

# Downtown Houston Pedestrian Lighting

Existing Conditions Lighting Analysis Report

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Downtown Houston Pedestrian Lighting - Existing Conditions Lighting Analysis Report | January 2024

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

ARUP

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# 1 Introduction

Arup were commissioned by the Downtown Houston + (formerly Downtown Management District, the Downtown Redevelopment Authority, and Central Houston Inc.) for the analysis of the current pedestrian lighting conditions and recommendations for future lighting enhancements of the public right-of-way in Downtown Houston, Texas.

This report summarizes the key findings and observations of the assessment of Downtown Houston nighttime site lighting and a nighttime vulnerability assessment on selected case study areas with a focus on nighttime activation.

We want to understand the pedestrian experience of those that spend their time in Downtown Houston, from Office Workers, Residents, Visitors and Tourists.

Light has the power to change the way we perceive a place; to make it safer, more attractive, and more inviting. However, our urban areas are not always optimized for human activity after dark and are often more focused on illumination targets and the needs of vehicular traffic, than our visual needs to fully interpret the scene. Lighting design needs to consciously consider all types of social movement at night.

The illuminated experience is crucial in developing a strong impression of a city and a well developed lighting character. Embracing the lighting philosophies of the city will help to reinforce the identity and functionality of Downtown Houston.

This report reviews the existing conditions of the sidewalk lighting around Downtown Houston, with the nighttime site visits being conducted during July and August 2023. As part of this assessment we also observed and document ambient effects generated by street lighting, landscape lighting, building lighting, storefront lighting, transit station lighting, existing pedestrian lighting, parking lot or garage lighting, vehicular wayfinding lighting, banner pole lighting, and high-mast or under-bridge highway lighting.

Over 6550 light measurement points were taken across Downtown Houston, which we used to influence the measurement of 24 Nighttime Vulnerability Assessment (NVA) locations. The goal of an NVA case study is to provide Downtown Houston + with the necessary information to allow them to engage with concepts of pedestrian safety and equal access after dark, reflect on possible lighting vulnerabilities, assess the risks involved, and act to mitigate and reduce the risk to the public.

Following a nighttime survey and Nighttime Vulnerability Assessments in 24 locations, we were able to use this data and information to create a high level overview of lighting vision and conceptual design approach for Downtown Houston. This can be explored further in the Arup Lighting Design Masterplan Report.



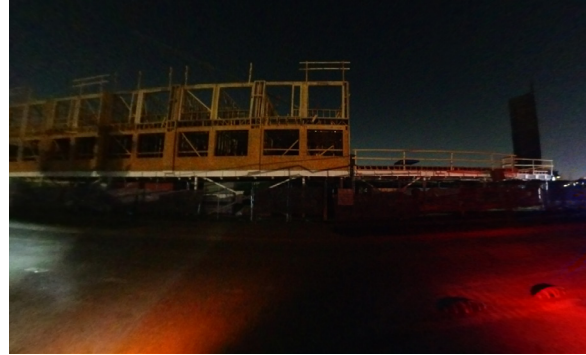
Figure 1: Downtown Houston from the air



# 1.1 Current Nighttime Lighting Conditions

As part of our pedestrian lighting analysis, we explored the streets to understand the different areas, atmospheres and the different energies in the range of districts that make up Downtown Houston. A selection of these are shown below, highlighting the range of both well illuminated areas, and the areas of opportunity across the city. These highlight areas that feel safe as well as areas with a lower perception of safety.

These are only snapshots of Downtown Houston, but they helped influence where we took our Nighttime Vulnerability Assessments. Using these alongside the existing conditions heat map helped to ensure we evaluated a broad range of locations. This study influences our areas of opportunity to ensure we collect an accurate, in-depth picture of the nighttime environment across Downtown.



Many areas of Downtown have minimal to no lighting at night, creating dark and unfriendly feeling spaces.



Many of the Downtown Houston artwork is lost to the night, with minimal or no illumination. There are many art pieces across the city with varying levels of illumination.



Multiple loading dock entrances leads to disconnects between the areas with high hospitality locations, with the brightly lit loading spaces contrasting with the darker streetscape, causing a 'spotlight' effect.



Fun façade lighting create navigational waypoints across the city and add nighttime fun and illumination.



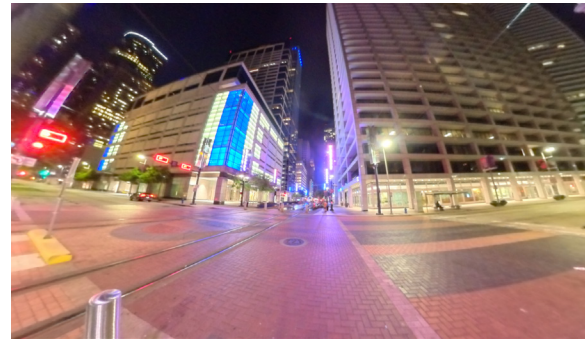
Illuminated squares provide visual and physical rest points across the city.



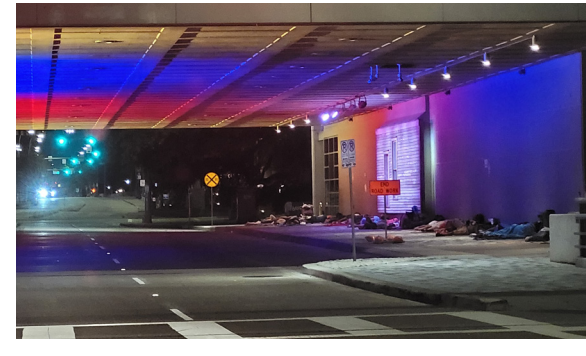
Large amounts of both garage parking and surface parking lots leads to disconnects between the areas with high hospitality locations. Surface parking lots are often unlit or poorly lit at night, creating dark voids next to the sidewalks.



The tunnel passageway around the Chevron Building creates a fun intersection, which is well lit and easy to navigate.



Some areas of Downtown, such as Main Street, are brightly lit with multiple amenities open into the night.



Underpasses tend to gather groups of the unhoused community. The Bagby Street Underpass (shown) is brightly illuminated with art pieces, whereas other underpasses around the outskirts of Downtown Houston are illuminated with 1-2 luminaires.



Light and sound installations along the street provide places for people to come together and interact with the city. Around the holiday season, festive installations are also installed in key locations.

# 2 Existing Conditions

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## 2.1 Baseline Summary

The existing conditions survey measured the horizontal light levels across entire of Downtown Houston. This provides both values and visualisation of the typical lighting levels around different areas of Downtown Houston and is our baseline to improve on where required. Understanding the current conditions influences where we take our Nighttime Vulnerability Assessment locations.

Site visits to Downtown Houston were conducted during July and August 2023. These visits took place at night, with the week of the new moon, to ensure minimal distortion by moonlight to the collected results. The baseline values of these nights are shown in section 2.3.

### Measurements

During this assessment, we also observed and documented ambient effects generated by street lighting, landscape lighting, building lighting, storefront lighting, transit station lighting, existing pedestrian lighting, parking lot or garage lighting, vehicular wayfinding lighting, banner pole lighting, and high-mast or under-bridge highway lighting. These are discussed later in this report.

These light measurements provide tangible information that is used to better understand the existing nighttime condition.

Across the site the horizontal light levels were measured using a calibrated Mintolta T-10.

Horizontal illuminance refers to the amount of light that falls onto a horizontal surface, such as a sidewalk. The standard measures for illuminance are footcandles and lux. Footcandles are used throughout this report.

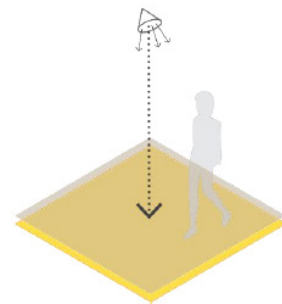


Figure 2: Horizontal Illuminance



Figure 3: Example image of the Illuminance meter used

### Abbreviations & Definitions

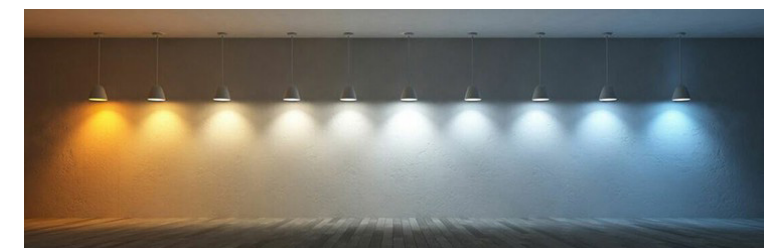
Below are a list of abbreviated terms that will be used throughout the document.

- ‘FC’ - illuminance is measured in ‘fc’ (footcandle) and quantifies the amount of light landing on a surface, illuminance on one square foot.
- ‘Luminance’ quantifies the intensity of light emitted from a surface per unit area in a given direction, cd/m2.
- ‘CCT’ (correlated color temperature) is a way to describe white light appearance and it is measured in degrees of Kelvin (K), on a scale from 1,000 to 10,000, candlelight to blue sky, respectively.
- ‘Eh’ - average maintained horizontal illuminance on the task plane unless otherwise noted.
- “CRI” (Color Rendering Index) is a measure of a light source’s ability to show an objects color “realistically” or “naturally” compared to a familiar reference source, either incandescent light or daylight. A CRI of 100 represents the maximum value. Lower CRI values indicate that some colors may appear unnatural when illuminated by the lamp.



High CRI - 90-100 Mid CRI - 80-90 Low CRI - >80

Figure 4: Color Rendering Example



1000K ————— 10,000K

Figure 5: CCT Example



## 2.2 Existing Conditions Survey

### 2.2.1 Methodology

Quantitative lighting measurements were taken during the site visits. The illuminance levels were measured on ground level, along each pedestrian pathway. Each pathway had a minimum of 5 measurement points, including

- Crosswalk midpoints
- Start of pathway
- Behind pathway light poles
- Between pathway light poles
- End of pathway

The points were recorded in Arc GIS to allow both images from site, notes and the measurements to be collated in one location.

### Measurements

In total, over 6550 horizontal illuminance points were taken across the Downtown Houston site.

### Weather Conditions

#### Week 1

- 07/18/23, 3:37 am | Partially Cloudy Skies | 0.015 fc
- 07/19/23, 4:03 am | Clear Skies | 0.017 fc
- 07/20/23, 1:47 am | Clear Skies | 0.05 fc
- 07/21/23, 2:59 am | Clear Skies | 0.08 fc

#### Week 2

- 08/15/23, 1:30 am | Partially Cloudy Skies | 0.004 fc
- 08/16/23, 1:50 am | Clear Skies | 0.002 fc
- 08/17/23, 1:40 am | Clear Skies | 0.002 fc
- 08/18/23, 1:10 am | Clear Skies | 0.002 fc

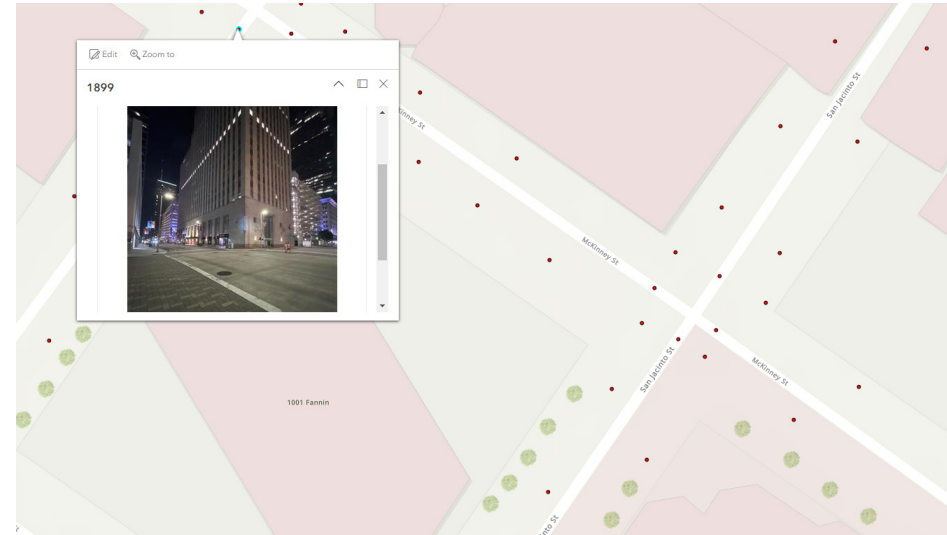


Figure 6: Zoomed in reference of Figure 8 showing the multiple points taken along each street with reference photographs.

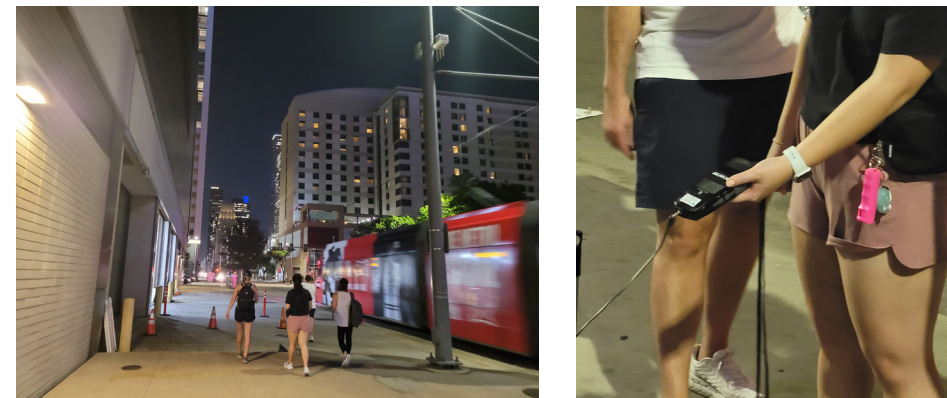


Figure 7: The team taking measurements across Downtown Houston using a Minolta T-10A Light meter and ArcGIS.

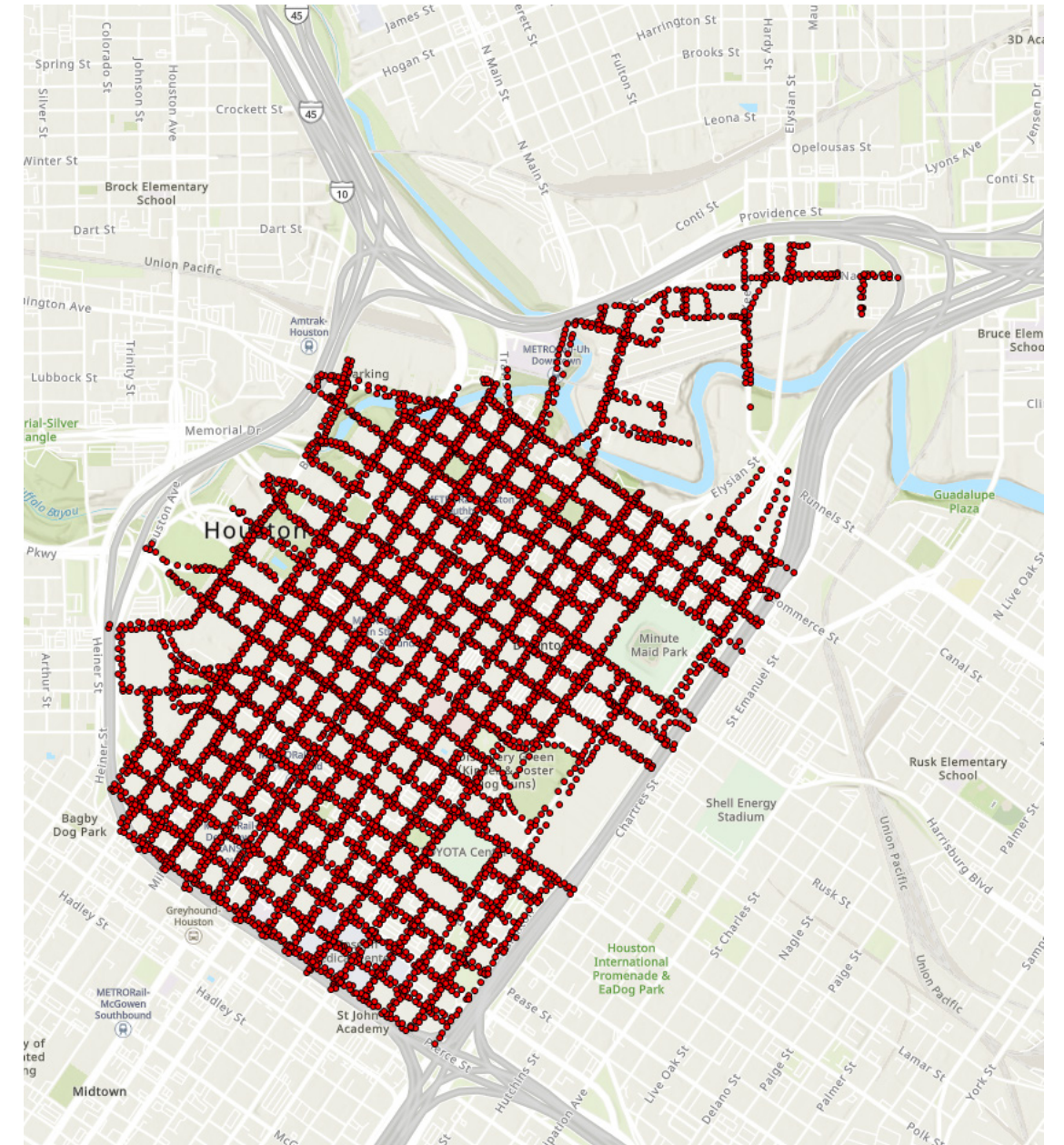


Figure 8: Overview of the 6550 recorded values



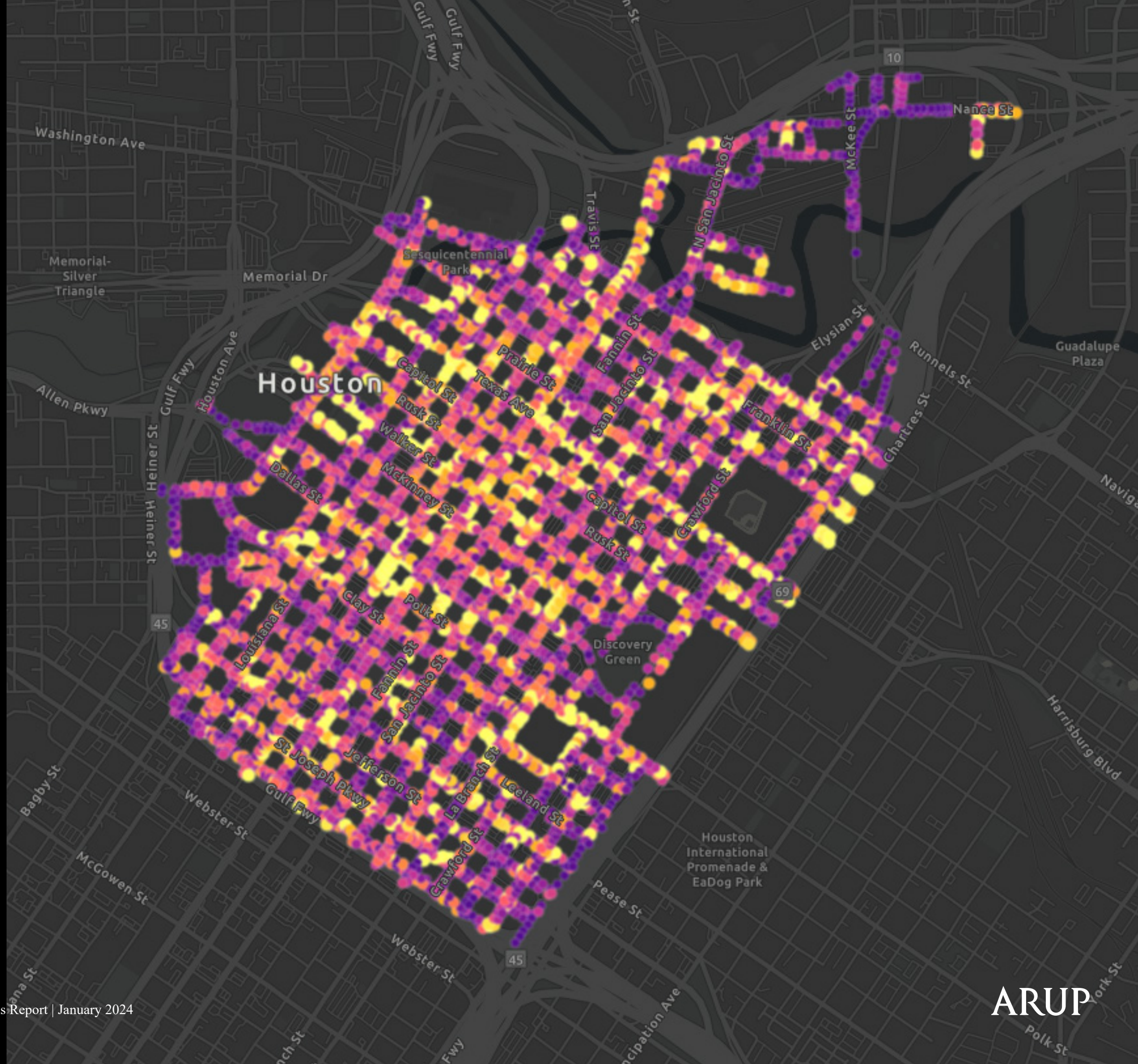
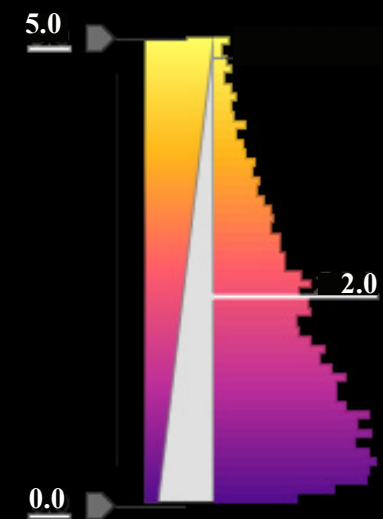
## 2.3 Existing Conditions Heat Map

Over 6550 points were taken, generating the heat map located to the right. 2fc is an industry reference for outdoor lighting levels. A higher fc measurement indicates that the location is more brightly lit. The darker purples and pinks are measurements below 2fc, the brighter pink is around the 2fc level, and the orange and the yellow are above the 2fc level.

Brighter than 2fc can cause glare to those walking through the space. This can create a spotlighting effect, where the user is brightly illuminated and unable to see those coming towards them from a darker space.

Darker than 2fc can cause a reduced perception of safety, due to users being unable to see what and who is around them.

Ideally we would like consistency in the colors across the entire map. Fluctuating light levels across an area can contribute to a sense of insecurity, as there are pockets of too much or too little visibility.





# 2.4 Existing Conditions Value Map

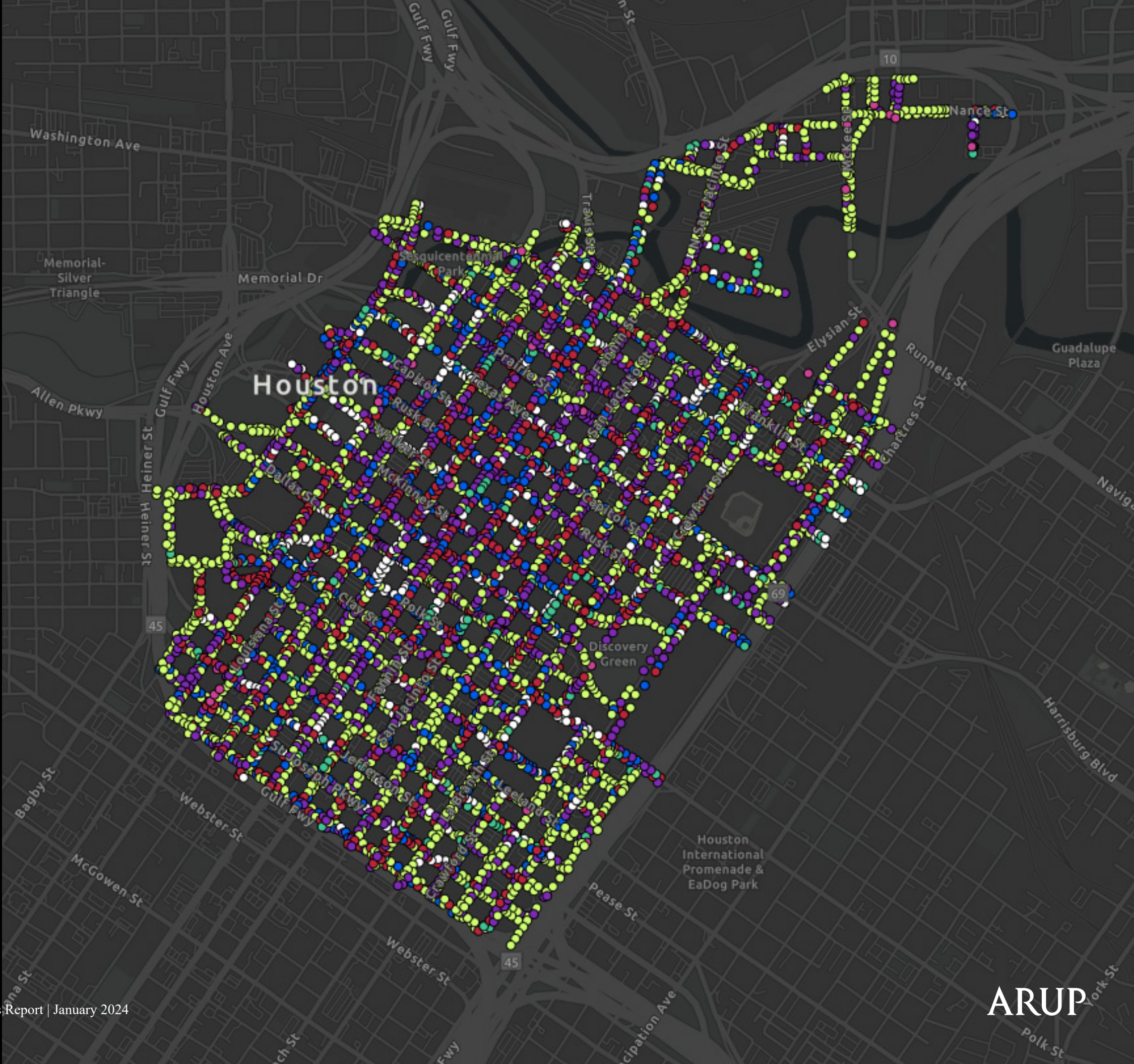
Another way to visualise this map is through each point showing its value in foot candles. All the areas in the light green are those that have potential for improvement.

It is to be noted that 2fc is the aimed for standard, however, between 1 and 4 footcandles can be acceptable, depending on the surrounding conditions, such as areas under canopies or front store of an active retail. As mentioned on the previous page, too high or too low a variation from 2fc can reduce the perception of safety.

Anything that is too high (white in colour) can be a problem, due to the high contrast.

Further discussion of what these mean on the ground around the streets of Downtown is discussed on the following page.

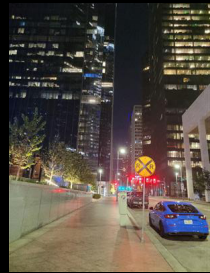
- 0.00 - 1.00
- 1.00 - 2.00
- 2.00 - 3.00
- 3.00 - 4.00
- 4.00 - 5.00
- 5.00 - 70.00
- Null Values







North Main Street provides a good general lighting due to many layers of light, including active storefronts, string lights, street lighting, and transit stops.



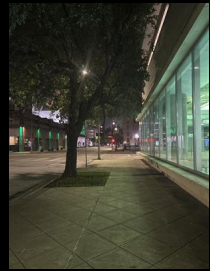
The Theater district in general provides a nice pedestrian experience, not only due the lighting but considering the physical characteristics for the site, with large sidewalks and horizontal illumination.



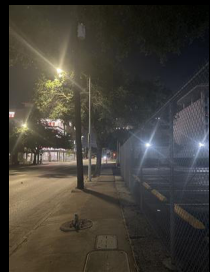
A lack of quality sidewalk lighting drives the average below the expected in this area. Alongside Sam Houston park there is no park lighting and many of the trees have grown over the street lighting, making the area dark.



Concentration of high light levels under the canopies, makes hard for the eyes to adjust on the surrounding light levels and perception of darkness is increased.



South Main St has adequate illumination with commercial building having additional pedestrian light or illuminated overhangs. However, site characteristics do not support the safety perception. During nighttime most of the buildings are closed. As a result there is almost no pedestrian activity.



The pedestrian experience around Trebly park is inviting, with appropriate light levels, good brightness balance and no physical obstructions. However, the experience dramatically decrease at the streets parallel to Leeland St, eg Pease St.



The Warehouse district has a consistently low illumination level with active construction work blocking some of the sidewalks. This reduces feelings of safety and both physical and visual transparency.



Here, there is a lack of public pedestrian lighting with social-economic issues which drive the location to feel very unsafe for any user walking through.



There is medium to low illuminance in this location, due to most of the street lighting being covered with tree branches and foliage. This was also noticed in a range of locations across the entire of Downtown.



The typical condition of the underpass are 1-2 floodlights, which although they provide illuminance, they lack quality. It generates glare and is not inviting for pedestrians.



Although the overall lighting levels looks low, the intense pedestrian activities, being able to see inside the Discovery Green, and lighting uniformity makes a good pedestrian experience in this location.



The combination of low lighting levels, empty parking lots and no pedestrian presence, makes the space feels unsafe.





