparable decking is a hypothetical product. Cost is generated by Lisa von Gunten, President of Bison Innovative Products. Further research would be needed in order to verify the accuracy of the estimated cost of the hypothetical baseline product.

Additional Information of Interest Outside of Performance Benefits

The following temperature studies were initiated as part of the exploration of an additional potential performance benefit but not completed due to inconclusive results.

Temperature Studies –Trees have the ability to cool ambient air temperatures through evapotranspiration and shade surfaces resulting in a reduction of radiant heat commonly referred to as heat island effect. Ambient air temperature samples (Image 28) were taken and infra-red imagery (measured with FLIR i3) was gathered in order to collect data on ground surface radiant heat. The following are a few image samples that highlight a variety of conditions of interest. Further sampling of the subject site and baseline spaces would need to be conducted in order to draw performance conclusions.

Image 28: Site Plan Diagramming sample locations (Credit: Base Perkins + Will / Location Diagramming Cameron Rodman)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Type	Plaza	Location #1	Location #2	Location #3	Location #4	Location #5	Location #6	Location #7	Location #8	Non-shaded	Shaded	difference	high low ns	high low s	General Weather Conditions
2	Time	Ambient Air c	85.3	85.6	84.4	83.7	83.7	83.7	87.3	88.34						Sunny, No Breeze
3	12:20 PM	Temperature avg. f	84.3	86	85.7	91.7	96.2	94.6	101.4	100.7						
4	Time	Ambient Air c	86.5	87.1	85.5	84.6	85.8	86	88.2	89.2						Sunny, Light Breeze
5	1:53 PM	Temperature avg. f	89.6	96.1	95.2	90.7	91.1	95.8	103.6	97.2						
6	Time	Ambient Air c	85.1	85.5	85.5	84.2	84.6	85.1	84.6	85.1						Overcast, Cloudy, Light Breeze
7	5:12	Temperature avg. f	91	98.8	95.8	90.2	92.6	91.6	104.2	98.1						
8	Average	Ambient Air c	85.63	86.07	85.13	84.17	84.70	84.93	86.70	87.55	86.22	84.60	1.62	87.55//85.13	84.93//84.17	
9	AVerage	Temperature avg. f	88.30	93.63	92.23	90.87	93.30	94.00	103.07	98.67	94.25	92.72	1.52	103.07//88.30	94//90.87	
10																
11	Type	Terrace	Location #1	Location #2	Location #3											
12	Time	Not taken due to site walk with Micah														
13	12:20 PM															
14	Time	Ambient Air c	89.6	89.6	89.6											
15	1:53 PM	Temperature avg. f	x	x	x											
16	Time	Ambient Air c	88.9	87.8	87.8											
17	5:12 PM	Temperature avg. f	x	107.3	102.6											
18	Average	Ambient Air c	89.25	88.7	88.7											
19	AVerage	Temperature avg. f	x	x	x											

Site Temperature Samples (Credit: Cameron Rodman)

	A	B	C	D	E	F	G	H	I	J
21	Location	Name	Description	All ambient air temperatures taken with SENSEAIR pSENSE at 3.5' above ground surface						
22	Plaza									
23		Location #1	Entrace to Perkins + Will office							
24		Location #2	Entrance to MODA							
25		Location #3	Entrance to Library							
26		Location #4	Under tree canopy in front of Library entrance							
27		Location #5	Under tree canopy in front of MODA entrance							
28		Location #6	On ramp in front of Perkins + Will entrance							
29		Location #7	On public sidewalk at base of ramp which leads to Perkins + Will entrance							
30		Location #8	On public sidewalk 10' from public transit stop							
31	Terrace									
32		Location #1	South entrance to terrace							
33		Location #2	middle of terrace							
34		Location #3	North entrance to terrace							
35										
36	Other									
39		temperature f	104.2	Seat Wall 2						

Site Temperature Location Descriptions - Key to Site Plan Diagramming sample locations above (Credit: Cameron Rodman)

