A Site Analysis for Programming Public Art

on the University of Washington's Burke-Gilman Trail

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Abstract

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This paper explores how public art can enhance the identity, wayfinding, and safety of the Burke-Gilman Trail along the University of Washington. A literature review of public art and identity, wayfinding, and safety identifies the key principles that help inform the best application of public art to urban trails. A site analysis evaluated the current conditions of the trail based on these principles. The potential problems identified in the site analysis included a lack of active wayfinding signage to orient new visitors to campus, potential conflicts between cars, bicycles and pedestrians, lack of adequate lighting, and lack of campus identity. Case examples were then used to explore ways in which public art has addressed the problems discovered during the site analysis and recommendations for public art programming were formed for three sections of the trail: Brooklyn Ave to 15th Ave, Rainier Vista, and the eastern segment of campus. This study determined that public art can provide valuable solutions to a nonexistent active wayfinding system, improve safety where multiple transportation modes interact, and increase perceptions of safety through lighting features while establishing a unique sense of identity for the Burke-Gilman Trail along the University of Washington campus.

Acknowledgements

I would like to thank my thesis committee members, Christopher Campbell and Manish Chalana who offered great insight and direction during my research, who challenged my thinking while providing constant encouragement. This research was also made possible by my mentor and supervisor Ted Sweeney at the University of Washington Transportation Services where I was able to learn the inner workings and institutional position of the University regarding Burke-Gilman Trail improvements, as well as gaining access and familiarity to much of the safety data. I also owe a large thanks to my thesis support group, Lizzie Moll and Melissa Gaughan. These two offered valuable critiques to my research design, maps and graphics and helped brainstorm case examples to investigate for this research. I could not have done this without their endless support and comic relief.

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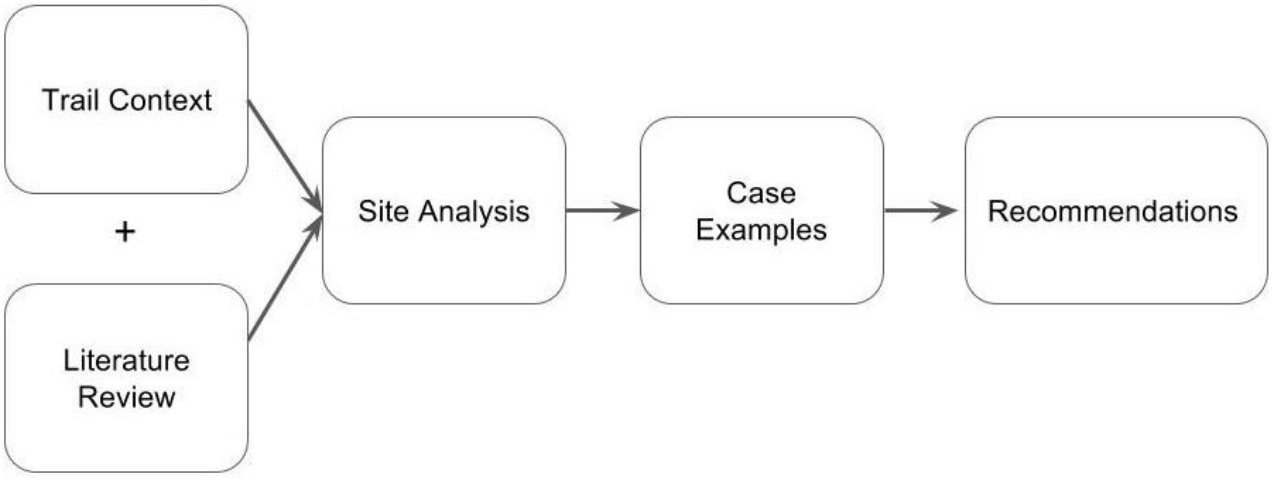
Chapter 1: Introduction

Trails are a valuable asset to the urban environment; they "represent a multidimensional type of public open space that can be expected to influence physical activity and health, as well as to shape urban form, enhance urban ecological functioning, and promote a sense of community pride and identity."[1] However, urban trails can struggle to successfully address user needs like wayfinding and safety while representing the identity of the space in innovative and creative ways. The University of Washington section of the Burke-Gilman Trail (BGT) is an interesting example of a public trail that struggles in these areas. Art has the ability to address these concerns and enhance the user experience along the trail.

Figure 1: Research Structure



This paper serves as an exploratory study that analyzes the current conditions along the University of Washington's Burke-Gilman Trail in order to determine how art can resolve wayfinding and safety problems while enhancing the trail's identity. Figure 1 diagrams the structure of the research. The paper first discusses the expected growth of the trail over the next 15 years and its regional context, which frames the importance for thoughtful planning for wayfinding and safety for the trail users. The paper then examines the literature regarding public art and identity, wayfinding, and safety characteristics of bicycle and pedestrian facilities in order to identify the major principles of these concepts. A site analysis evaluates how the Burke-Gilman Trail achieves these principles, and identifies the locations that struggle with identity, wayfinding, and safety. Case examples of public art addressing these subjects illustrate possible applications for the trail.

[1] Wolch, Jennifer R., Tatalovich, Zari, Spruijt-Metz, Donna, Byrne, Jason, Jerrett, Michael, Chih-Ping Chou, Reynolds, Kim. (2010). Proximity and perceived safety as determinants of urban trail use: Findings from a three-city study. *Environment & Planning A, 42*(1), 58.

The case examples paired with the site analysis help to shape the recommendations of programming art along the Burke-Gilman. The primary research questions that will be answered in this study are:

1. What are the principles associated with creating identity for a place, improving wayfinding, and increasing safety of bicycle and pedestrian facilities?
2. What are the current conditions and needs along trail?
3. How can art provide functional solutions to these needs?
4. Where can art be programmed to fulfill these needs?

Understanding the types of identity, wayfinding, and safety obstacles that exist on the trail creates an opportunity for the University of Washington to resolve current and expected functional problems that can impact the user experience and enjoyment of this important public space.

Chapter 2: The Burke-Gilman Trail

2.1 Geography

The Burke-Gilman Trail (BGT) is one of the most popular, paved, multi-use trails within the Seattle region for cyclists and pedestrians due to its close proximity to downtown and location to popular neighborhoods such as Ballard, Fremont, and the University District. The BGT is roughly 18 miles long, extending from Golden Gardens Park at Shilshole Bay in the west of Seattle, to Kenmore in the east where it then connects to the Sammamish River Trail creating another 10 mile extension to Redmond, WA.[2] Figure 2 illustrates the extent of the trail. This trail is known for its importance to bicycle commuters especially during the weekdays and plays a major role in creating a safe off-street route for their commute as well as a recreational space during the weekends. Due to its popularity and the variety of users, making it an accessible, safe and vibrant space is valuable to the current and future users and to the University of Washington campus.

Figure 2: Burke-Gilman Trail Context Map[3]

[2] "Burke Gilman." King County. Retrieved October 11, 2015 from, https://www.traillink.com/trail-history/burke-gilman-trail.aspx
[3] Burke-Gilman Trail Context Map. [Map] King County. "Trails in King County." Created by Ana Seivert; using ArcMap 10.3, November 2015.

2.2 Why Study the Burke-Gilman at the University of Washington?

The University of Washington is a major employment, education and transportation hub in the Puget Sound region with roughly 59,000 people traveling to campus each day.[4] Recent transportation expansions will provide even more pedestrians and bicyclists access to the campus via the BGT. In March 2016 the Sound Transit light rail station (ULink) at the University of Washington Husky Stadium opened, creating a connection from downtown Seattle to Capitol Hill with an estimated eight-minute commute. With this increased connectivity and efficiency, it is likely that more bicyclists and pedestrians will be encouraged to use the Burke-Gilman Trail as a part of their commute leading to potential congestion problems. (Figure 3, on page 14, shows the Link light rail station in relation to the trail.)

The University has anticipated the increase in usage as transportation connections and populations rise and have begun trail reconstruction along certain portions to accommodate future users. Figure 3 also shows the extent of the current construction project which runs from 15th Avenue NE and the Burke-Gilman to NE Pacific Place. This project began in September of 2015 with an expected completion date of July 2016. Leading up to these trail updates the University conducted a number of studies and assessments to evaluate the current conditions of the trail in 2010. This included compiling trail counts, determining Level of Service (LOS) and identifying nodes and traffic signage, to help develop designs for reconstruction. This information provided a context for the concerns the University has for expected usage of the trail in the coming years and helped frame the research for using public art to meet the University's needs.

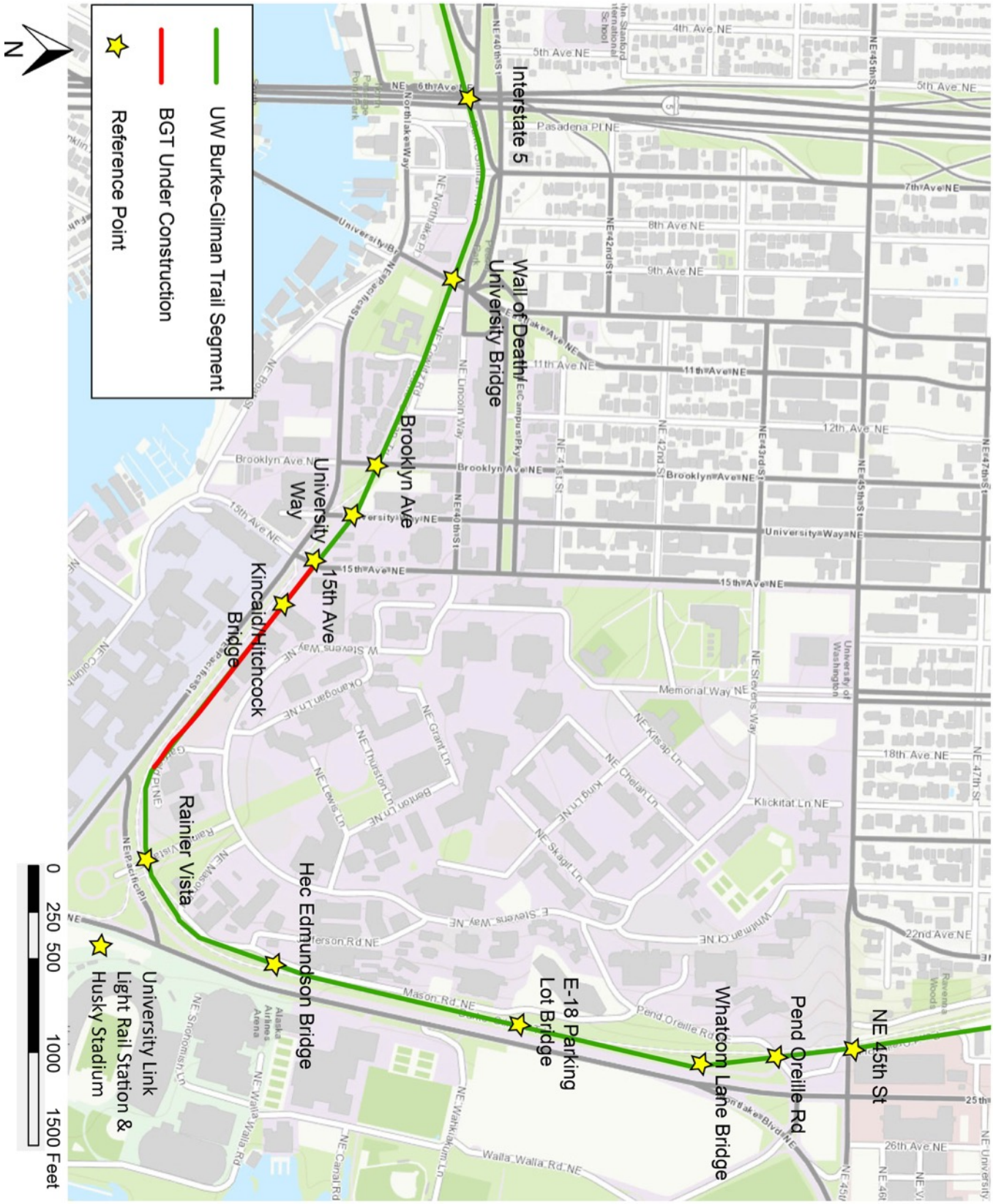
The Burke-Gilman Corridor Study compiled trail counts on the University of Washington section of the trail from various studies; the averages of the various locations are included in Table 1. The counts show that trail usage by bicyclists has increased steadily, with more recent 2013 numbers reaching 500 bicyclists and 300 pedestrians per hour at night.[5] PM peak hour counts have consistently been higher than AM counts through the years of data collection.

Table 1: Average User Counts on Burke-Gilman Trail at University of Washington[6]

1999 Campus Master Survey		2008 Sound Transit Survey		2010 Fehr & Peers Study		1999-2010 Average Annual Growth Rate	
Bicyclist	**Pedestrians**	**Bicyclist**	**Pedestrians**	**Bicyclist**	**Pedestrians**	**Bicyclist**	**Pedestrians**
207	326	351	313	479	446	7.9%	2.9%

[4] Gifford, C. (2016, January 22). *University of Washington Transportation Demand Management*. Lecture presented at University of Washington, Seattle, WA.
[5] Kaiman, Beth. "UW plans $19M in improvements to Burke-Gilman on campus." *The Seattle Times*, February 7, 2013. Accessed October 20, 2015. http://blogs.seattletimes.com/today/2013/02/uw-plans-19m-in-improvements-to-burke-gilman-on-campus/
[6] SvR Design Company, Fehr & Peers. University of Washington Burke-Gilman Trail Corridor Study. (2011, July). Retrieved October 12, 2015. http://cpo.uw.edu/sites/default/files/file/UW_BGT_Final_Report_Rev2_2011-07-26.pdf. 25

Figure 3: UW Section of the Burke-Gilman and Reference Locations[7]



[7]UW Section of the Burke-Gilman and Reference Locations. [Map]. University of Washington Transportation Services. "Burke-Gilman Trail." Created by Ana Seivert using ArcMap 10.3 and Adobe Illustrator, January 2012.

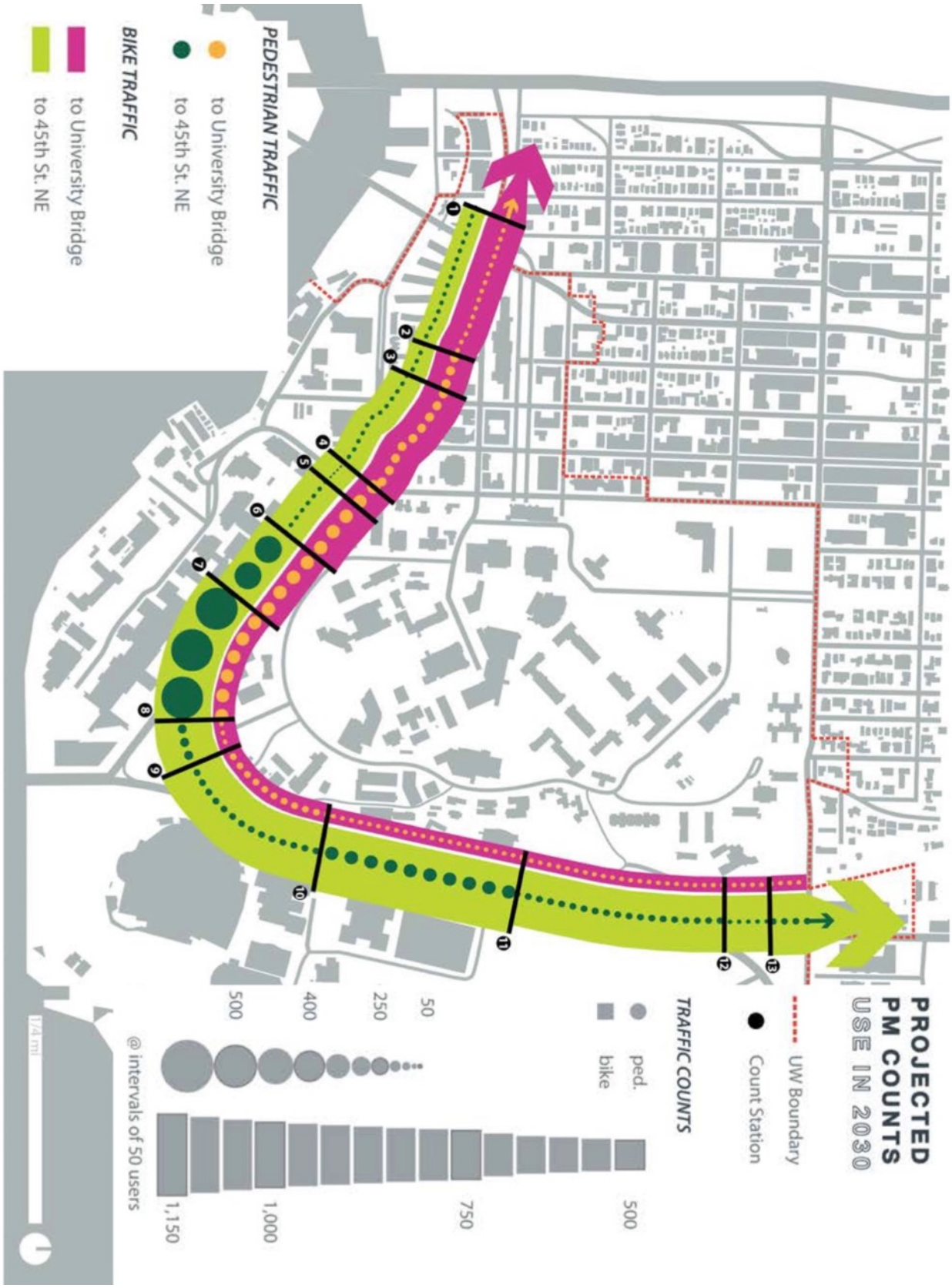
Taking into account the growth in usage, the trail is reaching its capacity. The University calculated Level of Service (LOS) grades after the 2010 counts and determined its sections of the trail had service grades of E (very poor) to F (failing) and projected a 92 percent increase in pedestrian traffic and a 238 percent increase in bicycle traffic by the year 2030.[8] Figure 4, on page 16, shows the projected nighttime counts for 2030.[9] The standard width of the trail is about 12 feet, but as the facility ages and volumes increase the travel speeds and user experience will deteriorate.[10] Due to the presence of trees and forest along the trail, users encounter frequent cracks in the pavement where tree roots are surfacing, which can provide an uncomfortable or dangerous experience especially for bicyclists, and is another reason trail improvements are important. The University of Washington section of the Burke-Gilman Trail is facing an important challenge in the upcoming years due to the projected increase in use as well as the current level of service grades. These two factors indicate that adjustments and new designs are needed to maintain the facility capacity and allow for a better user experience. Planning for art in these trail design concepts will not only add to the experience of riders and pedestrians on the trail but can also address other planning elements, such as wayfinding and safety concerns, that should be considered along a multi-use urban trail.