# 3 Nighttime Vulnerability Assessment

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## 3.1 NVA Overview

### About

The NVA (Nighttime Vulnerability Assessment) process identifies areas of vulnerability through the analysis of qualitative and quantitative measurements that brings together user nighttime experience, the built environment, and technical lighting. It is used to create more inclusive, energized, and safe spaces after dark. Additionally, it provides a holistic overview of the practical and technical lighting infrastructure as well as design requirements to prioritize when developing a future proof nighttime strategy or masterplan.

The goal of an NVA is to provide Downtown Houston+ with the necessary information through the case study areas that allows them to engage with concepts of pedestrian safety and equal access after dark, reflect on possible lighting vulnerabilities, assess the risks involved, and act to mitigate and reduce the risk to the public.

Through conducting a site survey for the NVA, data is collected to assess the current environment condition and existing lighting installations. By analyzing all the data together, a holistic understanding of the site is obtained. The results from the survey inform which areas are seen as more vulnerable and a higher priority to develop.

These sites are case studies of conditions, built environment, and other phenomena in a broad range of locations across Downtown Houston. This ensures the treatments further discussed in the Arup Lighting Design Masterplan Report can not only be introduced to the Location Sites across the NVA but to other Sites that have similar characteristics.

Sources:

- Nighttime Vulnerability Assessment - ARUP. (n.d.).
- How can lighting make our cities more inclusive? (n.d.). Arup.

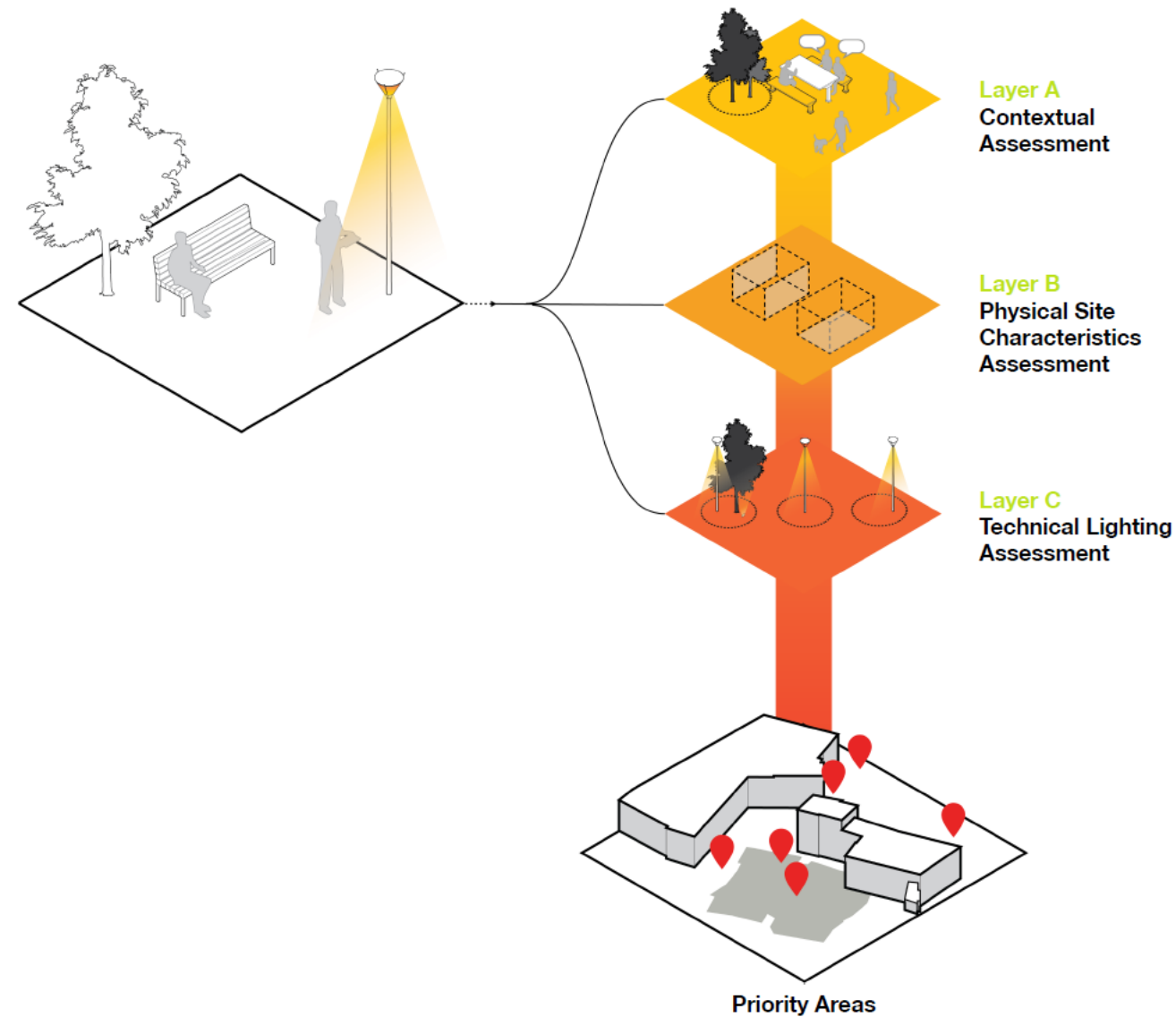


Figure 9: Overview of the layers used to create an NVA



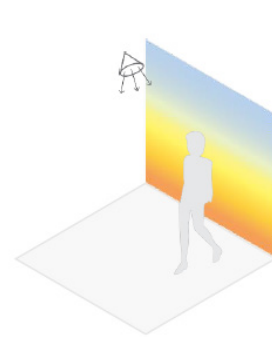
### 3.1.1 Measurements

The technical elements recorded are intended to provide a more holistic understanding of the human experience of light at night and give a qualitative overview of locations. A range of equipment is used to collect this information, including a luminance meter, illuminance meter, spectrometer and camera capable of taking High Dynamic Range (HDR) imagery

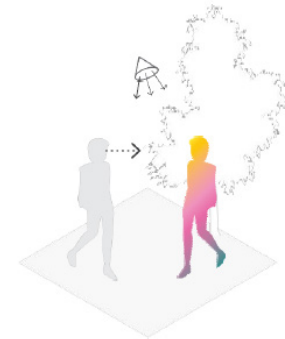
For this survey, these HDR images were taken using the Insta360 camera. The luminance imagery and levels of brightness were post-processed in a backwards ray tracing software program called Radiance, a process that is unique to Arup lighting.



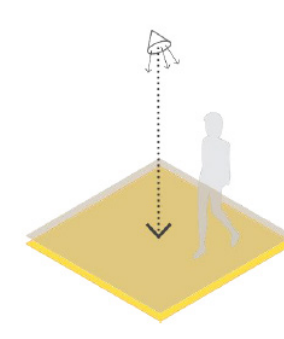
**Ambient Luminance**  
The degree of brightness over an area. It is measured using candela per square meter.



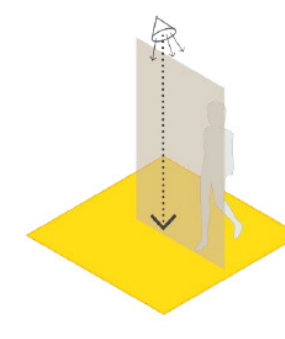
**Color Temperature**  
The measure of a light's color. It is measured in Kelvin (K)



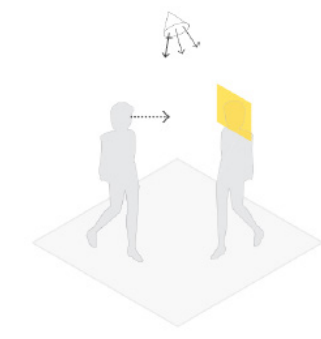
**Color Rendering**  
The capacity of a light source to accurately reproduce and show the colors of an object.



**Horizontal Illuminance**  
The amount of light that falls onto a horizontal surface, measured in foot candles.



**Vertical Illuminance**  
The amount of light that falls onto a vertical surface, measured in foot candles.



**Facial Illuminance**  
The amount of light that falls onto a face, measured in foot candles.



360 Camera



Luminance Meter



Spectrometer



Illuminance Meter

## 3.2 Site Analysis

The sites that have been surveyed have been inputted into the Arup Lighting NVA tool, allowing for the contextual analysis and characteristics of each site to be inputted. This tool produces a spider diagram and an overall site vulnerability score that can be used to compare the sites across Downtown.

An example and further explanation of the analysis is shown to the right:

### 3.2.1 Site Spider Diagram

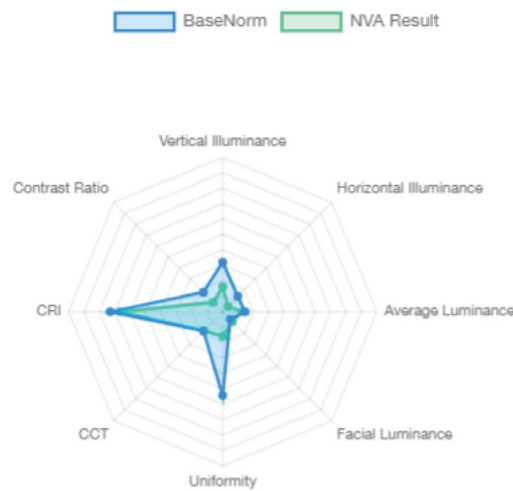


Figure 10: Site Spider Diagram Example

This radar plot per site can be compared to an existing baseline character of variables that contribute to the intended atmospheric outcome of the design.

The collected data on site can then be overlaid to the baseline measurement to identify any deviations and drive design decisions for that specific site. This baseline was designed through the findings of the collaborative research conducted by Arup Lighting and XYX Labs, Monash University.

This section of the analysis is quantitative, with the vulnerability score being qualitative in analysis.

This radar plot is further expanded in section 3.2.4.

### 3.2.2 Overall Vulnerability Score

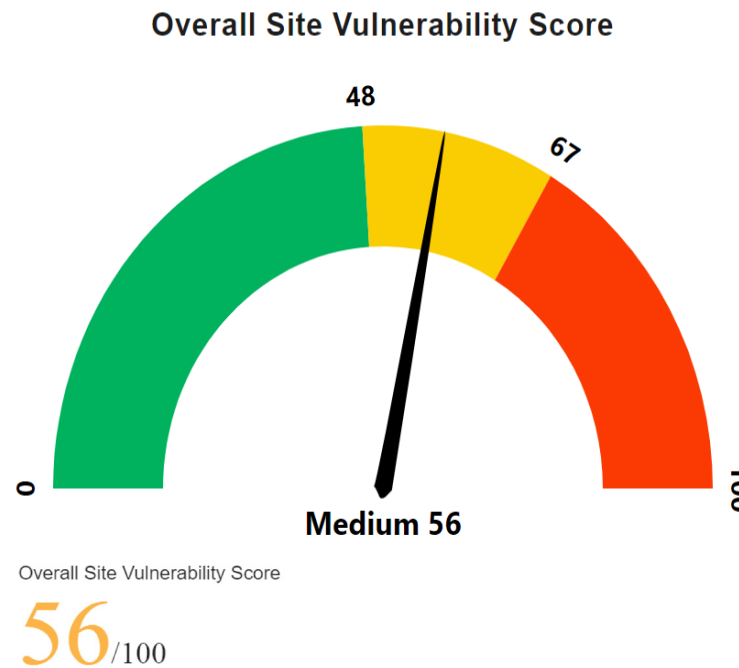


Figure 11: Overall Site Vulnerability Score Example

The physical site considerations are assessed and valued for each site, and this gives each site an overall vulnerability score. This metric allows for a rating out of 100.

A low vulnerability score, and therefore a site with a high perception of safety, is between 0-48.

A medium vulnerability score, and therefore a site with a moderate perception of safety with some area of opportunity for improvement, is between 48-67.

A high vulnerability score, and therefore a site with a low perception of safety with many areas of opportunity for improvement, is between 67-100.

A weighting formula was devised to balance the contribution of characteristic elements, based on research findings and community workshop feedback through the collaborative research conducted by Arup Lighting and XYX Labs, Monash University. The formula takes into account the importance and contribution of each plane of view and the physical characteristics.

The planes in the field of view are ranked from most to least important:

1. Left Field/Right Field
2. Ground Plane
3. Top Plane

The physical characteristics (discussed in section 3.2.4) are ranked from most to least important:

1. Visual Transparency and Reflectance
2. Scale
3. Physical Transparency and Specularity

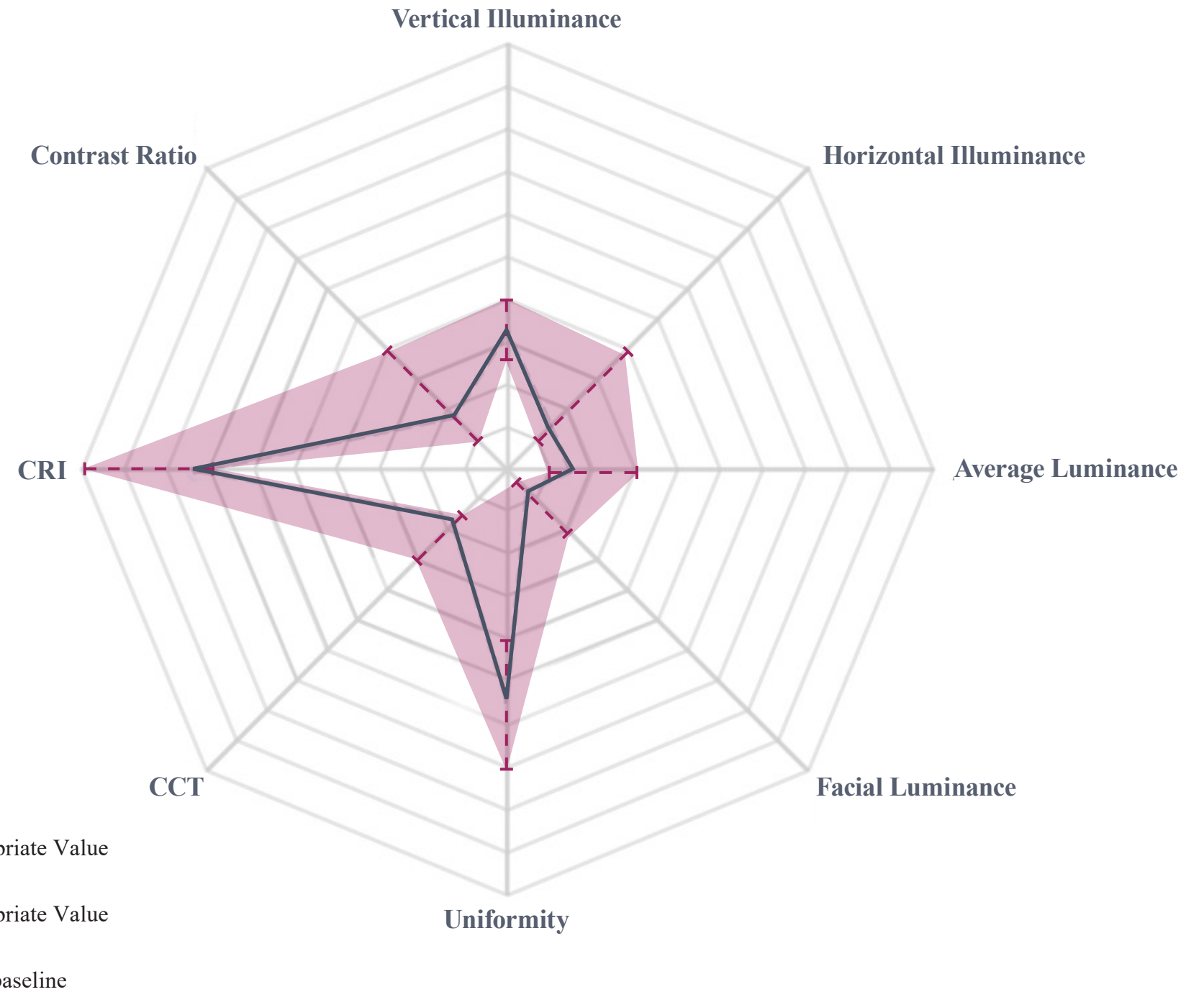


### 3.2.3 Site Spider Diagram Cont.

On this enlarged view, an appropriate range has been shown in pink. The NVA ideal baseline is shown in a black line.

These values explain a range of different lighting quantities.

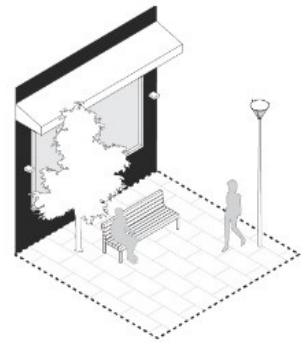
Value	What it Measures	How it Quantifies
<b>Contrast Ratio</b>	The ratio (or relationship) between the light falling on a task or display and the general lighting in the area immediately surrounding it.	High contrast ratios create drama, aid in wayfinding and add visual interest. But, they can also lead to eye strain, discomfort glare and distraction. Low contrast has a uniform quality that is easy on the eyes, it can be disorienting and lack visual interest.
<b>CRI</b>	The capacity of a light source to accurately reproduce and show the colors of an object.	High CRI lighting renders beautiful, vibrant tones across the full-color spectrum. Low CRI makes it difficult to distinguish between colors.
<b>CCT</b>	The measure of a light's color. It is measured in Kelvin (K)	A comfortable CCT range will be between 2700-4000K for public realm.
<b>Uniformity</b>	The variation between darker and lighter areas	Poor uniformity can cause eye strain due to bright and dark patches, with a higher uniformity being more comfortable for users moving through a space.
<b>Facial Luminance</b>	The amount of light that falls onto a face, allowing easy user differentiation between objects and people around them.	Facial luminance needs to be considered with average luminance. A high contrast between facial and ambient is correlated with a perception of feeling unsafe.
<b>Horizontal Illuminance</b>	The amount of light that falls onto a horizontal surface, measured in foot candles.	A high horizontal illuminance correlates with a perception of feeling unsafe, due to potential of increased glare. However, too low will make a space feel very dark.
<b>Vertical Illuminance</b>	the amount of light that falls onto a vertical surface, measured in foot candles.	A high vertical illuminance correlates with a perception of feeling unsafe, due to potential of increased glare.
<b>Average Luminance</b>	The average level of perceived brightness. This measurement is considered in tandem with surface reflectance.	One a level of luminance is reached, the perception of a space will be perceived as unsafe.



### 3.2.4 Physical Site Consideration

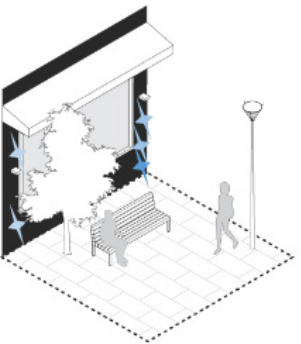
Light is only experienced when it interacts with the environment around us. Varying urban design finishes and textures can affect the way this light is perceived. This impacts the users sense of security, feeling of safety and ease of movement through the space.

The physical site assessment, that influences the vulnerability score aims to address this contextual level with light, to identify how it is interacting with the surrounding elements to impact the user experience.



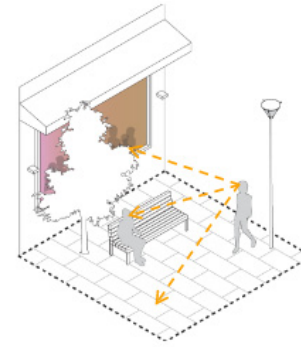
#### Reflectance

Surface reflectance refers to how bright the surfaces appear within the site, being assessed regardless of additional lighting. The light reflectance of a surface greatly influences the way in which light reflects and therefore the way it is perceived by site users. Generally, the more reflective the surface, the better a light will illuminate an area.



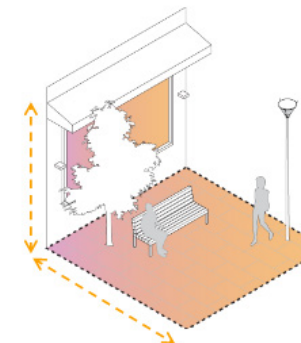
#### Specularity

Specularity refers to the visual appearance of reflections. The higher the level of specularity, the greater the level of mirror-like reflection. For example, a polished surface could have a high level of specularity in comparison with a matte surface. The distribution of illumination can be significantly distorted by specular reflections in surfaces.



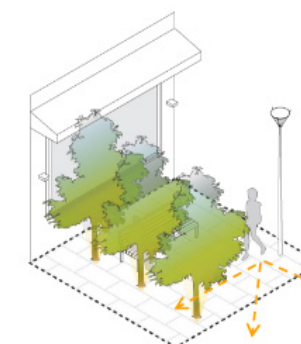
#### Visual Transparency

Visual transparency refers to the ability to see through the object plane and the sense of passive surveillance through accurate visual assessment of Prospect through the immediate medium. For example, the object plane will be very transparent if it is made of glass in comparison to a solid wall.



#### Scale

Scale considers the human scale of the site elements in the immediate foreground. Objects that are in a clear line of sight increase perceived safety, accessibility and sense of openness as opposed to objects that are too high above the visual line of sight. These elements contributed to the overall perception of safety, where urban lighting was implemented to enable a familiar, human scale of engagement with the surrounding environment.



#### Physical Transparency

Physical transparency refers to the openness of a site or the ease at which you can pass through the site without being diverted by existing physical elements, informed by the Prospect and Refuge theory. For example, a site with a great number of trees and furniture is far more difficult to pass through than a site without any furniture, vegetation or physical elements.



### 3.3 NVA Location Sites

In scoping the NVA sites, 14 key areas of interest were identified across Downtown for deeper analysis. These areas included 3 points along Main Street to capture differences characteristics (the south, north and central part), Trebly Park and Discovery Green, as references of good nighttime experience, the Warehouse District, and commercial streets like Texas Avenue and residential areas, amongst others. Population density, land use, known developments, and existing conditions were considered to capture the broadest overview of ranging conditions reflected throughout Downtown. Within these larger target areas, 24 sites for data collection were identified that best reflected the overall condition of each area of interest. The location of the 24 sites is shown on the map below. (Figure 13). Section 3.3 will provide a detailed analysis of each location, providing a narrative of observations captured while on-site, key takeaways, and opportunities for improvement.

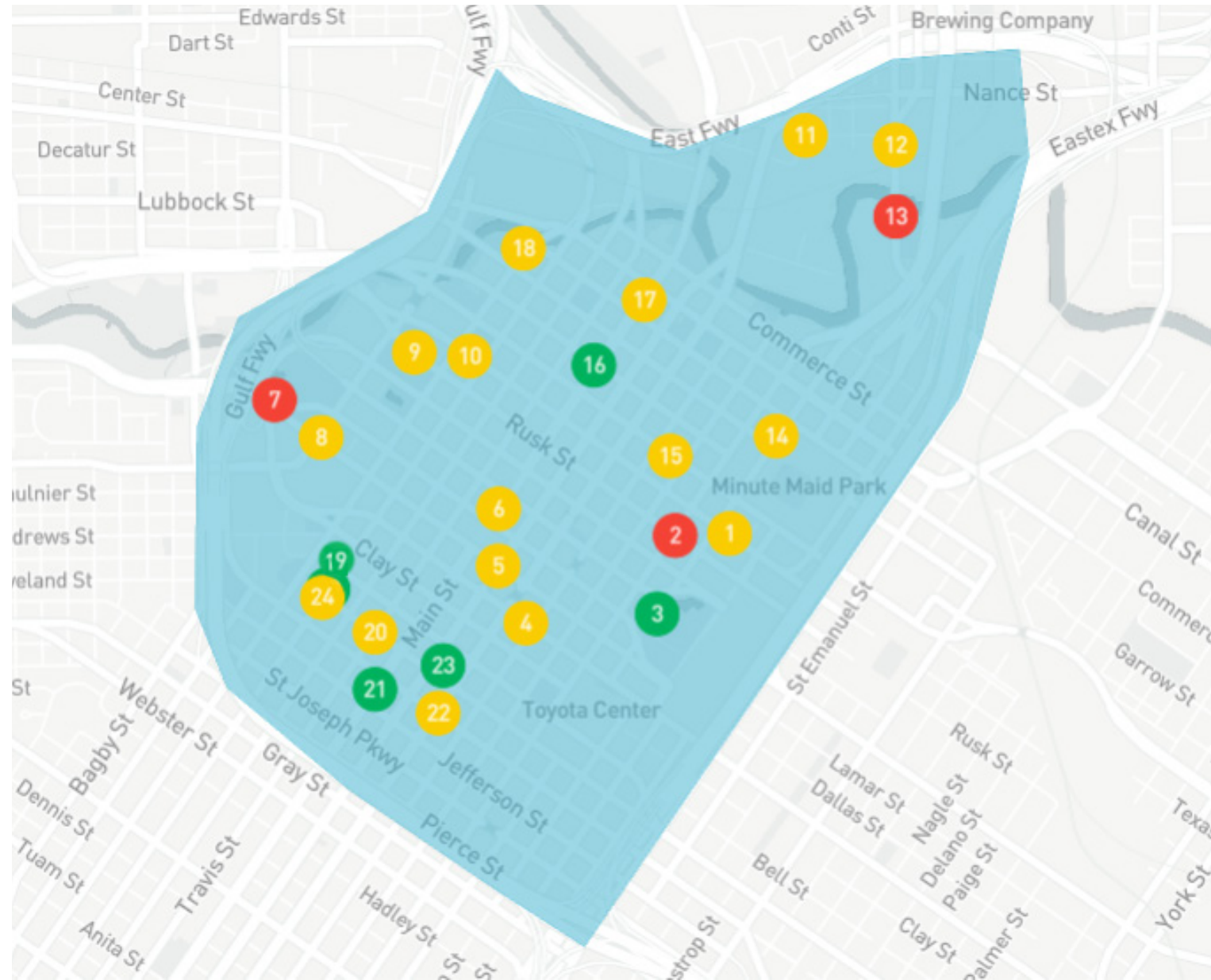


Figure 14: The 24 Selected NVA Site Locations inputted into the Arup Lighting NVA Tool.

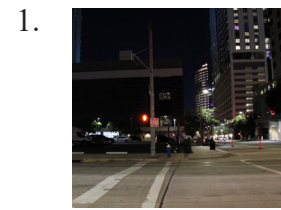
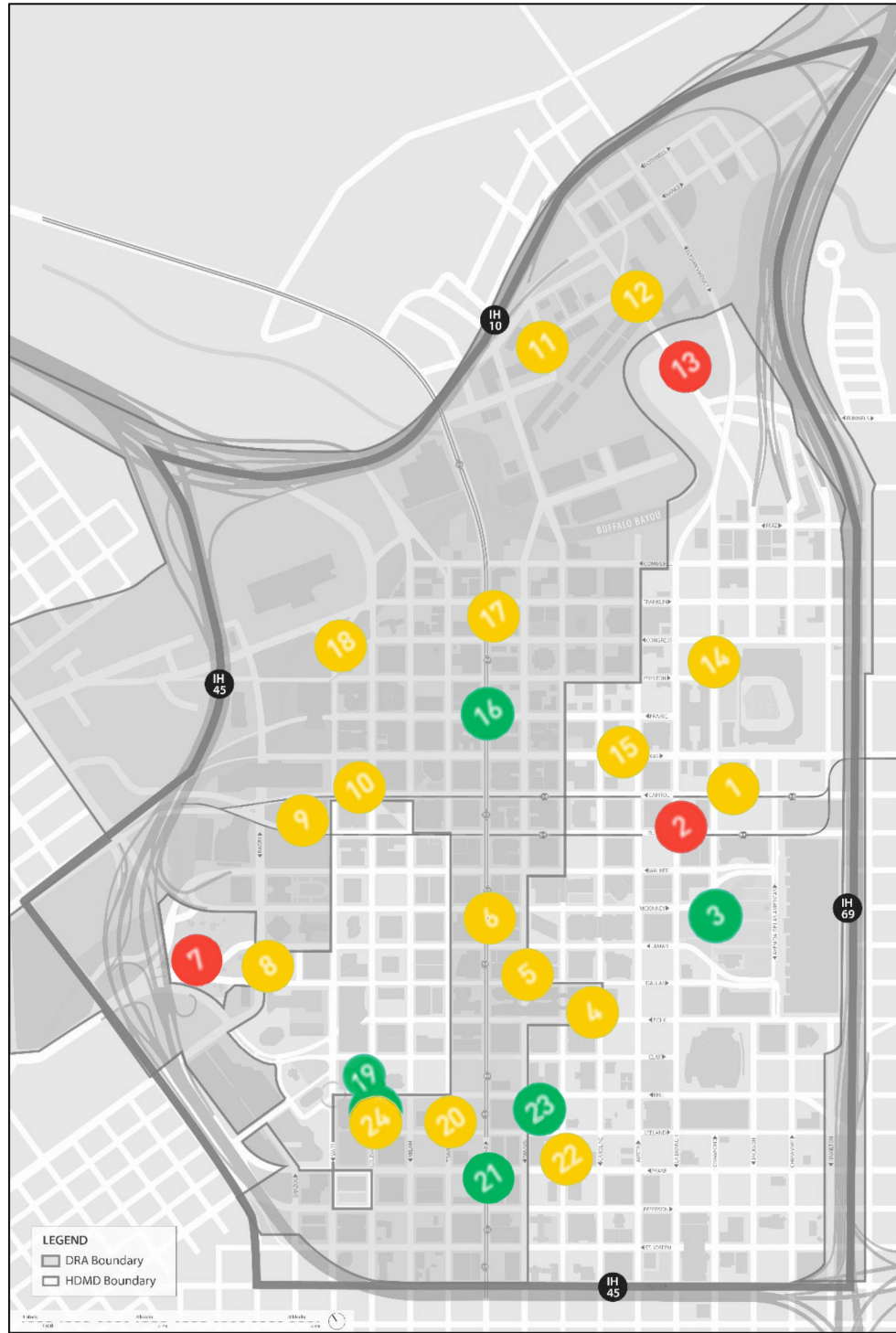
Figure 15: Table below shows a summary of the NVA score results.

