GUIDELINES FOR DESIGNING NODAL LANDMARKS THAT FOSTER ENHANCED PEDESTRIAN WAYFINDING, IMAGEABILITY, AND SENSE OF PLACE IN THE CENTRAL BUSINESS DISTRICT, OF DALLAS, TEXAS

by

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Presented to the Faculty of the Graduate School of

The University of Texas at Arlington in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF LANDSCAPE ARCHITECTURE

THE UNIVERSITY OF TEXAS AT ARLINGTON

MAY 2020

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ABSTRACT

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City nodes are designed and used to help improve a city's wayfinding, imageability, and sense of place. If these nodes lack evidence-based image creation and navigation facilitation design parameters, the result is often disorientation within the urban environment. This research through design thesis suggests that the Central Business District of Dallas, Texas is an ideal location for proposed design improvements. Backed by a review of literature, survey responses, behavioral observations, and research-through design, a problematic node was chosen for a detailed design proposal to improve the wayfinding, imageability, and sense of place within the West End Historic District of Dallas, Texas.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my committee chair Professor David Hopman, and my committee members Dr. Amy Archambeau and Dr. Diane Jones Allen for their guidance, support, and mentorship throughout the development of this thesis.

Also, I would like to thank all of my family members and friends for their support and patience throughout this process!

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Chapter 1: Introduction

In landscape architecture, city nodes are designed and used to help improve a city's sense of place. Many design priorities contribute to an urban environment's sense of place, including navigation, walkability, mental health, economic boost, sustainability, community pride, and loyalty to the neighborhood. In some cases, these nodes can also provide an inviting place for the community to gather. City nodes can also fill a generic city grid with landmarks that play a role in successful spatial navigation, wayfinding and sense of place. This research investigates how redesigning city nodes can address the problems of underutilized areas, within the urban environment. As a result, these nodal design improvements can potentially reduce urban blight while improving wayfinding, city imageability and sense of place, within the urban environment. Backed by research from various case studies, urban design literature, and site assessments, the concepts of developing design proposals for nodal landmark design and retrofitting them into the working city are explored. The nodal landmark design incorporates the programmatic elements essential for fostering improved user wayfinding as well as upholding and progressing a positive city image, and as a result can contribute to an improved sense of place.

1.1 Research Objectives

Various design elements of nodes and landmarks, within the urban environment, have the potential to positively impact both the city and the users of its various locales. These design elements, when applied correctly to noncomplex, monotonous environments, will improve pedestrian wayfinding, place imageability and sense of place, as a whole. Therefore, the aim of this research is as follows;

1. Identify and assess opportunities for implementation of nodal design interventions, within the Central Business District (CBD) of Dallas, TX.

2. Determine which locations, within the CBD of Dallas, TX, will be ideal locations for said design interventions.
3. Develop a design proposal for nodal design interventions within the central business district of Dallas, TX, to mitigate disorientation.

1.2 Hypothesis

Backed by a knowledge of landscape architecture, the purpose of this study is to identify multiple design parameters for nodal landmarks that will improve wayfinding, city imageability, and the user's sense of place within the Dallas central business district. These proposals can help in pedestrian navigation within the urban fabric from those traveling by foot, rail, bicycle, automobile, and other forms of transportation. It can also improve the central business district of Dallas an identity and sense of place when transitioning in and out of both districts and subdistricts in the central business district.

1.3 Research limitations

One limitation of this study is the sparse amount of community comments due to the COVID-19 pandemic. Surveys were initially intended to be distributed at site specific locations within the central business district of Dallas, TX. The initial survey distribution method, was advised against by the Center of Disease Control (CDC), resulting in an emailed version to various businesses surrounding the site-specific locations. Another limitation was the inability to test the design proposal, discussed later in Chapter 5.

1.4 Definition of terms

Imageability- "The quality in a physical object which gives it a high probability of evoking a strong image in any given observer" (Lynch 1960, p. 9).

Landmarks- "Elements with defining characteristics that are different from their surroundings and easily recognized or discernible from a particular station. They may also be buildings or elements of an urban scenes such as open space, that are different from their surroundings" (Lamit 2004, p. 66).

Legibility- "The ease with which a city's parts can be recognized and organized into a coherent pattern" (Lynch 1960, p. 9).

Linkage- "Features of an environment that promote the interconnectedness of different places while providing convenient access between them" (Ewing, 2013, p. 8).

Nodes- "Points, the exact location in a city to which the observer can enter, and which are the intensive foci to and from which he is traveling." (Lynch 1960, p. 9)

Sense of place- "Sense of place is a multidimensional attitude that describes an emotional connection to a physical environment, but it also includes values, symbols, and cultural meanings ascribed to the place" (Jorgensen & Stedman, 2001, 2006, 2011; Relph, 2008; Shamai, 1991; Stedman, 2003; Tuan, 1980, p. 1162).

Spatial cognition- The acquisition, organization, utilization, and revision of knowledge about spatial environments (Passini, 1996).

Spatial navigation (wayfinding)- Sensor input, primarily visual, that guides people through a physical environment and enhances their understanding and experience of a place (Passini, 1996).

Urban-blight- Urban decay consisting of the deterioration of part of a town or city due to ageing, neglect, and lack of financial support for maintenance (Merriman, 2009).

Chapter 2: Literature Review

2.1 Introduction

This literature review will focus on the importance, from a landscape architecture perspective, of well-designed urban nodes to aid in improved sense of place, while fostering enhanced pedestrian wayfinding and city imageability. This review assesses various works of literature showing the importance of these elements within an urban environment. The review transitions into design details of these definitions from precedent studies. These various case studies are analyzed and reviewed where cities have successfully planned and designed nodal landmarks to help improve the urban fabric, thus resulting in improved wayfinding and the city's imageability.

2.2 Perceptual Qualities of the Urban Environment

This section of literature discusses various components that make up the urban environment. These characteristics, according to scholars, are what gives the city its identity. Whether implemented correctly or not, these terms can either hinder or enhance the experience of the urban environment, if not executed correctly.

2.2.1 Imageability

Imageability is defined as the attribute of a specific location that makes it recognizable, memorable or distinct. When specific elements and their organization within the environment captures the individuals attention, a place has high imageability (Ewing, 2013). Lynch stated that the city's images can be divided into the following five terms; paths, edges, districts, nodes and landmarks. (Filomena, Verstengen, & Manley, 2019) Of these five terms, landmarks and nodes are the focus for the study. According to Lynch (1960), a highly imageable city is well-formed, contains distinct parts, and is instantly recognizable to anyone who has visited or lived there. It probes the innate human ability to see and remember various patterns. A city's image is grounded in its components grouped together in an overall legible pattern. Contributing factors to this legible pattern are the items within the urban environments. Their shape, color, and arrangement of features all facilitate the city in being vividly identified, powerfully structured, and highly useful for fostering mental images of the environment (Lynch, 1960).

Imageability is also related to 'sense of place' of an area. Cullen stated that the visual theme of an environment is an important contributing factor to a cohesive sense of place. A visual theme of a place can encourage individuals to choose to enter and remain in a space for any given amount of time (Cullen, 1961). Gehl explained this using the example of famous Italian city squares where "life in the space, the climate, and the architectural quality support and complement each other to create an unforgettable total impression" (Gehl, 1987, p. 183). Ewing (2013) stated that when all factors within a space are working together, a feeling of physical and psychological well-being will overtake the individual. This results in a feeling that a space is a thoroughly pleasant place to remain (Ewing, 2013).

The imageability of an environment is also influenced by various other urban design characteristics. Enclosure, human scale, transparency, complexity, coherence, legibility and linkage, variety, and diversity all play a crucial part in the makeup of a city's image. Of these nine characteristics listed, this study will focus on the following;

1. **Complexity**
2. **Legibility**
3. **Variety**
4. **Diversity**

These four characteristics can be implemented into the environment by various design methods. Structurally, the use of vernacular architecture adds to the complexity, legibility, variety and diversity of a place (see Figure 2). Landscape also contributes to the four characteristics listed above (see Figure 2.1). Street trees, planter pots, water features, urban furniture, all contribute to the complexity, legibility, variety, and diversity of the site. On the contrary, environments that display mediocracy in the above four terms may also evoke strong images. However, these may be negative images resulting in places that individuals want to forget. Visually repetitive industrial parks, bland strip malls, all can fall into the category of monotony. (Ewing, 2013)

Figure 2. San Francisco row houses (source: world property journal-photo by Michael Gerrity)

Figure 2.1 Rue Cremieux, Paris (source: Luxuo.vn)

2.2.2 Monotony

The importance of variety has been noted by various social scientists; each one of the scientists focus on the problems of an environment without variety, stressing the negative effects of monotony. “One of the most common experiences in a monotonous environment is to pass a place, regularly, without being aware of the physical elements in it” (Lozano, 1974, p. 358).

If monotony is defined as the quality of the environments lacking visual variety, then it can be said that monotonous environments lead to disorientation for two specific reason (Lozano, 1974).

In a study conducted by Evans and Piggins, the authors focused on how “all biological systems, particularly those equipped with specialized receptors and complex nervous integration centers, respond primarily to a changing environment” (Lozano, 1974, p. 358). The study found that one's mind responds to and receives information that is constantly changing rather than an aesthetic that remains constant. This is grounded in one's subconscious survival instincts. Since the natural environment is constantly changing, visually as one progresses through it, a steady repetitive environment seldom if ever occurs (Lozano, 1974). Because of the lack of differentiation in the environment, the brain tends to overlook the repetitive characteristics as it looks for variety to stimulate its self. This displays that an environment organized exclusively on low-level order, which is a strong visual aesthetic of traditional modern urbanism, will not be properly processed in a sense of conscious perception (Lozano, 1974). Since traditional modernism reflects little variation in visual aesthetic, continuous exposure to this architectural element will result in disorientation in the unchanging environment. To combat this lack of variety of the existing built environment, Ewing stated that adding various types of landscape elements to the monotonous environment (see Figure 2.2) can add to visual stimulation, thus triggering the mind's need for variety and changed in the environment (Ewing 2013).

Figure 2.2 Pruitt-Igoe: St. Louis public housing project 1956- showing lack of landscape elements which could have added to variety of the environment. (source: city of St. Louis – Bowser)

"Sensory deprivation caused by monotony is not only reducing the potential for orientation but could result in other negative effects of the observer, if he or she is immersed in the monotonous domain for a considerable amount of time" (Lozano, 1974, p. 358). According to Hall, when an individual moves through space, he or she depends on the visual messages received from the body to stabilize the visual world. Without such body feedback, people can lose contact with reality, causing panic (Hall, 1969). If the sensory deprivation corresponds to the individual's field of vision, the results could be negative because vision is the main system of guidance when moving through a space (Lozano, 1974) (see Figure 2.3).

Figure 2.3 lack of visual differentiation - monotony through modernism - Igoe homes: St. Louis, MO – July 23, 1955 – (source: city of St. Louis staff photographer)

The lack of minimum differentiation, is the second reason for disorientation in a monotonous environment (see Figure 2.4). Understanding that imageable and navigable environments need to be both simple and easily understandable while simultaneously offering various subtle changes in orientation differences. This provides clues to users within the environment when identifying specific landmarks for spatial orientation (Lozano, 1974).

Figure 2.4 Minimum differentiation - Hilton hotel, Gateway #1, and The State Office Building – Pittsburgh, PA 1964 (source: Plastichrome by Colourpicture)

An example of the orientation advantages of gradations and differentiations involves a comparison between a Manhattan-type city grid and a Portland (Oregon) -type city grid. In the first case, the Manhattan type of pattern (rectangle) offers a sense of hierarchy (see Figure 2.5) and gives users a sense of orientation if they lose their bearings. As long as users are aware of which side of the block is greater in length, they can soon re-orient themselves in the environment (Lozano, 1974). However, in a city grid that one would find in Portland (square), the lack of variation could result in confusion and lead to disorientation. “While the first is simple and understandable, it is also able to communicate more information on the observer’s location in it than the second” (Lozano, 1974, p. 359).

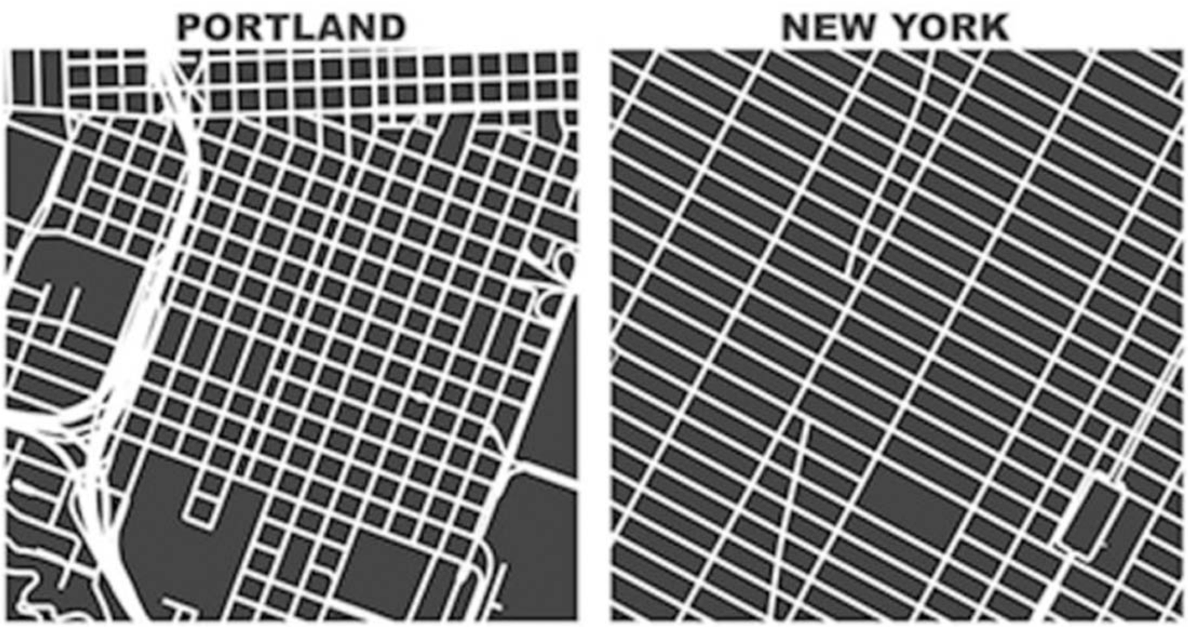


Figure 2.5 Diversity in urban city grid- Square city street grid vs. rectangle street grid (source: Shaunacy Ferro – mentalfloss.com)

In conclusion, urban designers should provide distinctive clues which avoid simplistic visual organizations that can result in a sensory deprivation, which will foster disorientation. Combining multiple visual orders will strengthen the complexity of a built environment. The addition of multiple landscape elements, is one design intervention to resolve the low visual orders of the monotonous surrounding architecture. Comparing Figures 2.4 & 2.6, the addition of street trees adds complexity to this monotonous environment at present day gateway center park in Pittsburgh, PA. (Lozano, 1974) The complexity of the trees visually breaks up the historic modern architecture. This addition of complexity allows gives each building its own identity, breaking the visual monotony of the space.

Figure 2.6 Present day gateway center park, street trees add complexity while assigning individuality to the buildings – Pittsburgh, PA (source: googlemaps.com)

2.2.3 Headings and navigation

The complexity of an environment reflects the visual richness of a place. The complexity of an environment relies on the diversity of the physical environments. Ewing (2013) stated that contributing components of an environments complexity are its:

1. Visually distinctive buildings
2. Architectural diversity and ornamentation
3. Landscape elements

4. Street furnishings
5. Human activity

The complexity of an environment is also related to the number or noticeable visual differences that an individual will observe in the time frame in which they pass through the environment. Because of this required time frame, individuals are most comfortable receiving and processing this information at appropriate rates of time while traveling through the environment (Ewing, 2013). Reviewing the previous study conducted by Evans and Piggins on the need for variety in the environment for successful navigation, it is known that too little information can result in sensory deprivation. In an additional study conducted by Rapoport and Kantor, subjects experiencing a high surge of visual complexity within an environment displayed signs of disorientation in the space (Rapoport, 1990). Rapoport contrasted the complexity requirements of pedestrians and motorists. Slow-moving pedestrians require a high level of complexity to hold their interests, whereas fast-moving vehicles perceive this as confusing and disorienting and chaotic.

Figure 2.7 complexity from building façade on K street in Washington, D.C.

(source:republicfamilycompanies.com)

The width of buildings can also add to complexity. “Narrow buildings in varying arrangements add to complexity, whereas wide buildings subtract” (Jacobs, & Appleyard, 1987)

Figure 2.8 Narrow building adding to visual complexity (source: Bruce Henderson Architects)

Figure 2.9 Wide buildings in Dallas' skyline fostering monotony (source: city of Dallas - photographer unknown)

Velessen (1994, 224) wrote that "If a particular building or up to three buildings are merely repeated, the result will be boring, and mass produced." This environment then becomes monotonous, which can cause negative impacts on the users in the space. Other contributing factors adding to complexity of a space are; signage, pedestrian activity, and trees. "Complexity is one perceptual quality that has been measured extensively in visual assessment studies (the development of an object's physical asset that are visible by the naked eye and can be evaluated in the field). It has been related to changes in textures, widths, heights, and setback of buildings

(Elshestaway 1997), as well as to building shapes, articulation, and ornamentation" (Heath, Smith, and Lim, 2000; Ewing, 2013, p. 7).

Other elements of the built urban environment can also contribute to the cities' complexity. Street trees serve various types of important functions within the urban environments. One of their functions is to restore the rich textural detail missing from modern architecture (Ewing, 2013). Light that has been filtered through the canopy of the tree gives life to a space. By manipulating light and shade simultaneously, it can transform stone, asphalt, and concrete into textiles of sunlight and shadow (Ewing, 2013). Street furnishings such as; fountains, benches, special paving, and street art are combined to make unique and imageable places (Jacobs, 1993).

2.2.4 Variety and Diversity

Variety can be defined as the characteristic of an environment made up by multiple sets of similar but not identical characteristics (see Figure 2.1). Their similar characteristics group the objects together to create a sense of harmony between one another. For example, Figure 2.1 displays the visual architecture aesthetic creates harmony between the buildings while the planter pots add to the complexity of the environment. However, no two objects are the same, subtle changes in detail, and appearance give the object complexity and variety (see Figure 2.1) (Lozano, 1974). As seen in the photo below of Vancouver (Figure 2.10), all buildings visually tie together but are different in height to give a complexity dynamic, while the exterior landscape also adds to the complexity of the environment at this scale.

Figure 2.10 Buildings Vancouver's variety in height (source: Grant harder)

Diversity is another element that goes hand-in-hand with variety. When defining diversity, it is simply an expansion on the word variety. "Diversity implies higher levels of differentiation than variety and may be applicable only to cases of analogy. For example, a row of residential brownstone buildings exhibiting minor architectural differences of detail is a case of variety within a common typology and homogenous use; but diversity should be applied to qualify the whole set of different building types devoted to housing in a given area" (Lozano, 1974, p. 357). The implementation of transportation modes, land uses, housing types, activities and people all are contributing factors to improving diversity within a space (Gehl, 1996). From a landscape architecture stand point, an example of diversity implementation can be flexible space design for streets, city nodes, and parking lots. The flex space would allow various types of actives to take place in the space, not limiting the area to just a single function. According to Jacobs mixed use development sites are an example of an area with positive visual diversity.

This setting creates pedestrian activity throughout the day and night of a space. Thus, the mix results in the appeal, safety and economic function of a place (Jacobs, 1961).

Figure 2.11 New York Brownstones (source: curbed.com - Robert Khederain)

Lozano discussed the importance of variety by stating the following because of the importance of variety in urban design, many social scientists have researched the topic. Many of these research reports focus on the problem of an environment without variety, stating the negative effects of monotony. Also, these findings are asserting the positive need for variety within an individual's environment (Lozano, 1974). The findings state that without clear variety and diversity, the space or environment will become monotonous, thus resulting in disorientation.

2.2.5 Legibility

The fourth term, legibility can be defined as; "the ease with which its parts can be recognized and can be organized into a coherent pattern" (Lynch 1960, p. 2). It is the repetition, and constant familiarity that one grows accustomed to. Repetition does not imply that all objects should visually be identical (this will result in monotony). Uniformity and repetition in identical appearance is disorienting. In this sense, repetition means sustainable without constant change. The result of this repetition will create a visual harmony throughout the built environment. The familiarity gives the pedestrians a sense of security; its familiarity is calming and reinforces a built environment's safety (Ewing, 2013).

Figure 2.12 Architectural harmony, Historic Gastown, Vancouver, BC (source:thetelegraph.com) Harmony in the massing building architecture gives a sense of repetition but there is variety and diversity in the details on the buildings.

"The more memorable one's mental images of a place, the stronger the potential for a bond to develop between people and place" (Ruggeri, p. 120). The easier a place is to visualize, the easier it is for mental mapping. When studying an areas sense of place; physical attributes, and organization foster an imageable sense of place (Brown & Cropper, 2001; Gifford, 2007; Kim & Kaplan, 2004; Lee, 1968; Pendola & Gen, 2008). Modern planning trends seem to pay attention to some places meaning (Ramadier & Moser, 1998) Because of this, if one is to ignore the symbolic meanings of the physical urban elements, it can result in monotony. "The legibility of a place is improved by a street or pedestrian network that provides travelers with a sense of orientation and relative location and by physical elements that serve as reference points" (Ewing, 2013, p. 8). By improving the streets, or paths in which one travels, improved wayfinding can be the result.

Places with visually distinct landmarks, and busy nodes allow people to form detailed and relatively accurate mental maps of the space. Conversely, a city that has no readily perceptible nodes or visually interesting features (landmarks) will be difficult to make sense of and to remember (Ewing, 2013, p. 8). Ewing added that legibility expedites wayfinding, resulting in an efficient choice in a route between two points, or an alternate route after the initial route has been deemed impassable. He also boasted that this can aid in the learning of a new spatial environment, especially when implementing distinguishable landmarks into the equation. Both landmarks and nodes have importance on the influence of imageability when it comes to the spatial mapping and legibility of a place.

