

Multimodal Transportation in Northeast Seattle: An Integrated Design

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Abstract

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Transportation planning in the United States has historically focused on reducing costs and improving efficiency of private automobile travel. In recent years, efforts have been undertaken around the world to increase the accommodation and availability of alternate modes of transportation, such as pedestrian travel, bicycle travel, and public transit – an endeavor known generally as Multimodal Transportation Planning. In Seattle, these efforts are undertaken by multiple levels of government for multiple different modes, and have resulted in rich networks of proposed multimodal improvements. The Roosevelt and Maple Leaf neighborhoods in northeast Seattle, for example, have been identified as the potential location of parts of both an extensive protected bike lane and a new RapidRide bus route. This project provides a conceptual design for the integration of these modes – as well as general pedestrian improvements – into the corridor and neighborhoods, with a focus on collaborative implementation and potential for mutual benefit (which is not always present in city-led transportation planning efforts). It does this by identifying the physical and regulatory requirements of these modes, presenting a site analysis for the area consisting of both secondary research and on-site observations, and exploring the different ways in which the modes can be integrated into the existing character and urban form of the area. The final design is presented as a full corridor site plan (and select sections) indicating specific design decisions and elements. In both its product and intent, this project serves as a sample best practice for collaborative and integrated multimodal transportation planning.



Multimodal Transportation in Northeast Seattle

An Integrated Design

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Master of Urban Planning Candidate, 2016

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1. INTRODUCTION

EXECUTIVE SUMMARY, GOALS & OBJECTIVES

This report presents a conceptual design for the Roosevelt Way NE/12th Ave NE couplet in Seattle, WA. The extent of the design is from NE 65th St to NE 80th St, and the portion of NE 75th St between Roosevelt and 12th. The design incorporates two main planned modes of transportation for the neighborhood: a portion of a RapidRide bus line and protected bike lanes, both of which extend roughly from Northgate to Downtown. The design also prioritizes pedestrian connectivity and safety over general purpose traffic speeds, in order to create a more comfortable and vibrant corridor. The report has four sections (other than the introduction), as follows:

- ▶ **Literature Review** presents a thorough overview of the different paradigms of transportation planning, how these shifting directions have occurred within the City of Seattle, and the specifications and requirements for the different modes of transportation (pedestrian, bicycle, transit, and general purpose traffic) as presented by various levels of government as in burgeoning industry best practices.
- ▶ **The Neighborhood** describes the specific improvements planned for the Roosevelt and Maple Leaf neighborhoods, and provides a look at other on-going planning projects in the area that have varying levels of relevance to these planned improvements.
- ▶ **Site Analysis** dives deep into the data and existing conditions of the corridor and the neighborhoods, and corroborates conclusions drawn from this material with on-site observations and accompanying photographs, to provide a thorough understanding of the area.
- ▶ **The Design** first explores how the different modes can be conceptually organized within the general constraints of the corridor, including factors such as the degree of modal overlap, the physical scope of the improvements, and the maintenance of existing corridor operations. It then presents the final, comprehensive design of the corridor, including both written descriptions and graphic representations of the specific design decisions that were made in order to transform the corridor into a functional and aesthetically pleasing public space.

This process resulted in a comprehensive design that responded to the varying priorities of each mode of transportation, incorporating them into a single, unified design that did not exclude improvements for any of the modes. Furthermore, this design in many ways challenges the current paradigm of transportation planning in Seattle, as it focuses on creating an integrated design (as opposed to for individual modes) for the corridor as a whole.

These efforts are undertaken for a number of reasons. Pragmatically, initial planning efforts by SDOT for these two modal improvements were vague and ambiguous enough to bring into question the true intent of each project, and there existed a need to explore and further specify what improvements would mesh best with the specific character and constraints of the

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neighborhood. Organizationally, designing improvements for each of these various modes has historically occurred separately from the others (separate teams of individuals with their own processes and priorities), resulting in improvements that might prevent the building of other modal improvements along the same corridor. This project presented the opportunity to set a precedent for how modes can be planned for simultaneously, hopefully with the effect of shifting how the process is typically undertaken by transportation planners in Seattle. Finally, academically, this project was an opportunity to explore the vast realm of multimodal transportation planning, and apply the knowledge and experience gained through the Masters of Urban Planning program at the University of Washington and through a student internship with Seattle Department of Transportation.

In undertaking this project, I hope to engage in the transportation planning and design process from the perspective of a professional planner/designer. This includes learning about the various infrastructure and regulatory requirements of different multimodal transportation modes (especially in regards to how they can share space), applying them to the site-specific characteristics of an area planned to receive the specific improvements, and creating a comprehensive, integrated, and legible design for the corridor.

CRITICAL STANCE

At its most basic, this project is an opportunity for me to engage in what might be considered a typical planning and design process, including the definition of scope, understanding of existing conditions and design constraints, and application of infrastructure requirements and best practices to achieve an ultimate goal as set forth at the beginning of the process (in this case, delivering these two new services to the Roosevelt and Maple Leaf neighborhoods, and beyond). An important consideration in this process is how and when the values of the planner/designer enter into the process, and to what extent they may shape the methodology and ultimate final product of the project. For example, while elements such as the site analysis and infrastructure requirements are largely fact-based pursuits (though some subjectivity may enter into the equation in how they are described, or what pieces are not considered), some values are important and even necessary to understand how these elements are prioritized (internally, as well as over other potential improvements) and how they influence the final design. This section is an opportunity for me to explore and set forth my own values as I enter into this project, so that I might critically analyze my own starting point as I approach what can often be a contentious topic in the real world.

First, it's important to establish what this project is not: an explicit argument in favor of multimodal transportation planning. That's not to say that this isn't an important argument, but is not a central theme I seek to defend. Rather, this value is inherent in the project, and simply engaging in this process as a focus for my thesis shows my belief that this is the appropriate direction for transportation planning in general. Relatedly, this project is not an argument for what modes are best or preferred for this specific study area, but rather a response to the fact that these two modes have already been planned for this area, a recognition of the potentially complex problems this presents from practical design and political standpoints, and an attempt to provide functional solutions that meet the goals of each mode and respond to the characteristics of the specific area.

Knowing this distinction is crucial for understanding how I approach the project, and the eventual recommendations I make.

My values, as related to this project, are relevant both implicitly (in that I'm engaging in this project in the first place) and explicitly (through analysis of the neighborhood's characteristics and different modal requirements, as well as specific design decisions made). These can be summed up in four main statements, as follows:

- ▶ Shifting transportation paradigms away from single-occupancy vehicles and aggressively planning for alternate modes of transportation is not only worth the cost (both monetary and politically), but necessary for ensuring equitable and sustainable growth for our major urban centers.
- ▶ Multimodal transportation planning is an important discipline, but one that often gets wrapped up in the policy level of urban planning in the City of Seattle. Great focus is given to political desires and overall, macro-level network concerns, and the actual, on-the-ground implementation is secondary. This has resulted in projects being built for political rather than pragmatic purposes, and that are often disconnected from their context.
- ▶ The City of Seattle has historically not planned well for multiple modes of transportation in the same space, creating one of two scenarios: either a first-come, first-served situation, where improvements for one mode preclude the implementation of improvements for other modes, or over-the-top integration, where all modes are incorporated into a single space under some misguided application of a "new urbanism" or "complete streets" framework. Collaboration at all levels - planning, design, and implementation - is crucial for creating functional multimodal spaces (recent projects, such as the recent Transit Master Plan update and the Center City Mobility Plan, indicate a notable shift towards this more inclusive and collaborative method of transportation planning).
- ▶ Indications made to the public about priorities and proposed planning projects, whether verbally or through published planning documents, should be done so carefully and deliberately. While from a planning perspective this information is non-binding and proposed transportation networks are nothing more than "lines on a map," this is not helpful in forging a functional relationship between planners and members of the public. Planners should do everything in their power to ensure that projects listed in documents or shown on maps are delivered, and similarly, should only list and show projects that they intend to deliver.

As mentioned above, these values come out in a number of ways throughout the project, but for the most part, remain divorced from the content and analysis presented throughout. The few exceptions are the discussion of current planning efforts occurring within the neighborhood, the discussion of the site analysis, and the eventual design at the end of the report.

PROJECT SCOPE

The study area for this project includes an area approximately 15 blocks long and one block wide, covering parts of both the Roosevelt and Maple Leaf neighborhoods in Northeast Seattle. These blocks represent only a part of the networks recommended for each modal type (as discussed in section three, “The Neighborhood”), but provide a distinct area on which to focus for this project. Specifically, the area includes Roosevelt Way NE and 12th Ave NE – the former from NE 65th St to NE 80th St, and the latter from 65th to NE 75th St – as well as the part of 75th between the two corridors. This study area provides a representative cross-section of the overall corridors, given the variety of land uses (neighborhood commercial, multifamily apartments, and single family homes, which typify the corridor from Northgate to Downtown) and shifts in urban form from one part of the corridor to the next.

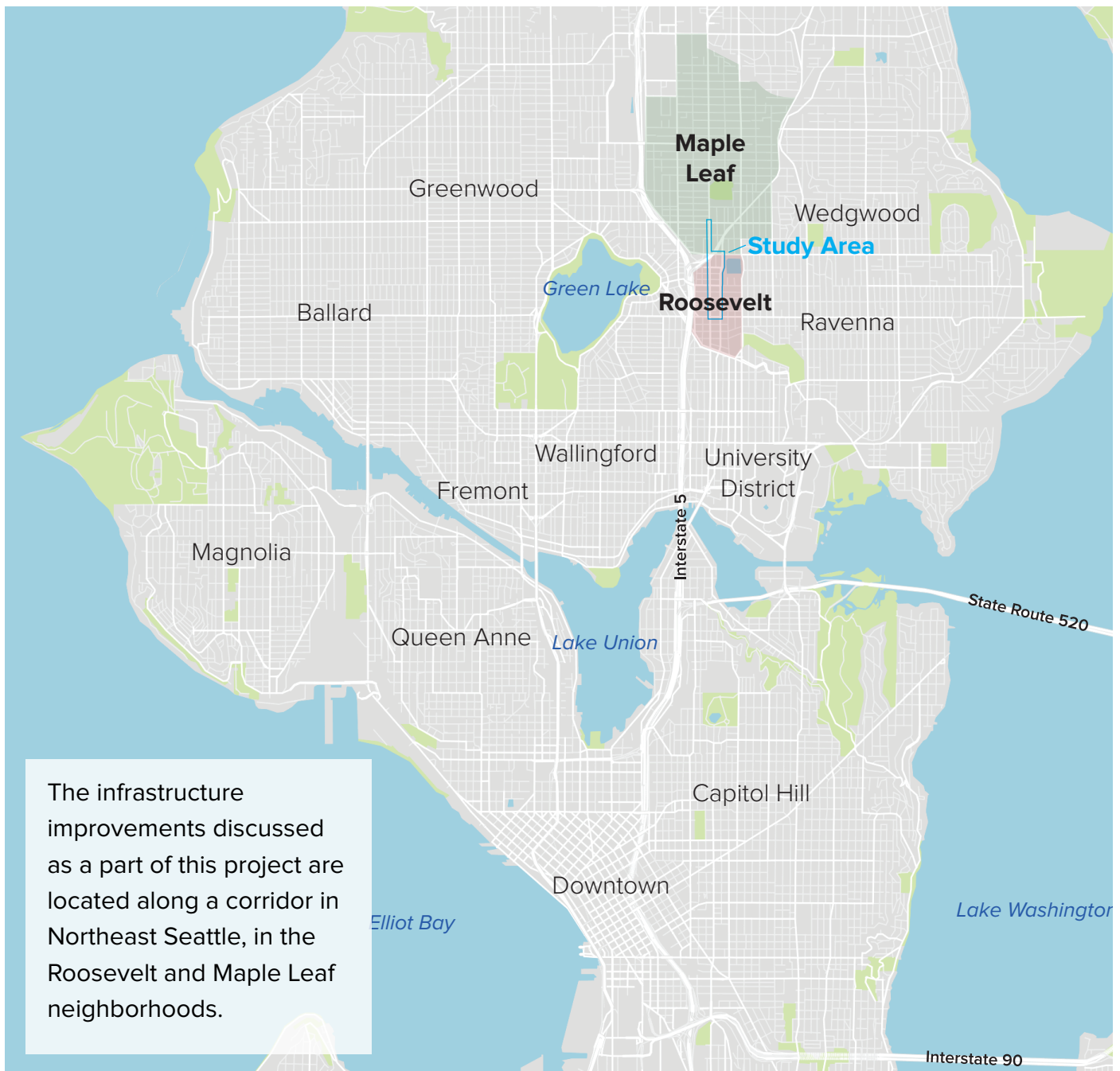


Fig. 1-1: City of Seattle context.

It's important to note that transportation networks are inherently complex, and improvements applied to one area will inevitably have convoluted and even unpredictable effects on other parts of the system, without regard for any arbitrary boundaries. Even projects that investigate the entire extent of a corridor or proposed improvement, and include implications for other parts of the system, can't possibly incorporate or predict every possible outcome. The study area used for this project is admittedly only a small section of the overall system, but provides a discreet area for which conditions can be studied and proposed modal improvements can be conceptually applied.

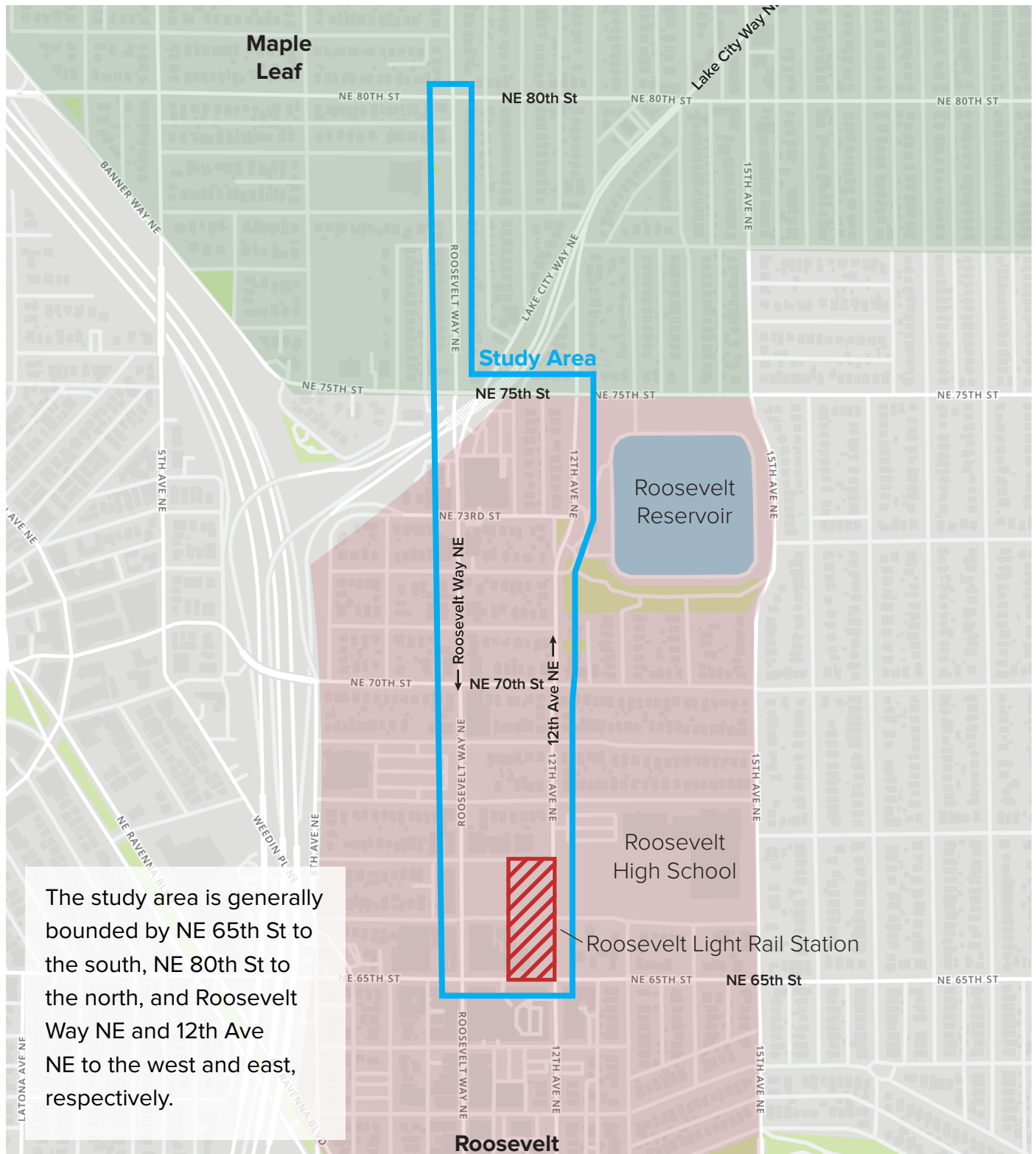


Fig. 1-2: Roosevelt and Maple Leaf neighborhood context.

METHODOLOGY

The methodology for this project was varied in both scope and tools used to gain the necessary information and come up with designs for the corridor. These methods included reviews of public reports, plans, and requirements, in-person site observations, understanding of industry standards and best-practices, the use of Adobe Illustrator to create diagrams and sections, and the use of AutoCAD, Illustrator, and Photoshop to create conceptual plan-view corridor designs. The methodology is presented as the individual steps necessary to complete each section of the report.

Modal Requirements

In order to create a practical and functional design for the corridor, it was important to collect and understand the different spatial and regulatory requirements for infrastructure dedicated to each different mode of transportation. This information was collected largely from technical manuals and requirements published by various government entities, include the City of Seattle’s Right-of-Way Improvements Manual, RapidRide and general service guidelines from King County Metro, and WSDOT’s Design Manual (which covers design guidelines for multiple modes of transportation). Additional information was collected from the series of design guides from the National Association of City Transportation Officials (NACTO) – including the “Urban Street Design Guide,” “Urban Bikeway Design Guide,” and the “Transit Street Design Guide” – which set forth burgeoning best-practices for designing for each relevant mode of transportation, and which challenge many of the long-held and misguided notions of what infrastructure elements different modes – especially private vehicles – require to properly function.

The inclusion of these last set of resources was important for creating designs that were not only tailored to the corridor, but that also represented more recent understandings of what’s required and possible within the public right-of-way. City and state requirements still list and rely on antiquated infrastructure requirements – such as wide lane widths and large corner radii to allow for easy turning, in the name of safety – which if used, will continue to result in overbuilt and, counterintuitively, potentially unsafe spaces (National Association of City Transportation Officials 2013). The NACTO requirements are based on recent pilot projects and quantitative research, which indicate the possibility for new standards for how these spaces are improved, especially to the benefit of alternate modes of transportation.

The section that includes the discussion of the various requirements for these different modes does not include all of the possible permutations of possible facilities for each. Although exhaustive, this would also be exhausting, and cataloging all of these different possibilities is not one of the goals of this report. Rather, the infrastructure requirements and best practices presented are already tailored to both the planned improvements of the corridor and the existing conditions of the study area (for example, because protected bike lanes are planned for the corridor, a discussion of sharrows or traditional bike lanes is not included). In this way, the section – in addition to the report in general – does not make an argument about the best overall improvements for the corridor, but rather responds to what has already been planned for the area (one notable exception is the set of alternatives presented at the beginning of section five, “The Design,” which investigate some

different methods of adjusting the corridors to absorb different implementations of the planned improvements).

Current Planning Efforts

As with any planning project, this report exists within the context of on-going projects and improvements in the city in general and specifically in Northeast Seattle. It was important to include a discussion of these other projects – especially along the continuation of the corridor being studied – to know how the project fits in and responds to other current planning efforts. For example, the incoming light rail station will provide an important and functional transfer point between different modes of transportation, while pavement improvements on Roosevelt Way NE south of NE 65th St provide both a context to which recommended improvements in this report need to respond and an indication of what may be politically or financially feasible in terms of bicycle and transit improvements. It's also important to understand how this project overlaps or interfaces with other on-going planning projects in the area, in order to create seamless, integrated, and functional designs. Of particular note are the two on-going projects that directly overlap with the scope of this project: The Transit Master Plan update and the Roosevelt to Downtown High Capacity Transit study. All of these are discussed in greater detail at the end of section three, "The Neighborhood."

All of these projects were found through a combination of conversations with planners at SDOT, a constant review of current events (through media resources such as the Seattle Transit Blog and the Seattle Bike Blog), and general ear-to-the-ground awareness of projects occurring in the city.

Site Analysis

The site analysis for this project can be generally split up into two phases – research of secondary materials and on-site, in-person observations. The review and collection of secondary sources focused largely on city documents and regulations, collected from the city's website. Data stored in proprietary databases at the city was also retrieved through ArcMap, and either exported as maps and data tables or transferred to other formats manually. Other data was pulled from various online sources, such as www.SeattleInProgress.com (which displays current and in-progress development proposals throughout the city) and Google Maps/Street View.

Street classification information was retrieved from the City of Seattle's "Street Classification Maps" resource, which provides graphics and descriptions of the types of travel different streets are expected to accommodate. Zoning information came from two sources – maps indicating geographic boundaries of each zoning designation in the neighborhood, and the user-friendly descriptions and requirements provided by the city for all of the different zoning types. Current land uses were compiled from data gained from Google Maps/Street View and GIS data retrieved from the City's internal data resources. As would be expected, neither of these sources provided perfectly up-to-date information, and both current development proposals and on-site observations were used to corroborate this information. These development proposals were retrieved from

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Seattle in Progress, and sites of potential future development were identified as such because of their similarity to the previous conditions of parcels currently planned for redevelopment (no quantitative or monetary standards were used to indicate any “underutilized” parcels in a more formal sense). Similar to current land uses, channelization for the Roosevelt Way NE, 12th Ave NE, and NE 75th St were combined from a number of sources (including city GIS data and Google Maps/Street View), and were ground-truthed during on-site observations. Basic information on current transportation options available in the neighborhood came largely from existing personal knowledge, but was corroborated both through Google Maps/Street View and existing channelization information. More detailed information – such as the effects of recent Metro service changes and traffic volumes – was collected from the King County Metro website, semiannual information Metro provides to SDOT on bus volumes, and a compilation of recent and semi-recent vehicle counts conducted for various other projects in the area, and compiled in one place accessible by city staff. Both topography and corridor safety were collected from an internal SDOT database.

The on-site collection of observational data on the area was less structured and more subjective in nature. In order to vary the type and quality of information collected, the first extended on-site observation was conducted before the bulk of the secondary data was collected, and the second was conducted after most of it was completed. In this way, the first visit focused on initial first impressions of the use, operations, and quality of the space, while the second visit focused on corroborating and further understanding the information collected and conclusions drawn during the secondary source analysis. Site visits varied in both time of day and day of the week, in order to investigate how users and traffic patterns varied along with these variables. During the visits, notes were taken to identify behaviors and corridor operations that were not clear through the secondary site analysis, and pictures were taken to document point-in-time perspectives and examples of this information.

Conceptual Alternatives

Prior to completing the full site design, the modal requirements and site analysis were used to explore a few different conceptual approaches that could be used to implement the improvements along the corridors. This filled the role that a full set of alternatives might play in a more detailed planning process. Rather than incorporate every piece of site analysis into these quick explorations, more general existing conditions (such as overall channelization, general land use patterns, and typical traffic volumes/movements) were used to investigate how different configurations of the planned improvements would interact with the site, allowing for an analysis of relative pros and cons of each overall alternative. What’s provided is an argument for which configuration intuitively fits well given existing conditions, while other configurations may fit better with other corridors with different characteristics.

Site plans for this section of the report were prepared initially in AutoCAD (in which basic line work was put together), transferred to Adobe Illustrator to add color and detail, and then finished in Photoshop to add textures. Sections of the different concepts were based off of what a “typical”

section of the block would look like under each concept, and to this end, may not always be a literal section of a specific part of the block. These graphics were prepared in Adobe Illustrator.

Corridor Design

The final section of the report presents a recommended design for the extent of the study area, and is a culmination of all of the work presented in the previous sections. It incorporates the review of modal requirements, the in-depth site analysis, exploratory conceptual designs, and (where relevant) current planning efforts into mode-specific decisions (e.g. how bike lanes should be aligned or where bus stops should be placed). As is discussed further in the section, this process resulted in a set of three block typologies that can be conceptually applied along this or any other similar corridor to create a functional and efficient space.

The first piece of this final design is a block-by-block site plan of the corridor. This was created by first retrieving drawings of current channelization for the corridor (GIS data from SDOT), and importing them into AutoCAD. These lines served as an accurately scaled base on which the block-specific improvements could be drawn, to provide the most realistic representation about the organization of modes. Also included were existing buildings along the corridor and the locations of street trees, again to provide design recommendations that were specific to the on-the-ground reality, especially as it changed from one block to the next. Similar to the conceptual site plans, this line work was then moved to Adobe Illustrator and Adobe Photoshop, again to bring it to life and to provide a more easily accessible graphic representation of the concept. Each block was also annotated where appropriate, to indicate specific design decisions (which are also discussed in the narrative part of the section). The second piece of the final design is two detailed corridor sections - one for Roosevelt Way NE and one for 12th Ave NE - which highlight interesting areas along each street (e.g. locations of new development or unique current/future uses). Similar to the overall site plan, these were first prepared in AutoCAD, and completed in Illustrator and Photoshop.

2. LITERATURE REVIEW

PLANNING FOR MULTIMODAL TRANSPORTATION

Since the advent of the automobile a century ago, private vehicle travel has remained the predominant and preferred mode of travel in the United States. Travel to and from work – which comprises the majority of trips taken on a daily basis, and is used as an indicator of general transportation mode choices – has been dominated by car travel for decades, and has steadily increased since at least 1960: Just over 40 million people listed “private vehicle” as their primary commuting option in 1960, which grew to 60 million in 1970, 80 million in 1980, 100 million in 1990, 110 million in 2000, and almost 120 million in 2010. In comparison, public transportation and walking/working at home are used by 16 million people combined, a number that has remained largely unchanged since 1960 (Pisarski and Polzin 2013).

Although it is difficult to speculate on the direction of causality, this steady rise in private automobile travel has been accompanied by massive private industry and government efforts to accommodate and support car travel. In the 1920s, coordinated efforts between car manufacturers were successful at shifting the blame for increasing car-pedestrian collisions from the relatively new automobile to “jaywalking” pedestrians, securing the automobile’s place as the predominant use of the street (Lewis 2014). In 1956, President Eisenhower signed the Federal-Aid Highway Act (also known as the National Interstate and Defense Highways Act), which authorized the construction of 41,000 miles of crossing, multi-lane highways to connect major cities and meet future vehicle demand, to the tune of \$25 billion over the first 12 years for initial construction (Weingroff 1996). More recently, in July 2009, President Obama signed the Car Allowance Rebate System bill, a \$1 billion co-venture with auto dealerships and car manufacturers to subsidize the trade-in of older, less fuel efficient vehicles for newer, more efficient ones (US Department of Transportation 2009).

Historically, local and state transportation planning efforts have also focused almost exclusively on private automobile travel. Improvements to the public right-of-way aimed to “maximize traffic speeds, minimize congestion and reduce crash rates” (Litman 2014). This narrow focus on transportation was even reflected in the name of the agencies responsible, which up until recently were more often named “highway” agencies than “transportation” agencies. Analytical methods used in these efforts focus on traditional monetary and efficiency factors, including project cost, vehicle operating cost, potential risk, and travel time. This ignored many other more complex and often qualitative measures that seek to measure effects on our society and natural environment, including environmental impacts, diversity and equity impacts, and perhaps most importantly, the effects on individuals’ desire to use other modes of transportation – such as walking, bicycling, and taking public transit (Litman 2014). It is these factors – and so many more – that the discipline and practices of multimodal transportation seek to address.

At its core, multimodal transportation planning is a response to this historically automobile-centric direction that transportation planning has taken, by incorporating other modes of transportation – most of which are considered preferable to single-occupancy vehicle travel, for many reasons –

into planning efforts and public right-of-way improvements. These modes typically include walking, biking, and transit (which in itself consists of everything from buses to streetcars to light and heavy rail), but can include modes as obscure as gondolas or as unconventional as escalators (Sadik-Khan and Solomonow 2016). From a practical stand point, multimodal transportation planning can include: The creation of planning documents ranging in scale from long range and visionary to short term and action-based; Designing specific improvements to benefit or improve the safety of one or more transportation modes; Implementing slightly larger-scale corridor or network improvements; Studying current transportation behaviors and preferences; And coordinating with other disciplines in the public realm (such as land use planning, economic development, and environmental planning), to reach these and many other goals (Litman 2014).

This burgeoning shift in how transportation is planned for is important for many reasons, including:

- ▶ **Accessibility:** No single mode of transportation is available to every individual as an option for moving around the urban realm. Operating a car, for instance, requires physical mobility, the benefit of sight, and that one falls within a certain age range (whether mandated by law, culturally expected, or for general safety reasons). Increasing transit operations, bicycle facilities, and pedestrian space creates a more accessible urban environment in which individuals of all ages and abilities can move and make use of all the city has to offer. For bikes especially, it has been shown that more robust bicycle infrastructure is correlated with higher bicycle travel, indicating that a relationship may exist between the quality of available infrastructure and the likelihood that people will choose that mode (Nelson and Allen 1997, Winters, et al. 2010). It isn't unreasonable to assume that similar improvements in the infrastructure of other modes can have the same general effect.
- ▶ **Individual Health:** Alternate modes of transportation, especially walking and biking, require people to move and be active. The health benefits of these activities have been well-known for quite some time (Buchner and Lee 2008, Garrard, Rissel and Bauman 2012), and encouraging more people to choose more active forms of transportation helps to increase both individual health and overall city health.
- ▶ **Environmental Health:** Most cars use fossil fuels, the combustion of which dumps incredible amounts of carbon dioxide and particulate matter into the air. Even the most environmentally friendly cars can take a notable toll on the environment, as manufacturing and shipping can still require a large amount of resources. Walking and biking, of course, produce no emissions, making them better options when considering the long term health of our environment. Even most public transportation systems run on cleaner power (especially in developed countries) and often have life spans that far outlast private automobiles.
- ▶ **Affordability:** Other than the cost of a pair of shoes, walking is free. Biking involves a one-time cost of a bicycle (or, if available, a bike-share membership). Taking the bus, street car, or light rail costs a few dollars each ride, and potentially less for low income riders and for those who's employer subsidizes the use of public transit. Compared to driving a car, which can cost the average driver anywhere from \$7,500 to almost \$12,000 per year (AAA 2015),

these modes present affordable options for moving around the city. Promoting these modes and providing safer, more connected, and more robust infrastructure for them will help those who depend on them continue to afford urban travel.

- ▶ **Efficiency:** Single-occupancy vehicles require the greatest amount of space per person to function – the footprint and volume of an entire car. In comparison, walking, biking, and riding a moderately full bus all require far less space per person. Dedicating additional right-of-way to these modes – assuming increased travel as well – will result in a more efficient allocation and use of the public right-of-way. This will become increasingly important as our urban areas continue to densify, and the relatively fixed supply of right-of-way is more highly demanded.

IN CONTEXT: CITY OF SEATTLE

In the City of Seattle, transportation planning occurs at many levels of government. At the smallest scale is the Seattle Department of Transportation (SDOT), who’s mission is “to deliver a high-quality transportation system for Seattle” (Seattle Department of Transportation 2016). At its most basic, SDOT is responsible for the city’s public right-of-way, and plans, oversees, and executes projects within it to improve safety conditions, economic activity, availability of open space, and overall transportation speed and reliability. At the county level, the King County Department of Transportation (KCDOT) oversees transportation projects that span multiple local jurisdictions, and in unincorporated areas of the county. Most notably, KCDOT provides the King County Water Taxi (providing commuter service between Downtown Seattle and both Vashon Island and West Seattle), and the majority of King County Metro Transit service – which provides 214 distinct routes to a 2,000 square mile area that’s home to 2 million residents (King County Metro 2016). Growing in coverage, Sound Transit is a multi-county transit agency that provides service to King, Pierce, and Snohomish counties. This includes bus (in conjunction with King County Metro) and commuter train services, as well as the highly-publicized and in-progress Link light rail line, which as of this writing connects the University of Washington to Downtown Seattle, South Seattle, and SeaTac airport, with current efforts underway to extend the line further in every direction (Sound Transit n.d.). The Washington State Department of Transportation (WSDOT) provides transportation services at the state level, including state-owned highways and bridges and the largest ferry system in the United States – a fleet of 22 ferries that carry 22 million passengers to 20 different ports throughout the Puget Sound (Washington State Department of Transportation 2016). Lastly, the U.S. Department of Transportation (USDOT) is responsible for transportation issues at the federal level, and where relevant in more local contexts. USDOT includes a number of more specific Operating Administrations, such as the Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA), which (as relevant to the city and these projects, at least) are responsible for administering grants to local jurisdictions for large scale transportation projects (Department of Transportation 2016). With five transportation agencies active in the region – and countless non-profits and advocacy groups – developing policy and delivering projects is an art of coordination, careful process, and balancing priorities.

As evidenced in part by some of the agencies' more notable offered services, the City of Seattle and the Puget Sound region has successfully begun to embrace the practice of multimodal transportation planning and all its benefits. In addition to transit at the county level, light rail at the regional level, and ferries at the state level, the Seattle Department of Transportation has made great strides towards improving multimodal transportation options at the city level, including walking, biking, and streetcar. As of 2015, Seattle also now contributes to bus service operated by King County Metro, allowing the city to play a larger role in how transit service is provided and improved within the city limits. Multimodal options within Seattle include a combined 135 miles of cycle tracks, Greenways, in street, off street, and shared bicycle infrastructure (Seattle Department of Transportation 2016), over 33,000 individual blocks of sidewalk, 40 miles of trails for pedestrians and bicyclists (Seattle Department of Transportation 2015), two streetcar lines (with a third being planned), and the majority of the bus routes operated by King County Metro.

The planning and visioning of pedestrian, bicycle, and transit improvements at the city level occurs in the three distinct master plans created and maintained by SDOT. These include the Pedestrian Master Plan (PMP), Bicycle Master Plan (BMP), and Transit Master Plan (TMP) (a fourth, the Freight Master Plan, is currently being written, and focuses on coordinating the delivery of goods throughout the city). Each of these plans envisions the state of each respective mode of transportation at least five years in the future, identifying priority corridors, individual projects, and policy strategies to help achieve the ultimate vision of a functional and interconnected transportation network. In one form or another, these plans are used to prioritize projects on an annual basis, and provide direction for projects and how they're implemented. It's important to note, however, that these plans do not present a legally binding list of projects (diagrams showing priority corridors, for example, are nothing more than lines on a map from a legal perspective), and that how these projects are prioritized, planned, and implemented are flexible, subject to the political whims of elected officials and the bureaucratic and financial realities of the teams working on them.

Funding for SDOT and the projects it implements comes primarily from appropriated funds from the city's budget, as with other executive city agencies. In the past, however, the scope of projects that SDOT has hoped to complete over the long term has necessitated the identification of new sources of income, which has taken the form of two, back-to-back, nine-year property tax levies, and accompanying increases in the commercial parking tax. The first of these levies, marketed as the "Bridging the Gap" levy, was passed by Seattle voters in 2006, and aimed to raise \$365 million over the life of the levy. In addition to addressing the city's infrastructure repair backlog and repaving many of the city's streets, the levy included funding for a whole host of multimodal projects, including creating safe routes to school, repairing – and building – sidewalks, and creating and implementing the first version of the BMP. Just before the expiration of this levy on December 31st, 2015, Seattle voters decided in favor of almost tripling-down on this initial levy, and passed the "Levy to Move Seattle." Also a nine-year property tax levy, Move Seattle seeks to bring in \$930 million, roughly 30% of the city's entire transportation budget. Once again, the levy includes basic infrastructure repair projects, but also goes beyond this to provide new bike lanes, added transit service, and safer pedestrian facilities. Funding from this levy, at least in part, will fund the added RapidRide service and protected bicycle facilities discussed in this report.

HISTORY OF TRANSPORTATION IN SEATTLE

The first alternate mode of transportation available in the region was a fleet of steam ferries – known as the “Mosquito Fleet” – which provided service from Seattle to across Lake Washington, Lake Union, and the Puget Sound. In 1884, the first street car system was launched in Seattle, at first as a set of horse-drawn cars and later upgraded to electric only five years later – the first electric rail system west of the Mississippi. By the end of the century, the city had 22 separate lines operated by a number of private entities, mostly seeking to provide transit service to new residential developments. At the end of 1900, Stone & Webster bought all the private streetcar lines and formed the Seattle Electric Company, entering into a 40-year contract with the city to provide pseudo-public transit service. That same year, the first automobile arrived in Seattle (King County Metro 2016).