Site	Score	Adjacent Land Use	Opportunities
1	56	Surface Lot / Public Transport	Consistent lighting across public transport Activate empty parking lots
2	67	Parking Garage	Illuminate foliage Activate empty parking lots
3	44	Park	Discovery Green does not require much intervention, it is already a well utilized space.
4	62	Retail	Illuminate foliage Relamping for consistent color
5	59	Retail	Activate retail lighting Activate Underpasses
6	49	Office / Public Transport	Consistent lighting across public transport Activate retail lighting
7	71	Park	Reduce darkness across public parks Illuminate foliage Activate Underpasses
8	58	Office	Reduce darkness across public parks
9	56	Park / Bridge / Public Transport	Reduce darkness across public parks Illuminate foliage
10	66	Office / Public Transport	Consistent lighting across public transport Activate retail lighting
11	63	Residential	Illuminate foliage Activate retail lighting Relamping for consistent color
12	59	Residential / Rail Crossing	Illuminate foliage Activate retail lighting
13	67	Park / Bridge	Reduce darkness across public parks Activate empty parking lots
14	55	Stadium	Activate empty parking lots Activate retail lighting
15	50	Surface Lot	Illuminate foliage Activate empty parking lots
16	47	Retail / Public Transport	Main Street is an area that will have opportunities alongside the More Space: Main Street 2.0 Project
17	55	Retail / Public Transport	Activate empty parking lots Activate retail lighting
18	54	Bridge	Reduce darkness across public parks Illuminate foliage
19	44	Office	Reduce darkness across public parks
20	61	Surface Lot	Activate empty parking lots
21	43	Residential / Retail / Public Transport	Consistent lighting across public transport Activate retail lighting
22	61	Retail	Illuminate foliage
23	44	Park	Activate retail lighting (Residential façades)
24	57	Office / Park	Reduce darkness across public parks

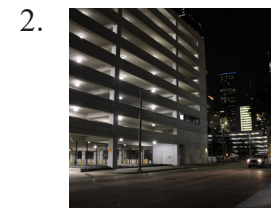
12 different types were identified; surface lot, public transport, park, stadium, rail crossings, retail, hotels, parking garage, office, residential and bridges.



Across these districts, 24 sites have been located through discussions with the team, stakeholders and clients. These sites are designed to give an overview of all the different areas of Downtown.



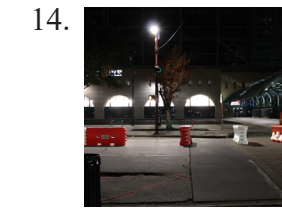
Capital / Crawford



Rusk / La Branch



James Bute Park



Preston / Crawford



Discovery Green



Austin / Polk



Texas / Caroline



Main / Preston



Dallas / Fannin



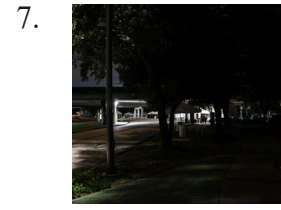
Main / Lamar



Main / Franklin



Louisiana / Congress



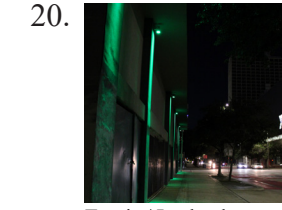
Sam Houston Park



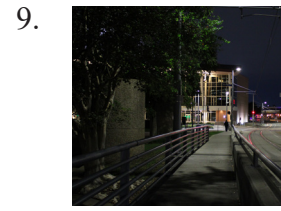
Dallas / Bagby



Milan / Leeland



Travis / Leeland



Rusk / Tranquillity



Capitol / Smith



Main / Jefferson



Pease / San Jacinto



Walnut / Sterrett



Sterrett / McKee



Trebley Park



Leeland / Louisiana

Figure 16: The 24 Selected NVA Site Locations inputted into the Arup Lighting NVA Tool.



## 3.4 Location Overviews

### Capital / Crawford

#### On Site Observations

This location has dark parking lots, but bright sidewalks, with the buildings being highly illuminated. The orange tinted light rail stops contrast with the dark roadway. All the stops across Downtown have orange colored lighting - whilst creating visual warmth, they have poor CRI.

#### Key Takeaways

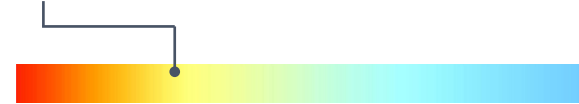
This NVA location has both public transport links and surface parking lots. The dark space of this parking lot negatively influences the surface reflectance of this area, increasing the vulnerability score. This area does have high physical transparency, with nothing blocking the users' journey as they move through the space. Updating the lighting scheme of the public transport stops to improve the color rendering and utilizing the parking lots at night will lift the perceived darkness of the space.

#### Opportunities

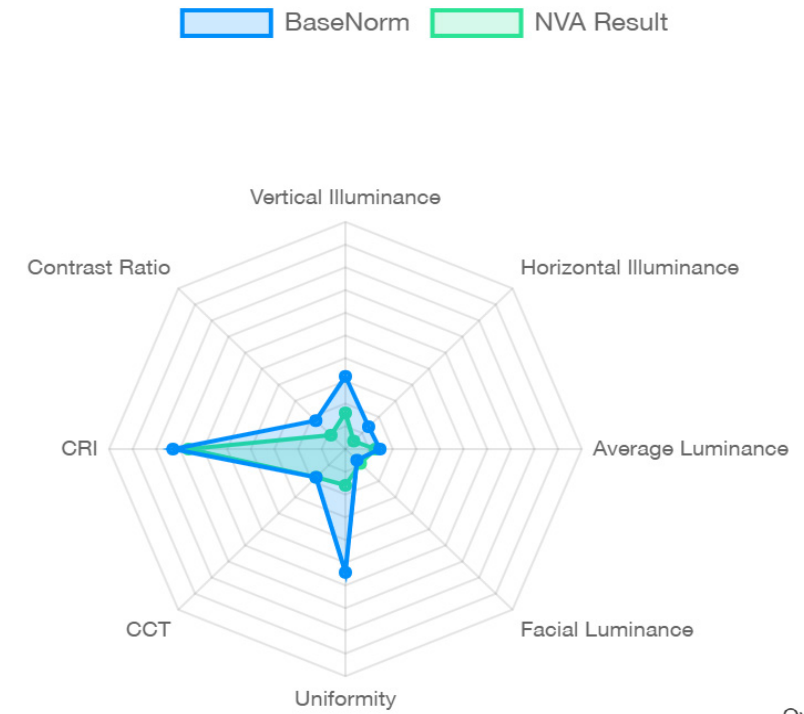
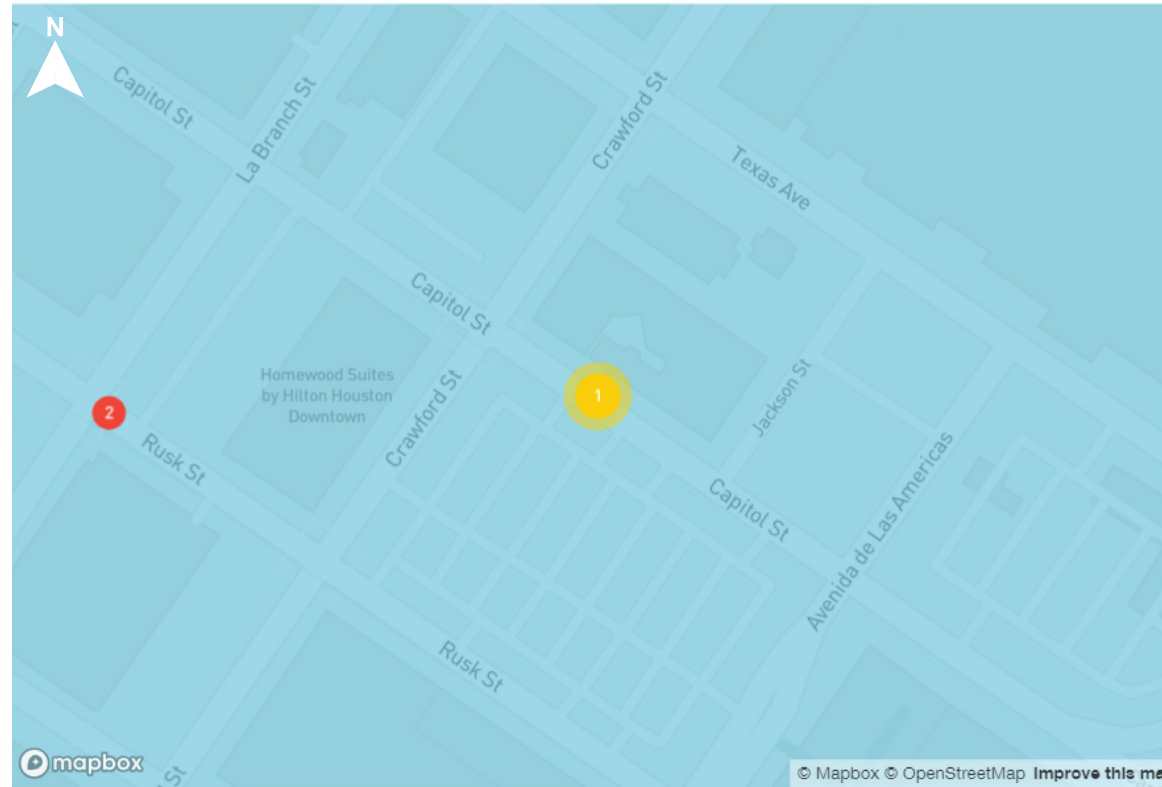
Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Consistent lighting across public transport
- Activate empty parking lots

Correlated Color Temperature (CCT): 3685K

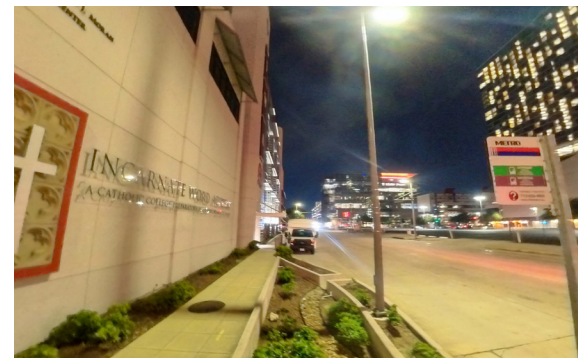
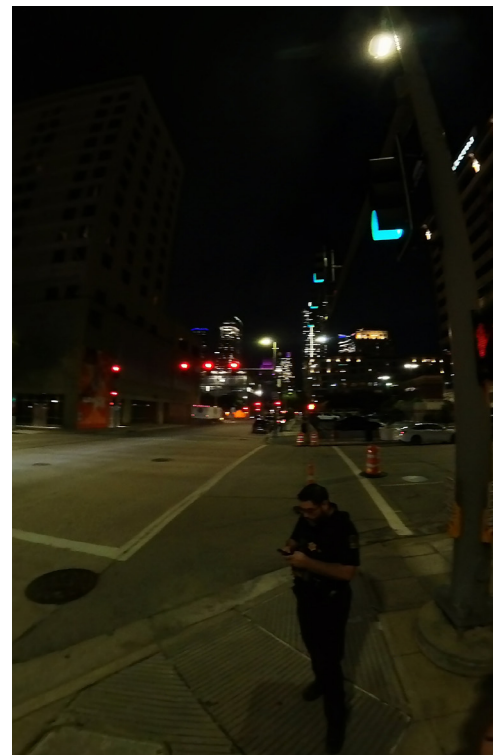


Color Rendering Index (CRI): 66.4



Overall Site Vulnerability Score

**56**/100





# Rusk / La Branch

## On Site Observations

This area feels much cooler in color temperature compared to Site 1 - but this is not represented in the gathered measurements. There is lots of glare from the multiple parking garages for the large amount of hotels in this area.

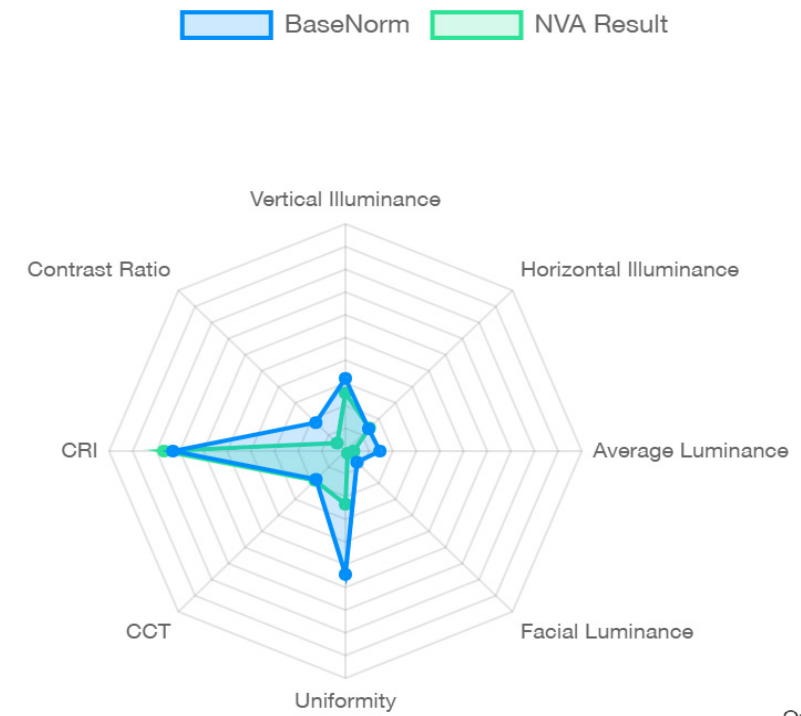
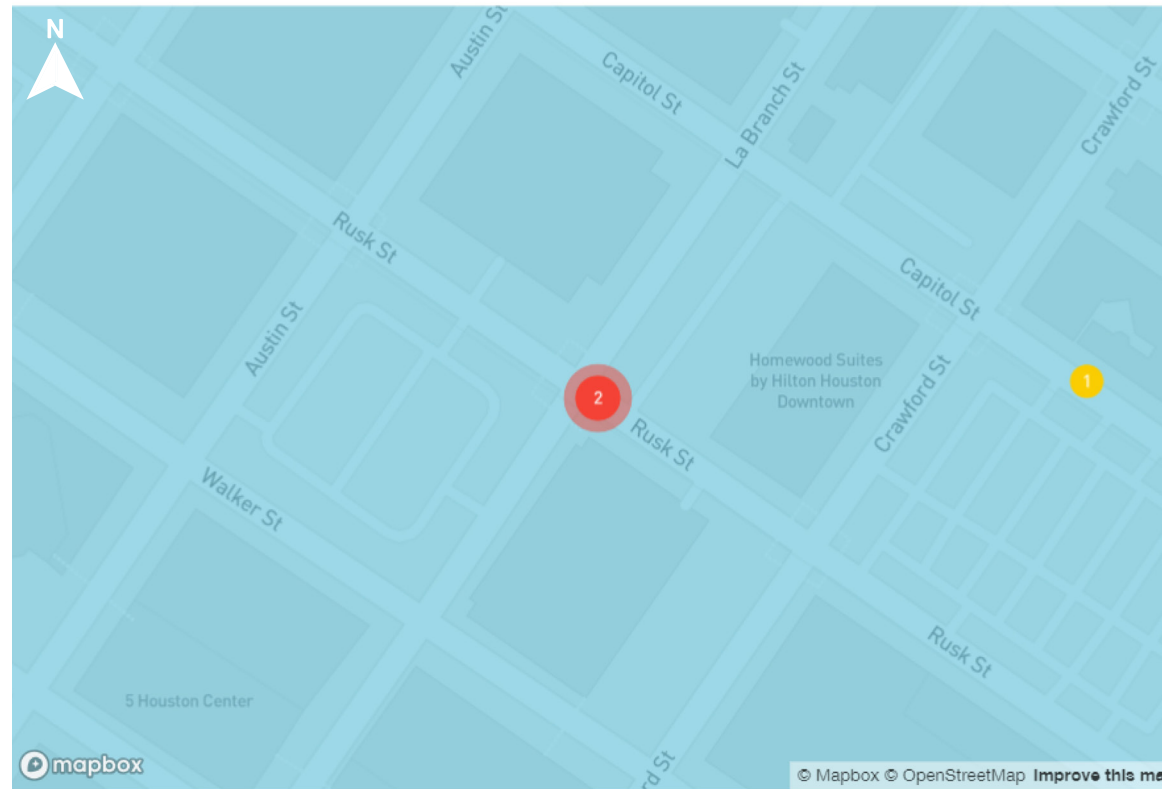
## Key Takeaways

This NVA site balances on the edge of medium and high. This is due to the poor surface reflectance in this area, negatively impacting the vulnerability score. Due to the high rise visual of the parking garage, this pulls the scale above eye height, making the user feel very small within the space. There are trees along this route, but many are blocking the street lighting, making the users route appear much darker despite ample lighting. Adding extra illumination to the trees, and creating ways to utilize the parking lots at night will improve the score of this location.

## Opportunities

Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Illuminate foliage
- Activate empty parking lots



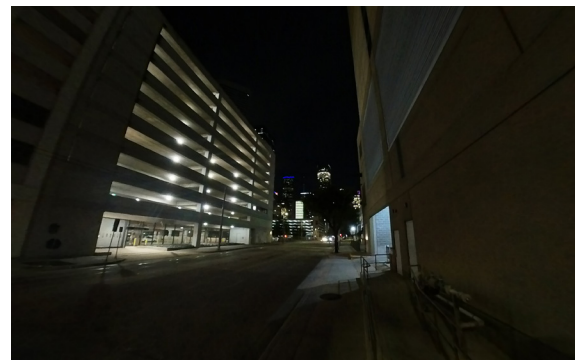
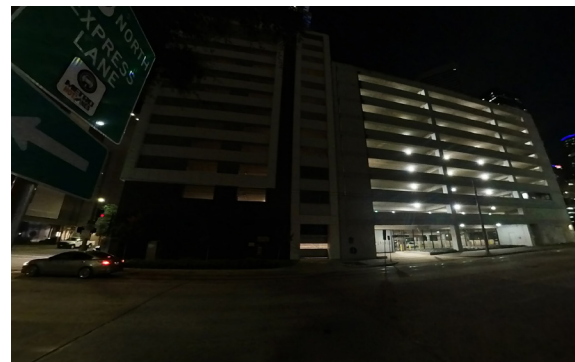
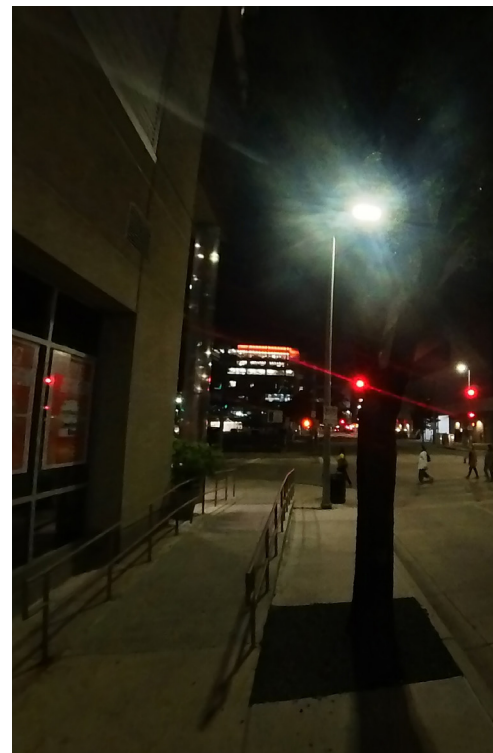
Overall Site Vulnerability Score

**67** /100

CCT: 3835K



CRI: 76.8





# Discovery Green

## On Site Observations

Discovery Green is an extremely busy area - there are a lot of families and kids, people selling food, and brightly illuminated toys. It feels safe due to the amount of people.

Across the park, there are many light layers. Some areas are brighter than others, but all areas are fairly uniform. This does cause a slight spotlighting effect, and it was noticed that not many people stood in the dark areas. Although there were areas of darkness, they felt comfortable and welcome.

Uplighting of the trees reduces the visual darkness. The art installation where the lawn is lit green is bad for the CRI, but interesting for people to be in and interact with.

## Key Takeaways

Discovery Green is an excellent example of a 'good' NVA site. There are multiple users, a wide range of light layers in warm tones, and a high CRI to allow good visual transparency to those moving through the space. It is clear from the high foot traffic in the playgrounds and parks that the public enjoys coming to spend time in this space after dark.

## Opportunities

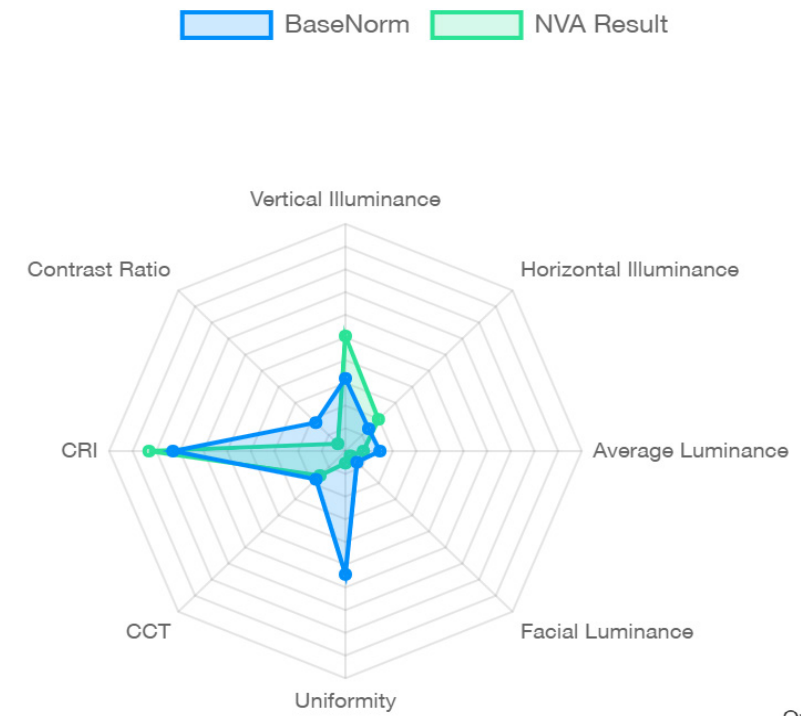
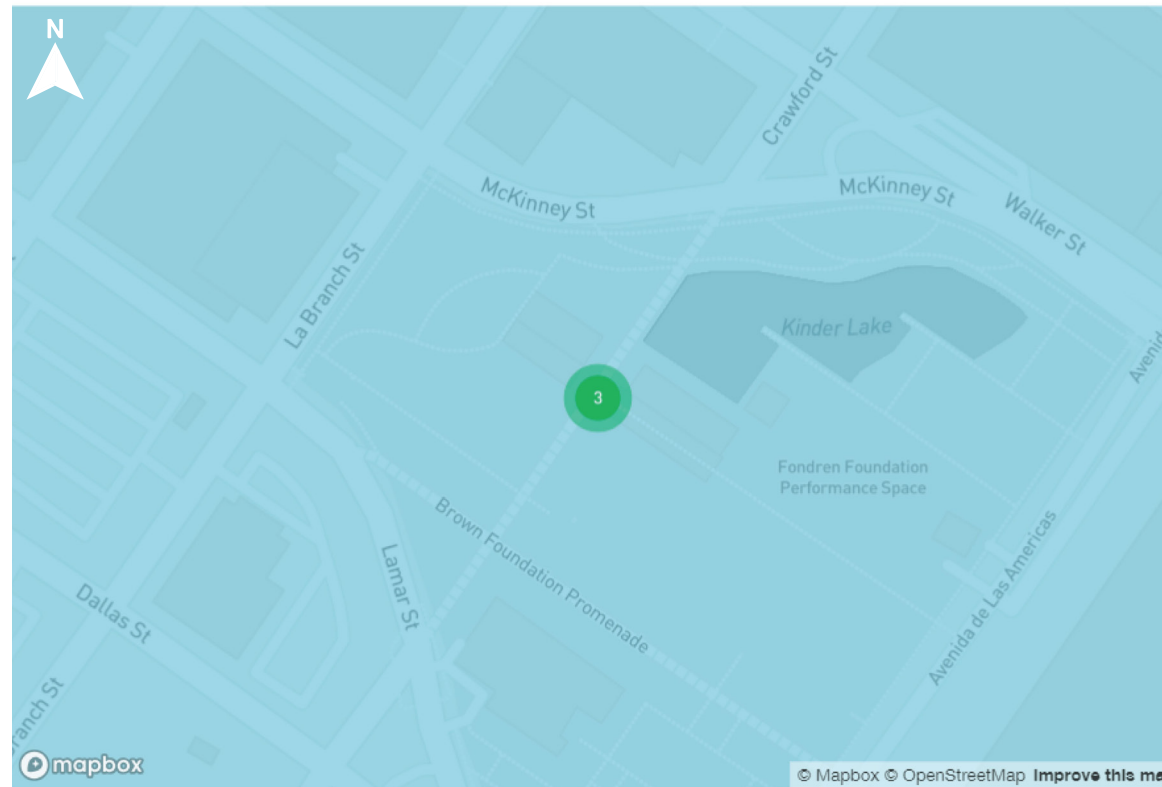
Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Discovery Green does not require much intervention, as it is already a well utilized and illuminated space.

CCT: 3200K

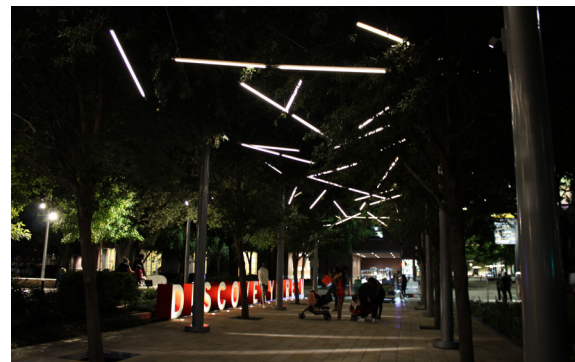


CRI: 83.1



Overall Site Vulnerability Score

44/100





# Austin / Polk

## On Site Observations

It's dark under the trees and near the stadium - with uneven light on one side. The street lights are pretty, but they are glary - so you can't see people's faces on the other side of the street. There is a range of color temperatures here.

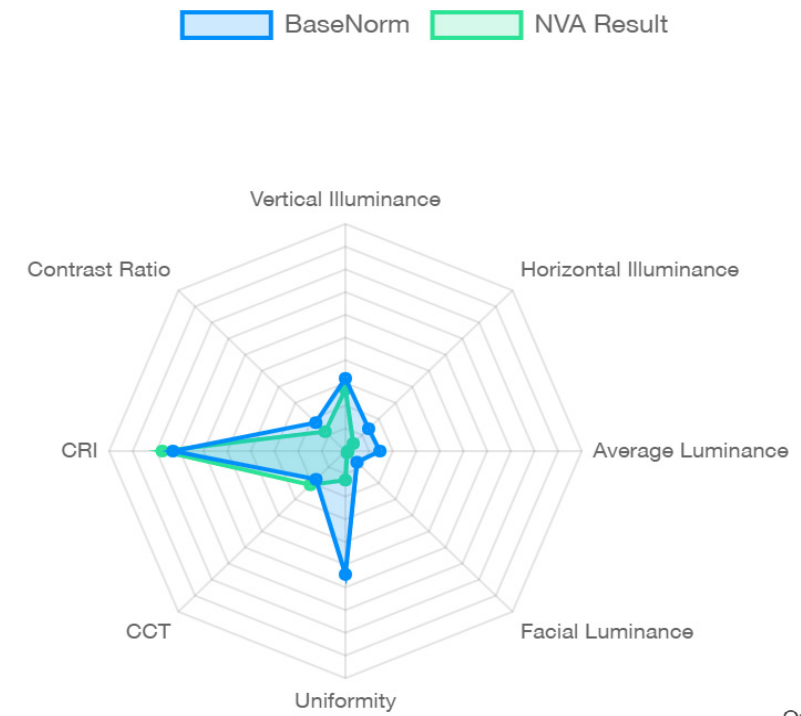
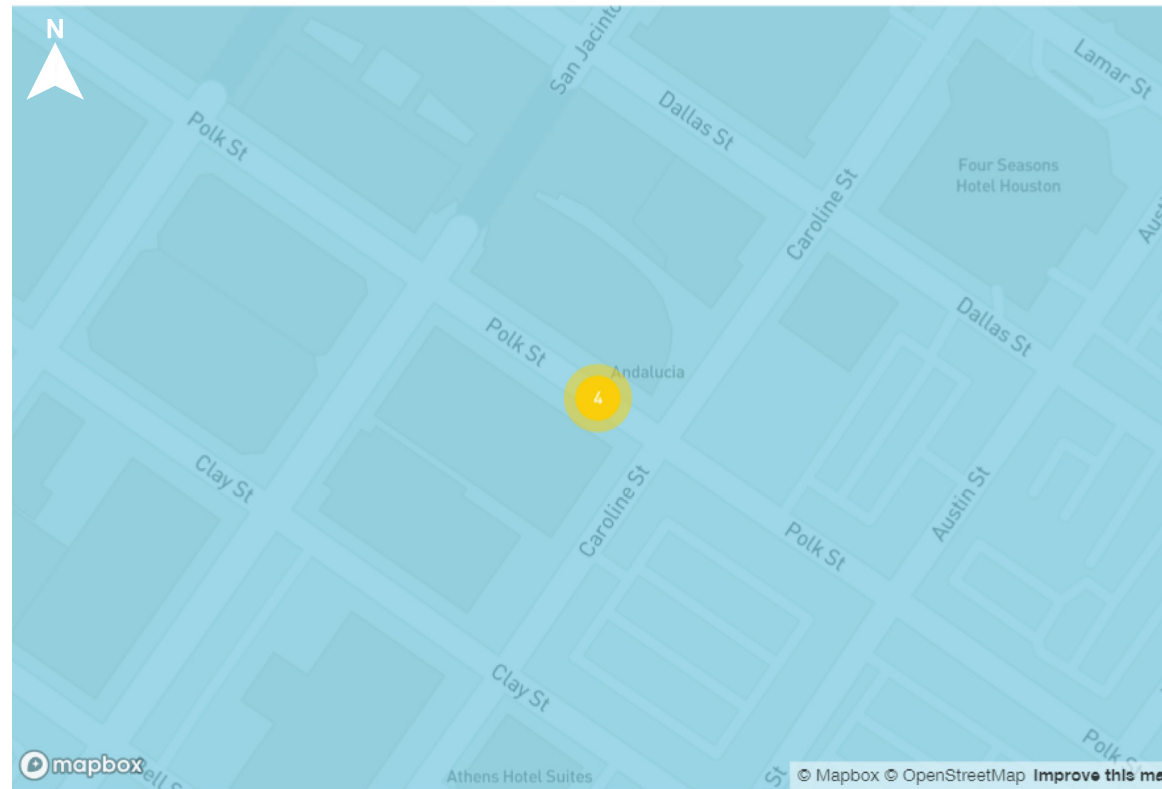
## Key Takeaways

The location at Austin St and Polk St sits in the medium band of site vulnerability. This is due to a combination of high glare luminaires and a mixture of color temperatures across the site. The lighter colored masonry across the site gives a lower specularly score; however, this is offset by the darker sidewalks due to the foliage blocking the street lighting. Adding illumination to the trees and creating a more even color temperature will improve the score of this site.