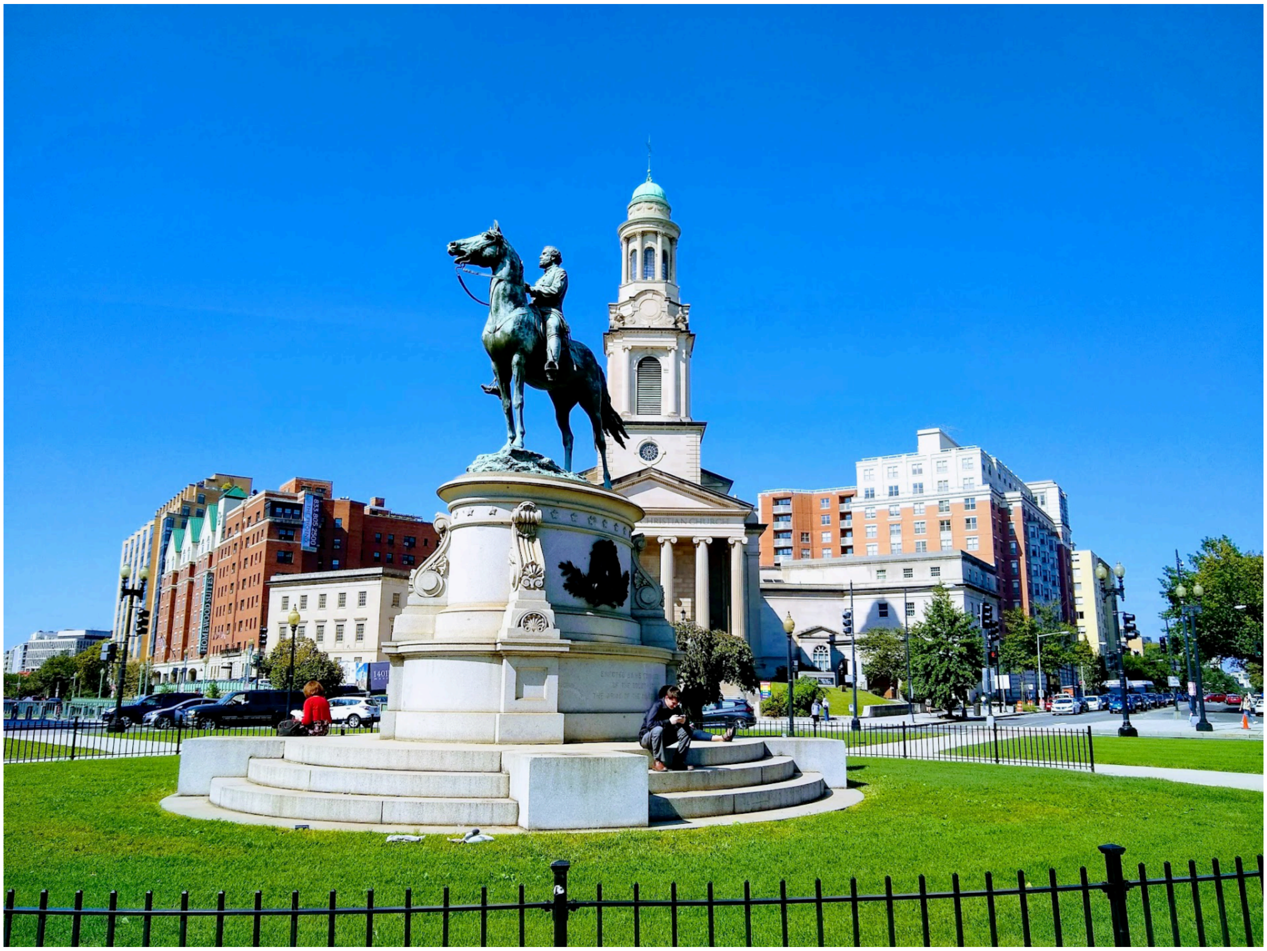


Figure 2.13 Washington D.C. nodal landmark ‘General George Henry Thomas statue’

(source: Jeffery Clark google earth)

According to Ewing, the street network layout of a city is also a key factor in legibility. However, this can sometimes be ambiguous (Ewing, 2013). “A regular grid of streets makes it easy for people to navigate even when they are unfamiliar with a place, although it does not provide a way of distinguishing one block from another. An irregular pattern of streets, in which blocks are of irregular length and compass orientation changes from block to block, may increase the difficulty of navigating and learning the network, although it distinguishes each block with different lengths and orientations” (p. 9).

In conclusion, working together with other elements within the environment, a city's grid system plays a crucial role in determining the legibility of a place. Signage, helps the user differentiate one area from another and to also orient and guide a user through the environment they are in. Landmarks that have already been identified as aiding in a city's imageability also play a crucial role in the users creating successful mental maps of an area, thus improving the legibility of a built environment.

Ewing ended with the statement that "visual termination and deflection points also contribute to legibility" (2013, p. 9). These visual termination points create focal points with in the environment. They are believed to focus the community, and also foster a degree of enclosure to the setting. On a larger civic scale, these can be large buildings, prominent landmarks and sometimes elements of nature. On a 'district' size scale, visual termination points can be created using smaller scale items. Examples of this include pergolas, landscaped traffic circles, bends in the road, and decision points in the road (nodes), where multiple streets meet (Ewing, 2013). Jacobs said the following, in regard to streets: "Since they have to start and stop somewhere, these points should be well marked." (Jacobs, 1993, p. 297) He stated that well-marked terminuses or end points can serve as beneficial reference points and can also foster a memorable identity of a place (Ewing, 2013).

2.3 Nodes

"Nodes are the strategic foci into which the observer can enter, and which are the intensive foci to and from which he is travelling. They may be primarily junctions, places of a break in transportation, a crossing or convergence of paths" (Lynch, 1960, p. 47). "But although conceptually they are small points in the city image, they may in reality be larger squares, or somewhat extended linear shapes, or even entire central districts when the city is being considered at a large enough level" (Lynch, 1960, p. 72). In a case where the junction or place of separation occurs in transportation, this can become important to an individual within the city. Because "decisions must be made at junctions, people heighten their attention at such places and perceive nearby elements with more than normal clarity" (Lynch, 1960, p. 72). According to Salingaros, when striving to improve the overall structure and organization of the built environment specifically pertaining to district transition, connecting nodes incrementally has proven beneficial. A sense of organization, harmony or connectivity is reached because of this attention to detail. Every observer, in the built environment, will then experience this urban environment as being 'linked' together, thus fostering improved legibility of the city (Salingaros, 1998).

Ewing re-enforced the importance of linkage between nodes. "Linkage can be defined as features that promote the interconnectedness of different places and that provide convenient access between them" (Ewing, 2013, p. 8). Both linkage and connectivity are focused on the ease at which a user can successful navigate throughout the built environment. This success is grounded in the design quality of nodes at which these navigational decisions are made. According to Ewing, maintaining site lines, cohesive sidewalks, and continuous tree rows, are positive examples of fostering successful nodal linkage in the built environment. (Ewing, 2013).

In summary, nodes mark points where wayfinding decisions are made. Knowing this, proper design techniques must be taken into consideration when planning a pedestrians navigation, within the city. In this research, transition points into both districts and subdistricts is the primary area of focus. Targeting nodal points that portray characteristics of a perceived 'non-place' urban realm, is imperative and interpolating design strategies to improve these areas or 'nodes' of non-place, is imperative.

2.3.1 Non-Places

According to the French anthropologist Augé, the term non-place refers to spaces where the concerns of relations, history and identity are erased. They are characterized by a feeling of detachment between and individual and the space the individual is traveling through.

These 'non-places' are rendered passive / monotonous and go unnoticed, by the traveler, when passing through the space (Merriman, 2009). As a result, for fostering monotony, these areas of non-place prove to be disorienting to the individuals traveling through them.

Figure 2.14 Example of 'non-place' Dallas farmers market street node (source: Michael Webb)

Figure 2.15 Decision point node example - Logan Square, Philadelphia, PN (source: Neil Gilmore)

Figure 2.16 Imageable nodal design intervention MLK Gateway-Portland, OR (source: 2.ink Studio Landscape Architecture)

2.3.2 Nodes & Landmarks

Although similar to nodes, landmarks also add to an environments imageability and also act as a cornerstone for visual navigation throughout the urban environment. According to Lamit, landmarks are “elements with defining characteristics that are different from their surroundings and easily recognized or discernible from a particular station. They may also be buildings or elements of an urban scenes such as open space, that are different from their surroundings" (Lamit 2004, 66). According to Spreirege, one of a city's more prominent visual features are their landmarks. One of these primary urban features are buildings. Buildings fall into this category of landmarks because of their variety in texture, size, and color. Because of their variety in these visual elements, they contrast well with the elements around them. Depending on their level of variety, these landmarks have memorable effects on the passerby and they are easily noticed. A result of visual contrast to the environment around the landmark, results in the passersby remembering the structure. In order the landmark to be successful, from a mental mapping standpoint, the surrounding elements should complement its size, design, color and or material. In conclusion, a good landmark is the one that is clear and evident but also a harmonious one, within the built environment (Bocekli, 2003).

'Landmarks are also important elements in the urban form. They have been considered to weave buildings, neighborhoods, squares and streets together. They also help individuals orient themselves in an area, as well as provide an identity to a certain place, when designed correctly. They can also transport information beneficial for effective and efficient circulations within the public space of the city. Their most important purpose, is giving an identity and structure to the public realm to help with the cognitive mapping of the user's city. Strengthening the image of the city for the citizen and visitor should be the first aim of the usage of landmarks' (Bocekli, 2003, p. 8).

'Landmarks can be broken down into basically two groups; the first of the two, a civic or 'distant' landmark, is a landmark that can be seen from various locations throughout the city. In a setting such as this, the landmark can be the most dominant element in the skyline. It can and will typically be used as a major point of reference for the individuals of the city. These specific types of landmarks could be, but are not limited to; hilltops, mountains, and towers. But regardless of the construct of the feature, one predominant characteristic they must all have, is that they must be seen from a distance and from multiple angles' (Bocekli, 2003).

Figure 2.17 Civic landmark Space Needle in Seattle, WA (source: Angela Brown)

Figure 2.18 Civic landmark Eiffel Tower, Paris, France (source: Alex Waltner)

The second group of landmarks is much smaller in scale. These district landmarks can only be seen from closer range, at a pedestrian or vehicular level, or from nearby buildings. Examples of these elements in the landscape include fountains, monuments, statues, sculptures, parks, trees, and clock towers. Although smaller in scale, these objects act as clues of identity that can make the travelers journey much more easy and familiar. Elements that are weak and are not connected in a cohesive sense can be designed in clusters and strategic sequences. This strategy will foster a more imageable environment to the traveling observer. Designing with sequence and cluster can then aid in better spatial mapping for the observer (Bocekli, 2003

&Lynch, 1960).

2.19 District landmark Farragut Square, Washington D.C. (source: Thomas Guiset)

In conclusion, both civic and district landmarks are important when it comes to creating a lively image for the observer and in helping with the mapping of an urban environment. They also contribute in creating a memorable urban landscape. Ornamentation in the city with various landmarks offers the designer and opportunity to give the users something to remember. They also aid in the cognitive mapping of the city. According to Moughtin, one of the primary jobs of a decorative imageable landmark is to build the image of a place (Bocekli, 2003). Landmarks containing properties with historical, memorial, symbolical, or other important meanings will be stronger in the person's ability to retain it cognitively. Also, landmarks that are built for sustainability, visible for years or even centuries are stronger with spatial mapping as well. The elements listed above are a stable point for the pedestrians and for the urban environment.

According to Bockli (2003), all successful landmarks / nodal landmarks have either historical, symbolical, or memorial properties.

2.4 Spatial navigation / Wayfinding

Spatial navigation (wayfinding) can be defined as information systems that guide people through a physical environment and enhance their understanding and experience of a space. It was led by the concept that spatial orientation, which referred to a “person’s ability to mentally represent the spatial characteristics of a setting and the ability to situate him or herself within that representation” (Passini, 1996, p. 322) “Wayfinding does not limit itself to the person’s representation of space (cognitive map) but includes all the mental processes which are involved in purposeful mobility. Wayfinding is a generic concept which incorporates the notion of spatial representations. Defined in terms of spatial problem solving. Wayfinding is composed of three interrelated processes:

1. **Decision making**, and the development of decision plans also called action plans.
2. **Decision execution**, transforming decision plans into behavior at the right time and place along a route.
3. **Information processing**, comprising environmental perception and cognition which provide the person with the information necessary for the two decision related processes” (Passini, 1996, p. 322).

Decision making is the step-by-step process that is required to negotiate an unfamiliar path between two points. A wayfinding study conducted by the U.K’s department of motor vehicles, focused on the topic of automotive decision making. This study provided elements that foster driving errors within the urban environment. Among all of the reasons, lack of clarity in street grid change and poor sign visibility were at the top of the reasons for poor vehicular wayfinding decision making. Specific places reported to cause problems were; road repairs / diversions, one-way road systems, large complicated junctions and new road layouts, within the urban context (Burns, 1998).

Decision execution happens on an already familiar route. Because of their hierarchical structure, decision plans / execution are easily retained. Decisions, according to Passini, are composed of a behavior; to go up, to look at, to turn right at. If the place's identity is understood in real time this behavioral example is executed. On the contrary, if the identity is not understood or 'familiar' to the person, this behavior cannot be carried out. This then results back to decision making (see Figure 2.20) (Passini, 1996).

Information processing "is when the information made available by the environment is processed by a series of processing systems (e.g. attention, perception, short-term memory)" (McLeod, 2008, p. 1). According to the model below, when drivers encounter an uncertain node / decision point, they must resolve the ambiguity of having multiple path options.

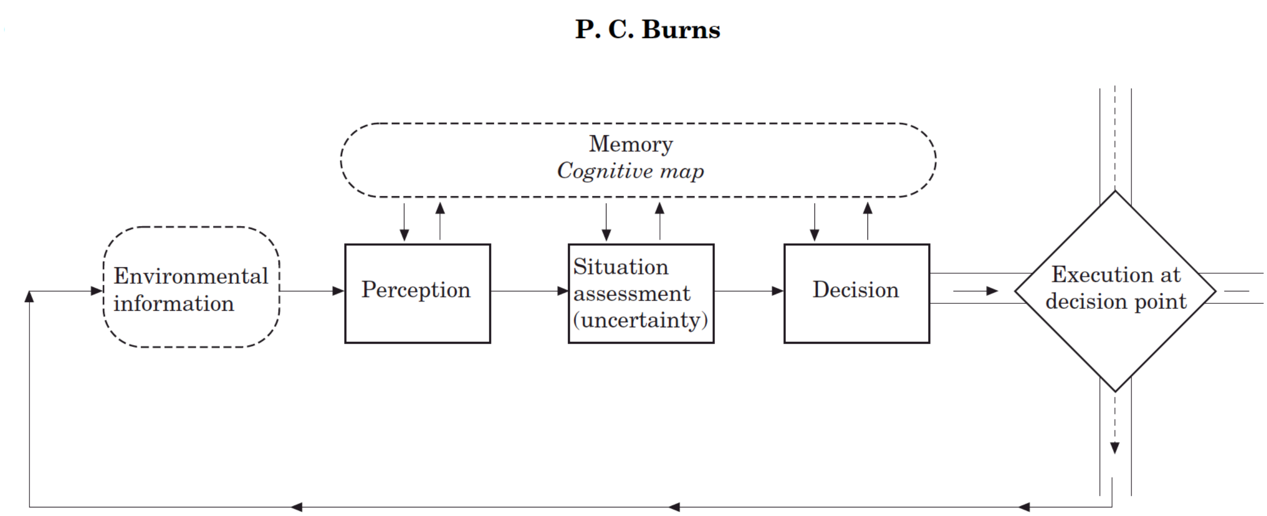


FIGURE 1. Model of wayfinding while driving.

Figure 2.20 Wayfinding while driving (source: Burns, 1998, 210)

According to Burns, the information which reduces the ambiguity of wayfinding decisions is recognized from our perception of the built environment and or has to be obtained from the individual traveler's mental map of the location (Burns, 1998).

2.4.1 Spatial working memory and greenspace

A study from Flouri, Papchristou, & Midouhas in 2018 researched the importance of greenspace and its benefit to the spatial working memory of child and adults within the urban environment. Spatial working memory is considered to be 1 of the 4 components of an individual's working memory. (Ang, & Lee, 2008; Jones, Farrand, Stuart, & Morris, 1995). "One's spatial working memory refers to the ability to retain and process visuospatial information and is strongly inter-related with attentional control" (Flouri, Papachristou, & Midouhas, 2018, p. 360). "In order to temporarily store and manipulate visuospatial material, as well as navigate and find objects, one must not only retain information on locations but also hold and manipulate information for short periods of time while concurrently inhibiting distracting information, an attentionally demanding task" (p. 360).

Another factor of the spatial working memory is Attention Restoration Theory. According to Kaplan Attention Restoration Theory engages passerby in involuntary attention to space. These spaces are primarily greenspaces and gardens, especially when found within the urban environment (Flouri, Papchristou, & Midouhas, 2018). Individuals will pass a greenspace and subconsciously be visually drawn to it. This involuntary attention to detail proves beneficial in the spatial working memory of individuals and wayfinding through complex urban environments (Blades, 1991).

In conclusion, greenspace within an environment causes individuals to explore their surroundings. Implementing greenspace throughout urban environments aids in improved wayfinding decisions and strategies. The greenspace encourages individuals to invest and immerse themselves in the environment. Greenspace, encourages an individual to frequently travel through and exploration their environment. Thus, resulting in the constant probing of one's spatial working memory which improves spatial navigation and wayfinding for the urban environment as a whole (Flouri, Papchristou, & Midouhas, 2018).

2.4.2 Orientation

According to Lozano, orientation is defined as the self-awareness on one's location within the environment, "when involving consciousness of general direction and distance to specific orientator [sic]-landmarks, which determines his or her relative position in an understandable and highly predictive spatial organization" (Lozano, 1974, p. 354).
Ideally, the sense of orientation should appear the same to both individuals who are familiar with the environment and others who are new to the environment. The visual matches and clues should be legible to both the everyday user and the individuals new to the space (Lozano, 1974).

When looking at the importance of orientation, a variety of social scientists stress the importance of this. One social scientist Hall stated that an individual's desire to be oriented properly with in a space lies deep within someone. This yearning for orientation is linked to our survival and sanity as a human race. If left in a state of disorientation, psychosis can eventually set (Hall, 1969). Lozano added that the ancestral need for orientation was paramount for daily lifestyle and survival. This same feeling of psychological demand is still felt today, without the direct sense of danger our ancestors used to face. (Lozano, 1974). "One of the most fearful experiences is to find oneself lost in a place that was assumed to be known" (Lozano, 1974, p. 355).

Contemporary urban life is constantly backing one's desire for orientation. "One of the more obvious examples of this lies within the potential level of personal danger that can be found within the metropolis, that can be compared with the survival needs in a wild environment. In this case, certainty of one's location and of one's capacity to sort out the minimum risk paths are essential" (Lozano, 1974, 355). There are other case too, outside of this extreme example that should be taken into consideration; decisions such as exiting a highway when driving at fast speeds, locating a street address while traveling, and locating goods and services are examples. With this being said, Lozano added that orientation does not just serve and an individual reaching a destination. He stated that orientation lies more on the psychological level. Orientation of a space calms the individual, thus promoting enjoyment of the environment. "Since the process of experiencing orientation is the result of a match between perceived visual clues and cognitive structures in the observer's memory, it is clear that it will increase with the personal experience of the environment" (Lozano, 1974, p. 355).

2.4.3 Architectural orientation

"Disorientation can be described as a typology of altered mental status. Orientation is knowledge of one's personal identity, location, date, time and present situation (www.healthline.com). Architectural orientation is grounded in legible identity, fixed relationships, and clear boundaries within the urban context. "Ultimately, orientation is what defines architectures location in both time and space while separating it from other spaces or places. The ability of architecture to orient both itself and society in space and time has been one of the most essential features, and in some cases a failure of the discipline." (Narell, 2016, p. 3)

2.4.4 Nodal Landmarks and successful wayfinding design characteristics

According to Passini, "wayfinding design concerns all features of the build environment which are related to the purposeful circulation of people and their ability to mentally situate themselves in a setting. These design features include spatial layouts, architectural features related to circulation and graphic displays including audible and tactile supports" (Passini, 1996, p. 320). "We must always remember, people get lost in complex urban settings, in fact, many people regularly get lost. Some designers, architects and graphic designers, will blame the users for not having a sense of orientation, for not paying enough attention to signs, for not seeing things when they are evidently there and for not understanding the simplest messages" (p. 321). Passini added that "the premise of wayfinding design is to plan for people's behavior in the real setting, that is, to design for their ability to perceive, select and understand information when faced with dense and stimulus rich environments, to design for their ability to understand the spatial characteristics of settings and their movements through them and finally, to design for their ability to develop decisions in order to reach destinations" (p. 321)

"Allen, categorized human navigation into three basic forms – the commute, the explore, and the quest (this term defining navigation to an unfamiliar destination) –he also recognized and highlighted the importance of landmarks in a piloting strategy used for a quest" (May, & Ross, 2006, p. 347). Thus, the term "piloting / aiming stake, involves the use of landmarks for environmental navigation. A quest is often guided by route directions that consist of a listing of landmarks with actions designed to lead from one to another" (Allen 1999, pp. 555-556). 'Humans perceive places not only as spatial locations (Creswell, 2004) but as social zones where meaningful representations of, and emotional connections to, people and setting can be formed

(Kearns & Gesler, 1998; Wilson, 2003) Spatial behavior, such as navigation, is more effective in urban environments when particular physical attributes have meaning for the navigator.

Kaplan outlined "two theoretical factors that lead to a place or objective acquiring landmark status: the frequency of contact with the object or place and its distinctiveness. Three types of distinctiveness were hypothesized: visual distinctiveness (a predominantly objective quality relating to the physical attributes that discriminate it from the surrounding environment); inferred distinctiveness (knowledge concerning its structure or form that makes is stand out from what is usual); and functional distinctiveness (the salience in terms of the goals or sub goals of the individual). In addition to the visual characteristics of nodal landmarks and their functional or social importance, the location of an object within the environment has also been shown to impact significantly on its effectiveness as a landmark" (May, & Ross, 2006, pp. 347-348).

Also, several studies have commented on various types of successful nodal landmark characteristics that are particularly useful in pedestrian navigation. Whether a pedestrian is walking, biking or driving, the following characteristics have been proven useful in numerous studies. "A study conducted by Akamatsu, Yoshioka, Imacho, Daimon, and Kawashima (1997) focused on the analytics of driving a vehicle with a navigation system in an urban environment and the importance of incorporating landmarks in the artificial intelligence verbal directions commands. The study found that the most beneficial of the nodal landmarks that were included in their study were noticed from a distance, unique in appearance, and close to and or part of the road infrastructure. In another case study, evaluating the usability of route guidance and traffic information systems, submitted by Green, Levison, Paelke, and Serafin (1995), their conclusions were the best landmarks were also close to the road, visual from a distance, permanent and near junctions. In another study, Burnett, Smith, and May (2001) identified five attributes that were characteristics of "good" nodal landmarks for pedestrian navigation: permanence, visibility, usefulness of location, uniqueness (incorporating distinctiveness), and ability to be described with brevity" (May, & Ross, 2006, p. 348). In conclusion, in regard to the study at hand, landmarks were generally defined as external reference points that were theoretically useful to a pedestrian as a navigation cue. A nodal landmark's visibility to an approaching individual, its uniqueness in regards of being dissimilar to other nearby objects, its familiarity to a typical viewer, and the usefulness of its location when being integrated within other environmental information in order to support navigation at a pedestrian's decision points (urban nodes) (May, & Ross, 2006). "As with regions too many landmarks can undermine their helpfulness. In order to aid with human orientation, the landmarks should be easy to distinguish. While it is important that the landmarks be distinctive, they should also be in tune with their surroundings. Distinctiveness that is jarring may not hurt way-finding but may detract from the overall experience of the place" (Kaplan, Kaplan, & Ryan, 2005, p. 54).

Furthermore, the location of nodal landmarks with regard to the route should be considered. Denis (1997) suggested that way finders often use both landmarks and nodal landmarks for the purpose of reorientation which happens at decision points where change of direction is necessary to reach the destination. Lovelace and Colleagues (1999) suggested that landmarks are not only important at locations where reorientation is needed, but also crucial at points where change of directions can be possible. At these potential decision points, way finders need to maintain their orientation by continuing toward the same heading directions" (Schwering, Krukar, Li, Anacta, & Fuest, 2017, 283).

In conclusion, the design characteristics of nodal landmarks can either foster advantageous or negative effects on an individual while traveling through a space. Their visibility, characteristics, visual aesthetics, symbology and historical value should all be taken into consideration, in the schematic portion of design. Finding the ideal location at decision points (nodes) while blending in the surrounding environment is paramount when designing the space. If the design is executed correctly, the nodal landmark will improve the not only the wayfinding experience of the user but also the imageability of the city, as a whole.

2.5 Precedent Studies

The precedent studies analyzed for this research range from site specific scale to overall city scale projects. These projects will provide visuals for successful implementation of design aesthetics and principles to foster a positive sense of place, while improving the city's imageability, pedestrian and vehicular wayfinding. the three urban environments offered insight on various designers and strategies with complex nodal points, the urban environment. The strategy of integrating complexity into an existing urban environment was also reinforced through these precedent studies.

In the subheadings below, discussion of two of the three locations will focus on successful design intervention examples that take place in these two different urban locations. The first is in Vancouver, BC. which in itself, is a model for new urbanism, studied by planners, architects and landscape architects all over the world. The second location is Washington, DC which is known for its successful interventions at various street intersection nodes, where more than two streets come together. The final case study will be of Denver, Colorado. Denver relates most closely to the problem at hand. Its dynamic street grid, historic modern architecture, and nodal design interventions will be crucial in this review.

2.5.1 Vancouver

Location: Vancouver, BC., Canada

Founded: 1886 A.D.