The first truly public transit system in Seattle was built from 1911 to 1913, in the form of city-built and city-owned streetcar lines. The city expanded this portfolio in 1918 by buying the consolidated streetcar lines from Stone & Webster. Only four years later in 1922, the Washington State Supreme Court ruled that general tax revenue could not be used to subsidize the building and operation of streetcar lines, spelling the eventual downfall of the system (which had operated at a loss in an effort to provide affordable transportation to the city). The system continued to operate in a state of financial ruin until 1939, when the city secured a federal loan to cover the debts incurred by continuing the streetcar service. Part of the terms of this loan included switching from fixed-path and relatively investment-heavy rail transit system to a fleet of more flexible buses and “trackless trollies” (the precursor to the trolley buses Seattle has today). The city’s last streetcar of this initial system completed its final trip in 1941, and another service of the same type wouldn’t exist in the city until the opening of the South Lake Union streetcar in 2007 – almost 70 years later (King County Metro 2016).

As a part of the nation-wide push towards private automobile travel (but under the guise of national security) the National Interstate and Defense Highways Act was passed in 1956, which included funding for Interstate 5, running along the west coast from the Canada to Mexico borders, running through Seattle. Many of the initial proposals for the function and structure of I-5 through Seattle included dedicated lanes for public transit in order to improve speed and reliability of growing transit service in the city, all of which were denied, citing mostly the added cost. This blow to the system came at the beginning of a laundry list of rejected ballot measures, forced consolidations, and unawarded federal grants, which hamstrung the effectiveness of the transit network for decades. 1972 saw 31 million transit trips in the Seattle metro area – down from 130 million in 1944 (King County Metro 2016).

With many of the transit providers in the area on the verge of collapse, King County Metro was formed the next year in 1973. Their primary mandate was to consolidate existing transit lines and modernize the system with new diesel buses. Additionally, they launched a number of programs around this time to try to get more people to ride buses, including through promoting mode shifts, adding park-and-rides, and conducting marketing campaigns. These efforts were generally considered a success, and ridership levels rebounded to 58 million by the end of the decade. By

adding new service and coverage in the area and coordinating with other transit authorities – both inside and outside the county – these numbers continued to rise, to almost 76 million in 1992 (King County Metro 2016).

In 1995, tri-county voters rejected a ballot measure aimed at raising \$6.7 billion for massive new transportation service in the region, including heavy and light rail, commuter buses, and new carpool lanes. In 1996, a far leaner (\$3.9 billion) version of the measure was passed (King County Metro 2016), which included only 21 miles of light rail (which was later further reduced to a mere 14 miles). Due to financial mismanagement and political strife, light rail service didn't open until 2009. The year before, an additional ballot measure was approved to extend light rail in all directions, including north to Lynnwood, east to Bellevue/Redmond, and south toward Tacoma. This system continues to grow and be a resounding success, with steadily increasing ridership that has consistently beaten initial projections (Sound Transit 2016). In November of 2016, voters in the area will get to decide on a \$50 billion funding package to expand this service even further.

Bicycling was first introduced to Seattle around the same time as the first streetcar. The first recorded bicycle showed up in the city in 1879, and by the turn of the century as many as 10,000 of the city's then 80,000 residents were biking. This massive growth in bicycle travel necessitated (and happened contemporaneous with) a big push for new and better roads and paths for bicycles to ride on. The many new riders in the city formed clubs around the new mode of travel, and were instrumental in creating an impressive network of safer bike streets and dedicated bike pathways crossing the city. However, even these paths paled in comparison to the amenities already being provided in other cities in the region, including Snohomish, which had a rich network of roads with dedicated space for bicyclists – in many ways the first incarnation of the protected bike lane, an amenity which Seattle wouldn't provide for another 100 years (Berger 2013).

Little to no bike infrastructure of note was provided in Seattle for most of the 20th century. After the wide-spread adoption (and resulting dependence on) the private automobile, as is still the case, taking public right-of-way for any use other than car travel is unpopular at best, and politically impossible at worst. Towards the end of the century, methods of providing space for bicycle travel without taking space away from cars began to come into vogue, such as the use of sharrows in curb lanes along popular bike routes (which only involve paint, and only indicate a shared space rather than a concrete taking-away of automobile space). With the exception of some isolated projects – such as the Dearborn bike lanes, built in 1974 (Seattle Department of Transportation 2016) – it wasn't until the early 2000s that the city began to take space away from cars – most often by narrowing overly-wide lanes – to create traditional bike lanes, where bicyclists could enjoy some spatial separation from moving vehicles. In the last several years this effort has grown further to include providing protected bike lanes and Neighborhood Greenways, which provide a physical barrier or specific and signed street designation for cyclists, respectively (Fucoloro 2016).

MODAL REQUIREMENTS

Alternate modes of transportation can have notably different infrastructure requirements than what is typically or historically found within the public right-of-way, and the list of possible and/

or best improvements is growing every day. These requirements include the amount right-of-way dedicated to the mode, the materials and signage needed to mark it, and its interaction with the other modes present along the corridor. The requirements listed below were pulled from a number of different regulatory sources (at both the city and state level), as well as design guidelines presented as best-practices when designing multimodal corridors, or for providing specific modal improvements.

It is important to understand that even the regulatory requirements provided by the city and state serve more as guidelines than true requirements, and one need not look too hard to find clear deviations from these requirements – even ones recently built or currently being planned. These relatively common deviations include smaller than “minimum” lane widths, which not only further indicates that these are soft requirements, but also shows that – assuming there are no overt safety problems with the narrower lanes – these minimum requirements may be excessively high. The minimum requirements for each mode are presented as such throughout the section, but are not strictly adhered to in the conceptual designs or final corridor design, which instead prioritize current operational conditions over blanket regulatory requirements.

This section covers all of the relevant infrastructure requirements for the different modes of transportation that utilize (or are planned to utilize) this corridor. This includes pedestrians, bicycles, transit, and general purpose traffic, as well as the various levels of overlap that may happen between them.

Pedestrians

Pedestrian amenities include two main categories: sidewalks and crosswalks. Although it is also important to consider pedestrian interaction with other modes of transportation (interface and use of transit stops, for example), those will be discussed in their respective sections. This section will consider the requirements specific to dedicated pedestrian travel areas within the public right-of-way.

In the City of Seattle, sidewalks are considered to be split into three distinct zones. The Landscape/Furniture Zone (which includes the curb) is defined as “the area between the roadway curb face and the front edge of the walkway” (Seattle Department of Transportation 2005). At a required minimum width of 5.5’, this area is designated for landscaping berms, trees, green stormwater infrastructure (such as bioswales), and other furniture. Next is the Pedestrian Zone, which is the movement-focused area of the sidewalk – the space where pedestrians typically walk. Zones of this type must have a minimum width of 6’, though they

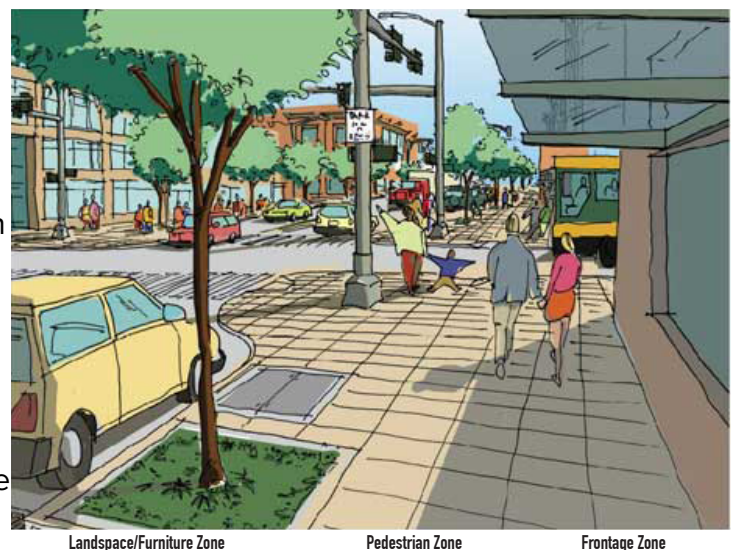


Fig. 2-1: Seattle sidewalk zones. Photo from SDOT.

are often larger depending on existing conditions. When sidewalks are replaced, SDOT requires that the new sidewalks at least meet the width of the previous sidewalks. Although the Landscape/Furniture and Pedestrian Zones are separate and cannot encroach on each other, elements of the former may extend into the latter at individual points (e.g. a bench mostly in the Landscape/Furniture Zone may extend slightly into the Pedestrian Zone), so long as at no point does the width of the Pedestrian Zone fall below 5'. The last zone is the Frontage Zone, which is a space at least 2' wide between the Pedestrian Zone and the adjacent property line, that exists only where there is sufficient space to provide it. This space is used not only as a buffer between adjacent uses and the dedicated pedestrian area, but also as a space for cafe seating, additional landscaping, etc. (Seattle Department of Transportation 2005)

Sidewalks near transit stations have slightly different requirements, reflective of the likely higher pedestrian use that those areas will see. The Frontage Zone requirement (or recommendation) extends to a minimum of 3', and the Pedestrian Zone almost doubles to a minimum width of 10-12'. The specific width should be determined by looking at "ridership projections for the station; Anticipated pedestrian volumes from adjacent land uses; Right-of-way dimensions; Block length; And location of bus transfer zones" (Seattle Department of Transportation 2005).

Although the ROW Improvements Manual only recommends the Frontage Zone "where sufficient right-of-way exists," it provides no such consolation for the width of the Landscape/Furniture zone. However, it is logical that the minimum width of the Pedestrian Zone is prioritized, as ensuring safety measures is useless without a fully-functional area for people to walk. Where relevant, other measures will be needed to ensure the safety of pedestrians using the space – such as the maintenance of sidewalk-adjacent parking or the inclusion of relatively low-impact bike lanes and additional buffers from vehicle traffic – which will be discussed in the designs presented in section five, "The Design."

The second main aspect of pedestrian infrastructure are crosswalks, which are marked locations at intersections that pedestrians can legally cross the street. Every intersection within the city, unless otherwise posted, is a legal crossing point for pedestrians, regardless of the presence of paint or signs. This lack of any required indication does not always make for a safe crossing, however, and the presence of paint and signs helps to clearly indicate to users of all transportation types that pedestrians use that space as well. The ROW Improvements Manual recommends a standard, "ladder-style" crosswalk, which is made up of a series of painted white stripes in pairs. Each stripe is 8" wide (parallel to the direction of ped travel) and 10' wide, and there is 8" of space in between each stripe in a pair, which are laid out with 5' between the centers of pairs. Deviations from this type of crosswalk are allowed for textured and/or colored concrete crosswalks (as long as they have solid white borders running the length of the crosswalk), which can be a good way to foster neighborhood ownership over the space (Seattle Department of Transportation 2005).

The "Urban Street Design Guide," a book on best-practices for city streetscape design created by the National Association of City Transportation Officials (NACTO), provides additional guidance on creating safe and usable pedestrian amenities on urban streets. Many of the specifications they provide for sidewalk design mirror similar requirements provided in the city's Right-of-Way Improvements Manual – such as a desired minimum width of 6' – but provide additional guidance

on organization and coordination with other infrastructure improvements. One of the specific improvements they discuss in great detail are curb bulbs, which are extensions of the curb at intersections (or sometimes midblock) perpendicular to the flow of traffic, which provide a number of benefits to pedestrians. First of all, these provide a far shorter crossing time, greatly reducing the amount of time pedestrians may potentially be in conflict with moving vehicles. Curb bulbs also usually take up the area in the ROW that would otherwise be used for parallel parking, which helps bring the pedestrians out from behind parked vehicles that might prevent moving vehicles from seeing the pedestrians prior to crossing. Lastly, if smaller corner radii are used, they can help change the needed path of turning vehicles, forcing them to move more slowly and be more careful as they make the maneuver. The Design Guide notes that these extensions should be at least as long (parallel to the flow of traffic) as the crosswalk is wide, but ideally should extend back as far as the advanced stop bar – another new concept that will be discussed further in the “Cars & Lanes” topic of this section (National Association of City Transportation Officials 2013).

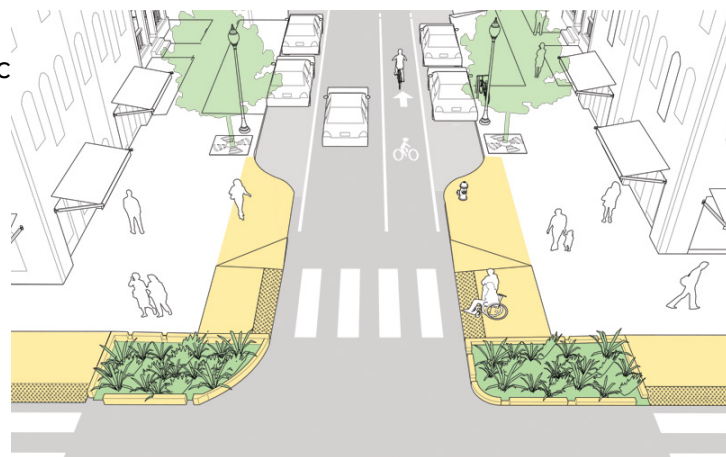


Fig. 2-2: Curb extension example. Image from NACTO.

The NACTO Design Guide also discusses the importance of crosswalks, especially in terms of helping to redefine a space and provide clear priority to pedestrian travel. As discussed above, while all intersections in the City of Seattle are legal crossing points, that doesn't always mean it is a safe place to cross, and perhaps more importantly, a place that feels safe to cross. While these are technically legal crossing points, misconceptions exist about this, and many people believe that crossing can only occur at marked crosswalks. The Design Guide explains that crosswalks can be used simply as a communication tool, to indicate to both pedestrians and drivers that they have the right to use that space as well. As a general rule, it states that streets with more than 3,000 cars per day on average, speed limits greater than 20 mph, and at least two travel lanes should have marked crosswalks at every intersection (National Association of City Transportation Officials 2013).

Bicycles

Bicycle transportation enjoys some of the biggest ranges of possible infrastructure improvements of any mode of transportation within the public right-of-way, from fully integrated lanes shared with general purpose traffic, to entirely separated, raised, buffered, and dedicated paths. Each potential improvement has its relative merits and compromises, including cost, degree of separation, and the safety/comfort of users. As discussed in the section four, “Site Analysis,” current infrastructure along the corridor consists mostly of separated bike lanes with a handful of sharrows, and planned future improvements include protected bike lanes in both directions.

According to Seattle's Right-of-Way Improvements Manual, the required width of bicycle lanes and related elements vary greatly depending on specific site conditions. When adjacent to the

curb, bicycle lanes must be at least 4' wide. Adjacent to parking, this minimum grows to 5' – a requirement that is reflected in the corridor’s current channelization. The Manual also recommends including a pavement marking that indicates the direction of travel for the bike lane. The ROW Improvements Manual, however, includes no direction on protected bike lanes (PBLs), two-way bike lanes, or best-practices for integration with other modes of transportation.

The City’s ROW Improvements Manual also points to the Washington State Department of Transportation’s manual on streetscape design, which provides information on improvements such as separated and buffered bike lanes and the strategic use of paint to improve safety and usability. It notes that separated bicycle lanes should be 3' to 7' wide, with a buffer of 2' to 3'. Furthermore, the minimum combined width of a bike lane and buffer should never be less than 5'. The Design Manual also provides specifications and typical sections for a number of more robust infrastructure options, including “Buffered,” “Separated Buffered,” and “Raised and Curb-Separated” bike lanes.

The state’s design manual also discusses the use of green paint to indicate bike lanes, a practice that is quickly gaining popularity throughout the city and the rest of the country. It notes that the surface treatment should ideally only be used “where the potential conflicts exist between cyclists and other design users” (Washington State Department of Transportation 2015), such as intersections or other overlapping paths. In these instances, 25' of solid paint should be used prior to the conflict area – as well as 25' after the conflict area – while a dashed green line with white borders on the sides should be used within the conflict area. The intent of this treatment is to provide a visual and tactile queue that the space is shared between multiple modes, for both bicyclists and whatever users they are in conflict with – pedestrians, cars, transit, etc.

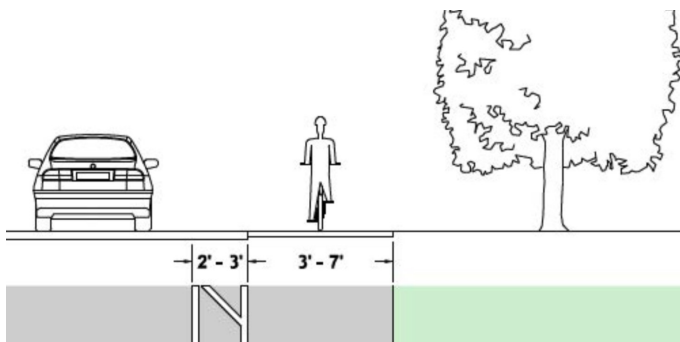


Fig. 2-3: Buffered bike lane. Image from WSDOT.

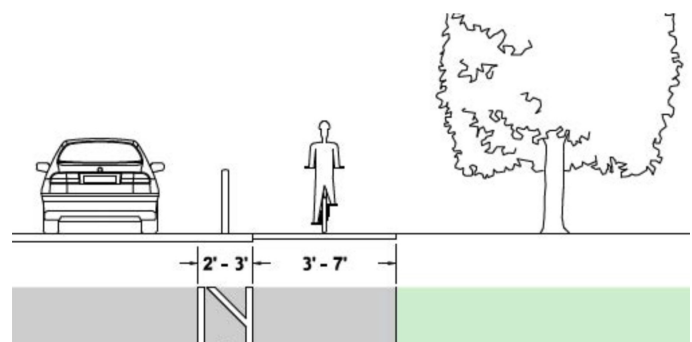


Fig. 2-4: Separated Buffered bike lane. Image from WSDOT.

NACTO produces another installment in its transportation design guide series, the “Urban Bikeway Design Guide,” that provides more specific best-practices for bike infrastructure – from conventional bike lanes to fully-separated cycle tracks, and how they interface with other infrastructure elements along the roadway. One relevant discussion included in the guide is the provision of and requirements for protected bike lanes (PBLs), or “cycle tracks.” These are horizontally or vertically separated and buffered bike facilities, that provide far greater safety than conventional bike lanes (a painted lane between moving vehicles and parking or the curb) or sharrows (wider and shared lanes for vehicles and

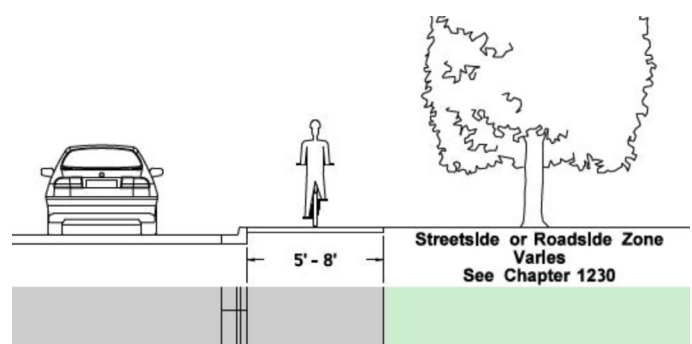


Fig. 2-5: Raised and Curb-Separated bike lane. Image from WSDOT.

bikes). The guide states that the minimum width of a PBL is 5' under normal circumstances, and 7' if uphill and passing is needed or expected. The minimum buffer required for the bike lane to be considered protected is 3', and can range in intensity of physical barrier from simply paint up to bollards, a raised curb, planters, or a full vehicle parking lane (the latter few of which provide a truly physical barrier and therefore greater protection). Given that the intent of this element is to prevent vehicle traffic where bicyclists would be riding, special consideration is needed for unavoidable points of interaction, such as driveways and intersections. At these locations, visibility of cyclists in the lane by vehicles should be prioritized, to further reduce conflict. Where vehicles are making turns (either into or out of a driveway, or at intersections), the right-of-way should be configured to force vehicles to make sharp turns, which must be taken slowly (National Association of City Transportation Officials 2014).

The guide also discusses raised cycle tracks, which are used less often within the City of Seattle, but provide vertical separation from vehicle traffic instead of (or occasionally in addition to) horizontal separation, as would be seen in a traditional PBL. The guide doesn't explicitly state which variation is objectively more safe, but does mention that vertical separation can provide a greater feeling of safety for bicyclists, which may make the amenity more appealing to broader cross-section of potential users. Given the higher volume of collisions along the north part of the corridor (see section four, "Site Analysis"), this may be an appropriate and even necessary improvement for parts of the study area. Furthermore, the public right-of-way is a finite – and often scarce – resource, and vertical separation requires that less overall horizontal space is taken for bicycle infrastructure. Instead of the 8'-10' minimum recommended for a traditional PBL, raised cycle tracks require only 6.5' normally, and as little as 5' at pinch-points along the route. The vertical separation between vehicles and bikes can range in height from 1" to as much as 6", and more means a lower chance of conflict between cars and bicyclists. Similarly, the raised cycle track can be vertically separated from pedestrian traffic to reduce conflict between these uses, which can be as much as 5". This sets up a situation in which compromises between degree of vehicle/bicycle separation and degree of pedestrian/bicycle separation need to be made, and other strategies to achieve the latter – such as planted berms within the landscape/furniture zone of the sidewalk – may help to provide the greatest amount of vehicle/bicycle separation. Lastly, similar to traditional PBLs, the issue of crossing vehicle traffic from driveways and intersections is an important consideration, and the guide recommends similar treatments as above (clear sight-lines, tight turning radii, etc.), as well as keeping the crossing at the grade of the bike lane (National Association of City Transportation Officials 2014).

Intersections are the areas of greatest conflict within the public right-of-way, as they are locations where different modes going in different directions overlap and cross paths. Specific treatments for intersections can be used to help improve safety for all modes, but especially bicyclists, as discussed in NACTO's design guide. At the approach to intersections, PBLs can convert to traditional bike lanes, which allows for a curb bulb and shorter pedestrian crossing times. When bike lanes cross through intersections, they most often revert to what is essentially a traditional, unbuffered and unseparated bike lane (providing a physical barrier or vertical separation would impact or even prevent perpendicular travel through the intersection). Depending on the level of expected conflict, the bike lane can be marked with as little as parallel dashed lines or as much as green paint through the entire intersection. Where substantial left turns are expected for cyclists (or

even encouraged, to align with provided bicycle improvements), a two-stage turn queue box can be provided adjacent to the painted lane, to give bicyclists a safe area to wait for a green light in the perpendicular direction. In order to utilize this amenity, left-turning cyclists continue through the intersection as if they are going straight, but instead stop in the box, rotate their bicycles to be facing in the direction of their turn, and wait for the green light in that direction. Although this substantially increases the amount of time

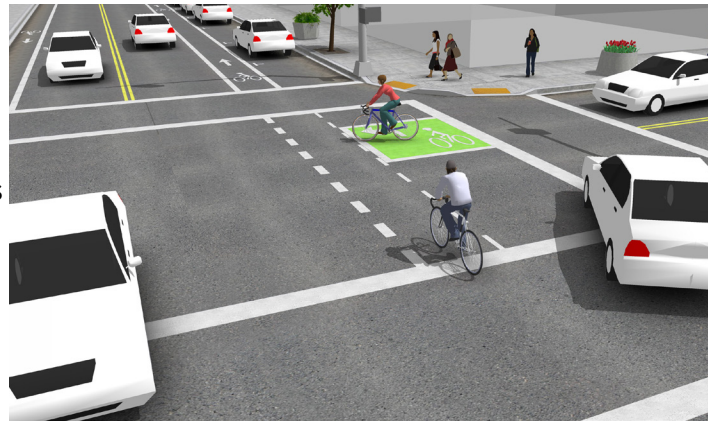


Fig. 2-6: Two-stage turn queue box. Image from NACTO.

required for cyclists to complete the maneuver, it is a far safer option than merging across lanes to make a left-turn with general purpose traffic. It also puts cyclists in front of cars facing in the direction of their turn, giving them a safety advantage when the light turns green.

Buses

If the successful implementation of other RapidRide lines throughout the city provides any indication, the transit improvements planned for this corridor will likely benefit the most individual people and their transit options. Luckily, transit planning has been actively engaged in within the city for many years, resulting in comprehensive and reliable guidelines and best practices for transit routes, stop placement, and connectivity. While some of the more general requirements were codified a number of years ago (including the 1991 “Metro Transportation Facility Design Guidelines”), others were created as a part of the city’s initial RapidRide efforts, and provide clear direction for developing and incorporating future corridors.

King County Metro organizes different bus stops into three distinct categories, depending on their location on the block: Near-side (stops located just before an intersection), far-side (located just after an intersection), and mid-block (located between two intersections). The first two of these are preferred to the third, as they require less overall space (intersections can be used for pulling out and pulling in, respectively), and provide better pedestrian connectivity than the mid-block stops, for which riders may be tempted to cross illegally to reach. Of these two options far-side stops are preferred, as they create less conflict between buses and right-turning vehicles, block sight-lines less than at near-side stops, and allow pedestrians to board and alight at less busy areas of the sidewalk (Municipality of Metropolitan Seattle 1991). For this reason, far-side bus stops will be recommended for all bus stop locations along both corridors.

Bus stops can vary in length, depending on location, separation from travel, and the number of buses that may use it at any given time. In the case of far-side stops, 70’ of parallel curb space is required for the actual stop, followed by 40’ of space to allow buses to pull out of the stop. The length of stopping space may be doubled if it’s likely that more than one bus will service the stop at the same time. No additional space is required before the stop, as buses can utilize the intersection to merge over to the curb lane. For in-lane stops, where buses don’t need to pull over to service the stop (but rather the curb bulbs-out to meet the path of the bus), the 40’ of pull-

out space is not required. Bus stop widths can also vary, but have strict minimums to ensure accessibility for persons with disabilities. Because bus lifts extend out 4' from the edge of the bus, and 4' of maneuvering space is required for wheel chairs and general mobility, there must be at least 8' of perpendicular space at bus loading areas. For transit loading areas that are, for example, separated from the sidewalk by raised bike lane, at least 8' would need to be provided between the bike lane and the street to meet this requirement. Lastly, no furniture should be within 4' of the curb (Municipality of Metropolitan Seattle 1991).

A final important general issue of bus infrastructure is the distance between sequential stops, known as “stop spacing.” Standard frequency is four to six stops per mile of route, though as many as eight can be provided if conditions warrant additional loading/unloading locations. Furthermore, no two stops should be within 500' of one another, and stops on a two-way street should be located along the corridor such that they are on the same block, wherever possible (Municipality of Metropolitan Seattle 1991).

Additional specifications exist specifically for RapidRide routes, which are exhaustively presented in the “RapidRide Passenger Facilities Capital Plan.” Likely the most important of these requirements – that substantially deviates from standard transit planning guidelines – is the stop spacing, which can be as infrequent as two stops per mile. This looser requirement is provided as a means of increasing the speed of the route, by consolidating loading and unloading areas to fewer spaces along the corridor. The RapidRide routes also come with their own suite of furniture, including specifically branded stops, information kiosks, station signs, and even trash cans. There are two types of shelters for RapidRide branded stops, the larger of which measures 8' deep. With a 4' buffer required in which no furniture may be present, this makes the overall possible depth of a RapidRide stop a minimum of 12'.

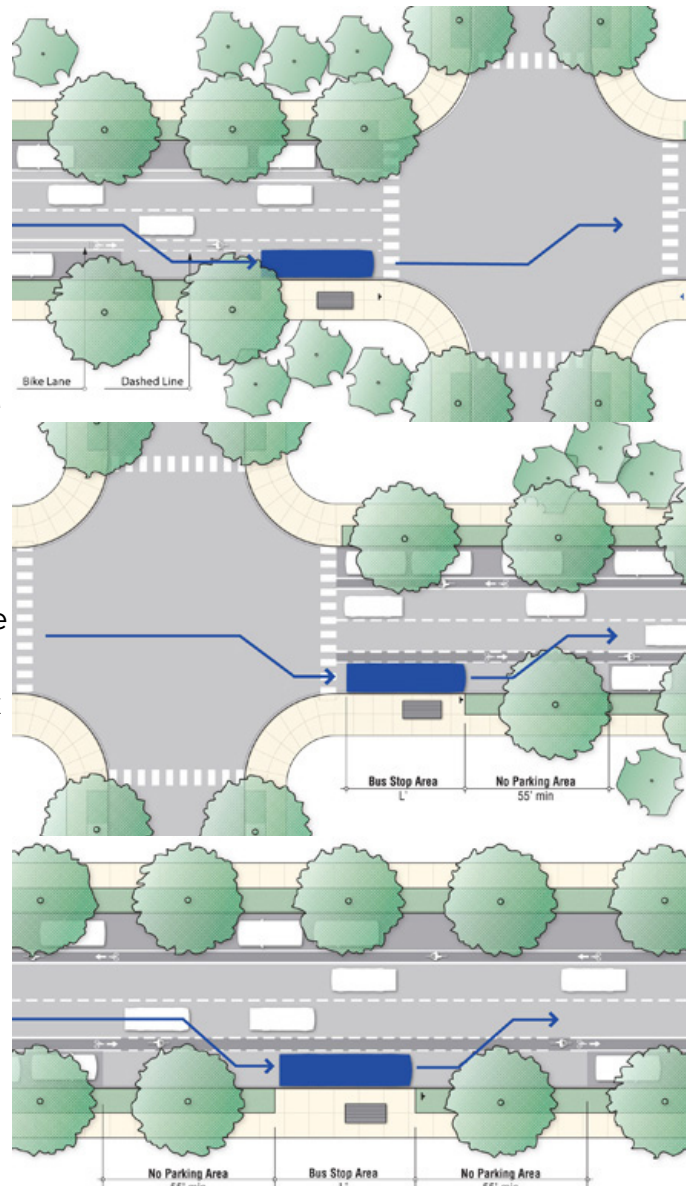


Fig. 2-7: Near-side, far-side, and mid-block stops. Images from Pace.

Many of the other bus requirements presented by both the City’s ROW Improvement Manual and the State’s Design Manual are descriptive in nature, indicating room for creativity and flexibility in trying to create the safest and most effective transit environment. For example, the ROW Improvement Manual includes utilizing “adjacent overhangs, canopies, and building arcades to provide weather protection for transit patrons,” giving “careful consideration [to] transit speed and reliability and overall traffic operations” when designing bus stops, and assuring “comfort, convenience and safety for all transit users” (Seattle Department of Transportation 2005). Specific

to the placement of bus stops, the WSDOT Design Manual notes the importance of “access for people with disabilities, convenient passenger transfers to other intersecting bus routes or transfer points,” and “connection to nearby pedestrian circulation systems,” in addition to many other criteria, for the effective placement and integration of bus stops (Washington State Department of Transportation 2015).

Cars & Lanes

The ROW Improvements Manual provides standard lane widths for arterial streets, a category into which both Roosevelt Way NE and 12th Ave NE fall, as follows: 8’ for standard parking lanes, 10’ for parking on a bus route, 11’ for through traffic lanes, 12’ for lanes adjacent to the curb, bus lanes, and turn-only lanes, and 14’ for shared vehicle/bicycle curb lanes. As mentioned in the introduction to this section, these widths are standard but not required, and it’s important to consider current best-practices for lane widths (especially if they function properly at a reduced width) when planning improvements for a corridor (Seattle Department of Transportation 2005).

Another important consideration is the angle of lane offsets along the corridor. While most lanes continue parallel to the orientation of the right-of-way along and between blocks, it is sometimes necessary for lanes to jog – at an angle – to one side or another to accommodate changes in lane width, additional infrastructure/uses, or the landscape in general. The minimum amount of length an offset must be is based on a number of factors, and can be calculated with the following formula: $L = (WS^2)/60$, where L = the minimum length of the offset, W = the perpendicular width of the offset, and S = the speed limit in miles per hour. For example, a perpendicular offset of 10’ (i.e. a lane shifting 10’ to the right or left) on a street with a speed limit of 25 mph would need to happen across at least $(10*25^2)/60 = 6250/60 = \sim 104'$ (Seattle Department of Transportation 2005).

One of the core tenets of NACTO’s “Urban Streets Design Guide” is creating streets that work for all modes of transportation, not just vehicle traffic – as streets have done historically. This necessarily means a reorganization of space that deemphasizes the role of cars within the right-of-way, and promotes the use of the street by individuals utilizing non-motorized and alternate forms of transportation – such as pedestrians, bicyclists, and transit riders. This also includes challenging many of the preconceptions transportation planners have, such as spatial requirements, traffic signals, and generally how cars move through our urban spaces. One of the most important of these considerations is lane widths, for which mandatory minimums – under the guise of safety – have existed for decades. 11’-12’ has long assumed to be appropriate and is often even exceeded – reflected in Seattle’s own lane width requirements and practices – but new research indicates that narrower lanes may actually help to regulate traffic speeds and improve better overall corridor safety (National Association of City Transportation Officials 2013). In urban areas, 10’ lanes are sufficient for general purpose traffic, and an additional foot is appropriate for lanes often used by trucks or buses. For lanes from which few or no vehicles will be turning (e.g. through lanes paired with separate and dedicated turn lanes or turn pockets), general purpose traffic lanes can go as narrow as 9.5’ or even 9’, which greatly reduces the amount of space that needs to be dedicated to vehicular traffic, opening up additional space for other modes of transportation. Lastly and perhaps most importantly, the guide states that there is really never any reason why a lane should be

greater than 12', as these wider typologies don't improve efficiency and may even cause speeding, negatively impacting overall corridor safety.

As noted above, the guide also notes the importance of providing an advanced stop bar, which is a required stopping location prior to the otherwise standard stopping location – the up-stream edge of the crosswalk. Forcing vehicles to stop short of the crosswalk (8' before the crosswalk is the recommended distance for advanced stop bars), in addition to curb bulbs, helps improve pedestrian safety at all intersections. Also, for blocks with on-street parking, the guide recommends a solid stripe between the parking lane and adjacent travel lane, which can help promote proper parking, and reduce the number of parked vehicles that are in the way of moving vehicles.

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NORTHEAST SEATTLE IMPROVEMENTS

As with many areas in the city, Northeast Seattle is currently in the middle of a period of transformational development, in which largely single family and auto-oriented uses are giving way to denser, mixed-use, and mixed-life developments. With such a transition comes the necessity to reevaluate how residents move to, from, and between neighborhoods, and to shift priorities to both meet current needs and shape potential future demands. This shift has not gone unnoticed by the city or region, which in addition to implementing a number of current multimodal projects in the neighborhood has identified the need for more infrastructure and facilities to improve bicycle and transit service, specifically.

The Bicycle Master Plan (BMP) includes a number of detailed maps indicating the location and nature of planned infrastructure improvements. These projects range in intensity from shared infrastructure (wider travel lanes with bike “sharrow” markings to indicate the shared nature of the lane) to entirely separated amenities (such as cycle tracks and trails). These maps – and accompanying written priorities – are transmitted into annual implementation maps, indicating planned projects for the upcoming funding cycle. One of the projects noted in the overall map is a protected bike lane for the extent of Roosevelt Way NE, from Northgate to the University bridge. Parallel to the extent of Roosevelt that only provides one-way travel in the southbound direction, a protected bike lane is also identified along 11th Ave NE/12th Ave NE (the former turning into the latter as it crosses NE Ravenna Blvd – see Fig. 3-1), which provides travel in the northbound direction, and in general serves as the second half of the Roosevelt/12th one-way couplet. While it’s logical to assume that the amenities provided will be one-way along the parts of the corridors that are also one-way, the plan makes no indication of this (Seattle Department of Transportation 2016).