## Opportunities

Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Illuminate foliage
- Relamping for consistent color



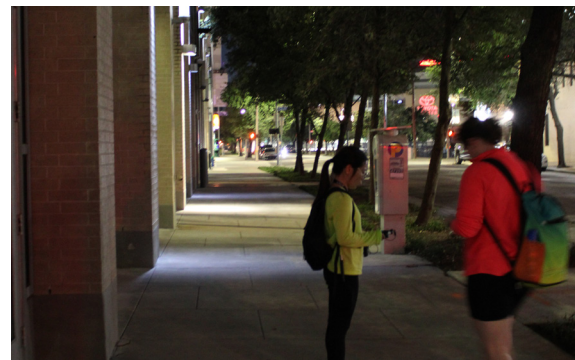
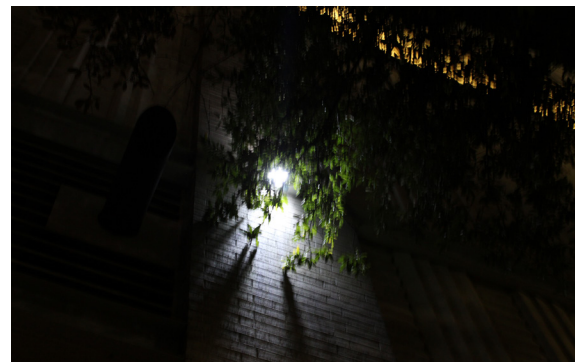
Overall Site Vulnerability Score

62/100

CCT: 4415K



CRI: 77.5





# Dallas / Fannin

## On Site Observations

Well lit and evenly illuminated through the mixed-use development, the site feels unsecure and dead at night. It is noted it is a Monday - weekends will be much busier with patrons.

The lighting is very even, making this area feel very safe.

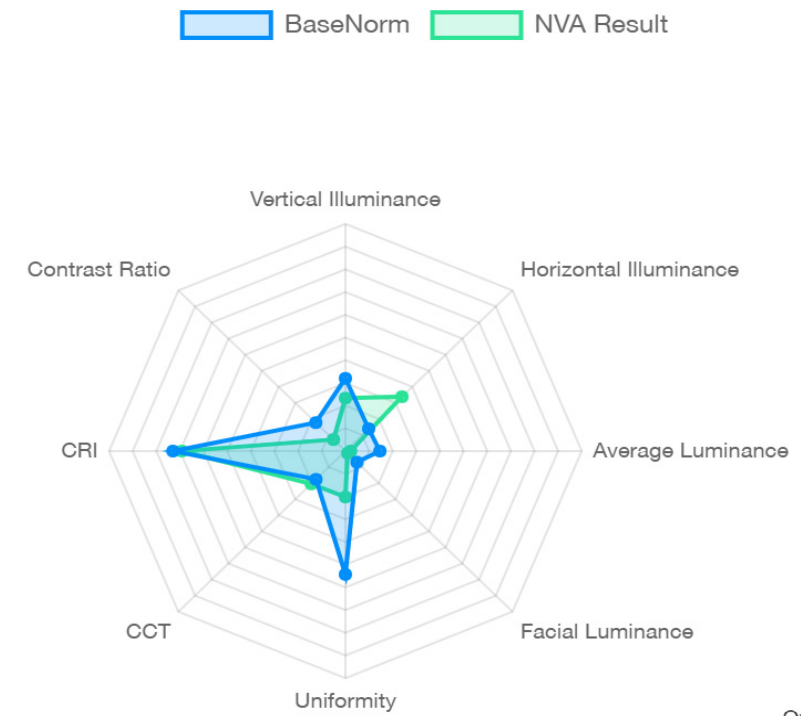
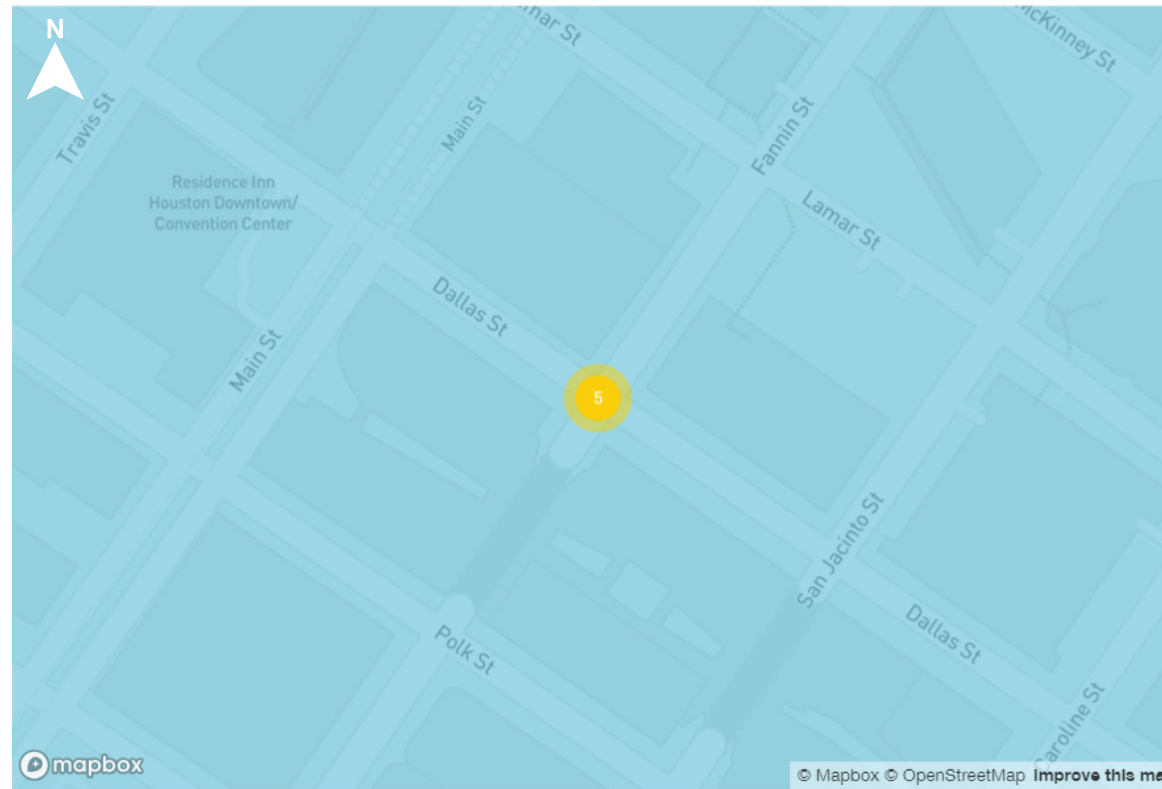
## Key Takeaways

Greenstreet has very little foot traffic, although it is to be noted that this site was surveyed on a Monday night. Most of the businesses were closed and had dark storefronts which negatively impacted the score. The site does provide consistent lighting in the underpass which benefits the pedestrian realm. Activating the retail spaces after hours will help improve the visual transparency around this site.

## Opportunities

Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

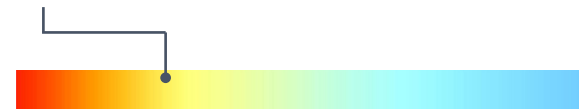
- Activate retail lighting
- Activate Underpasses



Overall Site Vulnerability Score

**59** /100

CCT: 3497K



CRI: 69.2





# Main / Lamar

## On Site Observations

Lots of people loitering in this area - causing a slight unease if you're moving through it on your own. The purple lighting and water around the lightrail stations add a nice ambiance to the space. It was discussed that often members of the unhoused community rest here during the hours of darkness, which can impact foot traffic through this area.

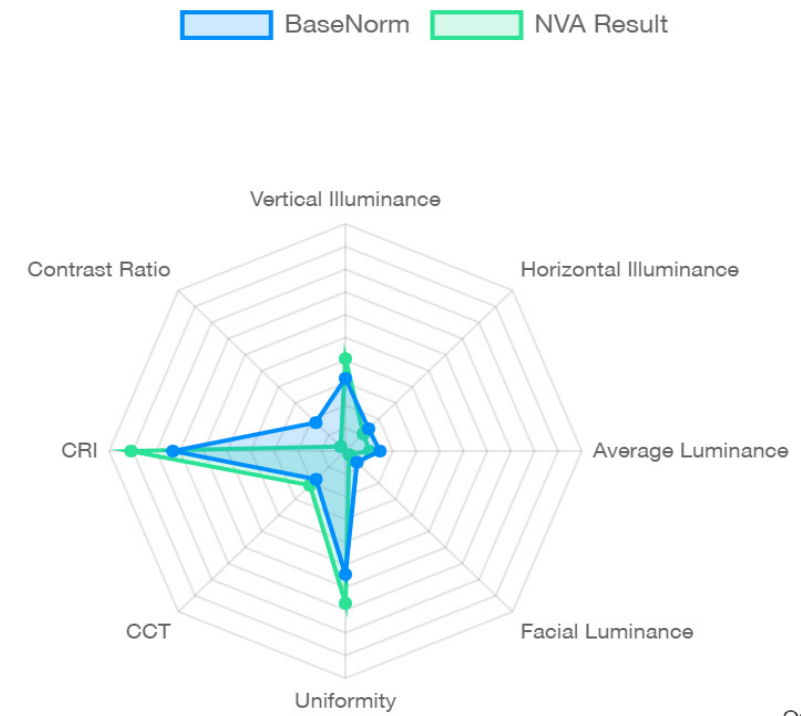
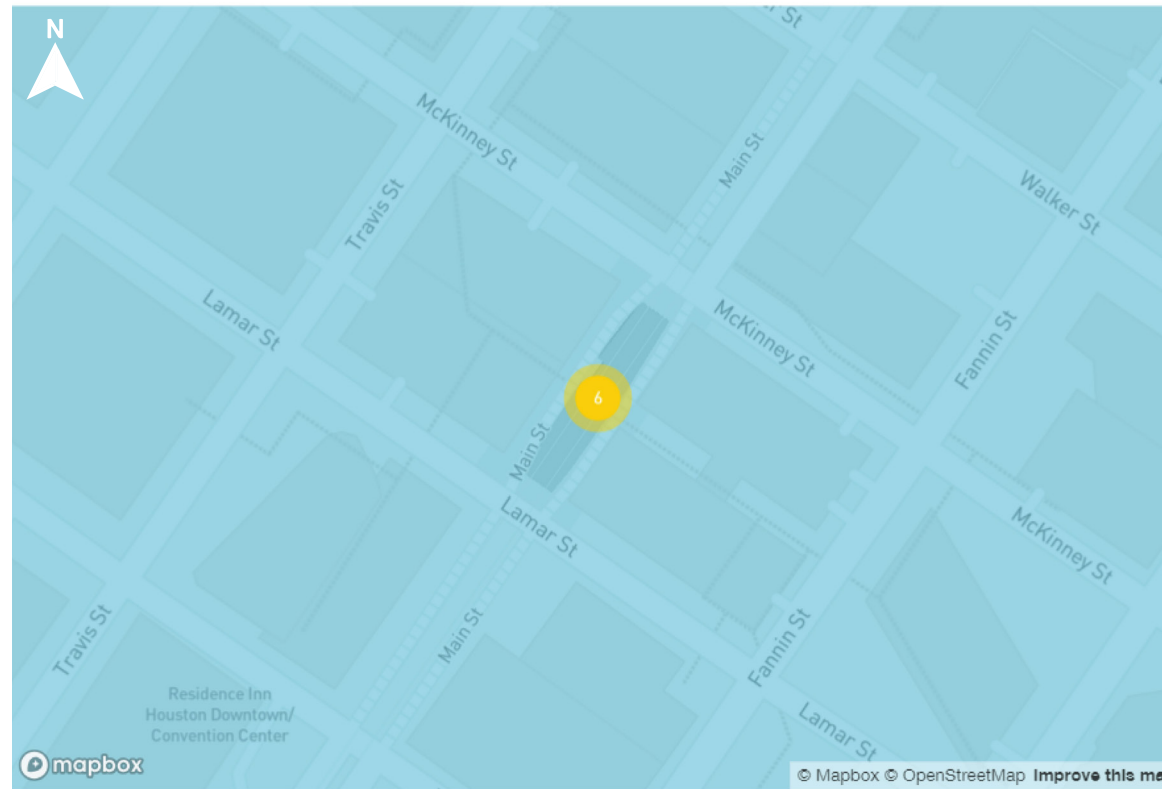
## Key Takeaways

This area of Main Street is further away from the main concentration of bars and businesses. Many of the storefronts are closed, making the purple lighting the most prominent feature of this area. This makes the space a fun area to walk through, with the water along the light rail giving high visual interest. The light rail is a key focal point of this area. Activating the retail space after hours will help improve the visual transparency around this site.

## Opportunities

Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Consistent lighting across public transport
- Activate retail lighting



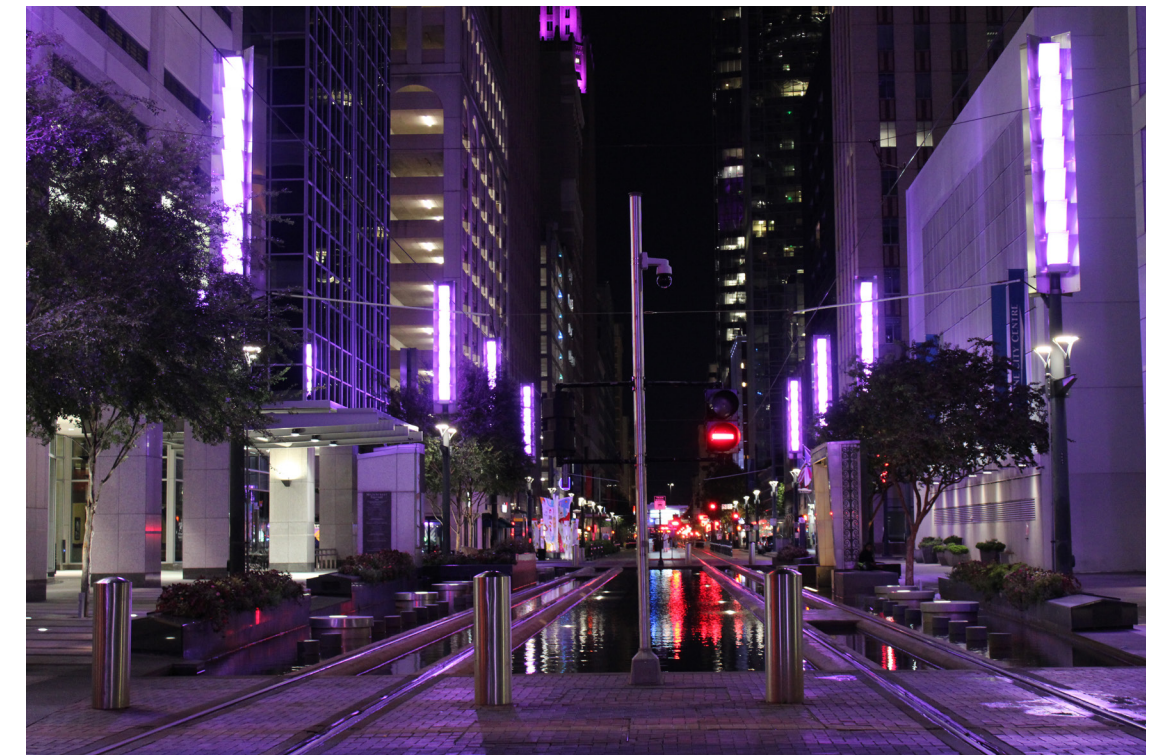
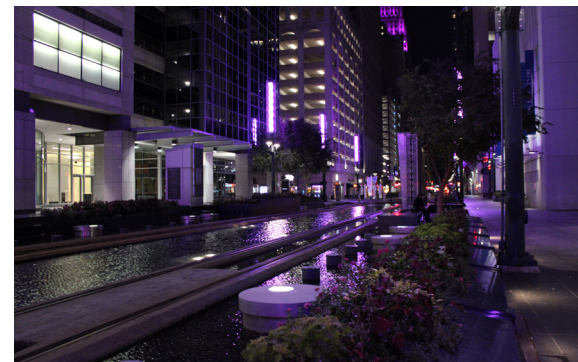
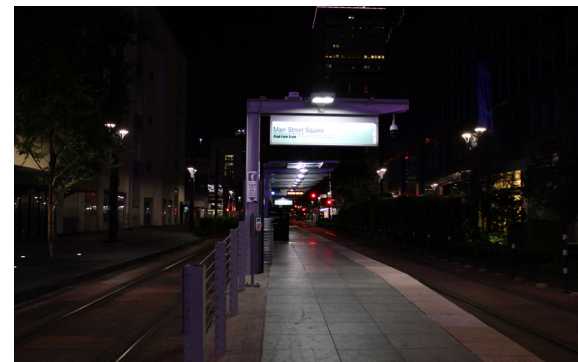
Overall Site Vulnerability Score

**49** / 100

CCT: 4483K



CRI: 90.7





# Sam Houston Park

## On Site Observations

This location was dark. You cross the road into what feels like pitch black. The foliage from the park blocks all of the light. People can be seen moving in the underpass, but there is zero recognition and no ability to see their features.

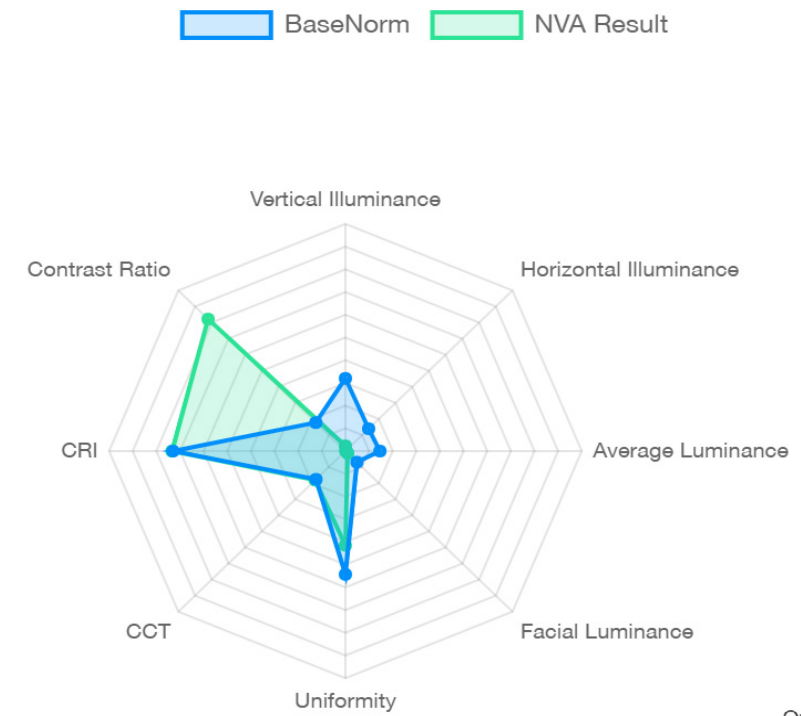
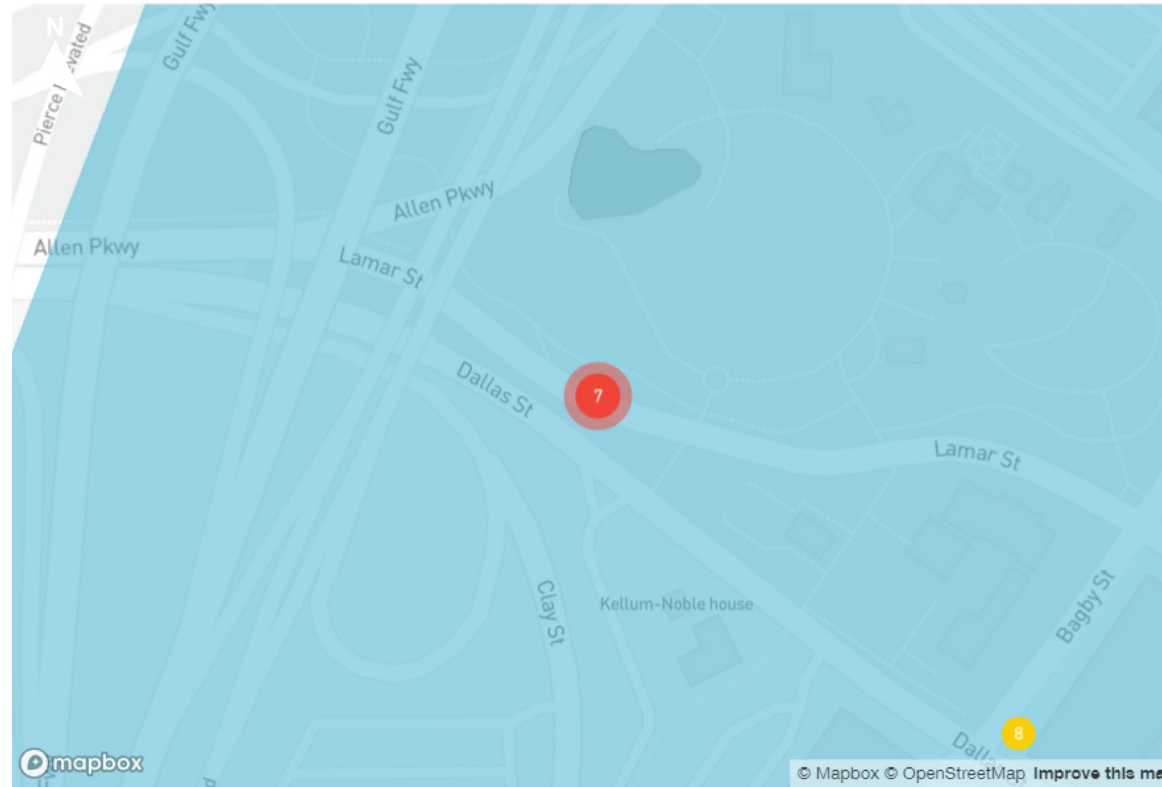
## Key Takeaways

This area of the city is incredibly dark, which makes it feel unsafe. There are dark voids alongside the sidewalk when the users walk through. This is a result of the street lighting being blocked by the foliage, and the neighboring park having no nighttime lighting. The underpass creates a bright spotlight for those standing within it. There are opportunities to make this area feel safer for those moving through it: activating the underpass to reduce the spotlighting effect and adding illumination to the trees and the parkland, will reduce the dark feeling of this pathway.

## Opportunities

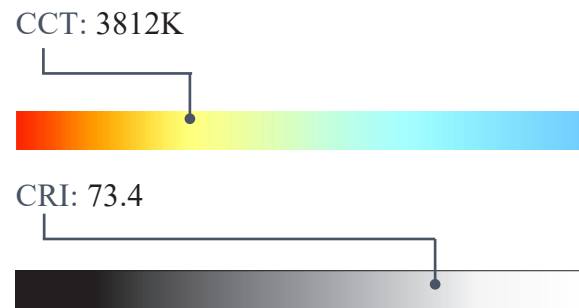
Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Reduce darkness across public parks
- Illuminate foliage
- Activate Underpasses



Overall Site Vulnerability Score

**71** / 100





# Dallas / Bagby

## On Site Observations

This street is newly renovated with a wide bike lane. It is very evenly illuminated. However, due to its proximity to the park, the light level drops off along the western edge, creating a hard visual barrier.

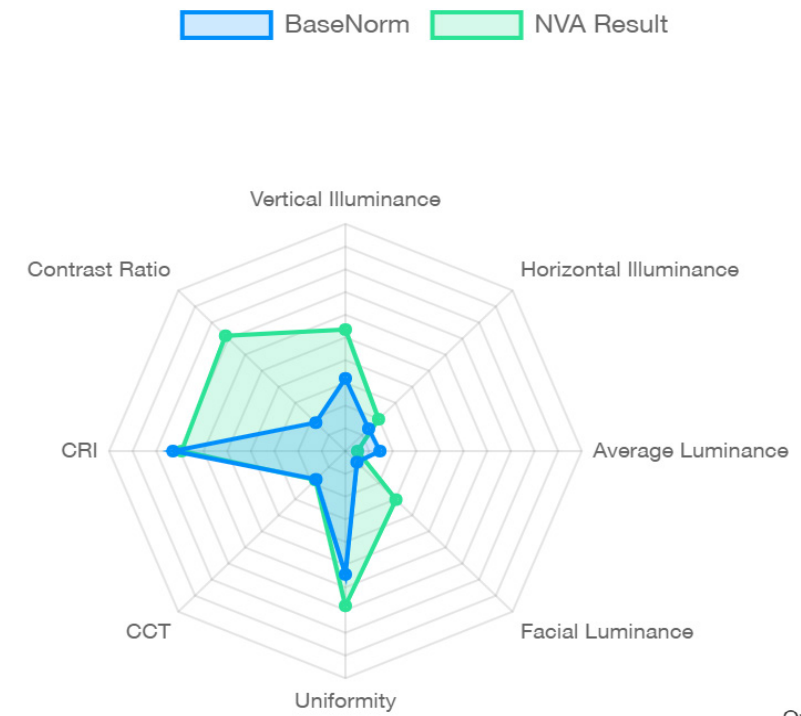
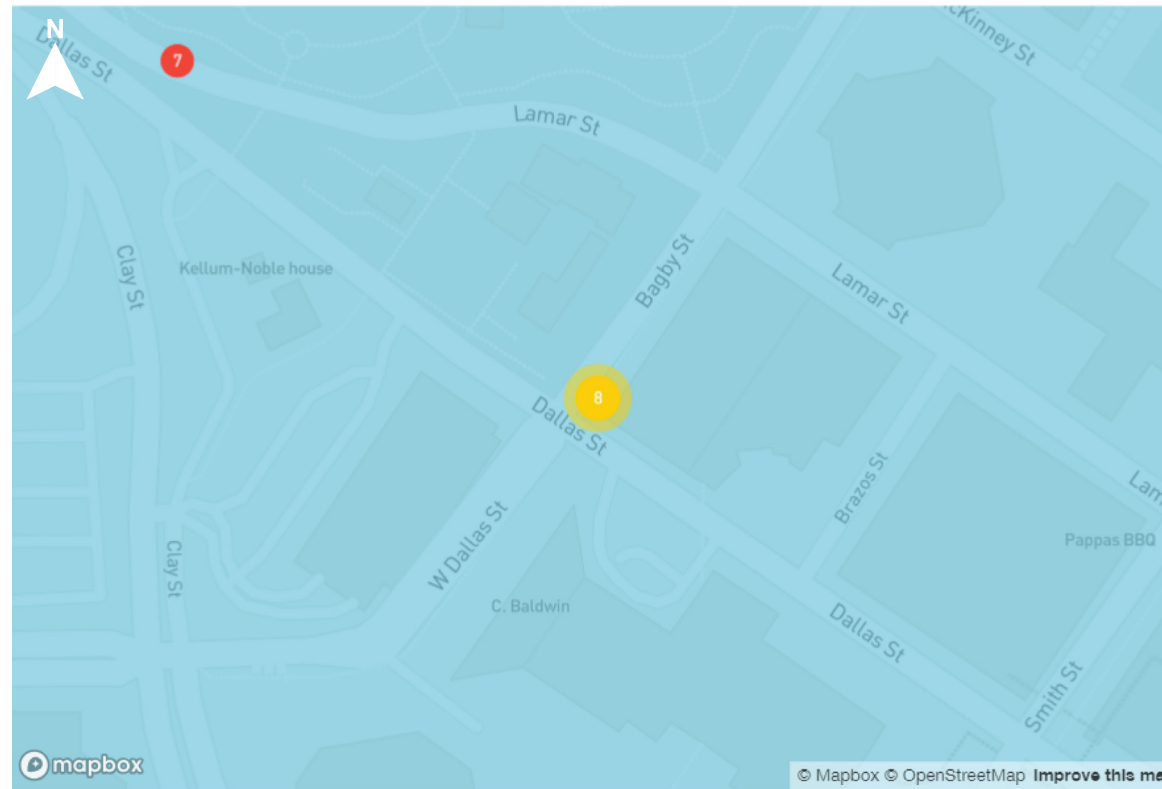
## Key Takeaways

Bagby Street has been recently renovated to create wider sidewalks and an evenly illuminated pedestrian walkway and cycle track, making it feel very safe to walk along. However, the Sam Houston Park to the west of the site has no lighting and creates a visual void, which impacts the vulnerability score. To reduce this, illuminating the parkland will greatly benefit the score of this location.