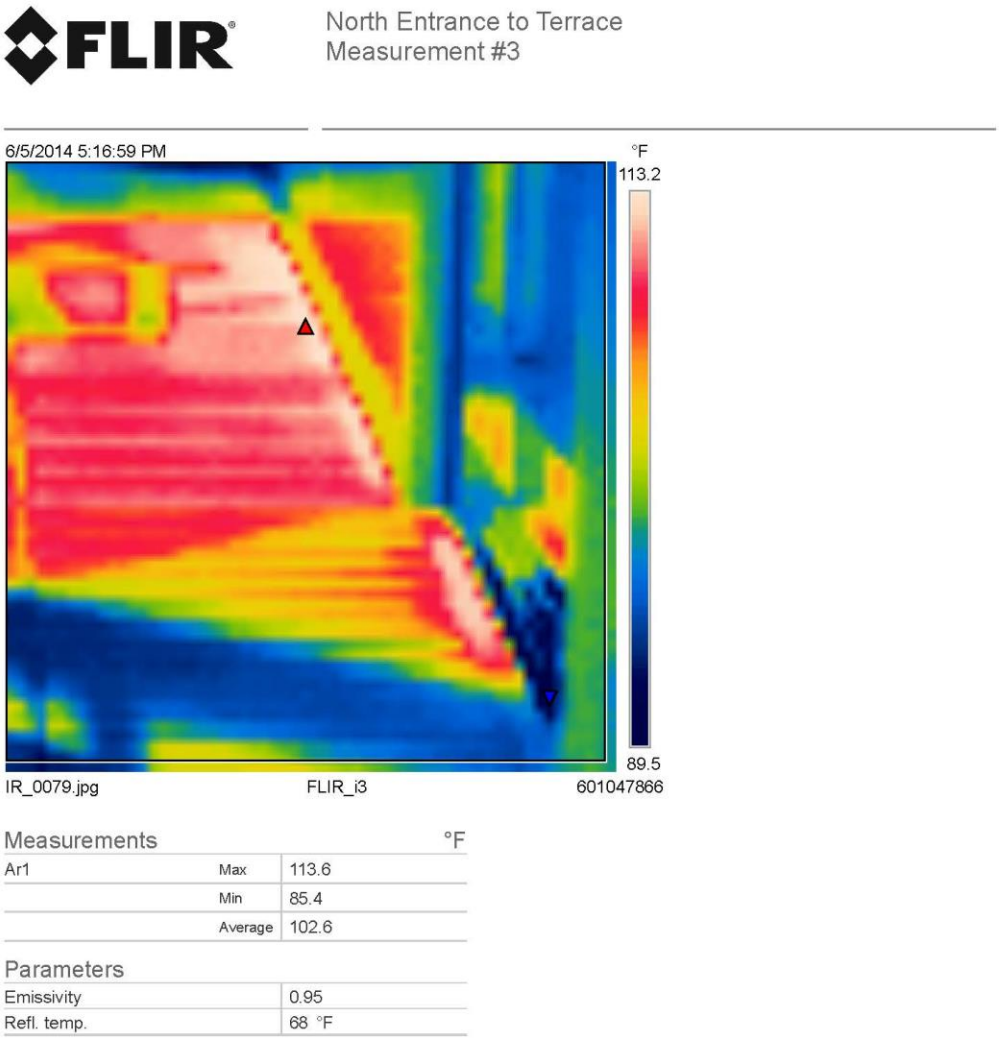


Image 29: IR Picture (Credit: Cameron Rodman)

- Each of these images show the maximum temperature and minimum reflective temperature as well as the overall image temperature average. These highs and lows are indicated by a blue and red arrow respectively.
- There are also other issues to consider when sampling with infrared temperatures. The surfaces included in the image would skew the results since we are specifically looking for a comparison between similar surface materials in a variety of settings. To ensure more accurate and telling data researchers would want to limit the image to one surface material in the shade or in the sun in similar weather conditions.
- This image shows the decking on the fifth level terrace. In the bottom left of the image you can see a shadow cast by the table. Shadows influnce the radiant heat from materials. The right side of the image is the interior door and windows.