"In terms of both aesthetic and livability, Vancouver is one of the world's most widely admired cities. It is a place where the skyline has been painstakingly designed to preserve striking views of the mountains and harbor. It is a place where high density residential neighborhoods are mixed with green space to create a walking-scale environment in which cars are an afterthought" (Kiger, 2014, p. 1). Walsh stated that Vancouver is said to be one of the better of the executed cites as far as city standards go. Revitalization, in the late 1960's put this model city on a course for what it is today. But there was a time when the well-designed Vancouver as individuals know it today, did not exist. Through various planning acts, zoning changes and big political moves, the city began to change for the better (Walsh, 2012). While there are many avenues to explore in the development / change that brought this city to the image it is currently, this study will examine a select few.

One of the first issues addressed was the city grid. "The original city street pattern was a haphazard collection of shifting street grids that were laid out as the city expanded, resulting in awkward intersections and shifts in grid orientation that impeded the movement of the traffic. In his reports and the eventual 1929 Vancouver Plan, Bartholomew set about systematically addressing these myriad concerns. He proposed improving traffic flow in Vancouver by adjusting the various street layouts, eliminating irregularities, and widening intended traffic arteries. Although this was not something he could change right way, this was a long-term goal that can improve the navigation aspect for all users" (Walsh, 2012, pp. 108-109).

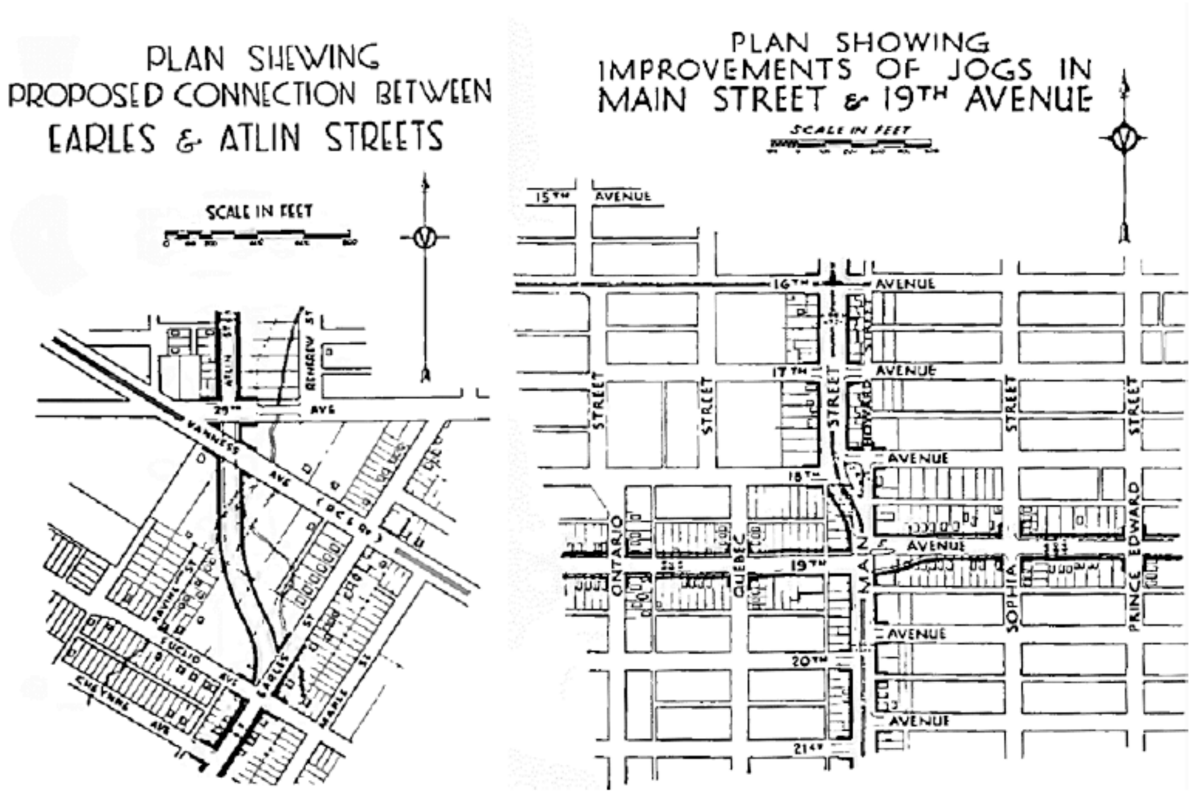


Figure 3.3: Two examples of revised street configurations proposals intended to improve traffic flow on city streets in Vancouver at specific intersections (Bartholomew, 1929).

Figure 2.21 Street grid adjustment – Vancouver, BC (Source: Walsh, 2012, p. 108-109)

Vancouver shows the benefit of correcting the convergence of multiple street grids into one uniform street system. It also displayed the beneficial use of street trees adding complexity to the built environment as well as maintaining sight lines for pedestrian within the city.

1. Redesign of the city's multiple converging grid. (see Figure 2.21)
2. Street trees adding complexity to the urban environment. (see Figure 2.22)
3. Maintain sight lines for improved pedestrian navigation. (see Figure 2.22)

Figure 4.4 Vancouver, British Columbia-complexity and sight lines (source: googleearth.com)

Second, Vancouver is making a progressive effort to move toward reduction in vehicle traffic. With less focus on the vehicle needs, more attention has been placed on the design of the buildings within the urban districts, and other elements that go along with this. The elements in the districts are intended to strengthen and emphasize the connections between the interior and exterior environment of the city (Walsh, 2012) Unlike most cities, that place large high rises into small lot sizes, to facilitate local business, Vancouver carefully placed buildings apart from each other and used these high rises for both residential use and business use (this gives the city a pulse). Both the interior and exterior of these buildings are studied and carefully executed in order to keep the connections visually to the outside world (Walsh, 2012). The pedestrian views were also taken into consideration when making this ‘connection’ to the exterior environment.

"In 1989, Vancouver City Council adopted 27 view cones to protect views to the North Shore mountains, the downtown skyline, and surrounding water bodies. Any development occurring within these cones may be further restricted in height beyond what is specified in the zoning and development bylaw or Official development plans" (Walsh, 2012, 21-22). This urban method has been uniquely developed by Vancouver's planners in order to maintain the pedestrian's connection to the outside environment. It also plays a crucial role in spatial mapping of the city to both locals and visitors of Vancouver, B.C.

City of Vancouver website (http://vancouver.ca/commsvcs/views/index.htm).

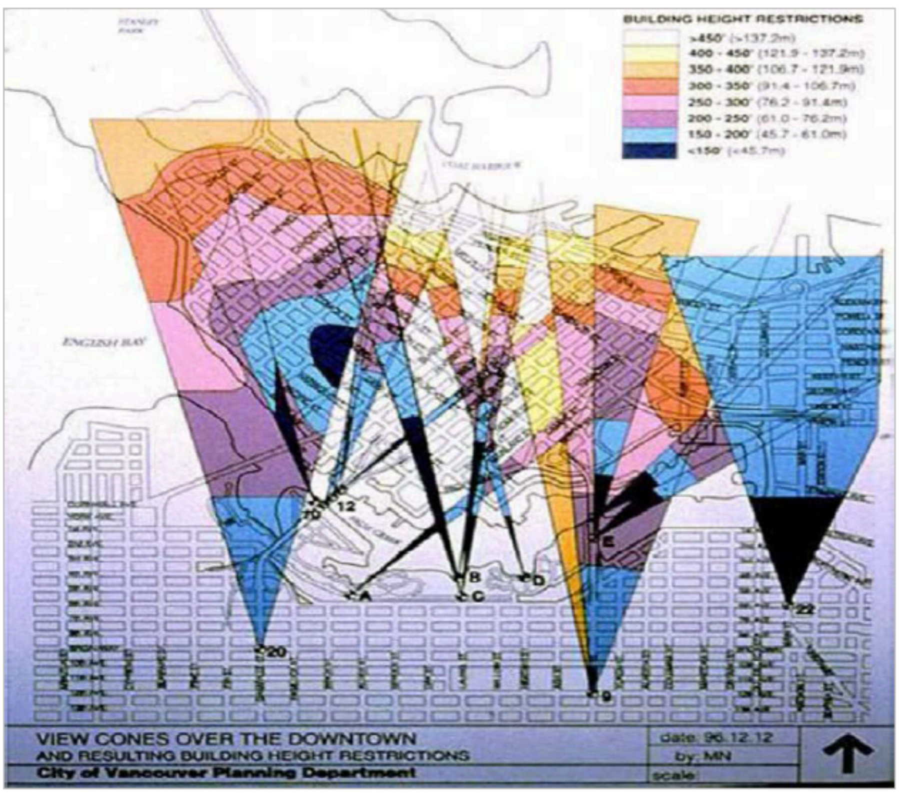


Figure 1.10: View Cones Over the Downtown, and resulting building height restrictions 12/12/1996, City of Vancouver Planning Department. Additional view corridors were also established outside the boundaries of this drawing (City of Vancouver website).

Figure 2.23 Maintaining sight lines in Vancouver (source: Walsh, 2012, 120)

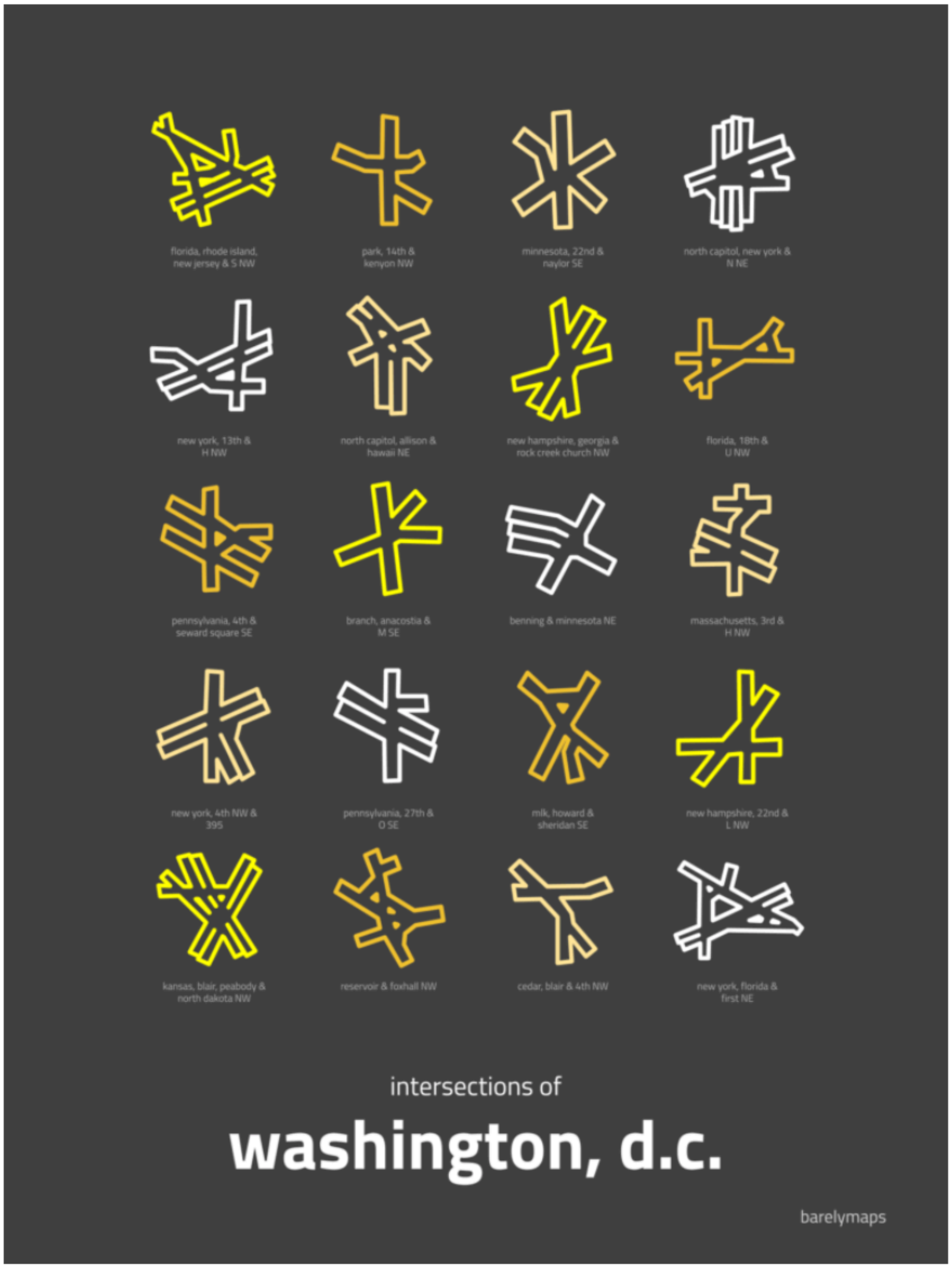
While these are just three of many components that make up the Vancouver model, Vancouver has been successful in finding its own way in becoming the city as we know it today. "Vancouverism resulted from a locally grounded process, based on the creativity of locally based designers responding to the needs, aspiration and opportunities present in their particular urban community. This could be considered a solid case study on how to adapt and blend the urban context with a natural surrounding environment" (Walsh, 2012, p. 39).

2.5.2 Washington, D.C.

Location: Washington, D.C., USA

Founded: 1790

In American cities, many of the issues that surfaces at various intersections are the result of diagonal streets which create disorienting decision points when they transect another street. In the case of Massachusetts or New York Avenue in Washington, D.C. Klein stated that in 2018 the DDOT ranked the intersection of New York Avenues and Bladensburg Road NE as one of the most dangerous intersections in Washington. This intersection alone was responsible for 165 car wrecks in 2018 (Le Dem, 2019). A retraining factor in correcting these streets falls in the historical significance of the route. Many of these were Native American trails, used to get from one destination, to another, in the most efficient fashion. Klein goes on to state that; "Once people-built structures around them, they became a part of the landscape and were hard to get rid of" (Le Dem, 2019, p. 1).



One longtime cyclist said the graphic was "absurdity made pretty".

Photo Courtesy of Peter Gorman

Figure 2.24 Washington D.C. intersection points (source:dc.curbed.com-Peter Gorman)

In the original city master plan by Pierre Charles L'Enfant, architecturally designed traffic circles were implemented at these nodal points (see Figure 2.25) in order to deal with the convergence of Washington D.C.'s street grid. Circles, according to Le Dem, are thought to be a far more natural way to address these complex traffic intersections (see Figure 2.24). Today, many of the traffic circles are being designed, in other places throughout the city, in order to foster improved pedestrian movement. An effort to assist in not only automobile traffic flow but cycling and walking has been taken into consideration (Le Dem, 2019). These traffic circles give the city its own identity while providing the users with a feeling of arrival and sense of place. (see Figure 2.25 & 2.26)

1. Intentionally planned for multiple city grids to converge, at various nodes. (see Figure 2.27)This intentional design was used for stationing cannon for the capitols defense.
2. Access various design strategies on how the city planners adapted this to the city's master plan. (see Figure 2.25 & 2.26)

Figure 2.25 Nodal design intervention Thomas circle, Washington D.C. (source: Paul Byland)

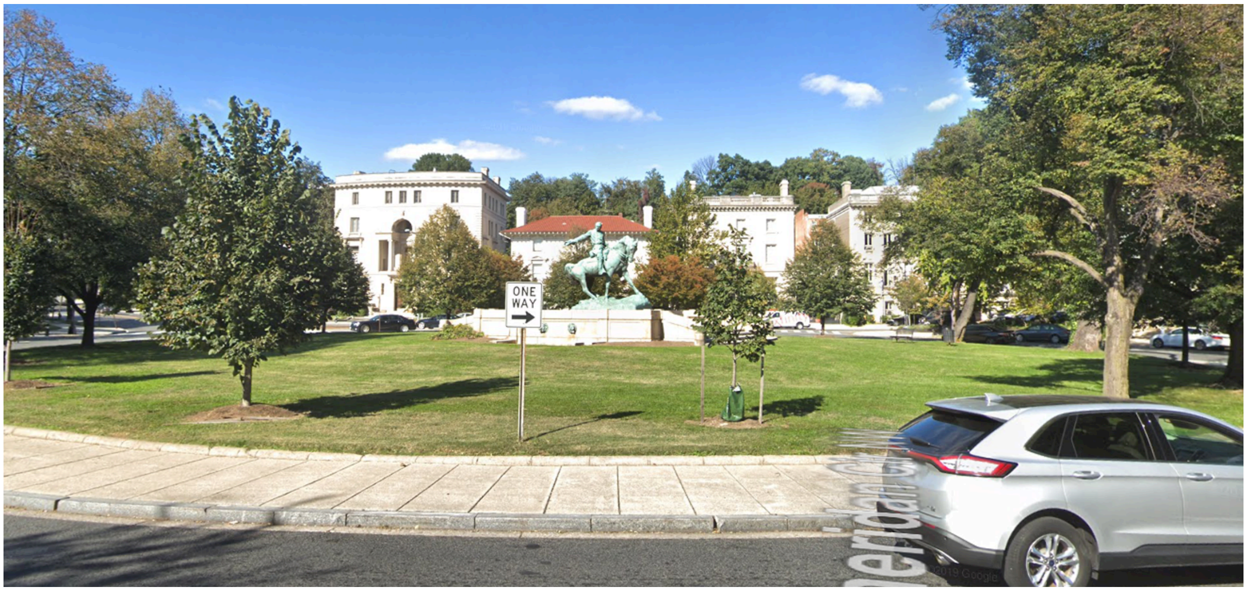


Figure 2.26 Sheridan Circle Northwest, Washington D.C.-Traffic circle (source: googlemaps)

Figure 2.27 Sheridan Circle Northwest, Washington D.C., Nodal design option (source: googlemaps)

2.5.3 Denver, CO

Location: Denver, CO., USA

Founded: 1858

Robert Speer encouraged the city of Denver by bringing the "city beautiful" concept to life. This European city concept created a movement in the reform of North American architecture and urban planning. This movement took place in the late 1890's and the early 1900's. The idea behind this was to present developing cities in the US with ongoing development that will strive for beautification and monumental grandeur. (Downtown Denver Partnership, Inc.) Speer stated "ugly things do no please. It is much easier to love a thing of beauty – and this applies to cities. Fountains, statues, lights, music and parks make people love the place in which they live" (Downtown Denver Partnership, Inc., 2008, p. 2).

In a 2007 Denver City Council meeting, the city council adopted the Downtown Area Plan (DAP) to serve as a 20-year master plan to aid government officials in future planning of the city. Within this plan, there are five elements that will help in fostering a more livable, sustainable, healthy and vibrant downtown area. The idea of "putting the pedestrian first" was a key vision element within this. The group then looked at various benefits and practices of multiple pedestrian-friendly environments. A conclusion was then found that focusing on improvements that foster improved pedestrian walkability, mass transit and cycling and vehicle navigation, throughout the city, were important for pedestrian friendly environments. (Downtown Denver Partnership, Inc.)

From various case studies, the Downtown Denver Partnership, Inc. found that individuals majority of the time choose their travel routs based on aesthetically desirable, safe, and welcoming environments. The design aspect is a key contributor in what makes a street / route desirable. This idea is apparent in some of the more successful streets in the world, such as; Las Ramblas in Barcelona and also Newbury Street in Boston. With this in mind, the following five terms were applied when considering improvements for the city of Denver (Downtown Denver Partnership, Inc.).

1. **Visual Interest**: Engage the pedestrian through elements such as interesting storefronts, landscape and art. (see Figure 2.29)
2. **Materiality**: The color and texture of paving, landscaping, buildings and other design elements affect the human experience. (see Figure 2.30)
3. **Human Scale**: Smaller modules and more delicate detailing provide aesthetic interest at the scale and pace of a pedestrian. (see Figure 2.31)
4. **Series of Zones**: A landscape buffer between pedestrian walkways and adjacent streets can mitigate traffic speed and noise.
5. **Variety**: An array of design elements can provide day and night interest or seasonal diversity. (Downtown Denver Partnership, Inc. 2008, 6)

Another regulation put into place was the idea that the design elements must relate to one another. They must create a cohesive design aesthetic which in return will give the street a cohesive character (Downtown Denver partnership, Inc.). This not only helps with the overall aesthetic of a place, but helps with the spatial navigation, and imageability of the city as a whole. Various actions were also included in this act, as well, to aid in imageability and navigation. Adding titles of districts at ‘gateways’ proved to be beneficial, in the spatial mapping of an environment to both locals and visitors.

Finally, the city of Denver, Colorado’s central business district resembles Dallas’ central business district in a variety of ways. The two areas of focus for this research were localized on the commonality between the architectural aesthetics of the buildings (historical modernism) and the convergence of multiple street grids. Due to the similarity between the two cities, inventory on multiple nodal design strategies was logged. The use of various materials to blend nodes with buildings, as well as the addition of landscape to add complexity to a setting, when adding these design elements to complex urban node settings. (see Figures 2.28-2.31)

1. Various design practices have been implemented in order to improve urban nodes in the central business district of Denver, Colorado.
2. Addition of landscape at multiple nodal points to add complexity to the environment (see Figure 2.28 & Figure 2.31)

Figure 2.28 Pocket park at city node, Denver, Colorado (source: googlemaps)

Figure 2.29 example of visual interest outside of the Lindsey Flanigan courthouse in Denver, CO

(source: googlemaps)

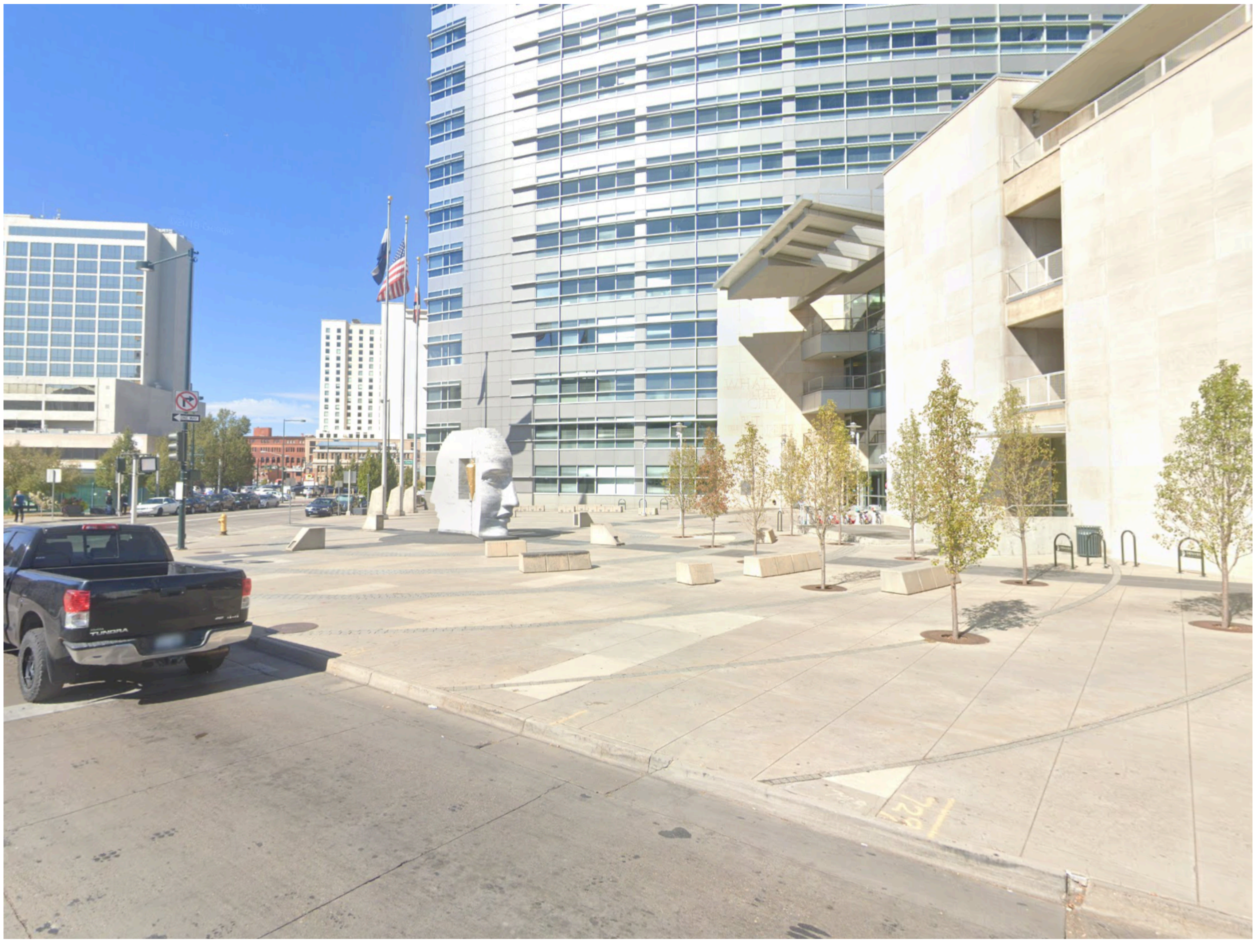


Figure 2.30 example of nodal design intervention outside of Denver publics works, Denver, CO

(source: googlemaps.com)

Figure 2.31 example of human scale design intervention at urban node in Denver, CO (source: googlemaps.com)

2.6 Site Selection Criteria and Design Criteria

A list of site selection parameters was synthesized from the review of literature. This synthesis provided both site selection criteria and nodal design criteria for the selected site See Figure 2.32 for site selection criteria.