## Opportunities

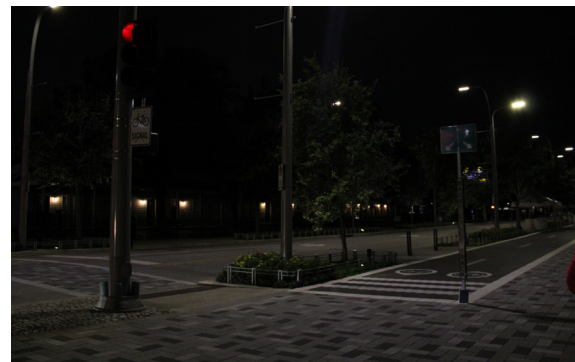
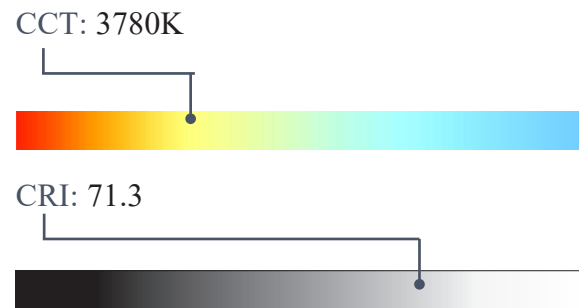
Key Opportunities for this site are listed below and are expanded more at the end of the location overview section

- Reduce darkness across public parks



Overall Site Vulnerability Score

**58**/100





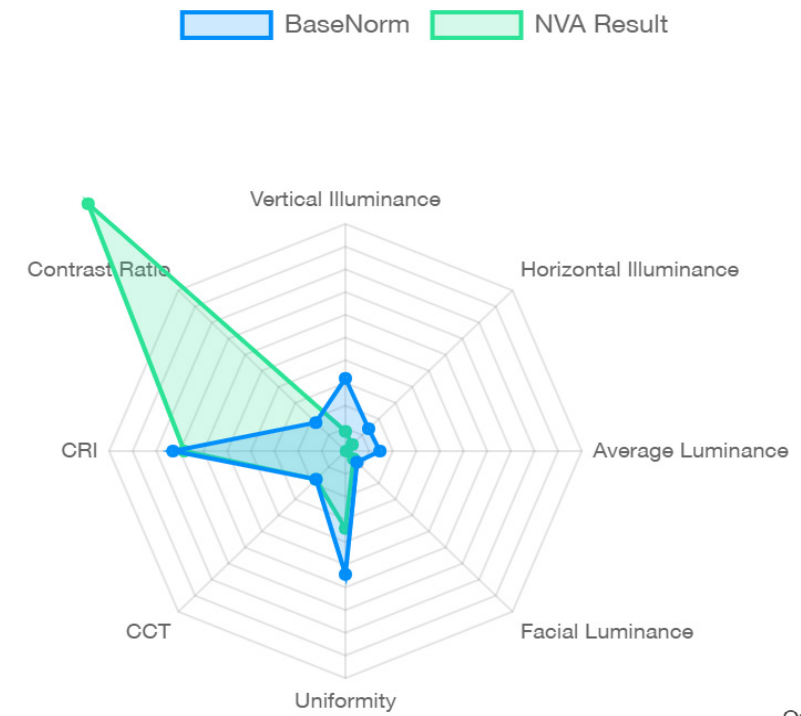
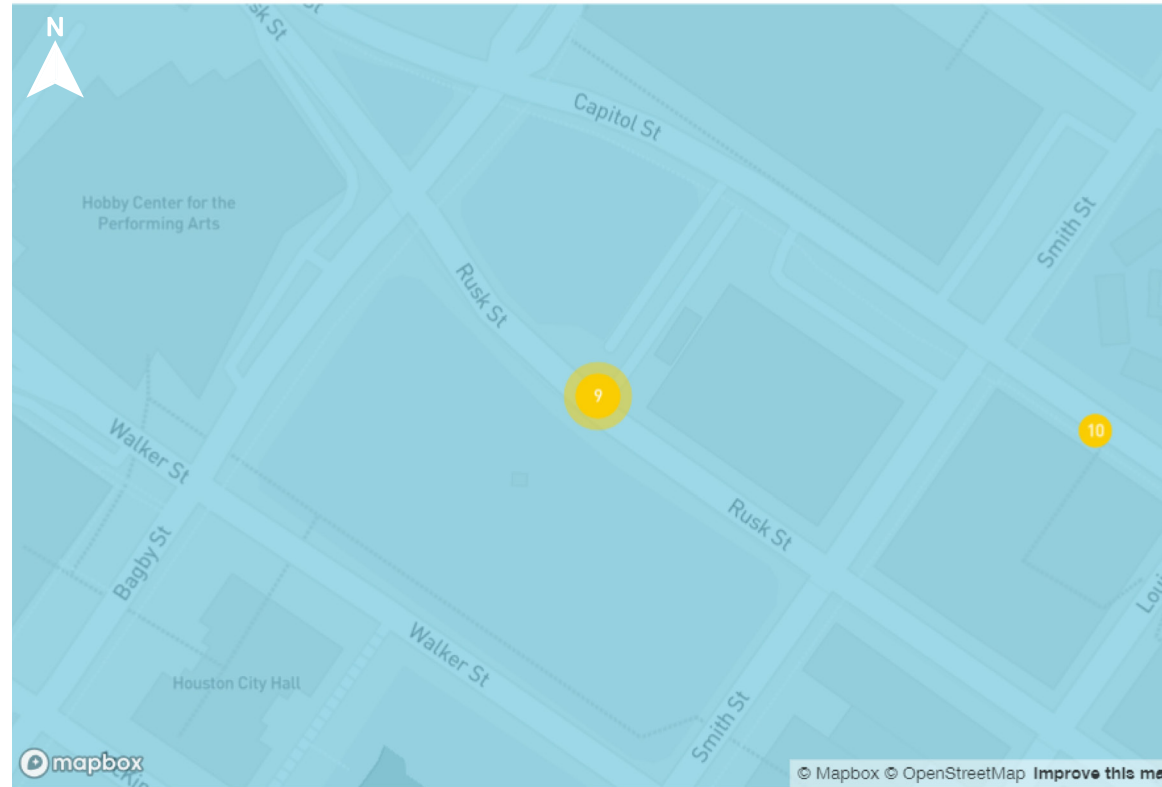
# Rusk / Tranquillity Park

## On Site Observations

Lots of foot traffic on a small contained bridge. There is a large amount of the unhoused community located at the nearby underpass. This location had very dark patches between brightly lit roads - with the light rail operating adjacent, causing big light blasts that make it hard to see. Not a lot of facial recognition at general distance.

## Key Takeaways

This NVA location has both physical and visual constraints which negatively impact the vulnerability score. High foot traffic across this area with the large amount of the unhoused community resting at the Bagby Street underpass added to a feeling of being unsafe. The park to one side of this junction is very dark, creating a visual void - with the passing light rail's headlights bringing high glare to the opposite side. This mix creates a very disorienting experience to those walking along this route. The foliage blocks any further street lighting, making the facial luminance very low. To improve this, bringing lighting into the trees and across the parkland will allow the area to feel less visually constrained.



Overall Site Vulnerability Score

**56**/100

## Opportunities

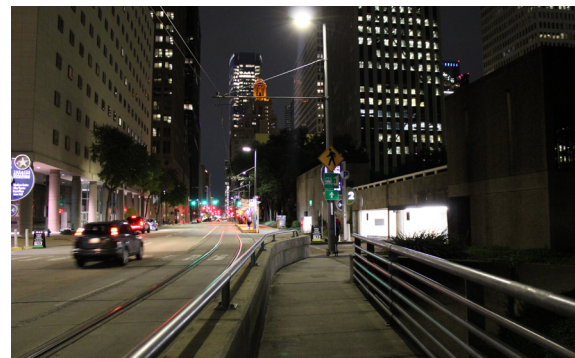
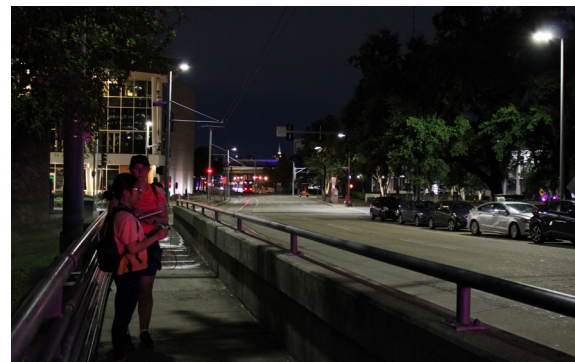
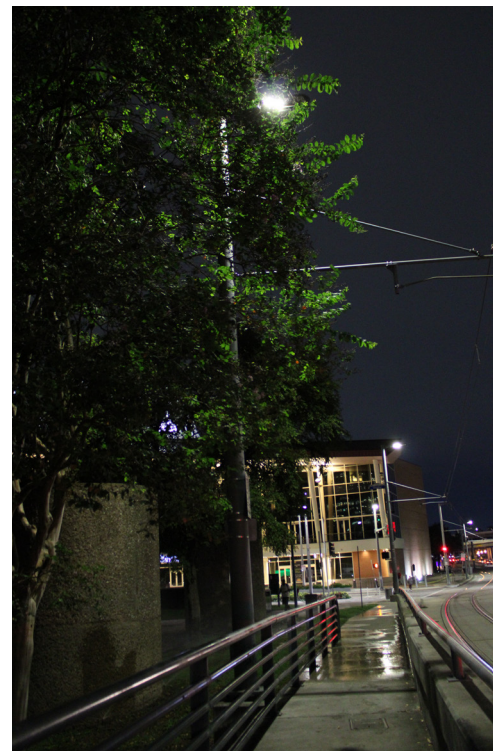
Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Reduce darkness across public parks
- Illuminate foliage

CCT: 3696K



CRI: 68.2





# Capitol / Smith

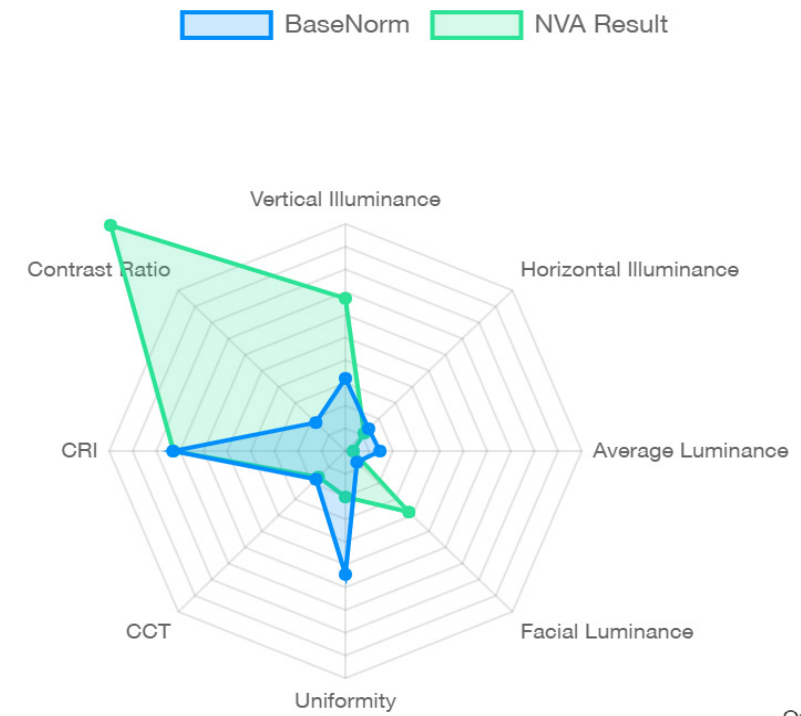
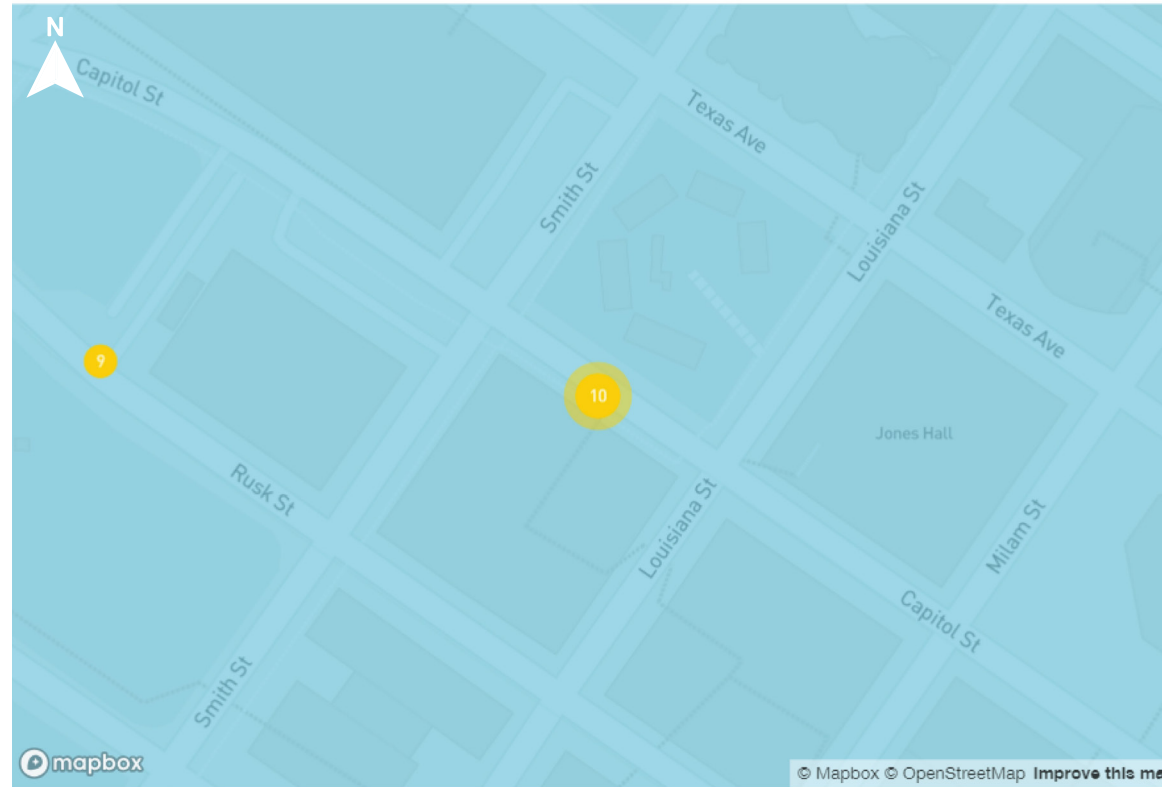
## On Site Observations

This location is near the Federal Courthouse and service side of the movie theatre which meant there are lots of loading docks in this area.

We were standing adjacent to the light rail stop; however, there was no indication that the location was a stop. Generally well lit, although a large blast of light from the passing light rail was very overwhelming for the team as we measured this location.

## Key Takeaways

This location has very dark surfaces throughout, so although there is high illuminance across the site from consistent street lighting, the luminance is very low. The low illuminance is causing a high contrast ratio spike that is impacting the vulnerability score. There was little signage or lighting to indicate this was a Metro stop. There is little in the view of this NVA that is within eye level, causing this location to have a poor scale score. Bringing more lighting to the Metro stop will tie this location into the design of the transport stops across the city.



Overall Site Vulnerability Score

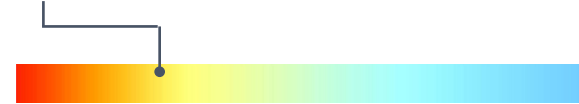
66/100

## Opportunities

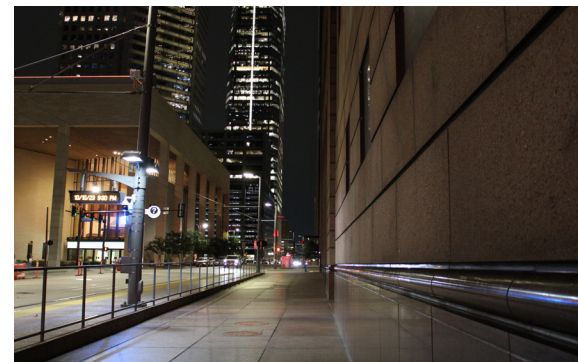
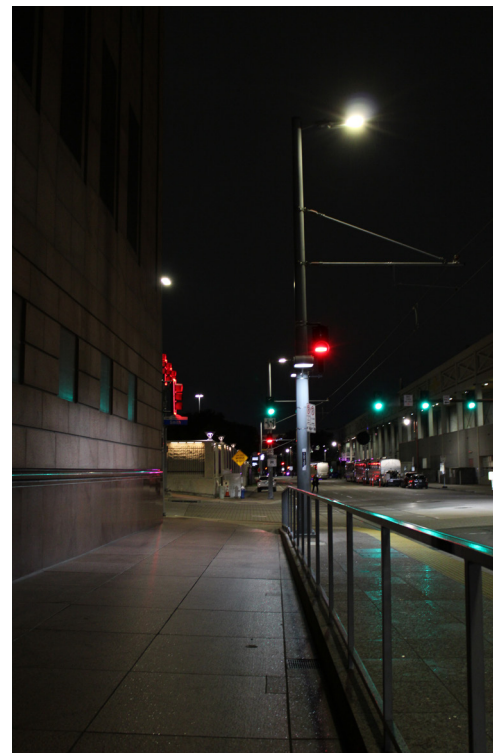
Key Opportunities for this site are listed below and are expanded more at the end of the location overview section

- Consistent lighting across public transport

CCT: 3397K



CRI: 72.7





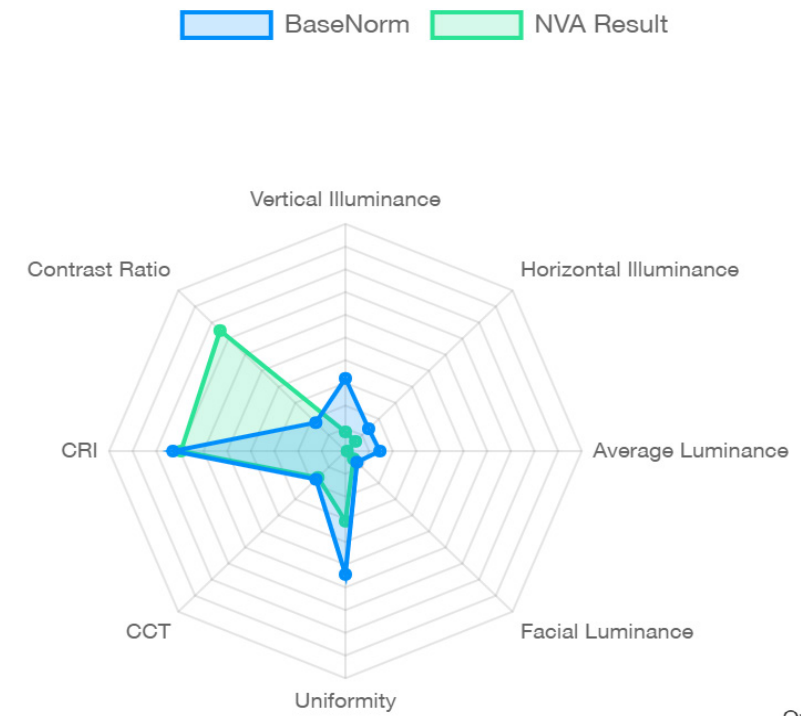
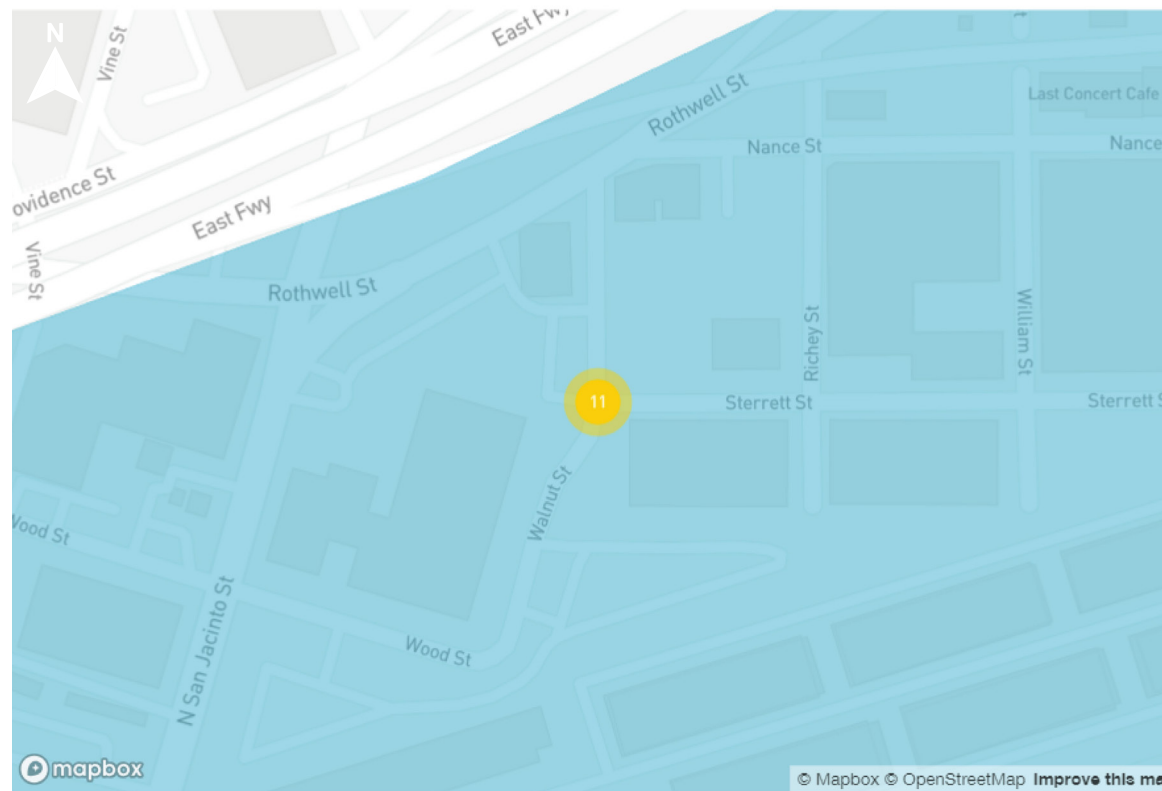
# Walnut / Sterrett

## On Site Observations

When we visited this location, the street lights were off, creating a very dark and oppressive feeling. The experience could have been completely different had they been on. This is a very quiet area with lots of the lights obstructed by trees. Lack of sidewalk and large amount of unhoused community resting nearby make it difficult to navigate safely. The abundance of empty buildings with no illumination creates a very eerie feeling and a wall of darkness in the night.

## Key Takeaways

The Warehouse District of Houston is an up and coming area, with a lot of construction actively in progress. This has led to a lot of empty buildings whilst the construction is finishing. This area is very quiet at night, with minimal foot fall, which heightens users' unease. Many of the trees along this street have grown over the street lighting, making it much darker. Bringing illumination to the foliage will improve this. Activating some of the construction sites at night will bring the focal point of the façades down to eye level.



Overall Site Vulnerability Score

**63**/100

## Opportunities

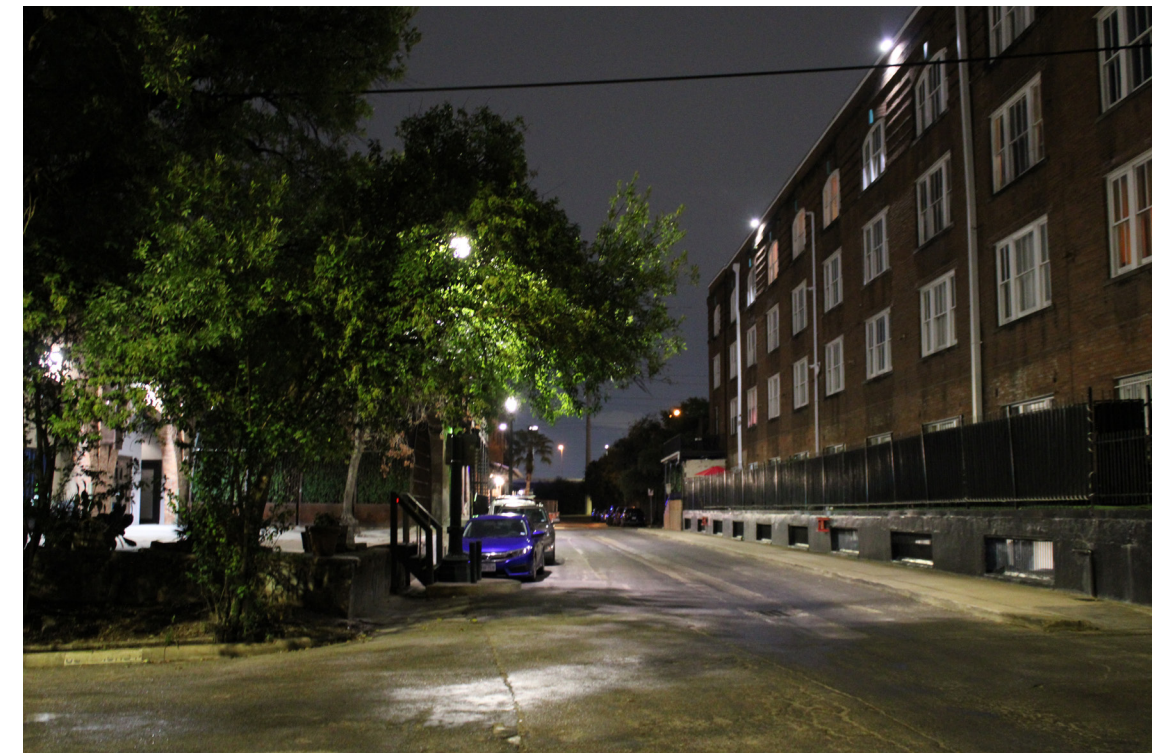
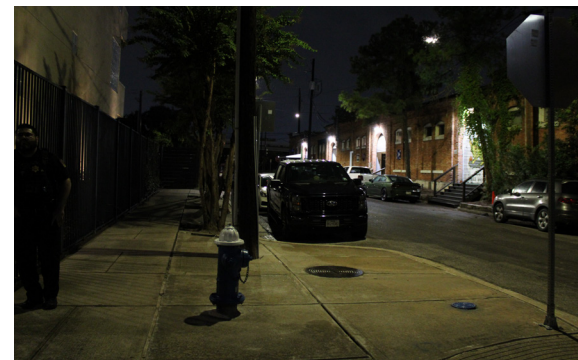
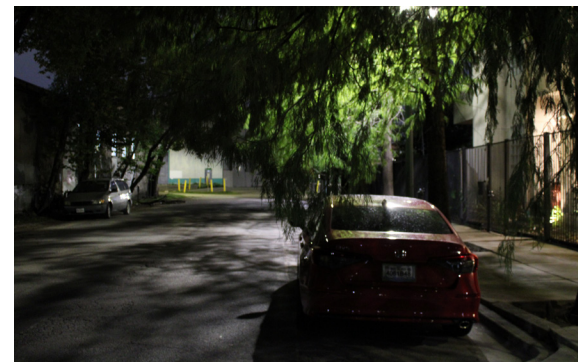
Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Illuminate foliage
- Activate retail lighting
- Relamping for consistent color

CCT: 3450K



CRI: 69.6





# Sterrett / McKee

## On Site Observations

Very dark and warm lighting with poor CRI in this area. A mix of color temperatures, and uneven lighting create a disconnected feeling - you don't feel like you are in Downtown Houston in this location. There are a lot of building sites, but they are not illuminated which creates visual walls of darkness at night.

## Key Takeaways

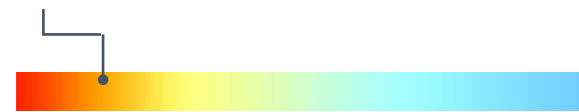
This area of the Warehouse District has multiple construction sites, which create dark, oppressive façades at night. The streets have the lowest measured CRI across all NVA sites. There is a feeling of disconnect and remoteness to the rest of Downtown in this area. Improving the color rendering of the street lighting will help those walking through the site feel more comfortable. Activating some of the construction sites at night will bring the focal point of the façades down to eye level.