[8] University of Washington. "Burke-Gilman Improvement Project." January 17, 2012, 1. Accessed October 12, 2015. http://your.kingcounty.gov/dnrp/library/parks-and-recreation/documents/task_force/meeting_materials/UW_BGT_Handout_08.28.12.pdf

[9] University of Washington Burke-Gilman Trail Design Concept Plan. (2012, November). PLACE Studio and Alta Planning + Design. Retrieved October 12, 2015, from https://www.washington.edu/facilities/transportation/sites/default/files/images/concept-plan.pdf. 20.

[10] SvR Design Company, Fehr & Peers. (2011, July). University of Washington Burke-Gilman Trail Corridor Study. 18, 33.

Figure 4: PM Trail Count Projections[11]



[11] University of Washington Burke-Gilman Trail Design Concept Plan. 20.

Chapter 3: Literature Review

The following is a literature review which focuses on what elements are associated with "good" public art and how art can be used to create a strong spatial identity. It also examines important characteristics that apply to the user experience of urban trails and bicycle and pedestrian facilities in terms of safety and wayfinding. Much of the research regarding wayfinding and safety focuses on prescriptive and conventional strategies, using art, on the other hand, introduces a more creative and experiential aspect to these functions.

3.1 Principles of Public Art and Identity

This section is about art and identity as a function of placemaking. It focuses on research that indicates art can be interactive, functional, and utilitarian and has economic and aesthetic benefits. These benefits contribute to a positive sense of community and sense of identity. For the purposes of this research, I will focus on identity as an element of placemaking, Placemaking involves many large concepts such as "sense of community" and "sense of place;" these concepts are too broad to unpack in this research. However, one important aspect to placemaking is that the artwork uses elements or concepts unique to the community and community identity. Creating this unique yet relevant connection between the community and the art will foster a caring for the place, which can lead to less vandalism and crime, and in turn encourage more use of the space.[12]

Public art has been used to enhance identity throughout history. It was used after the post-World War II period as a way to reconstruct European cities consumed by war. European planners and policy makers believed public art "might contribute to unified neighbourhoods, help overcome the neglect and alienation felt in deprived areas, and ultimately the crime and vandalism which, it was supposed, were contingent upon them."[13] Public art is artwork meant to be enjoyed by the public, but "gives pride of place that which is irreducibly personal."[14] Public art must be site specific, unique to the location and the community in order to truly be considered public art that serves as an effective placemaking tool. King County states in their Regional Trails Arts Master Plan that public art should "reflect a multi-cultural perspective and population, celebrate the history and people of nearby communities, and instill a sense of civic purpose and pride."[15]

Art is often associated with making a space more aesthetically pleasing, however it can serve functional purposes as well. The function of the piece ties directly to the identity of the space such as an artwork on a trail that also serves as

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[12] Fleming, R. (2007). *The art of placemaking : Interpreting community through public art and urban design*. Merrell. New York. 28.
[13] Selwood, S., & Policy Studies Institute. (1995). *The benefits of public art : The polemics of permanent art in public places* (PSI research report ; 770). London: Policy Studies Institute. 22.
[14] Hein, H. (1996). What Is Public Art?: Time, Place, and Meaning. *The Journal of Aesthetics and Art Criticism, 54*(1), 1.
[15] Borello, Brian & Willow Fox, ed. (2011). Arts Master Plan: King County Regional Trails System. *King County Parks.* Accessed October 22, 2015. http://www.4culture.org/publicart/threads/learn/media/print/brochures/rts/RTS_Arts_Master_Plan_Borrello.pdf. 9.

a tool to work on a bike. King County found art to be such an important element in public space and urban trails that they created an Arts Master Plan for the King County regional trail system, which includes the Burke-Gilman Trail. Public art along the regional trail system is funded through the One Percent for Art program which designates one percent of all tax revenue towards public art. This was adopted by King County, City of Seattle and the state of Washington in 1973.[16]

Brian Borello, a public artist, teamed up with King County to help develop this Arts Master Plan for the trail system in 2011. This involved site visits that evaluated the trails to determine what type of public art was most suitable for certain sites. The plan states that public art can enhance identity but also provide utilitarian needs such as benches or water fountains or anything a user would need along their commute or trip. Art that provides these needs encourages use and makes trails inviting as a space people don't only pass through. The plan states public art can create identity while improving wayfinding and safety in a number of ways. The key benefits include: [17]

- Thoughtful design and art encourages more trail use
- Art can aid in identifying and marking the trail system
- Art can provide a cultural background and setting to the trail
- Art has been associated with increased perceptions of safety and decreased vandalism

King County identifies the Burke-Gilman as a high priority trail for implementing the Arts Master Plan due to the presence of sites for significant projects, number of intersections to major trails, portals to communities, and locations that can enhance the overall quality of the trail system.[18]

Public art has also been used as a means of stimulating the economy and promoting tourism. Sara Selwood a researcher interested in art and culture devoted an entire book on the benefits of public art. She mainly focuses on programs in Europe that emphasize public art as an element of urban revitalization, but many of these benefits can translate anywhere when applied. One benefit she mentions is stimulating the economic vitality of a space either by providing job opportunities or by boosting tourism, especially when on a large scale.[19] There is also the benefit of providing a cultural and educational experience to communities at little cost, when galleries and museums can be out of the price range of certain demographics and income groups.

Most of the literature regarding identity in placemaking discusses the importance of culture and community but also aesthetics. For example, McCormack et al's study regarding characteristics of park use touches on the importance of

[16] Borello, Brian & Willow Fox, ed. (2011). 6.
[17] Ibid. 9
[18] Ibid. 11
[19] Selwood, S., & Policy Studies Institute. (1995). 26.

aesthetics in a public space to encourage use. Much of the literature they gathered demonstrates that elements like water features, gardens and plants were all positively related to park use, while graffiti and vandalism where deterrents for users.[20] According to Barbara Luecke, the Sound Transit Art Program Manager in the Seattle region, vandalism is usually a social commentary about what currently exists in the space, such as a disadvantaged neighborhood experiencing gentrification. Usually vandalism decreases as thoughtful public art is installed that relates to the community and its history.

There are many arguments that encourage the use of art to address the facility needs of urban trails like the Burke-Gilman. Public art can be designed to establish a means for people to navigate through a space, improve perceptions of safety of public spaces, all while creating a very specific identity for that space. It also provides accessible cultural and educational experiences for the community.

3.1.1 The Gaps in Identity and Public Art Research

The major gaps in the literature on public art and identity results from the fact that it relies mainly on observational research surrounding placemaking amenities like benches or water fountains. The research is structured around a "if you build it, they will come" mentality. The problem is that this approach does not always ensure a public space will be utilized or activated when thoughtful public art is installed. There isn't a hard and fast formula that says that an interactive, functional or aesthetic piece of public art will represent the identity of a community in a way that will encourage use and enhance the community's pride. This mainly poses an problem when trying to make the case for programming public art in a space to those who do not view it as a priority.

The important takeaways with any public art installation is that it highlights the history and identity of the site where its located and serves a function whether that is experiential or utilitarian for the user. If done in a thoughtful and purposeful way, the community will be more likely to care for the space and vandalism is often nonexistent.[21] This will help make it a place people will not only want to travel through, but also visit.

3.2 Principles of Wayfinding

Wayfinding is how one navigates through a space to get from one place to another. It considers how people think about spaces and attempts to provide visual cues that make the spaces legible and clear, uniform (or consistent between spaces), accessible to many users and levels of abilities, and creates an enjoyable experience while people travel through

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[20] McCormack, Gavin R., Rock, Melanie, Toohey, Ann M., & Hignell, Danica. (2010). Characteristics of urban parks associated with park use and physical activity: A review of qualitative research. *Health and Place,16*(4), 717.
[21] Luecke, B. (2016, April 18). *Sound Transit Public Art Program*. Lecture presented at Public Art in Transportation Infrastructure in Lane Powell, Seattle, WA.

the environment. If someone does manage to get lost, wayfinding has easily recognizable cues that capture the user's attention to help them re-direct themselves.

Wayfinding comprises three processes: decision making, decision execution and information processing.[22] Decision making refers to the point in time when someone comes to, for example, a fork in the road and must choose the direction in which they will go. Decision execution involves creating a mental image of what someone remembers from the environment with what they perceive of the environment, this is also referred to as recall and recognition.[23] The things people will most commonly remember are[24]:

- Form of a building, i.e. size, scale and/or the complexity of the shape
- Visibility and access of the environment
- The useful function of something
- Symbolic significance

Information processing relates to how one takes in their surroundings through perception and cognition. Perception is the "process of obtaining information through the senses," while cognition is "understanding and being able to manipulate information."[25] One way in which people gather and process information is through scanning and glancing at the surrounding environment. The eye initially records objects and information of interest and will store it in our short-term memory. Arthur and Passini, designers interested in the mental process of wayfinding, note that this aspect of information processing is why purposeful design of a is space crucial.[26] For example, if a sign intended to orient someone in a certain direction does not draw the eye's attention upon first glance, this information may be lost to the user.

Wayfinding is composed of active and passive cues. An active cue is what most people think of when they hear the word wayfinding. It is signage or direction indicators that point people in the right direction. Passive elements of wayfinding include the organization and structure of the space, for example a gated entry indicates to a user they may not be allowed to enter a certain area. Kevin Lynch, a popular American urban planner and writer, discusses the passive level of wayfinding through his concept of mental mapping in his work *Image of the City.* One of the most important elements in creating a space one can easily travel through is legibility. He defines this in terms of the urban context and the clarity and visual quality of the urban landscape. He says that legibility becomes increasingly important as the scale of the city increases because as scale increases so does the complexity of the landscape.[27] The city becomes more legible through

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[22] Arthur, P., & Passini, Romedi. (1992). *Wayfinding:People, signs, and architecture*. New York: McGraw-Hill Book. 25.
[23] Ibid. 37.
[24] Ibid. 37.
[25] Ibid. 33.
[26] Ibid. 34-35.
[27] Lynch, K. (1960). *The image of the city* (Publication of the Joint Center for Urban Studies). Cambridge, Mass.: MIT Press. 3.

elements that create a pattern and help someone find their way through an unknown cityscape. Lynch's elements of urban form that contribute to legibility include paths, edges, nodes, districts, and landmarks.

Paths are the spaces or "channels" people move through such as streets, walkways or transit lines. The presence of a defined path is an immediate way to indicate access for someone new to the space. Marking these paths in some fashion can be important for users especially as the system becomes more complex. These markings do not have to be as literal as a street sign; they could be a unique detail that separates the space from its surroundings. When developing his notions of paths, Lynch interviewed people navigating through the streets of Boston and Jersey City. He found that when major paths lacked a theme or certain identity people tended to be more easily confused between paths.[28] He also determined that marking paths to be identifiable when the path enters and exits an important area in the city "constituted a powerful means of giving direction and scaling to a path."[29]

Edges and nodes are another Lynchian element that accompany paths. Edges are linear elements that serve as boundaries between people and the landscape. This includes retaining walls, steep slopes, or impassable vegetation that commonly prevent people from leaving a path.[30] Nodes are points of intersection between paths or centers of activity. They also serve as a place for people to leave and enter, for example a transit station or street intersection.[31]

Districts are areas of a city with a particular identity. Lynch calls them "medium-to-large sections of the city, conceived of as having two-dimensional extent, which the observer mentally enters 'inside of' and has its own identity/character."[32] This concept can vary in scale. A district could be a public square that hosts a farmer's market on the weekends to a particular area of town like Seattle's University District.

Landmarks are the last element of the urban form that enhance legibility for wayfinding. This is a distinct feature, usually physical, that serves as a point of reference for wayfinding.[33] Again these can vary by scale, for example the Turning Torso, a massive residential skyscraper, in Malmo, Sweden is a landmark and wayfinding tool that can be seen from miles away. It allows people to orient themselves and get their bearings in relation to the tower in almost any part of the city. A smaller scale example is the Lenin sculpture in the Seattle's Fremont neighborhood, one that is only visible at a closer range of a couple hundred feet in either direction.

Thoughtful planning for wayfinding elements is important because there is the ability to orient people efficiently to where they need to go while offering them an enjoyable experience. The majority of studies regarding wayfinding

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[28] Ibid. 52.
[29] Ibid. 55.
[30] Ibid. 47.
[31] Ibid. 47.
[32] Ibid. 47.
[33] Ibid. 47.

investigate *how* people find their way. Few tackle the impacts of insufficient wayfinding tools. Alycia Hund and Jennifer Minarik are among the few who have researched this element. They conducted a study that investigated how well men and women navigated through an unknown space in terms of their speed and accuracy as well as how anxiety impacted their ability to navigate. The study focused on subjects' efficiency when using cardinal directions (go north on Main St) and landmark directions (turn left at the fountain).

There were 64 subjects involved in the study, an even split between men and women, where subjects navigated a toy car around a town model. The researchers gave the participants instructions on how to "drive" through town with the toy car, alternating between cardinal directions for one turn and landmark directions on the next.[34] After they completed the test the subjects were given a questionnaire asking them to rate the anxiety they would feel navigating an unfamiliar space.[35] They found that in their study both men and women were affected by spatial anxiety, or felt nervous upon losing their way which also led to an increase in navigation errors.[36] When someone loses their way there is more opportunity to be cognitively impaired, or "situationally stressed," which seems to have an impact on one's ability to orient themselves effectively and efficiently.

It is crucial to consider spatial anxiety when designing non-motorized transportation systems like the BGT, because people traveling by foot or bicycle are more vulnerable to accidents and often have fewer wayfinding resources at their command. The goal of wayfinding design is to "create interesting settings that allow for gratifying spatial experiences and that are safe, accessible and wayfinding-efficient, despite any complexity they may have."[37] If someone is frustrated or anxious about finding their way to the right destination due to a lack of legibility of the surrounding environment, their ability to have an enjoyable or safe experience walking or biking will be disrupted. Unfortunately, there are no studies that discuss the presence of wayfinding signage and the impact on bike ridership.[38] While there are many factors that encourage people to not walk or bike, it is important to note that a lack of legibility of a space can influence mode split. If someone isn't confident they will be able to get to their destination by foot or bicycle efficiently and comfortably they may opt to use other forms of transportation such as a bus or car.

On a finer scale, active wayfinding will provide users with the ability to navigate complex spaces efficiently and confidently by being explicit about the space they are navigating. The common and most classic example of this is

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[34] Hund, A. & Minarik, J. (2006). Getting From Here to There: Spatial Anxiety, Wayfinding Strategies, Direction, Types and Wayfinding Efficiency. *Spatial Cognition & Computation,*6(3). 182-184.
[35] Ibid. 185.
[36] Ibid. 190.
[37] Arthur, P., & Passini, Romedi. (1992). *Wayfinding:People, signs, and architecture*. New York: McGraw-Hill Book. 43.
[38] Pucher, John, Dill, Jennifer, & Handy, Susan. (2010). Infrastructure, programs, and policies to increase bicycling: An international review.(Report). *Preventive Medicine, 50*, S110.

signage.[39] Cues people often that help them find their way include distance, the direction of travel, street names and landmarks.[40] Wayfinding can include various types of signs or tools for open or public spaces. There are identification signs typical for exits and entrances, directional signage that provides cues on how to move through a space, orientation signs, usually a large scale map that helps users find their location in relation to other areas nearby, and regulatory signs that indicate appropriate behavior in a space.[41] The National Association of City Transportation Officials (NACTO) takes a slightly different approach and assigns wayfinding signs into three categories: confirmation, decision and turn wayfinding signs.[42] This is mainly due to the facilities on which the signs are used, primarily street networks and urban trails.

Identification signs could include gateways, thematic signage that indicates one has arrived in a particular space, see Figure 5 of an example of Pike Place Market. Directional signs are useful for circulatory systems like NACTO bike route signage. Consistency and simplicity are stressed for these types of signs. Orientation signs are typically campus maps or directories. Regulatory signs are necessary to comply with legal codes.

Figure 5: Pike Place Market Gateway

Photo Credit: Ana Seivert, 2014, Seattle

When it comes to programming public art into a wayfinding system much of the literature and best practices focus too specifically on what makes a "good" wayfinding sign. It emphasizes the legibility and uniformity of signage. Legibility in this context is different than what Lynch discusses. Here it has a much more literal meaning. Wayfinding elements are supposed to display clear information efficiently so one can recognize it as a wayfinding tool, read it, and be able to make a decision on the path they will take based on it. Proper placement of signage is one way to create a legible landscape, NACTO for example prescribes that signs along a bicycle or pedestrian path like the Burke-Gilman should be spaced a quarter to a half mile apart.[43]

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[39] Meuser, P., & Pogade, Daniela. (2013). *Wayfinding and signage* (Second ed., Construction and design manual). 12.
[40] Hund, A. & Minarik, J. (2006). Getting From Here to There: Spatial Anxiety, Wayfinding Strategies, Direction, Types and Wayfinding Efficiency. *Spatial Cognition & Computation,*6(3). 179
[41] Gibson, D. (2009). *The wayfinding handbook: Information design for public places* (Design briefs). New York: Princeton Architectural Press. p.48
[42] "Bike Route Wayfinding Signage and Markings System." National Association of City Transportation Officials. Retrieved from http://nacto.org/publication/urban-bikeway-design-guide/bikeway-signing-marking/bike-route-wayfinding-signage-and-markings-system/
[43] "Bike Route Wayfinding Signage and Markings System." National Association of City Transportation Officials. http://nacto.org/publication/urban-bikeway-design-guide/bikeway-signing-marking/bike-route-wayfinding-signage-and-markings-system/

Uniformity and consistency of wayfinding elements, especially when it comes to active cues like signage, is important to a user trusting the accuracy of the information being presented. If someone was traveling down the Burke-Gilman and several signs leading to an intersection indicated their destination is on the right, yet there is no marking once they reached the intersection, they may not trust that this is the place they are supposed turn. Uniformity also applies to the theme of the signs. If a theme is not consistent and the signage does not look similar along the journey people feel less confident in the wayfinding system. Prescription of wayfinding elements goes all the way down to size and types of material used, colors, types of symbols, size of the text in relation to the sign, and the font in order to address these concerns.[44]

The users of the wayfinding system will be a large indicator of what wayfinding elements are appropriate. Is there going to be a variety of different users and levels of familiarity with the space? For example, airports commonly have multilingual signs to serve a diverse population of visitors moving through the terminal. Users of all levels of ability should be considered when planning a wayfinding system. Unfortunately, these systems often exclude the impaired (visual, hearing, literacy, mobility, and cognitive) since they are strongly centered on visual aesthetics and literacy.[45] Much of the common public art examples cater to those without any impairments, especially visual impairments which does create a dilemma when trying to provide a wayfinding experience to a more diverse group of people.