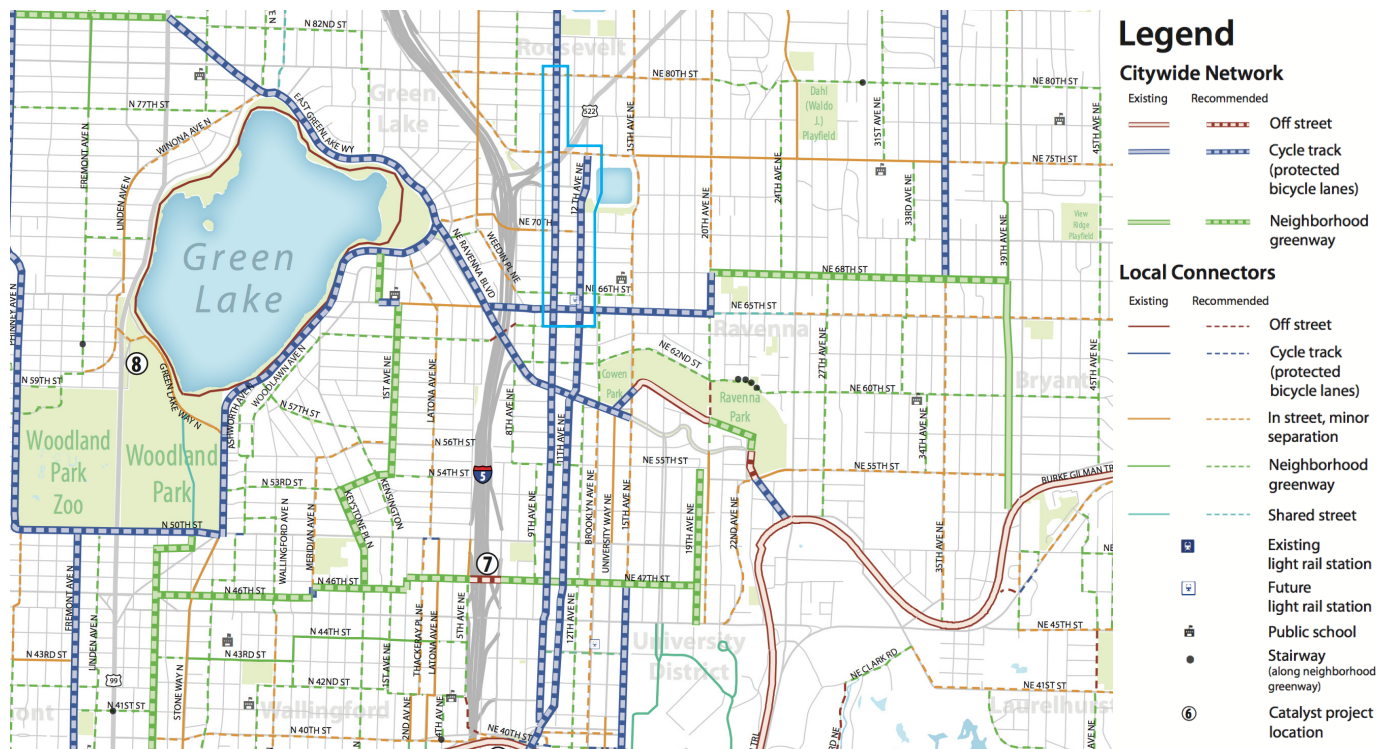
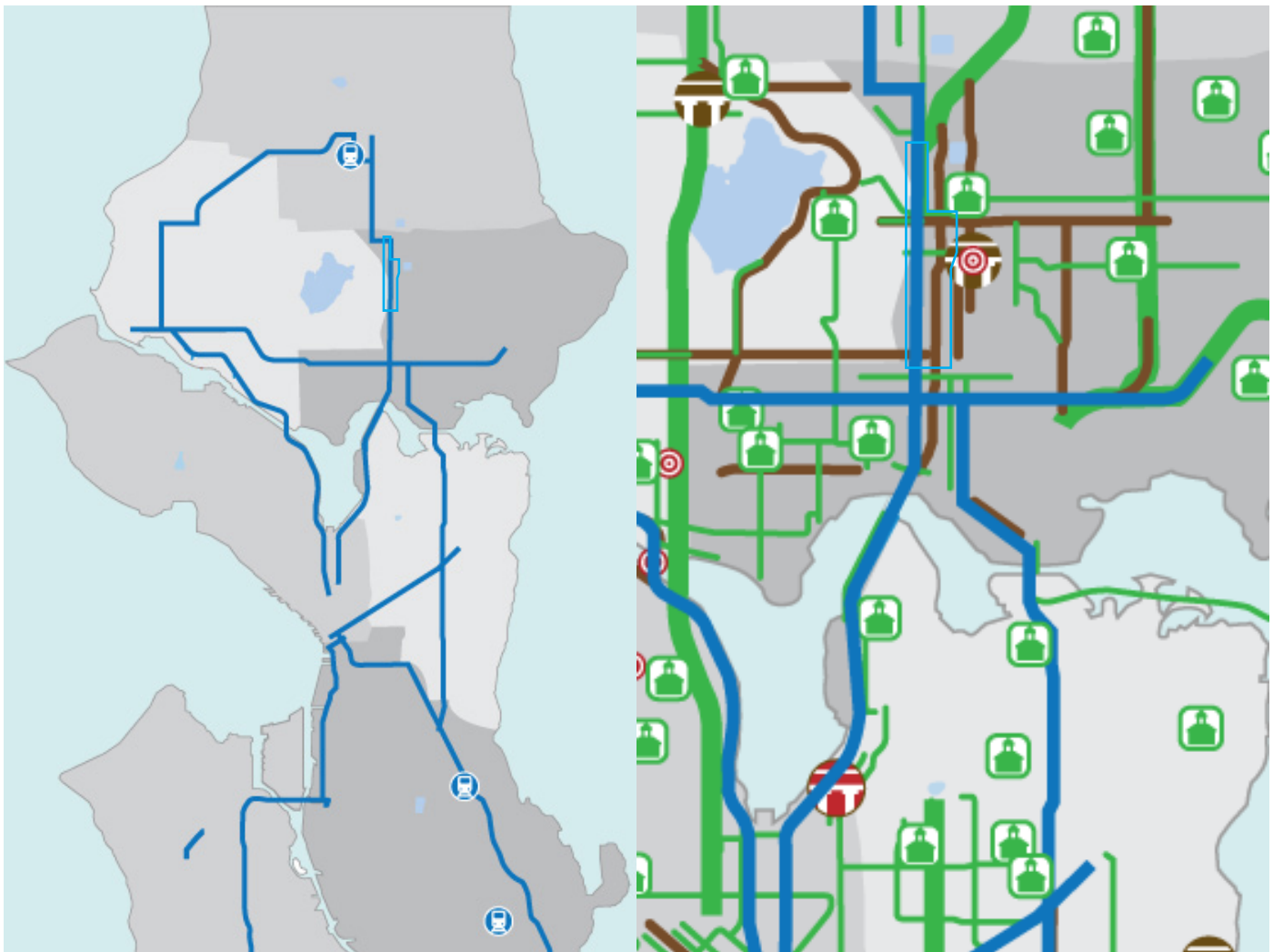


Fig. 3-1: BMP Master Projects Map (blue box added to indicate study area). Image from SDOT.

As mentioned above, the Levy to Move Seattle included funding for a whole host of multimodal projects. Arguably some of the more publicized projects included a set of seven new RapidRide corridors throughout the city. While some of these projects aimed to upgrade existing frequent service routes with full bus rapid transit features (e.g. route 44 between Ballard, Fremont, Wallingford, and the University District), others were brand new lines providing frequent service between destinations that have never had service of this type. The line planned for this area fell into this latter category, as even the existing routes between the neighborhoods and downtown provide infrequent or peak-only service, and a route connecting Northgate, Maple Leaf, Roosevelt, the University District, Eastlake, and Downtown is unprecedented. In the promotional materials distributed for the levy, different versions of a diagrammatic map (see Figs. 3-2 and 3-3) showing the various new RapidRide routes were used. These maps showed the Northgate to Downtown route (which travels through Maple Leaf and Roosevelt) as being routed along Roosevelt Way NE, NE 80th St, and 5th Ave NE. Unlike the indicated routing for incoming protected bike lanes in the BMP, the Move Seattle maps did not show a parallel routing along 12th Ave NE where Roosevelt is a one-way southbound street. Again, although the maps were likely only meant to serve a diagrammatic purpose, they didn't provide a clear indication of intended routing through the neighborhood.



Figs. 3-2 & 3: Two Move Seattle Project Maps. Blue lines indicate proposed RapidRide lines (blue boxes indicate study area). Images from SDOT.

The ambiguity presented in the two documents, in terms of both specific routing and directionality for each improvement, created a need for studying the corridor, the goals of these improvements, and how they can be most effectively implemented within the neighborhood. Furthermore, projects like these have historically been implemented by different teams at SDOT, which raises concerns about the ability to collaboratively implement each improvement along the corridor in such a way as to not prevent the other. These two angles, along with a desire to create a multimodal corridor that improves the quality and functionality of the space and responds to the unique needs of the neighborhood, provided the foundation for this project and report.

CURRENT PLANNING EFFORTS

As mentioned before, it's vitally important to not assume that any planning project is occurring within a bubble. Cities are complex systems, and the effects of a single action can have both direct and far-removed, indirect impacts on other parts of the network. The four current planning projects discussed in this section fall more into the direct category, as they all have clear implications on both the overall character of the neighborhood and the eventual design of the corridor itself. Each project is described, analyzed, and finally discussed within the context of the neighborhood and this project specifically. There are, of course, myriad other efforts that could be discussed in a similar fashion, and that should likely be incorporated into the analysis as the conceptual design is further refined into a more detailed design, but those are not included as a part of this project.

Roosevelt Light Rail Station

One of the most anticipated amenities planned for the Roosevelt neighborhood is the incoming light rail station, part of region-wide efforts by Sound Transit to provide the benefits of fixed rail transit to the region as a whole. As with the new stations that recently opened up in Capitol Hill and the University District (adjacent to Husky Stadium), this station will connect local residents to Downtown Seattle, SODO, and SeaTac, providing the first ever one-seat ride from north Seattle to the airport.

This station is part of the Northgate Link Extension, a suite of three connecting stations in the University District (Brooklyn Ave NE & NE 43rd St), Roosevelt neighborhood, and Northgate. This will provide an additional 4.3 miles of Link light rail connectivity, and collectively the stations are expected to add 62,000 daily boardings to the system by 2030. Construction of the Roosevelt station began in 2012, and it is expected to open in 2021 (though if previous station openings provide any indication, the station may open even earlier) (Sound Transit 2015).

The Roosevelt station will face out onto 12th Ave NE, and will have two entrances – one at NE 67th St and one at NE 65th St (see Figs. 3-4 and 3-5). These entry points will lead down to an underground platform (70' – 90' below street level), also similar to the recently opened stations in Capitol Hill and at Husky Stadium. The 90% designs for the station include connectivity with surrounding transit options, and promote bicycle travel to and from the station through the inclusion of bike racks near station entrances (Sound Transit 2015).



Figs. 3-4 & 5: South (left) and north (right) entrances of new Roosevelt light rail station. Image form Sound Transit.

The station is being built through a “cut and cover” process, where a pit is dug to the eventual depth of the station, and then covered with a surface level building that provides access points to the station below. These current construction efforts require more space than just the final ground area that will be taken up by the station, and have taken over the entire block between NE 66th St and NE 67th St (between 12th Ave NE and Roosevelt Way NE) and parts of blocks to the north and south, even though the final station will only be on the west side of 12th between NE 65th St and 67th. Once the station is completed, these construction staging areas will be made available for Transit Oriented Development projects, to help promote density around the station and increase the functionality and viability of such an important transportation service.

Overall this is an important transit connection for the Roosevelt neighborhood. As mentioned previously, this will be the first one-seat, non-personal vehicle ride from the neighborhood to SeaTac airport. This will also add a quicker and more reliable trip to Downtown (current Sound Transit estimates show a 14 minutes ride from Northgate to Downtown, placing the ride from Roosevelt close to 10 minutes), which will greatly increase the viability of the area as the other end of a typical commute trip to employment in one of the region’s busiest economic centers (Sound Transit 2015). Sound Transit’s ridership projections also indicate that the station’s integration with the neighborhood as a whole is important, and its effects on the neighborhood are important as well. Although it’s hard to draw direct connections, it’s safe to assume that much of the new development in the area – much of it concentrated along Roosevelt Way NE, as mentioned in section four, “Site Analysis” – is at least partially in response to this massive neighborhood amenity. However, many of these new developments incorporate notable amounts of resident parking spaces, which although may be a necessary amenity given the location’s relative lack of alternate transportation options, run counter to the vision the city has for the future of the neighborhood.

This creates an interesting paradox of anticipatory development around incoming transit improvements – while development is made economically attractive or even possible because of incoming improvements, it must include parking for residents to make them a viable option prior to the opening of future frequent transit. However, once this frequent transit becomes available, these parking spaces will continue to exist, making the use of the available transit (one of the elements that made the development possible) less or even not likely. Once the light rail and/or future RapidRide routes become a reality, these property owners – in conjunction with the city and transit

agencies – may consider converting these parking spaces to a use that is more supportive of the frequent transit in the area, such as park-and-ride spaces or even converted retail/commercial space.

Roosevelt Way NE Pavement and Safety Improvements Project

Since 2014, a project has been underway along Roosevelt Way NE to improve safety for all users along the corridor. The scope of the project includes Roosevelt between (and including) the University bridge to the south and NE 65th St to the north – terminating just shy of the study area for this project. Planned improvements include repaving and restriping, a southbound protected bike lane, and floating transit islands to serve existing – and future, to an extent – bus traffic along Roosevelt. The project also includes some bus stop consolidations (closing and reorganizing stops along a route to improve the speed and reliability of the route), which will help to improve overall corridor operations.

Project design occurred between early 2014 and late 2015, and construction began in March 2016, to be completed by the end of summer. Perhaps in response to criticism of other street improvement projects throughout the city, SDOT has divided the corridor into five zones (A through E), each of which is three to four blocks long. To minimize impacts on the neighborhood and traffic operations, the contractor overseeing the project is required to not work on adjacent zones simultaneously, having instead to substantively complete all the improvements in one zone before moving onto the next. The exception to this is zone E (which covers the University Bridge and connections points on either side of the water), for which improvements are scheduled to occur independently in April or May. SDOT estimates that every other zone will take four to eight weeks to complete (Seattle Department of Transportation 2016).

Overall, the project is projected to be a huge improvement for the corridor and the neighborhood in general. The final plans include not only a 7' bike lane along most of the corridor (1' wider than what's considered standard), but also a 4' buffer between the bike lane and general purpose traffic, which meets the requirements for a protected bike lane. Furthermore, the project shows clear and strong bus/bike integration, with pedestrian crossings from the sidewalk to new floating transit islands. These crossing points involve raising the bike lane to sidewalk/bus stop grade, allowing for a very smooth and intuitive connection (Seattle Department of Transportation 2015). This bus/bike integration design is very similar to Conceptual Alternative 2 (presented in section five, "The Design"), indicating that this concept as a preferred alternative also has the benefit of being substantially similar to other improvements along the corridor, increasing functionality and legibility.

Despite its benefits, the project has some clear areas of improvement, that would help Roosevelt Way NE become a more robust multimodal corridor. First and foremost, it is not aggressive enough with parking removal, which greatly reduces how much public right-of-way is available for other modal improvements. For example, maintaining this parking came at the cost of 1' of transit lane and 2' of bike lane at certain choke points along the corridor, narrowing these amenities to bare minimum level. Similarly, most of the transit islands are only 8' wide, which as discussed in the "Modal Requirements" section is the bare minimum needed for wheelchair loading/unloading

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(4' for the bus ramp, and 4' for maneuvering), and is too narrow for the wider of the two RapidRide shelters (an 8' wide shelter, accompanied by the 4' no-furniture zone). More specifically, the proposed far-side southbound stop at Roosevelt Way NE and NE 65th St would likely be the closest stop provided to the incoming light rail station (under their design), which would mean that connections between the two would require crossing both Roosevelt and 65th – a potentially dangerous proposition if volumes of these transfers are high. Providing an additional stop north of 65th to serve this purpose would make the two stops redundant from a spacing perspective, and would therefore ideally be provided instead of the stop on the far-side of 65th.

Lastly, although safety for non-motorized modes of transportation will certainly be improved as a result of this project, more could be done to improve it further. First of all, the buffer provided for the protected bike lane will be painted with bollards down the middle, which only provides a visual buffer between the uses. A more robust barrier – such as raised curbs, planters, or a combination of the two – would provide a truly physical buffer, further improving safety. Admittedly, these are elements that can be implemented as needed after the project's substantial completion. For pedestrians, the project does provide new curb bulbs to shorten crossing distances, but still leaves many crossing locations without marked crosswalks, which inevitably makes them less safe places to cross.

Perhaps most importantly, as can be seen on the map of improvement locations (see Fig. 3-6), improvements for 12th Ave NE have not been included as a part of this project. Instead, bicycle and transit improvements have been included only



- 1 Existing curb bulbs on NE and SE corners. Bus island south of 65th.
- 2 Existing curb bulbs all four corners
- 3 Curb bulbs into 63rd on west side (NW and SW corners), plus ped islands on both NW and SW corners
- 4 Curb ramps on all corners, plus SW corner will be built out. Ped islands both north and south of intersection.
- 5 Curb bulbs on north side of intersection (effectively moving crosswalk further north) and ped islands on both north and south sides of intersection
- 6 Bus island north of intersection, plus new directional ramps on NW and SW corners
- 7 Pseudo curb bulb with paint and delineator posts on east side, with new curb ramp. Ped island north of intersection.
- 8 Curb bulb on east side, with companion ramps to NW and SW corners. NW and SW corners will be bulbed out onto 58th. Ped island north of intersection.
- 9 Pseudo curb bulb with paint, delineator posts and a new companion curb ramp to meet SW corner. The NW and SW corners will be built out creating smaller radius.
- 10 Curb ramps will be built on the north side of the eastern leg. NW and SW corners will be built out. Directional ramps will be built on the NE and SE corners to cross north/south there. Ped island north side of intersection.
- 11 Bus island added south of intersection. Ped island north side of intersection. Curb ramps NE and SE corners.
- 12 Curb bulb added to east side of street, with new ramp. NW and SW corners built out. Ped island on north side of intersection.
- 13 Curb bulbs on NE and SE corners. Ped islands added north side of intersection, and north of the crosswalk on the south side of intersection (which is a T and doesn't extend to the west).
- 14 Bus island added south of intersection. Existing curb bulbs on NE and SE corners.
- 15 Ped island added both north and south sides of intersection
- 16 Bus island added south of intersection
- 17 Existing curb bulb NE corner. Ped islands on both north and south sides of eastern leg.
- 18 Curb bulb being added east side of street, opposite north side of western leg intersection (with ramp). Ped island on north and south sides of western leg intersection.
- 19 Curb ramp NE corner, bulbing into 42nd. Bus island added north of eastern leg intersection. Ped islands added to the south of both east/west crosswalks.
- 20 Curb bulb opposite north side of intersection (in front of Portage Bay Café). Ped island south of intersection.
- 21 Curb ramps NE and SE corners. Ped islands on south side of intersection. Curb ramp by others on west side.
- 22 Curb ramps NW and SW corners

Fig. 3-6: Project map and specific improvements. Image from SDOT.

for Roosevelt Way NE, which will benefit only southbound traffic through the area, creating no improvements for northbound traffic. Although these improvements may be planned for the future (or were somehow determined to be unnecessary given current operations on 12th), their lack of inclusion indicates a fundamental misunderstanding of how the corridors operate, and how these improvements are meant to improve usability for different modes. As one example, protected bike lanes provide the most benefit for uphill bicycle traffic (which tends to go far slower than vehicles on the same road), which in this case is on 12th. However, protected bike lanes are being provided for Roosevelt's southbound – and downhill – bicycle traffic. While this will certainly benefit and improve safety for bicyclists along this corridor, given limited resources for transportation infrastructure improvements within the city, an argument can be made for prioritizing improvements for uphill bicycle traffic.

2016 Transit Master Plan Update

Seattle's Transit Master Plan (TMP) is SDOT's guiding document for transit projects and improvements throughout the city. Overall, it "recommends strategies, projects, and policies that will make Seattle a more affordable, cleaner, vital, equitable, and enjoyable place to live and do business" (Seattle Department of Transportation 2016). It includes all of the city's priority bus corridors, future RapidRide lines, new streetcar projects, and how all of these affect Seattle's character, fabric, and vibrancy.

In November 2015, Seattle voters passed a record \$930 million transportation package known as Move Seattle, funded by a nine-year property tax levy. Included in the proposed projects for this package were seven RapidRide lines, including (in addition to routing through Roosevelt and Maple Leaf) well-publicized lines on Madison St and on Rainier Ave S. Despite the record funding package, none of these lines will be fully-funded as a part of the Move Seattle levy; Instead, the money raised will be leveraged to get Federal transportation grants in order to cover the full cost of each project. The Puget Sound Regional Council (PSRC) (which provides multijurisdictional support and coordination for the four county metropolitan area around Seattle) coordinates requests for federal grants requested by its member jurisdictions, and requires that jurisdictions doing so have the projects in question listed and described in their approved jurisdictional planning documents. In the case of Seattle's planned RapidRide projects, this meant amending the TMP to include them before grants could be applied for through PSRC.

After the levy was passed, SDOT was unclear about how the corridors were going to be planned and the specific method by which funding would be secured – whether to include RapidRide projects in the TMP and apply for funds as they were being developed, or amend the TMP to include all of the new lines, and secure funding for all of them at once. Regardless of the funding strategy, having all of the lines approved from the outset would provide flexibility in how the routes were planned and implemented over the next nine years, and this was the strategy they pursued. In early February 2016, the TMP was amended to include all seven RapidRide lines (including routing, stop spacing, specific amenities, and data on each route) and was approved by the city council.

Of course, as mentioned above, this amendment to the TMP included project information for the Northeast RapidRide corridor, which was more detailed and specific than any information published about the project previously. The section of the plan about the corridor includes network information, connections with other amenities, and specific routing – from Northgate to Downtown. The graphics provided also show specific stop locations, infrastructure improvements (such as bus bulbs, transit signal priority, and dedicated lanes), and current ridership. The section includes a list of other modal projects planned for the area, and strategies by which the implementation of the RapidRide corridor can coordinate with them – showing a clear intention to integrate future improvements with the character of the neighborhood.

The piece of this with likely the greatest impact on this project was the indication of an intended routing for the RapidRide corridor through Roosevelt and Maple Leaf. Previous to this amendment, the most information provided to this effect was a single, simple line drawn through the neighborhood, as provided in Move Seattle’s marketing materials (see pg. 28, Figs. 3-2 and 3-3). This ambiguity, in fact, was part of what spurred this thesis project: Realizing the need for a more detailed, site-specific routing and conceptual design for the RapidRide and protected bike lane corridor. The TMP amendment was approved simultaneously with the completion of the conceptual alternatives presented here in section five, “The Design,” and the routing provided in the TMP (northbound traffic on 12th Ave NE and southbound traffic on Roosevelt Way NE, with two-way traffic on Roosevelt north of NE 75th St, specifically) was substantially similar to the concept presented in “Concept 2: One-way Transit & Bike Corridors.” This provided some reinforcement that this conceptual routing presents the most effective – or at least the most likely – alternative for this project.

At a macro-level the update provides a good overall direction and intent for the project. As mentioned, it also includes specific elements along the corridor, such as bus stops and transit signal priority (TSP), which are included with varying levels of efficacy. First of all, the graphics included list bus stops at NE 65th St and NE 70th St (on both Roosevelt Way NE and 12th Ave NE), on NE 75th St between Roosevelt and 12th (an outbound stop), and at Roosevelt and NE 80th St (it is unclear in what direction, as this part of the corridor is two-way, but would likely be inbound and outbound). The placement of these stops seems to include very little consideration for on-the-ground factors, the incorporation of which would likely result in very different stop alignment (see further discussion on stop placement in section five, “The Design”). One encouraging inclusion is TSP at every

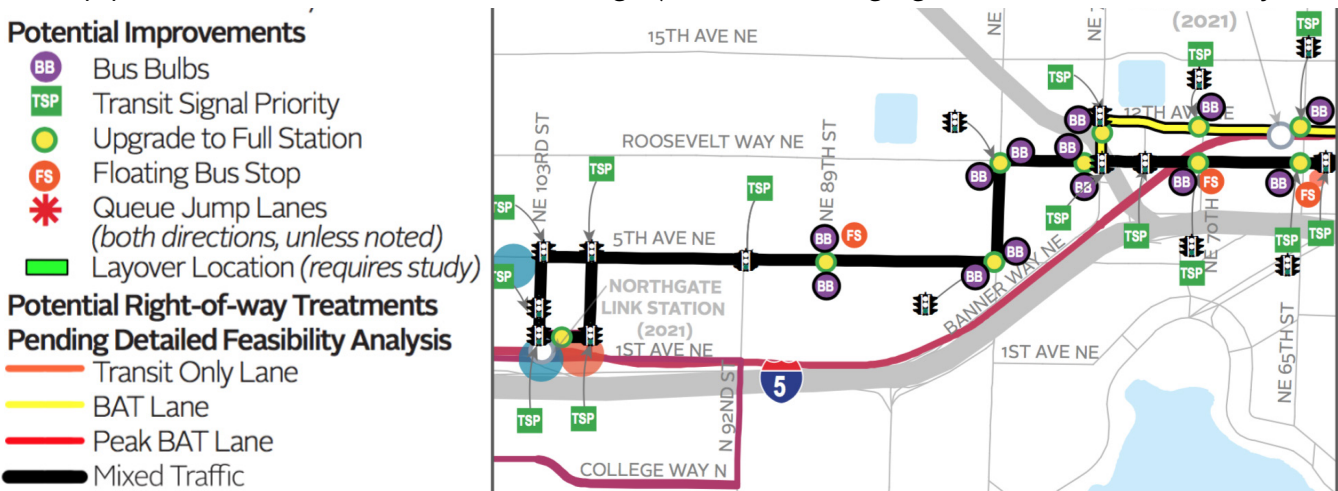


Fig. 3-7: North section of TMP routing RapidRide Corridor 7. Image from SDOT.

currently signalized intersection (which gives buses a green light in their own lane or pocket prior to general purpose traffic), which would likely provide enormous time savings for transit moving along the corridor (this signal priority can also provide an early green light for bicyclists, improving safety by giving them a chance to safely enter the intersection prior to other vehicles). While this is likely an over-the-top improvement given current traffic demand and corridor operations, it will likely have great benefit as the area and the city continue to densify, at which point such improvements might be politically divisive or physically infeasible. Lastly, the update provides dedicated transit lanes along 12th, which might fall into the same category as full TSP along the corridor, but to be truly effective, would likely need to be paired with similar infrastructure along Roosevelt – for which there may not be enough available space.

Roosevelt to Downtown High Capacity Transit

Current efforts are already underway to study the potential of adding High Capacity Transit connecting through the Roosevelt and Maple Leaf neighborhoods to both Northgate and Downtown. Initially, the project left the specific mode of transportation that would provide this service unidentified, in order to engage in a process to determine which mode – bus rapid transit, light rail, or streetcar, for example – would provide the best services for the identified areas. When the improvements as a part of Move Seattle were being determined, it was decided that incorporating this corridor as a part of the proposed bus rapid transit network fit the needs of this neighborhood as well, and it was included as one of the seven routes for which partial funding was being sought under the record-breaking property tax levy.

The stated purpose of the project is split into five parts: 1) Improve transit service; 2) Improve conditions for people biking and walking; 3) Meet transit mode share goals (i.e. support city-wide efforts to increase the number of people taking public transportation); 4) Strengthen the north-south connection; and 5) Serve growing population and employment centers (Seattle Department of Transportation 2016). All of these are logical goals, that the project clearly seeks to accomplish. Perhaps the most notable of these is the desire to improve conditions for people biking and walking, which indicates a clear direction towards improving multimodal transportation through the area – not just whichever mode was eventually chosen. Improving the conditions for these other modes also helps them reach the added bus service, further increasing the usability and success of the high capacity transit. It is encouraging that the project is being conducted in a way that is conscious of these important connections.

This project was first conceived back in 2012, and in late 2014/early 2015 an existing conditions report was compiled along the extent of the corridor. The first public meeting on the project was in May 2015, in which the scope, purpose, and proposed elements of the project were all discussed, as well as an analysis of possible modes that could meet these goals. This was followed up with another public meeting in December 2015, when bus rapid transit was identified as the preferred mode of transportation for the corridor. Materials presented at both of these meetings – and all published documents put out by SDOT between December 2015 and March 2016 on this project – included a specific route for the corridor, one that included northbound bus travel on 12th Ave NE and southbound travel on Roosevelt Way NE (south of NE 75th St) and two-way travel on Roosevelt

(north of 75th) before a left turn onto NE 80th St, with a jog over from 12th to Roosevelt along 75th for northbound bus travel (Seattle Department of Transportation 2016). This was not the final routing, however, and an update to the project in Mid-March 2016 adjusted the path such that both northbound and southbound travel utilized 75th west of Roosevelt, continuing to/from Banner Way NE and 5th Ave NE (see Fig. 3-8).

This shift was likely incorporated into the project because of realizations about the lack of available space on Roosevelt Way NE north NE 75th St, and understandable concerns about the ability to incorporate all of the project’s stated goals – including to “improve transit service” and “improve conditions for people biking and walking” (Seattle Department of Transportation 2016). While this routing still fits the overall corridor stated in the initial conception of the project, alignment with this portion of 75th and Banner Way NE greatly reduces the number of people served by this part of the corridor, as it is adjacent to I-5 and the interchange with Lake City Way NE. These areas have no residents that might use the route, and residents on the southwest side of I-5 are unlikely to utilize this part of the corridor due to a lack of connectivity. However, perhaps more importantly, while this doesn’t threaten the overall importance of this project, explosive growth within the city and the resulting need to move ever-more people and goods around it means that we will not always have the luxury of rerouting projects to more convenient and spacious streets. If we shy away from a certain street or corridor because its ability to absorb planned improvements seems threatened by a lack of available space, we will not attempt to innovate, and our success on such projects when there are no other options present is in jeopardy. For this reason, the design presented in this report continues to investigate the use of the two-way stretch of Roosevelt between 75th and NE 80th St for both RapidRide service and greatly improved bicycle infrastructure, and therefore presents a different routing – and design – than the preferred alternative being studied by the City.



Fig. 3-8: Proposed corridor routing. Image from SDOT.

4. SITE ANALYSIS

The importance of site analysis for any urban planning and design process cannot be overstated. Understanding the geographic, legal, regulatory, cultural, and even political climate of an area is integral to creating a design that responds to specific, on-the-ground concerns and that can be integrated into the site in an effective and sensitive way. Without proper analysis of the current conditions of the site, one runs the risks of proposing solutions that at best do not fully respond to the issues at hand, and at worst are fundamentally incompatible with the area.

The site analysis for this project began with a review of secondary materials, such as zoning documents, current land use maps, city planning documents, and street channelization drawings, to gain a macro-level view of the area's character and function. This was followed by extended site visits of the area, to understand how the area operates and how specific types of users interact with the current conditions of the site. These visits included taking many pictures, which are presented as an additional source of information for understanding the conditions of the site. All of the information presented in this section was integral in constructing both conceptual alternatives that address the over-arching issues of the site, and a final corridor design that can be fully integrated within the neighborhood.

SECONDARY RESEARCH

The review of secondary materials included documents and data provided by the city, early design guidance packages compiled and published by local design firms, corridor collision data collected from SDOT's Traffic Research Tool, and Google Maps/Street View. These data sources were used to provide mostly objective information about the area, including street classifications, zoning, current land uses, future planned and potential development, street channelization, transportation, topography, and corridor safety.

These documents provide a relatively comprehensive understanding of the site from a bird's-eye view, and some indication of current conditions (or at least current at the time the document was published or Street View photo was taken), but provide admittedly little in the way of subjective or qualitative character of the site. These details are discussed further in the next section, "On-Site Observations."

Topography

The neighborhood has a constant downward slope from north to south. The intersection of Roosevelt Way NE and NE 80th St has an elevation of about 372', while the intersection of Roosevelt and NE 65th St sits at about 207'. This places the overall elevation gain at about 165', which across the corridor's horizontal distance of 4,000' makes for an average slope of 4.1%. While not a hindrance, this amount of slope is enough to recognize the corridor as being on a hill, and to consider potential effects on traffic speeds, water run-off, and accessibility.

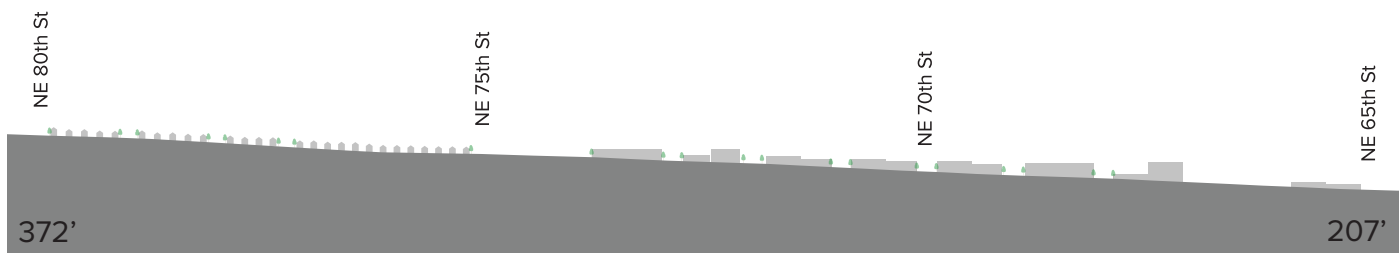


Fig. 4-1: Topography for study area. Cut is along Roosevelt Way NE.

Street Classifications

Both Roosevelt Way NE and 12th Ave NE are designated as “Principal Arterials,” both within the study area and beyond (Seattle Department of Transportation 2003). According to city definitions, Principal Arterials “serve as the principal route for the movement of traffic through the City. Connects Interstate Freeways to major activity centers, to minor and collector arterial streets and directly to traffic destinations. Serve major traffic generators such as the Central Business District, major shopping or commercial districts and move traffic from community to community” (Seattle Department of Transportation n.d.). It is clear from this definition that given their current designations, these two streets are seen as tools for moving people through the area, placing a priority on traffic efficiency and flow.

Both corridors are also designated as “Minor Transit Streets” from NE 65th St to NE 75th St, and Roosevelt from 75th to NE 80th St is designated as a “Major Transit Street” (Seattle Department of Transportation 2006). The city defines Minor Transit Streets as corridors that provide “local and neighborhood transit service,” while Major Transit Streets provide “concentrated transit service to connect and reinforce major activity centers and residential areas” (Seattle Department of Transportation 2006). The differences in classifications likely reflect that while both Roosevelt and 12th currently have bus traffic in one direction, Roosevelt north of 75th has bus travel in both directions – an overall more intense use of the corridor.

Lastly, neither corridor is designated as a “Major Truck Street” (Seattle Department of Transportation 2003), which means it is not expected to accommodate “significant freight movement” or “higher truck volumes than other streets” (Seattle Department of Transportation n.d.).

Although many of these classifications are from several years ago, there’s no reason to believe that any major changes in any of the above categories have occurred since then. However, with a new light rail station coming in, and new infrastructure for both bikes and buses in the near future, many of these classifications may need to be revised to accurately reflect the changing nature of the corridor. Furthermore, additional street classifications – beyond the scale of arterials or intensity of travel – may be created and used to more accurately reflect the modal priorities present on and planned for the corridor.

Zoning

This stretch of Roosevelt Way NE is home to four separate zoning designations (with a number of variations), and two overlays that provide added requirements for development. Starting from NE 65th St and moving north, the corridor is zoned for Neighborhood Commercial, Commercial, Lowrise, and finally Single-family. On top of these, both a Pedestrian Overlay and an Incentive Zone exist for the southern half of the corridor.

The Neighborhood Commercial zone extends from NE 65th St to NE 75th St. Along this distance, the height limits step down from 85' (65th to NE 67th St), to 65' (67th to NE 68th St), and finally to 40' (68th to 75th). These height limits indicate a clearly intended pattern of development, that is more intense towards the heart of the neighborhood (near 65th and Roosevelt Way NE, which serves as the neighborhood's main intersection), and steps down as you reach the less intense, single-family areas to the north. The 85' and 65' zones are designated as Neighborhood Commercial 3, which is intended to create "a larger pedestrian-oriented shopping district serving the surrounding neighborhood and a larger community, citywide, or regional clientele," while the 40' zone is Neighborhood Commercial 2, which promotes "a moderately-sized pedestrian-oriented shopping area that provides a full range of retail sales and services to the surrounding neighborhood" (Seattle Department of Construction and Inspections 2016). While the intended scale of target retail varies from one designation to the next, the clear emphasis is on creating a destination of pedestrian-oriented retail serving an expanded range of consumers.

These designations do not allow surface parking between buildings and the sidewalk, and allow minimal curb cuts along the block. Although they also recommend parking access through alleys, Roosevelt Way NE does not have parallel alleys, so parking access will likely still need to be from Roosevelt (to underground or rear parking), or onto perpendicular streets. Perpendicular access would be preferred, as long, uninterrupted stretches of curb along Roosevelt will allow for more robust and continuous protections for bicycle infrastructure along the corridor. The stretch of Roosevelt Way NE from NE 65th St to NE 68th St is also a Pedestrian-Designated Zone, which "preserves and encourages an intensely pedestrian-oriented, retail shopping district where non-auto modes of transportation, both to and within the district, are strongly favored" (Seattle Department of Construction and Inspections 2016). All of these pieces add up to promote a walkable, vibrant, and mixed-use area.