## Opportunities

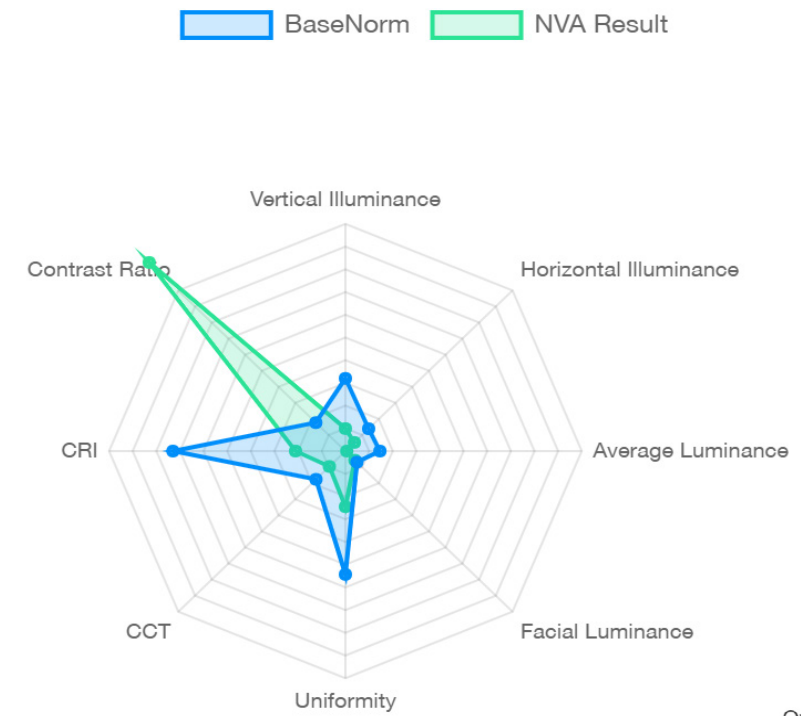
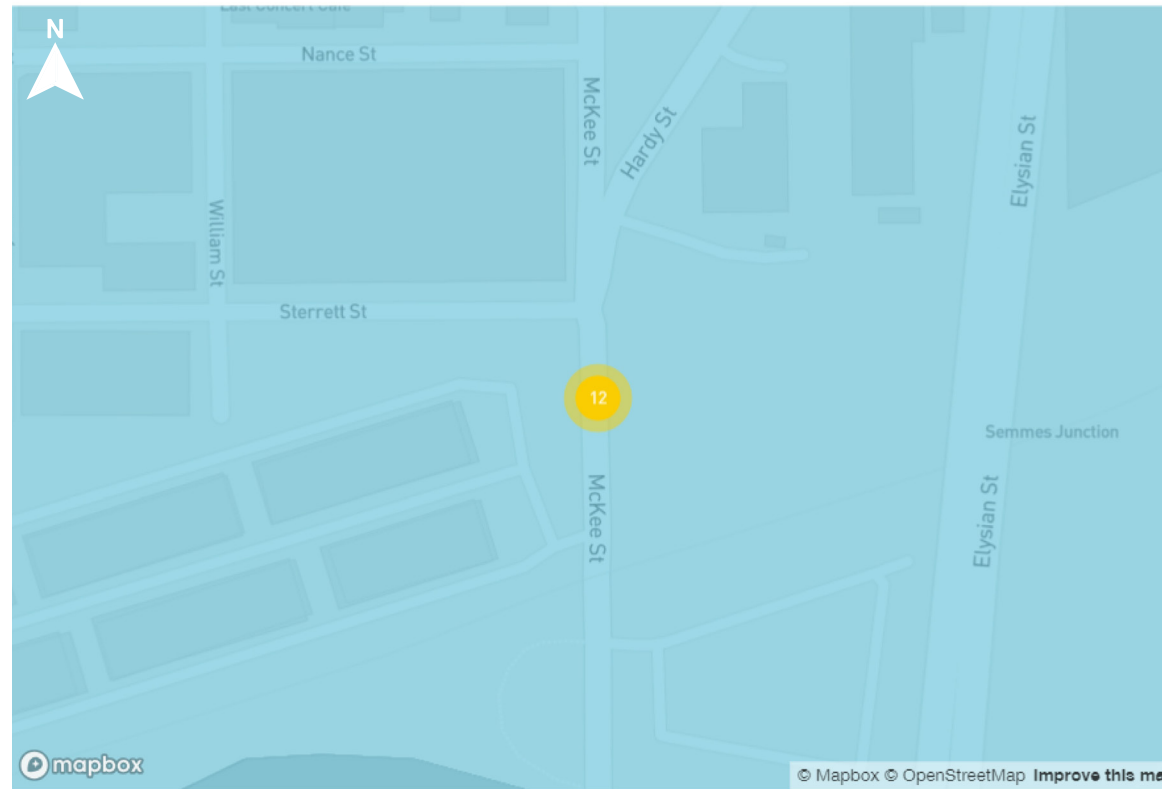
Key Opportunities for this site are listed below and are expanded more at the end of the location overview section

- Illuminate foliage
- Activate retail lighting
- Relamping for consistent color

CCT: 2020K



CRI: 21.1



Overall Site Vulnerability Score

**59**/100





# James Bute Park

## On Site Observations

The large unhoused community resting here coupled with little illumination made this location very dark and feel very scary. No buildings, no foot traffic, and no lights other than the bridge made everywhere else feel darker.

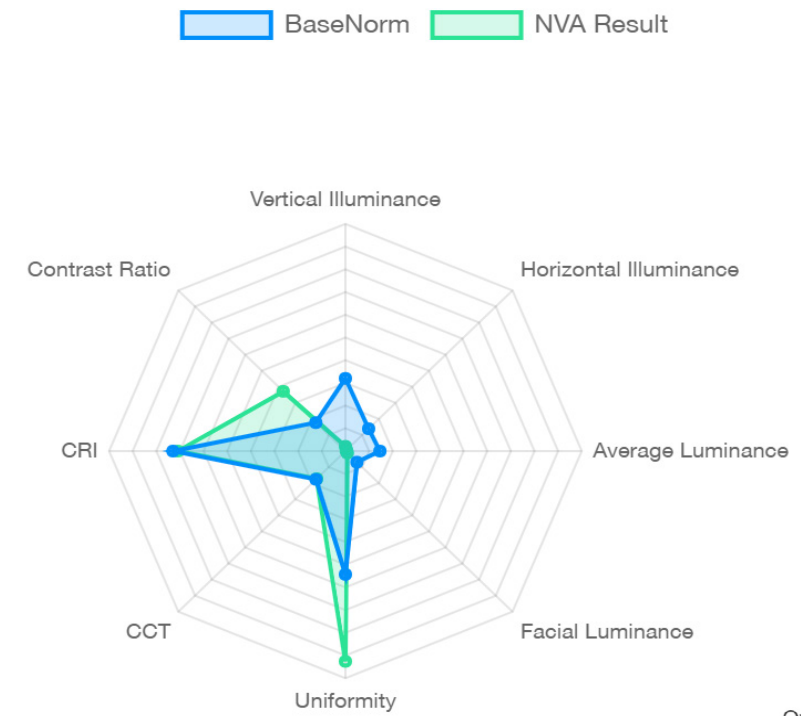
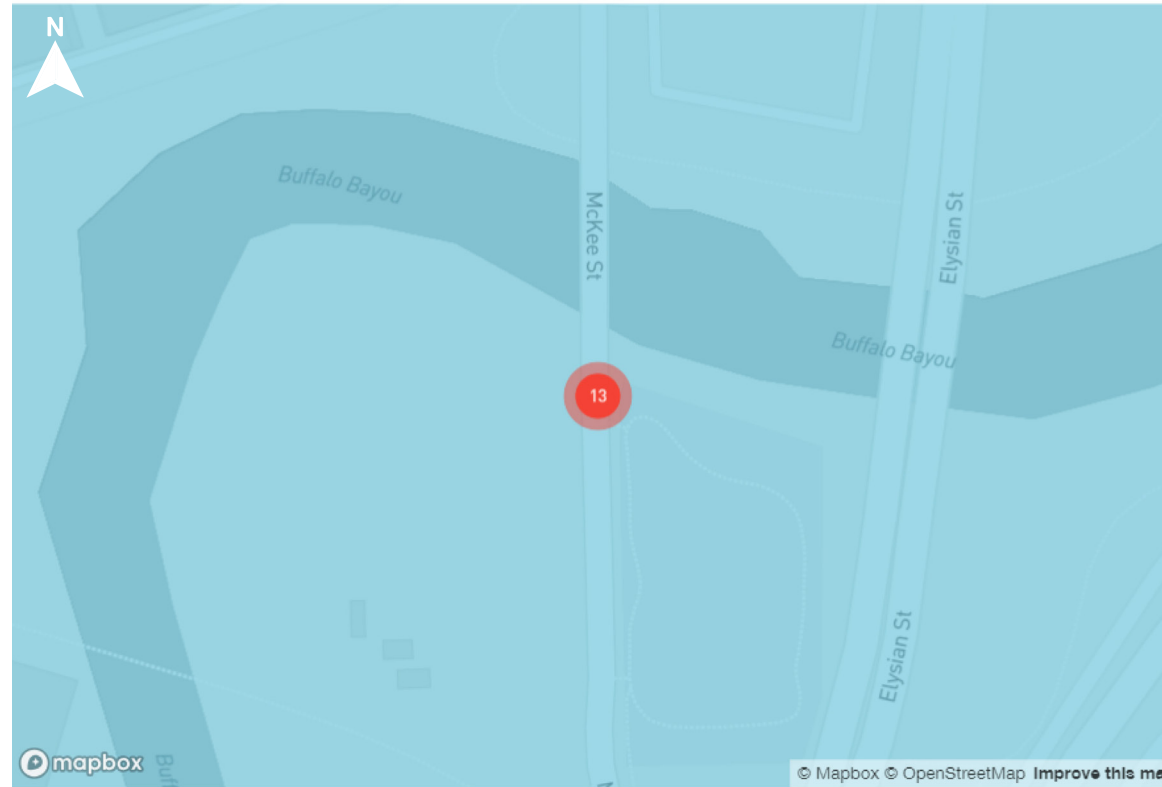
## Key Takeaways

This NVA location site felt the most unsafe across all 24 sites. The dark park creates an oppressive void, where you are unable to see anyone moving. The bridge creates a connection point to the rest of the Warehouse District, but has high glare fixtures and these cause a harsh spotlighting effect when users are on the bridge. Across this bridge, users can see the construction sites to the north. Increasing the lighting across the park to reduce the darkness will allow users to feel safer moving through the space.

## Opportunities

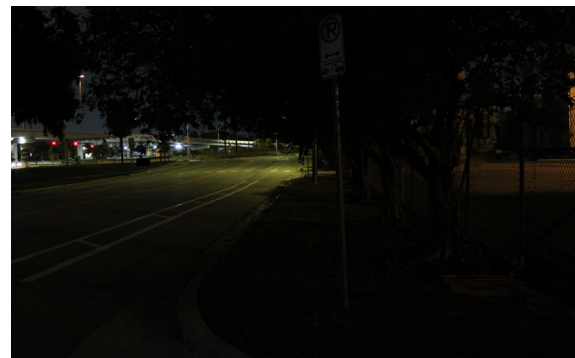
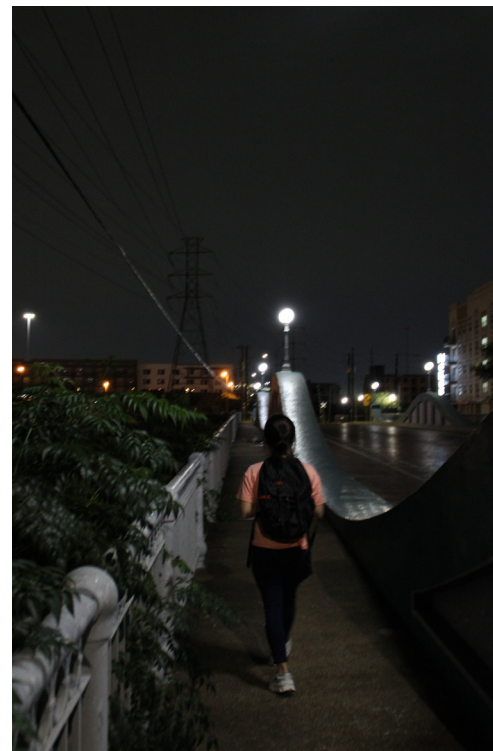
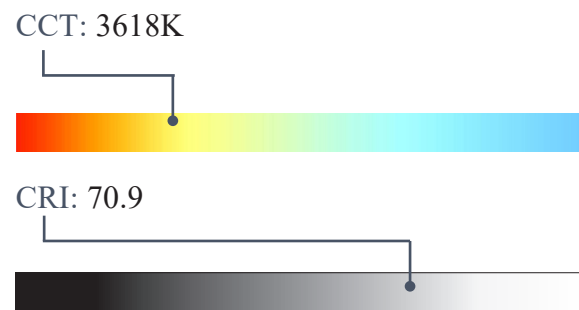
Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Reduce darkness across public parks



Overall Site Vulnerability Score

**67** /100





# Preston / Crawford

## On Site Observations

There was no event taking place at the stadium when the measurements were taken. The street was closed with barricades and bright, orange fencing due to the World Series playoff games that had recently taken place.

The southern edge of stadium felt very dark when compared to the bright and glary lit shop on the first floor of the northern corner. It feels under-utilized when there's not an event taking place.

## Key Takeaways

The feeling in this area varies wildly, depending on whether there are events going on in the stadium. When there are no events taking place, the site is quiet and feels under utilized, with the back of the stadium out of eye line. The space is well lit, with even lighting cross the streets providing easy navigation for those coming and going from the stadium. Adding lighting to the south end of the stadium and activating the western plaza when there is not an event will make this space somewhere people will want to spend time outside of the baseball season.

## Opportunities

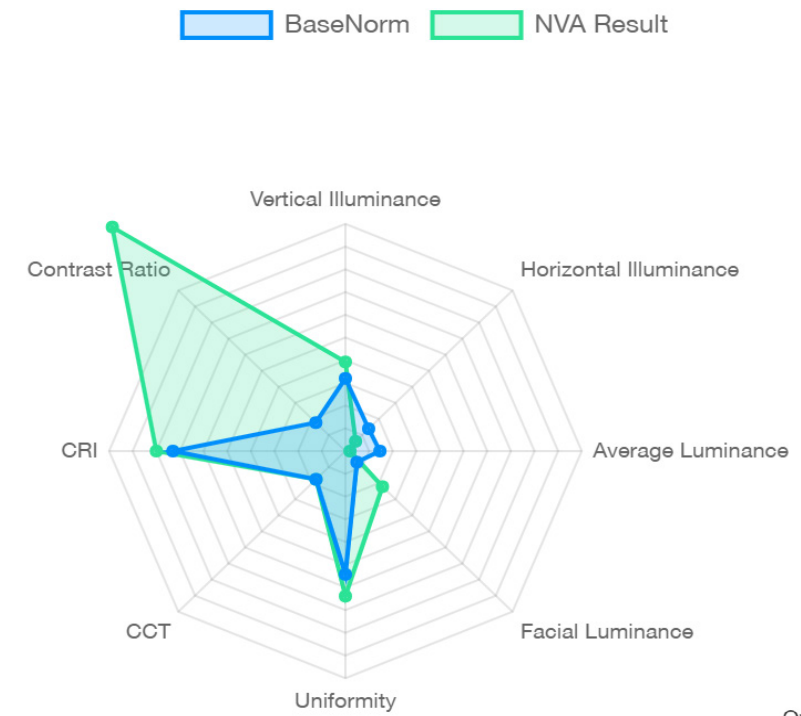
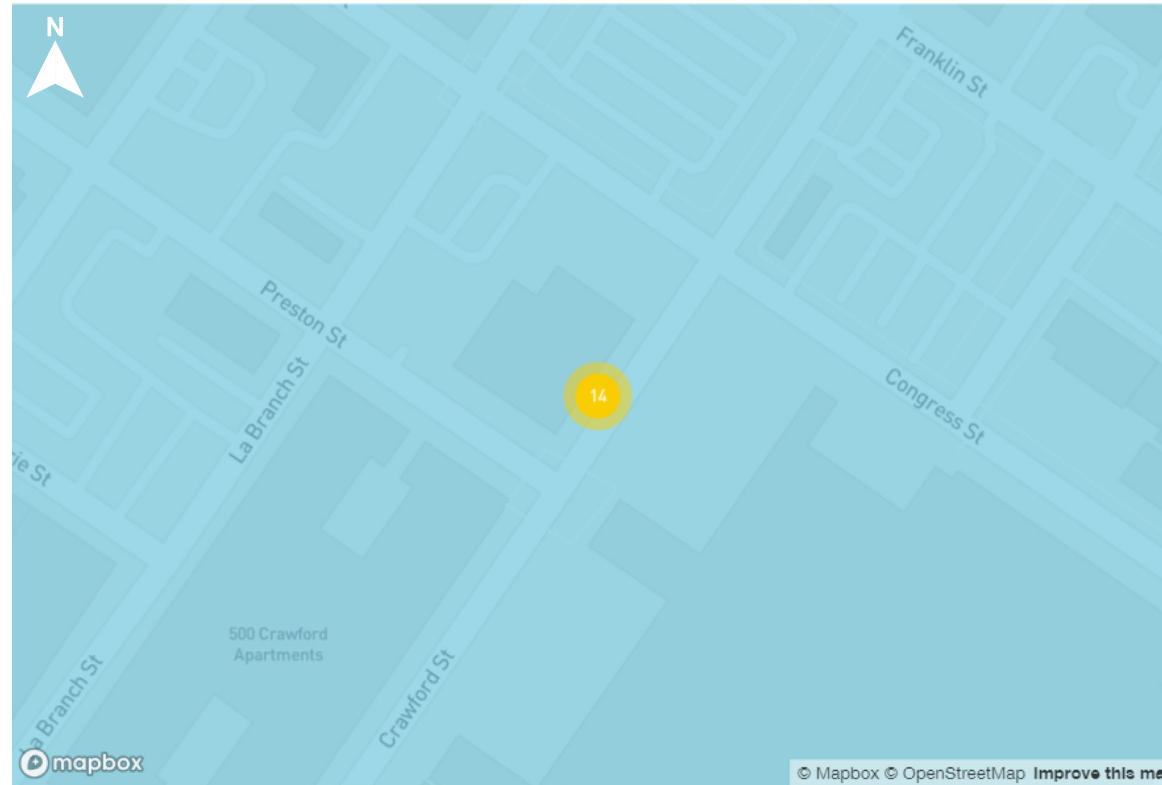
Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Activate empty parking lots
- Activate retail lighting

CCT: 3928K

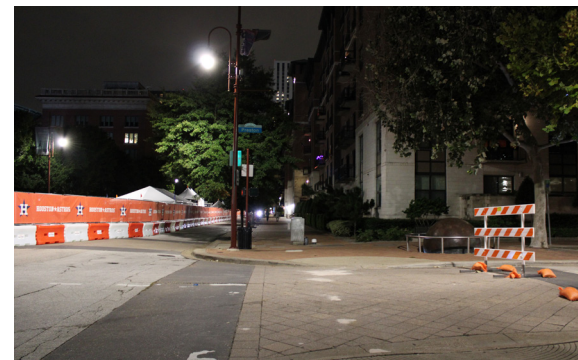
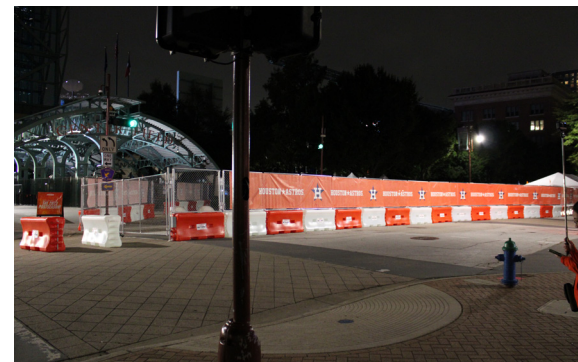


CRI: 80.0



Overall Site Vulnerability Score

55/100





# Texas / Caroline

## On Site Observations

The prison is very brightly lit, but this washes everything else out. Dark parking lots adjacent to a bright prison creates a jarring contrast.

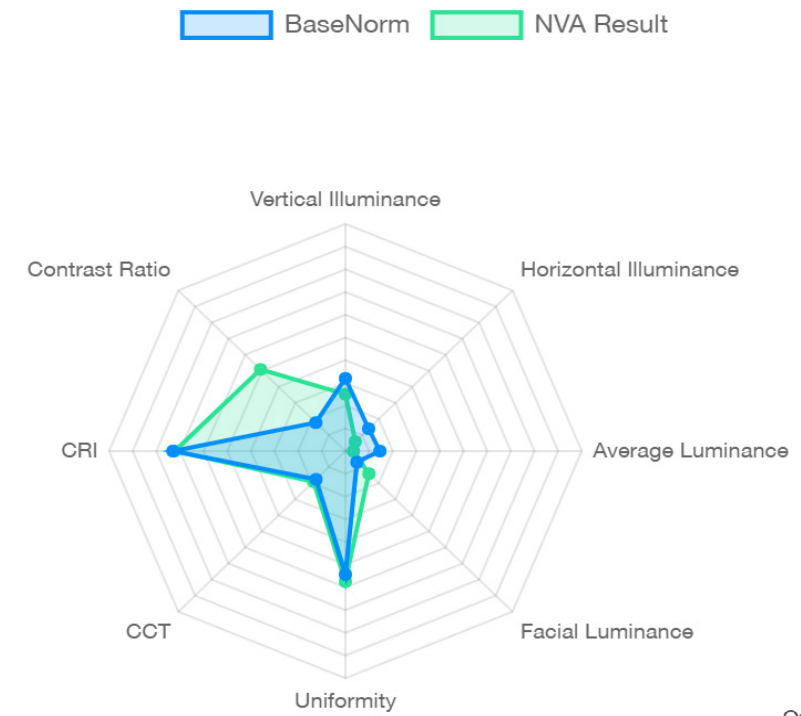
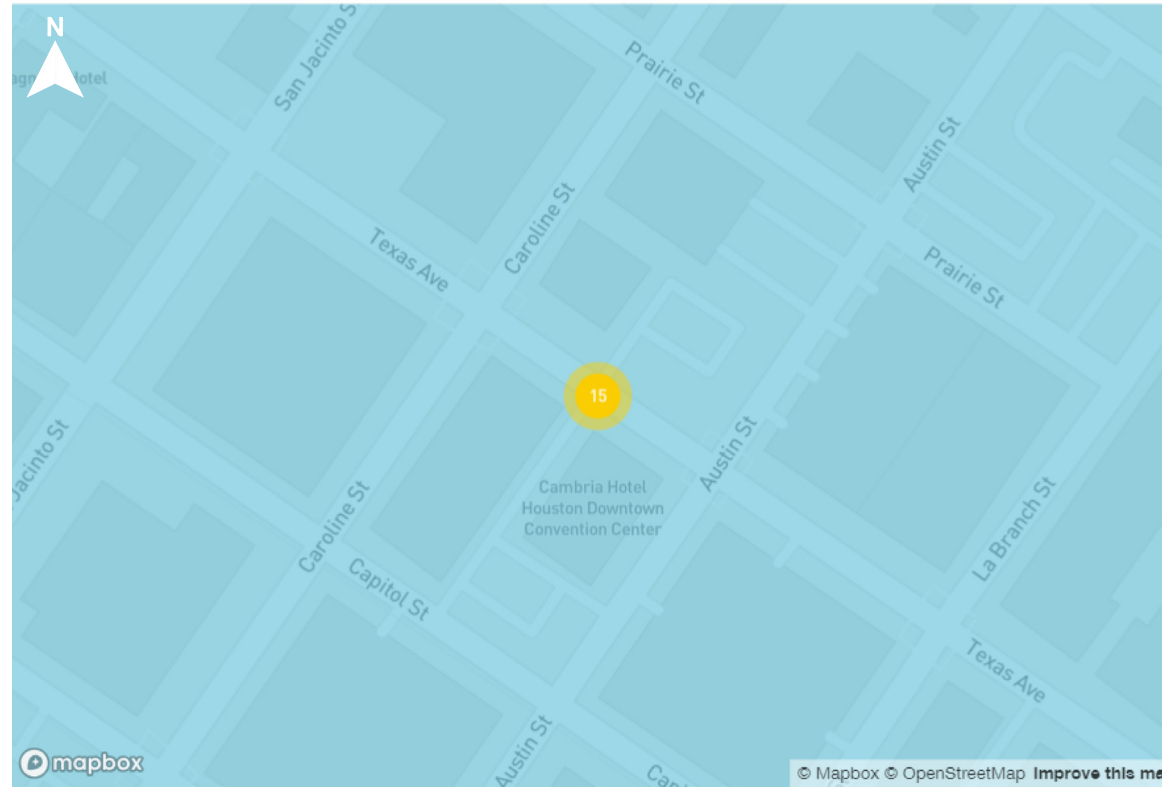
## Key Takeaways

This location is missing human scale elements - there is a flat, dark parking lot which contrasts with the large lit façade of the prison. This contrast in scale and surface reflectance raises the vulnerability score, tipping it over into the medium score. As with a range of locations across Downtown, many of the trees have grown over the street lighting, making the sidewalks much darker than they were originally designed to be. Introducing activation of the parking lot at night, and bringing more lighting into the trees will improve the feeling of this area.

## Opportunities

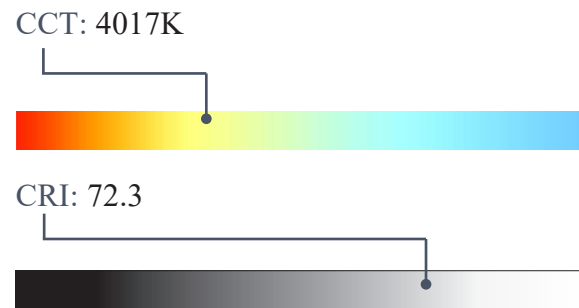
Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Illuminate foliage
- Activate empty parking lots



Overall Site Vulnerability Score

**50**/100





# Main / Preston

## On Site Observations

Lots of people, lights and music along this part of Main Street, with lots of layers of light. This area felt the most comfortable due to the human scale of lighting, and range of different types of light. It was noted that it's not iconically lit though - no district or feeling.

## Key Takeaways

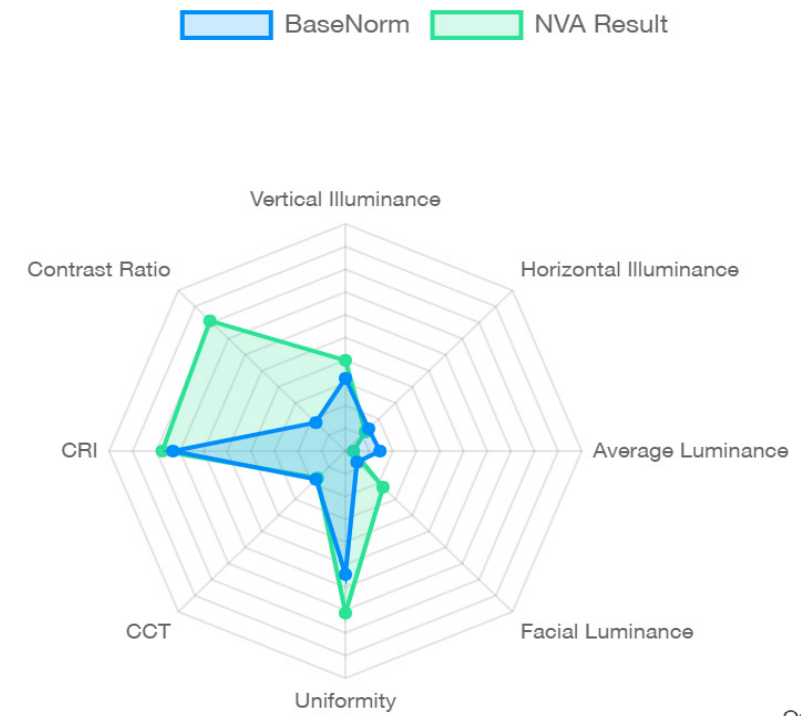
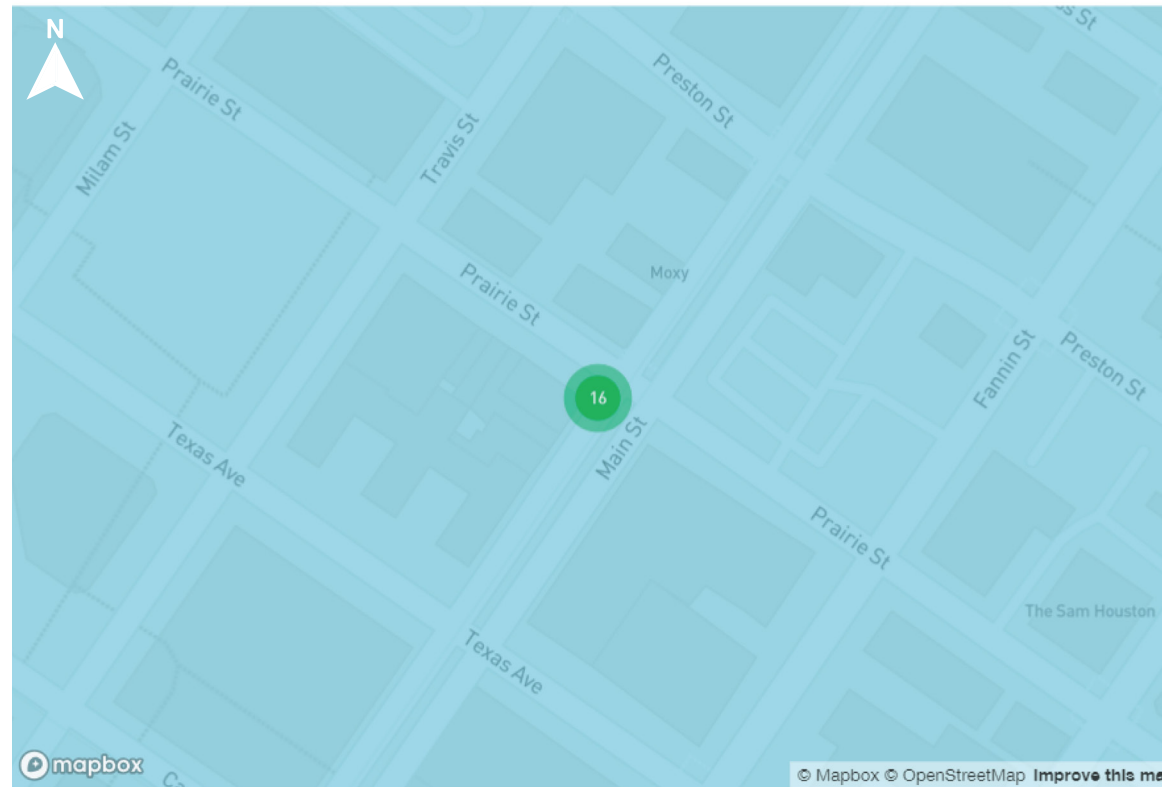
Main Street is the bustling hub of Downtown Houston with lots of layers of lighting, active shop fronts and footfall. These come together to make a safe feeling space for users walking through it. It will be key to create more of an 'iconic' lighting scheme for Main Street to create a sense of place in this Downtown hub.