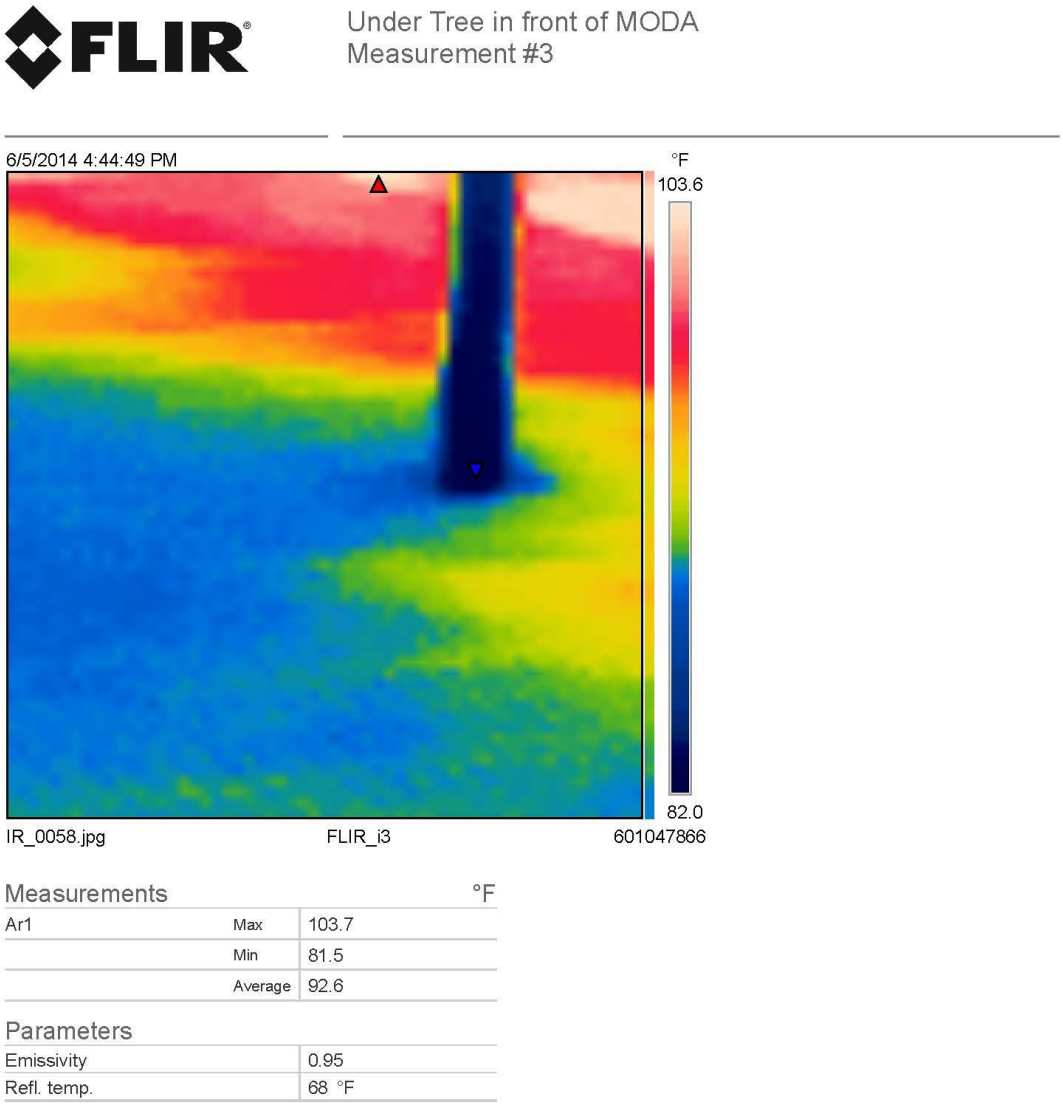


Image 30: IR Picture (Credit: Cameron Rodman)

- This image shows the reflective heat under one of the entry plaza's Trident Maples. The sun was coming from the right of the image. You can see the higher heat in red and descending to the cooler surface temperature in blue. This is a typical image and occurrence in tree shading.
- It is important to note that under shade the darker wood decking was hotter than the shaded and not shaded white concrete pavers.
- One could further study the impacts of reflective surfaces on surface temperatures. As seen in image 29 and 30, the hottest areas are near windows, leading one to think that sun is reflecting on the ground surface and heating it more. This information could inform site design to change the way we design near windows and buildings. Public comfort and plant survival would be impacted should the findings be significant.