The major principles identified from the wayfinding literature include planning a system that is legible for both active and passive cues, uniform, considers all users and levels of abilities, and creates an enjoyable experience while reducing spatial anxiety. A well designed wayfinding system has visual cues that are noticeable enough to re-direct someone if they do manage to lose their way. Art has a way of enhancing a user's wayfinding experience by not only capturing the eye's attention to provide them information about navigating the space but by also creating a space they desire to navigate through, which is why it is a practical element for the Burke-Gilman. It can create a space that is memorable, one that is seamless and safe to navigate and not cluttered with signs and arrows.

3.2.1 The Gaps in Wayfinding Literature

There are no studies that explore how bicyclists and pedestrians use wayfinding systems or what types of wayfinding works best for these users in public spaces which makes it slightly challenging to apply to the Burke-Gilman. The Hund and Minarik study focused on how users reacted to direction and orientation but this was simulated in a model of a town where they navigated a toy car and responded to instructions. There would likely be a much different wayfinding

[44] Gibson, D. (2009). The wayfinding handbook : Information design for public places (Design briefs). New York: Princeton Architectural Press. 83, 114-115.
[45] Arthur, P., & Passini, Romedi. (1992). 63.

experience in terms of anxiety and the ability for one to respond to directions if they were physically on a bike or walking, if they were on a dimly lit trail at night by themselves, or on a congested trail during the day. There are also no studies regarding wayfinding on urban trails that would indicate the need or the desire for a wayfinding system by users for either experiential or orientation benefits.[46] There are a variety of studies that could be done to begin to address these gaps, and should be investigated further.

As mentioned previously, much of the literature on wayfinding focuses on the very small scale wayfinding system of designed signs and markers. Many of the design elements of these specific tools go down to the fine details of what materials are acceptable all the way to the font and letter size. For this research, that aims to use public art to enhance the overall experience of the user on an urban trail, the prescriptiveness and design specifications do not provide much benefit. While it is useful to understand that chaos and a lack of uniformity in wayfinding tools can create anxiety and frustration for users, artists can have a broader impact by creating spaces people enjoy navigating.

3.3 Principles for Bicycle and Pedestrian Safety

Most of the literature regarding bicycle and pedestrian safety in their designated facilities discuss the type of facilities themselves (shared-use versus separated) and environmental conditions such as pavement quality and lighting. This is a problem because it does not focus enough on spaces shared solely between bicycles and pedestrians, and what features create a safer environment for bicyclists and pedestrians together. While much of the literature suggests important requirements for bicycle facilities *or* pedestrian facilities some elements can be translated as a necessity to ensure the safety for both bicyclists and pedestrians. The literature review is divided into facility design considerations for bicycles and pedestrians and facility features associated with park and urban trail usage. The research identifies the main principles that improve safety for facilities like the Burke-Gilman including design that considers interactions and intersections of modes, pavement condition and maintenance, and are well-lit.

3.3.1 Facility Design Considerations for Bicycles and Pedestrians

Much of the literature regarding bicycling and pedestrian facilities suggests that the best practice in terms of safety and comfort for non-motorized users is to have infrastructure that separates them from automobile traffic. Organizations such as NACTO (National Association of City Transportation Officials) champion separated facilities like cycletracks or protected bike lanes, which are designated on-street bike facilities that are completely separated from

[46] Pucher, John, Dill, Jennifer, & Handy, Susan. (2010). S110.

automobile traffic. These are the best ways to reduce on-street collisions between bicyclists and automobiles.[47] Since the Burke-Gilman is separate from most automobile traffic, these design standards are not applicable.

NACTO, however, does have design guides for intersection treatments where riders and cars do interact with one another. This concept is more applicable to the Burke-Gilman, which has points along the trail that intersect vehicular traffic. Intersection crossing markings are the primary way in which to notify cars that a bikeway is continuing through an intersection as well as for indicating a path for bicyclists to follow. According to NACTO, "they provide a clear boundary between the paths of through bicyclists and either through or crossing motor vehicles in the adjacent lane."[48] The benefits of this designation includes reducing stress for bicyclists by showing them a clear path of travel, making bike movements more predictable to vehicles, and increasing visibility of bicyclists to vehicles.

John Pucher, a renowned professor at Rutgers University, focused much of his academic research on urban transportation infrastructure and policies. His early studies have confirmed that off-road facilities and trails have substantially lower fatality rates for bicyclists than on-road facilities shared with cars. This is mainly due to the combination of higher traffic speeds of cars and the unpredictability of bicyclist movements.[49] In cases of bicycles and motorists, Pucher states that observational studies have indicated that colored lanes, share lane markings, and bike boxes (designated areas in intersections for bicycles to wait for signal changes visible to cars) lead to behaviors that reduce collisions.[50]

Pavement and maintenance is another factor in the safety of urban trails. In 2010 Pucher co-authored an article that explored the impacts on the physical infrastructure of bicycle facilities like bike lanes and signage but also maintenance which could impact usage. Pavement quality was one area analyzed, and as one might expect, better pavement quality is more desirable for riders. Several studies that Pucher collected such as a 1994 travel survey for cycling preferences conducted by Cathy Antonakos, stated that cyclists rated smooth pavement as being more optimal for a bike route rather than a route that had a bike lane and was poorly maintained.[51] Engineering students at the University of California Davis conducted a similar study where they used statistical analysis to measure the relationship between pavement surface type and bicycle vibration and ride quality. This study confirmed the importance of appropriate maintenance and pavement upkeep. Coarse surface treatments to patch areas in the pavement increase vibrations and

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[47] Cycle Tracks- National Association of City Transportation Officials. Retrieved March 09, 2016, from http://nacto.org/publication/urban-bikeway-design-guide/cycle-tracks/

[48] Intersection Crossing Markings - National Association of City Transportation Officials. Retrieved March 09, 2016, from http://nacto.org/publication/urban-bikeway-design-guide/intersection-treatments/intersection-crossing-markings/

[49] Pucher, John. (2001). Cycling safety on bikeways vs. roads. (Ideas in Motion).(Abstract). *Transportation Quarterly, 55*(4), 9.

[50] Pucher, John, Dill, Jennifer, & Handy, Susan. (2010). Infrastructure, programs, and policies to increase bicycling: An international review.(Report). *Preventive Medicine, 50*, S111.

[51] Ibid. S109.

resistance against the wheels making it a more uncomfortable experience for bicyclists.[52]

While many of the studies conducted by Pucher focus on bicycling policy and infrastructure, there is mention of a few infrastructure needs for pedestrians. His article *Promoting Safe Walking and Cycling to Improve Public Health: Lessons from the Netherlands and Germany* used policy case studies to compare the difference in bike ridership and pedestrian activity between Europe and the United States. It determined that well-lit sidewalks and raised or flashing beacons at crosswalks were the most important infrastructure needs for pedestrians to improve safety.[53]

3.3.2 Facility Features Associated with Parks and Urban Trail Use

Characteristics of Urban Parks Associated with Park Use and Physical Activity: A Review of Qualitative Research is one study that looked more in depth at facilities and elements that encourage park use. Urban trails correspond to parks as a public space because they both provide the opportunity of social engagement and physical activity or leisure. The researchers conducted a comprehensive search of all the literature on parks and usage and compiled the main characteristics that appeared across several studies.[54]

The features associated with increased park use from this study included amenities such as benches, fountains or bathrooms, condition and maintenance, and accessibility.[55] They also noted that the presence of lighting added to perceptions of safety. Whether there were safety concerns or not, people felt more comfortable with more lighting.[56] More lighting allows people to participate in activities with less concern for their surroundings whether they feel they are prone to an attack or likely to injure themselves due to visual impairment. Studies on bicycle facilities identified that while off-street facilities are preferred by most bicyclists, women generally feel less safe on trails than men, which is potentially related to the idea of being less visible and susceptible to attacks.[57] Sufficient lighting would be one way to help more users feel safer and less vulnerable on trail facilities like the Burke-Gilman.

While there is not a large amount of literature that discusses the metrics of lighting for a public space such as an urban trail, a new study conducted by Nasar and Bokaraei in 2016 researched how variations in lighting can change peoples' perception of safety and their desire to stay in a public space for extended periods of time. "People may interpret

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[52] Li, Hui, John T. Harvey, Calvin Thigpen, Rongzong Wu (2013) Surface Treatment Macrotexture and Bicycle Ride Quality. Institute of Transportation Studies, University of California, Davis, Research Report UCD-ITS-RR-13-30. http://www.its.ucdavis.edu/research/publications/publication-detail/?pub_id=2121. 1.
[53] Pucher, J., & Dijkstra, L. (2003). Promoting safe walking and cycling to improve public health: Lessons from The Netherlands and Germany. *American Journal of Public Health, 93*(9), 1513.
[54] McCormack, Gavin R., Rock, Melanie, Toohey, Ann M., & Hignell, Danica. (2010). 714.
[55] Ibid. 716-717.
[56] Ibid. 724.
[57] Emond, C., Tang, W., & Handy, S. (2009). Explaining Gender Difference in Bicycling Behavior. *Transportation Research Record: Journal of the Transportation Research Board, 2125*, 16-25. p. 22.

good lighting as a sign that someone cares about the area, which could heighten their sense of order, informal social control, natural surveillance and sense of community."[58] This study had 30 people, 16 males and 14 females look at 48 different images of public spaces at night on a computer and had them judge the appeal, excitement and safety from crime. Researchers used color slides over lamp posts in these images to simulate variations of light: non-uniform versus uniform (or the variety of lighting), dim versus bright, and peripheral (lighting the edges of a space) versus overhead.

Participants were asked various questions regarding their emotional judgments of the different simulated spaces. They found that participants tended to prefer uniform and bright lighting for excitement, appeal and safety.[59] However, peripheral versus overhead lighting had very close scores and they could not find any significance between the two.[60] They also determined that perceived safety tended to increase with openness.[61] This study suggests that uniform and bright lighting leads to greater excitement, appeal and safety for people in public spaces at night. However, these conclusions were made based off participants viewing pictures of spaces at night where someone's perceptions of a space might be different if they are actually experiencing it.

When it comes to planning bicycle and pedestrian facilities such as an urban trail the literature suggests modes should be separated and consideration of how these modes intersect is crucial to reducing collisions. The facility should be well-lit and well maintained, and more openness of the space itself can encourage use and improve comfort and safety.

3.3.3 The Gaps in Bicycle and Pedestrian Facility Literature

There are major gaps in the literature regarding safety and shared-use facilities for pedestrians and bicyclists. The main finding in the literature is that bikes and pedestrians should be separate on these paths to avoid conflict, but many of the other applicable safety issues along an urban trail in particular regarding lighting and pavement quality are not thoroughly investigated. Attacks on users of off-street paths are not unheard of because the facilities are more secluded. The Midtown Greenway in Minneapolis, MN a popular off-street bike and pedestrian facility has been hit several different times with strings of muggings and attacks on users.[62] So there is a need for further studies to identify what types of facilities or what characteristics of facilities could reduce these occurrences.

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[58] Nasar, J. L., & Bokharaei, S. (2016). Impressions of Lighting in Public Squares After Dark. *Environment and Behavior*. 0013916515626546. p.2.
[59] Ibid. 17-18.
[60] Ibid. 18.
[61] Ibid. 5.
[62] Incidents. Midtown Greenway Coalition. Retrieved from http://midtowngreenway.org/about-the-greenway/safety/incidents/.

3.4 Findings in the Literature Review

The literature review featured research on public art and identity, wayfinding, and safety elements that should be considered for an urban trail like the Burke-Gilman. The major finding for public art and identity states that “good” public art will be site and location specific and will evoke the identity of the place where it’s located. The function of the artwork also contributes to the identity and connection to the community, and whether they feel it addresses their specific needs. The four principles associated with wayfinding include legibility, uniformity, consideration of various user groups and levels of abilities, and creating an enjoyable experience that reduces spatial anxiety. Lastly, elements of safety for facilities such as the Burke-Gilman consider the interaction between modes of transportation, maintenance and pavement condition, and lighting. These characteristics are associated with public parks and trails provide a safe and comfortable environment.

Chapter 4: Burke-Gilman Site Analysis

In order to determine how art can resolve wayfinding and safety issues while enhancing the identity along the Burke-Gilman I conducted an extensive site analysis to understand the current conditions of the trail. I began the site analysis at the Burke-Gilman Trail and Northlake Place, just west of the University Bridge overpass. My analysis ended just North of Pend Oreille in the Ravenna Woods where the University jurisdiction over the trail ends, and was done from both directions. During this research period the section of the trail from 15th Avenue to just west of Rainier Vista was not able to be captured as it has been under construction.

This analysis used the findings from the literature review for the principles of identity and public art, wayfinding, and safety. A Lynchian analysis was used as the primary method to describe the experience and identity of the trail and captured open spaces and "eye sores," which included places of vandalism or where manmade elements contrasted the natural environment in a potentially unpleasant way. The Lynchian analysis also examined how the trail addresses the principles of wayfinding as well as notes on existing active wayfinding forms like signage. The safety element of my site analysis required identifying common areas for accidents for bicycles and pedestrians, traffic signage and features, and the quality of lighting of the trail at night. I conducted my site analysis by walking and biking the trail, filming it using a GoPro camera to have a visual record, and by taking photographs of features along the trail. The maps in this site analysis were created using ArcMap and Google Earth[63] aerial base maps of the University campus which I then superimposed with my site analysis findings using Adobe Illustrator.

[63] Google Earth's most updated aerial photos for the University of Washington campus are dated April 2015. Section B, Rainier Vista, base map depicts the site before construction on Rainier Vista was completed.

4.1 The Experience and Identity on the Burke-Gilman Trail

This portion of the site analysis describes the experience along the trail and illustrates a detailed analysis of three particular sections of the trail in order to depict the current character and identity of the Burke-Gilman. These sections are from the Stevens Court Apartments to NE 15th Ave (Section A), Rainier Vista (Section B), and the E-18 parking lot pedestrian bridge to Pend Oreille Rd (Section C). Figure 9 on page 34, indicates these sections, and Figures 10-12 on pages 35-37 show these three sections in greater detail.

The western segment of the Burke-Gilman is characterized by a faster pace of travel for bicyclists and pedestrians. This area has fewer University buildings to access, so the trail primarily serves for users to pass through this area of campus rather than stopping at a certain destination. There is a landmark identified as an art piece called The Wall of Death which was created by a Canadian sculptor and his son and commissioned by the City of Seattle in 1993 (Figure 6). This piece was met with much public controversy due to the location and concept.[64] The section just past the Wall of Death sees slightly more usage as the landscape is surrounded by newer developments of student dormitories mixed with older buildings that house a variety of University services. The portion of the trail from the Wall of Death to the end of the Mercer Court Apartments is recognizably newer and wider than other sections of the trail.

Figure 6: Wall of Death

Photo Credit: Ana Seivert. 2016. Seattle.

The pace of bicyclists tends to slow down as they pass through Section A (Figure 10 on page 35), from the Stevens Court Apartments to NE 15th Ave. This section is characterized as a complex portion of the trail due to the number of entries into campus, especially for vehicular traffic. Bicycles and pedestrians have many opportunities to cross paths near Stevens Court, especially as people are crossing the trail to access their dorms. Once a traveler reaches

[64] Miller, B. (2008, September 19). The Wall of Death. *Seattle Weekly News*. Retrieved April 2, 2016, from http://www.seattleweekly.com/2008-09-17/calendar/the-wall-of-death/

Brooklyn, there is more interaction with vehicular traffic until 15th Avenue. These intersections slow the pace of the trail and allow people to connect to other areas of campus. The section between Brooklyn and University also has three picnic tables and a small amount of open space where people will often be eating on their lunch breaks.

On the 15th Avenue portion of the trail heading east, there are edges in the form of slopes and landscaping on both the north and south sides of the trail. The Rainier Vista portion of the Burke-Gilman, seen in Section B (Figure 11 on page 36), is by far the most active area of the trail and is associated with the vibrant campus atmosphere. It is the newest renovated stretch, purposefully landscaped and designed with a wider path for users. There is multidirectional traffic between bicyclists and pedestrians traveling east/west on the trail as well as using the trail to travel north/south. This area of campus is a major transportation hub with the presence of the Link Light Rail station that opened in March and frequent bus service accessible nearby. People are either traveling to transit stations, to the University of Washington Medical Center, Husky Stadium or to academic buildings in the center of campus. Just past Rainier Vista there is a vandalized utility box, indicated as an eye sore in the Section B figure. Figure 7 shows the box, feet from the trail, tagged with graffiti. This box and the graffiti are also visible from the adjacent roadway, Montlake Boulevard.

Figure 7: Vandalized Utility Box

Photo Credit: Ana Seivert. 2016. Seattle

The eastern segment of the BGT is characterized by more isolated stretches of trail which allow bicyclists and pedestrians to move at a much quicker speed than Rainier Vista, but a few points of congestion become more problematic during the rush hour period. The Hec Edmundson and E-18 parking lot pedestrian bridges have higher traffic in afternoon rush hour because people are using the trail or crossing the trail to get to the gym or their cars on the east side of campus Section C, Figure 12 on page 37, depicts the trail from the E-18 pedestrian bridge to Pend Oreille and shows the limited access to the trail. The vegetation and slope that surround the trail make many areas impassible without formal established ramps and paths. There is also significant tree cover that contributes to the feeling of isolation along this stretch. The natural environment is more prominent and the pavement is cracking where tree roots have broken the surface making the trail appear more neglected than other sections. A fenced utility area just east of the pedestrian bridge

is a stark contrast to the natural environment surrounding the trail. Figure 8 shows the fenced off area and also shows an area where the pavement is cracking.