Literature Review-Findings

Site Selection Criteria	Nodal design Criteria
Convergence of multiple city street grids	Near junctions
Imageable landmarks absent	Unique in appearance, prominent visual feature
Lack of accessible green space	Increase connection by green space implantation
High traffic volume	Attributes have meaning to the navigator, visible from distance
Connection between district edge condition is absent	Blend architecture and materials to connects districts
Lack of complexity	Use of landscape, materials, and activities for complexity
Multi modal transportation location	Improves pedestrian navigation, near junctions

Figure 2.32 Nodal design and site selection criteria extracted from literature review

Chapter 3: Research Methods

3.1 Introduction

This study was carried out in a six-step process including:

1. Literature review
2. Precedent studies
3. Surveys
4. Behavioral observations
5. Inventory and analysis
6. Design proposal

The literature review provided information required to strengthen the problem statement of this research, as well as set up parameters for design characteristics. The precedent studies provided examples of design interventions working toward improving the imageability, spatial navigation, and sense of place of their city. Surveys were administered to the general population of the sites selected, in order to gain additional design characteristic parameters. Observations took place, to further understand the sites selected and further strengthened the inventory and analysis portion of the research. Finally, after synthesizing all of these components, the site location was selected, and a design was completed.

3.2 Literature

This study reviewed literature on the importance of effectively designed nodal landmarks, within a city, in order to do the following; foster enhanced pedestrian wayfinding, promote improved imageability, and sense of place in the central business district, of Dallas, Texas. The literature identified the factors that contribute to beneficial nodal landmark design strategies, to help promote improved wayfinding and city imageability. These factors were then used to formulate the overall approach of the study.

These findings help to reinforce certain design techniques used and also supports the promotion for improved planning at a city scale. Furthermore, the literature on successful nodal landmark design was critical in formulating the criteria used for the design guidelines. These guidelines include criteria for: the site selection, nodal landmark design features, and the programmatic elements essential for a nodal landmark to improve pedestrian wayfinding and taking a step in the right direction for imageability improvement.

3.3 Precedent studies

Precedent study investigations were conducted on the following three metropolitan areas; Vancouver, British Columbia, Washington DC, and Denver, Colorado. Ranging from small scale design interventions to civic size interventions, all of these projects helped improved the cities; imageability, wayfinding, and sense of place.

While the primary data was collected from the review of literature and site inventory and analysis, the precedent studies were conducted using mostly secondary data. The data used was gathered from various works of literature, websites promoting landscape architecture, and city master plan proposals found on the studied cities websites.

3.4 Surveys

The primary goal of this research is to determine an appropriate design intervention proposal, that would be located at a nodal point within the central business district of Dallas, Texas. This design intervention improves wayfinding (Keliikoa, Packard, Smith, Kim, Akasaki, & Stupplebeen, 2018), the city image, and sense of place (Ökesli, & Gürçinar, 2012) Therefore, surveys were conducted to gain a better understanding of the respondents means of travel, favorite local architecture, and existing imageable structures, and their overall perception of each chosen site (both positive and negative). The surveys derived from various research studies on urban transportation methods, wayfinding and a city's imageability, were then synthesized to create the survey used for this study; see 'Dallas Central Business Districts', wayfinding and imageability improvement questionnaire, Appendix A.

3.5 Behavioral Observations

Using detailed behavior mapping and behavioral notation (Zeisel 2006) the researcher observed activities at the three different site locations over the course of a month as an inconspicuous bystander. Each observation session lasted between 1-2 hours. To make notes of the subjects' activities and behavior, the researcher logged field notes, and used behavioral mapping. The behavioral mapping used involved the mapping of various individuals' movement throughout the three different sites. The visual method of observation proved helpful, as it gave the investigator a better sense of how each individual location was used from the pedestrian perspective, as opposed to tables and charts which are not location based (Zeisel 2006). The researcher carried out these observations from inconspicuous vantage points, (see Figures 3.1-3.3) on various edges of the three chosen sites, in order to not disturb the behavior of the subjects.

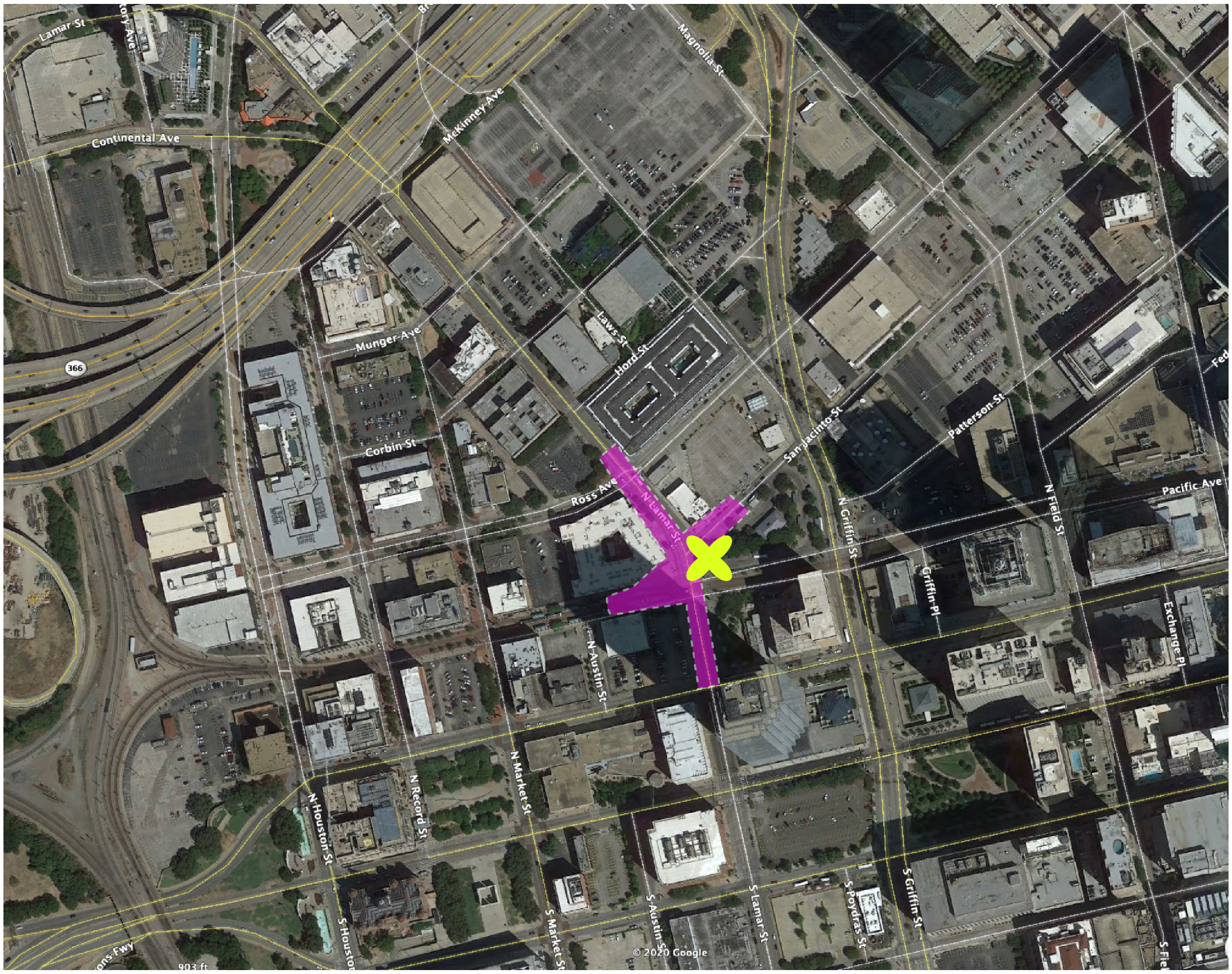


Figure 3.1 The West End Historic District observation point Dallas, Texas (source: googlemaps)

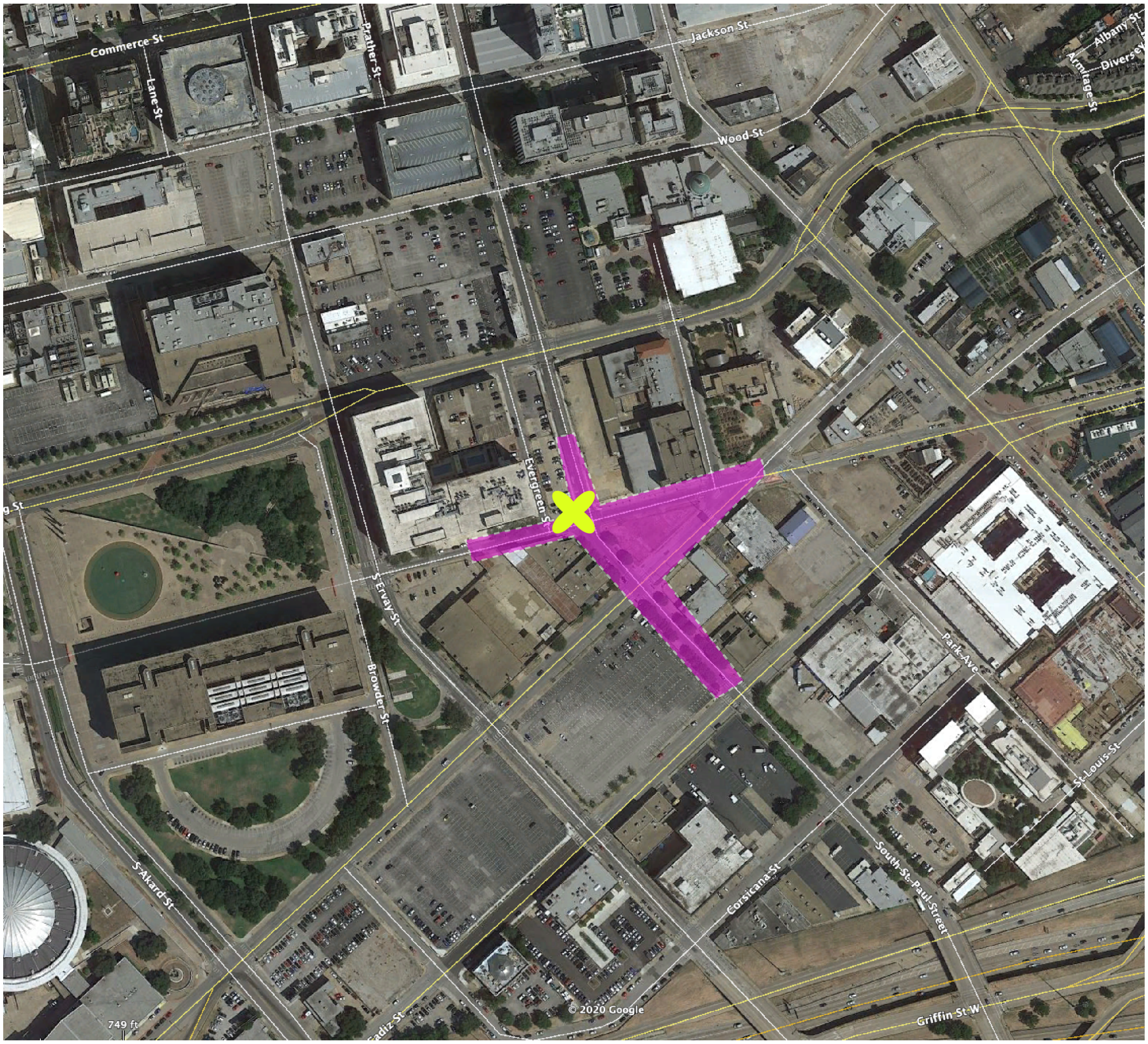


Figure 3.2 Farmers Market District observation point Dallas, Texas (source: googlemaps)

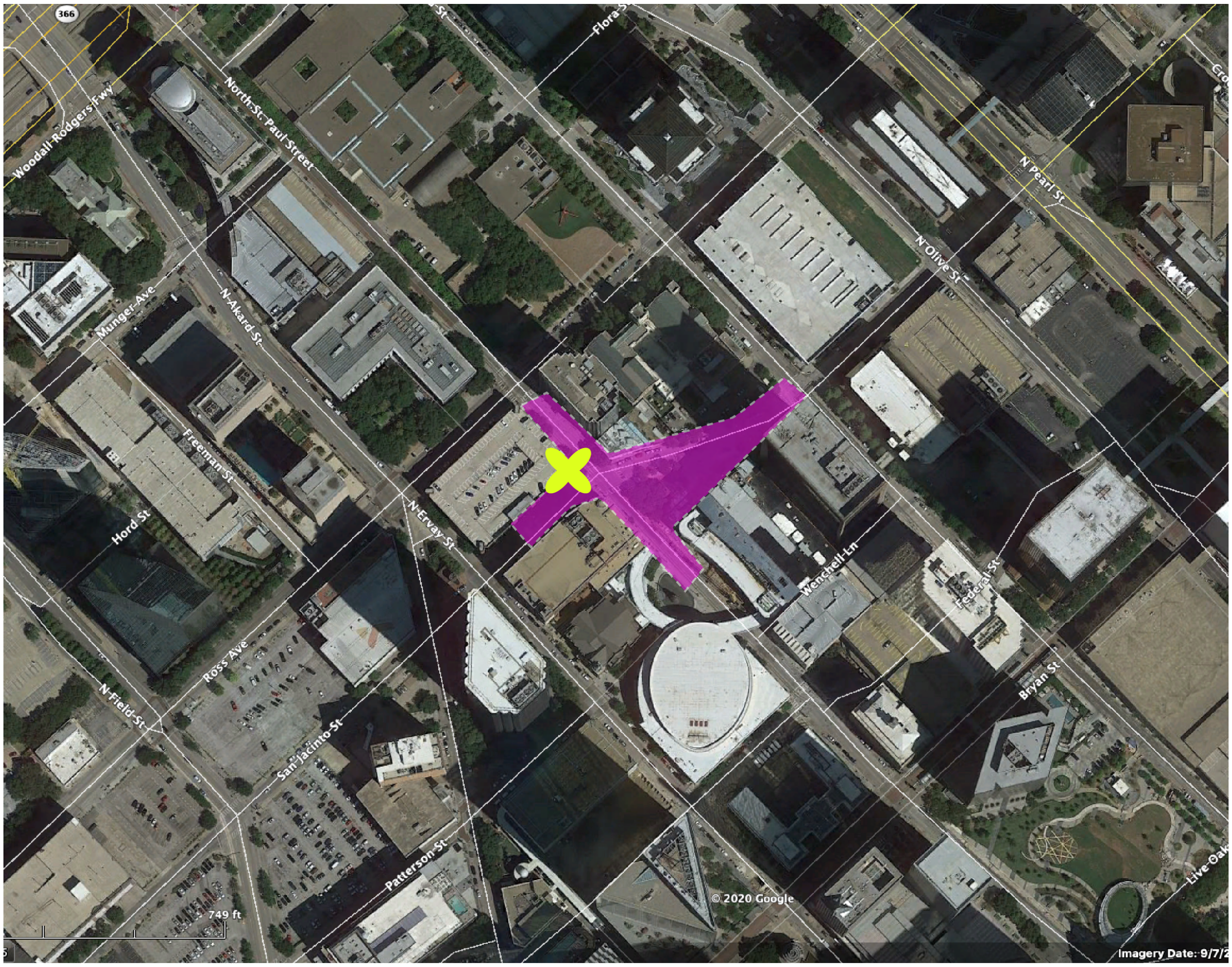


Figure 3.3 Commercial Center District observation point Dallas, Texas (source: googlemaps)

3.6 Inventory & Analysis

Intensive inventory and analysis was conducted in order to locate site specific locations, within the central business district of Dallas, Texas for possible design interventions. This phase provided the critical data required to determine the best three locations for these nodal design interventions, within the central business district.

The inventory and analysis included:

1. Circulation mapping (vehicle / pedestrian),
2. Public transit networks,
3. Bicycle lane / shared lanes,
4. Land use,
5. Connectivity and proximity studies,
6. Identification and location of nodes,
7. Architectural aesthetics surrounding the site,
8. Existing edge conditions, and
9. Identifying existing landmarks.

Demographic and historical information for each district pertaining to the chosen site location, was collected as well for each district pertaining to the chosen site location. This additional information was used to drive other design characteristics for each location, to improve the; imageability, wayfinding, and sense of place at each location. Knowing these various characteristics gave each location individuality, while still maintaining the harmony of the larger central business district.

3.7 Design proposal

The collective findings (see Figure 3.4) from the literature review, precedent studies, observations and surveys, and sub district inventory and analysis were utilized to develop a design proposal for one of the three selected sites in the central business district of Dallas, Texas. The nodal landmark design incorporates the programmatic elements uncovered that are most essential for fostering improved user wayfinding as well as upholding and developing a positive city image, that will improve the user's sense of place.

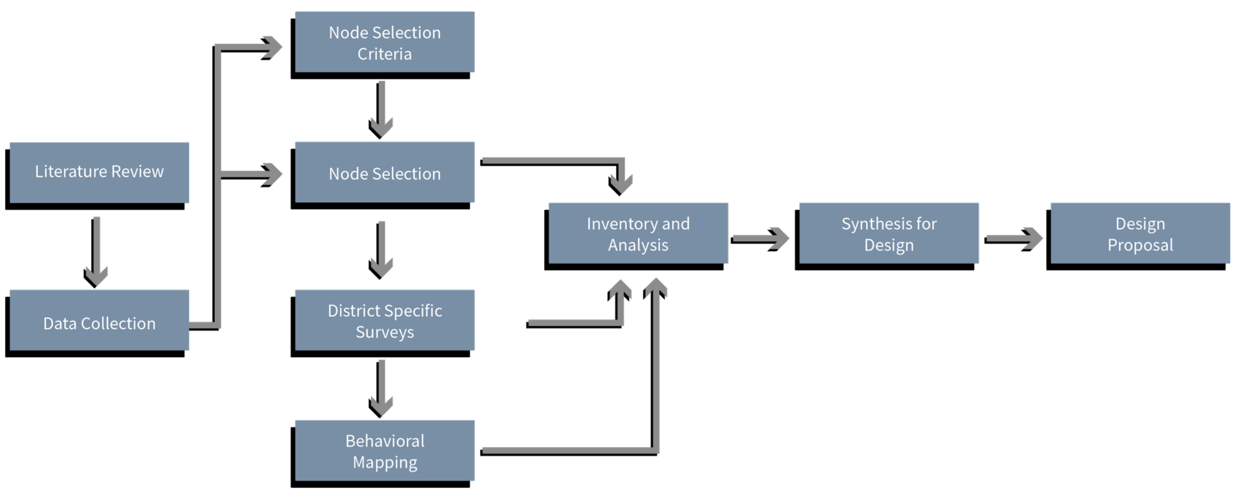


Figure 3.4 Design proposal methodology

Chapter 4: Site analysis and findings

4.1 Literature Findings applied to the design problem

4.1.1 Importance of Imageable Nodal Landmarks in an Irregular Street Grid

Ewing stated that a well-organized street grid makes it easier for an individual to navigate an urban environment, especially when the environment is new to them (Ewing, 2013). A study conducted by (Burns 1998) on automobile navigation in the United Kingdom, revealed one of the primary contributing factors to poor wayfinding decisions is the decision points in an irregular street grid. Such problematic nodes identified in the study, are located where the street grid changes direction due to the convergence and collision of two different directional street grids. As seen in Figure 4.1 below, the street grid of Dallas' central business district changes directions at various locations, due to the convergence of street grids. For multiple reasons, these collision points (nodes) are likely to cause poor wayfinding decisions because of their current design. One of the primary causes of this disorientation is lack of imageable landmarks at these nodal decision points.

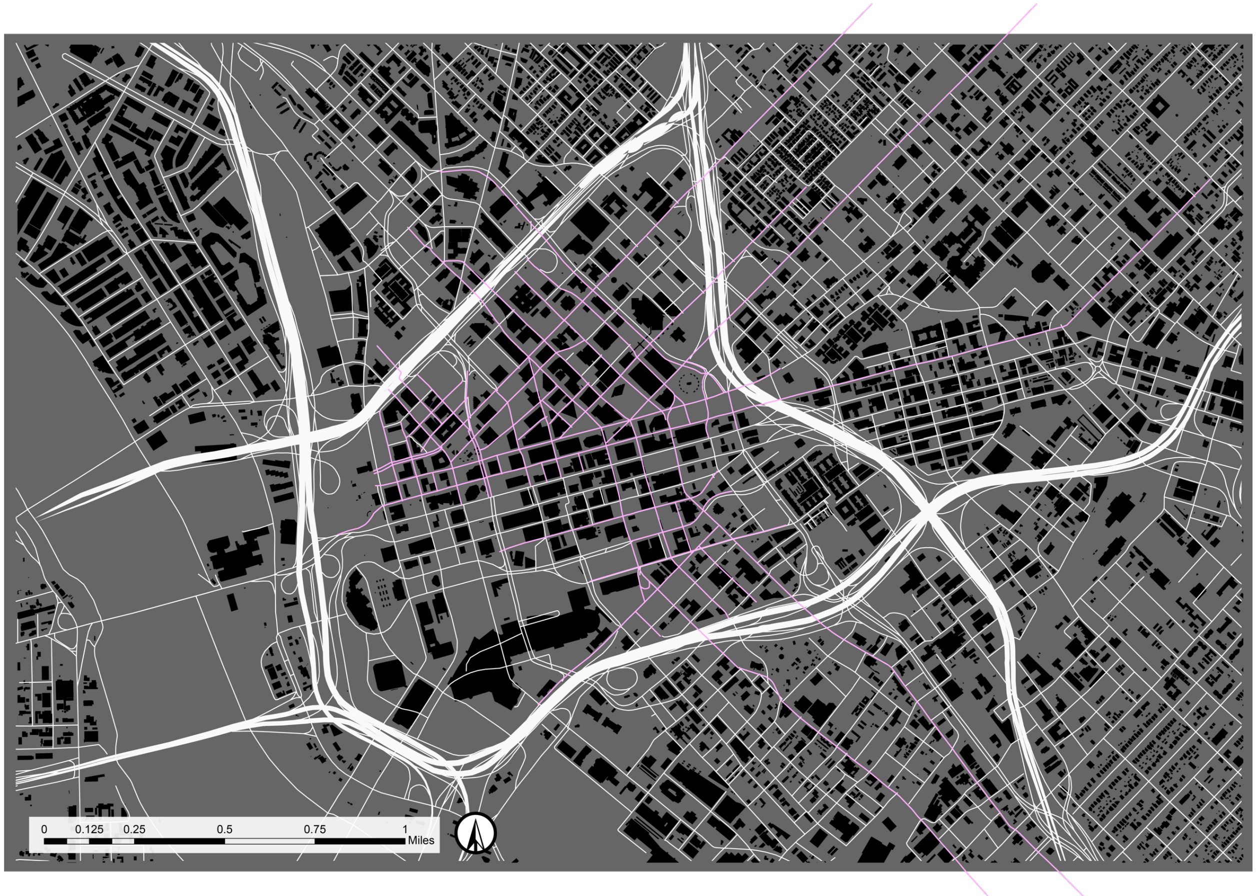


Figure 4.1 Dallas' central business district street grid layout- purple lines represent different street grids within the central business district of Dallas, Texas. (source: ESRI ArcGIS)

As stated by Lynch, areas with distinct imageable landmarks and well designed nodes allow individuals to form accurate and detailed mental maps of the built environment (Lynch, 1960). Landmarks that act as key visual termination points contribute to the imageability of an area as well. Conversely, a city that has few visually distinguishable (imageable) nodes or landmarks will be difficult to make sense of and to remember (Ewing, 2012), resulting in disorientation to the traveler. Figure 4.2 show a nodal decision point, located in the Farmers Market district of Dallas, which could be improved by the implementation of a well-designed nodal landmark.