Averaging and estimating the benefits of a tree during its lifetime instead of on an annual basis.

During research we came across some peer reviewed journal articles which helped us set an average life time for a urban street tree[1]. A potential performance benefit could read as '**Sequesters 18,340 lbs. of atmospheric carbon, intercepts over 63,028 gallons of stormwater, by 11 new trees over an averaged 28 year lifespan.'**

Tident Maples (3)	Trees	Year(s)	Gallons water intercepted annually	Total	Raise property value non adjusted	Total	conserved kWh	Total	reduce atmospheric carbon	Total
	1	1	348	348	4	$4.00	20	20	94	94
	3	1	348	1044	4	$12.00	20	60	94	282
	3	28	348	29232	4	$336.00	20	1680	94	7896
Sweetbay Magnolias (1)	1	1	291	291	4	$4.00	17	17	77	77
	1	1	291	291	4	$4.00	17	17	77	77
	1	28	291	8148	4	$112.00	17	476	77	2156
Yaupon Holly (3)	1	1	80	80	1	$1.00	6	6	20	20
	3	1	80	240	1	$3.00	6	18	20	60
	3	28	80	6720	1	$84.00	6	504	20	1680
Armstrong Red Maple (4)	1	1	169	169	8	$8.00	10	10	59	59
	4	1	169	676	8	$32.00	10	40	59	236
	4	28	169	18928	8	$896.00	10	1120	59	6608
Grand Total	11	1		2251		$51.00		135		655
	11	28		63028		$1,428.00		3780		18340

Calculations for tree values[2] and self-generated

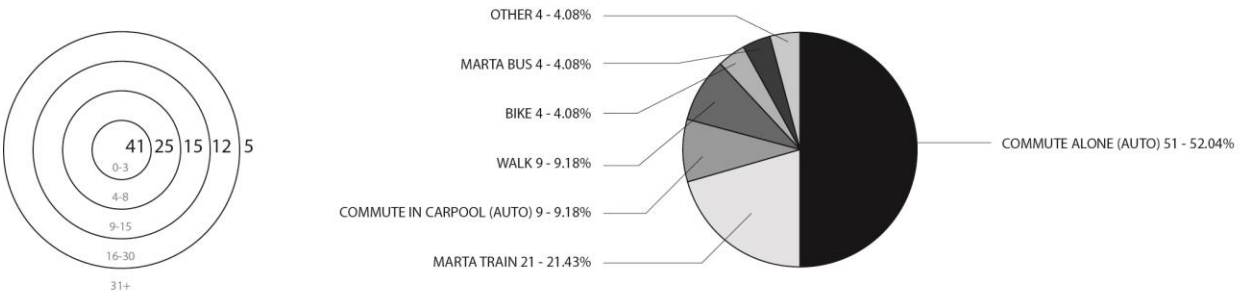
Sources

[1]Roman, L. A. & Scatena, F. N. (2011). Street tree survival rates: Meta-analysis of previous studies and application to a field survey in Philadelphia, PA, USA, *Urban Forestry & Urban Greening*, 10 Retrieved from http://www.actrees.org/wp-content/uploads/2012/08/roman-scatena-2011-street-tree-mortality.pdf

[2]http://www.treebenefits.com/calculator/index.cfm (accessed: 6.13.2014)

- The National Tree Benefit Calculator was conceived and developed by Casey Trees and Davey Tree Expert Co.
- This tool is powered by i-Tree; the data generating the results comes from the i-Tree Tools CD ROM: http://www.itreetools.org/
- Significant text and graphical content was originally published by the USDA Forest Service's Center for Urban Forest Research through their Tree Guide series of publications. Credit should be given to authors of these publications.
- Facts about personal carbon production based on driving and flying courtesy of Conservation International
- For questions about this tool, contact Scott Maco (Davey Tree Expert Co.)