Figure 8: Fenced Off Utility Boxes

Photo Credit: Ana Seivert. 2016. Seattle

The intersection of Pend Oreille and the Burke-Gilman is the first and only time trail users interact with vehicular traffic on the eastern section of the trail. This is another place where a user's travel speed slows in order to make a comfortable and safe crossing. The remaining stretch of the trail to the Ravenna Woods feels very remote, paths accessing other areas of campus are even more infrequent, and there are no landmarks identifying that one is leaving (or entering if approaching from the east) the University campus.

Figure 9: Site Analysis Reference Map

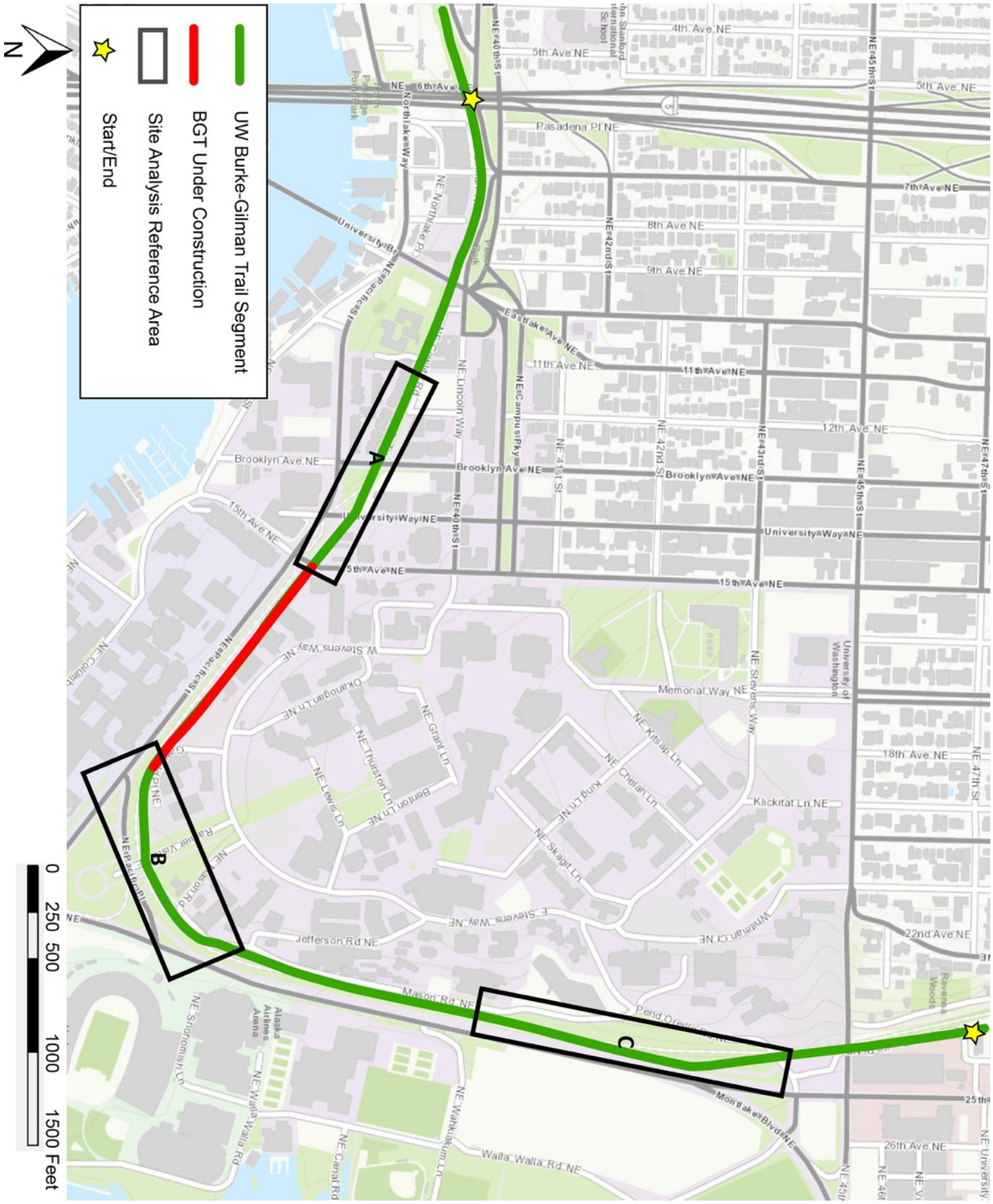


Figure 10: Section A – Steven's Court to NE 15th Ave Analysis

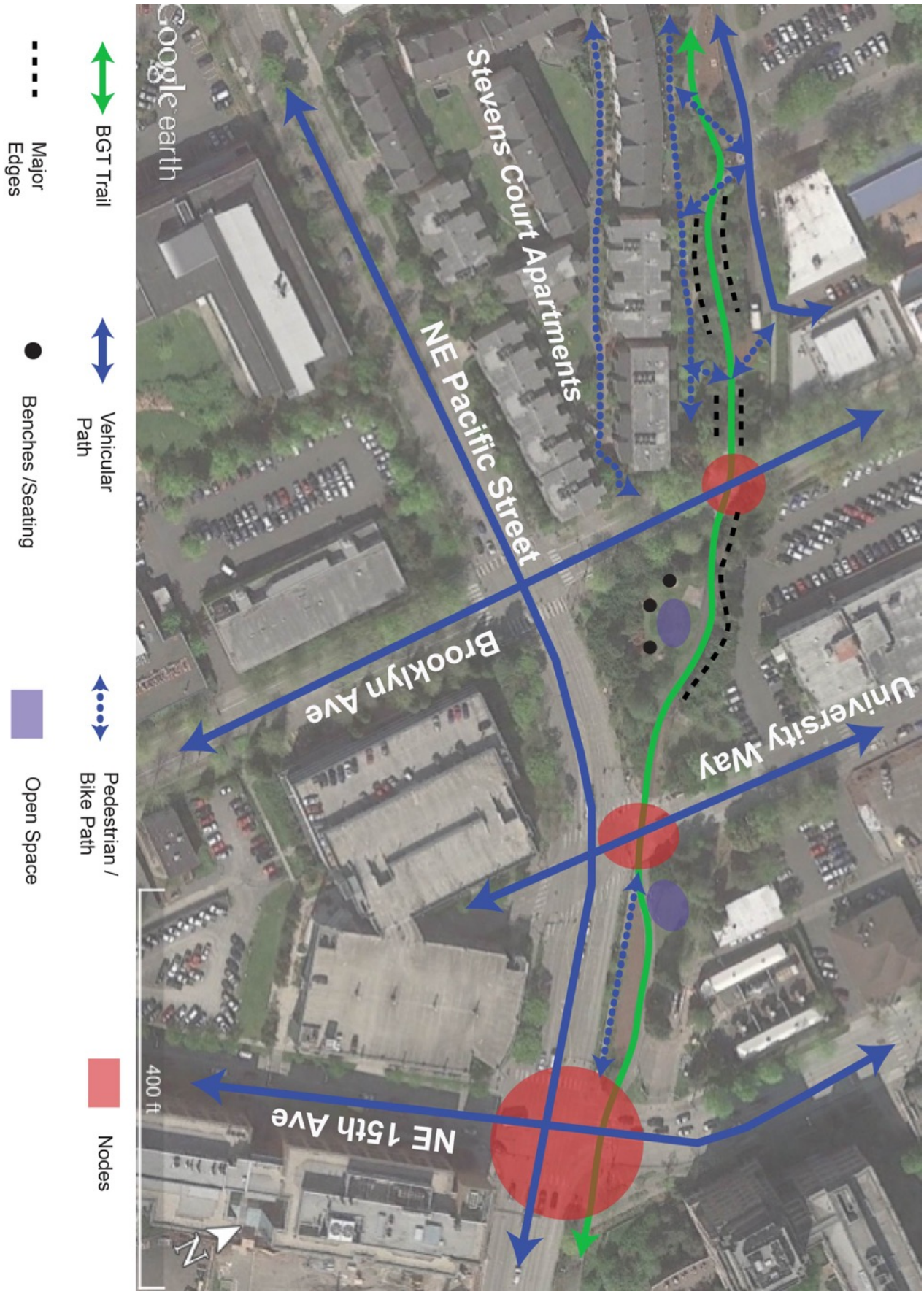


Figure 11: Section B – Rainier Vista Analysis

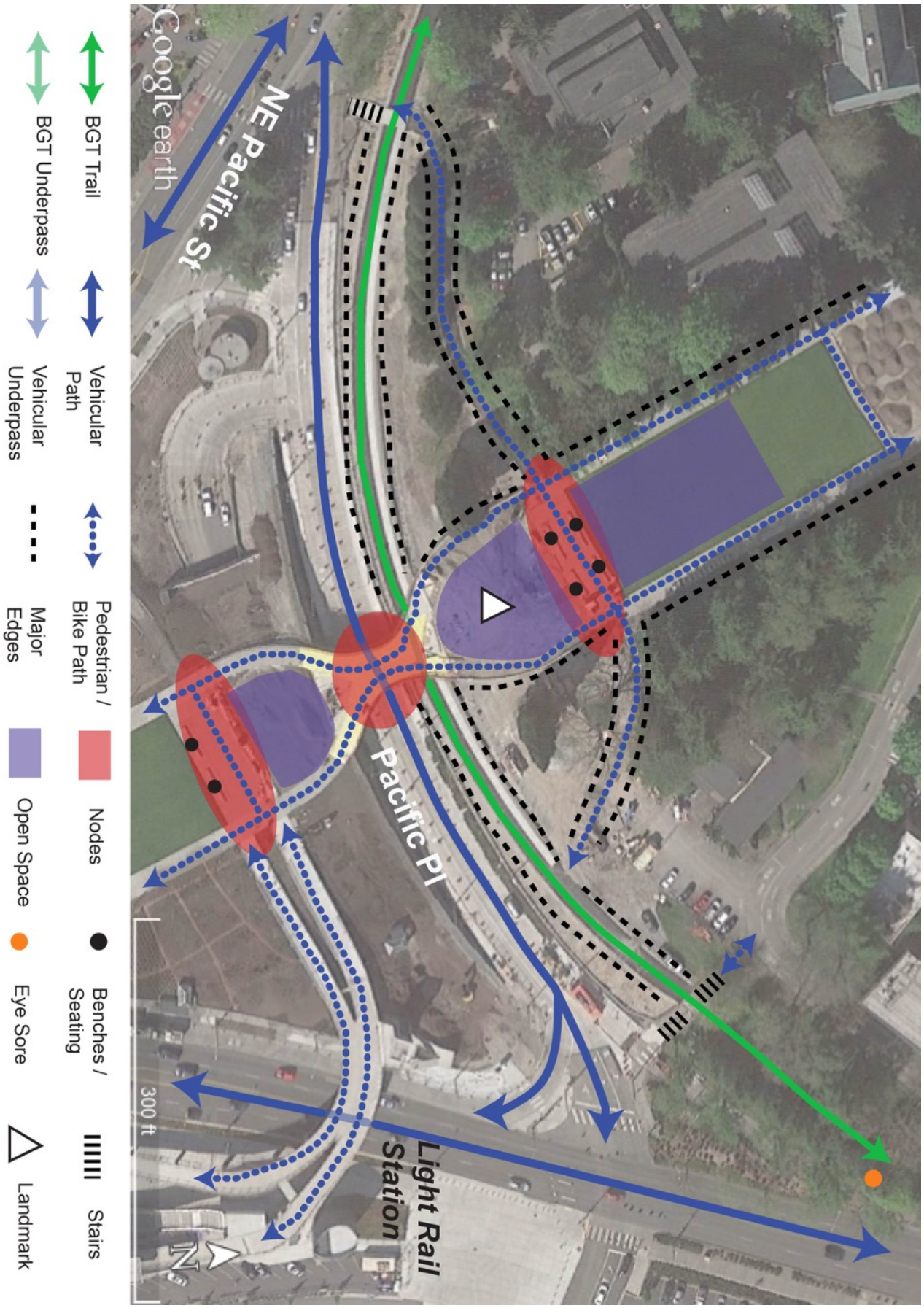


Figure 12: Section C - E-18 Bridge to Pend Oreille Rd

4.2 Wayfinding Site Analysis

A Lynchian analysis helped identify how legible and uniform the landscape and the Burke-Gilman Trail are from the lens of passive wayfinding. Paved paths are a way for travelers to recognize they can enter a space and edges such as vegetation show them the boundaries of these paths. Figure 13 (page 39) is a compilation of the Lynchian analysis conducted from the site visits. It highlights the major nodes along the trail, the most severe edges and landmarks as well as the hierarchy of these elements. The paths are not included in this scale as they were used to inform the hierarchy of the nodes.

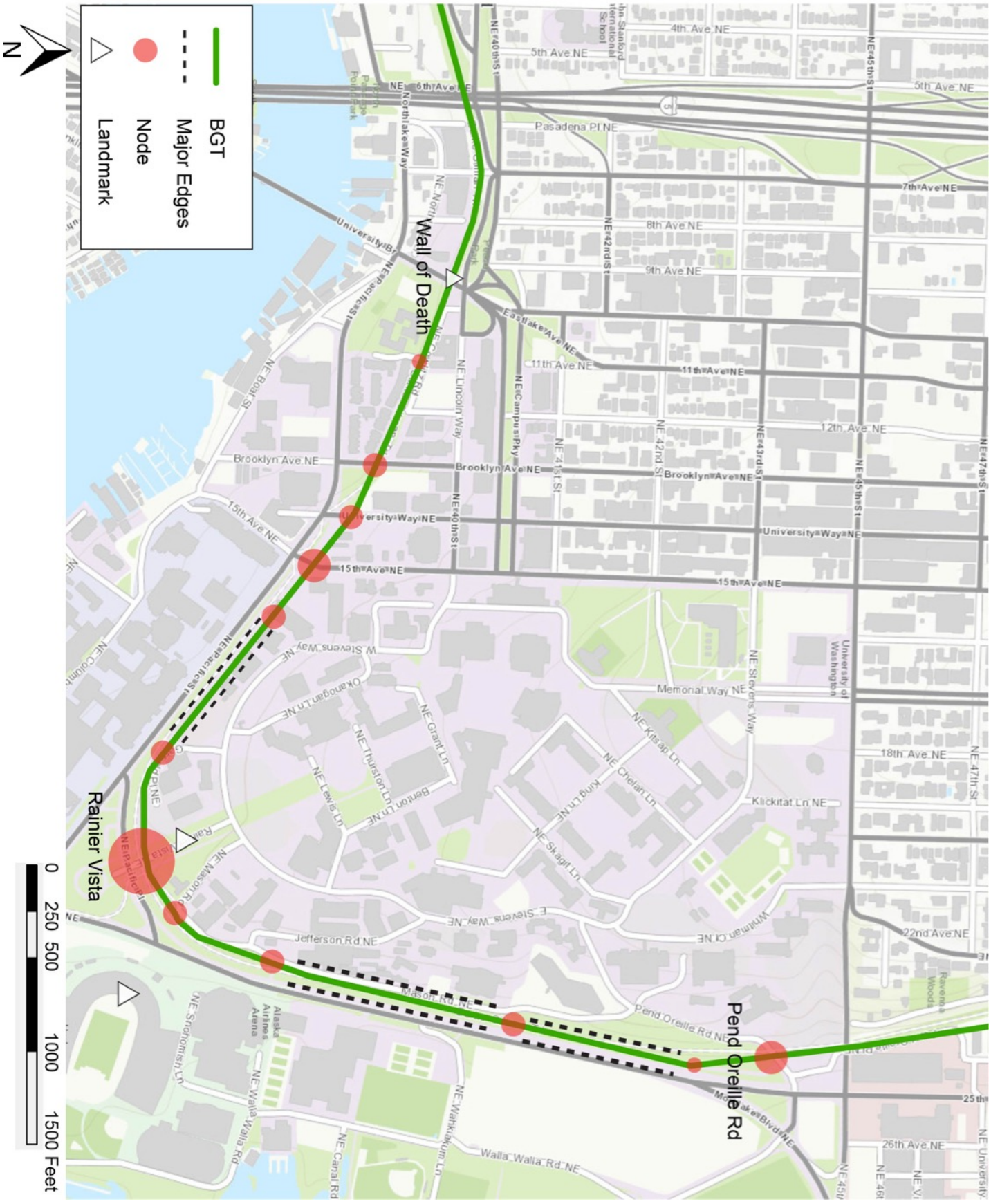
Rainier Vista is the largest node stemming from the amount of bicycle and pedestrian activity passing through the space from access to transit and other major campus locations. Secondary nodes include the intersection of 15th Avenue and Pend Oreille Road. While these nodes have high volumes of vehicular traffic, the level of multidirectional travel and intersecting paths make Rainier Vista the larger node. Tertiary nodes include those at most pedestrian bridges, Brooklyn Avenue and University.

While the trail is accessible at many points through campus, the landscape can provide some challenges to entering and exiting the trail. A short portion of Section B had impassible edges, along with two longer stretches in Section C on the east side of campus. These edges on the east are much more impassible due to their steeper slope, indicated by a thicker edge line. Much of the steep slopes between the campus and the trail are made accessible to bicyclists and those with mobility issues by way of ramps. The location of these ramps are not always intuitive, or consistent along the trail so a bicyclist or someone in a wheelchair might find themselves backtracking to leave or enter the trail.

There are three main landmarks on this section of the Burke-Gilman. The first is the Wall of Death on the western-most segment of Section A. This is labeled as a minor landmark because it doesn't hold the same weight to the campus community as the other two, Rainier Vista and Husky Stadium. Rainier Vista gets its name from the spectacular view of Mount Rainier on a clear day. It is common to see many visitors and students enjoying the view making it a primary landmark. Husky Stadium is just south of Rainier Vista and another landmark used to orient visitors and commuters to transit access.

Overall, the landscape of the Burke-Gilman is legible and uniform from passive cues for navigating. Paths identify clear routes for people to travel along. However, areas where the number of available paths increase, such as Rainier Vista, can create some confusion regarding what paths will get a user to their destination most efficiently. On the other hand, the number of paths can provide more options for bicyclists and those with mobility concerns.