Figure 4.2 Aerial of location showing opportunity for nodal landmark design intervention near the Dallas' Farmers Market district

(source: googlemaps)

Figure 4.3 Pedestrian level view of figure 4.2 showing lack of imageable landmarks (source: googlemaps)

4.1.2 Node / Landmark Design Characteristics

The following studies (Green, Levison, Paelke, & Serafin 1995; Burnett, Smith, and May 2001) on successful pedestrian wayfinding, in regard to nodal landmark design, revealed the following about beneficial nodal landmarks design characteristics.

A landmark that aids in positive wayfinding must;

1. Blend districts / neighborhoods together,
2. Be noticeable from a distance,
3. Be unique in appearance (imageable),
4. Contrast well with the environment,
5. Provide an opportunity for the landmark and elements surrounding it to complement one another,
6. Serve as part of or be close to the road's infrastructure,

7. Be permanent, and
8. Be located at or near junctions.

Complexity and linkage should also be taken into consideration when designing these locations. Areas lacking complexity, such as areas with historical modernist or minimalist architecture, can result in a high level of monotony, which will foster disorientation in individuals in the urban environment (Ewing, 2013). Combating this lack of complexity can be achieved, for example, by adding a visually prominent landscape element to the building surround of the structure. Well executed planting design will add to an improved complexity of a space. Other design elements such as benches, chairs, water features, and public art will also add a higher level of imageability to an area as well. Additionally, linkage elements between these nodal landmarks are also crucial in providing improved pedestrian navigation and city imageability (Burns, 1998). Maintaining sight lines, planting street trees and installing a cohesive sidewalk are all key factors in the linking together of nodes.

In conclusion, the linking of a city's nodes can improve imageability and wayfinding of the city itself. Understanding and acting on the user's needs for complexity in the urban environment as an aid to successful navigation is imperative. To achieve this linkage or pattern in the central business district of Dallas, this study targeted implementing nodal landmarks with various design characteristics, to help with the goal of the research: improved imageability, wayfinding, and sense of place within the central business district of Dallas, Texas.

4.2 Study Area

4.2.2 Site Overview, Area, & Boundaries

The location of this study is Dallas county in the state of Texas (see figure 4.5). The three areas pertaining to this study (see Figure 4.6) are located within the central business district of

Dallas, Texas. The 1.4 sq/mile area, surrounded by; I-30, I-35E, US-HWY 366, and US-HWY 75, and the seven subdistricts (see Figure 4.7) all represent the central business district of Dallas, Texas.

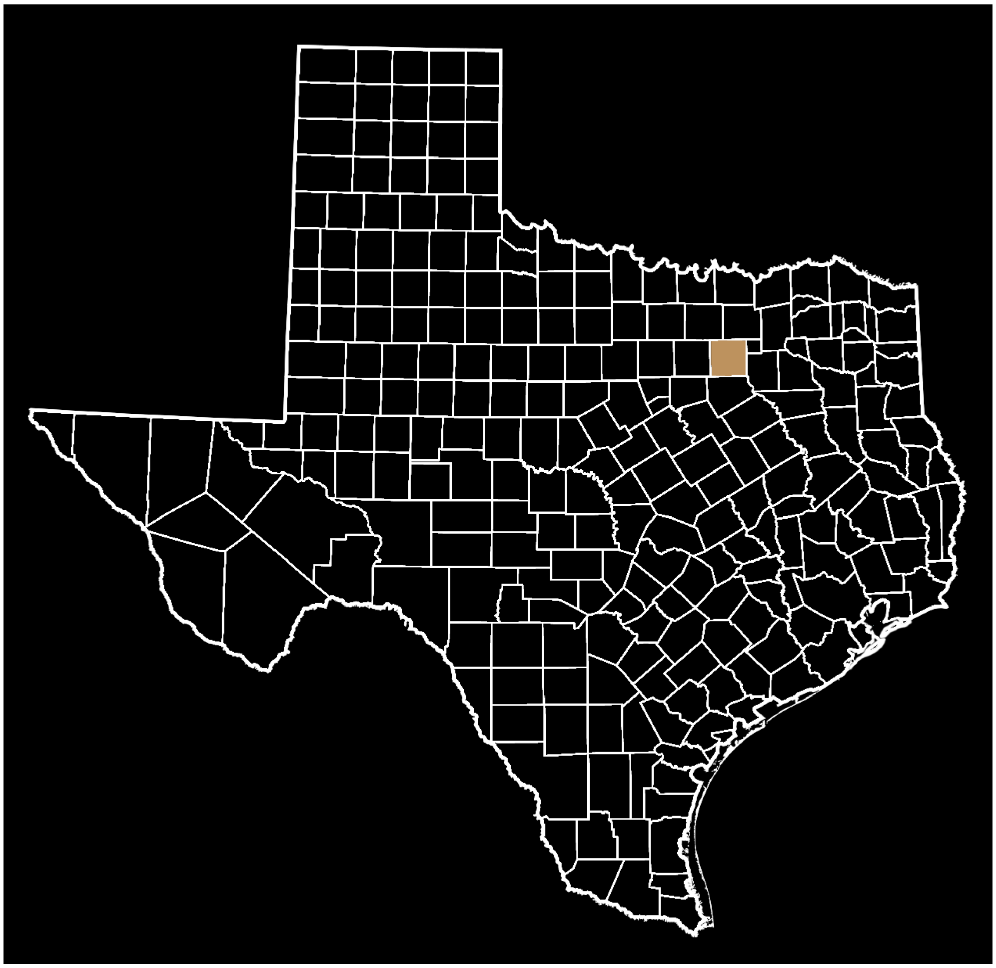


Figure 4.5 Texas outline showing Dallas county (source: ESRI ArcGIS)

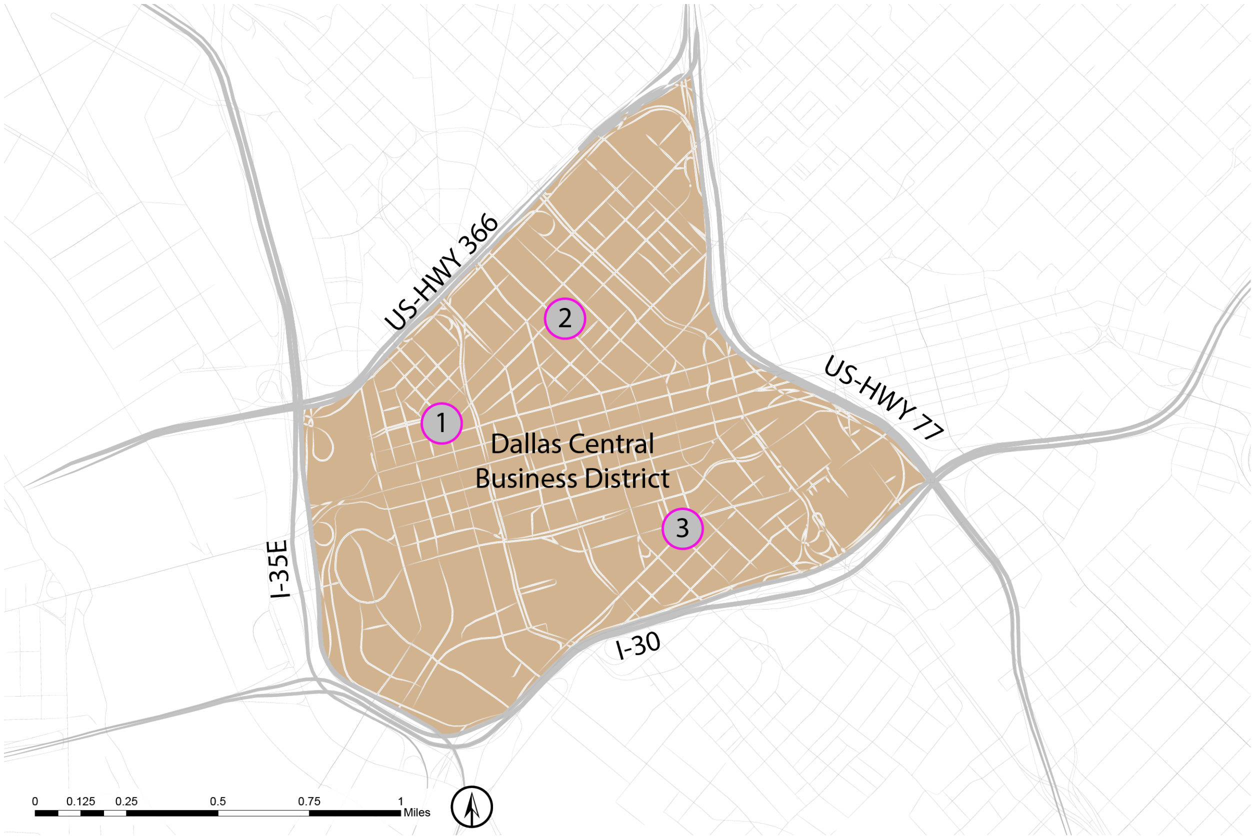


Figure 4.6 Plan view of Dallas central business district (source: Dallas city hall – ESRI ArcGIS)

The following districts will be referenced as shown below;

1. The West End Historic District – West End

2. The Commercial Center District – Commercial Center

3. Dallas Farmers Market District – Farmers Market

4.3 Site Overview Inventory and Analysis

This analysis used the following site selection parameters:

1. Convergence of multiple city grids
2. Shared subdistrict edge conditions
3. Lacking connectivity among surrounding nodes

Three sites within the central business of Dallas, Texas were chosen for further evaluation (see Figure 4.7).

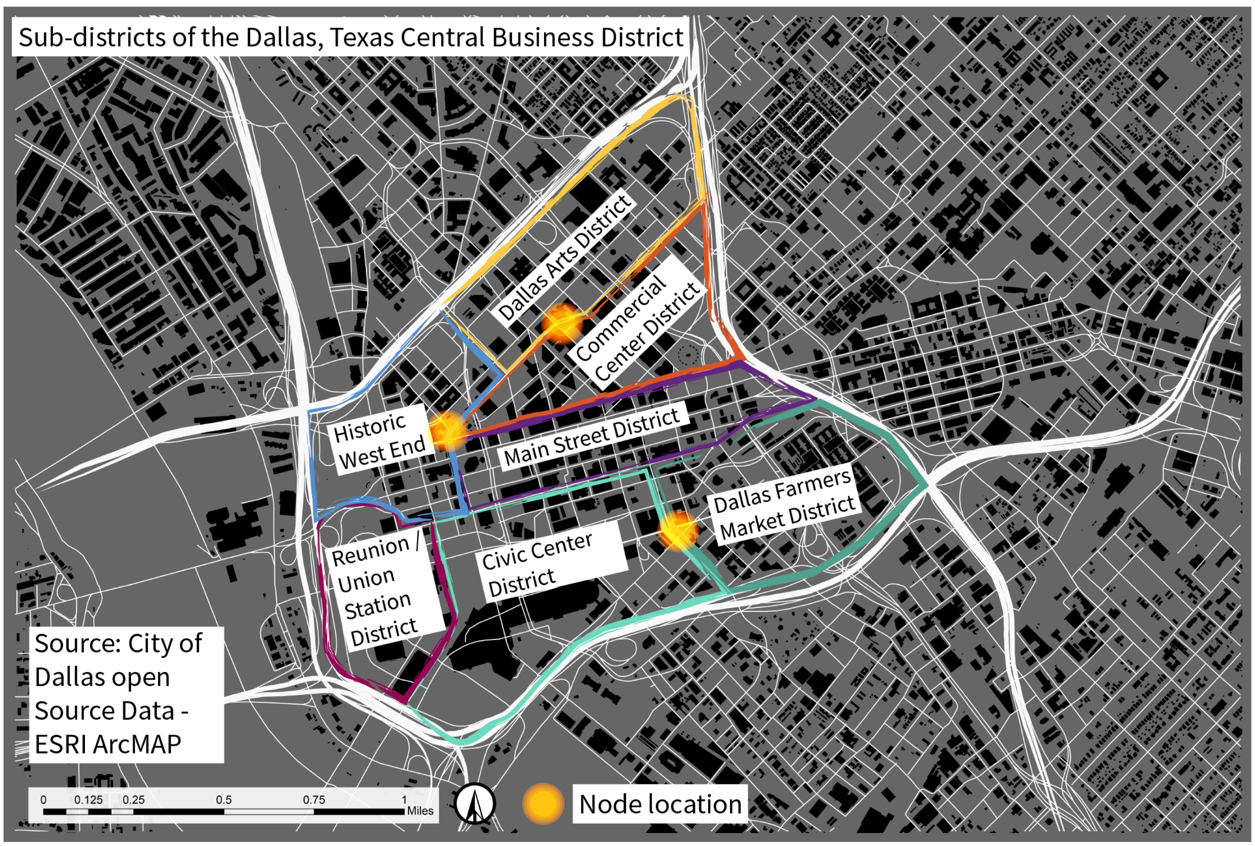


Figure 4.7 color coded sub-districts of the Central Business District in Dallas, Texas with site selection location (source: cityofdallas.com – ESRI ArcMAP)

4.3.1 Overview Infrastructure, Green Space, & Boundaries

The infrastructure, green space, and boundaries inventory and analysis aided in the site-specific selection in that the site must be located in an area lacking greenspace connectivity. After reviewing the infrastructure, green space, and boundaries map (see Figure 4.8), the analysis concluded the following;

1. The Farmers Market, has the strongest connectivity of greenspace
2. The West End and The Commercial Center both lack greenspace
3. The West End has the largest concentration of surface parking, within a ¼ mile radius, compared to the other two sites.
4. The West End shares three subdistrict boarders while the others only share two

In conclusion, The West End ranks first in the infrastructure, green space, and boundaries criteria, due to the lack of green space connectivity and surplus of surface parking. The surplus of surface parking suggest that this area currently remains underdeveloped. Thus, implementing these design solutions now rather than later will benefit the city and users as a whole. Finally, The West End is located on the edge of three subdistrict borders, as opposed to the other two sites which display only two subdistrict edge conditions.

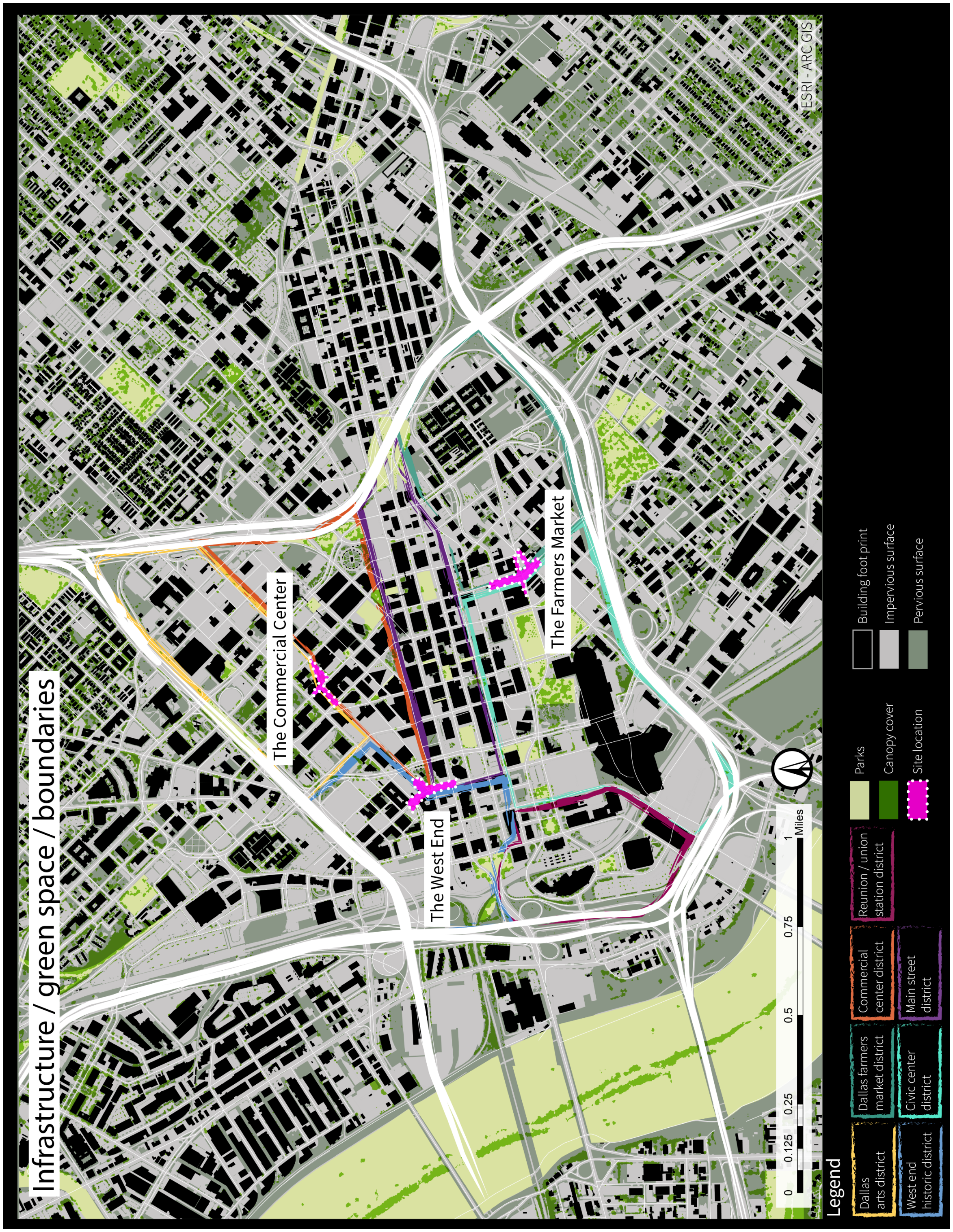


Figure 2.8 map showing the infrastructure, green space & boundaries of the Dallas, Texas Central Business District (source: cityofdallas.com – ESRI-ArcMAP)

4.3.2 Traffic and Circulation

The traffic and circulation inventory/analysis contributed to the site-specific selection in the following ways;

1. Site location at convergence of multiple city street grids
2. High traffic volume
3. Multi modal transportation locations (or options)

After reviewing the traffic and circulation map (see Figure 4.9), the analysis concluded the following;

1. The West End experiences the highest volume of traffic of the three sites.
2. The West End contains three transit options: rail stop, bus stop and small bus station. The other sites only offer a single bus stop.

In conclusion, The West End ranks first in the traffic and circulation analysis and has the only arterial street passing through it. The other two sites are served by collector streets only. The West End also offers a multi modal transportation hub. A rail-stop, three bus stops and a small bus station are all located within the nodal convergence zone.

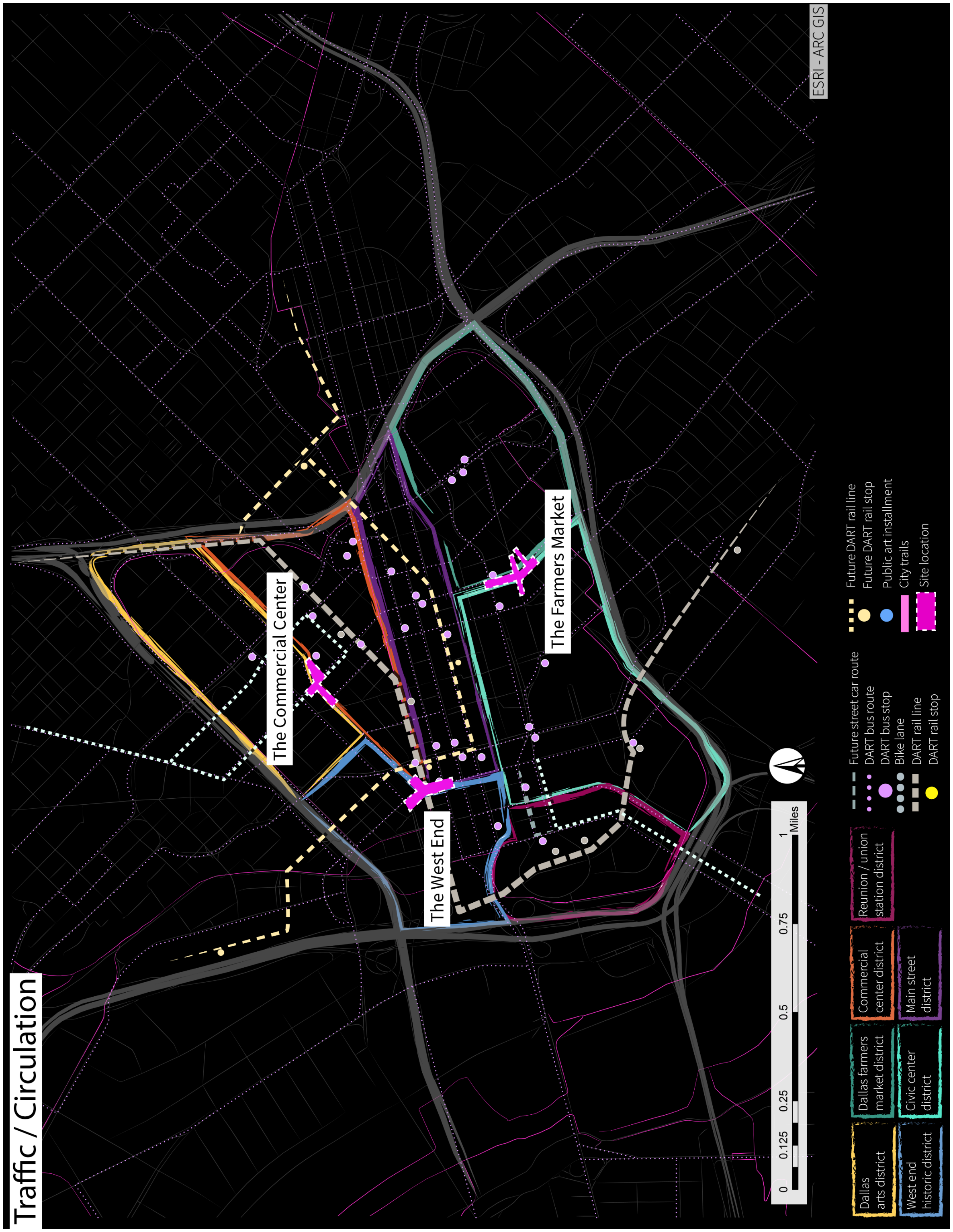


Figure 2.9 Traffic & Circulation of the Central Business District of Dallas, Texas

(source:cityofdallas.com – ESRI-ArcMAP)

4.3.3 Zoning

The zoning inventory and analysis aided in contributing to the site-specific selection in displaying surrounding zoning associated with specific sites, bordering the node.

After reviewing the zoning map (see Figure 4.10), the analysis concluded the following;

1. The West End shows the highest density of commercial and residential zoned properties of the three sites,
2. The Commercial Center and The Farmers Market are primarily surrounded by industrial and education zoned properties.

In conclusion, The West End ranks first in the zoning analysis. The West End displays a majority of the surrounding zoning to be commercial/mixed use development and residential. The residential and commercial mixed-use aspect, lacking greenspace and connectivity, demonstrates the need for a design intervention.