Transportation –We also included a few questions which aimed to gather data on the distance with which people live form 1315 Peachtree St. and their common modes of transportation (Image 31). This data is compared to previously collected information (Image 32). Below are the results of our questions and the previous survey.



Living distance from work.

Commute Type

Image 31: 2014 survey results[1]

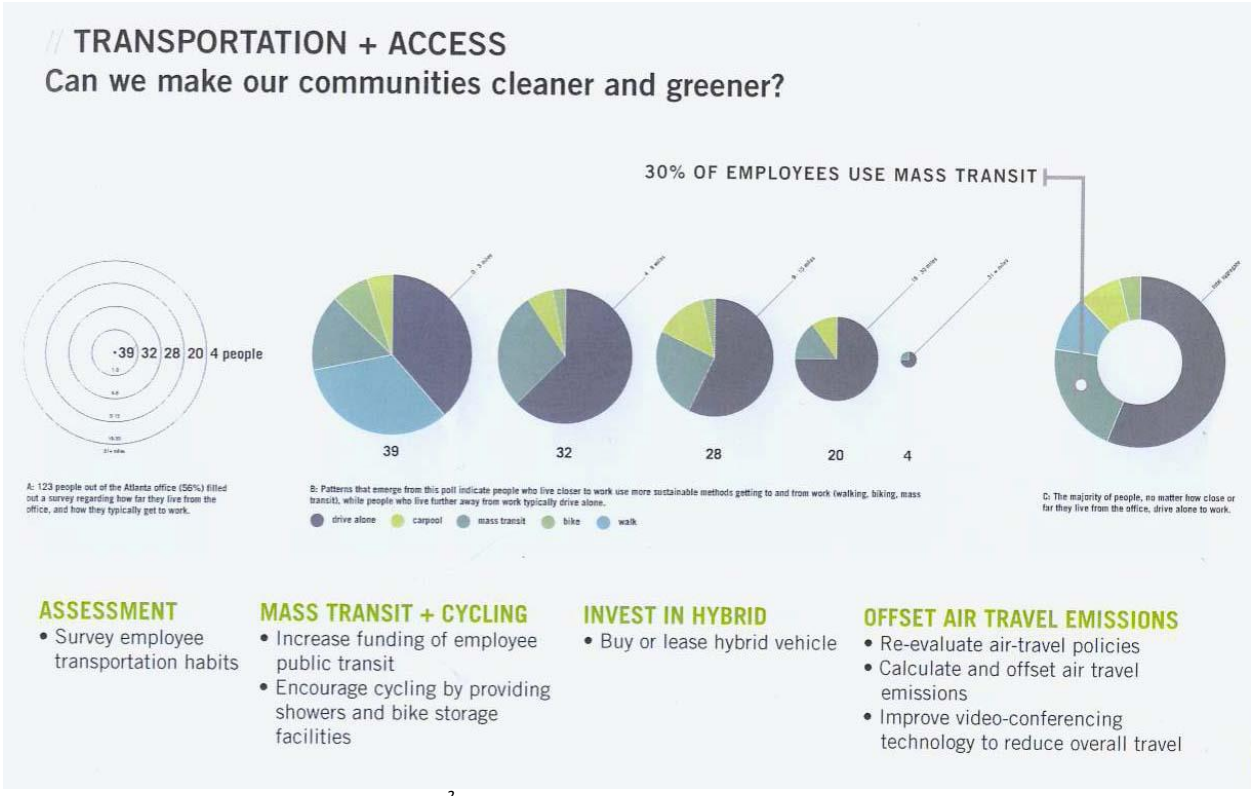


Image 32: Post-occupancy data survey results[2]