Potential land uses under the Neighborhood Commercial designations are quite varied, and include all manner of retail on the ground floor (coffee shops, restaurants, grocery stores, etc.), and the potential for residential uses above them. Offices and hotels are also allowed under these designations, but are unlikely given the location of the neighborhood (though this may change with added connectivity to downtown and the airport). The biggest single consideration for potential retail is the maximum size of each commercial space under the different designation. This area has both NC2 and NC3 zoning designations, which allow for 25,000 – 50,000 ft² and 10,000 ft², respectively. This may encourage noticeably different types of commercial space along the corridor as these designations shift. If recently completed projects (as well as currently planned ones – see "Future Development" below) are any indication, the area is able to support standard mixed-use buildings with pedestrian-oriented retail and market-rate apartments above, as well as

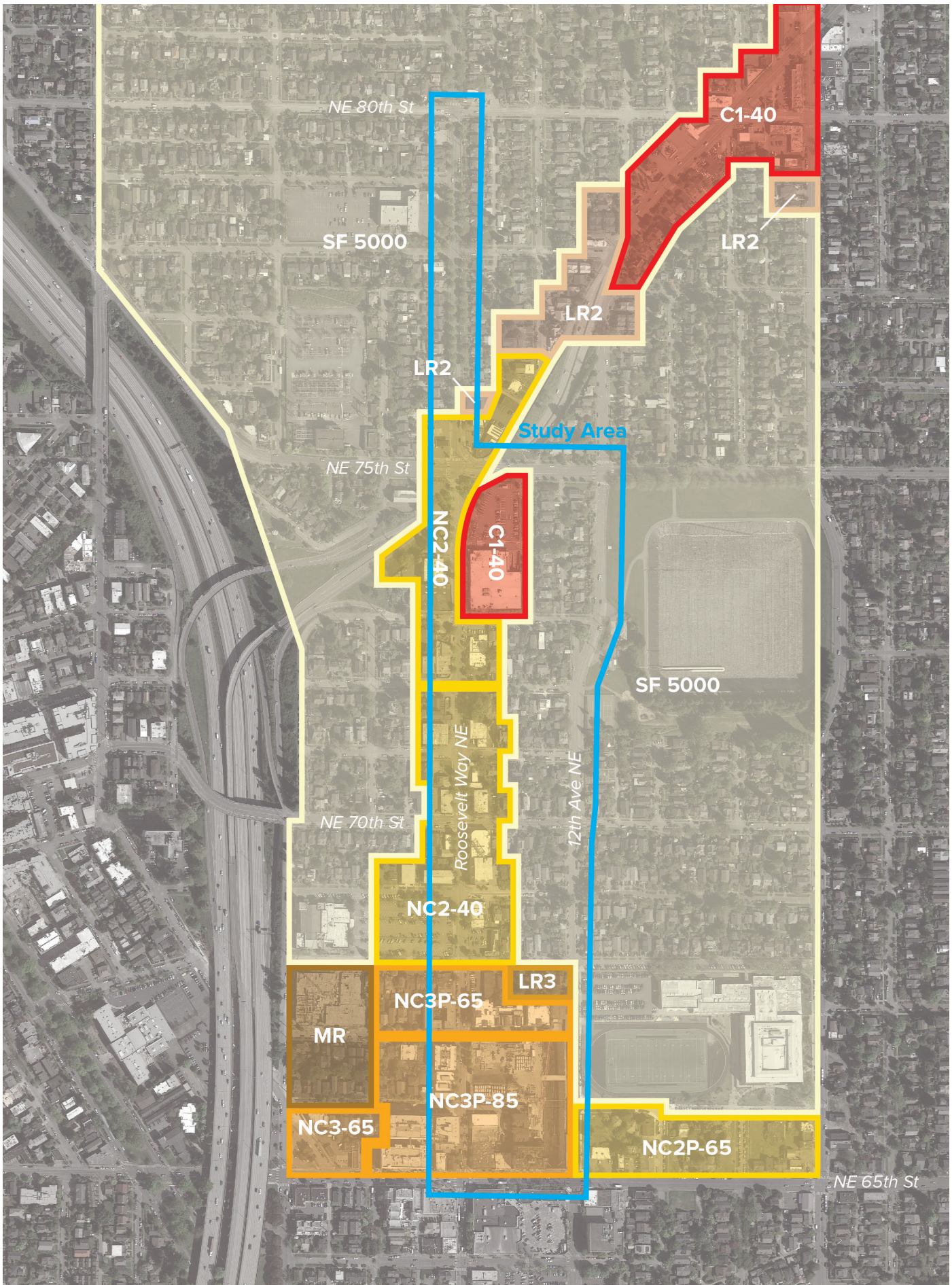


Fig. 4-2: Current generalized zoning for the Roosevelt Neighborhood.

developments with exclusively rental housing. Furthermore, with an Incentive Zone in place from NE 65th St to NE 72nd St, the potential exists for developers to “provide public benefits, such as affordable housing, historic preservation, and open space” if they intend to develop to the full capacity of their land (Seattle Office of Planning & Community Development 2013).

NE 73rd St to NE 75th St breaks from the Neighborhood Commercial zoning of the rest of this part of the corridor, and is designated as typical Commercial. Unlike the rest of the area, this designation promotes auto-oriented commercial buildings and sets no parking restrictions, creating a space that supports uses like the Safeway that’s there today. Although this land use is unlikely to change in the near future, any future development within this zone should trigger a rezone to more pedestrian-oriented designations to help further promote the walkability and sustainability of the area.

There is a small slice of Lowrise zoning (LR2 RC) just north of NE 75th St (covering two parcels), which allows for smaller-scale multifamily developments (such as townhomes and triplexes). This provides a small transition from the larger-scale apartment buildings to the south to the largely single family zone to the north, and as the neighborhood densifies, should potentially be expanded to further this specific purpose.

The Single Family 5000 zone to the north of NE 75th St requires a minimum lot size of 5,000 ft², and is the densest of the three single family designations under the city’s zoning code (the other two being “7200” and “9600”). These areas are “typified by detached single family structures on lots compatible with the character of single family neighborhoods” (Seattle Department of Construction and Inspections 2016). Although this designation still allows for relatively spread out development patterns, it is the densest of the strictly detached single family designations, which may allow for more aggressive stop spacing for transit – higher densities allow each stop to serve more riders, in this case allowing for only a single stop along the five single-family blocks of Roosevelt Way NE (see section three, “Modal Requirements,” for more discussion on the benefits and trade-offs of various stop spacing strategies).

Similar to Roosevelt Way NE, 12th Ave NE is zoned Neighborhood Commercial from NE 65th St to NE 66th St (NC3P-85 on the east side of the street and NC2P-65 on the west), and from 66th St to NE 68th St on just the west side (NC3P-85 from 66th to NE 67th St and NC3P-65 from 67th to halfway to 68th). The last piece of 12th before 68th on the west side of the street is zoned as Lowrise (LR3), which allows for “a mix of small to moderate scale multifamily housing”, at slightly higher densities than the LR2 or LR1 designations (Seattle Department of Construction and Inspections 2016). The rest of 12th, up to NE 75th St, is zoned as Single Family 5000, which provides the main source of character for the corridor. Any planned improvements for 12th should take into account the quieter, less intense nature of the corridor.

Relevant Planning Documents

The City of Seattle publishes city-wide Design Guidelines, which provide the foundation of the city’s design review process for new development projects. The guidelines are designed to “define the qualities of architecture, urban design, and public space that make for successful projects and

communities.” Neighborhoods that choose to do so may adopt more stringent or specific guidelines that respond more directly to the unique character of the area, which Roosevelt has chosen to do (first established in 2000 and updated in 2013), in order to “help to reinforce existing character and protect the qualities that the neighborhood values most in the face of change” (Seattle Department of Planning and Development 2013). Where Neighborhood Design Guidelines conflict with those provided for the city as a whole, the former takes precedent. A number of the guidelines directly or indirectly relate to transportation and the public right-of-way, including “Connectivity,” “Walkability,” “Street-Level Interaction,” and “Active Transportation.” Of these, Roosevelt has adopted the city-wide guidelines for all except “Street-Level Interaction,” for which the neighborhood-specific recommendations seem very similar to those provided in the city-wide guidance. Collectively, these sections aim to promote an increased supply of public space, more pedestrian-oriented environments, increased setbacks and additional ground-level commercial activity, and design that encourages the use of active and alternate modes of transportation (Seattle Department of Planning and Development 2013).

The Roosevelt Neighborhood is also designated as a Residential Urban Village (this designation terminates north of NE 75th St, where the study area and corridor move into the Maple Leaf neighborhood). Of the three Urban Village designations (Urban Center, Hub Urban Village, and Residential Urban Village), this one is the least intense, aiming to “provide a focus of goods and services for residents and surrounding communities but may not provide a concentration of employment” and promote “predominantly residential development” (City of Seattle 2005). However, the city’s Urban Village strategy is intended to identify the areas of the city which will absorb the most growth in development intensity and population over the coming few decades, and even this least-intense of the three designation still shows a clear intent to promote new development and growth in Roosevelt (most of the city has no designation at all). This designation explicitly notes that Residential Urban Villages should provide “densities... that support transit use” (City of Seattle 2005) which meshes well with both the incoming Light Rail station and proposed RapidRide service. To this end, Roosevelt’s rezone (as a part of their designation as a Residential Urban Village) included a Station Area Overlay District, which “waives any parking requirement for multifamily and non-residential uses” within a certain distance of the station (about ¼ mile), in order to help promote nearby residents’ use of the massive added transportation amenity (Seattle Department of Planning and Development 2011).

Current Land Use

Reflective of the zoning, the development intensity along Roosevelt Way NE lessens as one moves north along the corridor. This shifts from retail and mixed-use development closer to 65th, to exclusively multifamily developments, to auto-oriented and fringe retail uses mixed with lower-intensity multifamily buildings, and finally to single-family homes at the north end of the corridor. Having said that, no two blocks along the corridor can be characterized in the same way – even generally – and a block-by-block evaluation is necessary to understand current land uses along the corridor.

Roosevelt Way NE from NE 65th St to NE 66th St is the primary retail/commercial area of the corridor. It is characterized by small, single-story store fronts and new mixed-use development with ground floor retail. This transitions into mostly large multifamily buildings as one moves north to NE 68th St, which for the most part have their main entrances opening onto side streets rather than onto Roosevelt itself. Exceptions to this typology include an auto mechanic and older, fringe retail at Roosevelt and 68th, as well as the construction site for the incoming light rail station on the east side of the street between 66th and NE 67th St.

NE 68th St to NE 69th St is an atypical block, with a surface parking lot on the west side of the street and current construction on the east side of the street (which is replacing small-scale retail and a set-back auto mechanic – see “Future Development” below). Moving north, there’s another auto mechanic, more fringe retail, and smaller scale multifamily buildings from 69th to NE 72nd St, followed by a preschool/daycare center and the Swedish medical clinic just south of NE 73rd St. North of the intersection lies a small apartment building and a Safeway, the only grocery store along the corridor. NE 74th St to NE 75th St has little in the way of use (other than the rear parking lot for the Safeway), as it is taken up by the infrastructure needed for the interface with 75th and for the Lake City Way NE tunnel.

NE 75th St to NE 80th St is the most consistent stretch of the corridor, typified by single family detached houses for the majority of frontage along Roosevelt Way NE. There are a few exceptions to this: A gas station on the northwest corner of the Roosevelt & NE 75th St intersection; Lowrise multifamily housing across the street; A Catholic school on the west side of the street between NE 78th St and NE 79th St; And a small restaurant on the southwest corner of the Roosevelt & NE 80th St intersection.

12th Ave NE, from NE 65th St to NE 68th St is far less vibrant than parallel sections of Roosevelt Way NE. The current light rail construction occupies almost the entire west side of this portion of the corridor, and the east side is home to a recently closed auto parts store, a vacant lot, the raised edge of Roosevelt High School’s sports field – a neighborhood attraction and location of a number of city-wide activities – and a parking lot. The rest of the corridor (until it merges with Lake City Way NE at around NE 77th St) is typified by single family homes, again reflecting the current zoning designations. There are three notable exceptions to this land use, all on the east side of 12th: The Roosevelt P-Patch, between NE 70th St and NE 71st St; Froula Playground, between 71st and NE 73rd St; And the former Roosevelt Reservoir, between 73rd and NE 75th St.

Future Development

As with much of the city, Northeast Seattle is a rapidly growing area. Also as with much of the city, growth along this corridor is taking the shape of maximized mixed-use (residential and commercial) and exclusively multifamily buildings. A number of these developments are currently planned for the southern, more dense part corridor (no current development is planned along Roosevelt Way NE north of NE 75th St), and other parcels are currently underutilized given existing land uses and zoning designations – providing areas ripe for additional development.

Proposed Development Projects



Fig. 4-3: 6800 Roosevelt Way NE. Image from Fuller Sears Architects.



Fig. 4-4: 6921 Roosevelt Way NE. Image from Cone Architecture.



Fig. 4-5: 7011 Roosevelt Way NE. Image from Caron Architecture.

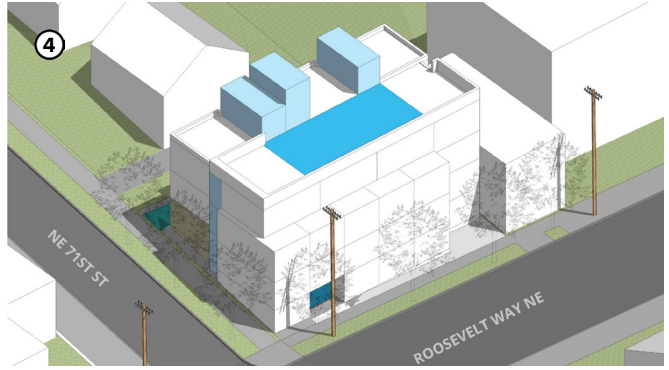


Fig. 4-6: 7012 Roosevelt Way NE. Image from S+H Works LLC.



Fig. 4-7: 6516 12th Ave NE. Image from Weinstein A+U LLC.

Potential Future Development Sites



Fig. 4-8: 6717 Roosevelt Way NE. Image from Google Street View.



Fig. 4-9: 6718 Roosevelt Way NE. Image from Google Street View.

6800 Roosevelt Way NE: This proposed and approved development is for a five story building with 79 residential units, 3,061 ft² of commercial space, and 64 below-grade parking spaces. The development takes up the entire east side of Roosevelt between NE 68th St and NE 69th St, and takes full advantage of the 40' height limit allowed by the NC2-40 zoning designation. Overall, this development intends to enhance the pedestrian environment along this block, by providing a functional retail edge with a good, pedestrian-scale rhythm. The building edge appears to be set back from the property line in places, providing additional space for amenities and pedestrian flow. Although four parking stalls for every five units is potentially excessive given future proximity to mass transit (both RapidRide and light rail), some demand should still exist for public transportation (Fuller Sears Architects 2015).

6921 Roosevelt Way NE: This proposed development is for a four story building with 72 residential units and no parking. It is situated on the southwest corner of the intersection between Roosevelt and NE 70th St, in place of existing single-floor retail. This building will also take full advantage of the 40' height limit allowed by the NC2-40 zoning designation, but will appear as only three stories from the uphill corner (closest to the intersection) due to the area's topography. Furthermore, the proposed 3' setbacks on the sides abutting Roosevelt and 70th will increase the space available for pedestrians moving along the corridor, although no amenities are provided to encourage them to use the space for anything other than through travel. The decision to include no parking in the development is certainly an uncommon one, and while it may encourage residents to utilize other modes of transportation, it may also preclude vehicle dependent residents from renting units. (Cone Architecture 2016).

7011 Roosevelt Way NE: One block to the north, another four story housing development has been proposed on the west side of the street, providing 48 residential units (including two live-work units) and no parking. It is also situated on the southwest corner of the intersection – Roosevelt and NE 71st St. The parcel on which it is proposed is currently mostly vacant, with a small single-family home converted to retail. A 10' setback is provided along 71st (to match adjacent single family residential uses), while a 3' setback is provided along Roosevelt. Similar to 6921 Roosevelt, the absence of parking will appeal to certain renters

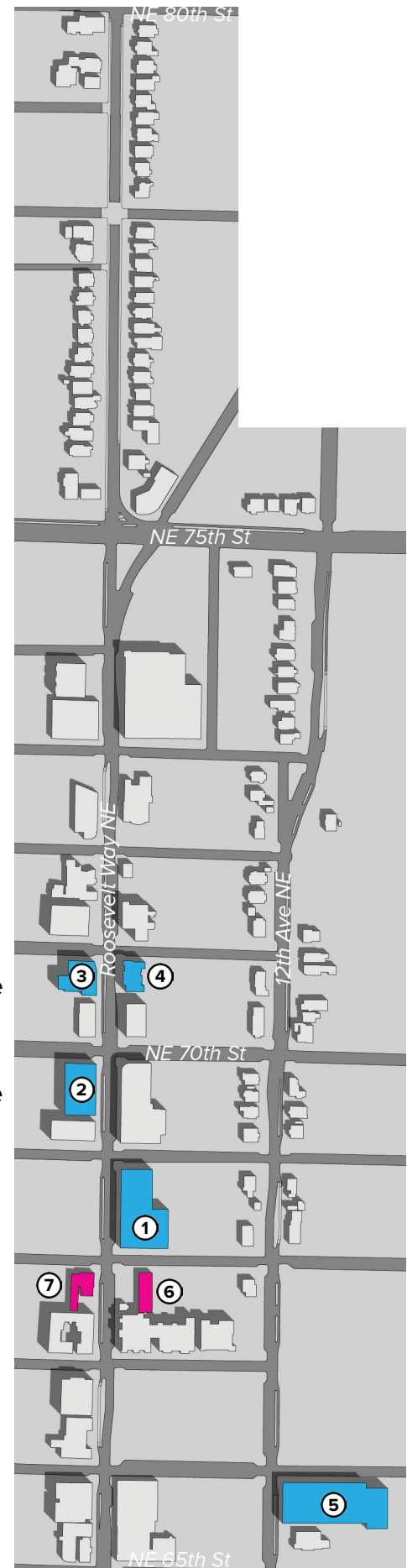


Fig. 4-10: Proposed development (blue) & Underutilized parcels (pink).

while alienating others, and residents who still decided to own a car may stress existing and future street parking supply (Caron Architecture 2016).

7012 Roosevelt Way NE: Across the street from the above project is a proposed development that includes 29 residential units, 22 stalls of bicycle parking, and no car parking. Similar to other projects, the proposed building is slightly set back from both Roosevelt and NE 71st St, and includes additional street trees to further enhance the pedestrian environment. The project would replace an existing single-story commercial building (currently an auto mechanic), and similar to the above two projects, would provide no additional retail or commercial space on this site. Lastly, the lack of automobile parking and the addition of bicycle-dedicated parking shows a clear effort to help improve the lifestyles of the building's residents and the health of the community as a whole, though similar parking concerns exist as the above two projects (S+H Works, LLC 2016).

6516 12th Ave NE: The only development currently proposed for 12th is a seven story mixed-use building on the southeast corner of 12th and NE 66th St, which will provide 206 residential units, 1,956 ft² of commercial space, and 150 below-grade parking spaces. This will be built largely on a currently vacant lot, and therefore won't be displacing any existing uses on the parcel. As many as three parking stalls will be provided for every four units, a possibly excessive number given the project's immediate proximity to the incoming Roosevelt light rail station and other alternate transportation modes. However, ground-floor retail should help to improve the quality of the pedestrian space along the corridor, by providing amenities to residents, high school students, light rail riders, etc. (Weinstein A+U LLC 2016).

First of all, it is encouraging to see that all of the above projects have been designed such that their main entrances open onto the main arterials (rather than a side street), which will help activate the streets, and is in stark contrast to many of the existing multifamily buildings along the corridor (the one exception is the proposed development on 12th Ave NE, which provides a residential entrance on NE 66th St). However, it is important for the overall health of the corridor and livability of the area that not all existing commercial is removed to make room for admittedly lucrative housing, and that additional retail and commercial spaces are added to help create a mixed-use and mixed-life area, rather than a homogeneous area of only housing. The last three projects on Roosevelt listed above include no retail or commercial space (other than the two live-work units in 7011 Roosevelt Way NE), yet all replace existing retail along the corridor. The properties discussed below – those that appear to be underutilized given current uses and zoning designation – indicate areas of future potential development, and efforts should be made to encourage the inclusion of retail or other commercial amenities in any future projects along the corridor.

6717 Roosevelt Way NE: Zoned as NC3P-65, this parcel offers the opportunity for additional development along the corridor. Featuring single story retail, it is similar to both 7011 Roosevelt and 6921 Roosevelt, as discussed above. As this property is zoned for 25' more height than either of these other two parcels, the development potential here is actually greater than parcels that are already in the process of being redeveloped.

6718 Roosevelt Way NE: Across the street from the previous property, this parcel is also zoned as NC3P-65, and is home to a set-back auto mechanic with parking in front – similar to current (or recently former) uses at 6800 and 7012 Roosevelt. Similar to 6717 Roosevelt, the disparity between current uses and potential use under the area’s zoning designation provides the potential for future development.

Channelization

Between NE 65th St and NE 75th St, both Roosevelt Way NE and 12th Ave NE are 40’ wide one-way arterials with 8-10’ sidewalks (including berms and trees for Roosevelt), for a total public right-of-way width of 56-60’. 12th maintains this channelization north of 75th, but Roosevelt transitions to a 36’ wide two-way arterial with 10’ sidewalks (also including berms and trees). Other than this large shift in both directionality and width, the rest of both corridors maintain rather typical and consistent channelization, with a few minor exceptions.

Roosevelt Way NE, from NE 65th St to NE 73rd St, is generally characterized (from west to east) by a 6’ sidewalk, a 4’ berm/tree planting strip, a 7’ parking lane, a 5’ southbound bike lane, an 11’ southbound general purpose lane, a 10’ southbound general purpose lane, a 7’ parking lane, a 4’ berm/tree planting strip, and a 6’ sidewalk. Between 65th and NE 66th St, the west parking lane and bike lane are replaced with a right-turn lane (onto 65th) and sharrows.

Roosevelt Way NE between NE 73rd St and NE 74th St provides a transition between the complex channelization north of 74th and the typical channelization of the rest of the corridor. From west to east, this section of Roosevelt has a 6’ sidewalk, a 4’ berm/tree planting strip, a 10’ southbound general purpose lane with sharrows, a 12.5’ southbound general purpose lane, a 10.5’ southbound general purpose lane, a 7’ parking lane, a 4’ berm/tree planting strip, and a 6’ sidewalk. The western-most general purpose lane merges into the middle lane approaching the Roosevelt & 73rd intersection.

Roosevelt Way NE between NE 74th St and NE 75th St acts as a confluence between Roosevelt and the surface portion of Lake City Way NE (the rest of which is underground, traveling below the intersection of Roosevelt and 75th). Lake City Way is a one-way, southwest-bound street that crosses 75th just to the east of Roosevelt, merging into Roosevelt just south of 75th. What is essentially just one lane of Lake City Way (varying in width in this area from 30’ to 10’) becomes the left-hand southbound lane of Roosevelt just north of 74th. This small stretch of Lake City Way is also the only opportunity for general purpose traffic traveling westbound on 75th to turn left onto southbound Roosevelt. Although there is no truly typical section of this stretch of the corridor, in general (from west to east) there is a 6’ sidewalk, a 4’ berm/tree planting strip, an 11’ southbound general purpose lane with sharrows, an 11’ southbound general purpose lane, a variable width southwest-bound to southbound general purpose lane (30’ to 20’ to 12’ to 10’), an 8’ parking lane, a 4’ berm/tree planting strip, and a 6’ sidewalk.

North of NE 75th St, and continuing to and past NE 80th St, Roosevelt Way NE transitions into a two-way, 36’ wide, mostly single-family residential corridor. From west to east, this portion of the

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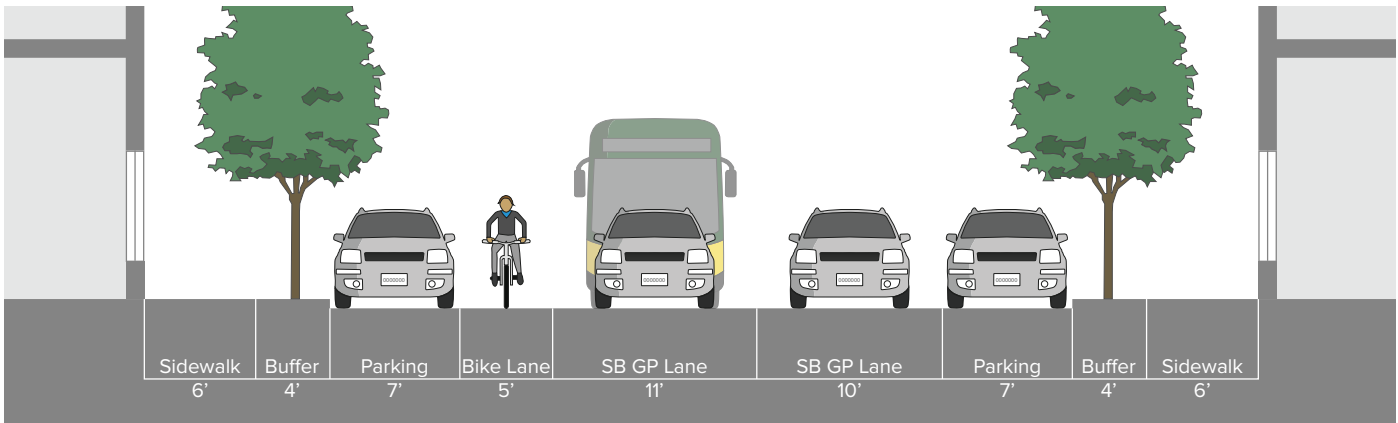


Fig. 4-11: A. Roosevelt Way NE, from NE 65th St to NE 73rd St - Typical Section (roadway is same for 12th Ave NE)

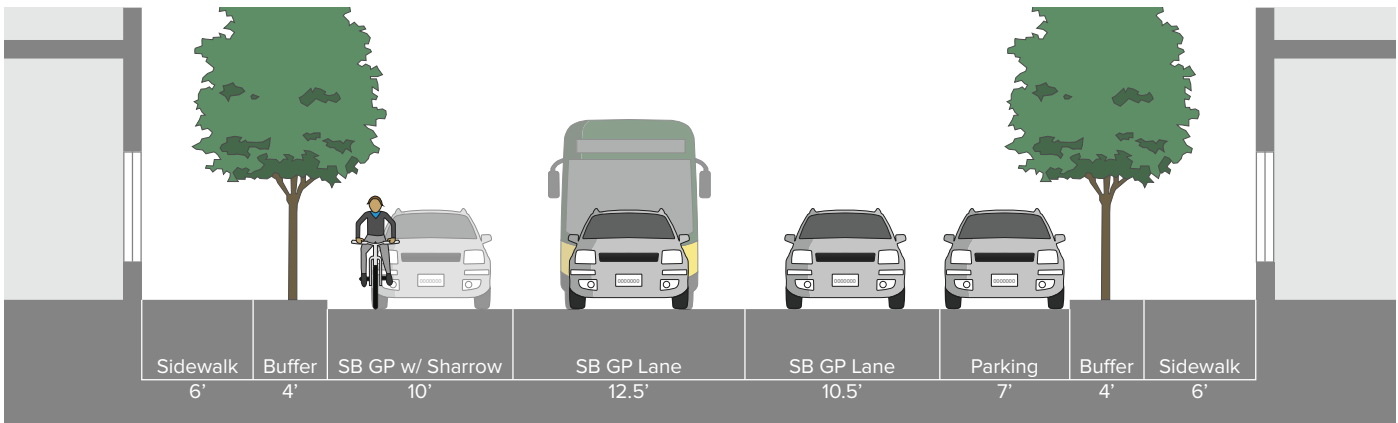


Fig. 4-12: B. Roosevelt Way NE, from NE 73rd St to NE 74th St

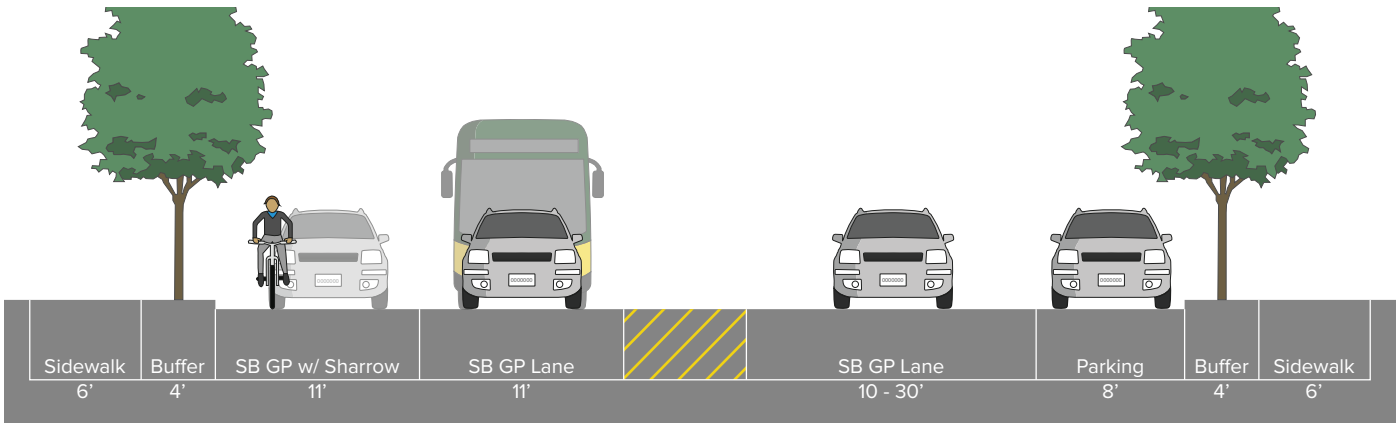


Fig. 4-13: C. Roosevelt Way NE, from NE 74th St to NE 75th St

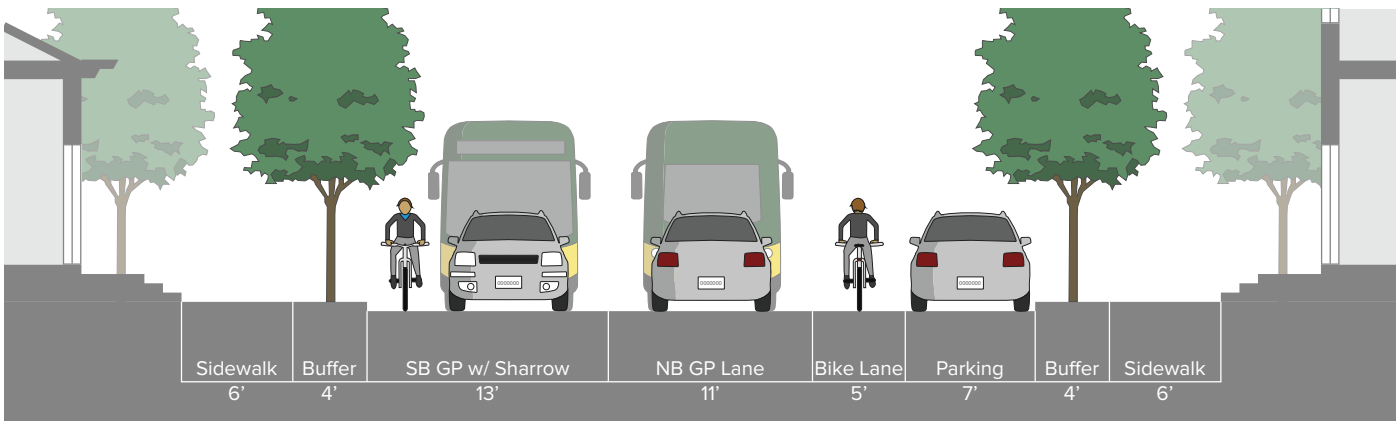


Fig. 4-14: D. Roosevelt Way NE, from NE 75th St to NE 80th St - Typical Section

corridor has a 6' sidewalk, a 4' berm/tree planting strip, a 13' southbound general purpose lane with sharrows, an 11' northbound general purpose lane, a 5' northbound bike lane, a 7' parking lane, a 4' berm/tree planting strip, and a 6' sidewalk.

12th Ave NE has a very similar channelization to that of Roosevelt Way NE, and is also 40' wide from curb to curb, though with wider sidewalks without berms or street trees. The majority of the corridor, from NE 65th St to NE 75th St is made up of (from west to east) an 8' sidewalk, a 7' parking lane, a 10' northbound general purpose lane, an 11' northbound general purpose lane, a 5' northbound bike lane, another 7' parking lane, and another 8' sidewalk – a mirror image of Roosevelt's typical channelization, with the exception of the sidewalks. The street widens slightly as it crosses NE 70th St, where the bike lane expands to 7' at the near-side of the intersection and the right-hand parking lane expands to 12' on the far-side. The corridor then returns to the same channelization until 75th, where it shifts to a 7' parking lane, an 11' northbound through and right-turn lane with sharrows, a 12' northbound through-only lane, and a 10' northbound right-turn only lane with sharrows.

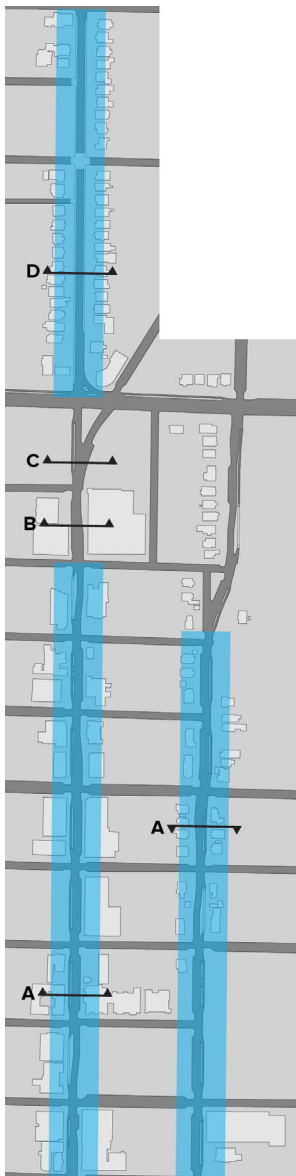


Fig. 4-15: Street section locations.

Transportation

Although future projects will certainly improve facilities for all modes of transportation, current infrastructure already exists for all of them: Pedestrians, bicyclists, general purpose vehicles, and buses.

Unlike other parts of the city, no part of either corridor is lacking sidewalks of at least minimal width. These are also more often that not accompanied by a planting strip with intermittent trees between the sidewalk and the street (with the exception of 12th Ave NE), with occasional parking on the other side of that, creating a relatively safe and inviting pedestrian environment. Because the corridor is largely auto-focused, however, it is lacking in sufficient crosswalks both parallel to and across the corridors. Currently, only seven out of the 15 intersections along Roosevelt Way NE have at least one crosswalk, as follows: NE 65th St (all four), NE 66th St (east-west, north of the intersection), NE 68th St (east-west on both sides of the intersection), NE 70th St (all four), NE 73rd St (all four), NE 75th St (including Lake City Way NE intersection, crosswalks in all directions), and NE 80th St (all four). Similarly, only four out of the 10 intersections along 12th have at least crosswalk, as follows: 65th (all four), 68th (east-west, south of the intersection), 70th (all four), and 75th (all four).

As mentioned in the previous section, bike infrastructure exists on both corridors, and reflects the directionality of each: Southbound on Roosevelt Way NE and northbound on 12th Ave NE. For the majority of each of these corridors the infrastructure takes the shape of 5' traditional bike lanes, with a couple of exceptions: Southbound sharrows on Roosevelt between NE

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73rd St and NE 80th St and just north of NE 65th St; And northbound sharrows on 12th just south of NE 75th St in both the left and right lanes.

Roosevelt Way NE between NE 65th St and NE 75th St sees an average of between 10,200 (from 65th to NE 73rd St) and 11,700 (from 73rd to 75th) cars per day. North of 75th, Roosevelt holds an average of 10,600 cars per day, though these volumes are not directly comparable: Because the southern part of the corridor is one-way, traffic volumes are for one direction, while the two-way part of the corridor serves traffic in both directions, and these volumes reflect that. From this we can extrapolate that about half of the traffic on Roosevelt south of 75th is continuing from the part of the corridor north of 75th, while about half is turning onto Roosevelt from 75th. 12th Ave NE has far less traffic than Roosevelt, at an average of 8,200 cars per day between 65th and 75th.