Figure 13: Wayfinding Analysis



In addition to the Lynchian analysis, the site analysis found no permanent wayfinding signage along the trail to indicate where users can access certain parts of campus. There were a couple signs that marked the Burke-Gilman trail, see Figure 14, and street signs that indicate the intersection of the trail with major streets such as Brooklyn Ave, University Way, Pacific St (Figure 15), and Pend Oreille Rd. The trail design currently does a disservice to users with different abilities or impairments such as blindness or mobility issues.

While there are a number of ramps for accessing the trail in different locations, there doesn't seem to be a consistent and thoughtful way that the trail is designed for those who use senses other than sight for navigating the trail. From a public space stand point this is an equity issue where not everyone is able to move through the space quite as well.

With Rainier Vista serving as such a vital node for transit connections to the light rail station and bus routes, it is surprising that there are no wayfinding signs installed here. The closest indicator of direction to the Burke-Gilman is at the light rail station across the street. If someone did happen to get lost, the current active wayfinding elements are so few and far between that they wouldn't be able to redirect themselves very easily.

Figure 14: BGT Trail Sign

Photo Credit: Ana Seivert. 2016. Seattle

Figure 15: Burke-Gilman Street Sign

Photo Credit: Ana Seivert. 2016. Seattle

4.3 Safety Analysis

The literature review findings for safety on urban trails highlighted the importance of considerations of interactions between modes, pavement condition, and lighting quality. This site analysis includes an inventory of bicycle and pedestrian accident reports within the last eight years on the BGT, current traffic safety signage and features, and the pedestrian and bicyclist experience of lighting quality at night. These three factors are all important to understanding the current conditions of the Burke-Gilman and for informing how programming public art can address these areas of concern.

4.3.1 Bicycle and Pedestrian Collision Analysis

As a part of the safety analysis for the University of Washington segment of the Burke-Gilman Trail, I assembled bicycle and pedestrian related incidents from 2008 to October 2015 within a 50-foot buffer of the Burke-Gilman Trail. This information was crucial for understanding how modes currently interact with each other along the trail. These years were selected because they were part of a campus mobility study for the University of Washington's Transportation Services Department and the data was already accessible. It is compiled from University of Washington accident reports from the Environmental Health and Safety Department, University of Washington Police Department (UWPD) reports, and the Seattle Department of Transportation (SDOT) GIS data. It is made of up collisions and independent bicycle and pedestrian falls.

I geocoded this information using SDOT GIS collision data mapping standards in order to maintain as much consistency of information across all three sources of collision/incident information. Due to the number of fields, this standard provided the most opportunity to capture as much information as possible for each incident. I sorted the data by car versus pedestrian, car versus bike, bike versus pedestrian, as well as bike and pedestrian independent crashes or falls since these are the types of incidents one can anticipate occurring on the trail. A more detailed procedure for organizing the data is located in Appendix A.

Results

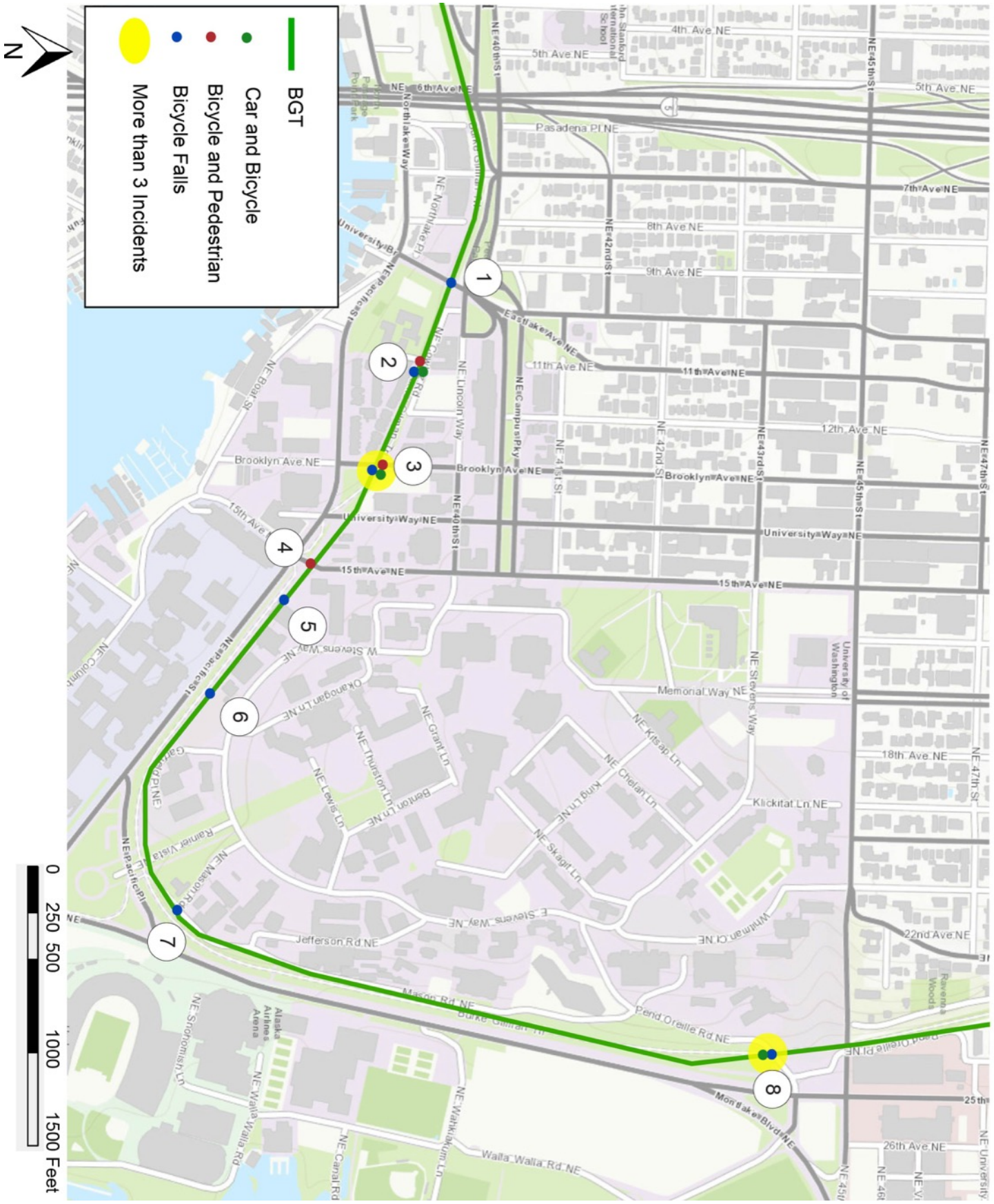
A total of 23 incidents were identified from this dataset on the Burke-Gilman Trail over the eight-year data period. The only incident types that occurred were 10 independent bike falls, 10 car and bicycle, and 3 bicycle and pedestrian incidents. Table 2 includes a description key of each incident that corresponds to the incident location numbers on Figure 16, page 43. (Appendix B has the detailed report information that provides the date, time of day, which party was at fault, and any environmental conditions that were included in the reports.) The major locations were identified by areas of more than 3 incidents over the data period. These locations include Adams Lane, the intersection east of the Mercer Court building (# 2 on the Map), Brooklyn Ave (#3), and Pend Oreille Road (#7).

Table 2: BGT Accident Description and Location

Key Number	Incident Type	Number of Incidents	Location
1	Bike Fall	1	Wall of Death
	Bike Fall	1	Mercer Building & BGT
2	Bike Fall	1	Henderson Hall & BGT
	Bike and Pedestrian	1	Adams Ln & BGT
	Car and Bike	1	Adams Ln & BGT
3	Bike Fall	1	Brooklyn & BGT
	Bike and Pedestrian	1	Brooklyn & BGT
	Car and Bike	5	Brooklyn & BGT
4	Bike and Pedestrian	1	BGT & 15th Ave
5	Bike Fall	1	2400 BGT
6	Bike Fall	1	C10 Parking Lot & BGT
7	Bike Fall	1	BGT & Mason Rd
	Bike Fall	1	BGT & Wilcox Hall
8	Bike Fall	2	BGT & Pend Oreille Rd
	Car and Bike	4	BGT & Pend Oreille Rd

Brooklyn Avenue and Pend Oreille Road had the most number of incidents over the eight-year period with seven incidents at Brooklyn Avenue and six incidents at Pend Oreille. These locations also had the most number of car and bicycle related accidents, five at Brooklyn and four and Pend Oreille.

Figure 16: UW Burke-Gilman Trail Accidents



Limitations

An important caveat to the accident data that is presented is that only a fraction of all bicycle and pedestrian incidents are reported. According to the Federal Highway Administration's Bicycle and Pedestrian Information Center, only 10 percent of bicycle and pedestrian accidents are reported. Of those reports one of the most frequent injuries to bicyclists and pedestrians is being hit by a car, 29 percent for bicyclists and 12 percent for pedestrians.[65] Pend Oreille and Brooklyn Avenue have the highest number of incidents but based off this information, there could be other spots along the trail with greater safety concerns but a lack of reporting could skew the results. Another major problem is the lack of information that can be concluded from this data that would help understand causes or factors in these accidents, Appendix B goes into greater detail regarding various limitations.

There is a long list of reasons why accident data should be taken with a grain assault. The main considerations to recognize when analyzing the bicycle and pedestrian incidents for the University section of the BGT include:

- Reported incidents are a fraction of actual events
- Reported locations may not be exact
- Lack of information of directionality of collisions

These uncertainties provide large gaps in identifying the reasons behind collisions, however finding a pattern of locations is a helpful way to extract areas that are worthy for further safety studies and what types of incidents appear to occur. The areas that seem to be problem spots on the trail are the intersection of Mercer Court at Adams Lane, Brooklyn Avenue, and Pend Oreille Road at the Burke-Gilman, with both Brooklyn and Pend Oreille having the most number of car and bicycle related instances. These are locations that could potentially benefit from some safety intervention through some sort of public art work.

4.3.2 Traffic Safety Analysis

Documenting traffic signage and features is important for understanding what types of traffic interventions are present and how that possibly relates to safe interactions between modes on the BGT. The majority of traffic treatments along the University of Washington segment of the trail occur at the most congested and active sections of campus for bicycle, pedestrian and car traffic. This stretch begins from Mercer Court and the Wall of Death on the west to Pend Oreille on the east of campus. Figure 17 highlights the different types of traffic treatments on the trail that attempt to alert different users of potential traffic conflicts.

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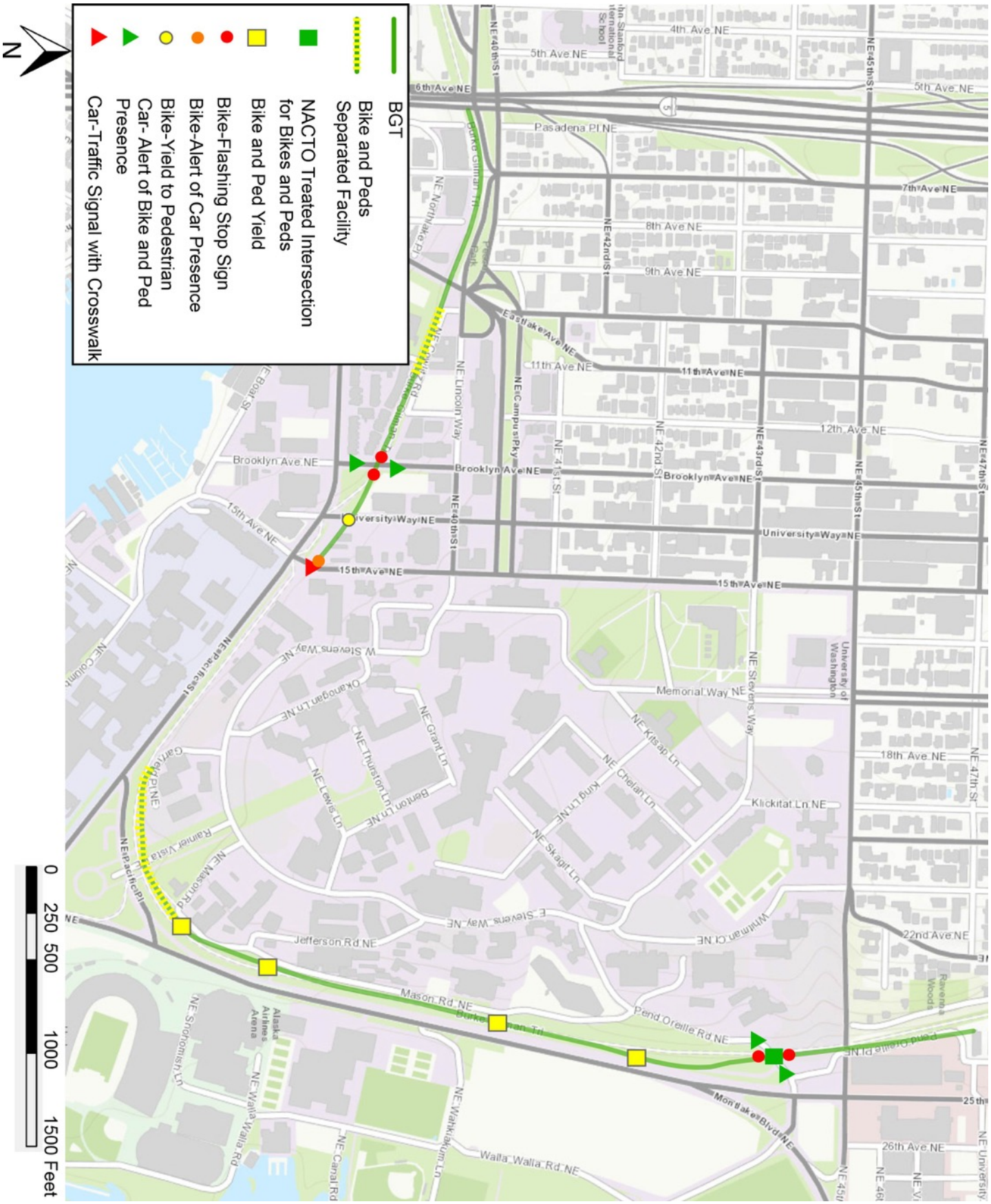
[65] "Pedestrian and Bicyclists Crash Statistics." Pedestrian and Bicycle Information Center. University of North Carolina Highway Safety Research Center. 2015. http://www.pedbikeinfo.org/data/factsheet_crash.cfm#No1

Figure 17: Traffic Safety Site Analysis Map



There are only two sections of the trail where pedestrian and bicycle traffic is separated as the literature indicates as a best practice to reduce collisions between these two modes. This mode separation occurs along newer sections of the trail. The first area on the west by Mercer Court Apartments and Stevens Court physically separates pedestrians and bicyclists by having a slightly elevated pedestrian path. Mercer Court was constructed in 2012 and the trail was updated with this construction.[66] There is also physical signage that indicates where bicyclists and pedestrians should be on the trail; Figure 18 below was taken during the site analysis. Once the modes join on the same path again, there is a pavement marking to indicate this change noted in Figure 19.

Figure 18: Bike and Pedestrian Separated Path

Photo Credit: Ana Seivert. 2016. Seattle

Figure 19: Bike and Pedestrian Merge Pavement Marking

Photo Credit: Ana Seivert. 2016. Seattle

Rainier Vista is the second section of the trail that has a separated bike and pedestrian path and is the newest portion completed July of 2015. This area differs from the Mercer Court section because there is no elevation difference between the two paths and no physical markings that identify the actual separation of modes. Figure 20 shows the western entrance to this section.

The Burke-Gilman Trail Design Concept Plan created by Alta Planning + Design indicates that all updates to the trail will include bike and pedestrian separation, however there seems to be differences in implementation from the Rainier Vista and Mercer Court projects. One theory among active transportation staff is that elevated separation was more expensive, and institutional concerns regarding aesthetics is the reason why signs to indicate a separation of modes are not in place.[67] While it is unclear whether newer sections will have the pedestrian path elevated from the bike path, the

[66] Heater, D., & Guthrie, J. (2012, August 23). UW's Mercer Court aims to keep students socially connected. *Daily Journal of Commerce*. Retrieved March 26, 2016, from https://www.djc.com/news/co/12044218.html

[67] Sweeney, T. (2016, April 26). Burke-Gilman Rainier Vista Reconstruction Project [Personal interview].

section currently under construction today from 15th Ave NE to Rainier Vista will have some element of physical separation.

Most major intersections between bicyclists, pedestrians, and vehicles are noted by some sort of caution or regulatory signage. Two intersections are regulated on the BGT by flashing stop signs. This occurs at Brooklyn and Pend Oreille Rd and the trail. Figure 21 shows the signage at Brooklyn and the Burke-Gilman. Users at these intersections also face vehicle and bicycle traffic traveling north-south. In order to alert the on-street traffic about the trail crossing, signs are installed on both sides of the intersection.

One of the most prominent safety makings along the trail is yield signage which occurs where modes are crossing paths at major bike and pedestrian intersections. These locations are identified by a pavement marking, Figure 22 (page 47), as well as a yellow sign to indicate the other mode that could potentially cross a user's path, Figure 23. These locations occur at the east end of Rainier Vista, at the Hec Edmundson Bridge,
the bridge at the E-18 parking lot, and the Whatcom Lane Bridge. According to PM bicycle and pedestrian counts from the Burke-Gilman Trail Design Concept Plan, these bridge intersections are nodes for travelers either accessing their cars in the east campus parking lots or accessing transit near UW Medical School.

Figure 20: Rainier Vista Separated Path

Photo Credit: Ana Seivert. 2016. Seattle

Figure 21: Flashing Stop Sign at Brooklyn

Photo Credit: Ana Seivert. 2016. Seattle

Figure 22: Yield Pavement Marking

Photo Credit: Ana Seivert. 2016. Seattle

Figure 23: Bicycle Alert Sign to E-18 Bridge Traffic

Photo Credit: Ana Seivert. 2016. Seattle

The last considerable safety treatment along the Burke-Gilman Trail is a NACTO (National Association of City Transportation Officials) approved intersection treatment from the *Urban Bikeway Design Guide* at Pend Oreille Road and the trail, see Figure 24. This one location has had more bicycle and car incidents over the last eight years which has motivated campus transportation planners to advocate for safety improvements. Several locations along the trail would qualify for a similar treatment when simply considering the traffic volume on Brooklyn Avenue, University Way and 15th Avenue, yet this location is the *only* NACTO crossing marking. It was installed March 2015 and there haven't been any bicycle and vehicle related incidents since April 2014 so it is unclear if this treatment has had any impacts on safety.[68]

Figure 24: Pend Oreille NACTO Bicycle Intersection Treatment

Photo Credit: Ana Seivert. 2016. Seattle

[68] Sweeney, T. (2016, February 17). University of Washington Bicycle and Pedestrian Collision Report. [Personal interview].