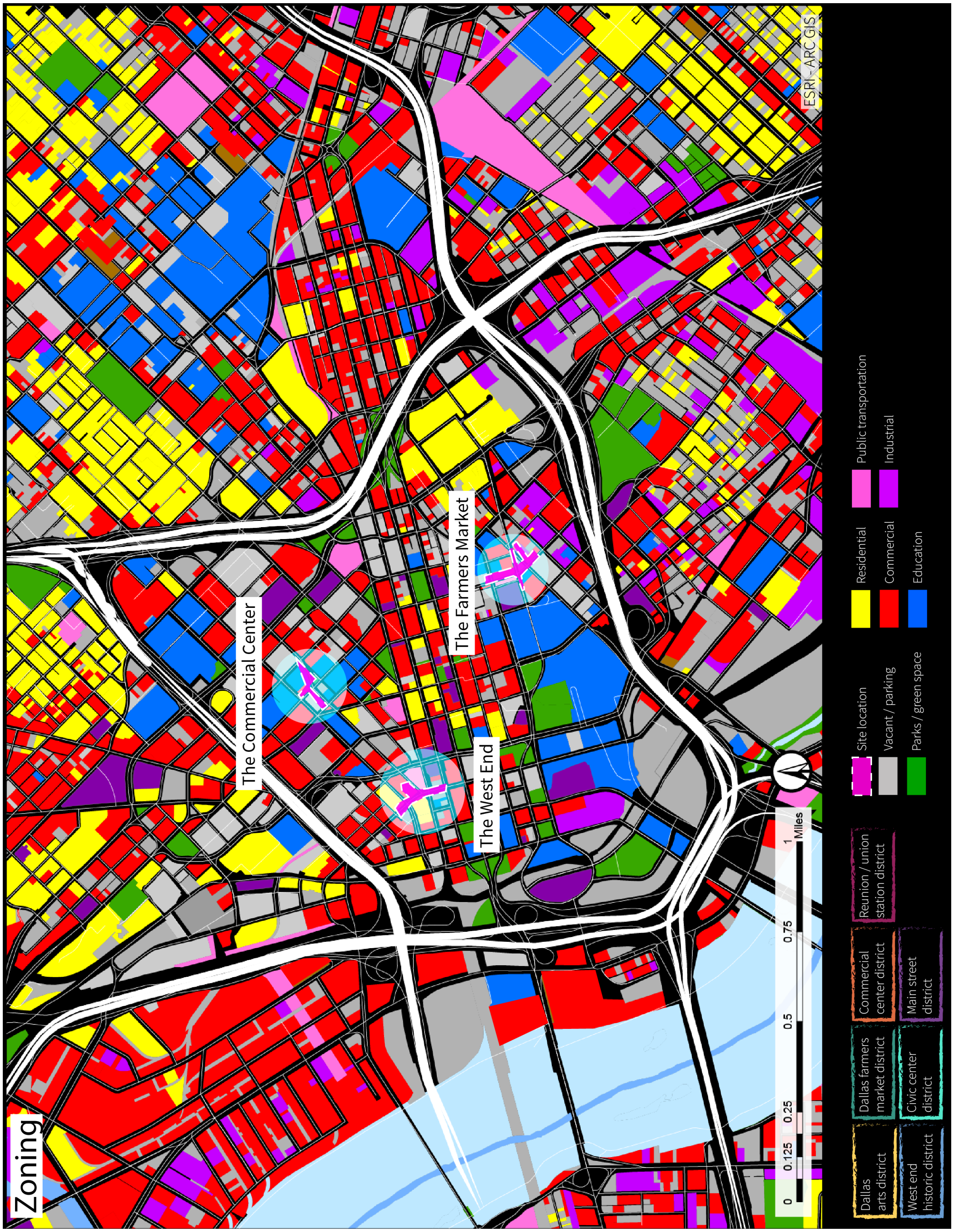


Figure 2.10 Zoning-Dallas, TX (source:cityofdallas.com – ESRI-ArcMAP)

4.3.4 Site Specific Selection

As a whole, all three of node locations under consideration offer components for the site selection criteria list. However, the node located in The Historic West End District, rates highest as a site selection choice. See Figure 4.11 for sites meeting selection criteria as applied to the three chosen district locations.

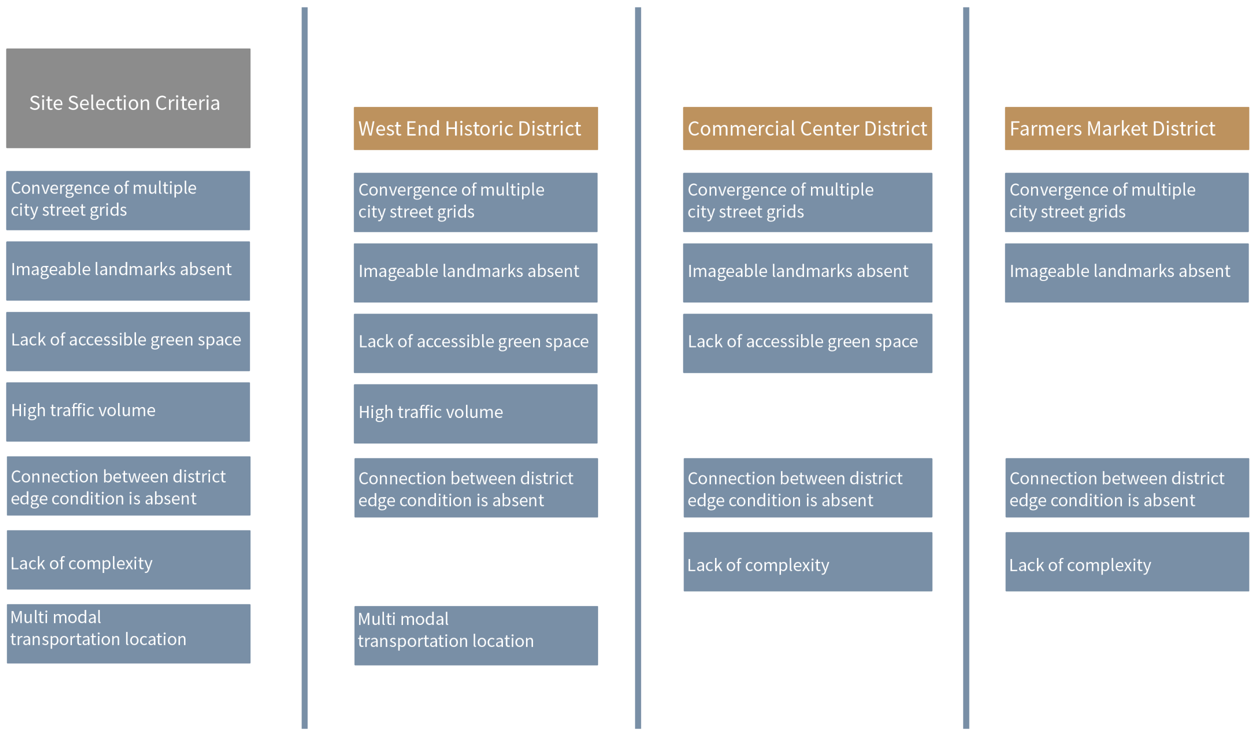


Figure 4.11 The Westend Historic District only lacks 1 out of 7 criteria needed.

4.4 Site Specific Inventory & Analysis of the West End Historic District

4.4.1 History of the West End Historic District

The West End Historic District (see Figure 4.13) is comprised of century-old brick warehouses (see Figure 4.12), which have been converted into a diverse mixed-use development area consisting of urban apartments, restaurants, and shops. Featuring live entertainment, museums, dining and shops, the interior of the West End Historic District is a sought-out destination for both tourists and residents of Dallas, Texas.

Established by John Neely Bryan, in 1872, this area was a trading post at a railroad stop for the Houston & Texas Central Railroad line. During this time, various manufacturing companies and warehouses established themselves in this area. This historic industrial aesthetic still resonates in the architecture today. At present, the West End Historic District is best known as the subdistrict in which John F. Kennedy was assassinated.

Figure 4.12 Historic West End District (source: dallasnews.com photo by Ashley Landis)

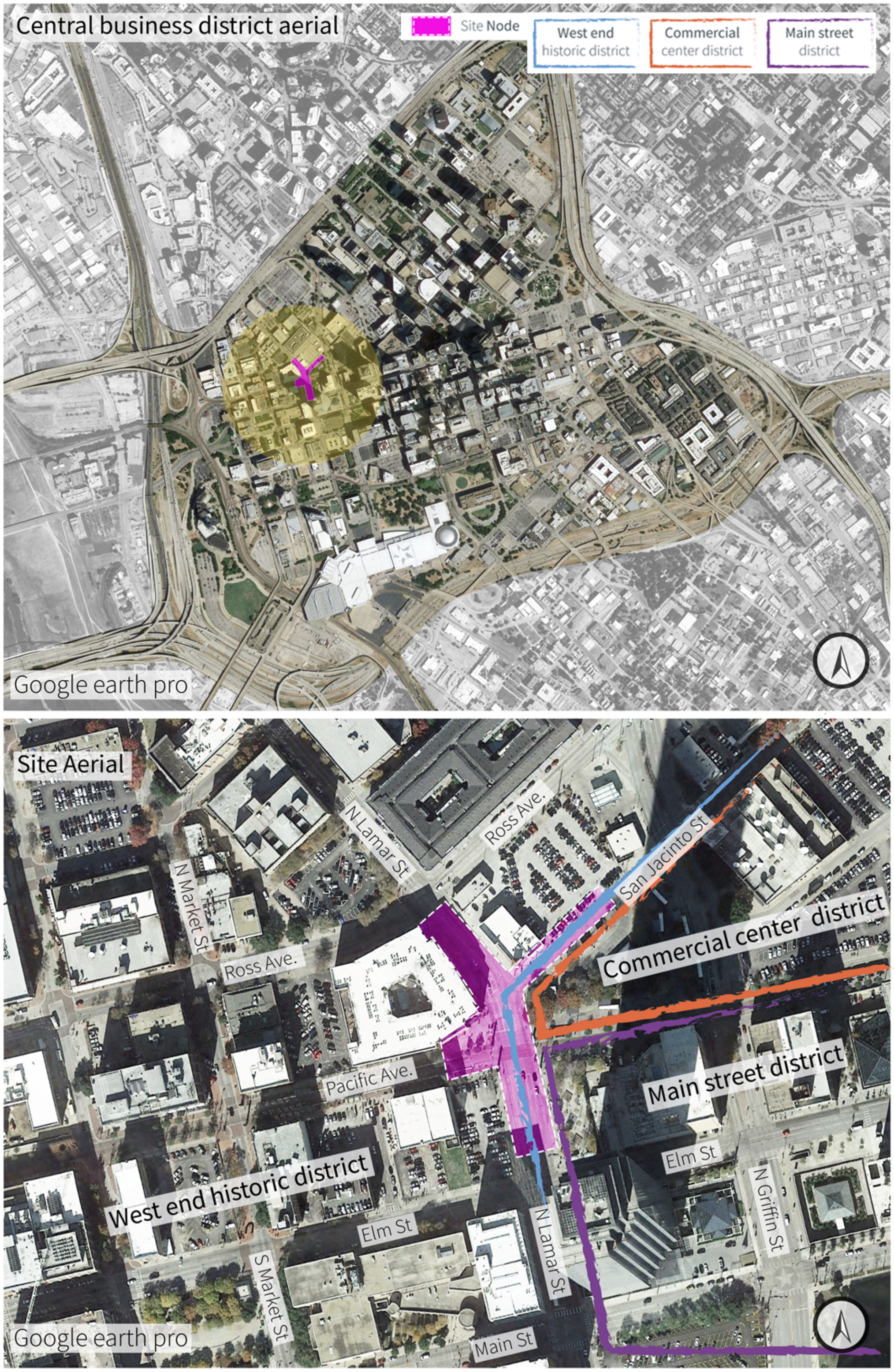


Figure 4.13 Nodal site selection Historic West End (source: googlemaps)

4.4.2 Site Inventory and Analysis of The West End

Lamar Street, along with Pacific Avenue, and San Jacinto Street, are the primary streets that have created this nodal location. (see Figure 4.13) The primary road arterial, Lamar Street, passes through the node from the North and South direction while Pacific Avenue and San Jacinto Street pass through from East to West. (see Figure 4.15) Further inventory mapping displays the ‘three-point’ edge condition of the West End Historic, Main Street, and Commercial Center Districts that meet at this nodal location. (see Figure 4.15) The transition zone or edge condition of these subdistricts are lacking harmony and connectivity amongst them. (see Figure 4.18) Figure 4.16 & 4.17 also display the lack of imageable landmarks at the central part of the node.

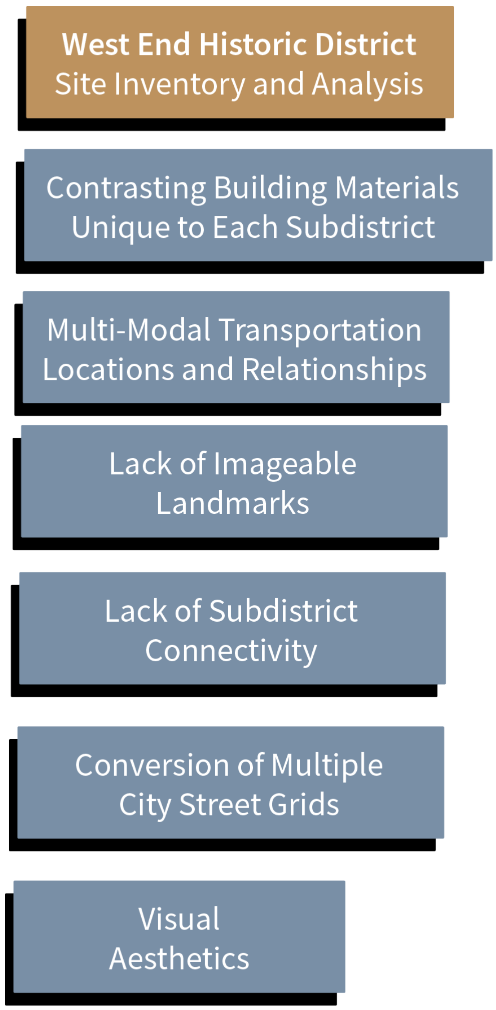


Figure 4.14 West End site inventory and analysis data collection table

Further details of the site inventory were wind directions, as well as sun-rise / sun-set conditions during the winter and summer solstice. (see Figure 4.20) Lastly, inventory on the West End Historic District also logged demographic information was logged as well. (see Figure 4.21)

Figure 4.15 The West End inventory and analysis (source: cityofdallas.com – ESRI ArcMAP)

Figure 4.16 The West End inventory and analysis, North bound – aesthetics, opportunity, components

Figure 4.17 The West End inventory and analysis, South bound – aesthetics, opportunity, components

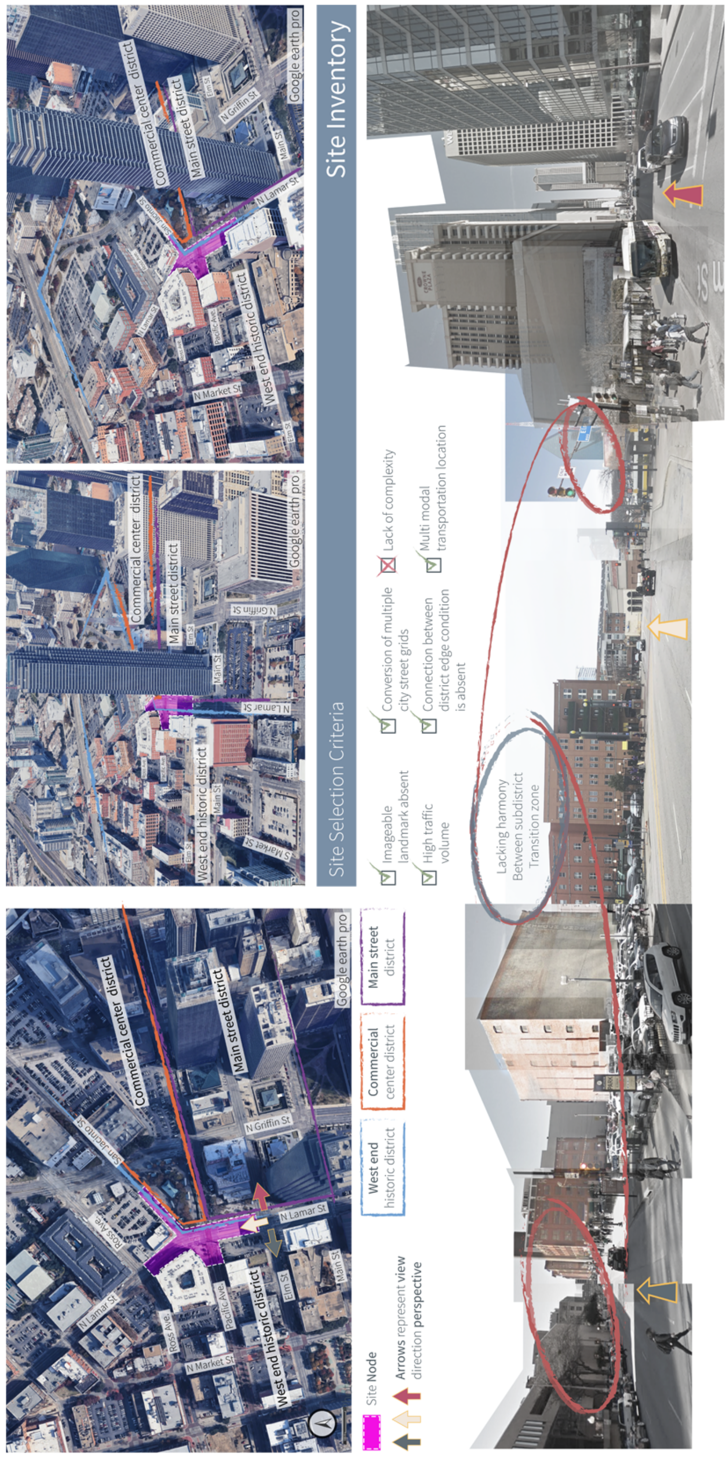


Figure 4.18 The West End inventory and analysis, North bound – Connectivity

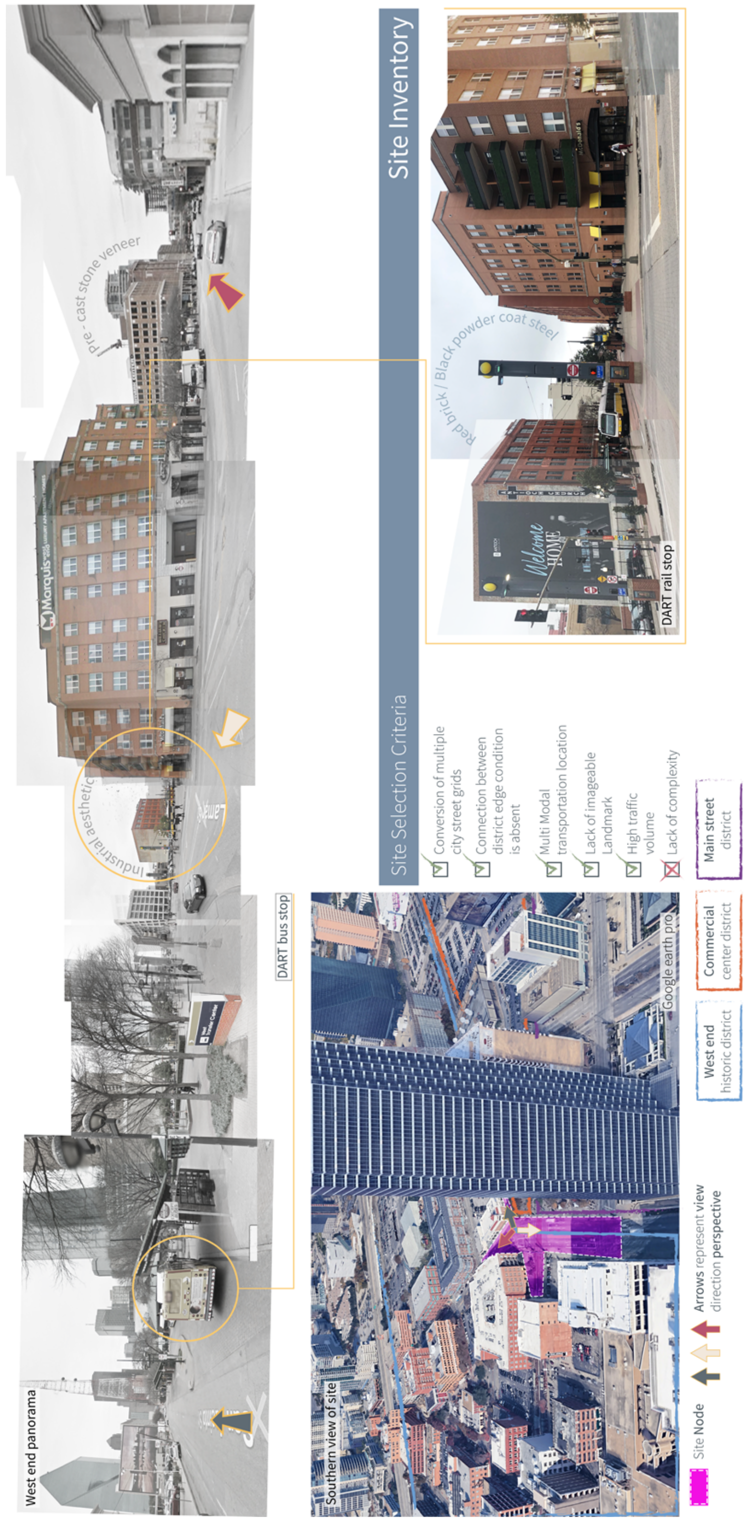


Figure 4.19 The West End inventory and analysis, corner of San Jacinto & Lamar Street – material inventory

Figure 4.20 The West End inventory and analysis – wind direction & sun-rise / sun-set inventory

4.4.3 The West End's Demographics

See Figure 4.21 for West End Historic District's demographics

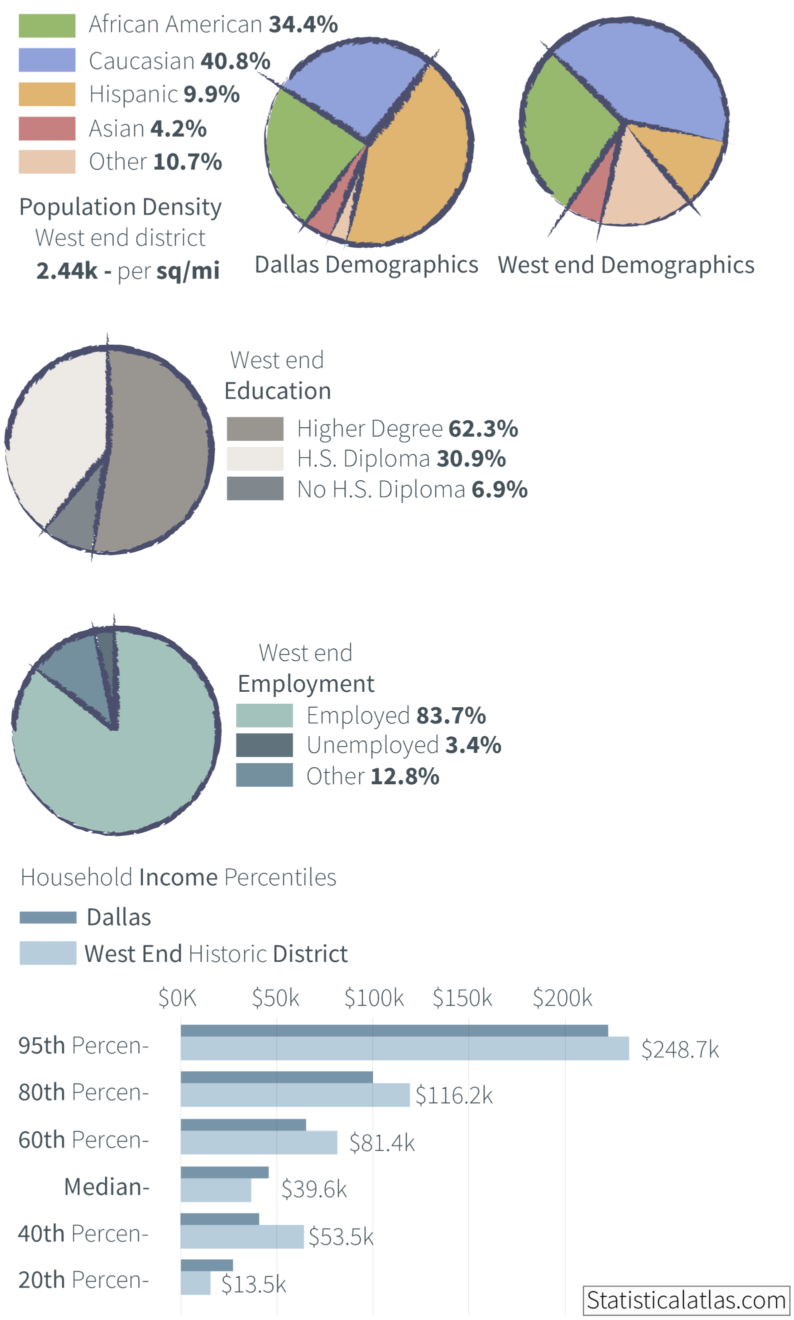


Figure 4.21 The West End demographics (source: statistical atlas)

4.5 The West End Historic District Survey Findings

The following information was collected after the distribution of the 'Dallas's central business districts', wayfinding and imageability improvement questionnaire' Appendix B. The survey distributed in The West End consists of 8 participants.