As was indicated in the current channelization of each street, ample parking exists on both corridors. For the most part Roosevelt Way NE south of NE 75th St has parking on both sides of the street, and north of 75th it has parking on the east side of the street. This is a lot of parking supply for an area characterized by auto-oriented retail uses and multifamily structures, both of which more often than not have their own parking for customers and residents, respectively. Although maintaining some parking is important for the overall health and vibrancy of the corridor, the 14' (or 7' for the north part of the corridor) of right-of-way allocated for this use provides the opportunity to reallocate space for other uses (such as protected bike lanes and more robust transit amenities) without directly affecting the flow of the corridor, and while maintaining more appropriate parking supply levels to still serve the businesses and amenities in the area.

As of the beginning of this project, the Roosevelt Way NE/12th Ave NE couplet served three King County Metro bus routes: the 66, 67, and 68. The 66 and 67 provide service from Northgate, through Maple Leaf, Roosevelt, the University District, and Eastlake, and to Downtown. Southbound, these routes turn right onto Roosevelt from NE 80th St, and travel the extent of Roosevelt (past NE 65th St), continuing onto the University Bridge to the south. Northbound, they enter the neighborhood along 12th (11th Ave NE south of NE Ravenna Blvd), and travel north along this corridor before turning left onto NE 75th St, and right onto Roosevelt. The 68 traveled up and down Roosevelt north of 75th, taking 75th through Ravenna to 25th Ave NE before continuing to University Village and University of Washington campus, but the route was deleted as a part of the March 2016 King County Metro U Link restructure.

Currently, there are seven bus stops within the service area: four on Roosevelt Way NE, two on 12th Ave NE, and one on NE 75th St (there used to be a second stop on this stretch of NE 75th St that served the westbound 68 at 75th & 11th Ave NE, but it was closed after the route 68 was canceled). Roosevelt has far side stops at 69th (southbound), 75th (southbound and northbound), and 80th (southbound), all serving routes 66 and 67. The stops on 12th are both far side as well, at 65th (northbound) and 70th (northbound), serving the same two routes, as does the far side stop at 75th & 12th (westbound). Prior to the service change, these two routes combined had 143 daily weekday trips, serving an average of 4,970 daily weekday riders.

The U Link restructure also included changing the Express 66 to the peak-only route 63 (with alignment along 5th Ave NE and 8th Ave NE), and providing additional service for route 67, upgrading it to frequent status (8 – 15 minute headways during peak hours). The route 67 will likely provide the basis for the planned RapidRide improvements, meaning that the only underlying service will be the peak-only route 63.

Corridor Safety

As with most urban areas, the Roosevelt Way NE/12th Ave NE corridor is not without its collision-prone intersections. Most of the intersections and blocks within the study area have had at least one collision of some type (involving some combination of cars, bikes, and/or pedestrians) since the beginning of 2013. A number of intersections stand out with exceptionally high number of collisions, including Roosevelt Way NE and NE 75th St (10), Roosevelt and NE 80th St (12), 12th Ave NE and 75th (14), and 12th and NE 65th St (also 14). This is not a surprising list, as these are all intersections of Principal or Minor Arterials, and some of the busiest intersections in the neighborhood. Surprisingly absent from this list is Roosevelt and 65th, which is arguably the busiest intersection in the neighborhood.

At a more fine-grained level, bicycle travel enjoys varying levels of safety along the corridors. While only one collision involving a bicyclist occurred along the entirety of 12th Ave NE in the past three years (in which a bicyclist struck a pedestrian on June 20th, 2014, injuring both parties), three separate incidents involving bicyclists have occurred on the portion of Roosevelt between NE 75th St and NE 80th St – one at NE 75th St, one between 75th and NE 78th St, and one at NE 79th St – of which all involved a motor vehicle hitting the bicyclist. This indicates a clear need for added bicycle infrastructure to improve safety along this corridor.

Similar to overall collisions, those involving pedestrians are centered around major intersections in the neighborhood: one at Roosevelt Way NE and NE 80th St, two at 12th Ave NE and NE 75th St, and three each at Roosevelt and NE 65th St and 12th and 65th. Luckily, none of these events resulted in any fatalities or even serious injuries, but clearly the need still exists for improved pedestrian infrastructure along the corridors, and especially at these intersections.

Overall, there have been no collisions of any type within the study area over the past three years that have resulted in fatalities, and only two incidents that resulted in serious injuries (both of which involved two motor vehicles and no pedestrians or bicyclists). While this may indicate less of a need for added infrastructure to improve safety along the corridor, the study area (including Roosevelt Way NE from NE 65th St to NE 80th St, 12th Ave NE from 65th to NE 75th St, and the blocks of 65th to 75th in between the corridors) is responsible for an average of about 50 collisions of some severity per year – clearly indicating room for improvements in the realm of transportation safety.

ON-SITE OBSERVATIONS

An integral aspect of any conceptual design project, in addition to rigorous research and data analysis, is in-person, on-site visits to investigate the area in which the project is planned. While reading and data gathering can tell you a lot about macro-level issues (zoning, planned projects, etc.), many micro-level, intangible characteristics of an area can only be learned through personally experiencing and witnessing them. How do people interact with the existing infrastructure? Where do people move, and what do they move between? Where and when do people stand, sit, run, or lean? All of these questions – and so many more – are as integral to creating a functional design as all of the data collected above, and are insights one can only hope to gain through personal experience.

To accomplish this, two extended weekday on-site observations were conducted, that represented different times of day and days of the week: Monday, February 8th, 2016 from 3:30 – 5:30 pm, and Thursday, March 31st, 2016 from 7:00 – 9:00 am. Weekend visits were not included, as these tend to represent times of least intense use. The observations from these site visits are compiled in the rest of the section by topic area, so as to draw parallels between how the corridor functions depending on weather, time of day, numbers and types of users, and more.

Traffic Flow & Corridor Operations

As it currently operates, Roosevelt Way NE is predominantly a corridor designed for general purpose traffic. It's clear that its intended purpose is moving cars at great speeds (for a surface



Fig. 4-16: Roosevelt Way NE, facing south from NE 66th St. Traffic during the PM peak period (3pm - 7pm) often backs up along the two blocks of Roosevelt north of NE 65th St. However, this traffic typically clears when the signal turns green.

street) and with great efficiency, and storing them in close proximity to desired uses. Although the posted speed limit along the corridor is 25 mph, it feels as though cars are routinely going 30 or even 35 mph. Even if they are staying closer to the posted limit, the one-way channelization and downhill slope of Roosevelt Way NE help the cars fly down the street, which when coupled with the narrow sidewalks, creates an unwelcoming environment for pedestrians. This is exacerbated by the lack of any variation in the width or directionality of the travel lanes, allowing general purpose traffic to quickly travel down the corridor without ever moving the steering wheel.

This behavior can be seen throughout the majority of both streets. One notable exception is the intersection of Roosevelt Way NE and NE 65th St, where cars routinely back up as far north as NE 67th St (see Fig. 4-16), though they are also able to clear the queue on a green light under normal conditions. Although not directly on either of the corridors being studied, NE 75th St also experiences substantial back-ups just west of Roosevelt Way NE. 9th Ave NE (one block west of Roosevelt) provides a route to I-5 south, and vehicles queue at the westbound left-turn pocket on 75th to take advantage of this (see Fig. 4-17). During both signal cycles witnessed during the morning site visit, cars became backed-up all the way into the 75th and Roosevelt intersection, blocking southbound traffic along Roosevelt when the signal changed. This creates a clear impact on the southbound traffic, and likely impacts the speed and reliability of both bus and bike traffic as well. This also indicates the impossibility of trying to draw finite borders for a transportation projects, as the effects of operational issues outside of those borders can sometimes have greater, rippling effects than anything occurring within them.

There are very few driveways that open onto Roosevelt Way NE, and the few that do can either be closed (as there are other entrances to the same space) or accommodated. Instead, properties



Fig. 4-17: NE 75th St, facing west from Roosevelt Way NE. Cars hoping to get on I-5 south queue in and behind the left turn pocket for 9th Ave NE, blocking both the through lane and often part of the intersection back at 75th and Roosevelt, substantially impacting operations on both corridors.

with parking prefer entrances on side streets (also a recommendation in the neighborhood’s design guidelines), which while on the one hand helps keep traffic on Roosevelt moving and free from obstructions, also means that traffic on Roosevelt is able to move quickly and directly down the corridor. The dearth of driveways along the corridor means raised barriers can be provided without impacting access to these buildings, which would greatly improve non-motorized safety along the corridor. Notable exceptions on the west side of the street (which would be impacted by right-aligned protected bike infrastructure) include the block between NE 71st St and NE 72nd St, the block between NE 73rd St and NE 74th St (both of which have curb cuts for residential and commercial buildings), and the block between NE 68th St and NE 69th St (occupied by a large parking lot that also has entrances on side streets).



Fig. 4-18: NE 79th St, facing northwest from Roosevelt Way NE. The typical land use north of NE 75th St is single family detached homes, a sudden change from the existing and proposed mixed-use and dense residential uses of the southern part of the corridor.



Fig. 4-19: Roosevelt Way NE, facing south from NE 69th St. The typical channelization along the corridors (from left to right: a parking lane, two travel lanes, a bike lane, and a parking lane) can be seen continuing almost uninterrupted all the way to the University bridge, about 30 blocks south.

Parking

As discussed in the previous section, there is parallel street parking on both sides of most of both Roosevelt Way NE and 12th Ave NE. Along Roosevelt, this parking is relatively well-utilized, though during neither the AM nor PM peak is it fully utilized (see Fig. 4-19). As would be expected, there is greater utilization around the southern part of the corridor, which may provide some parking supply for the businesses in the area. Given the more residential nature of 12th, parking along this corridor is far less utilized. For both streets, the capacity exists to reduce some of the on-street parking in favor of safer and more robust infrastructure improvements for all modes of transportation.

Pedestrian Connectivity

Similar to other arterials within the city, it can often times be difficult to cross Roosevelt Way NE at intersections without a signal and/or crosswalks all together (see Figs. 4-22 and 4-23). One must plan ahead when walking down the corridor in order to take the safest route, though it is still possible to cross the street if enough attention is paid to oncoming traffic. Even marked and signalized crosswalks, however, suffer from a lack of visibility for oncoming traffic, though due to the one-way nature of the corridor this is only a factor for the “up-stream” (northernmost for Roosevelt, southernmost for 12th Ave NE) crosswalks at each intersection. The lack of crosswalks is most evident along Roosevelt north of NE 75th St, where the only marked crossing – in addition to 75th itself – is NE 80th St. This forces crossing pedestrians to risk a quick dash in front of often fast moving traffic, or a journey to either of the signalized and painted intersections.



Fig. 4-20: Roosevelt Way NE, facing north from NE 75th St. Sidewalks north of 75th are in no better shape than those on the southern part of the corridor, and pose a safety and accessibility risk to pedestrians of all ages and abilities. Debris also accumulates along property lines, limiting the functional space of the path.



Fig. 4-21: Roosevelt Way NE, facing north from NE 70th St. Current sidewalks along the corridor are barely 6' wide, and many are in substantial disrepair. While there is little room for widening them, many sections need to be repaved to ensure safety and accessibility.



Fig. 4-22: Roosevelt Way NE, facing northeast from NE 72nd St. In addition to subpar sidewalks, the corridor is lacking in appropriate across-the-street pedestrian safety. This intersection at NE 72nd St has no painted crosswalks, giving no visual indication to cars that it is, in fact, legal for pedestrians to cross here.



Fig. 4-23: Roosevelt Way NE, facing south from NE 75th St. The lack of functional crosswalks along the corridor force people to cross at unsignaled, mid-block locations, posing a safety concern for pedestrian, bicyclists, cars, and buses.

The 10' sidewalks along Roosevelt (6' pedestrian and 4' landscape zones) are a carry-over from the corridor's once residential nature. Although in theory this provides enough space for current corridor operations, where the 4' landscape zone encroaches into the walking space, or the roots of adjacent trees have buckled the sidewalk (see Figs. 4-20 and 4-21), there is barely enough room for two individuals to pass, and basic accessibility needs are not met. Furthermore, as the area continues to densify and gain new amenities – such as the incoming light rail station or a future RapidRide line – an ever-growing strain will be placed on this inefficient infrastructure. As new development comes in, efforts should be made to require setbacks in order to widen sidewalks, and existing patches of sidewalk in disrepair should be brought to a higher standard of accessibility.

Multimodal Operations

The lack of appropriate pedestrian infrastructure is reflected in the number of people on foot who seem to be using the corridor at any given time – very few. Across the three site visits, only a dozen or so people were out and occupying the sidewalk, whether walking, making use of retail, or maintaining the front of their house. In general, a lone pedestrian out on this corridor can feel like one of the only people in the world, and given the lack of amenities, can make one question why they're even out there in the first place.

Similarly, a lack of robust bicycle infrastructure makes this corridor only usable by the most avid cyclists, and not a friendly space for cyclists of all ages and abilities. During the site visits for this project, the few cyclists using the existing infrastructure might have belonged better in a race –



Fig. 4-24: Roosevelt Way NE, facing northwest from NE 68th St. Currently, the best transit facilities along the corridor include small transit shelters and trash cans. This stop, in front of the Calvary Christian Assembly parking lot, provides little in terms of pedestrian amenities, though incoming development across the street may help rectify this.

SITE ANALYSIS

expensive road bikes and varying amounts of activity-specific outerwear. All of the recorded users were also adult and male and appeared able-bodied, indicating that this corridor, like so many throughout the city and the country, do not provide the conditions necessary for women, children, and individuals with limited mobility to feel safe riding along it.

Lastly, transit service specifically through the study area is not very well utilized. Both the 66 and 67 (the former of which only before the March 2016 Metro service change, now the express-only 63) were never seen at capacity, likely given their less intense connection points – Northgate to the University of Washington for the 67, and Northgate to First Hill for the 63. Although it doesn't run through the study area, route 76 – which runs adjacent to the study area and provides express service to the heart of downtown – is routinely at capacity during peak hours, indicating a clear demand in the area for quick travel to downtown.

DISCUSSION

The site analysis, when taken as a whole, provides a clear impression of the character and potential of the area. While the area of Maple Leaf within the study area is unlikely to drastically change given the current zoning, Roosevelt is a neighborhood still at the beginning of what will likely be many years of transformation, from a single-family, auto-oriented neighborhood to one with higher density uses and mixed-use, pedestrian focused amenities. Conclusions can be drawn from each element of the site analysis, each of which has a clear and specific nexus to how the neighborhood can continue to develop and effectively absorb the infrastructure improvements planned for it.

Topography often plays a role in the types of bicycle infrastructure provided along a corridor, as this mode is most affected by changes in slope along a route. For example, sloped roads are often given a sharrow for the downhill direction (where bikes can travel at speeds more similar to vehicle speeds) and a typical, separated bike lane in the uphill direction (where bikes travel far slower than vehicle travel, therefore requiring additional separation for the same level of safety). This is a popular – and cheap – solution for providing bicycle infrastructure in space-limited and financially constrained situations. However, protected bike lanes are planned for the corridor in both directions, which provide even higher levels of protection, rendering the topography's effect on infrastructure improvements unimportant in this case.

Both Roosevelt Way NE and 12th Ave NE can remain as “Principal Arterials,” as it is unlikely in the short-term that they will reduce in intensity of vehicle travel, as even modest reductions would hopefully be matched with increases in pedestrian, bicycle, and transit travel. However, following the implementation of RapidRide service, both corridors should be upgraded from “Minor” to “Major Transit Streets,” to reflect added service and further reinforcement of the neighborhoods transition to a more robust activity center. Although these designations may seem purely semantic, they help the city to indicate the intended intensity and types of uses that a certain corridor should expect to contain, and may therefore affect the feasibility and/or design of future development.

Overall, the study area's zoning will be an important force in helping to transform the feeling and character of the neighborhood. The zoning within the study area ranges from 85' Neighborhood

Commercial along the south end of Roosevelt Way NE to Single Family 5000 along 12th Ave NE and the north part of Roosevelt, with many intermediate levels in between. This creates the possibility for a diverse group of uses and users to occupy the area, creating a vibrant and mixed-life space. The zones with pedestrian designation show a clear push towards creating a more pedestrian-oriented area, and this designation should be incorporated into all of the zones along the corridors. Furthermore, many of the zones prevent elements that may threaten a potentially vibrant pedestrian character (e.g. limited curb cuts and no parking between buildings and the sidewalk). As the neighborhood continues to develop, and assuming departures are not granted to potential developers to bend these requirements, these zones will help the corridor become more pedestrian, bicyclist, and transit friendly.

The rest of study area (Roosevelt Way NE north of NE 75th St and 12th Ave NE north of NE 66th St) is all zoned SF 5000, and is more or less built-out under this designation. Barring an up-zone of these areas to allow higher density development, it is unlikely that the area will change in any remarkable way in the foreseeable future. While this is important to help maintain a part of the historical and current character of parts of the neighborhood, this also means that these areas are unlikely to substantively contribute to a shift in focus to a more pedestrian and multimodal-friendly space. These efforts, in whatever way they manifest, will therefore mostly focus on improving those underutilized areas for which zoning allows higher and better uses than what's currently on the ground, and that are more likely to be developed in the near future.

Both the Neighborhood Design Guidelines and designation as a Residential Urban Village indicate a clear push towards a connected, pedestrian/transit-friendly, neighborhood commercial area. Without carefully reviewing the design review process for recent developments along the corridor, however, it's difficult to know how effective these guiding documents have been at directing the future of growth within the neighborhood. Some new developments have included setbacks to increase available pedestrian space and/or ground-floor retail to improve the availability of commercial amenities along the corridor, but certainly not all of them, and likely not enough of them for the area to begin to provide "goods and services for residents and surrounding communities" (City of Seattle 2005). While some of these amenities do already exist in other parts of the neighborhood (along NE 65th St and parts of Roosevelt Way NE, especially south of 65th), added residential capacity in the area will likely increase demand for these goods and services. Lastly, the Station Area Overlay District has made parking not required for many of the currently proposed developments, meaning that included stalls for residents were the developers' prerogatives.

As was discussed previously, the current land uses along Roosevelt Way NE vary greatly, and generally reduce in intensity as one moves north along the corridor – reflecting the same changes in zoning. While this variability is good for creating a diverse place, many of the current commercial uses are auto-oriented in nature – in terms of both form (parking in front) and use (a handful of auto mechanics) – which don't lend themselves to or help to reinforce a more pedestrian-focused space. As the neighborhood continues to transform, more uses aimed at pedestrians will help activate the corridor, and will help reinforce the use of added multimodal improvements.

12th Ave NE is a much more homogeneous corridor, largely typified by single family homes. The few exceptions – the incoming light rail station, Roosevelt High School, and the proposed

development at 6516 12th – will help to reinforce the benefits of improved transit and bicycle facilities in the area, while the single family areas are unlikely to grow any time soon (as the current zoning would need to be changed to enable it), and will therefore contribute less to the success of the multimodal improvements.

Similar to many parts of Seattle, Roosevelt is absorbing a notable amount of growth – especially along this section of Roosevelt Way NE. As discussed above, two of larger incoming developments include a combined 214 parking spaces, which is unfortunate – and potentially even unnecessary – given the project’s proximity to both an incoming light rail station and incoming RapidRide service (see the discussion about the incoming Roosevelt Light Rail Station in section three, “The Neighborhood”).

Also as discussed above, the ratio of new housing to new commercial seems to be too high to help create a mixed-use area rather than simply a dense residential area. This is compounded by the fact that much of this new development is replacing existing commercial space. This effectively creates a corridor that people (other than residents) will use to travel through the neighborhood, rather than to the neighborhood. Additional commercial space may become more economically feasible as current projects are completed and bring more residents into the neighborhood – thereby increasing potential demand for local goods and services – but incentives for developers to include commercial space in new developments could go a long way towards ensuring a new, more vibrant character for the area. Luckily, as mentioned at the beginning of this section, the neighborhood is still in the beginning stages of what will likely be a long-term transformation, and the potential still exists to provide this needed commercial space.

The majority of both Roosevelt Way NE and 12th Ave NE are only 40’ from curb to curb, and sidewalk widths range from 8’ to 10’ (include berms/planting strips, where included). Although this space is currently dedicated to only one direction of travel for each street (allowing for ample travel and parking space), public right-of-way will still need to be reapportioned to other uses in order for this to become an efficient and functional multimodal corridor. As the most space that is currently dedicated exclusively to non-automobile travel is 5’ (for standard bike lanes southbound on Roosevelt between NE 65th St and NE 73rd St, northbound on Roosevelt between NE 75th St and NE 80th St, and 12th between 65th and 75th), additional space will need to be taken away from vehicles in order to add both bicycle and transit improvements. This space could come from either space used to travel (a typical lane) or space used to park, the trade-offs of which depend on a number of factors. This shift in the proportion of the ROW for different uses will also help to redefine the character of the corridors, towards a more multimodal-friendly feeling.

Roosevelt Way NE north of NE 75th St is only 36’ from curb to curb, and far fewer options exist for how to integrate other modes of travel into the space. The same issues of taking space from vehicle travel arises, but this time with an easier solution: Because there is only one travel lane in each direction along this part of the corridor, taking space away from traveling vehicles (other than just narrowing lanes, which doesn’t provide much) would mean preventing either northbound or southbound travel, which compromises the corridor’s operations. Therefore, this part of the corridor will necessarily see a reduction in the amount of available on-street parking in order to accommodate upgraded bicycle and transit infrastructure.

Both Roosevelt Way NE and 12th Ave NE currently accommodate both transit and bicycle travel, which indicates at least a basic capacity (and demand) for these modes of travel, and may present a more forgiving situation than adding infrastructure improvements to corridors that have not historically contained these modes. However, with over 10,000 vehicles per day on Roosevelt and almost 9,000 per day on 12th, both of the streets still functional as primarily – and almost exclusively – routes for private automobile travel. Barring any unforeseen changes in modal split, these numbers are likely to remain at or around current levels in the short to mid-term, which indicates a continuing demand for two lanes of travel along the corridor. Since volumes remain relatively steady along the one-way sections of the corridors, there's no argument for providing differing number of lanes from one section to the next (as this would only artificially slow traffic or cause a bottle-neck at the section with fewer lanes). This means that most of the space that will be used for multimodal improvements will come from space that is currently used for parking, for both the north part of Roosevelt (as discussed in the previous paragraph) and the one-way stretches of both Roosevelt and 12th.

As it seems like there will be little to no bus service underlying the RapidRide improvements (previous RapidRide routes have replaced non-RapidRide routes that have provided service along similar routes, so this new route will likely replace one or both of the existing routes along the corridor), quarter mile stop-spacing will provide a good mix of local and rapid service for the neighborhood. This standard will be used in siting the location of future bus stops for the corridor.

As with most corridors with typical, auto-oriented intersections throughout the city and country, this area needs overall safety improvements to bring it up to the level of current standards and best practices. Generally, this includes making pedestrians more visible, slowing vehicles, and greater separations of more vulnerable modes (such as pedestrians and bicyclists). Strategies to achieve these goals were discussed in great detail in the discussion of modal requirements in section two, "Literature Review," as they are mostly direct improvements to the infrastructure for each mode of transportation. More specifically, special consideration is needed for bicycle infrastructure along the northern part of Roosevelt Way NE, which has seen a disproportionately high number of collisions involving bicyclists. More intense and generally safer improvements should be used to go above and beyond for this area, and it's important to consider how this will coincide with less overall public right-of-way to work with along this stretch of the corridor.

Overall, the capacity and potential exists to provide the planned improvements along the corridor. As with many other multimodal projects, this will come at the cost of space previously designated largely for private vehicle travel and storage. The next section starts the conversation of how the existing supply of public right-of-way might be reallocated to the benefit of alternate modes of transportation.

5. THE DESIGN

CONCEPTUAL ALTERNATIVES

The first step in coming up with a comprehensive conceptual design for the corridor that incorporated all of the relevant modal priorities was to develop alternatives that explored how and where these different modes could move through the neighborhood. Variations in this regard include the physical scope of potential improvements (while Concept 1 investigates only Roosevelt Way NE for future improvements, Concepts 2 and 3 expand this to include 12th Ave NE), the maintenance of and/or deviation from existing channelization and flow (Concept 2 maintains the Roosevelt/12th one-way couplet, while Concepts 1 and 3 deviate towards a partially and fully two-way system, respectively), and the degree to which different transportation modes are integrated within the public right-of-way. The lessons learned from investigating these alternatives is discussed within the context of each concept as well as in the discussion at the end of the alternatives, and help influence the comprehensive design presented at the end of the section.

Rather than literal interpretations of specifically identified priority corridors or existing lines on modal maps, these alternatives serve as thought experiments focused on investigating the above variables and many other factors that are important for successfully designed streetscapes. While some of these factors only become apparent through rigorous on-site investigation and site analysis, others become apparent through the iterative design process, which forces one to resolve issues and make decisions as pen is put to paper. Many of these decisions – and their resulting tradeoffs and compromises – are explored in-depth in the “Pros” and “Cons” sections presented in each alternative, and both explicitly and implicitly influence the final design at the end of the report.

Concept 1: Two-way Transit and Bike Corridor

This concept investigates the possibility of utilizing Roosevelt Way NE as both a transit and bicycle corridor, in both directions. This necessitates a rechannelization of the entire corridor from one-way to two-way, which would have wide-reaching impacts on the flow and utilization of other streets in the area. Typical blocks include (from west to east) a 10' two-way bike lane (5' in each direction), a 1' raised concrete buffer, an 11' southbound GP lane, an 11' northbound GP lane, and a 7' parking lane. Blocks with transit stops include a 9' two-way bike lane (4.5' in each direction), a 1' raised concrete buffer, an 11' southbound GP/transit lane, an 8' center-running transit island, and an 11' northbound GP/transit lane. At most intersections, right-of-way dedicated for parking and transit islands give way to curb bulbs on the east side of street.

Because this concept only looks at improvements to Roosevelt Way NE, it functionally ignores 12th Ave NE, which currently serves as the northbound half of the Roosevelt/12th couplet. If 12th is left as is, converting Roosevelt to two-way would mean better northbound flow through the neighborhood than southbound, which would likely mean a large reduction in overall efficiency, due to inefficiently allocated right-of-way. Although not discussed as a part of this concept (see concept 3 for some discussion on converting 12th to two-way), any project that aims to change Roosevelt's channelization should also investigate how 12th functions as well, and what rechannelization may be needed to maintain overall system and/or couplet efficiency.

Pros:

- ▶ As a busier arterial street, Roosevelt Way NE is a good target for more intense traffic - both buses and bikes. This will help maintain 12th Ave NE as a quieter, residential street.
- ▶ Concentrating improvements on a single street can help reduce overall costs, which don't have to be split across two streets.
- ▶ A single, center transit island provides a shared space for both northbound and southbound traffic, and reduces the amount space needed for transit operations.
- ▶ The transit island (as opposed to individual curb-side stops) allows for a fully-separated bike lane for the extent of the corridor south of 75th.
- ▶ Having a two-way bike lane on one side of the street allows for curb bulbs at most intersections, helping to reduce pedestrian crossing times and improve safety.
- ▶ A small extension of the southern end of the transit island provides added pedestrian safety.

Cons:

- ▶ A Roosevelt-only design ignores 12th, which acts as the northbound half of a two-way Roosevelt/12th couplet.
- ▶ Keeping 12th as one-way northbound while changing Roosevelt to a two-way corridor will allow for better northbound flow than southbound flow.
- ▶ Changing the corridor to two-way will reduce movement efficiency through the area, and may require an adjustment period for users to understand new channelization.
- ▶ Buses loading and unloading at transit stops will bring traffic to halt because of single lanes in each direction - as much as eight extra minutes of delay per hour.

- ▶ A single, shared 8' transit island is the minimum allowable, and may create an unsafe feeling for transit riders. This is also too narrow for the full suite of RapidRide furniture.
- ▶ 5' bike lanes in each direction provide a narrower amenity for cyclists. This is reduced to 4.5' at transit stops, which may create a safety concern for cyclists.
- ▶ A 1' buffer between the bike lanes and southbound traffic is small, and does not meet typical PBL standards.
- ▶ All parking on the west side of the street - and most on the east side - will be removed. All parking on blocks with a transit island will be removed.

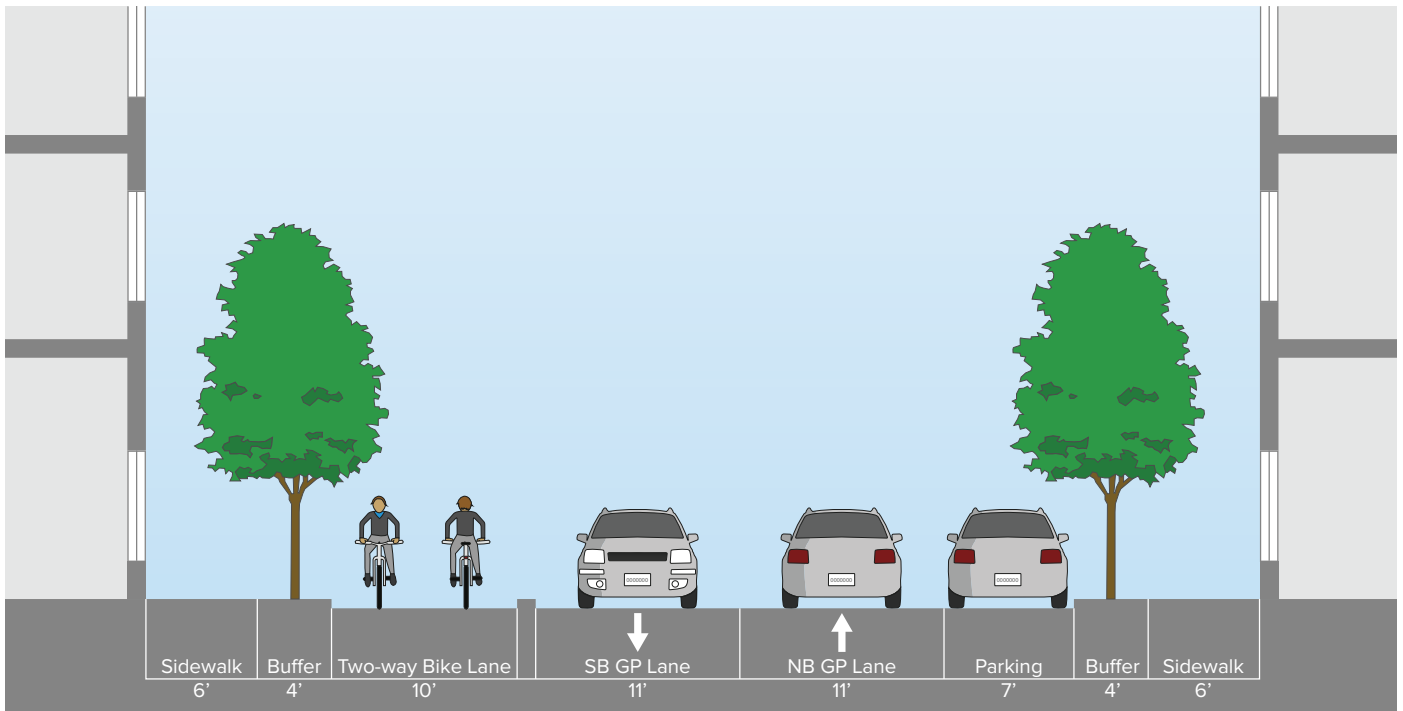


Fig. 5-1: Section - Roosevelt Way NE, two-way with parking & protected bike lanes.

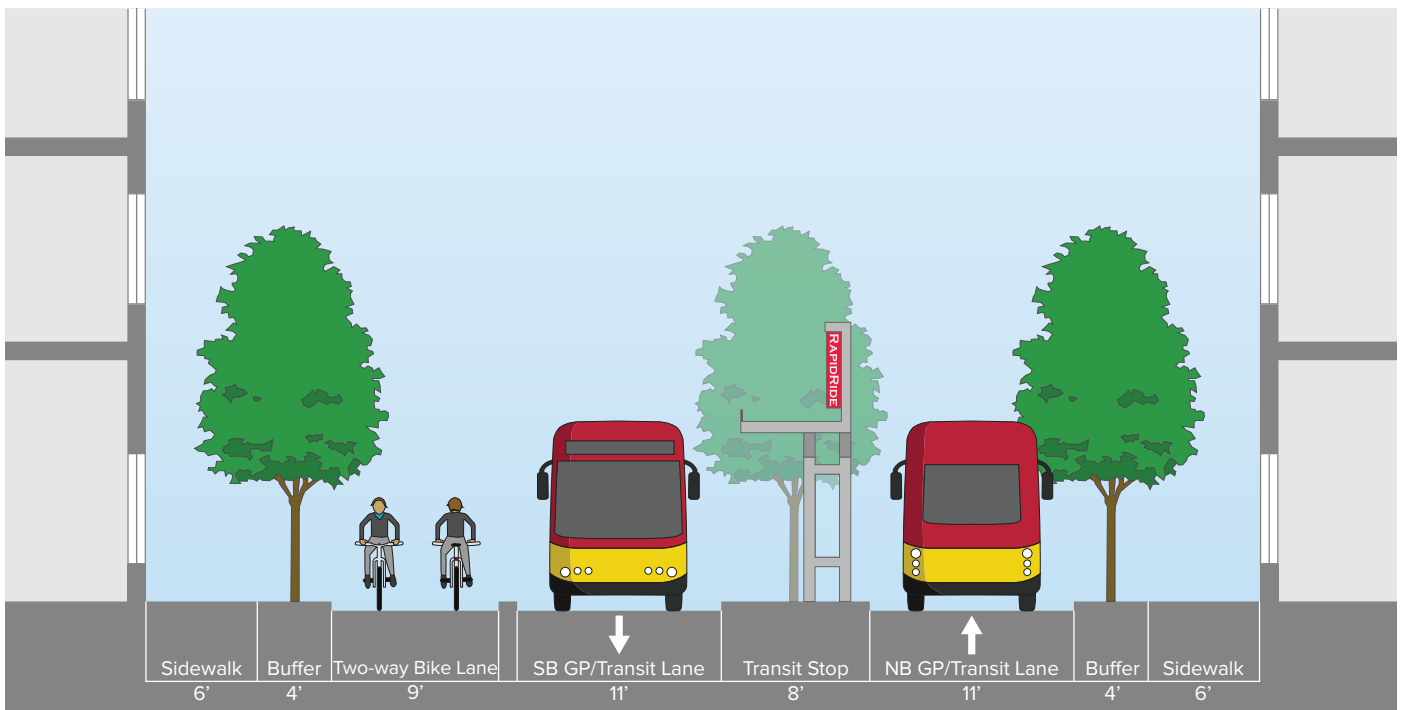


Fig. 5-2: Section - Roosevelt Way NE, two-way with transit island & protected bike lanes.

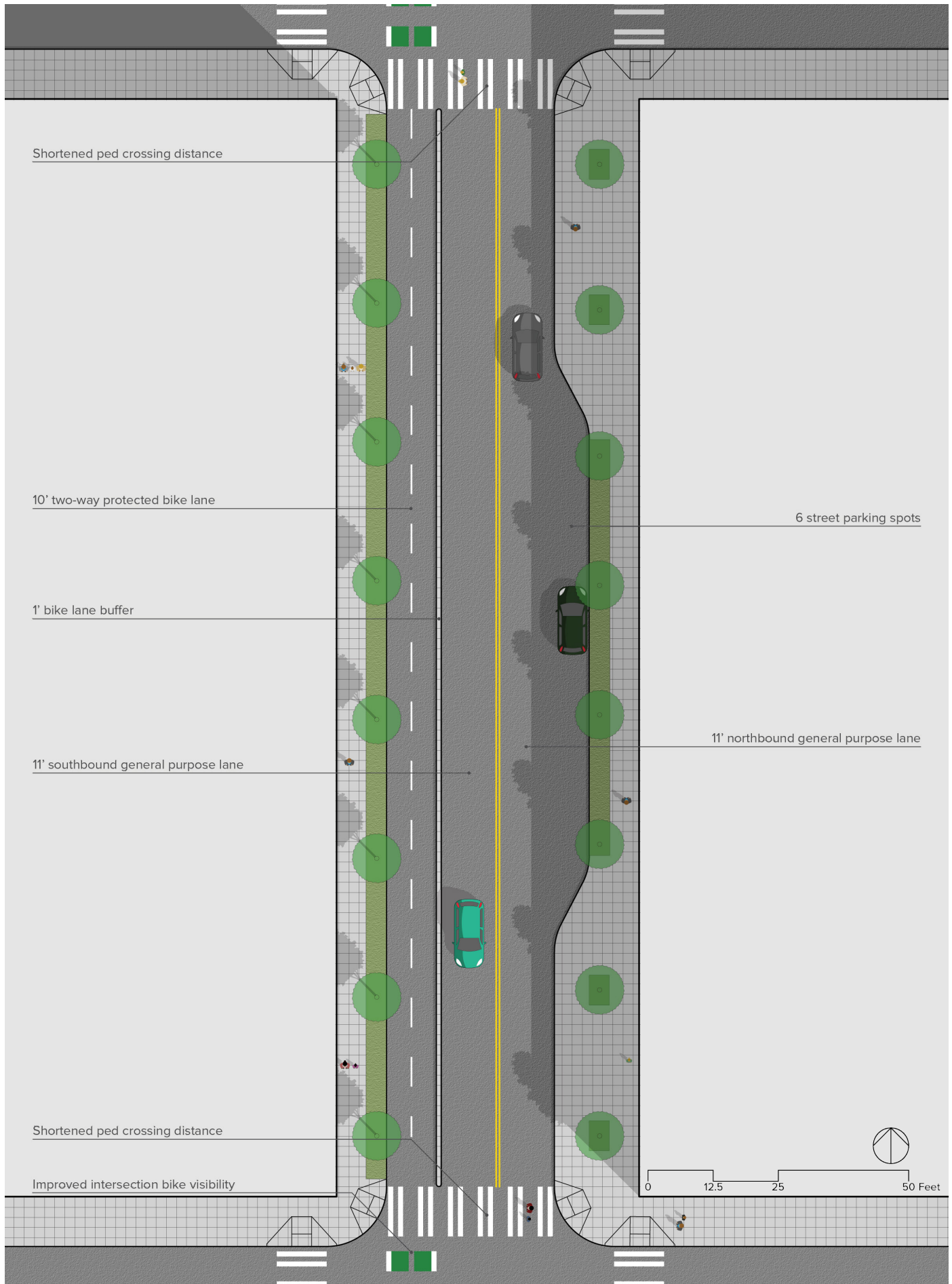


Fig. 5-3: Site plan - Roosevelt Way NE, two-way with parking & protected bike lanes.