## Opportunities

Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

Main Street is an area that will have opportunities realized through the More Space Main Street 2.0 Project.

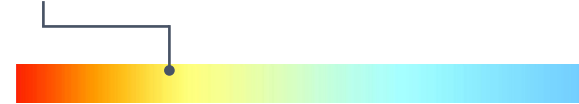
- Illuminate foliage
- Activate retail lighting



Overall Site Vulnerability Score

47 /100

CCT: 3528K



CRI: 77.5





# Main / Franklin

## On Site Observations

Much more quiet despite only being 1 block away from Site 16. There is less visual transparency as there is no retail or bars here, but still good lighting. The closed storefronts are not inviting.

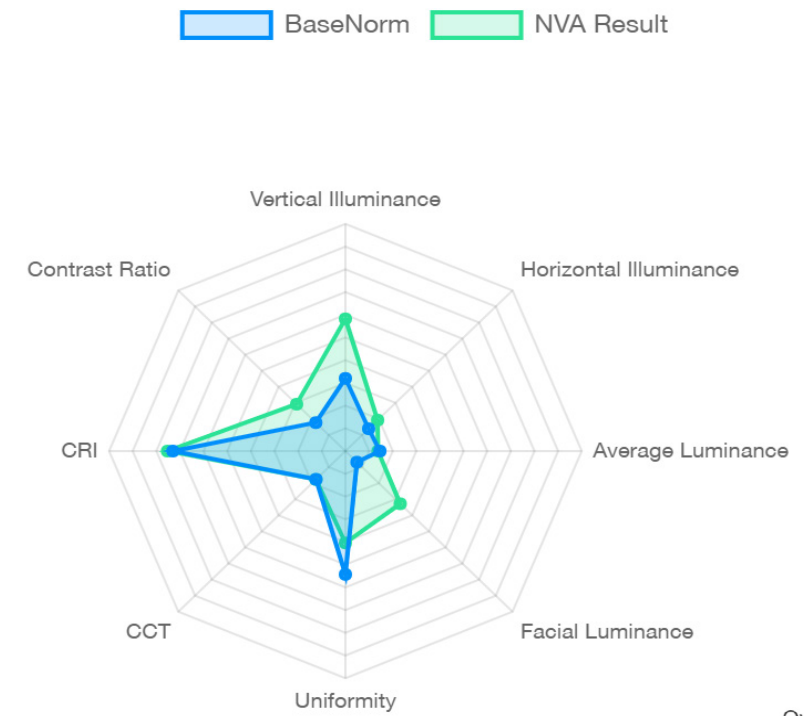
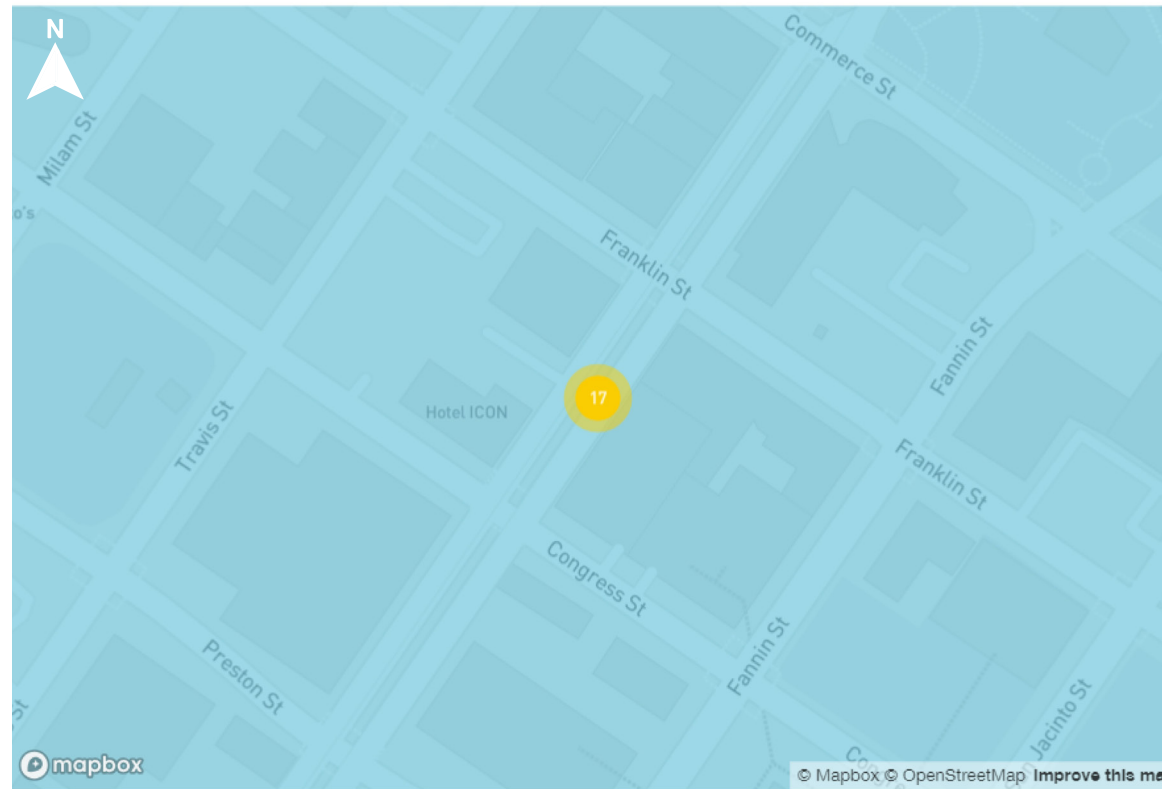
## Key Takeaways

One block up from Site 16, the streets get much quieter, with lots of closed storefronts creating a low visual transparency. These closed storefronts are interspersed with surface parking lots, which create dark patches as users walk along. Although fairly consistently lit, with the same visual language of festoon lighting, this area can be activated more at night to continue the nighttime energy of Main Street and enhance connectivity.

## Opportunities

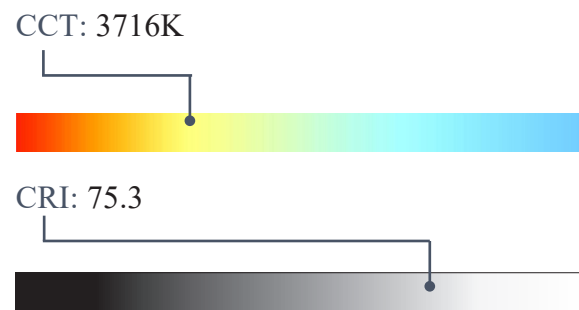
Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Activate empty parking lots
- Activate retail lighting



Overall Site Vulnerability Score

**55**/100





# Louisiana / Congress

## On Site Observations

Quiet here due to minimal foot traffic, but lots of road traffic. It is not clear where to cross to get to Post, which is a beacon. Sesquicentennial Park below has some lighting that brightens it - makes it less of a dark void. Trees are blocking a lot of the street lights. It feels unwelcoming, but it is not a dark area.

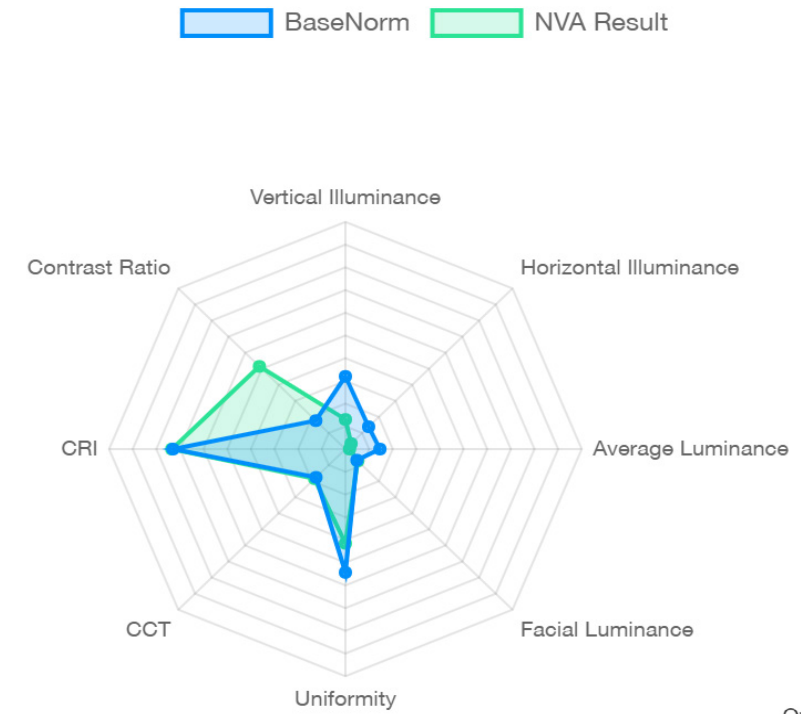
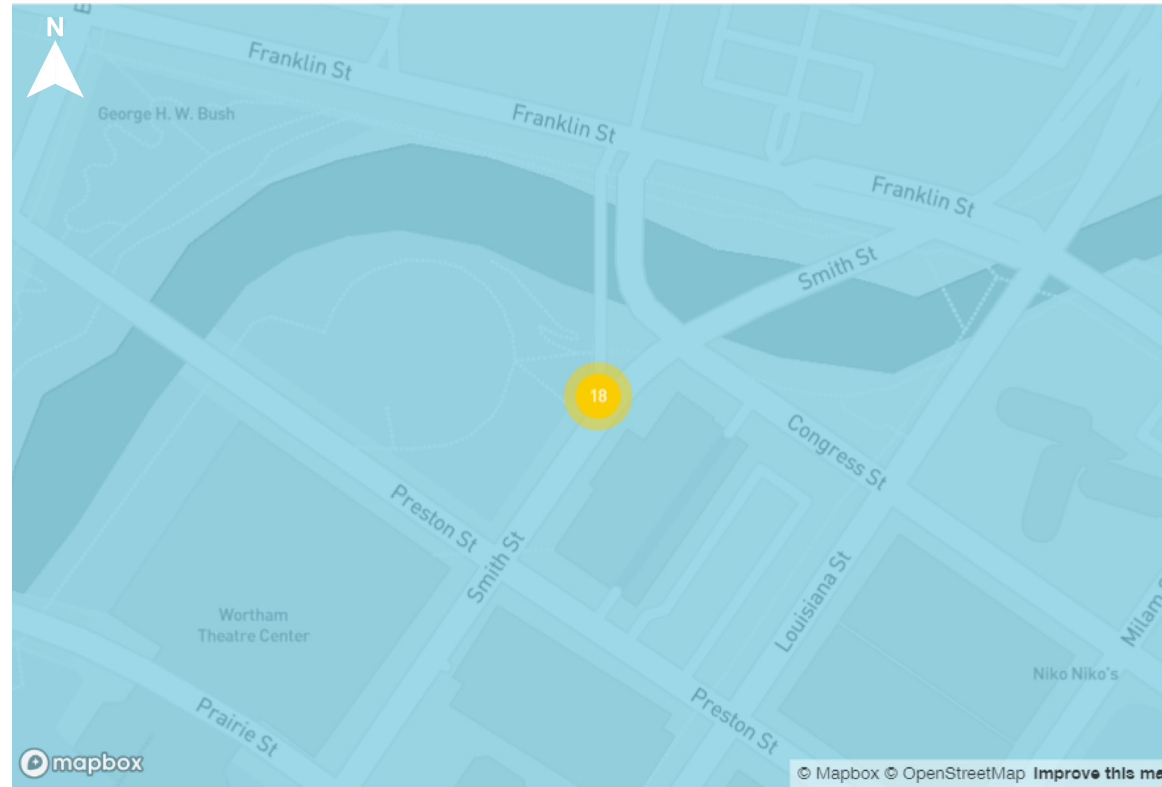
## Key Takeaways

Post has become a new 'Go To' Spot in Downtown Houston, but it is very isolated due to the dark roads and sidewalks. Creating clear pedestrian pathways to navigate this area, and adding illumination to the parkland and foliage to improve the surrounding lighting will improve the site score and make the area feel more welcoming to users navigating their way.

## Opportunities

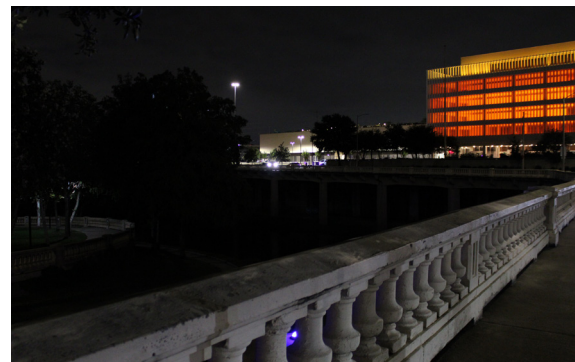
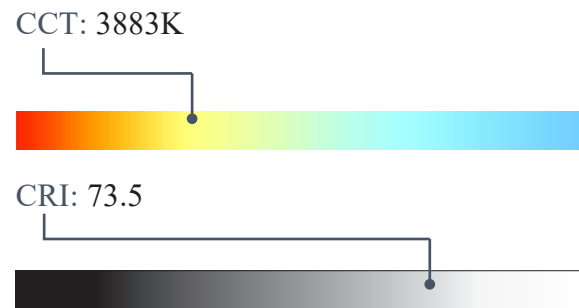
Key Opportunities for this site are listed below and are expanded more at the end of the location overview section

- Reduce darkness across public parks
- Illuminate foliage



Overall Site Vulnerability Score

**54**/100





# Milan / Leeland

## On Site Observations

String lights illuminate the road and reduce the scale of the front façade entrance; however, the park behind still feels dark (see Site 24). A lot of layers of light create a more human scale feeling, with the illumination of the floors and trees bouncing to the other side of the road.

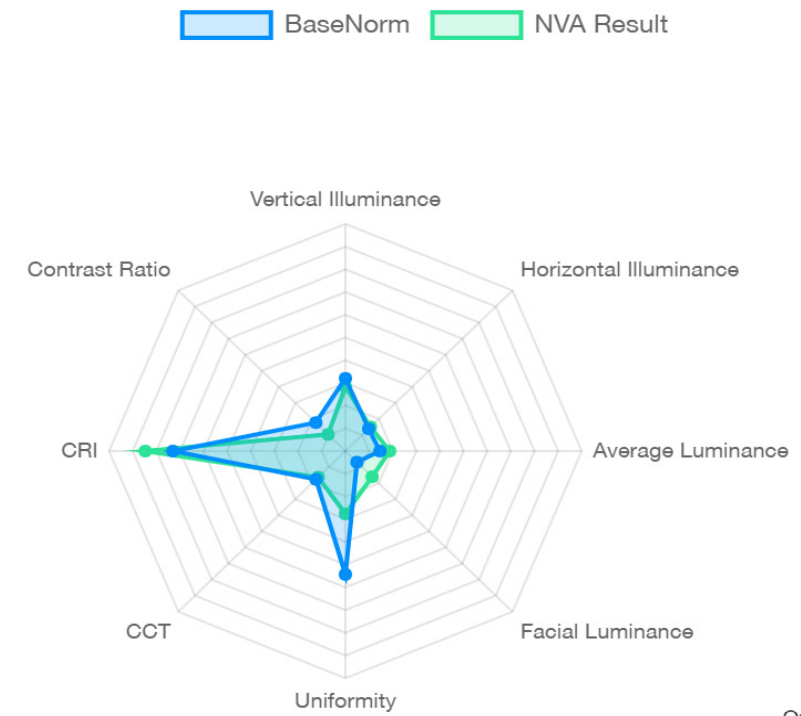
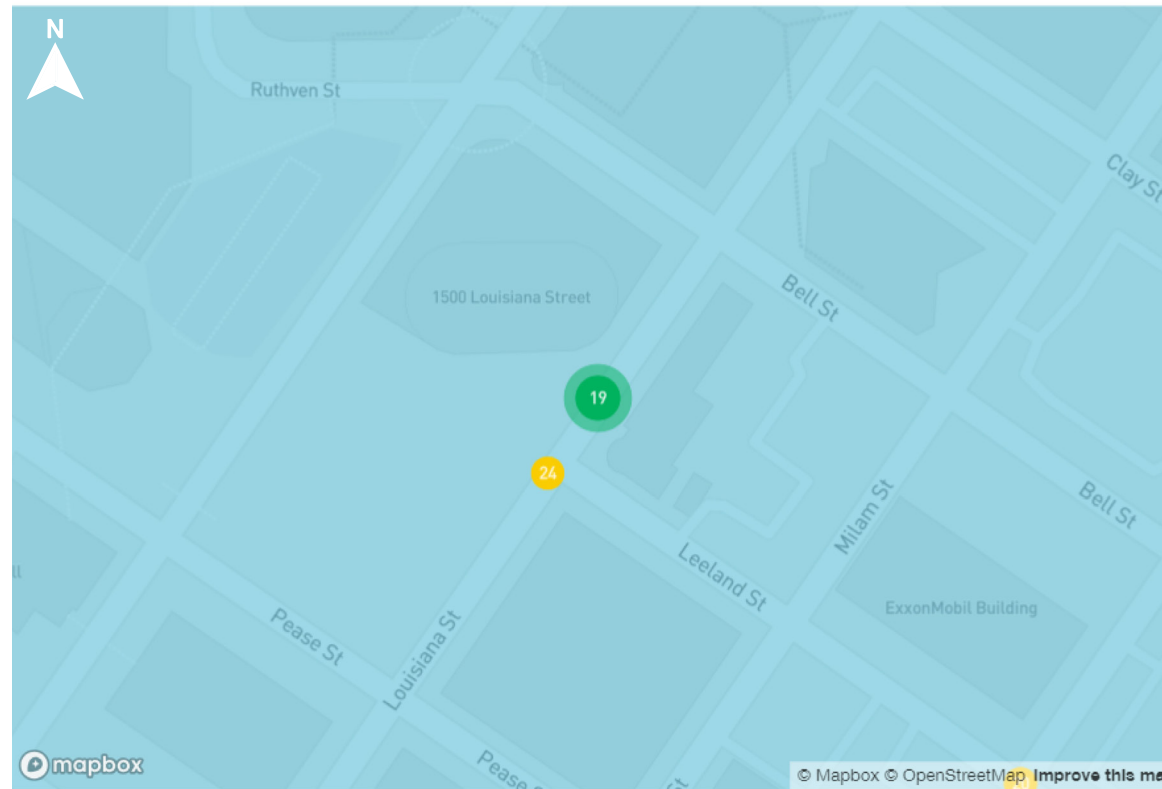
## Key Takeaways

The area in front of the Chevron building has many layers of light, creating a rounded atmosphere. There is some activation of the front façade, giving an improved visual transparency to the space. The main entrance area does not require much input; however, the park south of this viewpoint is very dark and creates a dark void in front of this bright hub.

## Opportunities

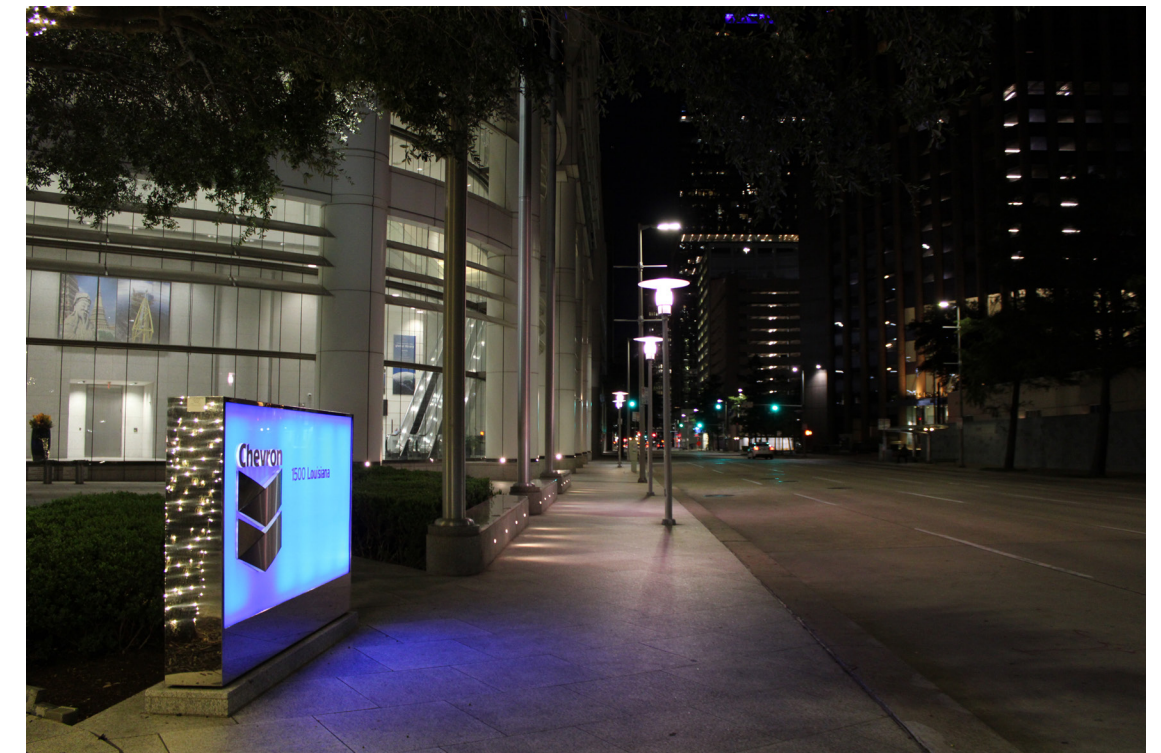
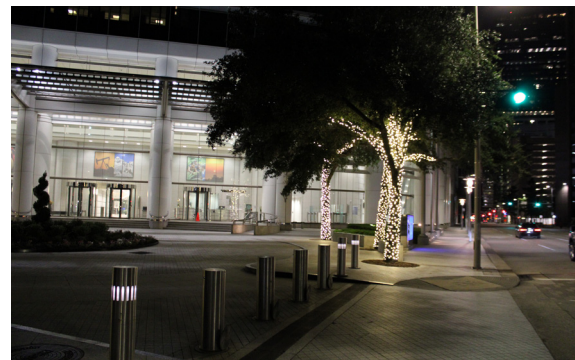
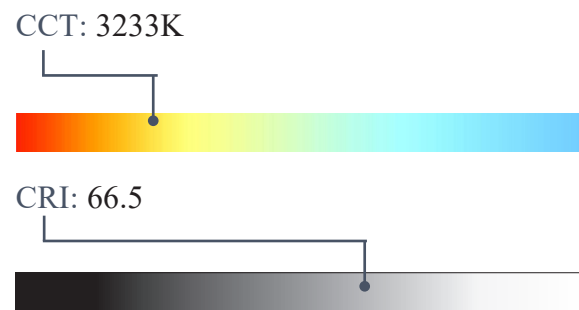
Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Reduce darkness across public parks



Overall Site Vulnerability Score

44/100





# Travis / Leeland

## On Site Observations

The bright hotel along Main contrasts with dark parking lots and creates a visual disconnect. The mural on the western face of the hotel lifts the eye, but it is drowned out by the blank wall in the parking lot. It is quiet here as there is no foot traffic, but lots of cars. Surface lot darkness is all consuming. However, as it is open on both sides, there's a good building hierarchy as you can see what's coming.

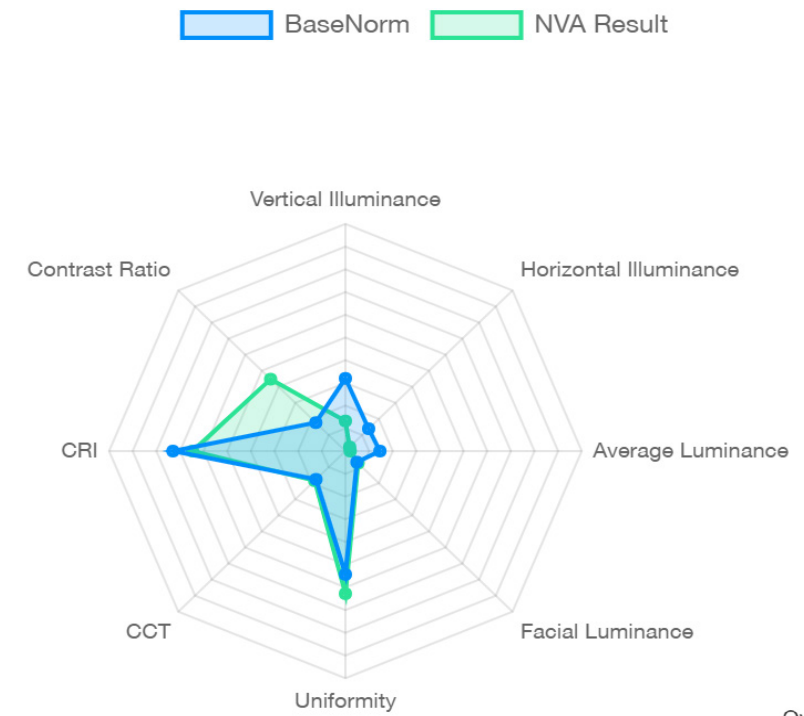
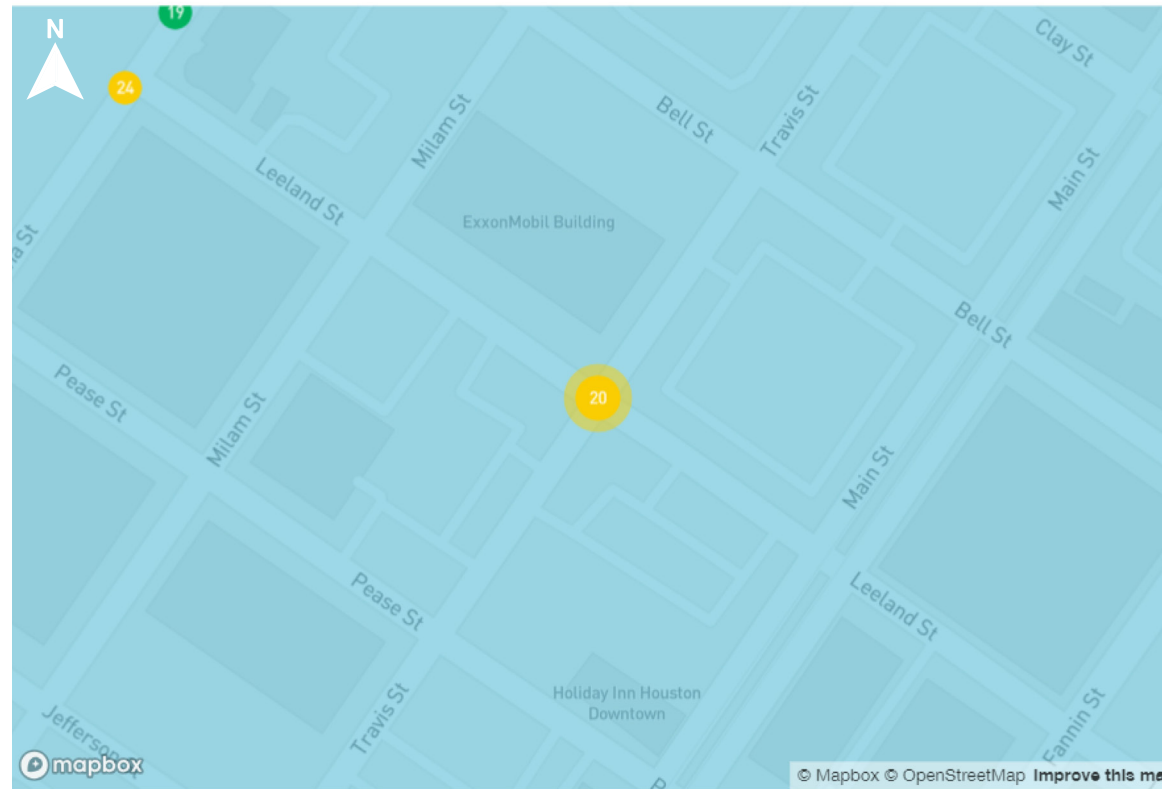
## Key Takeaways

This location creates a juxtaposition between the two visuals. On one side, the brightly highlighted hotel and dark parking lot create an uneasy feeling, whilst the opposite direction has good building hierarchy and allows the user to see a long way across the city. There is a mural here, but it is lost to both height above the user eye and to the darkness of the surface parking lot.