1. 75% live outside of the central business district / 25% live in the central business district.
2. 50% work in the central business district / 50% do not work in the central business district.
3. 100% of subjects own an automobile.
4. 100% of subjects use an automobile 4-7 times per week on average.
5. 100% of subject use a bicycle 0-2 times per week on average.
6. 87.5% rely on an automobile for primary means of transportation while the other 12.5% either rely on other forms.
7. 62.5% of subjects are willing to walk 3-6 blocks when traveling to and from destinations in the central business district. 25% reported they would walk 0-3 blocks and 12.5% reported they would walk 9+ blocks.
8. Elements to persuade subjects to walk more:
    a. Shade improvements
    b. Landscaping and public art
    c. Improved bicycle/scooter lanes
9. Favored buildings of the central business district (only listed if mentioned by more than one subject)
    a. Reunion Tower

   b. Majestic Theatre

10. Dislike buildings of the central business district (only listed if mentioned by more than one subject)
    a. Dallas City Hall
11. Primary recurring building, in one's mind, when thinking about the central business district: (only listed if mentioned by more than one subject)
    a. Reunion Tower
12. What comes to mind when thinking about the West End Historic District:
    a. Traffic lights and Parking
    b. Traffic, expansive, homeless population

The data collected from the district survey in Figure 4.21was interpreted to reflect the programmatic elements that would prove beneficial if implemented into the design proposal. These findings indicate that the majority of individuals would like to see help directed at the homeless population in the area, shade elements, and various types of activities available for public entertainment. The findings also displayed that the automobile is the primary source of transportation.

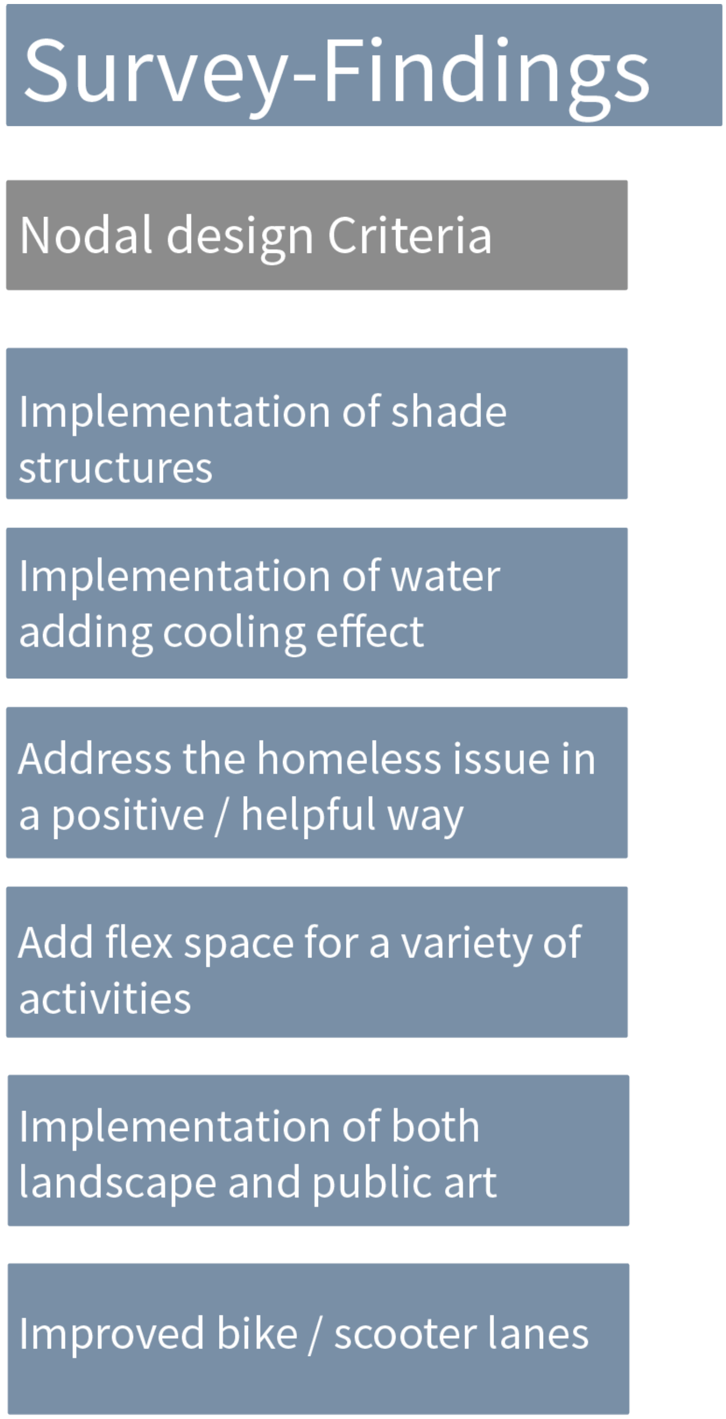


Figure 4.21 The West End nodal design criteria useful for the design intervention taken from the district specific survey

4.6 Behavioral mapping results of The West End

After observing the subjects in the space multiple times, over the course of a month, the following inventory was logged from the behavioral inventory and mapping of the node:

1. Unsafe feeling when in this ‘non-place’ edge condition
2. Three police officers within the site the variety of times visited
3. High traffic volume and fast-moving vehicles
4. Lack of flexible space for organizations within the subdistricts
5. Visitors seemed disoriented and constantly asked police officers for directions

After analyzing these observations, programmatic elements for the design proposal were assembled. (see Figure 4.22)

Observation -Findings

Observation Inventory	Programmatic elements
Unsafe feeling	Private security
3 police officers at multiple locations	Day and night activity
Visual complexity in both districts, lack of harmony	Mix materials from districts to create harmony
High traffic volume	Imageable nodal landmark
Connection between district edge condition is absent	Blend districts with design proposal
Lack of imageable landmarks for visual orientation	Multi functional imageable node
Poor navigation from visitors traveling to West End District	Imageable landmarks for both pedestrian and automobile
Lack of sidewalk space of church members	Flex space for district use

Figure 4.22 The West End observation inventory and analysis – programmatic elements reflect researchers suggestions for improving the node in The West End.

4.7 Design Matrix + Design Process

After categorizing and analyzing the data collected from all of the above methods, the researcher synthesized the findings in a design proposal with multiple design recommendations based on the review of literature, user feedback, and observations. The researcher then developed a design matrix (see Figure 4.23) to cross-reference the design elements suggested from the users unique to the site selected area, details logged from the observations and information researched from the review of literature. This matrix aided in determining the levels of priority for the design elements recommended. The researcher proposed 10 design patters that address the following:

1. Wayfinding
2. Harmony
3. Linkage
4. Patterning / Legibility
5. Complexity / Variety / Diversity

Many design elements can be associated with multiple categories, as they serve different needs.

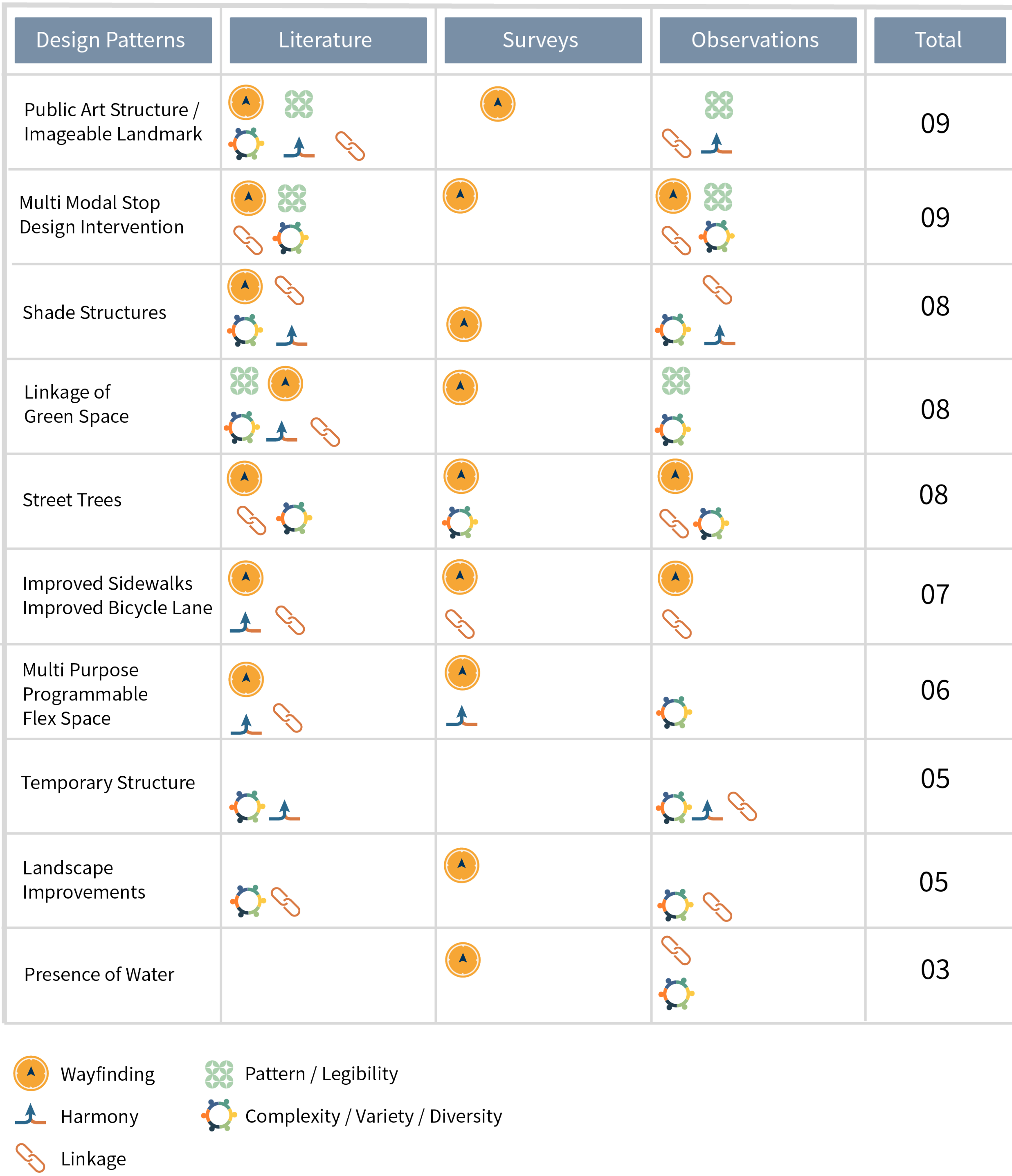


Figure 4.23 Design matrix criteria create from needs logged from surveys, observations and reviews of literature for The West End design proposal.

Chapter 5: Design Recommendations for The Historic West End

After developing the programing and determining the priority of the programs and design patterns, the researcher developed a design proposal to improve the wayfinding, imageability and sense of place in the central business district of Dallas, Texas. As shown in Figure 4.23, the proposal addresses the needs requested by the users, for site specific improvements. The design proposal also reflects the needs of the space from the review of literature and the multiple observations logged by the researcher.

5.1 The West End Design Concept

The proposed concept (see Figure 5.1) explores adding the following generic programmatic elements:

1. Imageable Landmarks
2. Street Trees
3. Improved Sidewalks
4. Linkage of Landmarks
5. Green Space
6. Shade Structures
7. Flex Space

Various uses of materials and design aesthetics were explored for the 'imageable landmark' design characteristics, as well. (See Figure 5.2) Mixing clean lines from the Main Street District with the industrial aesthetic of the West End Historic District was studied extensively.

Figure 5.1 The West End concept diagram for nodal design intervention

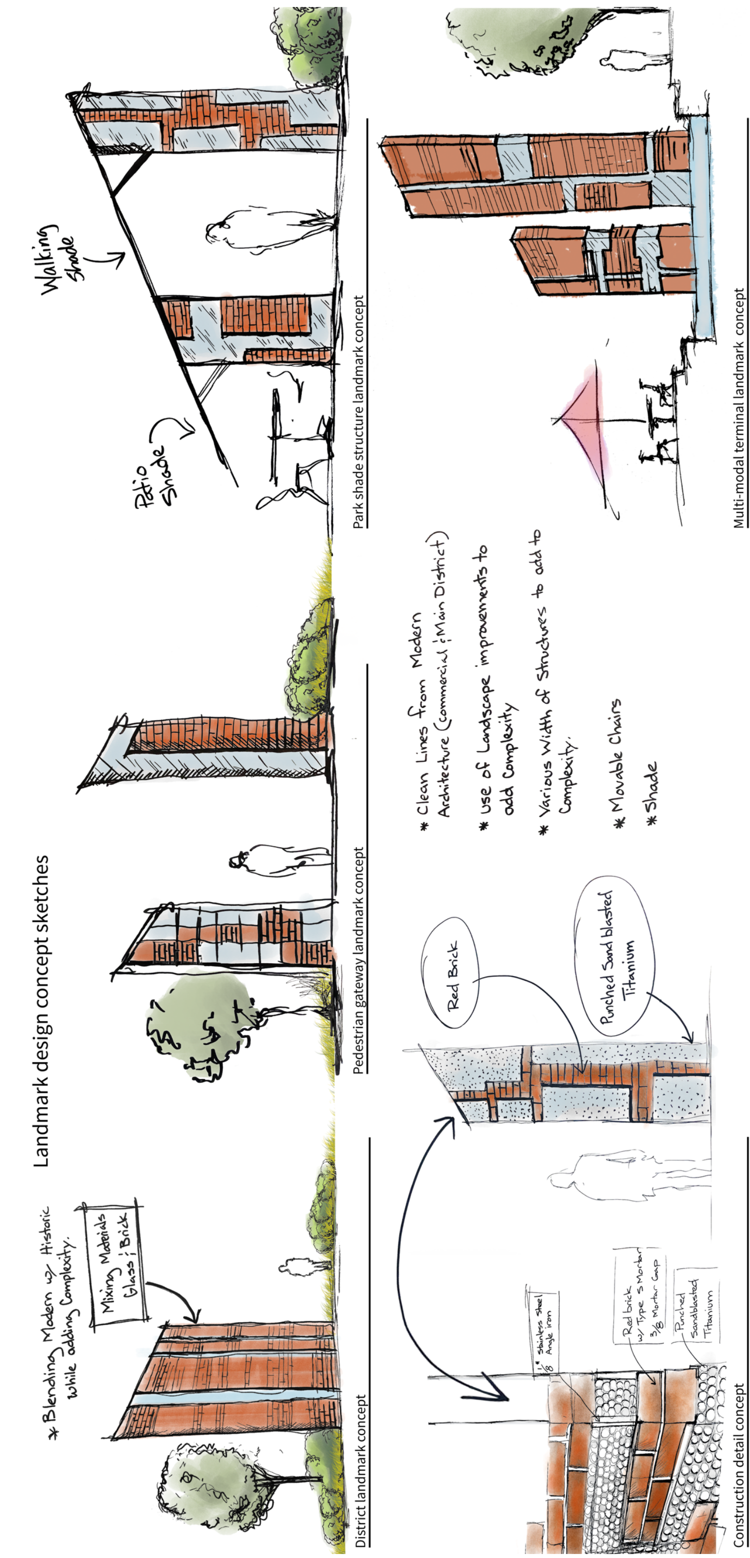


Figure 5.2 Landmark concept elevations for The West End node design considerations

5.2 The West End Design Proposal

The proposed design will improve the imageability and wayfinding of this selected nodal point and in return, provided this location within the central business district of Dallas, Texas with an improved sense of place. With the use of landscape architecture, the design displays multiple imageable landmarks, as well as landscape improvements, at various locations throughout the site. (see Figures 5.4, 5.5, 5.6, & 5.7) These landmark structures use a mix of materials such as punched sand blasted titanium (glare reduction), aged red brick and strategic lighting for a dramatic night time effect. (see Figures 5.8 & 5.9) The landscape architecture of the site creates a visual aid in branding the node, resulting in its own unique image. Both the landmarks and the landscape improvements will also provide a linkage between other (see Figure 5.4) elements similar, throughout the node.

The use of large canopy tree additions and shade structures next to both DART bus & rail stop, provide complexity and linkage to the surrounding environments. They also provide the travelers with a sense of place, upon arrival. (see Figure 5.10) The shade structures in the green space & parking lot act as multi-functional structures. They can keep the individuals cool during the daylight hours while at night, they could offer refuge for the homeless. The homeless proposal would need to be regulated by law enforcement to ensure the feeling of safety by other individuals within the site. (see Figure 5.10)

Finally, some larger landmarks, resembling the ones portrayed in Figures 5.8 & 5.9, will be installed in central portion of the node. These larger imageable landmarks may also add to the spaces identity and improve the travelers' wayfinding decisions. Theses landmarks will be visible during by daylight and twilight hours, for increased visibility. (see Figures-5.10, 5.11, 5.12, 5.13, 5.14, 5.15, 5.16, 5.17, 5.18)

Hardscape improvements were also added at the various junction points, in order to aid in decision making and decision execution when faced with a navigational choice. (See Figure 5.5)

Figure 5.4 Site overview master plan showing central node connection opportunities

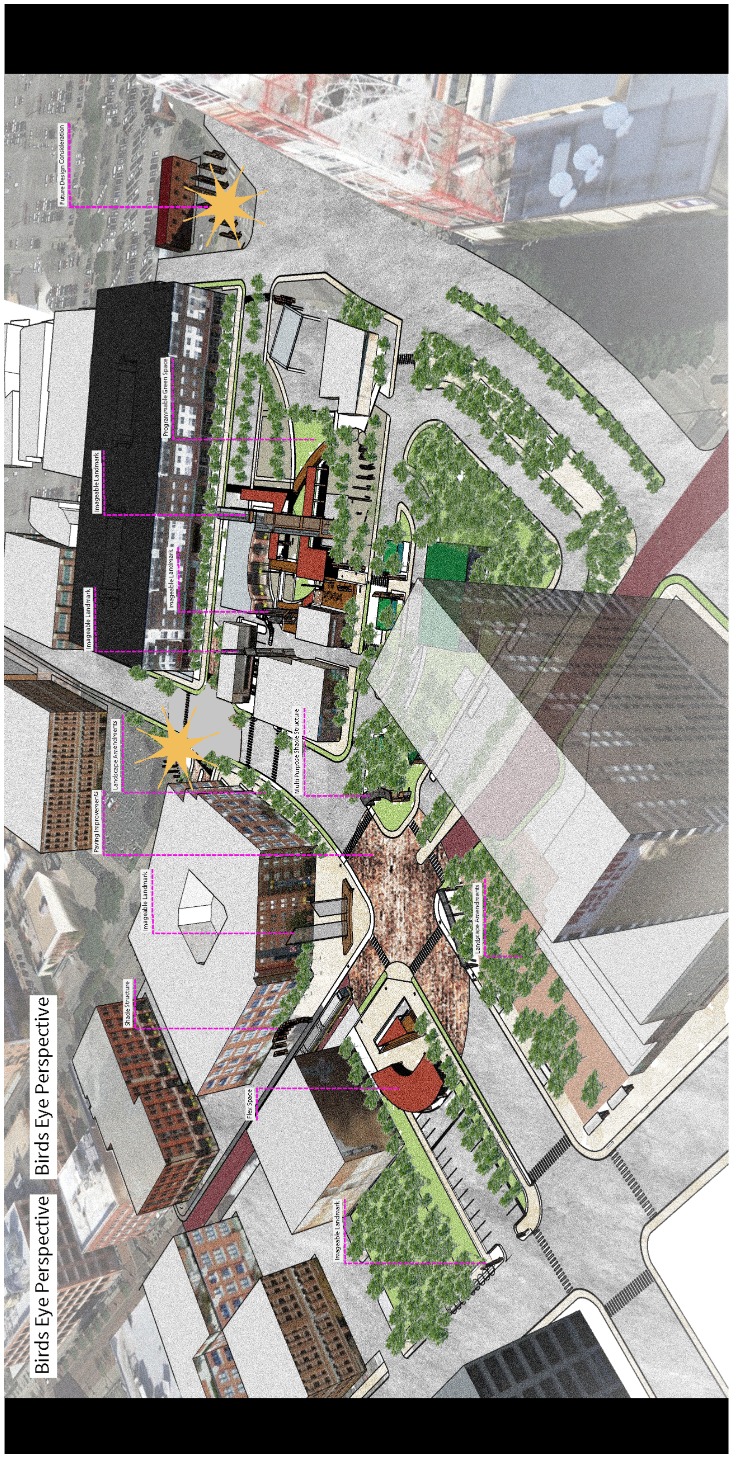


Figure 5.5 Site Design Proposal Birds Eye Overview for The Historic West End

Figure 5.6 The West End area enlargement landscape matchline-101 node design proposal

Figure 5.7 The West End area enlargement landscape matchline-102 node design proposal

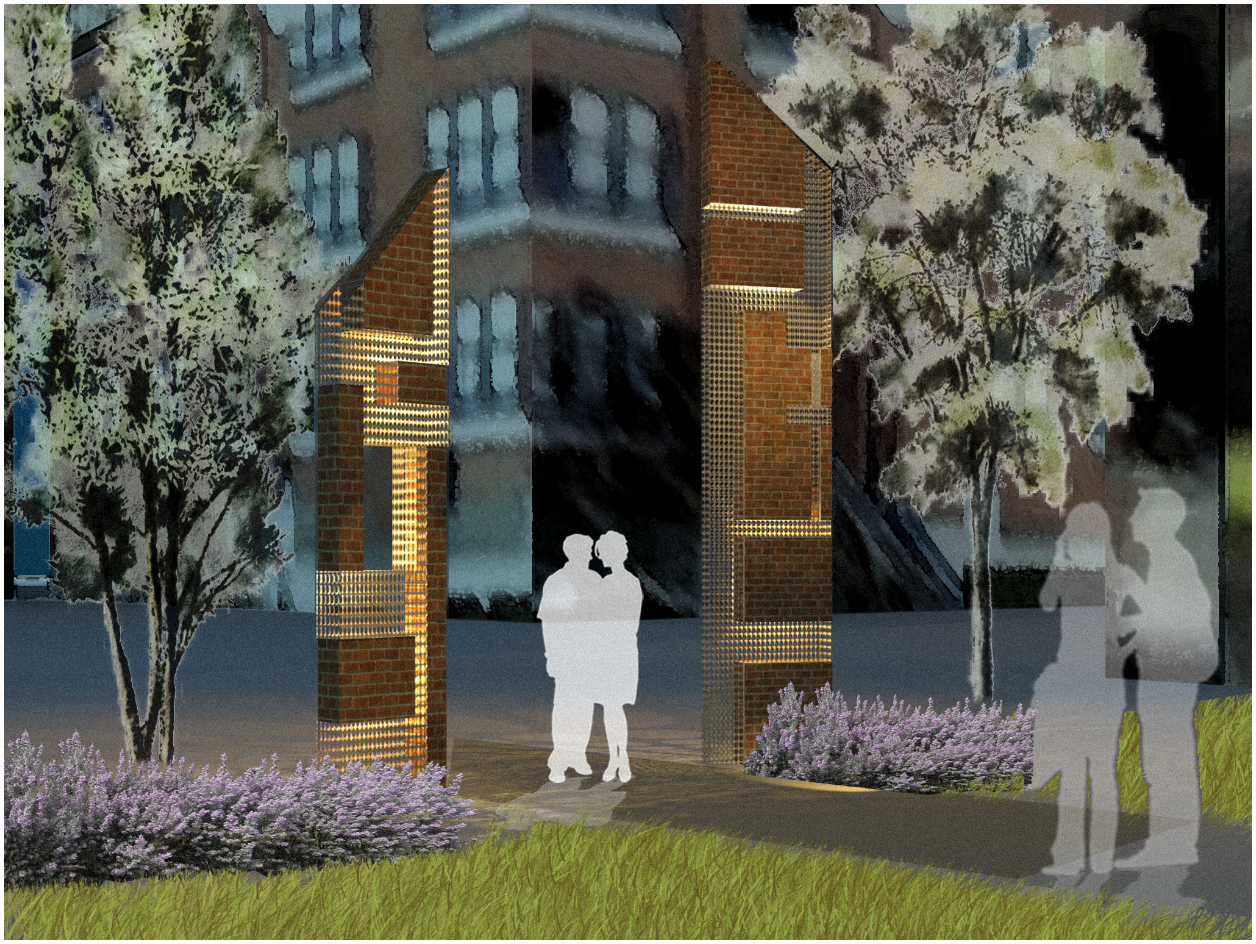


Figure 5.8 Landmark structure design characteristics – Night visualization

Figure 5.9 Site sections – Multi modal transit relationship, shade structure and landscape improvements