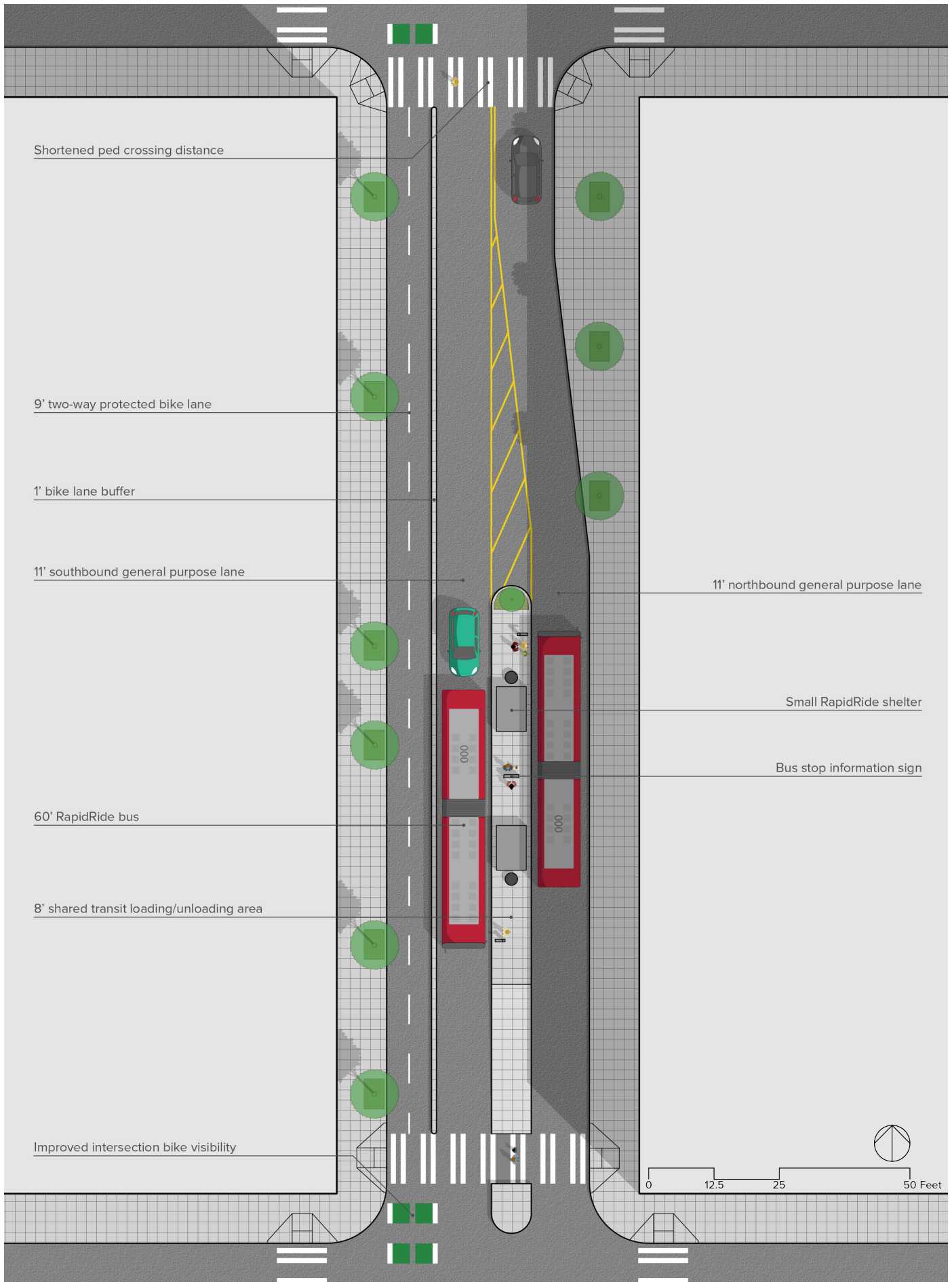


Fig. 5-4: Site plan - Roosevelt Way NE, two-way with transit Island & protected bike lanes.

Concept 2: One-way Transit and Bike Corridors

This concept extends the scope of design to 12th Ave NE, and maintains both corridors as efficient, one-way streets. This renders fully rechannelizing the corridors unnecessary, instead making small adjustments to include transit and bicycle travel in the appropriate directions. Typical blocks on Roosevelt Way NE include (from west to east) a 6' southbound bike lane, a 5' raised planted buffer, an 11' southbound GP lane, a 10' southbound GP lane, and a 7' parking lane. Blocks with transit stops include a 6' southbound bike lane (at-grade behind bus stops), a 13' southbound transit stop, an 11' southbound GP/transit lane, and a 10' southbound GP lane. Again, curb bulbs are provided on the east side of most intersections. Blocks along 12th include similar channelization, only northbound instead of southbound.

Including 12th Ave NE in the scope of the design provides immediate benefits to the overall strategy, allowing for the directionality of each street to be maintained. This maintains the efficiency of parallel and opposite one-way streets, while still providing space for transit and bicycle improvements on both. While this concept does have the added construction cost and time needed of adding improvements to two corridors (as discussed in Concept 1), it also has the added benefit of largely maintaining the current function and usability of the corridors. Lastly, although the transit stop is presented as a near-side stop, it could just as easily be mirrored and provided as a far-side stop. This would slightly reduce the safety of the bus-bike integration (by providing less time before the potential area of conflict), but would greatly increase vehicle and transit safety, as discussed in the modal requirements part of section two, "Literature Review."

Pros:

- ▶ Maintaining both Roosevelt Way NE and 12th Ave NE as one-way streets helps maintain corridor efficiency, and is beneficial for overall usability.
- ▶ Blocks with transit stops maintain an open travel lane for general purpose traffic, even when buses are loading and unloading.
- ▶ A 13' wide transit stop provides ample room for safe loading and unloading, as well as for full suite of RapidRide furniture.
- ▶ Extending the raised transit stop north along the block allows for additional green space to improve aesthetic feeling of the area.
- ▶ Having just a one-way bike lane allows for curb bulbs at most intersections, helping to reduce pedestrian crossing times and improve pedestrian safety.
- ▶ A 6' bike lane meets engineering and safety standards, and provides a safer and more comfortable thoroughfare for bicycles - especially when not part of a two-way bike lane.
- ▶ Buffers on both sides of the bike lane - 4' next to the sidewalk and 5' next to southbound traffic - further improves bicycle comfort and safety.

Cons:

- ▶ A strategy focusing on a Roosevelt/12th couplet would either increase the overall cost of the project or split the budget across two corridors.
- ▶ All parking on the west side of Roosevelt - and most on the east side - will be removed, and the inverse for 12th. All parking on blocks with a transit stop will be removed.

- ▶ Integrating bicycle infrastructure behind transit stops may cause conflict, though similar configurations are being used elsewhere in the city.
- ▶ Splitting transit service between two corridors would maintain buses driving on 12th Ave, a quieter, more residential street.

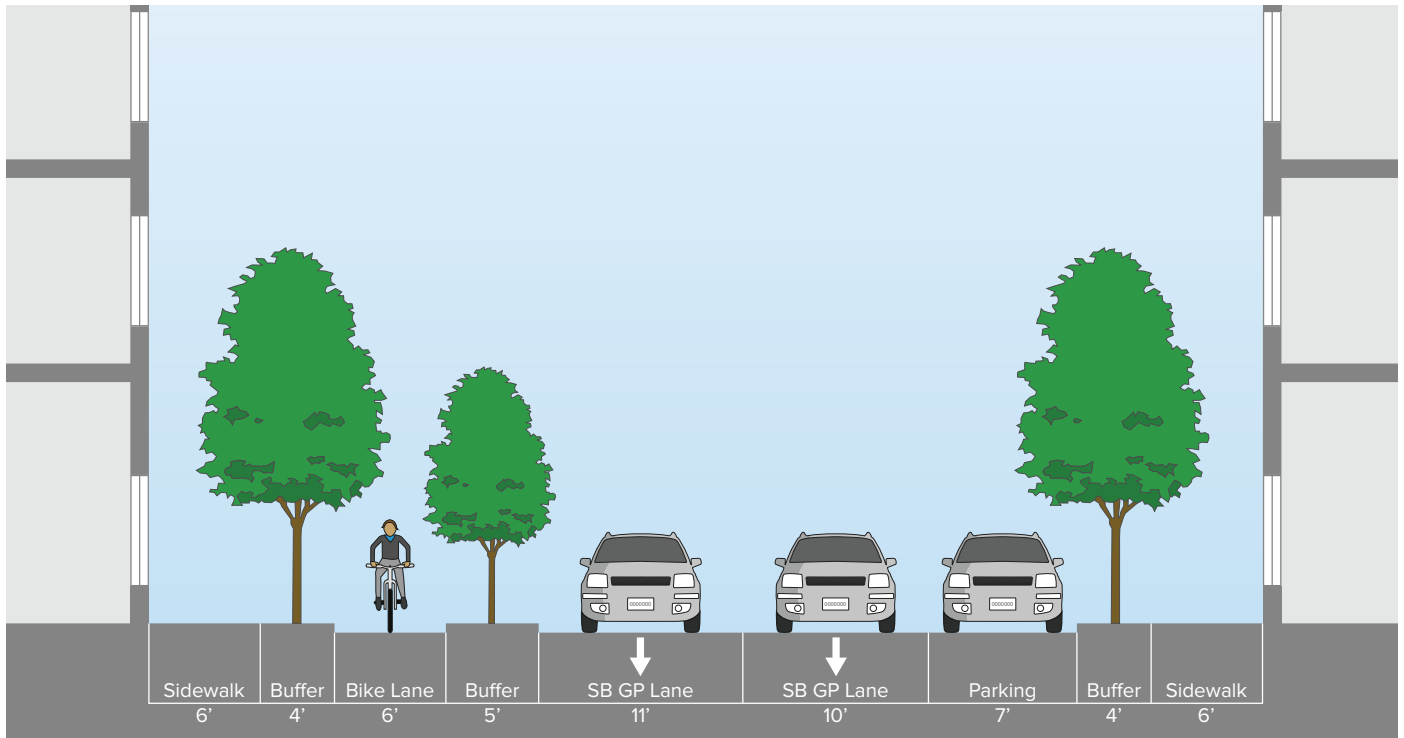


Fig. 5-5: Section - Roosevelt Way NE/12th Ave NE, one-way with parking & protected bike lane.

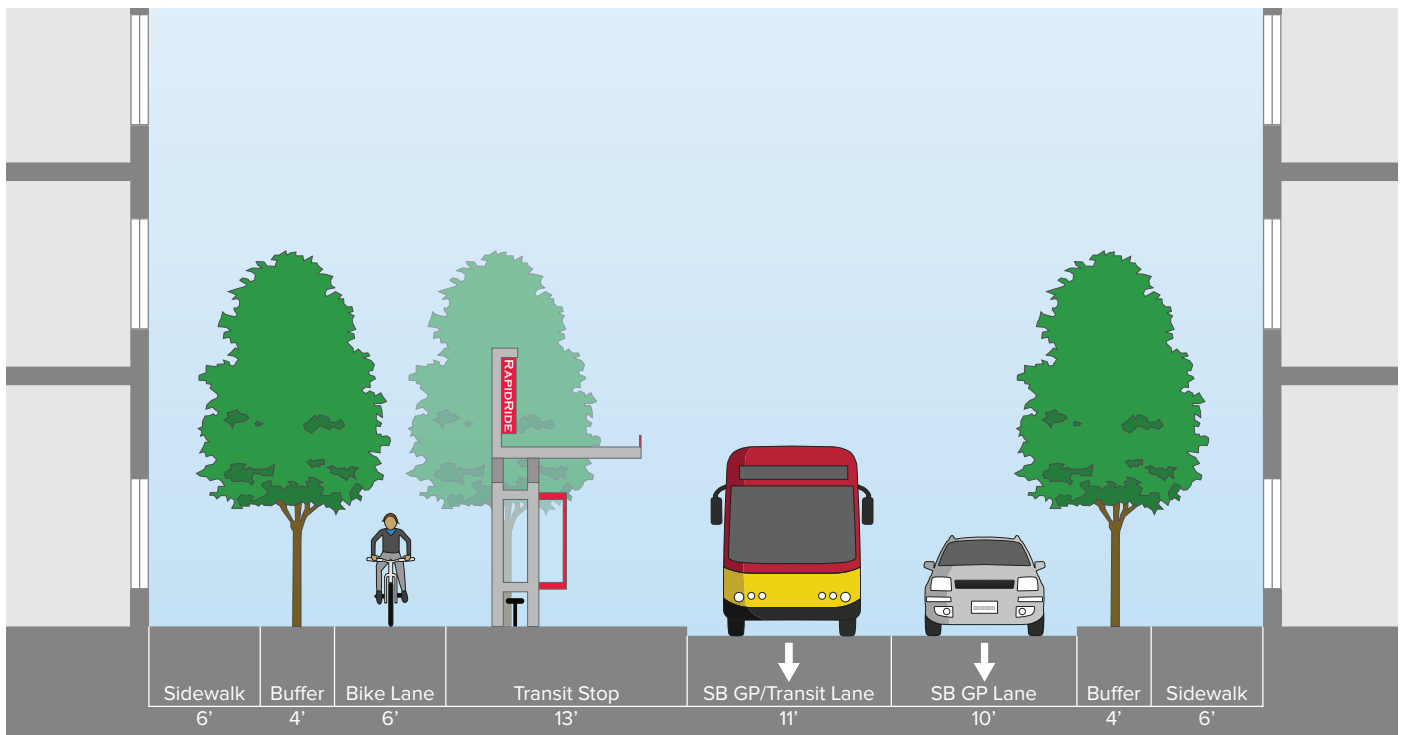


Fig. 5-6: Section - Roosevelt Way NE/12th Ave NE, one-way with transit stop & protected bike lane.

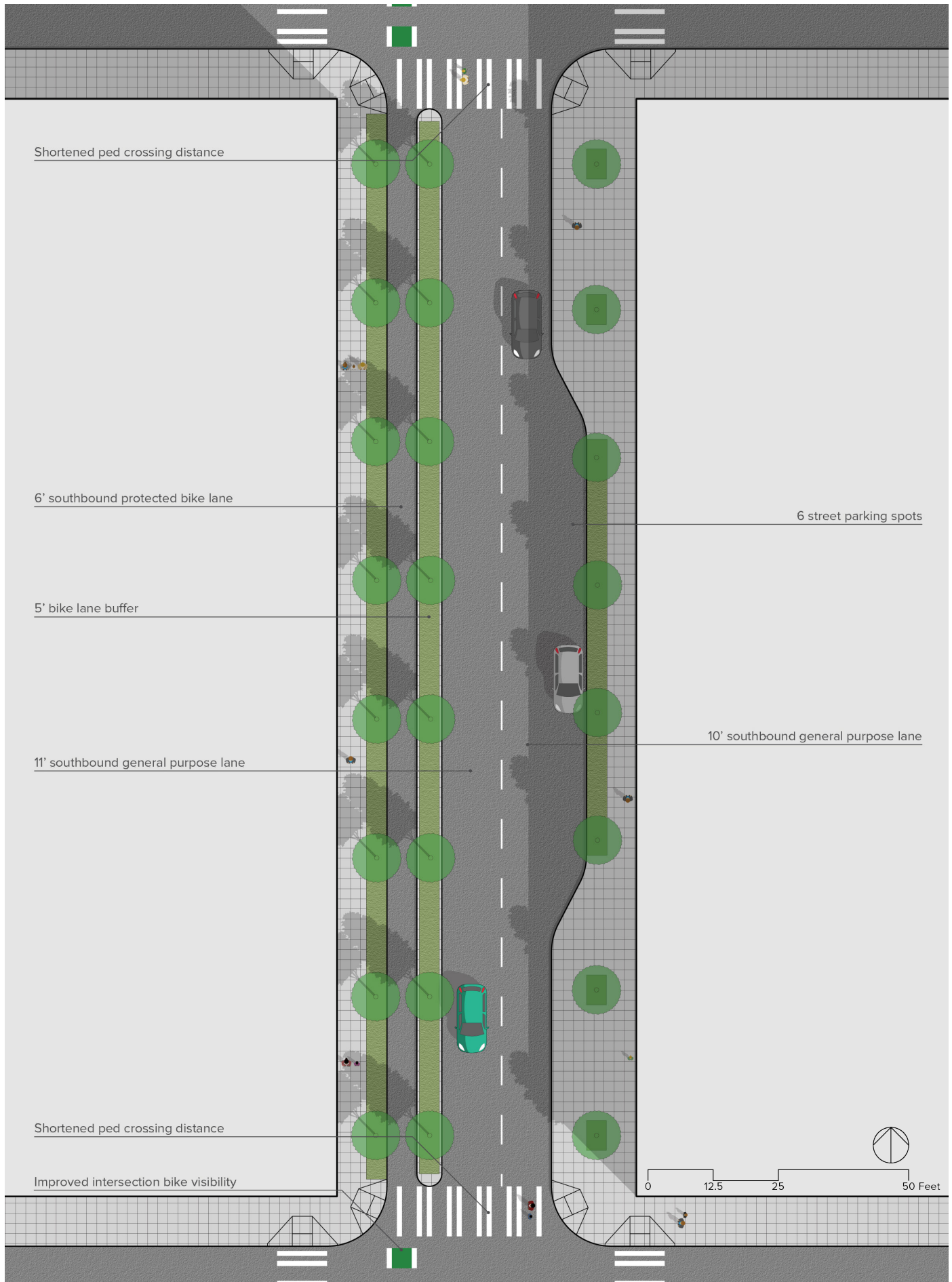


Fig. 5-7: Site plan - Roosevelt Way NE/12th Ave NE, one-way with parking & protected bike lane.

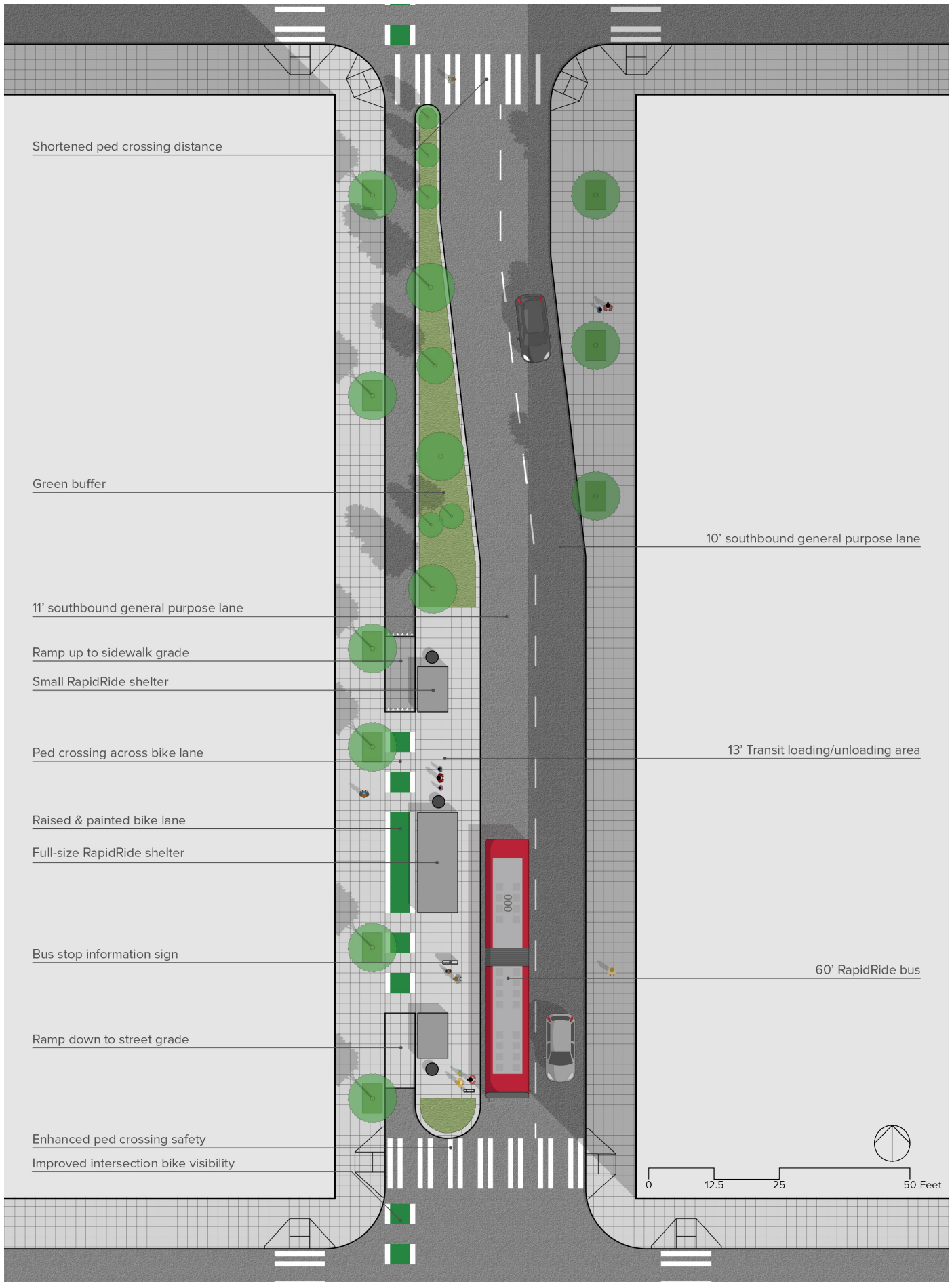


Fig. 5-8: Site plan - Roosevelt Way NE/12th Ave NE, one-way with transit stop & protected bike lane.

Concept 3: Two-way Parallel Corridors

This concept maintains the scope of the previous concept - focusing on both Roosevelt Way NE and 12th Ave NE - while rethinking the function and operations of both. Unlike the previous two concepts, this one looks at the possibility of splitting transit and bicycle infrastructure on two separate but parallel corridors. Similar to Concept 1, this would necessitate a rechannelization of both Roosevelt and 12th to two-way streets. Typical blocks on Roosevelt include (from west to east) an 8' parking/parklet lane, a 12' southbound GP lane, a 12' northbound GP lane, and an 8' parking/parklet lane. Blocks with transit stops include an 8' southbound transit stop, a 12' southbound GP/transit lane, a 12' northbound GP/transit lane, and an 8' northbound transit stop. Typical blocks on 12th include a 6' southbound bike lane, a 4' raised planted buffer, a 10' southbound GP lane, a 10' northbound GP lane, a 4' raised planted buffer, and a 6' northbound bike lane.

Rechannelizing both Roosevelt Way NE and 12th Ave NE to this extent makes this concept, by far, the biggest deviation from existing conditions. The impact that this might have on project cost, implementation timelines, and corridor operations should be studied intently before considering this concept. Furthermore, splitting modes onto separate corridors requires compromises about safety and the nature of each corridor. While having bikes on 12th and transit on Roosevelt makes sense from the perspective of current land use and development intensity (12th a quieter residential street, and Roosevelt a denser, mixed-use street), the Roosevelt channelization north of NE 75th St would require a jog over for cyclists traveling both north and south under this alternative (see discussion about bike connectivity in the next section).

Pros:

- ▶ A strategy that addresses both pieces of the Roosevelt/12th couplet is more comprehensive, as it recognizes how these corridors currently operate.
- ▶ Separating modes by street can help to improve the safety and efficiency of the corridors, by reducing conflict and allowing for targeted improvements.
- ▶ No bike lanes on Roosevelt provides greater flexibility of use for curb space, including car parking, bike parking, parklets, etc. as needed.
- ▶ Improvements would require minimal changes to existing right-of-way, reducing both cost and scope of project.
- ▶ Curb bulbs on both sides of the street reduce pedestrian crossing time even more than other alternatives: ~5.5 seconds vs. ~7.5 seconds.
- ▶ Modal designations make sense given development intensity for each corridor: Transit for higher density Roosevelt, bikes for lower-density 12th.
- ▶ Lane widths meet ROW Improvement Manual standards (12' general purpose/transit lanes and 8' parking lanes).

Cons:

- ▶ Conversion of one-way streets to two-way reduces efficiency of corridors, and complicates short-term usability as users learn new patterns.
- ▶ Conversion also compromises long-term operations, as corridor efficiency will be more crucial after future development and growth.

- ▶ Modal designations may have inverse effect: Higher bus traffic on Roosevelt may push more GP traffic to 12th, threatening quieter nature of the corridor.
- ▶ Splitting modes onto separate streets ignores some of the potential benefits of integrating different modes onto the same corridor.
- ▶ Interaction with NE 75th St and north part of Roosevelt Way NE creates a lose-lose compromise situation.

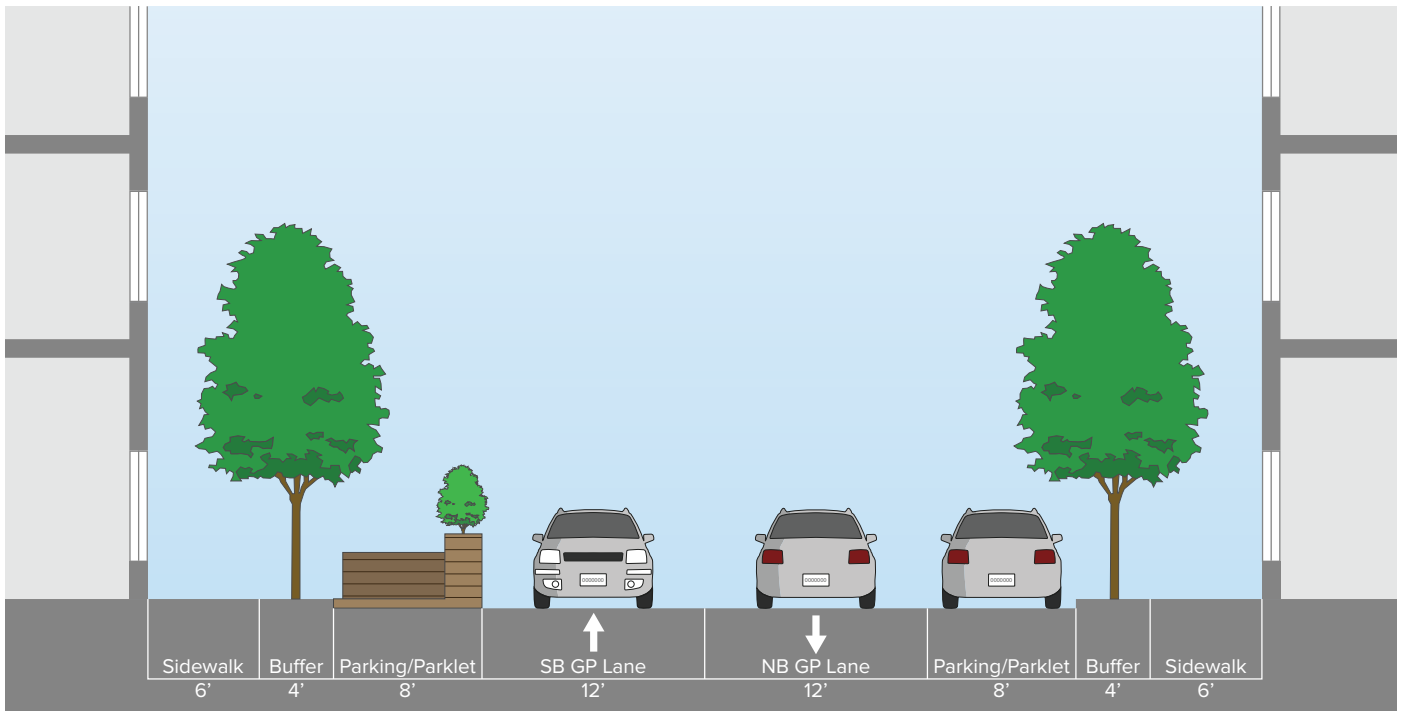


Fig. 5-9: Section - Roosevelt Way NE, two-way with parking & parklets.

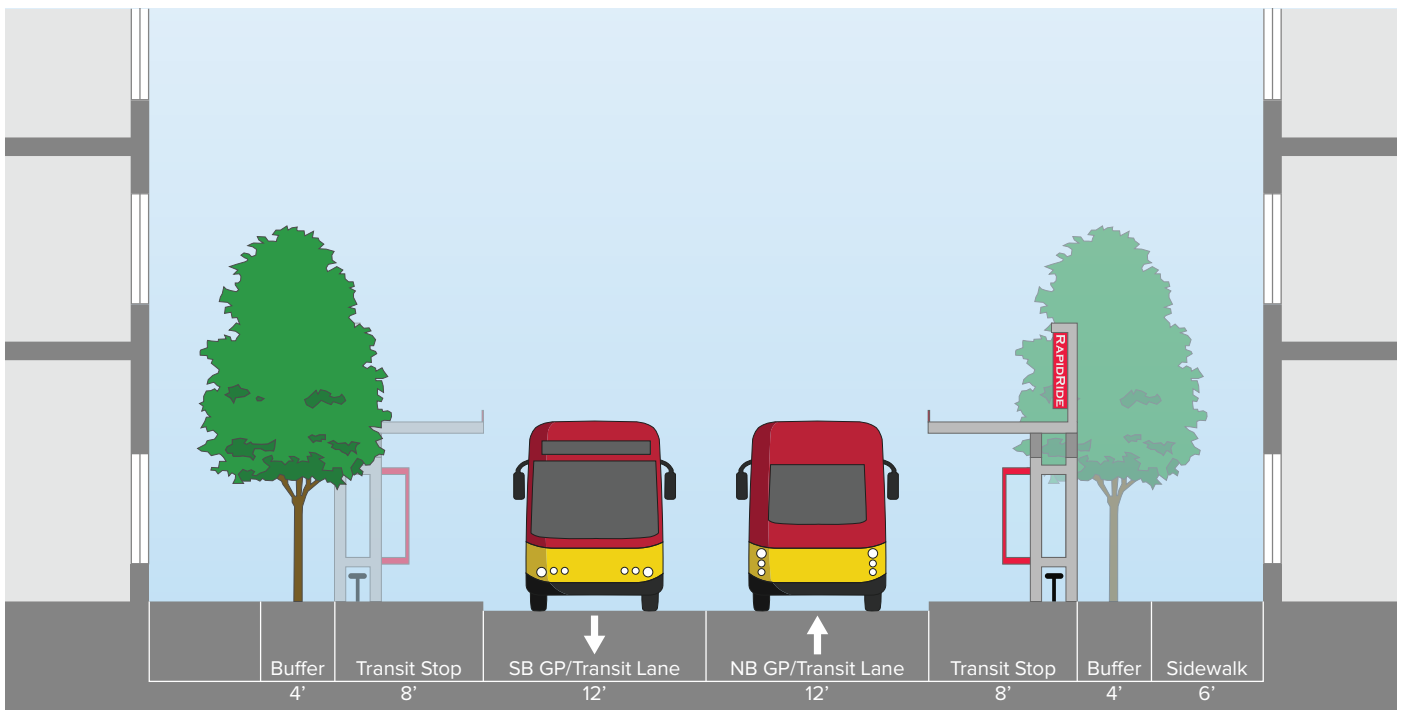


Fig. 5-10: Section - Roosevelt Way NE, two-way transit stops & parking.

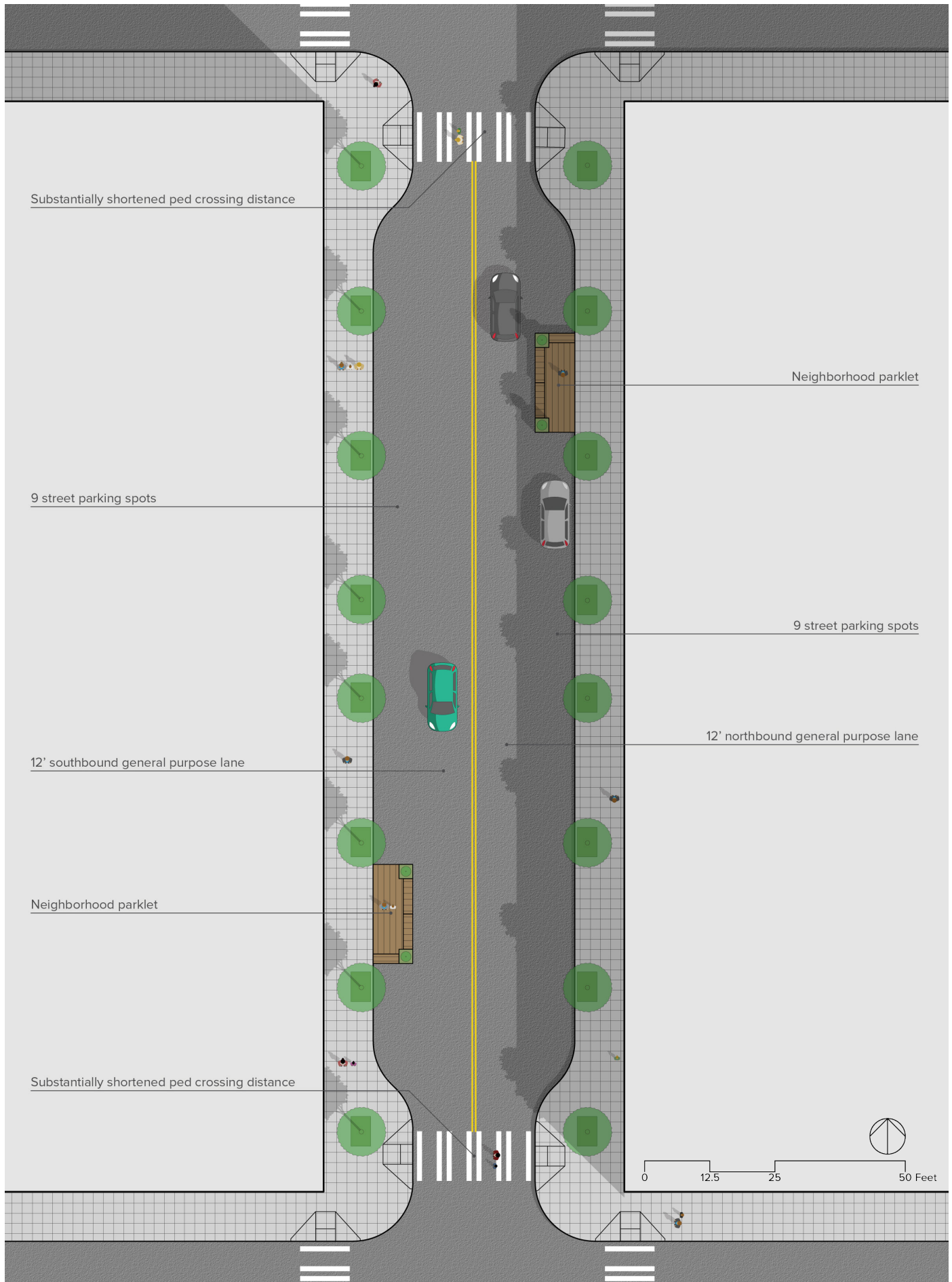


Fig. 5-11: Site plan - Roosevelt Way NE, two-way with parking & parklets.