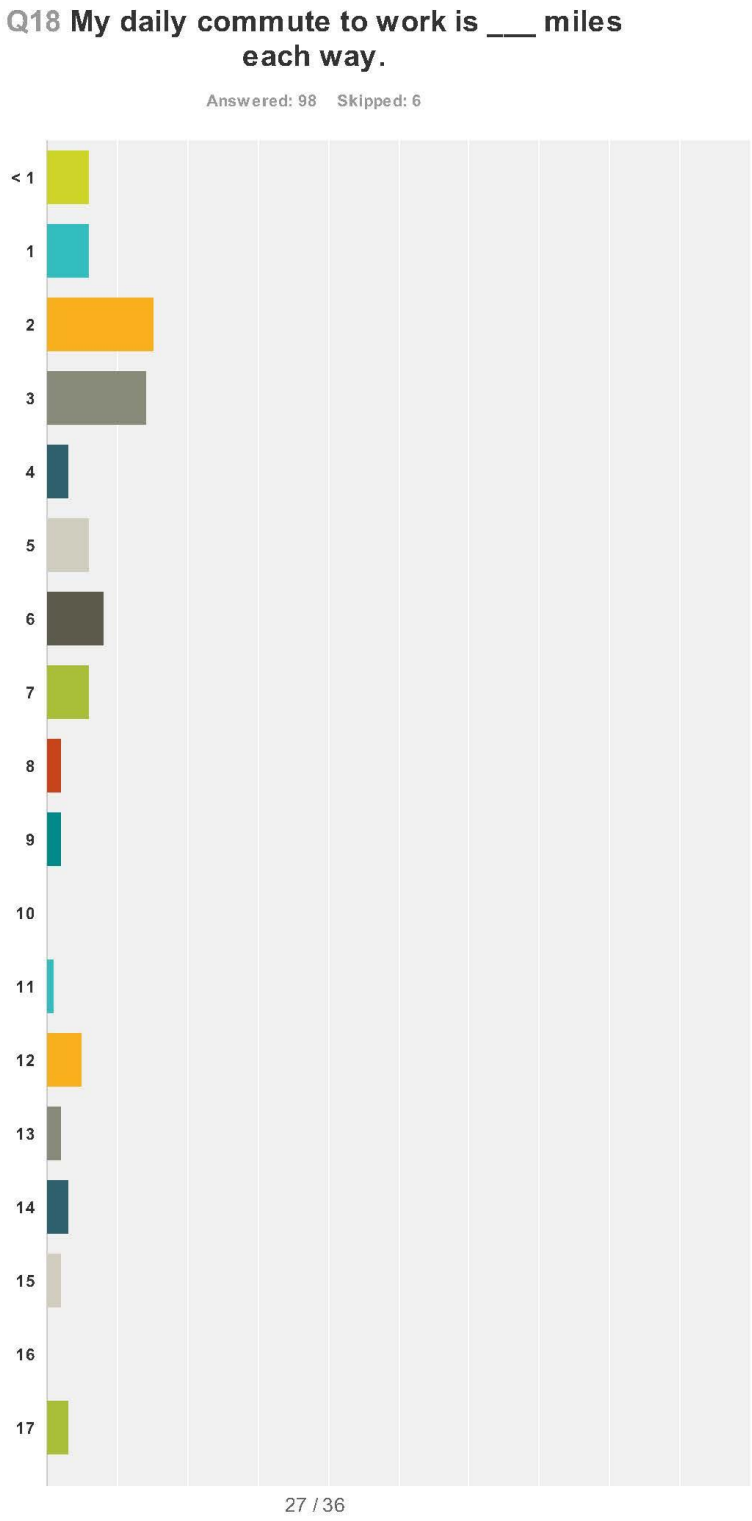
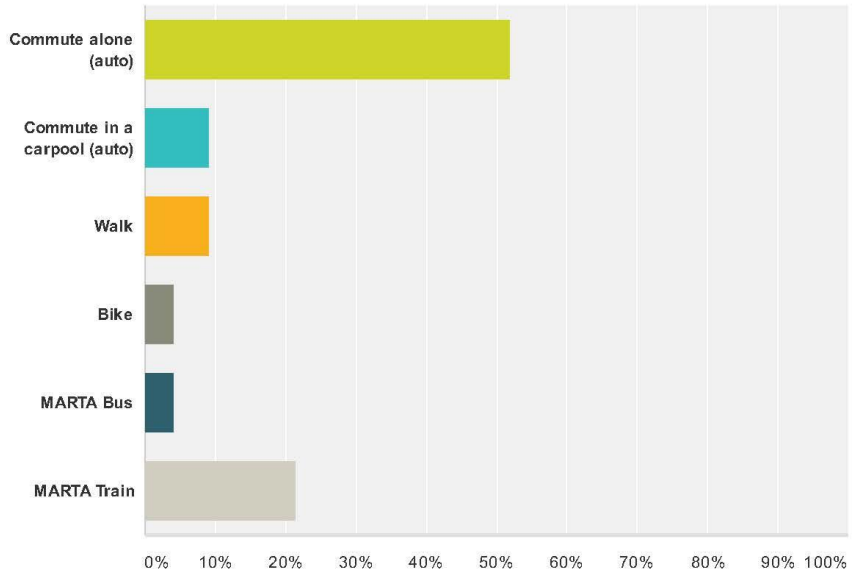