## Opportunities

Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Activate empty parking lots



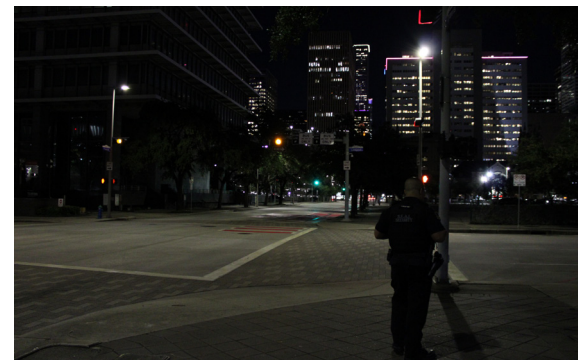
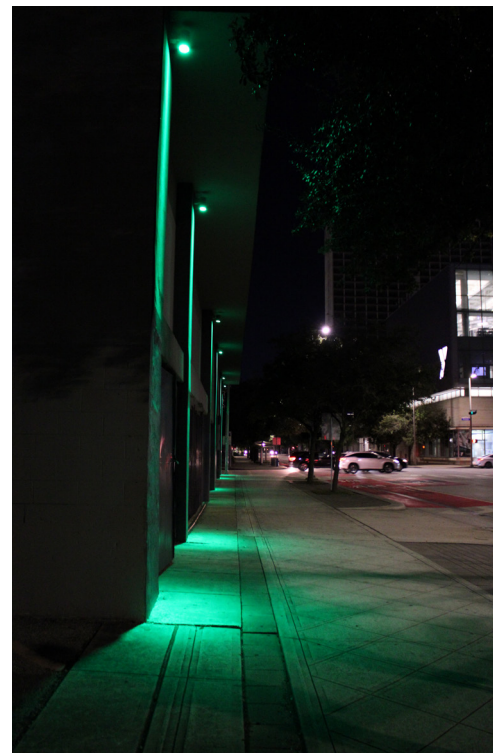
Overall Site Vulnerability Score

61/100

CCT: 3882K



CRI: 64.7





# Main / Jefferson

## On Site Observations

Dark façades contrast with the bright light rail stops. The light rail itself is very glary when it comes through the station - its almost blinding. It is a quiet area - not a lot of foot traffic. This lack of users, although the site is not necessarily dark, makes it feel a little eerie.

No shop front illumination, but there are a lot of hotels along this road. Wall packs are washing out everything - over lit with a cooler color temp. The team didn't even realize the trees were being uplit because of it.

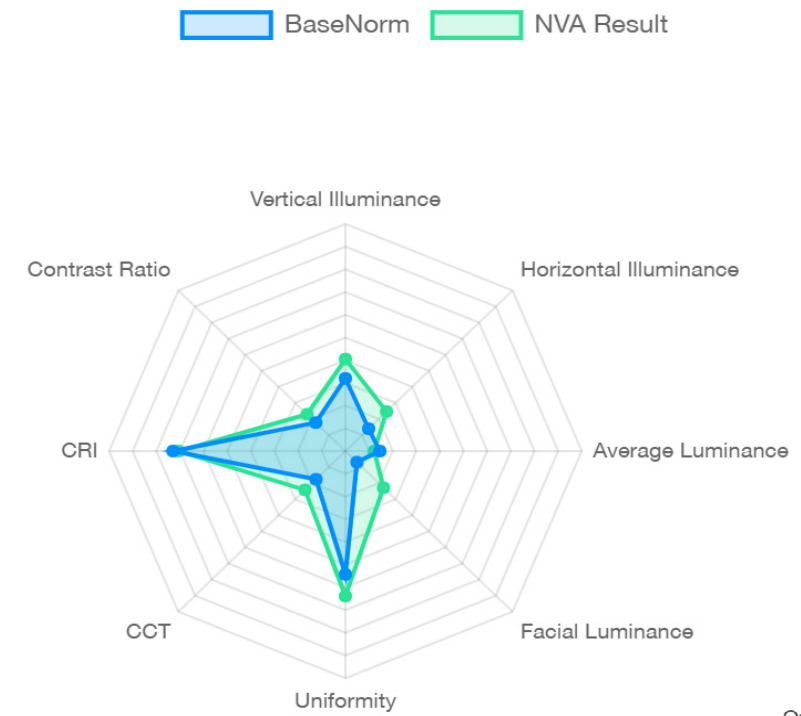
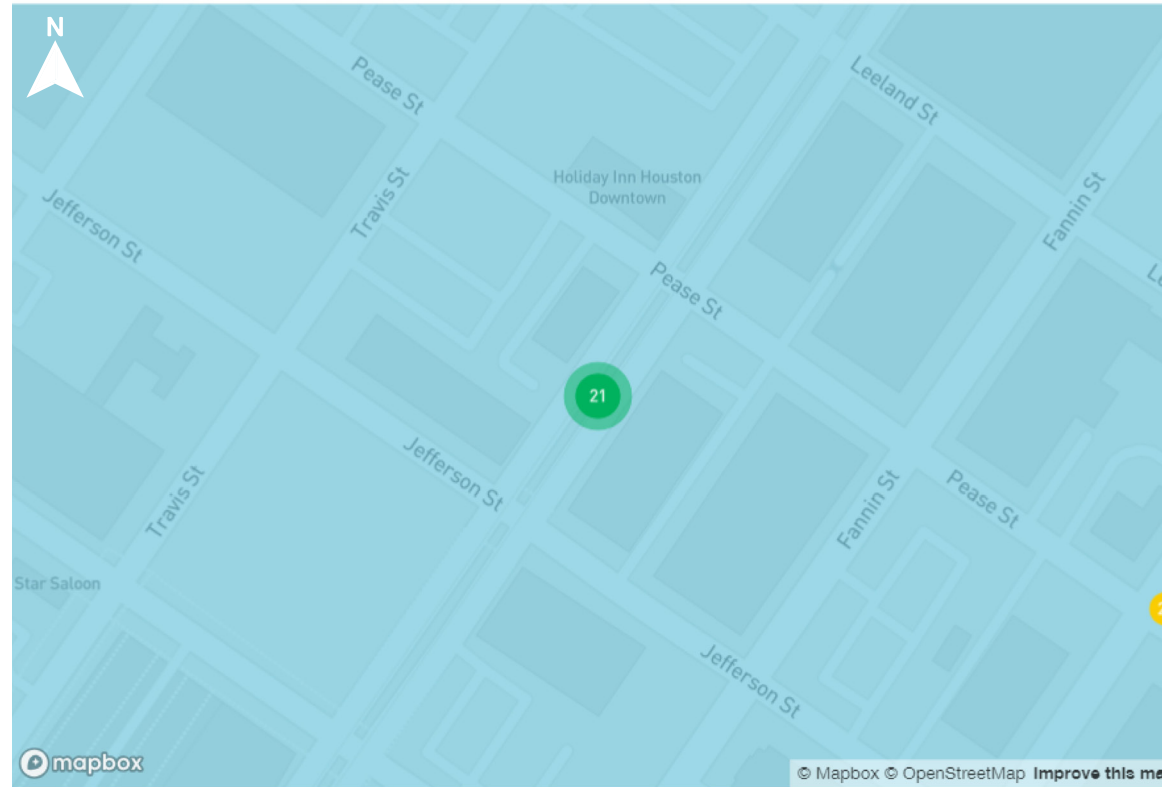
## Key Takeaways

This end of Main Street has ample street lighting - however much of the decorative lighting (such as the tree uplighting) is washed out by wall packs. There are multiple shop fronts down here, which are closed down in hours of darkness. It would be beneficial to improve the visual transparency to activate these where possible.

## Opportunities

Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

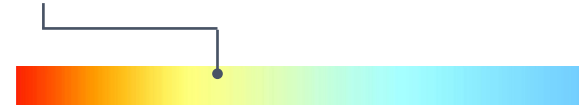
- Consistent lighting across public transport
- Activate retail lighting



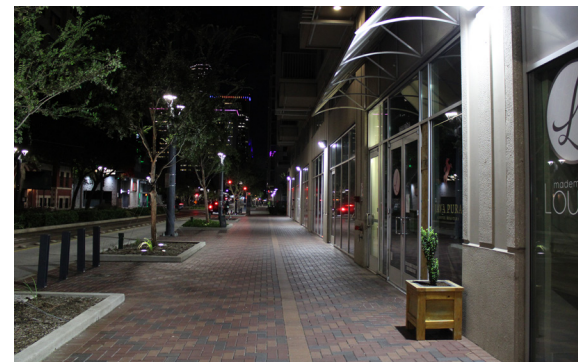
Overall Site Vulnerability Score

**43**/100

CCT: 4310K



CRI: 75.0





# Pease / San Jacinto

## On Site Observations

Despite being only one street away from Trebly Park - this location is dark and empty. Much of the foliage is covering the lights.

A lot of traffic and car noise, but no foot traffic. A lot of dark walls that make the space feel enclosed with broken sidewalks. It looks and feels disconnected from Downtown.

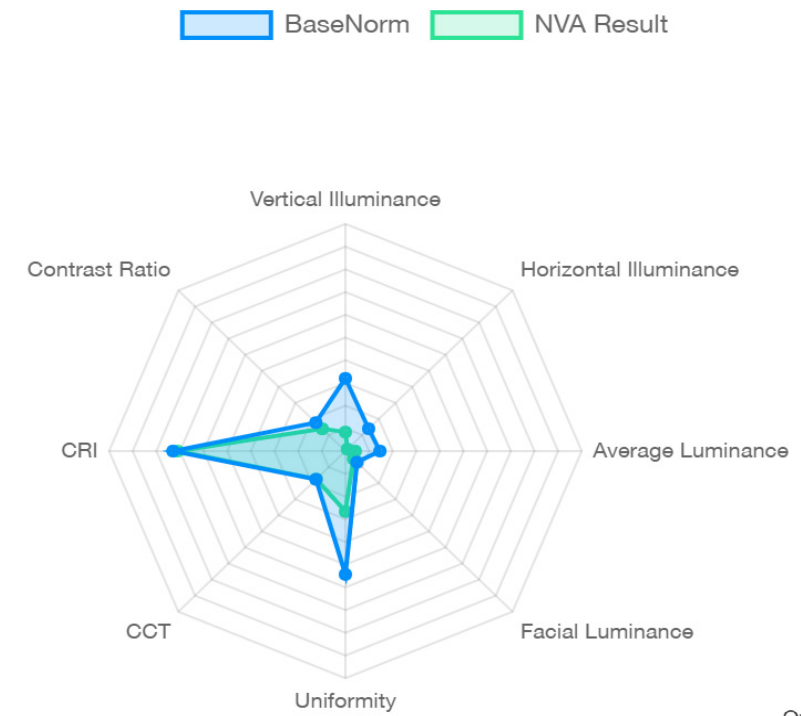
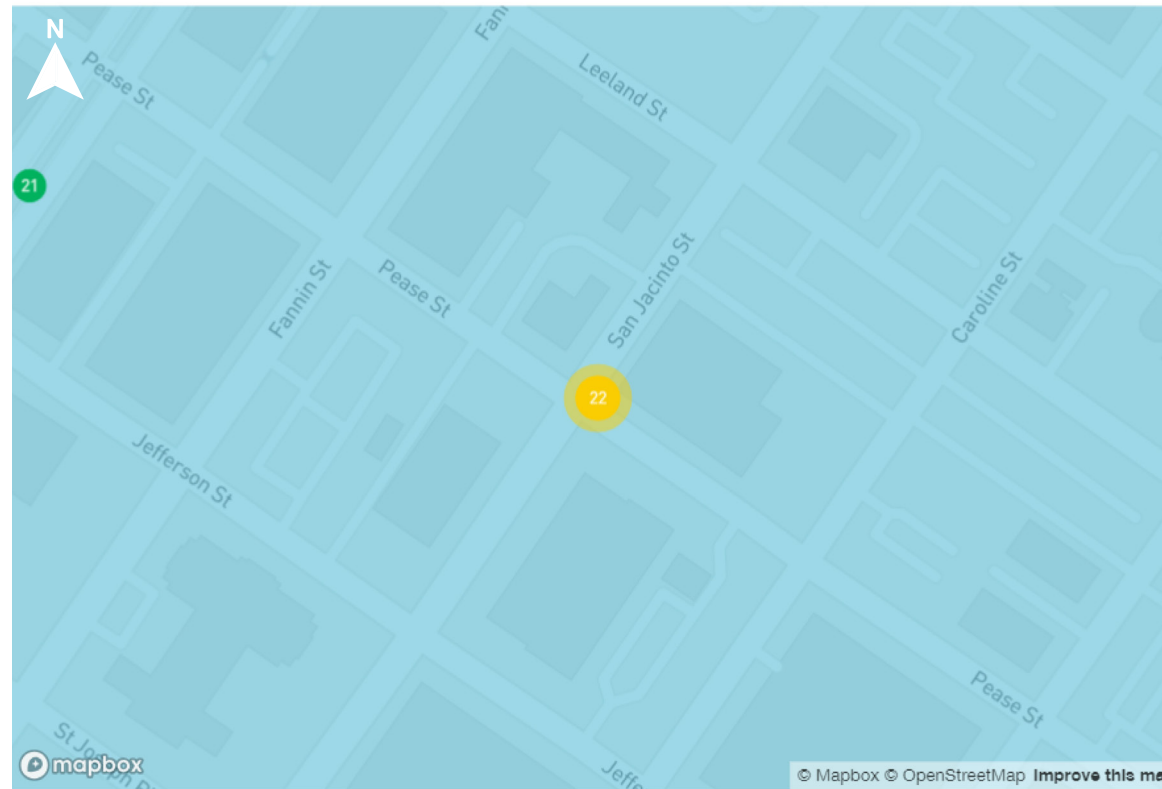
## Key Takeaways

This street was very dark, due to many of the trees growing over the street lighting. It is a stark change from the lighting of Trebly park, and it does not feel like it is part of the Downtown system. There is bright façade lighting from the storage building, which becomes the main focal point of the area. Adding illumination to the trees will improve the score of this site.

## Opportunities

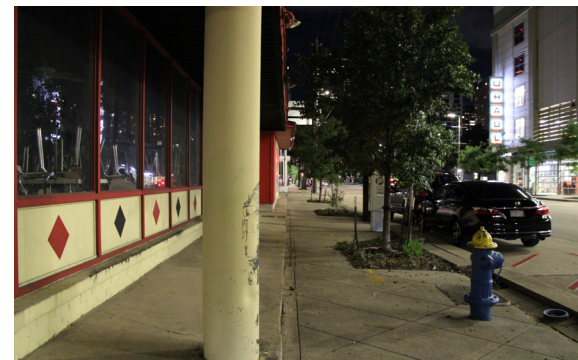
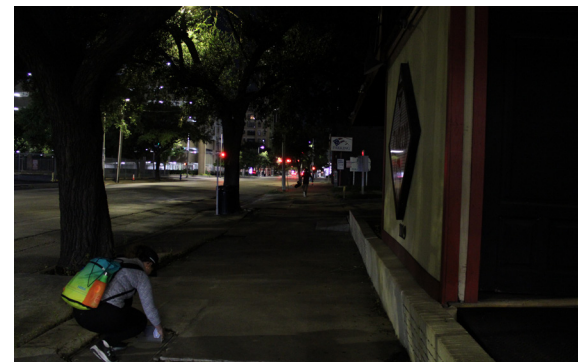
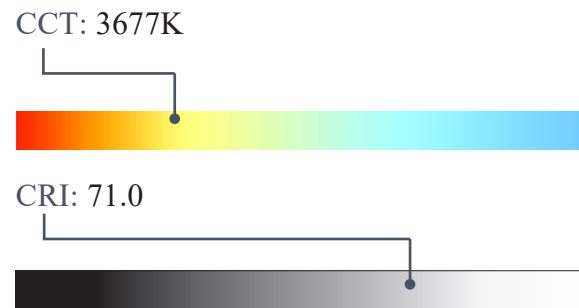
Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Illuminate foliage



Overall Site Vulnerability Score

61 / 100





# Trebley Park

## On Site Observations

Movie night was taking place in the park as we were measuring, so we moved to the corner away from the screen. Due to the high volume of people it feel very safe. The street lighting was a little glary. Lots of human level lighting from both the trees, benches, planting and visitor centre.

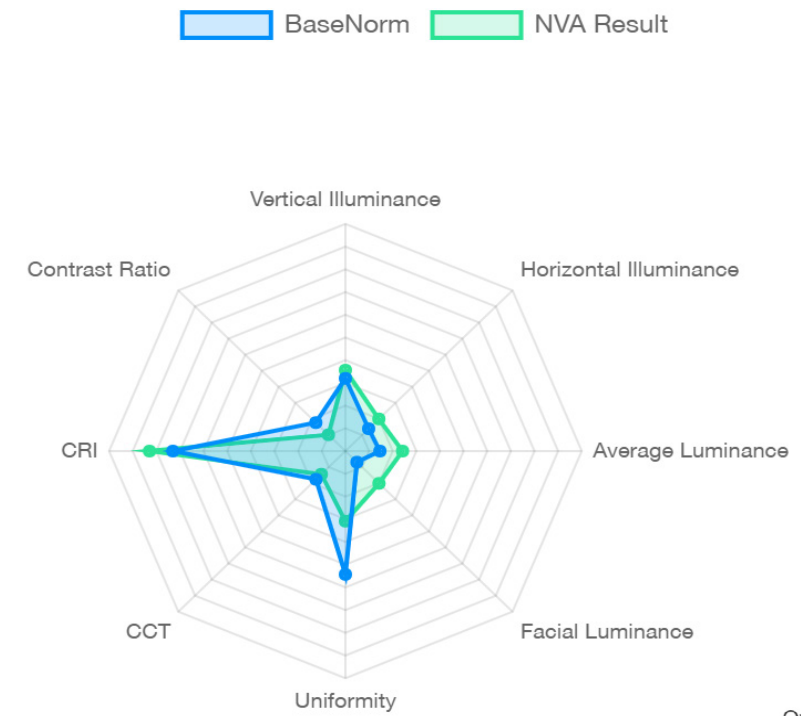
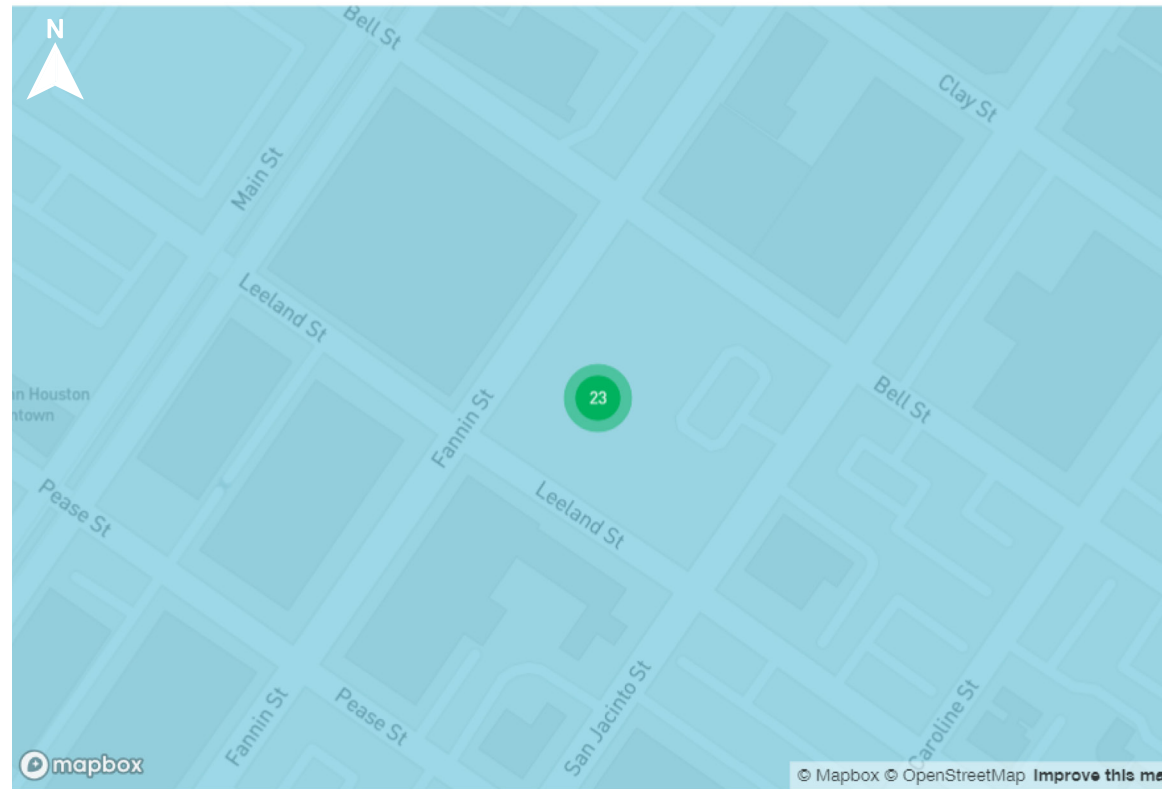
## Key Takeaways

Trebley Park is another well activated and attended park in Downtown Houston. Multiple layers of light make this a nice space to spend time within. Some areas around the outside of this park are residential with dark entrances and façades. To match the illumination levels within Trebley Park, activating some of these façades to reduce any spotlighting effect would be beneficial.

## Opportunities

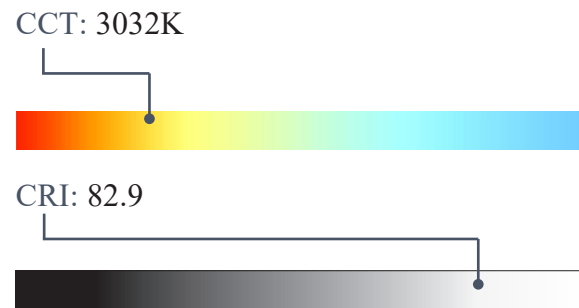
Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Activate retail lighting (Residential façades)



Overall Site Vulnerability Score

**57** /100





# Leeland / Louisiana

## On Site Observations

When this location is reviewed with Site 19, the contrast between the two is strong. You turn 180 degrees and the area feels completely different. The dark park space is all consuming as the trees have no lights. There is a dark façade on the southern edge which looms over, with glary parking garages. There is no pedestrian-level lighting or retail in this direction.

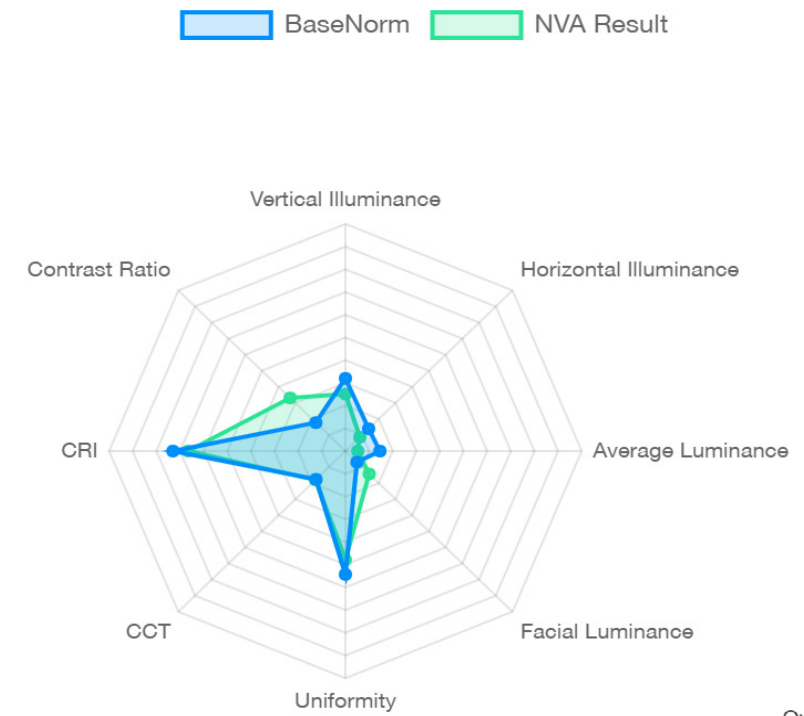
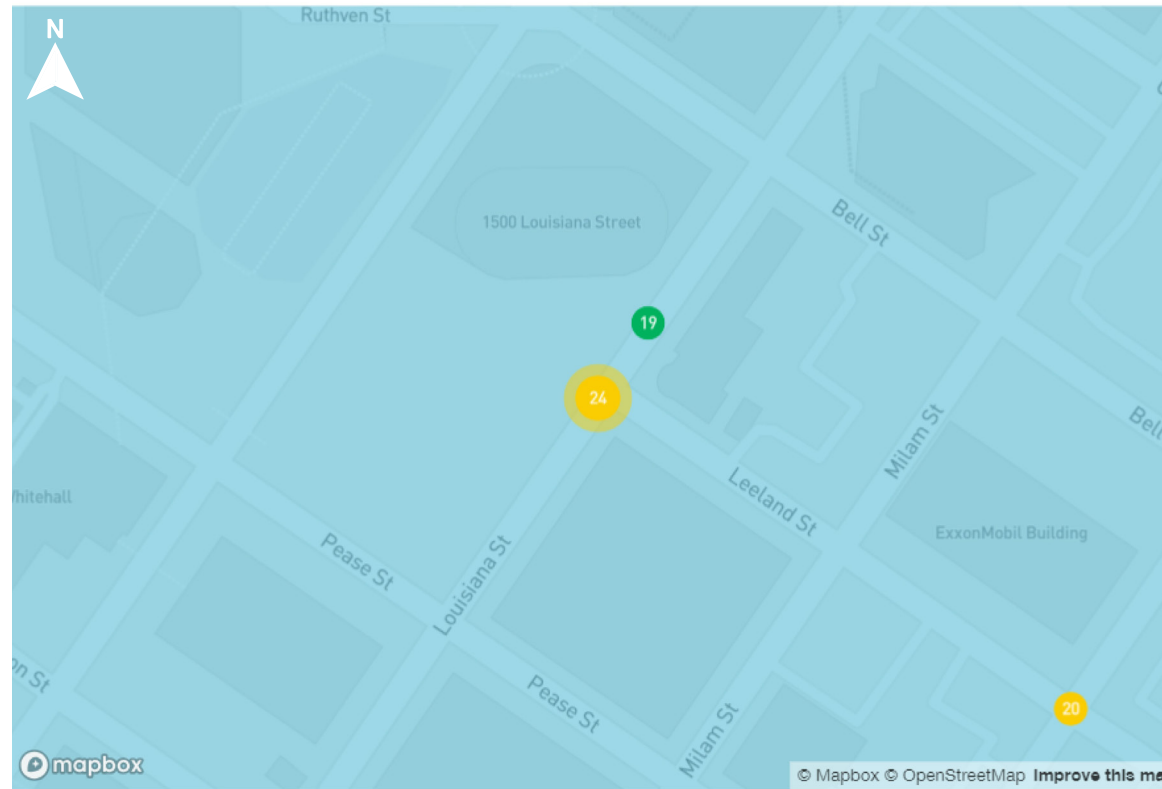
## Key Takeaways

This viewpoints looks at the park away from the Chevron Building. Although some of the façades are illuminated at night, many are not, and these create visual blockades. The parkland here is not illuminated and creates a dark void where it is hard for users to see who is coming. Illuminating this parkland and activating some of the façades will help this area match the Chevron building and unify the space.

## Opportunities

Key Opportunities for this site are listed below and are expanded upon at the end of the location overview section

- Reduce darkness across public parks
- Illuminate foliage



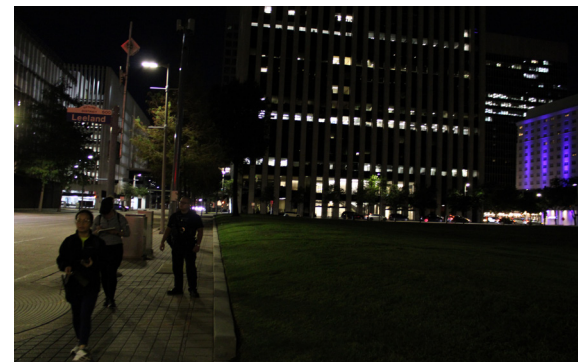
Overall Site Vulnerability Score

**57** /100

CCT: 3779K



CRI: 66.5





# 4 Conclusion

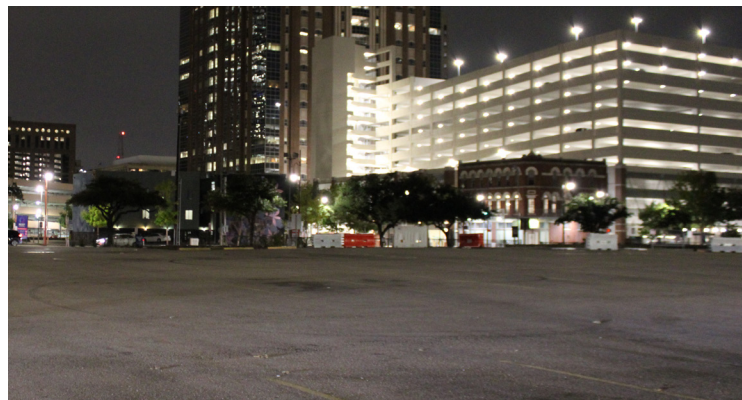
The NVA identified only a few locations deemed very unsafe for the vulnerable population.

Location 7. Sam Houston Park and 13. James Bute Park presented lower lighting measurements, and combined with absence of other pedestrians, rated the two locations as the worst pedestrian experience in Downtown Houston. With a similar vulnerable rating, location 2. Rusk / La Branch lacks uniformity and presents high contrast, although the average illuminance in the location is within an acceptable light level.

The NVA also highlighted many key areas of opportunity across the 24 locations that are consistent across Downtown Houston. These have helped provide information that allows us to engage with concepts of pedestrian safety and equal access after dark, reflect on possible lighting vulnerabilities, assess the risks involved and act to mitigate and reduce the risk to the public. A selection of different key areas of improvement have been outlined here.

These key areas will be discussed in the Arup Lighting Masterplan Report with a lighting implementation for the range of different locations across Downtown Houston.

## Activate Parking lots



Dark and empty surface parking lots contrast to the highly lit and often glary high rise parking lots. This disconnect creates empty pockets of Downtown.

## Consistent Public Transport Lighting



Create a consistent lighting across public transport stops to aid navigation and feelings of safety.

## Activate Underpasses



The underpass creates a bright spotlight for those standing within it. Activating these at night will make them more of an entrance to Downtown.

## Illuminate Foliage



Many of the walkways have low uniformity and dark light levels due to foliage growing over the street lighting,

## Increase Public Park Lighting



Many parks are not illuminated and creates a dark void where it is hard for users to see who is coming.

## Activate Retail Lighting



Prevent dark façades at night with add negative visual transparency to walkways at night.

## Relamp for Consistent Color



Ensuring a more even color temperature across site will make each district feel more cohesive.