Based on the site analysis of traffic and safety features, the trail along the UW section is heavily marked with cautionary signage to notify bicyclists and pedestrians of potential intermodal conflict, especially at congested areas. It is unclear when all the signage and safety improvements were installed compared to the accident reports. This is mainly due to a lack of record keeping between the University of Washington facilities and planning departments. Due to this unknown about safety treatment installations and the short period of time the accident reports were collected it is uncertain how the installations have impacted users' safety along the trail.

4.3.3 Quality of Light and Perception of Safety for Users at Night

It is the expectation that trail users may be caught at work or at school later than they anticipated and may have to commute home when it is dark. Whether they choose to use the trail at night depends on their comfort level but the quality of lighting as the literature identifies, can suggest whether users feel safe enough to ride or walk the trail at night. I conducted a third site analysis on March 24th, 2016 at 8pm, after sunset, in order to understand and experience the level of light on the trail at night. On this visit I rode the trail by bicycle east to west with a front and rear flashing light of 100 lumens and walked the segment west to east with no light accessory.

This site analysis was centered on a more qualitative method of mapping perception and experience because the literature on specific measures for sufficient lighting in a public space is lacking. I noted on the same campus map (Appendix A) areas of moderate and little light, by a thickness of line weights. This was done for both the walking portion and biking portion on two separate maps, as my initial belief was that the experience could be different for different users. Bicyclists are traveling faster so bumps in the road or dark patches of trail might be more unnerving. Pedestrians are moving slower so pavement quality might not be as great a concern whereas stretches of darkness might impact a pedestrian's perception of safety more. Surprisingly there were a handful of pedestrians running and walking the trail and several groups of bicyclists during this analysis.

Prior to conducting the analysis, I anticipated being more uncomfortable on foot in poorly lit areas of the trail rather than on a bicycle. Having a bicycle seemed to be an advantage, where someone is moving faster and able to avoid being in an unlit area for a longer period of time feeling less vulnerable and exposed. Contrary to my assumptions, I found that walking the trail was more comfortable than riding the trail from my perspective because the eyes could adjust to changes in light more subtly than while riding a bicycle. The west side of campus was also more comfortably lit more often than the east side of campus.

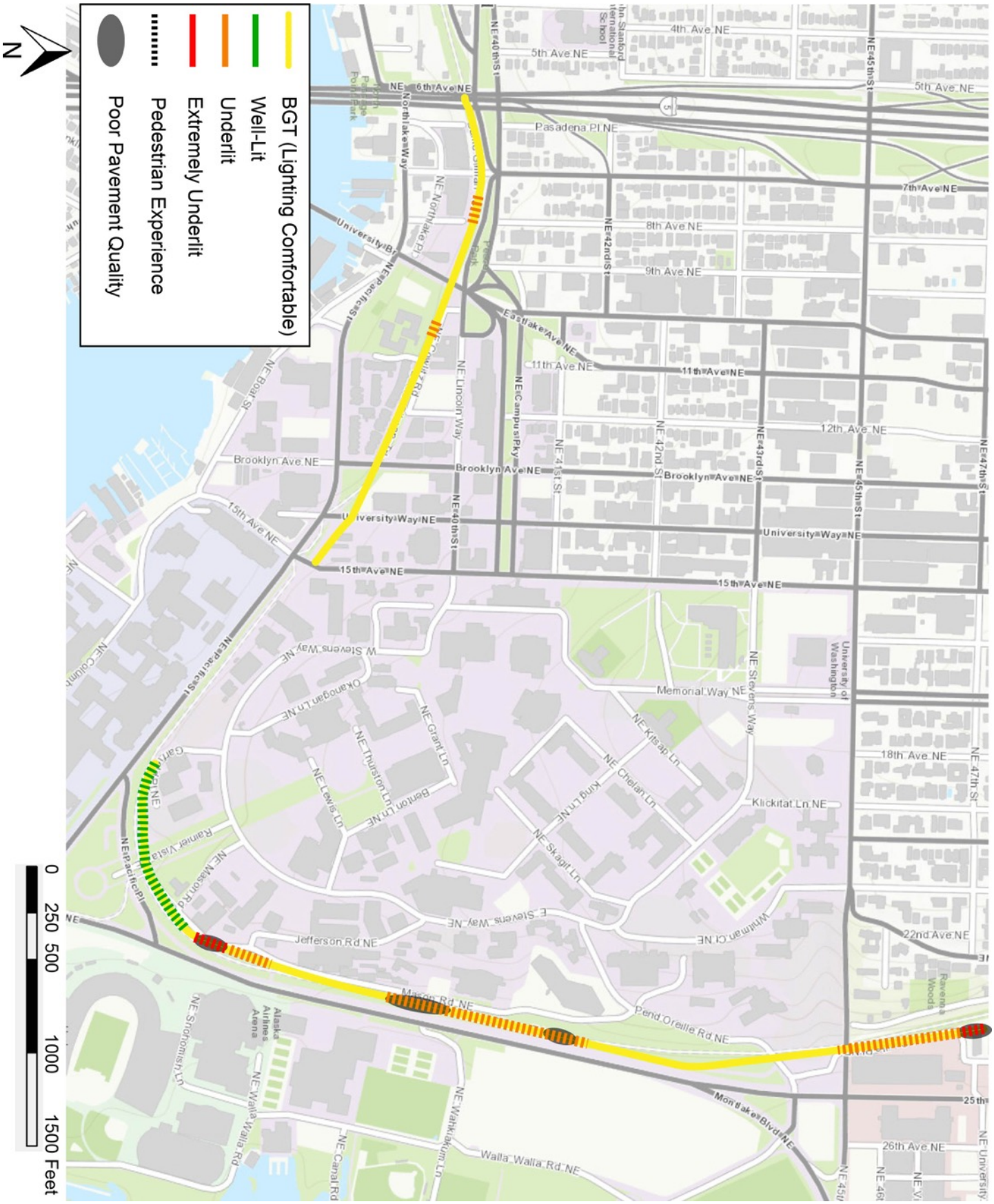
During the pedestrian site analysis most of the lighting around the trail was tolerable in terms of quality of light and my perception of safety, with very few portions of the trail that appeared too dark. This is indicated by the yellow line in Figure 25, illustrating the pedestrian experience. The newly remodeled Rainier Vista was by far the most well-lit area on the trail

with newer LED lighting. There were more lamp posts in closer proximity to each other and light from Montlake Boulevard and the Husky Stadium also lit the trail. There was also no canopy cover that would shield external ambient light from the path.

Areas that appeared under lit, or just under my comfort level, are indicated in orange. These areas occurred in small segments on the west side of campus between Interstate 5 and the University Bridge, a section near Mercer Court, and in larger sections along the east side along Montlake, across from the sports fields, as well as towards the end of the trail. These longer stretches also have a canopy covering the trail which prevents ambient light from passing through to the path. These sections also made areas with poor pavement quality more difficult to see than during the daytime, as also noted on the map of pedestrian experience.

There were only two areas of the trail that appeared extremely under lit. One followed the Rainier Vista section and the other included the last portion of the trail on the east. The section immediately following Rainier Vista was unexpected because the latter portion was so brightly lit, however this different in light makes it difficult for the eyes to adjust comfortably to the much darker section of the trail. The last section of the trail is uncomfortable not only because of the lack of lighting and the presence of tree cover, but also because it is very isolated from open areas. There are little to no options for someone to leave the trail to find a safer route unless they pass through this dark stretch or double back.

Figure 25: Levels of Light Impacting Pedestrian Experience at Night

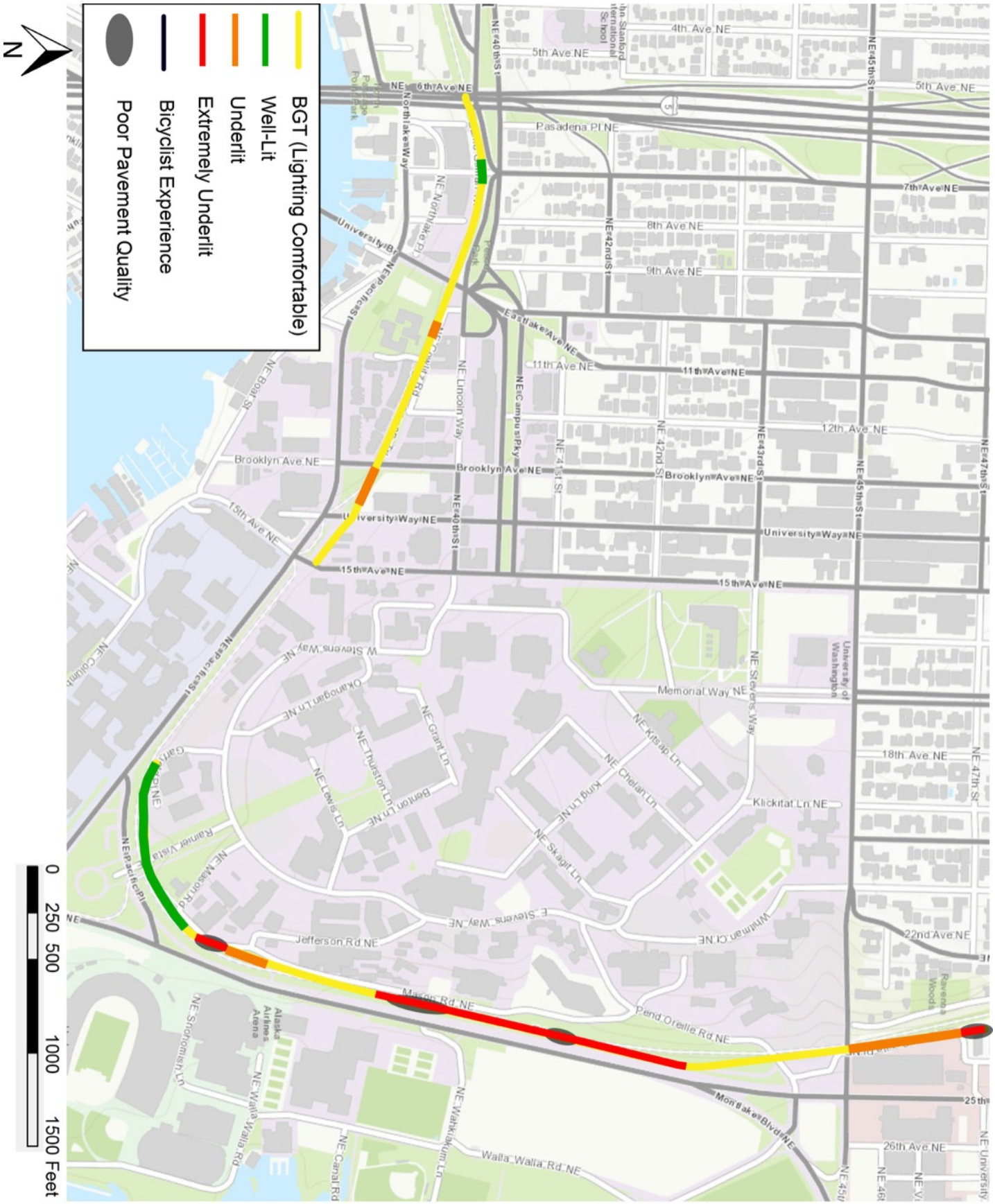


As mentioned before, the experience on the trail as a bicyclist was slightly different and there were longer sections that were more uncomfortable than as a pedestrian, seen in Figure 26. Rainier Vista and a small section of the trail between the Interstate 5 overpass and the University Bridge overpass had the perception of better lighting than the rest of the trail. Rainier Vista was a very comfortable section to ride; the pavement was smooth and the surroundings were well-lit so there was no fear of encountering a questionable patch in the pavement or being caught by surprise by other pedestrians or bicyclists.

There were similar sections of under lit areas as with the pedestrian experience. A short stretch along Mercer Court, between Brooklyn and University, just after Rainier Vista, and the section after 45th St were all documented as under lit areas. The stretch between Brooklyn and University is the main area of difference between the bicycle and pedestrian experience. This is mostly due to the fact that while there was a fair amount of light, tree growth beneath the light source created shadows on the path which made seeing sections of the trail difficult.

The primary difference between the bicycle and pedestrian experience was along the stretch just past the Hec Ed Bridge to the Whatcom Lane Bridge. This section had pavement quality problems where the roots were buckling the pavement as well as having lower levels of light along the trail. There are also fewer locations to leave the path if needed. Because bicyclists are traveling faster than pedestrians, the inconsistencies in the pavement create greater uncertainty and impact comfort on bicycle.

Figure 26: Levels of Light Impacting Bicyclist Experience at Night



Overall the trail was much better lit at night than expected. New sections like Rainier Vista indicate that lighting to areas like the stretch from 15th to Rainier Vista will be improved, however for pedestrians and riders transitioning between such high levels of light to the areas with less lighting should be a concern to consider. The major stretch identified through this analysis that could be improved through public art is the stretch of the east side of the trail after Rainier Vista because of the pavement condition, the lower levels of lighting, and the longer stretches where users are not able to leave the trail if they do feel unsafe. The University is aware of these problems particularly around lighting and pavement condition and have addressed them in their Burke-Gilman Trail Design Concept Plan.

Chapter 5: Examples of Art and Identity, Wayfinding and Safety

There are a number of examples for how art attempts to serve multiple functions and enhance identity, wayfinding, and safety, which could benefit the users of the Burke-Gilman Trail and resolve some of the concerns discovered in the site analysis. This section explores real world examples of artworks that offer potential approaches or models for the Burke-Gilman. As the principles of public art indicated in the literature review "good" public art will relate to a community's identity and serve a function for the community. Oftentimes public art will overlap across the categories of identity, wayfinding and safety but these examples aim to highlight how they directly relate to the individual areas of identity, wayfinding *or* safety.

5.1 Art and Identity

As mentioned previously, the major principle to public art is that it is site specific and provides some sort of function for the community, which will in turn enhance the community identity. Examples where identity and art come together on spaces similar to the Burke-Gilman are the Interurban Trail in Seattle, Atlanta BeltLine, and the Lance Armstrong Bikeway in Austin. All of these pieces attempt to highlight the local identity for users of the space.

5.1.1 The Interurban Trail

The Interurban Trail is a 24-mile trail traveling from north Seattle to Everett. [69] In 2006 Flipbooks was selected to be installed along the right-of-way of the trail with funding by the Department of Transportation. The installations are signs on traffic posts that are animated as users bike or walk the trail.[70] This piece calls on identity by depicting a Pacific Northwest theme and using items found in the urban landscape to feature "stories of a fish swimming, a deer sprouting antlers, an erupting volcano fashioned from candy, a blossoming pom-pom tree, and a girl blowing bubbles."[71] Figure 27

[69] Interurban Trail (North). Rails to Trails Conservancy. Retrieved May 29, 2016, from http://www.traillink.com/trail/interurban-trail-(north).aspx
[70] FlipBooks-Permanently Sited. City of Seattle. Retrieved May 29, 2016, from http://www.seattle.gov/arts/permanently-sited
[71] Ibid.

shows one of the signs from the set of stories. While this art piece uses identity to enhance the user experience the major critique of this work is the broad scale of the identity, and whether these stories being told really do connect to a Pacific Northwest theme. It is an interesting example in that the art piece creates an animation as someone moves through the space but again, the link to local identity is a stretch.

Figure 27: Flipbooks

Photo Credit: Jim Tilman. 2008. *Flipbooks.* Seattle

5.1.2 The Atlanta BeltLine

A stronger example where artworks capture the identity of an urban trail is the Atlanta BeltLine. The BeltLine is a former railroad line similar to the Burke-Gilman Trail that extends 33 miles and was founded in 2005.[72] The Art on the BeltLine program strengthens identity along the trail by providing local artists a place to showcase their work. According to program marketing description "this spectacular project places working professionals alongside emerging artists, and draws residents and visitors into some of the most unique public spaces in the City of Atlanta, providing powerful new perspectives on the city and its vibrant neighborhoods."[73] The trail has an impressive history of artists and exhibitions. One art piece calling specifically on the identity of the trail is the Iron Column (Figure 25). The description from the Art on the BeltLine installation information calls it "a stunning Corinthian column weighing over 13 tons, this 23-foot tall iron sculpture was created entirely out of historical railroad artifacts. The description from the Art on the BeltLine installation information calls it "a stunning Corinthian column weighing over 13 tons, this 23-foot tall iron sculpture was created entirely out of historical railroad artifacts. The column represents Atlanta's architectural and railroad history.

[72] The Atlanta BeltLine: Overview. Retrieved April 15, 2016, from http://beltline.org/about/the-atlanta-beltline-project/atlanta-beltline-overview/
[73] Ibid.

Figure 28: Iron Column

Photo Credit: Art on the BeltLine. 2016. *Iron Column.* Atlanta

The structure also recalls the Corinthian columns on the façade of the former Union Station, the city's main railroad station, demolished in 1972."[74] This art piece aims to tie in the history of the BeltLine, educate users and provide a visual aesthetic along the trail. . It is just one artwork out of man programmed on the trail that features the unique community identity.

5.1.3 The Lance Armstrong Bikeway

The Lance Armstrong Bikeway (LAB) in Austin, Texas is another trail that uses art to honor the identity of the trail. Lance Armstrong is a famous cyclist that grew up and developed his passion for biking in Austin. In 2009 this trail was opened to honor his accomplishments as a cyclist and his advocacy for cancer research.[75] Public art was planned as the key element to connect the name to the trail. Figure 29 is a piece representing the iconic Livestrong bracelets to recognize Armstrong's efforts in supporting cancer research.

Figure 29: Art on the LAB

Photo Credit: Tacoma Arts. 2011. Austin.

[74] Ibid.
[75] Rodriguez, F. (2013, January 18). Should Austin Rename the Lance Armstrong Bikeway? Retrieved May 30, 2016, from http://kut.org/post/should-austin-rename-lance-armstrong-bikeway

The examples found on the Interurban Trail in Seattle, the Atlanta BeltLine, and the Lance Armstrong Bikeway in Austin are a few different ways in which art has invoked a specific identity of a place. Whether it is the broad scale identity of the Pacific Northwest to a very specific identity of a well-known competitive cyclist, these art pieces are purposeful about recognizing the identity of the place. These examples provide inspiration for potential approaches for enhancing the identity along Burke-Gilman. Noteworthy public art will create relevant pieces for the University community to admire and enjoy.