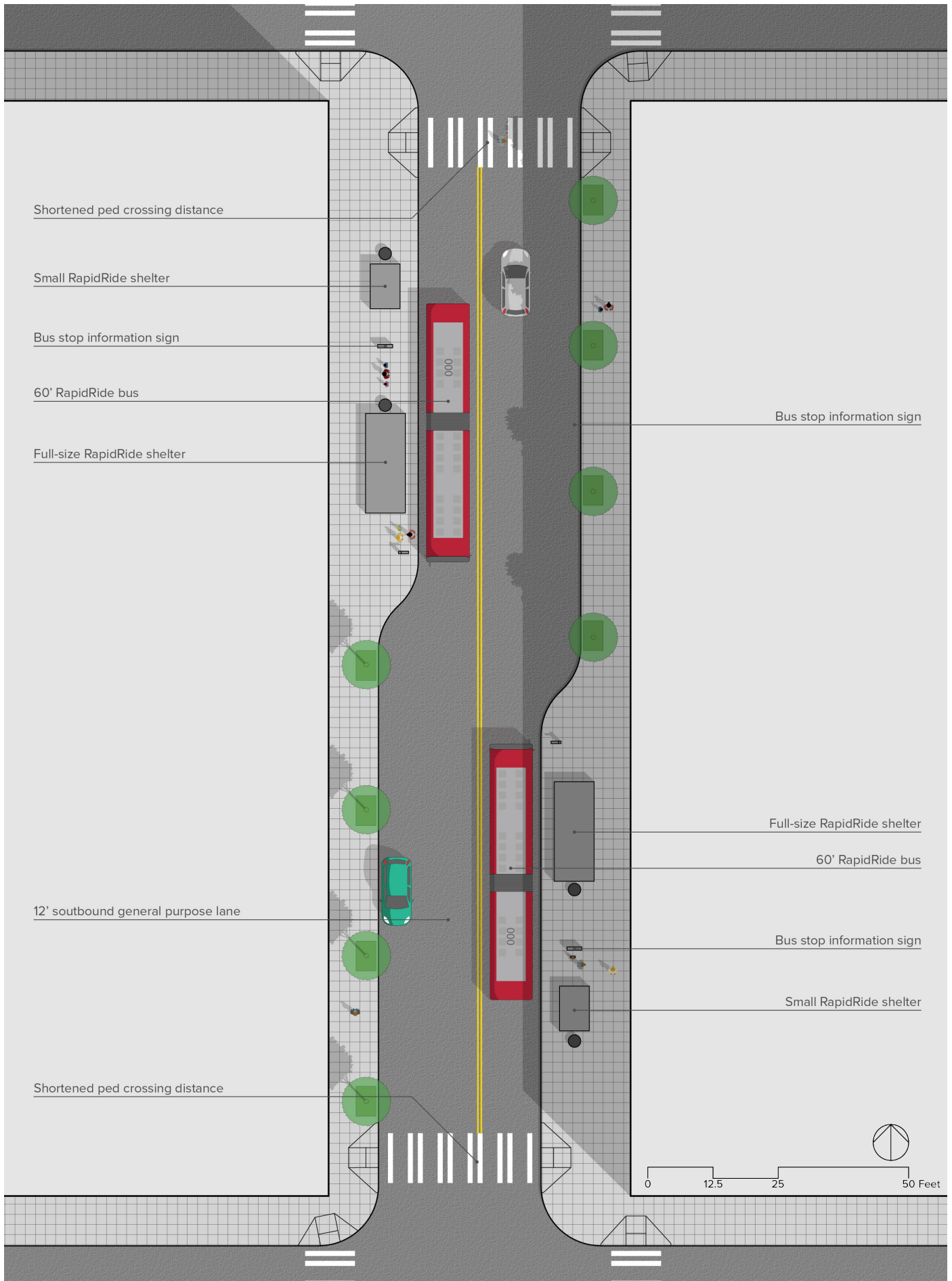


Fig. 5-12: Site plan - Roosevelt Way NE, two-way transit stops & parking.

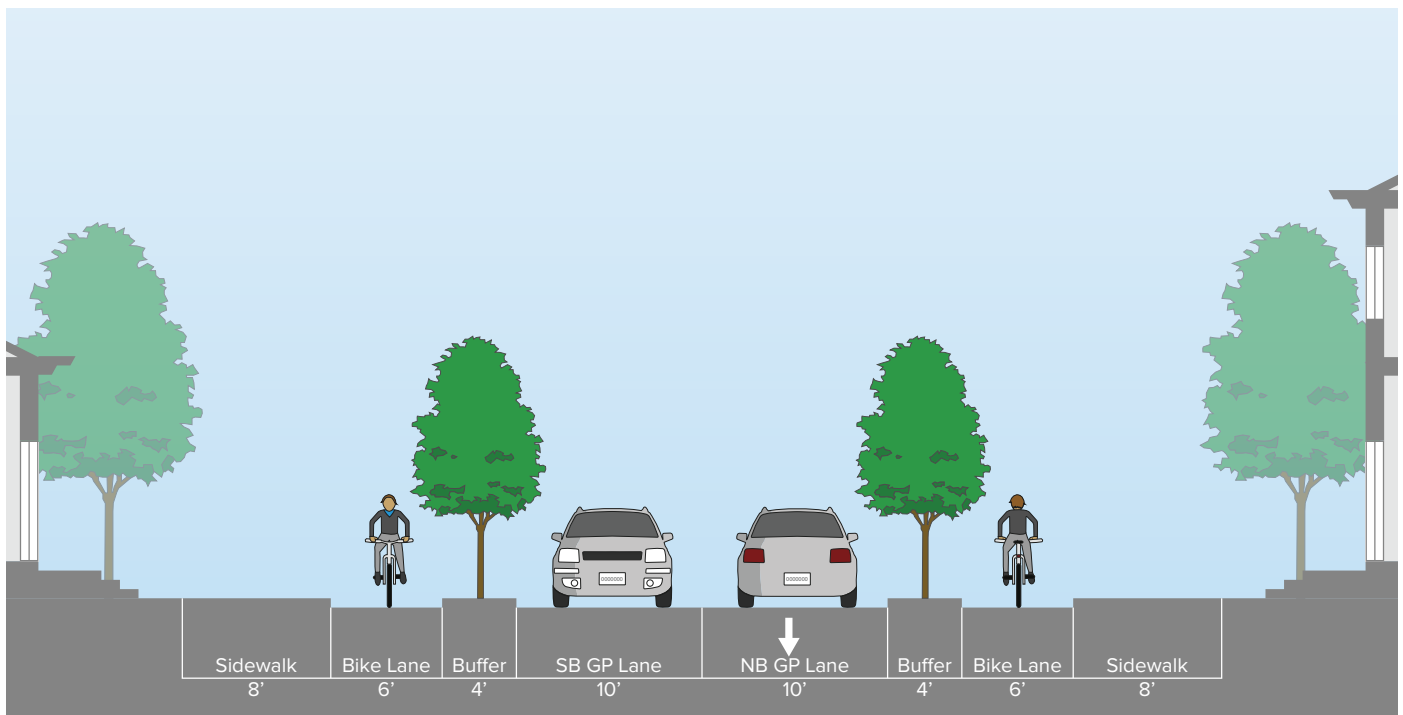


Fig. 5-13: Section - 12th Ave NE, two-way with bike lanes.

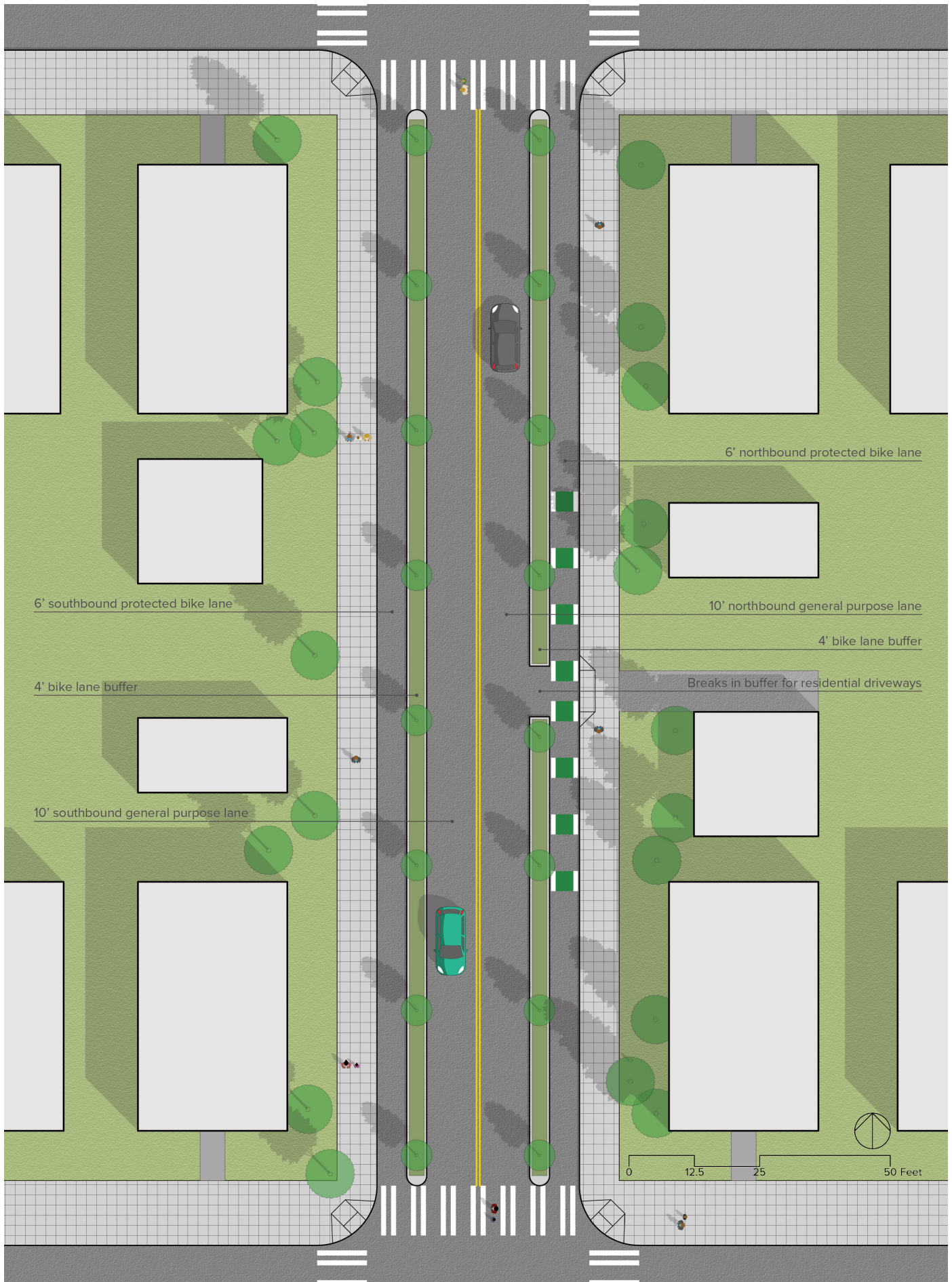


Fig. 5-14: Site plan - 12th Ave NE, two-way with bike lanes.

Roosevelt Ave NE, NE 75th St to NE 80th St

The above conceptual alternatives have all focused on the part of Roosevelt Way NE between NE 65th St and NE 75th St, and parallel parts of 12th Ave NE. These sections of the corridors are more or less consistently 40' wide and have similar and consistent block lengths, allowing for functionally generalizable concepts on a per-block basis. As noted in section four, "Site Analysis," 12th north of 75th merges into Lake City Way NE, meaning that bus service aiming to serve the Maple Leaf neighborhood (generally north of 75th in this area) and into the Northgate area can't functionally utilize this corridor past 75th. The current channelization of Roosevelt north of 75th indicates some awareness of this fact, as it switches to a two-way corridor (see section four, "Site Analysis" for more detail about this part of the corridor).

In addition to switching to a two-way corridor, the street narrows from 40' down to 36', which despite being only a 10% decrease greatly limits the range of possible improvements that still meet the infrastructure and safety priorities of each planned mode. Presented here is a concept for rechannelizing Roosevelt Way north of NE 75th St that meets these priorities, that can be integrated with any of the above concepts to help create a cohesive and connected corridor. For Concepts 2 and 3 – which incorporate 12th Ave NE in addition to Roosevelt Way NE – the issue arises of east-west connection from northbound 12th to northbound Roosevelt along NE 75th St. While this will be discussed in terms of bike alignment in this section, a specific design for this connection point will be investigated further at the end of this section, in the context of the full corridor.

Incorporating only this design for this section of the corridor is not meant to imply that there aren't alternatives that are worth considering, or even that this specific alternative is the best among them. However, it offers some of the greatest compatibility with the concepts explored above, and provides an opportunity to investigate how to incorporate these various improvements under greater constraints.

First of all, this concept retains the current two-way flow of the corridor. With buses unable to continue north of NE 75th St on 12th Ave NE, it is important to maintain this portion of Roosevelt Way NE as two-way to accommodate this flow. This requires a total of 22'-24' for general purpose vehicle use (11'-12' in each direction needed for bus traffic), leaving only an additional 12'-14' of roadway for protected bike lanes, buffers, and any other amenities. Given preferred bike lane widths of 6', this leaves little to no room for anything else, such as buffers. To accomplish the physical separation that makes protected bike lanes what they are, this concept separates the bike lanes vertically through grade-separation (rather than horizontally with a buffer). While this is not a model that is currently utilized in Seattle in such a context, it is in place elsewhere in the world, and has been successful at providing the same separation needed for protected bike lanes (see Fig. 5-15).

This raises the issue of transit loading/unloading for those blocks with transit stops. Once raised, the possibility exists of bringing the bike lane behind transit stops, similar to Concept 2. However, obvious potential constraints exist, in the form of existing trees and street furniture. Shown in this concept is a model for bus/bike integration also being utilized elsewhere around the world (in many of the same places utilizing raised bike lanes), where transit loading/unloading occurs across the raised bike lane, essentially bringing bikes to a stop during that process. Through creative paint, warning signage, and good visibility, it is possible to alert cyclists to the changing dynamic of this space, and allow them to briefly yield to passengers getting on and off the bus when needed.

It's important to consider how the bicycle infrastructure of this concept meshes with that of the other three concepts, and the various safety impacts of each. While Concept 1 provides the most direct alignment (two-way on Roosevelt Way NE both north and south of NE 75th St), the shift from two-way on one side of the street (south of 75th) to individual lanes on either side of the street (north of 75th) requires northbound cyclists to cross traffic in order to utilize the northbound lane on the east side of the street (see Fig. 5-16, next page). Concept 2 addresses this issue by shifting northbound cyclists to 12th Ave NE, but this alignment requires a left turn onto 75th (or another east-west street prior to 75th), followed by a relatively safe right turn into the northbound bike lane (see Fig. 5-17, next page). Concept 3 maintains this same left turn followed by a right turn for northbound cyclists, but additionally requires that same movement for southbound cyclists – creating likely the most complex overall connection between the two concepts (see Fig. 5-18, next page).



Fig. 5-15: An example of a raised, protected bike lane in Copenhagen, Denmark. Photo from Wikipedia

THE DESIGN

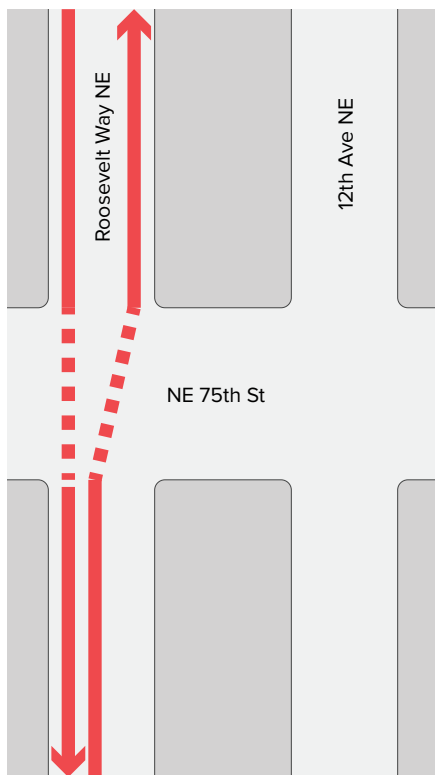


Fig. 5-16: Bike lane alignment, Concept 1

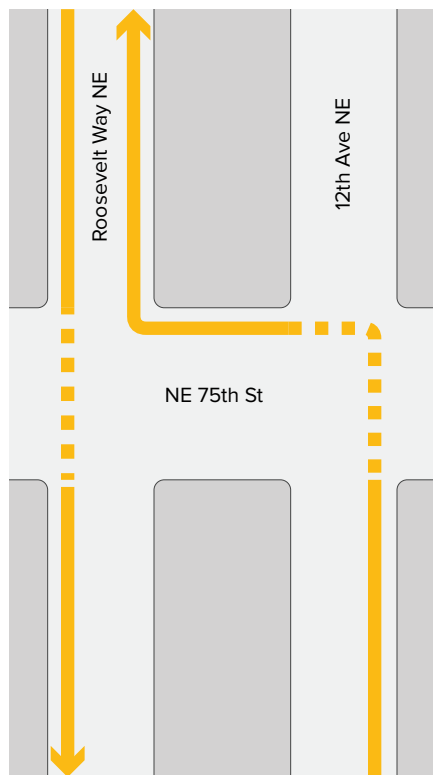


Fig. 5-17: Bike lane alignment, Concept 2



Fig. 5-18: Bike lane alignment, Concept 3

Pros:

- ▶ Concentrating all modal improvements onto a single corridor helps reduce overall project cost and scope.
- ▶ Strong emphasis on bus and bike integration reduces the amount space that needs to be exclusively dedicated to each.
- ▶ Concept requires minimal change to existing corridor, both in terms of infrastructure and channelization.
- ▶ Raised bike lanes provide an additional spatial buffer between traffic flow and largely residential uses on either side of the street.

Cons:

- ▶ Bike lanes on both sides of street prevent the addition of curb bulbs, but other intersection pedestrian safety improvements may be possible.
- ▶ Street width leaves little room for exploring how to best integrate different modes on the same corridor.
- ▶ Bus/bike integration, while efficient, may cause conflict during times of high use – especially both AM and PM peak hours.
- ▶ Concentrating all modes onto a single corridor – even though this is representative of current conditions – may overwhelm operations and residents.

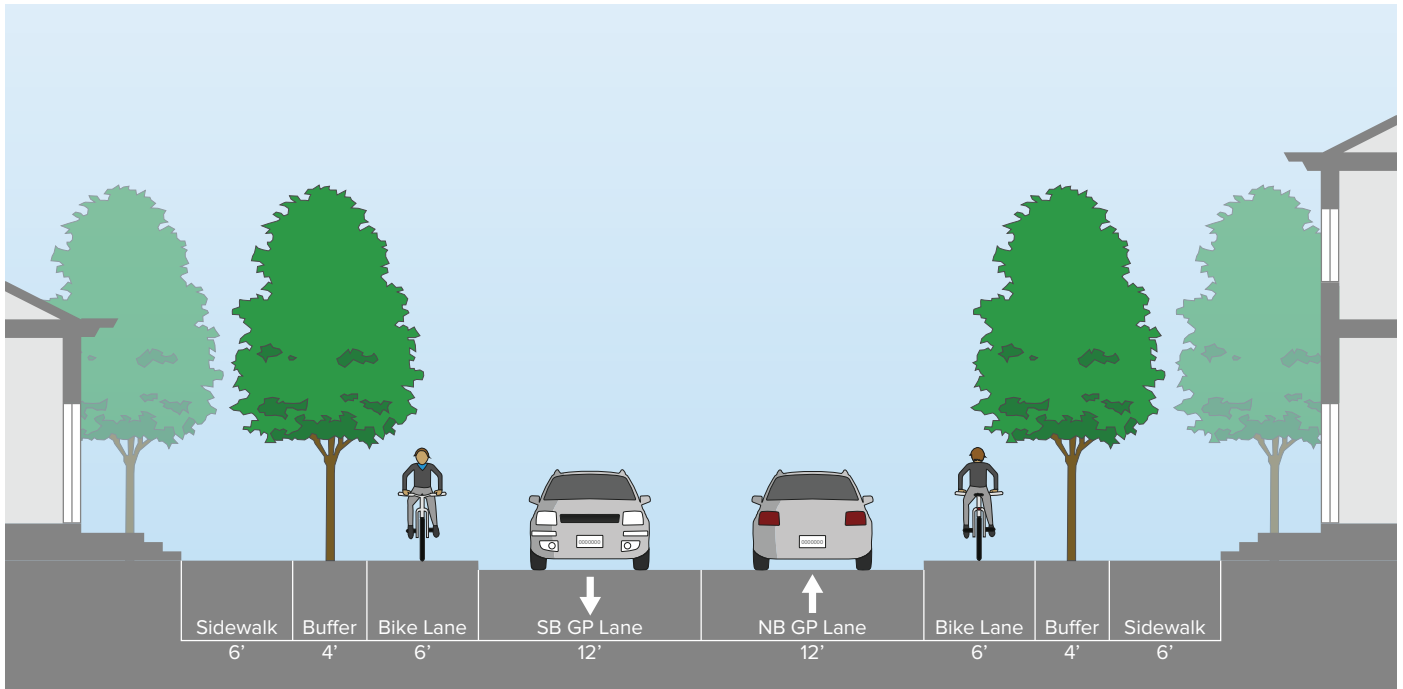


Fig. 5-19: Section - Roosevelt Way NE, two-way with raised bike lanes.

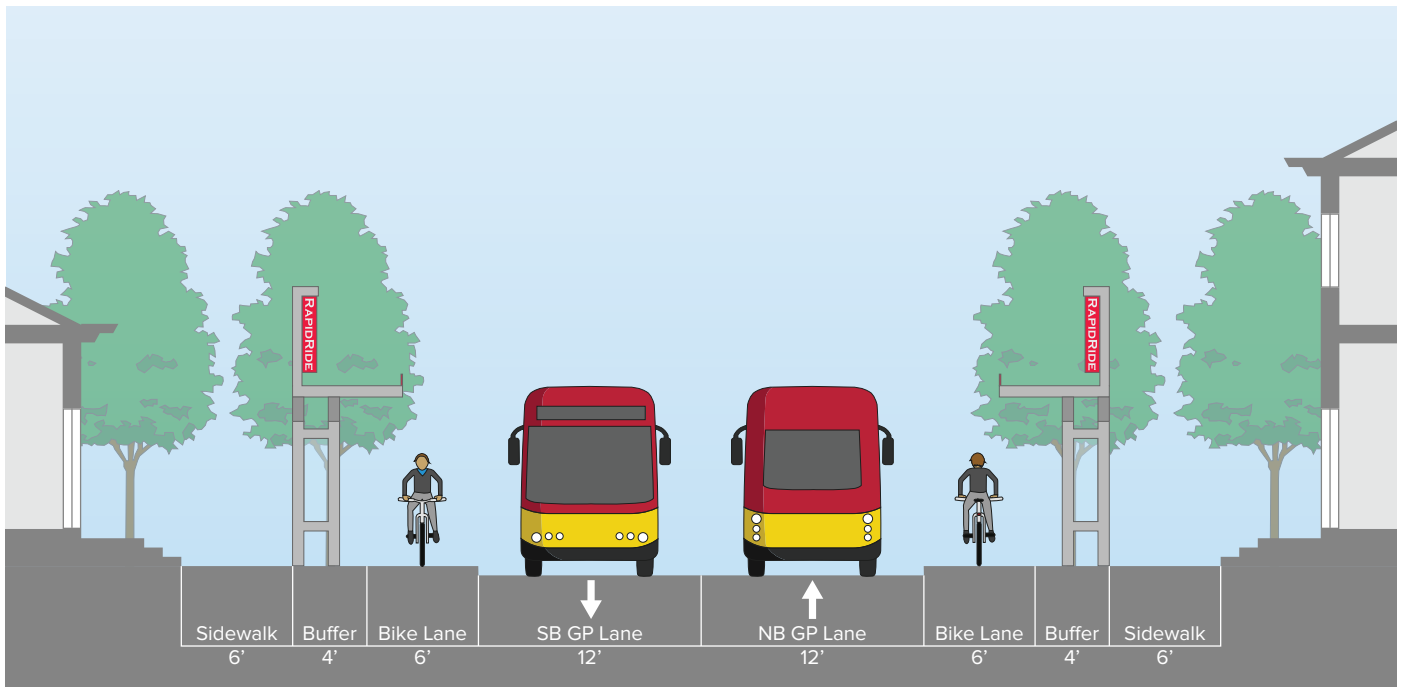


Fig. 5-20: Section - Roosevelt Way NE, two-way with transit stops.

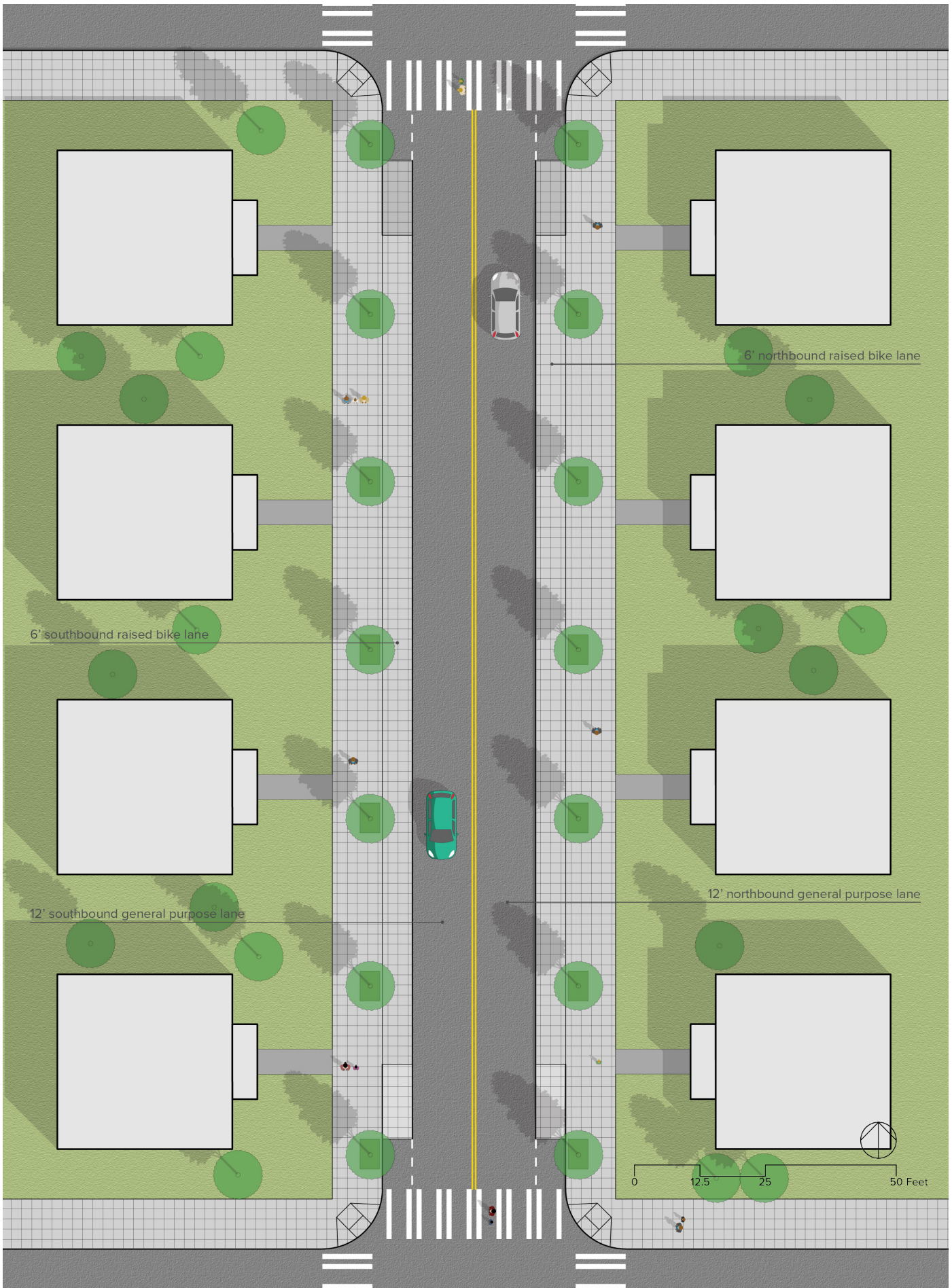


Fig. 5-21: Site plan - Roosevelt Way NE, two-way with raised bike lanes.

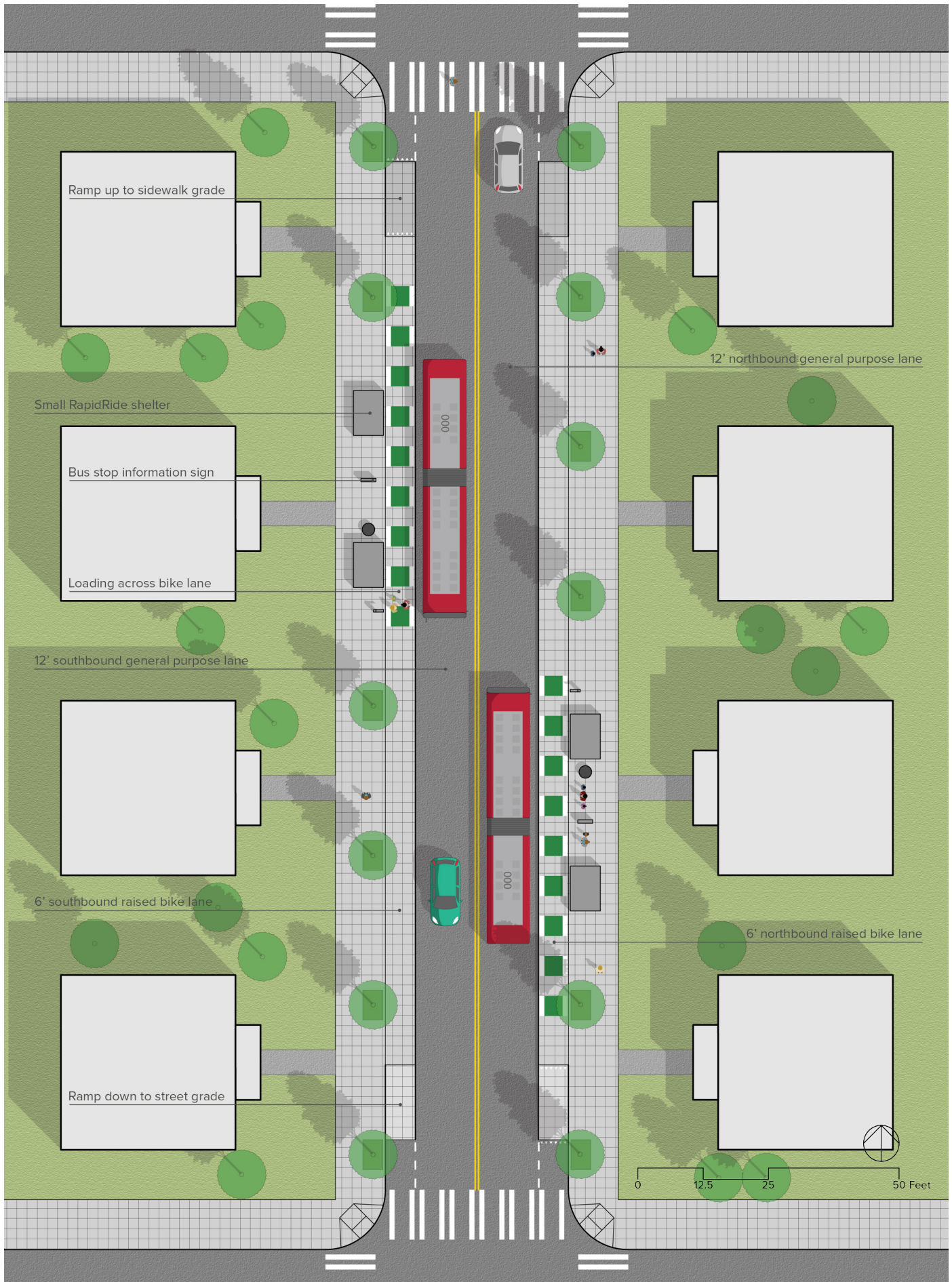


Fig. 5-22: Site plan - Roosevelt Way NE, two-way with transit stops.

Discussion

Overall, it is clear from these three concepts that the capacity exists on these corridors for robust bicycle and transit infrastructure, to improve the operations and safety of both modes. However, these improvements do come at a price, which varies from concept to concept, and based on a number of decisions and priorities. Each affects traffic operations, pedestrian safety, modal priorities, and parking supply in different ways, and balancing these is a complex task that requires careful investigation.

Concept 1 converts Roosevelt Way NE into a two-way corridor to provide added service to both transit and bicycles, through wide lanes and a two-way protected bike lane on the west side of the street. It does so without regard for 12th Ave NE, the second half of the couplet. Even incorporating 12th into the design (by converting it to two-way as well, without any other improvements for cyclists or transit), does not solve some of the other alternative's flaws. Converting Roosevelt to two-way – with a single lane in each direction – will cause traffic to come to a stand-still whenever a bus is stopped at a transit island. Assuming headways of 7.5 minutes, dwell times of 20 seconds per bus per stop, and three bus stops along this section of the corridor, this means an additional 8 minutes of potential delay per hour, in each direction. While this isn't a concern during off-peak hours, this could have devastating affects on operations during peak hours.

One advantage that this concept has over the others is in terms of bike lane alignment with the north section of Roosevelt Way NE. As discussed previously, all three alternatives face challenges in bike connectivity between the north and south parts of the corridor, though perhaps least so for this alternative. While southbound cyclists can continue straight in the bike lane, northbound cyclists will have to move from the west to the east side of the street – a maneuver that can be aided by a bicycle-only queue jump at 73rd. Although not ideal, this provides a safer movement than what cyclists under Concepts 2 and 3 would need to do, which require left-turns onto NE 75th St.

Concept 2 is notable because it is the only alternative that maintains the current directionality of both Roosevelt Way NE and 12th Ave NE, while providing added transit service and bicycle infrastructure to both. This is important for two main reasons: First, the objective efficiency of one-way corridors can be maintained, providing additional capacity for future growth in the area; and second, keeping the current directionality will mean a shorter and less dramatic adjustment period for the corridor's users. This second point not only helps maintain existing operational quality along the corridor, but can also help prevent potential safety issues – converting a one-way street to a two-way street, for example, creates the possibility for someone unfamiliar with the change to turn into a left-hand lane and into on-coming traffic, potentially hurting both themselves and others.

Maintaining the one-way flow also maintains at least one open travel lane in each direction during transit loading/unloading, as mentioned in the analysis of Concept 1. While this is technically true for Concept 3 as well (with no buses on 12th Ave NE, travel lanes in both directions will be free from any delays caused by transit), it is done so in a way with potential unintended consequences: As the opposite will be true on Roosevelt Way NE, general purpose traffic may choose to use 12th instead, causing it to become a busier corridor than it is now, and perhaps even busier

than Roosevelt would be. Maintaining both corridors as one-way provides a balance between operational flow, corridor character, and potential added delay.

Concept 3 presents a “parallel corridor” model of transportation planning, by relegating all bus infrastructure to Roosevelt Way NE and all bike infrastructure to 12th Ave NE. Specializing each corridor allows more public right-of-way to be dedicated to each mode, creating safer and more usable spaces. Similar to Concept 1, however, converting both corridors to two-way will compromise overall corridor efficiency (though in a more comprehensive way given the inclusion of 12th in the scope of the project). Also, as mentioned above, the bike lane alignment between 12th (south of NE 75th St) and Roosevelt (north of 75th) is the weakest of the three concepts, requiring left turns onto and the use of one of the busiest parts of 75th in order to connect. Solving this problem in a bubble would be easy, by simply switching the modal designations of the two corridors – protected bike lanes on Roosevelt and transit improvements on 12th. Outside of the bubble, however, it is important to consider that pushing bus travel to 12th may compromise the nature of the corridor. The need for compromise between these two elements – one block of bicycle safety and the residential nature of 12th – may present a fatal flaw for the overall viability of this concept.