Figure 5.10 Landmark perspective 01- location map

Figure 5.11 Landmark perspective 01 – day condition

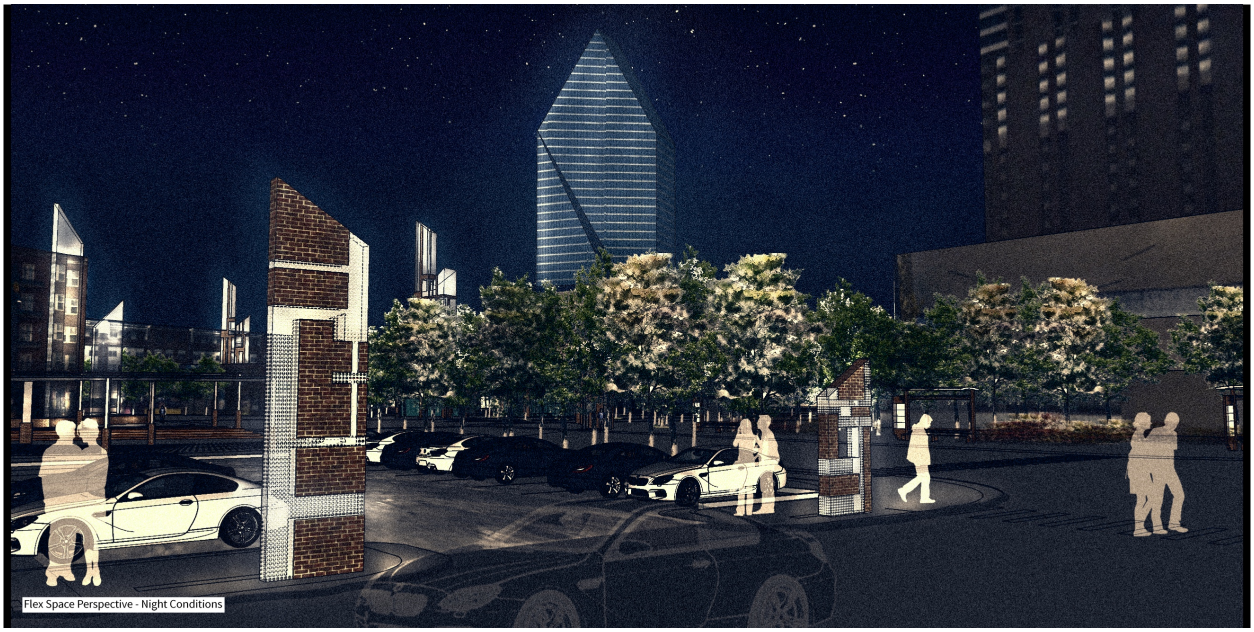


Figure 5.12 Landmark perspective 01 – night condition

Figure 5.13 Landmark perspective 02 – location map

Figure 5.14 Landmark perspective 02 – day condition

Figure 5.15 Landmark perspective 02 – night condition

Figure 5.16 Green space perspective 01– location map

Figure 5.17 Green space perspective 01 – East view

Figure 5.18 Green space perspective 02– location map

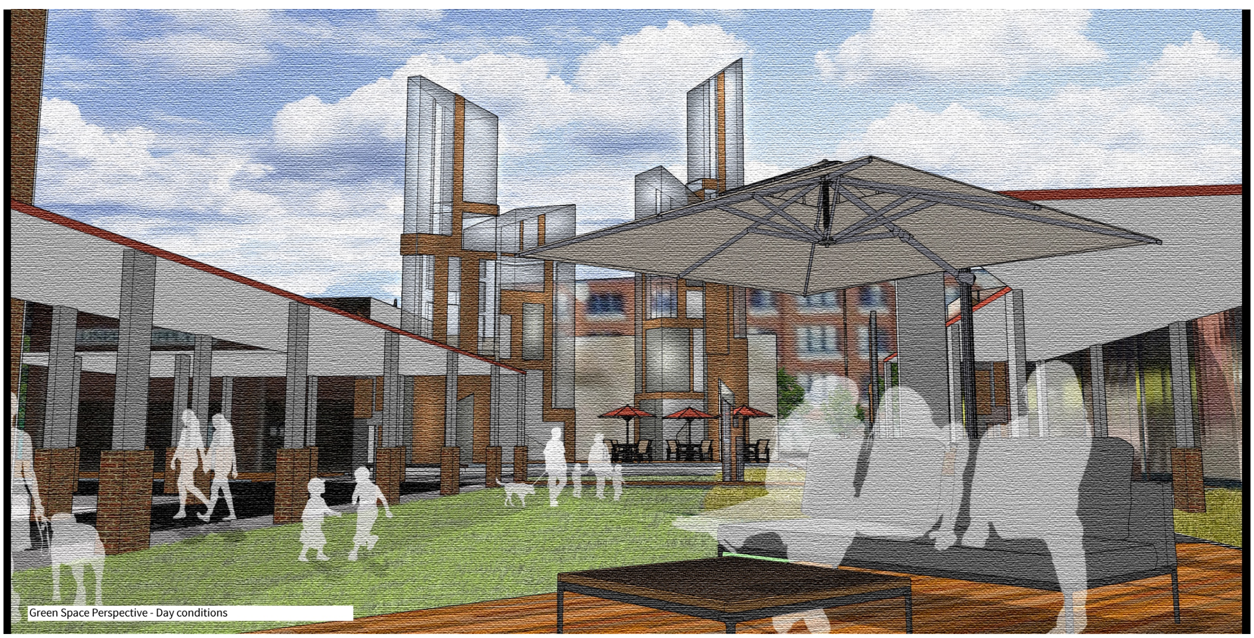


Figure 5.19 Green space perspective 02 – West view

Figure 5.20 Landmark perspective 03 – location map

Figure 5.21 Landmark perspective 03 – night condition

Chapter 6: Conclusion

6.1 Conclusions and Discussion

Based on the parameters synthesized from the review of literature, case studies, observations and community surveys, the proposed landscape architecture changes in the node improved the imageability, wayfinding and sense of place of the West End Historic District through use of various imageable landmark structures, paving patterns, and plants. Perspectives showing these enhancements demonstrate how they provide the West End Historic District with imageability, wayfinding and sense of place improvements. The street trees, side walk amendments, shade structures and multiple landmark locations add to the complexity as well as the linkage improvements within the node. Finally, the greenspace and improved pavement patterns can be expected to aid pedestrian wayfinding.

From these design interventions, the research and design proposal meets the goal of creating elements to improve the imageability, wayfinding, and sense of place in the Central Business District of Dallas, Texas. Adding structures with a mix of materials and architectural styles to create harmony and, complexity to the pre-existing environment have been shown to be beneficial in similar settings. Creating multiple areas of flexible space, and adding landscape improvements also contribute to thematic character of the site.

6.2 Importance to the profession of landscape architecture

The importance of possessing knowledge in landscape architecture proved beneficial in various ways. Demonstrating how landscape elements add to the complexity of the urban environment, is a prime example of the importance of a knowledge in the field of landscape architecture. Multi-disciplinary research that is conducted and then synthesized is what landscape architects do every day. They are the bridge between builders, engineers, planners, and architects by uniting all of our ideas about the built environment and bringing them to life. The field of landscape architecture also encourages practicing professionals to obtain a sound knowledge in horticulture. This deep and broad knowledge informs sustainable plant selection when choosing which trees and shrubs to implement into the urban environment, in order to add complexity to a monotonous environment. From a financial stand point, plants can be a more cost-efficient approach to a city's image improvement rather than the construction of an exterior structure.

6.3 Limitations

A major limitation to completion of this study was the onset of the COVID-19 pandemic. The use of photo elicitation was going to be a key component to strengthening the final design proposal, but due to the virus outbreak, in person meetings were not possible. The pandemic also had an impact on the number of survey responses collected.

6.4 Future Research

There are many opportunities created by this research for future engagement with the individuals in the central business district of Dallas, Texas. The exact time of this engagement as of this writing is to be decided. With the use of additional design feedback from landscape architects, urban design professionals, and city planners other design characteristics may be implemented to the West End Historic node. Also, the use of photo elicitation can be implemented on a follow up survey to the initial study group. This initial feedback could influence the nodal design in positive way. From an imageability, wayfinding and sense of place aspect, the effects of landscape lighting, water features, and street furniture should be researched in order to gain an increased understand on the effects in which they have on the urban environment. Various colors and building materials all should be considered, as well.

Homelessness is another topic that is mentioned in the survey feedback from the questionnaire. Further research on various design strategies, flexible / multi-use designs, that contribute to offering benefit and support to the homeless population, while combating Dallas' imageability, wayfinding, and sense of place would be important for future research.

Other important questions raised by this research include:

1. What colors and building materials result in individual spatially recalling a location in an environment, more than others?
2. How would strategic hardscape improvements cause an increase in imageability, wayfinding and sense of place?
3. What type of economic impact would result, due to the installation of these improvements?
4. What are the strategies of other cities to provide funding for these types of design improvements?
5. What type of beneficial or negative psychological impacts would these interventions create on pedestrians?
6. What impacts would these design interventions have on the social, economic and environmental "tipple bottom line"?

Appendix A:

Wayfinding and imageability improvement Survey

Wayfinding and imageability improvement survey

1. Do you live in the central business district of Dallas, TX?
   a. Yes
   b. No

2. Do you work in the central business district of Dallas, TX?
   a. Yes
   b. No

3. Do you own a car?
   a. Yes
   b. No

4. If you own a car, how often do you use a car, during the week?
   a. 0-2 days
   b. 2-4 days
   c. 4-7 days
   d. Not Applicable

5. How often do you use a bike, during a week?
   a. 0-2 days
   b. 2-4 days
   c. 4-7 days
   d. Not Applicable

6. Generally speaking, what is your primary means of transportation, when in the central business district?
   a. Walk
   b. Bike
   c. Automobile
   d. Public Transportation
   e. Other

7. What distance are you willing to walk to get to destinations in the central business district? (aprx. 12 blocks in a mile)

a. 0-3 blocks
b. 3-6 blocks
c. 6-9 blocks
d. 9+ blocks

8. What would persuade you to walk more, in the central business district? (Short response)

9. List the three buildings you like most in the central business district.
   a.
   b.
   c.

10. List the three buildings you dis-like most in the central business district.
   a.
   b.
   c.

11. What one building recurs first in your mind about the central business district?
   a.

12. Describe what comes to mind when you think about the area, of the central business district, that this survey was distributed in. (Short response)

Appendix B:

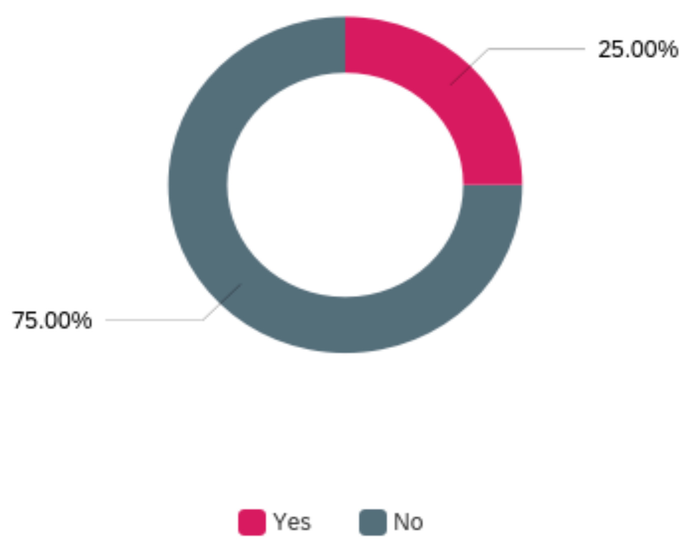
Wayfinding and imageability improvement

Survey (results)

Wayfinding and imageability improvement questionnaire (results)

Figures below reflect the survey responses distributed in the West End Historic District in Dallas, Texas.

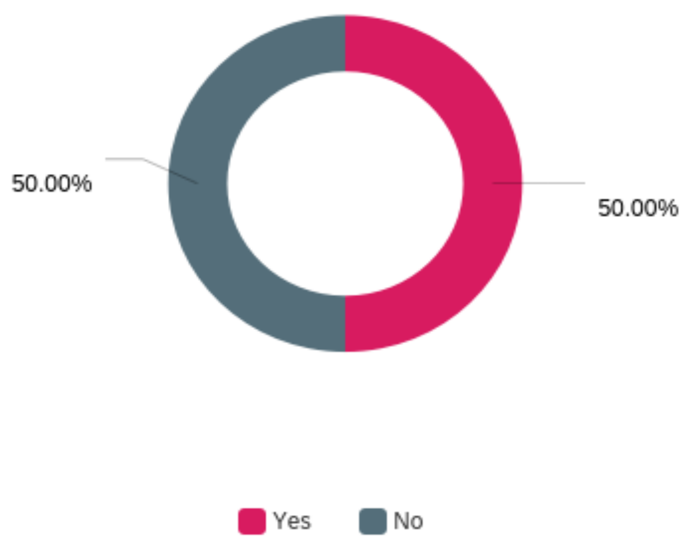
Q1 - Do you live in the central business district of Dallas, TX?



Do you live in the central business district of Dallas, TX?	Percentage
Yes	25.00%
No	75.00%
Total	8

Figure 4.21 survey question 01 (source: Qualtrics.com)

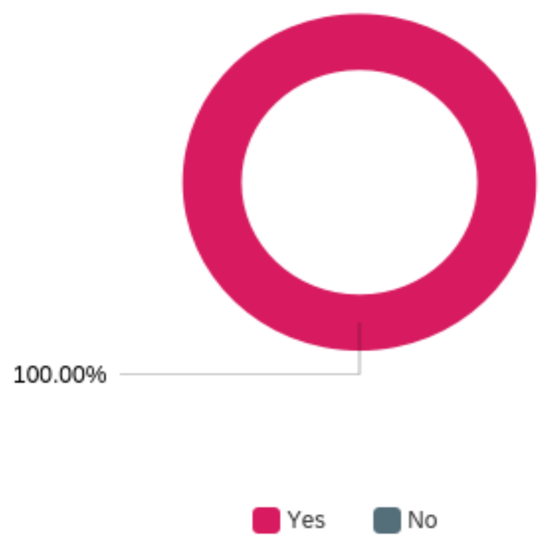
Q2 - Do you work in the central business district of Dallas, TX?



#	Do you work in the central business district of Dallas, TX?	Percentage
1	Yes	50.00%
2	No	50.00%
	Total	8

Figure 4.22 survey question 02 (source: Qualtrics.com)

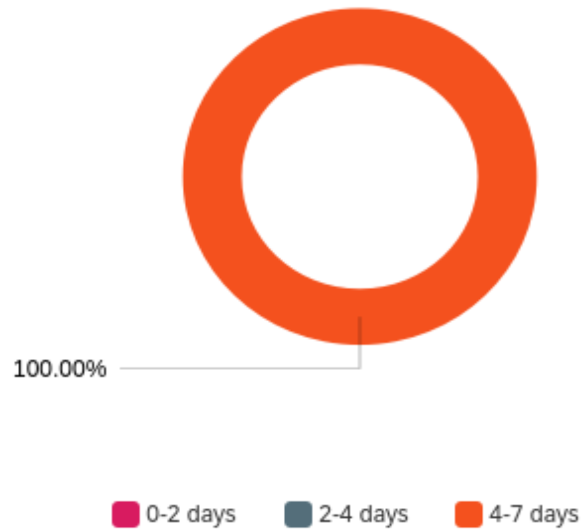
Q3 - Do you own a car?



#	Do you own a car?	Percentage
1	Yes	100.00%
2	No	0.00%
	Total	8

Figure 4.23 survey question 03 (source: Qualtrics.com)

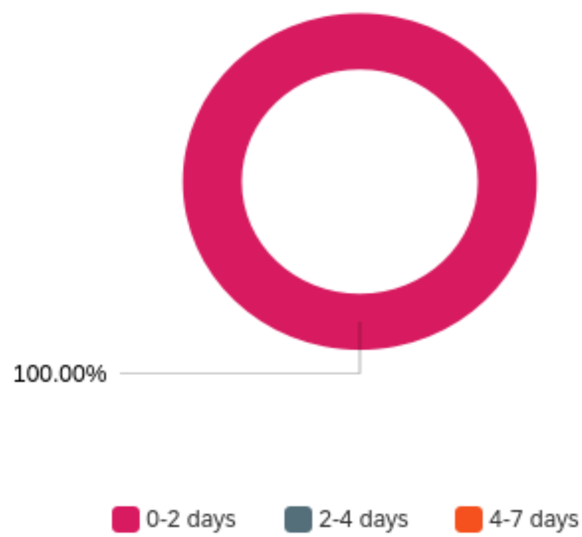
Q4 - If you own a car, how often do you use a car, during the week?



#	If you own a car, how often do you use a car, during the week?	Percentage
1	0-2 days	0.00%
2	2-4 days	0.00%
3	4-7 days	100.00%
	Total	8

Figure 4.24 survey question 04 (source: Qualtrics.com)

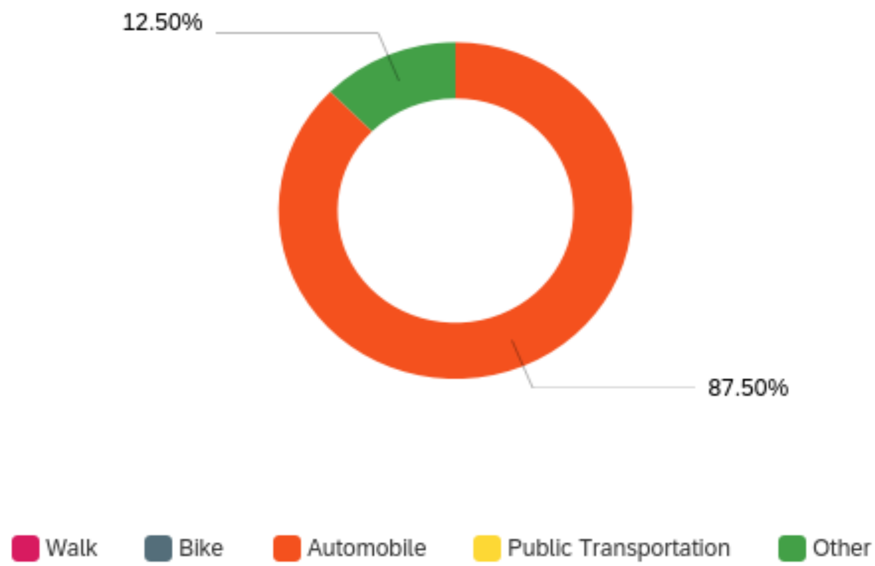
Q5 - How often do you use a bike, during a week?



#	How often do you use a bike, during a week?	Percentage
1	0-2 days	100.00%
2	2-4 days	0.00%
3	4-7 days	0.00%
	Total	8

Figure 4.25 survey question 05 (source: Qualtrics.com)

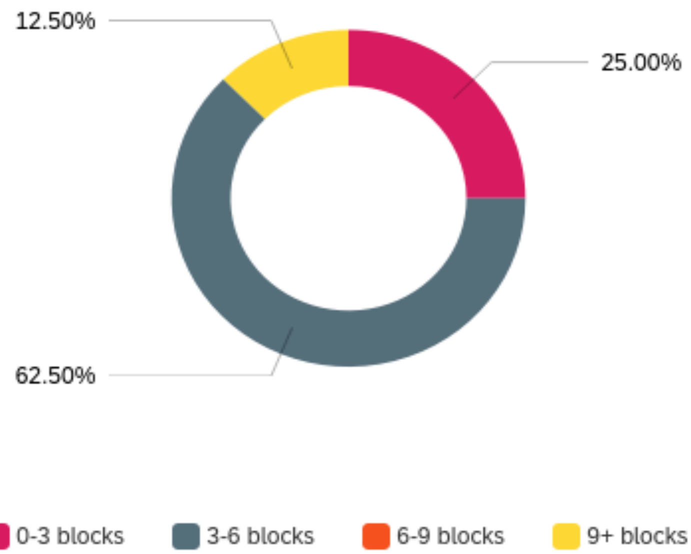
Q6 - Generally speaking, what is your primary means of transportation, when in the central business district?



#	Generally speaking, what is your primary means of transportation, when in the central business district?	Percentage
1	Walk	0.00%
2	Bike	0.00%
3	Automobile	87.50%
4	Public Transportation	0.00%
5	Other	12.50%
	Total	8

Figure 4.26 survey question 06 (source: Qualtrics.com)

Q7 - What distance are you willing to walk to get to destinations in the central business district? (aprx. 12 blocks in a mile)



#	What distance are you willing to walk to get to destinations in the central business district? (aprx. 12 blocks in a mile)	Percentage
1	0-3 blocks	25.00%
2	3-6 blocks	62.50%
3	6-9 blocks	0.00%
4	9+ blocks	12.50%
	Total	8

Figure 4.27 survey question 07 (source: Qualtrics.com)

Q8 - What would persuade you to walk more, in the central business district? (Short Response)

What would persuade you to walk more, in the central business district? (Short Response)
More shade if it is hot.
Scenery
nicer weather
Nicer weather - too hot in Dallas
Very weather and event dependent. If its too hot I don't want to walk far to anything I need to look nice for.
Landscaping, artwork to look at.
better bike lanes/scooter friendly

Figure 4.28 survey question 08 (source: Qualtrics.com)

Q9 - List the three buildings you like most in the central business district.

List the three buildings you like most in the central business district.
Reunion Tower, Old Red Museum, Bank of America Tower
Reunion tower, Spanish majestic theater, and Neiman Marcus
Bryans Tower, Chase building, Addison Circle
unknown
the Perot Museum, the Majestic theater, Reunion Tower
Dallas City Haller, Reunion Tower, and fountain Place
thanksgiving tower, Adolphus Hotel, Comerica Bank Building

Figure 4.29 survey question 09 (source: Qualtrics.com)

Q10 - List the three buildings you dis-like most in the central business district.

List the three buildings you dis-like most in the central business district.
At&t Building, World Trade Center, Dallas City Hall
Tex mex restaurants, parking lots/garages, construction
none
unknown
There aren't any buildings I especially dislike
Bryan tower. That’s about it
211 N. Ervay,

Figure 4.30 survey question 10 (source: Qualtrics.com)

Q11 - What one building recurs first in your mind about the central business district?

What one building recurs first in your mind about the central business district?
Bank of America Tower
Reunion tower
chase building
Thanksgiving Tower
the Perot Museum or the Dallas County Court House
Reunion tower
Joule Hotel

Figure 4.31 survey question 11 (source: Qualtrics.com)

Q12 - Describe what comes to mind when you think about the area, of the central business district, that this survey was distributed in.

Describe what comes to mind when you think about the area, of the central business district, that this survey was distributed in.
Traffic Lights and Parking
Innovative
development
Traffic, expensive, homeless population
Parks, JFK memorial
I love CBD, have lived downtown for almost 4 years. I am happy to see all the work being done to bring this area back to life. I would like to see more options available for the homeless population, this problem is very apparent when you live downtown.

Figure 4.32 survey question 12 (source: Qualtrics.com)

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