5.2 Art and Wayfinding

Many newer wayfinding designs and concepts are not only focused on orienting someone to help them move from point A to point B but tend to also implement wayfinding through aesthetic design. This section draws on passive and active wayfinding cues, such as gateways, landmarks, unique paths, and signage.

5.2.1 The Burke-Gilman's Wayne Tunnel

The Wayne Tunnel on the Burke-Gilman is one example of art and wayfinding uniting in the form of a gateway *and* landmark. This section of the trail, located in Bothell, WA, accommodates over over two million travelers every year.[76] Artist Kristen Ramirez worked with University of Washington-Bothell art students to create design concepts for the tunnel. "[Students] researched local histories, identified appropriate materials, developed engagement strategies, and created drawings and maquettes"[77] or scale models. The final design called Ebb & Flow, seen in Figure 30, "combines blasts of bright yellow, orange, pink and purple, symbols that represent the flora and the fauna of the region, and the tunnel's own architecture to produce a playful kaleidoscope for the enjoyment of Burke-Gilman Trail users."[78]

Figure 30: Ebb and Flow, Wayne Tunnel

Photo Credit: Eli Brownell. 2014. *Ebb & Flow.* Bothell

[76] Howland, J. (2013, June 26). Kristen Ramirez Selected for Wayne Tunnel Project. Retrieved April 15, 2016, from http://www.4culture.org/2013/06/kristen-ramirez-selected-for-wayne-tunnel-project/

[77] Howland, J. (2014, April 7). UW Bothell Students = Future Public Art. Retrieved April 15, 2016, from http://www.4culture.org/2014/04/uw-bothell-students-future-public-artists/

[78] Howland, J. (2014, August 2). Ebb & Flow on the Burke-Gilman Trail. Retrieved April 15, 2016, from http://www.4culture.org/2014/08/ebb-flow-on-the-burke-gilman-trail/

In the process, it transformed a former commonplace tunnel into a gateway, announcing the riders' entrance into the Bothell community. Another success of this artwork is the community engagement aspect that not only allowed more people to be involved in the design concept but allowed them to have ownership over the art added to the trail. This type of gateway approach could be utilized at entrances to campus along the trail, particularly the eastern or western sections of the trail to help announce one's entry into the University of Washington.

5.2.2 Verconin, Switzerland

Another example where art is used for wayfinding is in Verconin, Switzerland. Every year the town commissions art to be painted on the streets to enjoy during the summer months. Street Painting #5, (Figure 31) created by Lang Baumann in 2010, is intended to direct people to the village center and extends to the connecting streets. While temporary, it provided a definite destination, so the user is able to identify that they are in fact in the village center, with little confusion.[79] It also elicits a Lynchian form of wayfinding, allowing the paths to guide someone through a space. This would be a captivating strategy at Rainier Vista, which has many paths that join together at one active center. While, visually pleasing, a major critique of this piece is that it does not consider those with visual impairments.

Figure 31: Street Painting#5

Photo Credit: Lang Baumann. 2010. Verconin.

[79] Photo by Lang Baumann. 2010. http://langbaumann.com/?project_id=259

5.2.3 The Lake to Bay Trail

Figure 32: Lake to Bay Trail Sign

Photo Credit: Ana Seivert. 2016. Seattle.

The Lake to Bay Trail signage in South Lake Union is an example a wayfinding system that is focusing on art or creative methods for helping people navigate around the Seattle Waterfront. The design is a produce of the Seattle Waterfront Wayfinding Master Plan. The document states that signs are primarily objective and that the new plan focuses on symbols that are subjective and more open to interpretation through active cues. [80] Figure 32 for the Lake to Bay Trail is uniform and consistent in design along the waterfront.

Not much has been written about this design and its implementation but this is one example of an active wayfinding element that uses art to provide a greater aesthetic while users navigate the waterfront in South Lake Union. This strategy could be used at pedestrian bridges and Rainier Vista where paths converge and intersect to help orient visitors on campus. One critique of this design is that while it is unique to the South Lake Union area, it excludes those who may have visual impairments and its placement on the pavement is not necessarily legible to all users who may need to orient themselves in the appropriate direction.

Art and wayfinding attempt to orient people through spaces while also enhancing the experience and aesthetic. These examples avoid more commonplace wayfinding elements such as directional signs on posts or maps and help users navigate through spaces by creating memorable, eye catching designs. The major critique, which is common for most wayfinding approaches is the lack of consideration for visually impaired users that also need wayfinding cues to be accessible.

5.3 Art and Safety

While wayfinding and identity are commonly associated with art and wayfinding and art, art and safety is a less common combination. There are fewer examples where art speaks to a safety concern for users. In order to address safety concerns an artwork or design must call on the user to encourage a shift in behavior. Some of the safety concerns

[80] Waterfront Wayfinding Master Plan. (2014). Retrieved April 14th, 2016 from http://waterfrontseattle.org/Media/Default/pdfs/Waterfront_Program_Wayfinding_Master_Plan.pdf. P. 7.

identified in the site analysis were poor pavement quality, interactions between modes and light quality at night. These following examples of art serve as a model but are not only ways in which to resolve safety issues found on the Burke-Gilman.

5.3.1 The "Fun Theory" Speed Camera Lottery

The "fun theory" created by Volkswagen (yes, the car manufacturer) provides an innovative model that encourages a behavior change that can improve safety. "The fun theory award recognizes those thoughts, ideas and inventions that help prove the fun theory. That fun is the easiest way to change people's behaviour for the better."[81] One example was a speed camera lottery created by Kevin Richardson, that rewarded drivers driving under the speed limit by submitting their name into a lottery funded by all the citations of those over the speed limit.[82] It was installed on a roadway in Stockholm, Sweden where the speed limit was 30 kilometers per hour. Figure 33 shows the installed design. The average speed before the experiment was 32 km/h and the average speed during the experiment was 25 km/h which is a 22% reduction in speed.[83]

Figure 33: Speed Camera Lottery

Photo Credit: Sean Michael Ragan. Makezine. 2010.

While this example is not what one traditionally considers as public art it serves as an innovation created from a public forum to address a specific locational issue. It also encouraged a specific behavior between drivers and their speeding habits. This concept could translate to areas along the trail with specific safety concerns, perhaps areas on the eastern portion of the trail that were identified as fast tempo stretches, yet also has potential conflicts of modes intersecting such as the E-18 parking lot bridge, Whatcom Lane bridge, and Pend Oreille intersection.

5.3.2 Creative Crosswalks

Creative Crosswalks are another example of art and safety coming together to change behavior while enhancing the surrounding environment. Creative Crosswalks stem from placemaking programs promoting neighborhood and community development such as Seattle's Community Crosswalks Program. The main goal is to use pedestrian

[81] The Fun Theory. (2009). Retrieved April 15, 2016, from http://www.thefuntheory.com/fun-theory-award
[82] [Rolighetsteorin]. November 12, 2010. *The Speed Camera Lottery – Fun Theory.* Retrieved from https://www.youtube.com/watch?v=iynzHWwJXaA
[83] Ibid.

crosswalks to highlight the identity of the specific community.[84] Mayor Ed Murray did this with the Capitol Hill crosswalks in June of 2015, honoring the LGBT community and its history there by painting rainbow crosswalks at several intersections. Portland, Oregon followed Seattle's lead, but also believed the crosswalks would help improve safety because "pedestrians will be more likely to notice and use the pathways presumably, and [the crosswalks will] be easier for motorists to spot and obey."[85] Figure 34 illustrates their raindrop crosswalk design. This is one potential option to explore for areas where cars and pedestrians/bicyclists interact or even areas between bicyclists and pedestrians. There is no evidence whether these crosswalk designs actually improve safety for pedestrians as they are still very new. Nevertheless, the communities do seem to enjoy their presence and they do attempt highlight safety *and* identity through art.[86]

Figure 34: Portland Raindrop Crosswalk

Photo Credit: Portland Bureau of Transportation. 2015. Portland

5.3.3 Pioneer and Midtown Greenway Bridge Lighting

As discovered in the literature review and the site analysis, the quality of light in a public space and an urban trail can add an element of comfort and safety to users of that space. A cycling and pedestrian bridge in Surrey, British Columbia is one example of how light is being used to energize a space, particularly at night. The Pioneer Bridge was designed by the architecture firm Perkins + Will and artist Doug Welch created the LED lighting shown in Figure 35 which not only provides light for a confined dark space at night but also allows the City to program the lights for the season and for special events.[87]

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[84] Community Crosswalks. Retrieved April 15, 2016, from http://www.seattle.gov/neighborhoods/programs-and-services/community-crosswalks
[85] Metclafe, J. (2015, June 10). Portland Gets Weirder With 'Creative Crosswalks' Retrieved April 15, 2016, from http://www.citylab.com/design/2015/06/portland-debuts-rain-themed-creative-crosswalks/395495/
[86] Photo by Hannah Schafer, Portland Bureau of Transportation. http://www.smart-magazine.com/content/uploads/2015/07/portland-raindrop-crossing-smart-magazine.jpg
[87] New cycling and pedestrian overpass opens in Surrey - NEWS 1130. (2011, October 22). Retrieved May 30, 2016, from http://www.news1130.com/2011/10/22/new-cycling-and-pedestrian-overpass-opens-in-surrey/, Passerelles of the Month – Tynehead and Pioneer in Surrey. (2011, May 01). Retrieved May 30, 2016, from https://pricetags.wordpress.com/2011/08/01/passerelles-of-the-month-tynehead-and-pioneer-in-surrey/

The Midtown Greenway in Minneapolis, MN has implemented a similar design along their bicycle and pedestrian trail. The Martin Sabo bridge is cable suspended and lights shine from the cables, as seen in Figure 36, to illuminate the path, as well as the skyline.[88] . The primary focus for both the Pioneer and Midtown Greenway bridges was to provide safe connections for bicyclist and pedestrians across busy freeways, but the use of light adds to the perceptions of safety for users particularly at night. Lighting elements such as these on pedestrian and bicycle paths can reduce the level of vulnerability one might feel while traveling on the path at night. The addition of lighting on the path can also allow bicyclists to travel at faster speeds with less fear of encountering bumps or imperfections in the pavement.

Figure 35: Pioneer Bridge Lighting

Photo Credit: City of Surrey.

Figure 36: Midtown Greenway Lighting

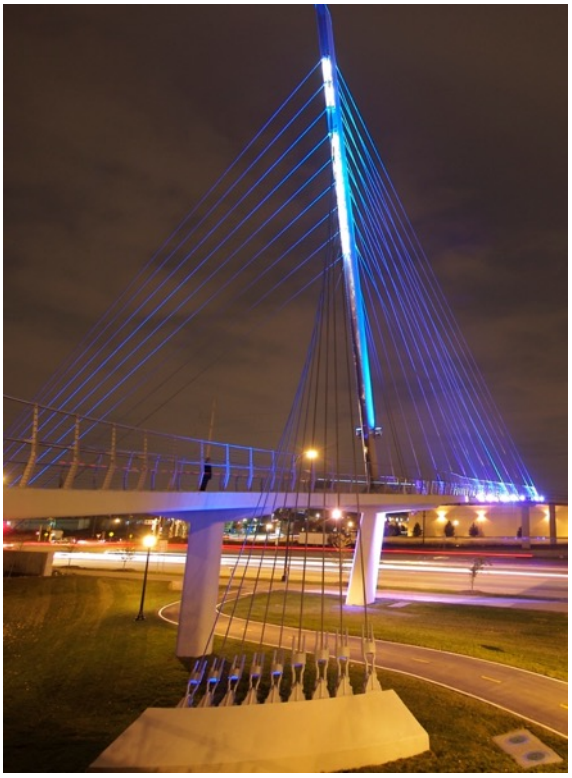


Photo Credit: Wikipedia Commons. Minneapolis.

5.4 Findings

These examples emphasize how multifaceted art is in terms of solving identity, wayfinding and safety issues. Public art, at least worthy example of it, have a tendency to overlap across categories as can be seen in some of these situations. Art, especially in the context of urban trails, would ideally consider a multidimensional approach, incorporating wayfinding and identity, wayfinding and safety, safety and identity, or all three. The examples presented here indicate that art can serve not only an aesthetic purpose but also provide functions that add benefit to the user experience.

[88] Bridges | Midtown Greenway Coalition. Retrieved May 30, 2016, from http://midtowngreenway.org/about-the-greenway/greenway-bridges

Chapter 6: Recommendations for Public Art Programming

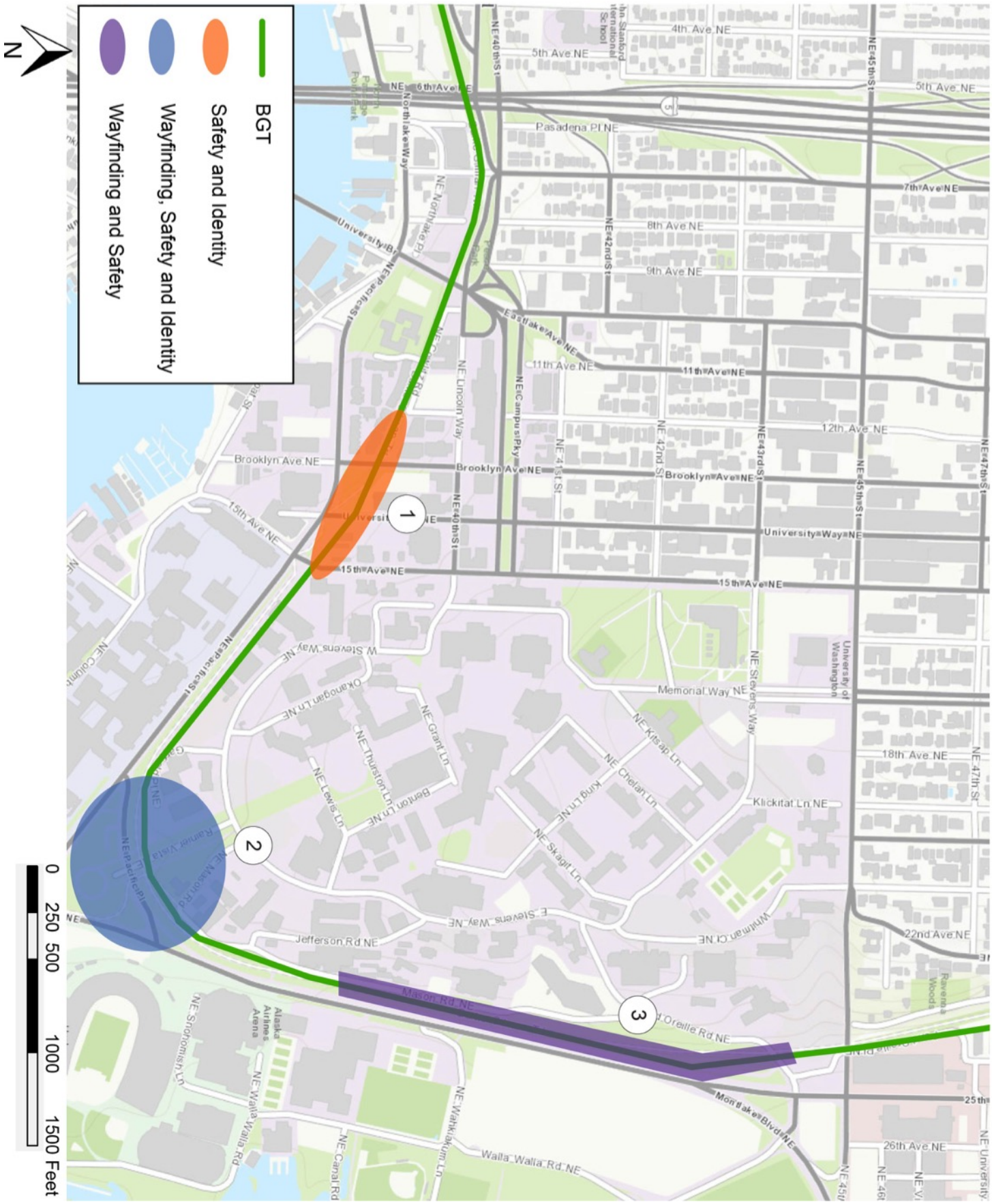
The following recommendations use public art to improve identity, wayfinding, and safety while enhacing the identity along the Burke-Gilman. These recommendations highlight opportunities for art to meet multiple needs on the trail and were informed by the site analysis and the case examples. Three areas were identified based on the current conditions as the best locations for public art programming to address these concerns. Figure 37 on page 64, illustrates these areas along the trail.

Area 1 is categorized as a location for public art to address safety and identity. The safety analysis of the Burke-Gilman indicated specific concerns for bicyclists and pedestrians crossing vehicular traffic at the intersections of Brooklyn, University and 15th Avenue. Brooklyn had a high number of incidents between bicyclists and cars over the past eight years. The detailed site analysis illustrating the various paths and nodes present identified this location as one of complex interactions between bicyclists, pedestrians and cars. Public art could approach safety concerns from the strategy of the "fun theory" which encourages a behavior change through design *or* by creative crosswalks which attempts to improve safety while calling on the identity of the community. This location also has open space between Brooklyn and University with seating people already use to enjoy their lunches that could accommodate a physical art piece. These are examples but not the only way that art can resolve safety issues and identity in this location. Upon seeing the location artists have the opportunity to develop more innovative and site appropriate designs to improve safety and identity.

Area 2, Rainier Vista, is identified as a location that can benefit from identity, safety, *and* wayfinding improvements. In the site analysis there were both potential wayfinding and safety concerns established, especially as volumes of pedestrians and bicyclists increase. As a major entry to campus and transportation hub, Rainier Vista can benefit from active wayfinding elements like creative signage or other markings to help orient visitors and commuters on campus. These markings may also help reduce conflicts between pedestrians and cyclists but art can potentially resolve this problem through other designs as well. While the quality of lighting along Rainier Vista is better than the rest of the trail, there are safety concerns on the periphery of this location as the brightness of the lighting makes transitioning to other areas troublesome for the eyes, which is another possible application for art.