Image 33: Question 18 Survey – 1315 Peachtree Employees[1]

Q19 My typical mode of transportation to and from work is:

Answered: 98 Skipped: 6



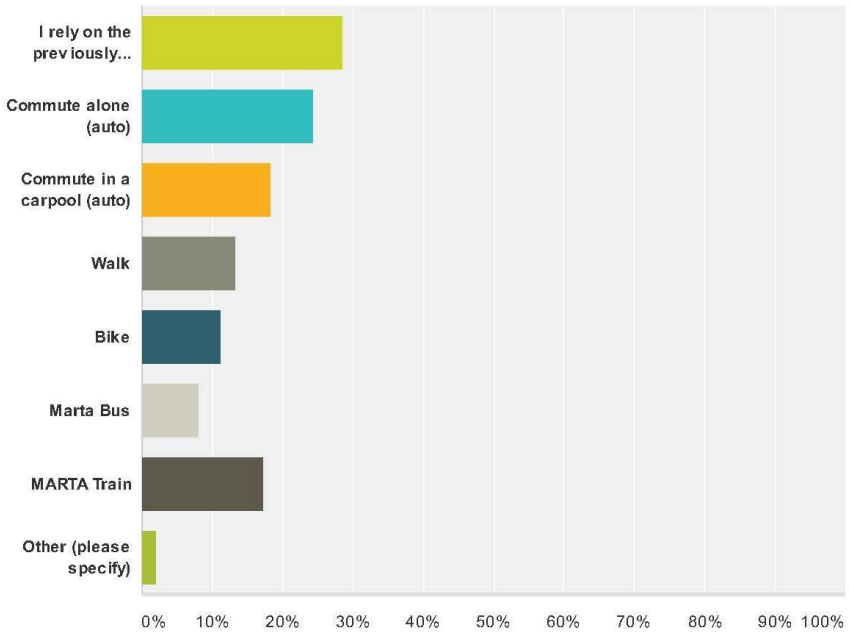
Answer Choices	Responses	
Commute alone (auto)	**52.04%**	51
Commute in a carpool (auto)	**9.18%**	9
Walk	**9.18%**	9
Bike	**4.08%**	4
MARTA Bus	**4.08%**	4
MARTA Train	**21.43%**	21
Total		**98**

#	Other (please specify)	Date
1	Commute to Chamblee Station, take MARTA in from there	6/13/2014 8:09 AM
2	MARTA bus and train	6/10/2014 3:53 PM
3	and MARTA bus	6/10/2014 2:06 PM
4	walk and bike	6/10/2014 1:50 PM

Image 34: Question 19 Survey – 1315 Peachtree Employees[1]

Q24 Though not my typical mode of transportation, I occasionally also do the following to get to and from work:

Answered: 98 Skipped: 6



Answer Choices	Responses	
I rely on the previously indicated mode of transporation exclusivly	**28.57%**	28
Commute alone (auto)	**24.49%**	24
Commute in a carpool (auto)	**18.37%**	18
Walk	**13.27%**	13
Bike	**11.22%**	11
Marta Bus	**8.16%**	8
MARTA Train	**17.35%**	17
Other (please specify)	**2.04%**	2
Total Respondents: 98		

#	Other (please specify)	Date
1	CRT bus	6/12/2014 5:33 PM
2	Regional Bus System (CCT)	6/10/2014 1:51 PM

Image 35: Question 24 Survey – 1315 Peachtree Employees[1]