The open spaces that highlight views of Mount Rainier can also provide an opportunity for public art to communicate and enhance the identity of the campus. Just east of the Vista itself there is the vandalized utility box that can provide the canvas for an artist to create a wayfinding and identity piece if the University was interested in the idea. The public seating, open space and volume of users make Rainier Vista ripe for public art opportunities, especially if temporary works are established to provide a rotating exhibit for users to enjoy regularly. Art can help to resolve these

Figure 37: Public Art Recommendations Map



wayfinding and safety concerns while also enhancing the identity of the campus by highlighting the views of Mount Rainier and creating another reason for people to pause and enjoy the open spaces at this location.

Area 3 is located along the eastern section of campus, and can benefit from art installations that improve safety and wayfinding. This section of campus involved a number of pedestrian bridges and intersections that have potential conflict areas between bicycles and pedestrians, especially as these modes intersect paths. These incidents are more likely to occur during peak hour traffic. Pend Oreille Road was a location with six accidents over the eight-year period, four of those were between bicyclists and cars. It is unclear whether the National Association of City Transportation Officials (NACTO) approved intersection treatment, installed March 2015, will resolve these types of interactions between modes but if not, using art similar to creative crosswalks might be one method.

The primary recommendation for this location is to use art to improve the quality of lighting on this segment of the trail. This location was where lighting for bicyclists in particular was the poorest and the pavement was deteriorating. While art will not solve the cracking pavement, enhancing the lighting on the trail will allow bicyclists to see these problem spots more easily so they can travel at a faster pace. For pedestrians walking the trail, the lighting can help increase the perception of safety, making them feel less isolated and vulnerable by illuminating their surroundings. The Pioneer Bridge and Midtown Greenway lighting examples do not translate perfectly to this segment of the BGT, but provide inspiration for solving the lighting problems on the trail. Creating some sort of lighting feature will also create a wayfinding element that will help users orient themselves along the path.

These three locations are not the only areas where art can improve identity, wayfinding and safety issues but they are the primary locations where attention should be paid due to the concentration of problems in these spots. The case examples of public art and identity, wayfinding and safety are not the only means that art can improve the trail but they do provide a visual representation of what art installations could look like on the Burke-Gilman.

6.1 Student Involvement and Collaboration Recommendation

Because of the location of the Burke-Gilman and relationship it has with the University of Washington, with a diverse student, employee and tourist population, it would be worthwhile to explore an art program where student artists could lend a hand at answering these identity, wayfinding and safety concerns. It would be a rewarding element particularly to an art student's education if they were offered an opportunity to gain professional experience in submitting art proposals while having a public space to showcase and generate an audience for their work. It also offers them experience creating identity based, site-specific art that is functional by attempting to address safety or wayfinding concerns in an unconventional way. Having this interaction between the University, the University community, and the trail

would set a precedent for public art programming that other regional trails have not yet explored, and would mark the trail with the unique identity of the University of Washington.

Chapter 7: Conclusion

The University of Washington section of the Burke-Gilman provides a unique environment where education, tourism and commute trips occur. As the region grows, traffic along the Burke-Gilman is expected to increase 92 percent for pedestrian traffic and 238 percent for bicyclists by 2030. This means the University will have to accommodate new users of the trail and more multi-modal interactions. Public art programming can emphasize a distinctive identity while also resolving wayfinding and safety concerns that might arise with these new users.

The literature identified the key principles associated with public art and identity, wayfinding and safety. “Good” public art will be site and location specific and serve a function for the community and in doing so will connect to the identity of that community. The main characteristics associated with wayfinding are legibility, uniformity, that it considers a variety of user groups and levels of ability, creates an enjoyable experience while reducing spatial anxiety, and if someone does get lost, the visual cues are obvious enough to help them re-orient themselves. Lastly, the key principles identified for safety of bicycle and pedestrian facilities, such as the Burke-Gilman, include consideration of mode interaction, pavement condition, and lighting. The case examples of public art and identity, wayfinding and safety demonstrated how these principles can be achieved through public art and applied to the Burke-Gilman Trail.

This research identified Rainier Vista as a primary location for art to develop identity, wayfinding and safety solutions. It is a major transportation hub for new visitors to campus, employees and students with potential for conflict between bicyclists and pedestrians, especially as usage increases. The intersections along the west end of campus at Brooklyn, University and 15th Avenue were found to be an important location to use art to address safety and identity because of the number of interactions bicyclists and pedestrians have with higher volume vehicular traffic. Finally, trail segments on the east side of campus could benefit more from safety and wayfinding applications of art. This location had longer stretches of isolated trail that were particularly dark at night. The University can go one step further by allowing students to get involved in the design and programming process. Encouraging student designs that enhance wayfinding and safety will create an unmistakable identity to the Burke-Gilman and establish a precedent for public art programming on regional trails.

Appendix A: Campus Map Used for Site Analysis

Source: “Campus and Vicinity.” University of Washington. 2014. \

Appendix B: Detailed Incident Table

Key Number	Incident Type	Incident Date	Incident Time	Location	Fault (if known)	Description
1	Bike Fall	5/19/2011	N/A	Wall of Death		
	Bike Fall	2/5/2013	6:45 AM	Mercer Building & BGT		
2	Bike Fall	4/13/2012	N/A	Henderson Hall & BGT		Bicyclist struck a pole
	Bike and Pedestrian	1/14/2009	N/A	Adams Ln & BGT	Bike	
	Car and Bike	2/1/2013	3:50 PM	Adams Ln & BGT	Car	
3	Bike Fall	10/24/2008	N/A	Brooklyn & BGT		Tire slipped on leaves
	Bike and Pedestrian	11/3/2010	8:00 AM	Brooklyn & BGT	Bike	
	Car and Bike	7/2/2012	4:35 PM	Brooklyn & BGT	Bike	
	Car and Bike	2/13/2014	N/A	Brooklyn & BGT	Bike	
	Car and Bike	11/7/2013	7:54 PM	Brooklyn & BGT	Car	Rainy/Wet pavement
	Car and Bike	8/10/2011	7:00 PM	Brooklyn & BGT	Bike	
	Car and Bike	11/16/2013	5:10 PM	Brooklyn & BGT	Car	Rainy/Wet pavement
4	Bike and Pedestrian	3/6/2008	N/A	BGT & 15th Ave		
5	Bike Fall	6/28/2013	N/A	2400 BGT		
6	Bike Fall	8/25/2009	N/A	C10 Parking Lot & BGT		
7	Bike Fall	6/6/2014	N/A	BGT & Mason Rd		
	Bike Fall	5/9/2015	N/A	BGT & Wilcox Hall		
8	Bike Fall	3/26/2015	9:00 AM	BGT & Pend Oreille Rd		
	Bike Fall	10/23/2012	N/A	BGT & Pend Oreille Rd		
	Car and Bike	4/15/2014	N/A	BGT & Pend Oreille Rd	Car	
	Car and Bike	3/19/2012	N/A	BGT & Pend Oreille Rd	Car	
	Car and Bike	11/1/2010	N/A	BGT & Pend Oreille Rd	Bike	Bike ran flashing red stop sign
	Car and Bike	10/30/2012	N/A	BGT & Pend Oreille Rd	Bike	

Appendix C: Organizing Collision Data into Incident Types

Incident types were generated by the "SDOT_Colde" field, which had variations of incident descriptions like "motor vehicle struck pedalcyclists" and motor vehicle struck pedalcyclist at front end." The six incident types were sorted in ArcGIS by the methods below:

- *Bike versus Bike*- In order to separate the bike versus bike incidents select by attributes and select any attributes that state "Pedalcyclist struck by pedalcyclist…"
- *Bike versus Pedestrian* - Select by attributes and select any attribute that states "Pedalcyclist struck pedestrian."
- *Car versus Bike* – Select by attributes and select any attribute that states "Motor vehicle struck pedalcyclist…" and "Pedalcyclist struck motor vehicle..." There will be several elaborations of these two in the description that explains more about the collision, and these descriptions also indicate the party at fault.
- *Car versus Pedestrian* – Select by attributes and select any attribute that states "Motor vehicle struck pedestrian" and "Motor vehicle struck by pedestrian."
- *Bike Falls* – Select by attributes "Bike Overturned."
- *Pedestrian Falls* – Select by attributes "Pedestrian Fell."

Appendix D: Limitations to Collision Data

The SDOT collision data is taken from Seattle police report information which is then mapped to the centerline of the street, leading to a lack of information on where specifically the accident occurred and in what direction the party/parties were traveling. The SDOT data does the best it can at allowing collision reports to be as specific as possible but many of the times this information isn't available from the police reports so many of the GIS categories read "<Null>" but it provides a space for this information if it's available such as road condition which was sometimes provided in the UW reports for bike solo crashes if the pavement was wet.

There were also issues with categorization from SDOT that weren't described in the Collision Metadata (Appendix E) they provided which made it hard to know how to incorporate the University of Washington data. An example was the "person count" category. It wasn't clear if this was the number of people involved in the incident, the number of people reporting the incident with the officer there, or the simply the number of pedestrians involved. Another example is the classification of a serious injury; the metadata doesn't tell us what qualifies as a serious injury, so it is hard to gauge the severity of each of these incidents. Bicycle and car incidents may seem more severe but perhaps the injuries in these reports were less than in independent bike falls. Without this level of detail, it is hard to truly understand the severity of the incidents and how these incidents relate to the surrounding trail context.

The University of Washington reports were provided via the UWPD and University of Washington Environmental Health and Safety Department. They maintain this data in a Microsoft Excel format. In order for them to sort through this file they conducted a search for bike or pedestrian related words throughout the cells. This poses some issues with completeness of data, because information was distributed across multiple cells so if a related word wasn't used within a cell, it was not populated in the search. When looking in the "Description" field in the GIS data much of this information is made up of fragments of the actual report so information that helps explain the specific scenario is often missing.

The reports also weren't able to capture specific locations of these incidents. In some cases, the locations were recorded in detail in the description and other times it appears that an address was used from UWPD as the closest location but the incident may or may not have been in that exact spot. This information also suffers from the same lack of detail on direction of travel from the parties involved. When geocoding UW incidents, much of this information was interpreted through the description and address to make a best guess of the location where incidents occurred. In order to account for the information reported by the University of Washington reports new attributes were created to the GIS data titled "Col_Miss_Fall" and "Description." The "Col_Miss_Fall" category was meant to capture the reports where there could have been an accident but the party maneuvered out of the way and perhaps sustained an injury. It also includes scenarios where falls occurred that weren't necessarily due to a collision but perhaps another environmental factor. The

“Description” category was meant to help add context to the information being mapped with the SDOT data from the University reports to help clarify the incidents, data provided from SDOT will not have this field filled in.

Appendix E: SDOT Collision Code Metadata

Code	Description
0	NOT ENOUGH INFORMATION / NOT APPLICABLE
1	MOTOR VEHICLE STRUCK BY PEDESTRIAN
2	DRIVERLESS MOTOR VEHICLE STRUCK BY MOTOR VEHICLE
3	MOTOR VEHICLE STRUCK BY PEDALCYCLIST NOT IN TRAFFIC
4	MOTOR VEHICLE STRUCK BY TRAIN
5	DRIVERLESS MOTOR VEHICLE STRUCK BY TRAIN
6	PEDALCYCLIST IN TRAFFIC STRUCK BY TRAIN
6	PEDALCYCLIST IN TRAFFIC STRUCK BY TRAIN
7	STRUCK OFF ROAD ON SIDEWALK OR PARKING STRIP
7	STRUCK OFF ROAD ON SIDEWALK OR PARKING STRIP
10	MOTOR VEHICLE STRUCK MOTOR VEHICLE, HEAD-ON
11	MOTOR VEHICLE STRUCK MOTOR VEHICLE, FRONT END AT ANGLE
12	MOTOR VEHICLE STRUCK MOTOR VEHICLE, RIGHT SIDE AT ANGLE
13	MOTOR VEHICLE STRUCK MOTOR VEHICLE, LEFT SIDE AT ANGLE
14	MOTOR VEHICLE STRUCK MOTOR VEHICLE, REAR END
15	MOTOR VEHICLE STRUCK MOTOR VEHICLE, RIGHT SIDE SIDESWIPE
16	MOTOR VEHICLE STRUCK MOTOR VEHICLE, LEFT SIDE SIDESWIPE
17	MOTOR VEHICLE STRUCK PEDALCYCLIST, HEAD-ON
18	MOTOR VEHICLE STRUCK PEDALCYCLIST, FRONT END AT ANGLE
19	MOTOR VEHICLE STRUCK PEDALCYCLIST, RIGHT SIDE AT ANGLE
20	MOTOR VEHICLE STRUCK PEDALCYCLIST, LEFT SIDE AT ANGLE
21	MOTOR VEHICLE STRUCK PEDALCYCLIST, REAR END
22	MOTOR VEHICLE STRUCK PEDALCYCLIST, RIGHT SIDE SIDESWIPE

Source: Seattle Department of Transportation Collision Metadata. 2015. Craig Moore

23	MOTOR VEHICLE STRUCK PEDALCYCLIST, LEFT SIDE SIDESWIPE
24	MOTOR VEHCILE STRUCK PEDESTRIAN
25	MOTOR VEHICLE STRUCK TRAIN
26	MOTOR VEHICLE STRUCK OBJECT IN ROAD
27	MOTOR VEHICLE RAN OFF ROAD - NO COLLISION
28	MOTOR VEHICLE RAN OFF ROAD - HIT FIXED OBJECT
29	MOTOR VECHILE OVERTURNED IN ROAD
30	DRIVERLESS VEHICLE STRUCK MOTOR VEHICLE HEAD-ON
31	DRIVERLESS VEHICLE STRUCK MOTOR VEHICLE FRONT END AT ANGLE
32	DRIVERLESS VEHICLE STRUCK MOTOR VEHICLE RIGHT SIDE AT ANGLE
33	DRIVERLESS VEHICLE STRUCK MOTOR VEHICLE LEFT SIDE AT ANGLE
34	DRIVERLESS VEHICLE STRUCK MOTOR VEHICLE REAR END
35	DRIVERLESS VEHICLE STRUCK MOTOR VEHICLE RIGHT SIDE SIDESWIPE
36	DRIVERLESS VEHICLE STRUCK MOTOR VEHICLE LEFT SIDE SIDESWIPE
37	DRIVERLESS VEHICLE STRUCK PEDALCYCLIST HEAD-ON
38	DRIVERLESS VEHICLE STRUCK PEDALCYCLIST FRONT END AT ANGLE
39	DRIVERLESS VEHICLE STRUCK PEDALCYCLIST RIGHT SIDE AT ANGLE
40	DRIVERLESS VEHICLE STRUCK PEDALCYCLIST LEFT SIDE AT ANGLE
41	DRIVERLESS VEHICLE STRUCK PEDALCYCLIST REAR END
42	DRIVERLESS VEHICLE STRUCK PEDALCYCLIST RIGHT SIDE SIDESWIPE
43	DRIVERLESS VEHICLE STRUCK PEDALCYCLIST LEFT SIDE SIDESWIPE
44	DRIVERLESS VEHICLE STRUCK PEDESTRIAN
45	DRIVERLESS VEHICLE STRUCK TRAIN
46	DRIVERLESS VEHICLE STRUCK OBJECT IN ROADWAY
47	DRIVERLESS VEHICLE RAN OFF ROAD - NO COLLISION
48	DRIVERLESS VEHICLE RAN OFF ROAD - HIT FIXED OBJECT

Source: Seattle Department of Transportation Collision Metadata. 2015. Craig Moore

49	DRIVERLESS VEHICLE OVERTURNED IN ROAD
50	PEDALCYCLIST STRUCK MOTOR VEHICLE HEAD-ON
51	PEDALCYCLIST STRUCK MOTOR VEHICLE FRONT END AT ANGLE
52	PEDALCYCLIST STRUCK MOTOR VEHICLE RIGHT SIDE AT ANGLE
53	PEDALCYCLIST STRUCK MOTOR VEHICLE LEFT SIDE AT ANGLE
54	PEDALCYCLIST STRUCK MOTOR VEHICLE REAR END
55	PEDALCYCLIST STRUCK MOTOR VEHICLE RIGHT SIDE SIDESWIPE
56	PEDALCYCLIST STRUCK MOTOR VEHICLE LEFT SIDE SIDESWIPE
57	PEDALCYCLIST STRUCK PEDALCYCLIST HEAD-ON
58	PEDALCYCLIST STRUCK PEDALCYCLIST FRONT END AT ANGLE
59	PEDALCYCLIST STRUCK PEDALCYCLIST RIGHT SIDE AT ANGLE
60	PEDALCYCLIST STRUCK PEDALCYCLIST LEFT SIDE AT ANGLE
61	PEDALCYCLIST STRUCK PEDALCYCLIST REAR END
62	PEDALCYCLIST STRUCK PEDALCYCLIST RIGHT SIDE SIDESWIPE
63	PEDALCYCLIST STRUCK PEDALCYCLIST LEFT SIDE SIDESWIPE
64	PEDALCYCLIST STRUCK PEDESTRIAN
65	PEDALCYCLIST STRUCK TRAIN
66	PEDALCYCLIST STRUCK OBJECT IN ROAD
67	PEDALCYCLIST RAN OFF ROAD - NO COLLISION
68	PEDALCYCLIST RAN OFF ROAD - HIT FIXED OBJECT
69	PEDALCYCLIST OVERTURNED IN ROAD
70	STRUCK CROSSING AT INTERSECTION, NO X-WALK
71	STRUCK CROSSING AT NTERSECTION, IN X-WALK
72	STRUCK CROSSING AT INTERSECTION DIAGONALLY
73	STRUCK CROSSING NON-INTERSECTION, IN X-WALK
74	STRUCK CROSSING NON-INTERSECTION, NO X-WALK

Source: Seattle Department of Transportation Collision Metadata. 2015. Craig Moore

75	STRUCK CROSSING NON-INTERSECTION, FROM BETWEEN TWO PARKED VEHICLES
76	STRUCK CROSSING NON-INTERSECTION, FROM BEHIND A PARKED VEHICLE
80	IN ROAD WALKING WITH TRAFFIC
81	IN ROAD WALKING AGAINST TRAFFIC
82	STANDING OR LAYING IN ROAD
83	GETTING OUT OF VEH - LEFT SIDE
84	GETTING OUT VEH - RIGHT SIDE
85	PLAYING IN ROAD
86	IN ROAD - OTHER
87	Bike Overturned-added by transportation services

Source: Seattle Department of Transportation Collision Metadata. 2015. Craig Moore

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