This concept also helps maintain the efficiency of general purpose traffic through the area, as almost all of the parking removed will be along 12th (because of the addition of protected bike lanes), while almost all of the parking along Roosevelt will be retained – almost all on-street parking for blocks without transit stop improvements, and up to half of the parking for blocks with new bulbed-out transit stops. This helps concentrate parking supply on the busier, mixed-use, commercial corridor, while discouraging parking on the quieter residential street. This is contrasted with Concept 2, which removes half of existing parking on typical blocks and all existing parking on blocks with transit stops for both Roosevelt and 12th, providing about half the amount of overall parking as Concept 3, and spreading that parking supply across both corridors. Because it does not propose improvements for 12th, Concept 1 technically maintains the most parking (all of the existing parking on 12th and about half of the existing parking on Roosevelt, in a similar manner to parking on Roosevelt under Concept 2), but its lack of comprehensiveness outweighs this marginal benefit over Concept 3. Maintaining this much parking along the corridor in Concept 3 is not only politically appealing, but from a street-use perspective maintains additional flexible space for other creative uses, like parklets and additional curb bulbs – amenities not as easily incorporated in the other two concepts.

Though each Concept has its respective merits, Concept 2 presents a preferable alternative, by largely maintaining current corridor operations (and therefore general usability), safely integrating the different modes, and providing a comprehensive strategy for the corridor. It’s middle-of-the-road bicycle alignment on either side NE 75th St is an acceptable compromise, and it is able to effectively balance the needs and characters of each of the two corridors. In contrast, Concept 1 does not provide a holistic solution, instead ignoring 12th Ave NE, and provides an important lesson in ensuring that one chooses an appropriate scope for multimodal corridor design projects. Incorporating both modes – in both directions – on a single 40’ corridor is a tight fit, and necessitates compromising the amount of space that can be dedicated to each mode. While Concept 3 is more comprehensive and appears to smartly dedicate different modes to their appropriate corridors, it runs the risk of actually pushing more general purpose traffic to 12th, and

provides the most complex bike alignment between 12th and Roosevelt north of 75th. Therefore, the general design and right-of-way allocations presented in Concept 2 will be used as the basis for the design presented in the next section.

CORRIDOR DESIGN

This section presents the final conceptual design for incoming RapidRide service and added protected bike lanes – and associated improvements to pedestrian and vehicle travel – on Roosevelt Way NE, 12th Ave NE, and NE 75th St. Every aspect of the neighborhood and other information discussed up until this point – theories about multimodal transportation planning, in-person and secondary site analysis, consolidated modal requirements, conceptual alternatives, and local in-progress planning projects – are all incorporated into the design described and shown within this section, both explicitly and implicitly. First, a written justification for the design elements is included, as well as site and mode-specific considerations. These are then presented, holistically, in a full-corridor site plan that represents the study area after improvements are completed.

The corridor improvements presented below are organized by specific mode. There is, however, almost endless overlap between the requirements and benefits of specific improvements (e.g. bus stops can act as buffers for protected bike lanes, and protected bike lanes can act as buffers for pedestrian travel), and relevant improvements are referenced in other sections, as needed.

Pedestrian Improvements: Sidewalks and Crosswalks

The major – and perhaps most visible – improvement for pedestrian travel is the addition of at least basic, marked crosswalks at almost every legal crosswalk location. Although, as discussed in the modal requirements part of section two, “Literature Review,” these locations are all already legal crossing locations, providing clear indications of this status will help to both counteract any potential public or individual perception of the contrary, and redefine the space as a shared amenity, providing added visibility and safety for crossing pedestrians. The few exceptions that won’t receive marked crosswalks are the north part of the intersection of Roosevelt Way NE & NE 73rd St (where east-west pedestrian crossing conflicts with a Safeway parking lot entrance) and the intersections between NE 77th St and NE 79th St & Roosevelt (where raised bike lanes prevent east-west connections across Roosevelt). The intersection of Roosevelt & NE 78th St will see the largest intersection improvements, in the form of fully raised, sidewalk-grade intersection. This will act as a speed table for vehicles, and provide an additional level of safety for pedestrians crossing in all directions. This makes up for the lack of east-west crosswalks at the two intersections along the northern part of Roosevelt as mentioned above, and strengthens pedestrian connectivity in close proximity to added northbound and southbound transit stops, as discussed below.

One of the big drawbacks of the design is the inability to provide much needed widening for sidewalks along both corridors. Current sidewalks hover around 6’, but get functionally pinched down to 4’ at certain locations. A number of the new incoming developments include 3’ setbacks which help provide additional pedestrian space, and although this practice should be encouraged

in future development proposals, this potential isn't reflected in the site plan (except for projects that have already listed this as a provided setback). Other improvements – such as the protected/raised bike lanes and their associated buffers – will help to improve pedestrian safety as well, by putting additional space between them and moving cars, but effort should still be made to provide wider sidewalks wherever possible. For locations where wider sidewalks cannot be provided due to site constraints, at the very least new sidewalks should be provided, as many of the current sidewalks are in disrepair and may not meet basic accessibility requirements.

Bicycle Facilities: Physical Separation

For the one-way sections of Roosevelt Way NE and 12th Ave NE, 6' bike lanes with raised 5' raised buffers provide the best protection available. While this overall 11' could be further allocated in favor of travel space over buffer, a 5' buffer allows for more creative use of the space to enhance the overall aesthetic feel or functionality of the space – planters, trees, bike racks, and even art. At transit stop locations, the bike lane is at-grade with the sidewalk and transit waiting area. To help address potential conflict between bicyclists and pedestrians crossing to the transit area, green paint is used to warn of an upcoming conflict, and to indicate where the conflict is likely to happen. This is accompanied by clearly marked crossing areas and signs indicating that bicyclists should yield to crossing pedestrians.

The narrower public right-of-way along Roosevelt Way NE north of NE 75th St prevents the implementation of typical, buffered protected bike lanes. As transit will use lanes in both directions along this corridor, a width of 11' per lane is provided, leaving a total of only 14' for both directions of bicycle travel and any buffers. While a 6' bike lane and a 1' buffer would fit within these constraints, it would not meet general PBL minimum requirements, and it would not interface well with added transit stops (as there is no room for the lane to go behind, unlike the transit stops provided in the southern parts of the study area), and would not adequately address many of the safety issues along this stretch of the corridor. Instead, raised bike lanes – at-grade with the sidewalk – are provided, with a 2' mountable curb (a sloped buffer that rises ~6" across the 2', allowing for bicyclists to pass one another and emergency vehicles to use the space if needed). At transit stops, the raised bike lanes continue as they would normally, providing the curb-side loading space that a normal transit stop would otherwise have. Paint and signage are used to reinforce how the space is used and defined: During loading, bicyclists yield to pedestrians and stop well before the transit stop area, and during all other times, it functions as any other section of the raised bike lane.

Aligning the protected bike lane and its buffer on the one-way parts of the corridors with the right or left side of the street was an important consideration that was carefully analyzed prior to eventually choosing the right side of the street. NACTO's "Transit Streets Design Guide" recommends that one-way streets with both bicycle and transit improvements provide these amenities on opposite sides of the street, in order to reduce conflict between them and provide a generally more organized use of the public right-of-way (National Association of City Transportation Officials 2016). For this corridor, this would likely manifest as (from west to east) two travel lanes, a parking lane, and then the protected bike lane. Using vehicle parking as part of the buffer for protected bike lanes is a practice that's gaining popularity, but in order to be provided in the safest

way requires an additional buffer between vehicles and the bike lane, so no space is saved over the alternative option. For blocks with transit stops, bulbed-out waiting areas would be provided (similar to the design presented in this section), but would be connected directly to the sidewalks instead. Although essentially equivalent to the design presented in this report, issues arise when this alignment is considered in conjunction with the north part of Roosevelt Way NE (which would provide bike lanes in each direction on the more typical sides of the street, requiring southbound bicyclists to cross from the right side of street north of NE 75th St to the left side of the street after the intersection) and the current paving project on Roosevelt south of NE 65th St (which provides the protected bike lane on the right side of the street). Because of this, and because of the assumption that conflicts between bicyclists and transit users is at worst no different and at best safer than conflicts between bicyclists and parked cars, the protected bike lanes are aligned with the right side of the street.

A special treatment is needed for the interface between the northbound bike lane on 12th Ave NE and the westbound bike lane on NE 75th St, which brings cyclists to the northbound bike lane on Roosevelt Way NE north of 75th. This interface requires a left turn for cyclists, a scenario which is always difficult to structure in a way that is both functional and safe. A bus queue jump is planned for this specific intersection (essentially giving buses a green light to make their maneuver before general purpose traffic – see below for more discussion), and the length of this green light can be extended slightly to also provide signal priority for any bicyclists waiting to turn left from 12th to 75th. For cyclists who reach the intersection while general purpose traffic already has a green light, however, a two-stage left turn box (as discussed in the modal requirements part of section two, “Literature Review”) is provided at the northeast corner of the intersection.

Transit Improvements

The current bus stop locations in the study area (that serve route 67 and peak-only route 63) don't seem to be placed near amenities or potential connections, but rather just fit into a standard bus stop spacing of about four stops per mile. As discussed in the section five, “Current Planning Efforts,” the 2016 update to the Transit Master Plan (TMP) included a conceptual routing and a set of bus stops for this planned RapidRide route, which followed a similar spacing-based logic, though centered around the major, signalized intersections – NE 65th St, NE 70th St, NE 75th St, and NE 80th St. While a slightly more intentional set of stops, this doesn't take advantage of existing or planned activity centers, such as nodes of increased development along the corridor. The stop spacing and locations recommended in this design are a departure from both existing stops and the stops recommended in the TMP update, and attempt to prioritize both activity centers and potential transportation connections, as follows:

- ▶ **Roosevelt Way NE & NE 79th St, Southbound, Far side:** Mid-point between 75th & 80th, connection to Fairview Christian School and businesses on Lake City Way NE, and central point of single family area of neighborhood
- ▶ **Roosevelt Way NE & NE 73rd St, Southbound, Far side:** Proximity to neighborhood amenities, including Safeway, Swedish Physicians, and New Discovery School

- ▶ **Roosevelt Way NE & NE 67th St, Southbound, Far side:** Main southbound connection point with incoming Roosevelt light rail station, and central to incoming multifamily and mixed-use developments
- ▶ **12th Ave NE & NE 68th St, Northbound, Far side:** Main northbound connection point with incoming light rail station, and proximity to Roosevelt High School
- ▶ **12th Ave NE & NE 73rd St, Northbound, Far side:** Connection point to above listed amenities on Roosevelt Way NE, and proximity to 75th
- ▶ **Roosevelt Ave NE & NE 78th St, Northbound, Far side:** Same as Roosevelt Way NE & NE 79th St

Because far-side, in-lane stops are planned for this corridor, and there is no substantial underlying non-RapidRide bus service (that may require two buses to be at the same stop at the same time), 70' is the maximum stop length to be used (the 60' required plus a small buffer). Additionally, also because there is no underlying service, a stop spacing of four stops per mile will be used to ensure that the route adequately serves the neighborhood (given that the scope of this project along Roosevelt is less than a mile and less than half a mile along 12th, a stop spacing of two per mile would result in only one or two stops along Roosevelt, and only one along 12th, which seems too few to adequately provide service to the area).

Each intersection with an existing traffic light will be upgraded to provide transit signal priority (TSP) – also known as a “queue jump” – for buses and bicyclists. Essentially, a separate green light is provided for transit and bicyclists prior to one being provided for general purpose traffic, allowing transit to quickly enter the intersection and merge in ahead of the queue of general purpose traffic (improving transit speed and reliability), and allowing bicyclists to safely enter the intersection while it's otherwise clear (reducing the chance of collisions). As even a head-start of only a few seconds can greatly improve both safety and reliability, TSP can be implemented in such a way as to minimally impact the timing of the light cycle, though space otherwise available for parking is taken away in order to provide dedicated space for the bus to wait, separate from general purpose traffic. Providing TSP was an element identified in the TMP update, and is a good way to improve transit travel times with minimal impact on traffic operations, and has therefore been included as a part of this design.

Lane Requirements

The widths of each lane are tailored to their intended use, and range from 10' – 11' along the corridor (excluding the variable width lane used by southbound traffic from Lake City Way NE to merge onto Roosevelt Way NE south of NE 75th St). In general, right lanes are 11' – to accommodate buses traveling along the corridor – and left lanes are 10' – as they won't need to accommodate regular bus travel. Intersection approaches with queue jumps have two 10' general purpose travel lanes while the queue jump pocket itself is 11', as transit should only over use this part of the right-of-way. As neither street is designated as a Major Truck street, substantial truck travel is not expected through the area, and these lane widths should be adequate for serving local freight delivery to the handful of business in the area. Although lanes could be further narrowed to encourage slower traffic speeds and improved safety, this added level of safety is achieved

through the constant shifting of lanes to left and right. Lanes that are perfectly straight and do not require any action on the part of the driver to remain within them are easy to speed through without regard to surroundings, and forcing drivers to continuously shift to the left and right (even the slight amount included in this design) help them to pay attention to their surroundings as they move through the area, while not preventing them from traveling at appropriate and reliable speeds. Cautious driving behavior is further enforced by improving every corner to have 5' radii, which is much smaller than the standard along the corridor now and forces vehicles to make tighter – and therefore slower – turns. Although these specifications do not line up with the minimum requirements laid out in the city's Right-of-Way Improvements Manual, they do reflect current industry best practices, and additionally present an argument for updating the Manual to reflect more current standards.

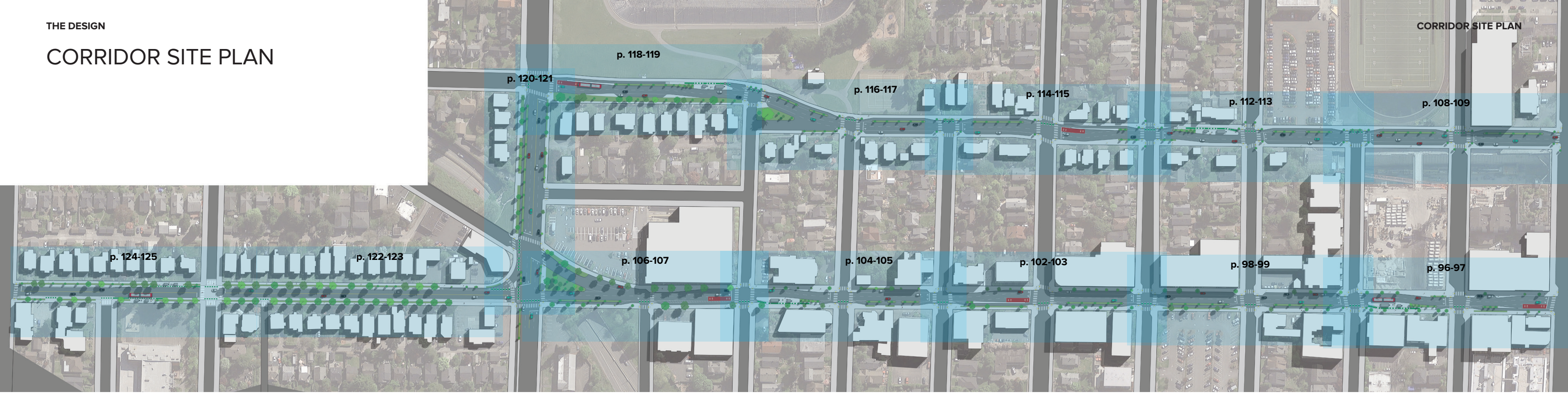
Block Typologies

All of the improvements listed above have been applied to every block along the corridor, with the exception of transit stops and queue jumps which are specific to those locations for which they apply. Having these three scenarios – blocks with transit stops, blocks with queue jumps, and blocks with neither – lends itself to a set of block typologies that can be conceptualized out of context, and then applied to specific blocks based on existing conditions and other considerations. Other than where otherwise noted, each of these typologies include marked crosswalks and pedestrian curb bulbs. The three typologies can be found on the following page.

In addition to their proximity to connection points and neighborhood amenities, proposed transit stop locations (and their respective blocks) have the added advantage of not overlapping with blocks preceding signalized intersections, allowing these two typologies to be implemented independently of one another. The one exception is the extra long block of 12th Ave NE between NE 73rd St and NE 75th St, which is treated as two separate blocks for the purposes of these typologies – the southern half receiving a transit stop and the northern half receiving a queue jump.

Given the very different nature of Roosevelt Way NE north of NE 75th St, these block typologies do not apply in the same way, and the section of the corridor is short enough that a separate set of typologies is not needed. Generally speaking, however, 75th to NE 78th St and NE 79th St to NE 80th St can be thought of as having the standard set of improvements, with 11' foot lanes and 5' raised bike lanes – with 2' mountable curbs – in each direction. As mentioned above, transit stops in both directions are planned for the block between 78th and 79th, though because loading/unloading will happen using and across the raised bike lanes, the only change is the absence of the mountable curbs in order to allow buses to pull directly alongside the loading/unloading area.

CORRIDOR SITE PLAN



Block Typologies

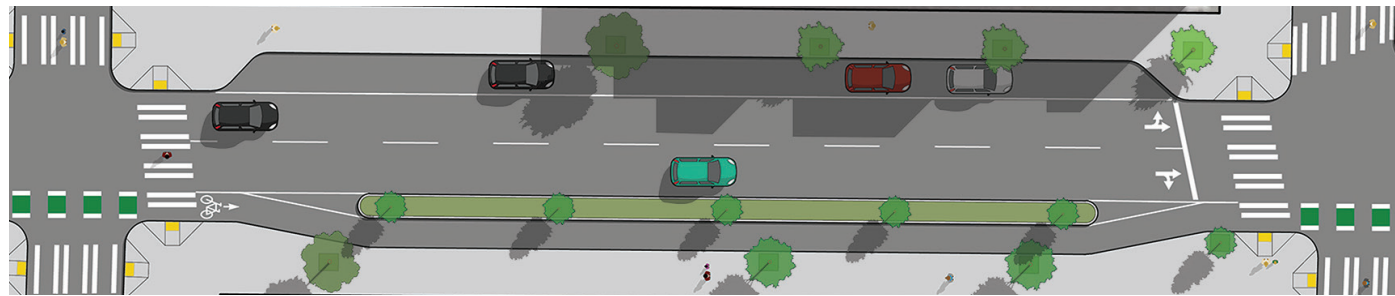


Fig. 5-23: Example of block with standard improvements.

Standard Improvements: The most common typology is essentially a block with no specific transit improvements. From an operational perspective, these blocks are focused on through-travel, and include space for two-lanes of travel in one direction, a protected bike lane, and a buffer. The lower intensity of improvements allows for a full block of on-street parking on one side of the street, and pedestrian curb bulbs perpendicular to Roosevelt on all corners (as well as parallel to Roosevelt where space is available on side streets).

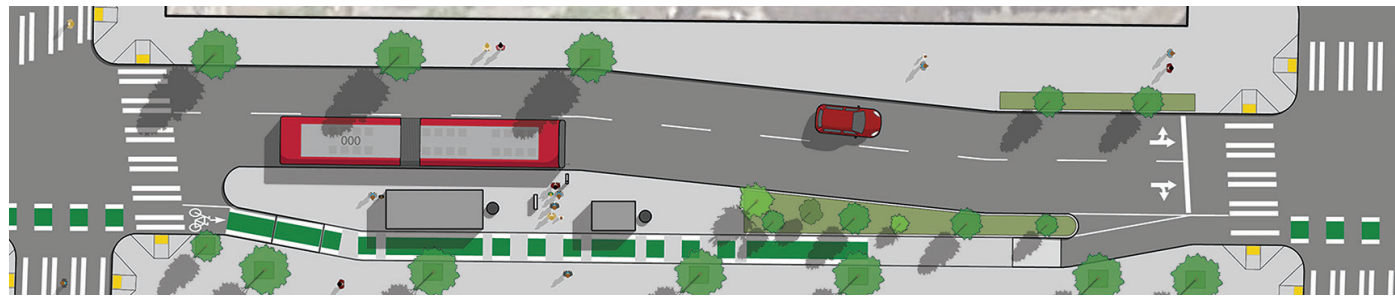


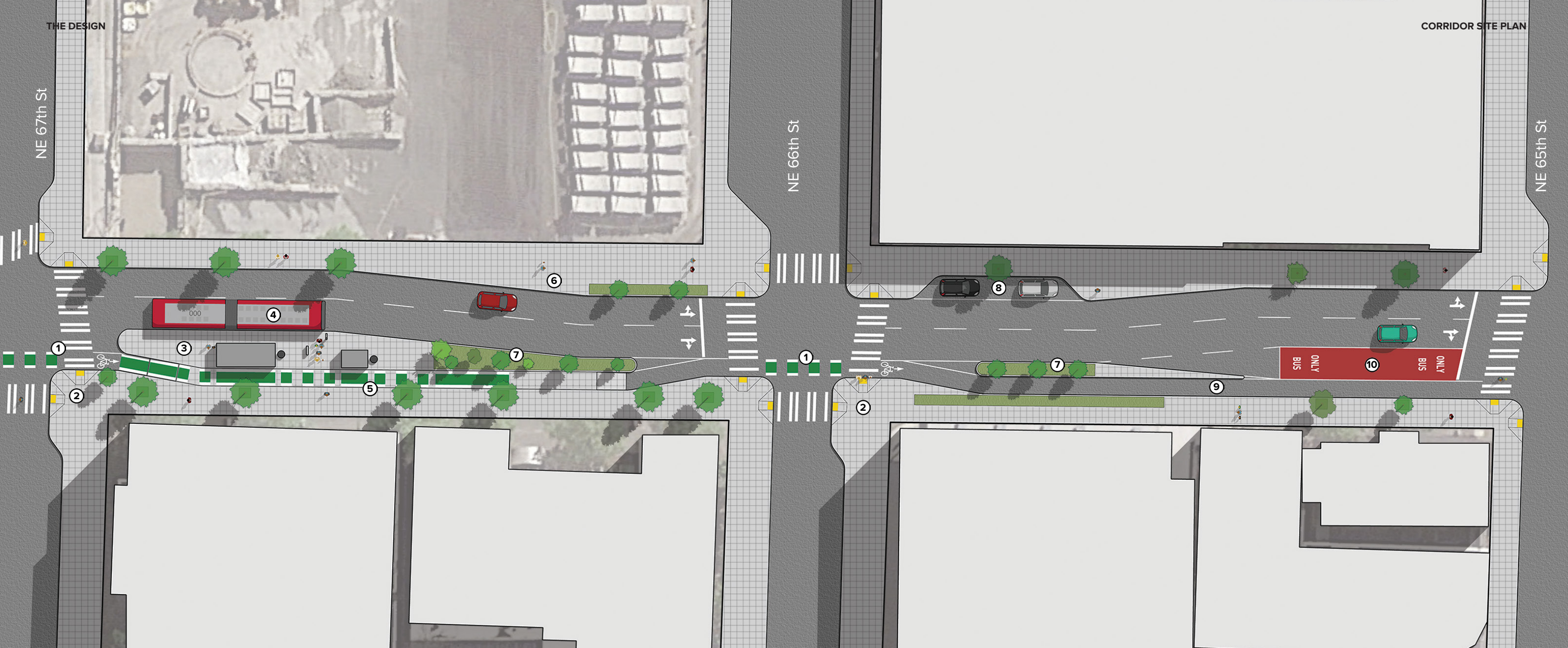
Fig. 5-24: Example of block with a transit stop.

Transit Stop: These blocks focus on providing a comfortable, safe, and accessible space for the proposed transit service. This includes a transit island connected to the protected bike lane, which ramps up to sidewalk-grade to allow pedestrians to cross to the transit stop. The island tapers from 13' to 5' in the downstream direction, and the lower half is heavily landscaped to provide added natural amenities to the space. The relative intensity of the improvements prevents curb bulbs at the preceding intersection, and any on-street parking from being retained.



Fig. 5-25: Example of block with a queue jump.

Queue Jump: As recommended in the Transit Master Plan, queue jumps are provided prior to most signalized intersections along the corridor. These blocks essentially shift from two to three lanes, the right-most of which is provided for transit only to wait for an early green light. Similar to the Transit Stop blocks, this comes at the cost of on-street parking, as well as some of the buffer provided for the protected bike lane. Furthermore, pedestrian curb bulbs are only possible on the side of the street closest to the bike lane given the space requirements for the added lane.



Roosevelt Way NE, NE 65th St to NE 67th St



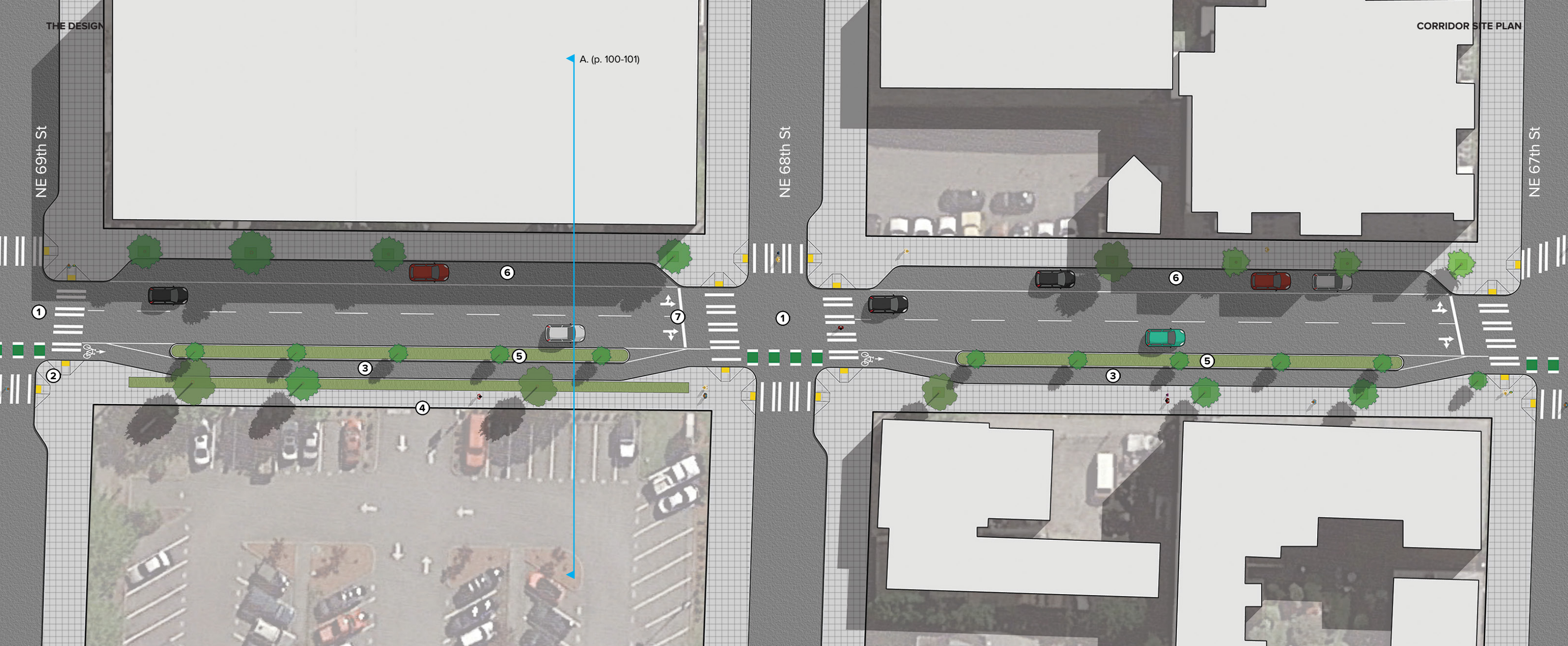
- ① Bike striping through intersection improves safety and visibility for downhill cyclists.
- ② Curb bulbs shorten pedestrian crossing times and new crosswalks improve safety and visibility.
- ③ 13' bus bulbs provide ample waiting and loading/unloading area for RapidRide passengers. Location allows for strong connectivity with incoming Roosevelt light rail station.

- ④ RapidRide stops provide stopping space for standard 60' coaches, plus 10' of buffer.
- ⑤ 6' protected bike lanes become raised behind transit stops to improve connectivity.
- ⑥ Removed street parking on both sides of the street provide room for larger transit stop.
- ⑦ New trees and tree pits improve quality of environment along the corridor, and improve runoff collection and retention.

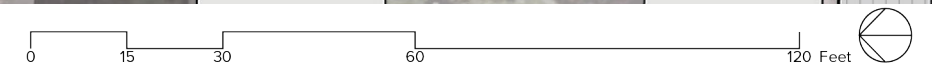
- ⑧ 3 parking spaces are retained to provide accessibility for local businesses.
- ⑨ Protected bike lane with raised buffer provides exceptional safety and comfort for cyclists of all ages and abilities.
- ⑩ Transit queue jump provides a dedicated space for transit signal priority at the signalized intersection at NE 65th St.

Extent Map





Roosevelt Way NE, NE 67th St to NE 69th St



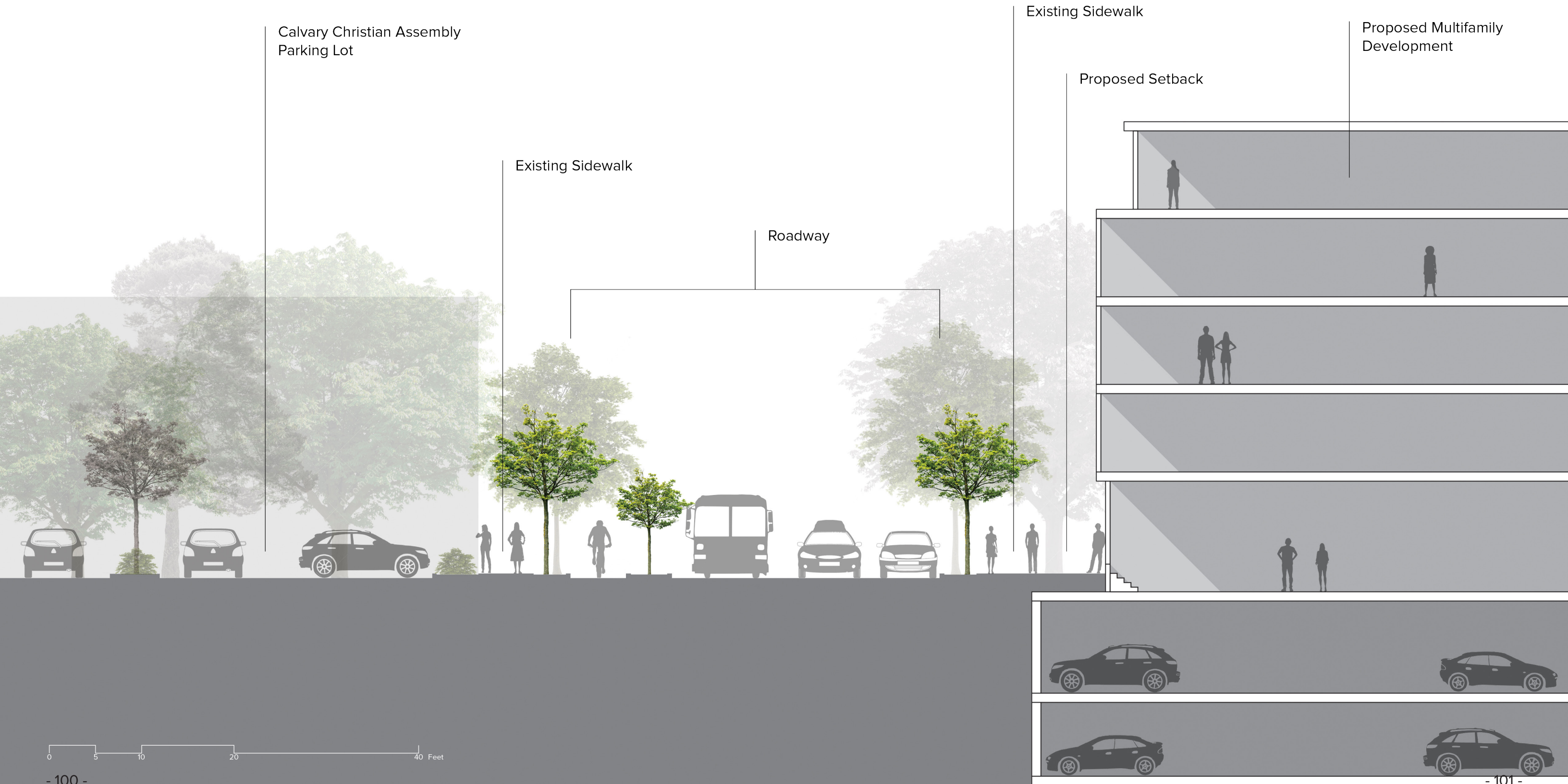
- ① Intersections with pedestrian curb bulbs on all four corners provide the optimal conditions for pedestrian safety and feelings of comfort.
- ② 5' corner radii restrict quick, sweeping turns, forcing vehicles to slow down to make the maneuver.
- ③ 6' protected bike lanes have a raised and planted buffer to provide additional safety.

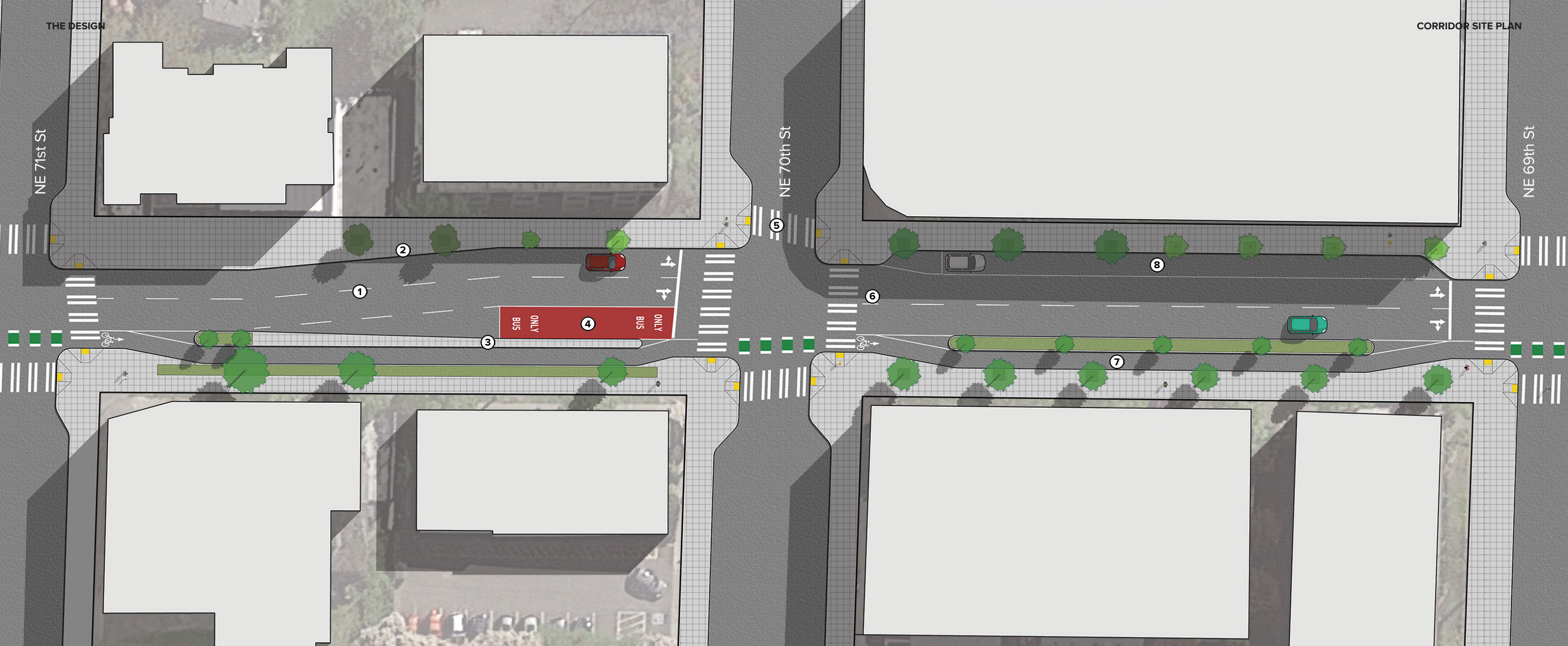
- ④ Entrance to parking lot between 68th and 69th is closed to provide a continuous buffer - other entrances are available on side streets.

- ⑤ Raised buffers with new plantings and street trees provide protection to cyclists and enhance the space's natural environment.
- ⑥ All parking on the east side of the street is retained to provide access to local stores.
- ⑦ An advanced stop bar placed 8' prior to the intersection helps prevent vehicles from prematurely entering the intersection and interfering with pedestrians.



A. Roosevelt Way NE, between NE 68th St & NE 69th St - Looking North



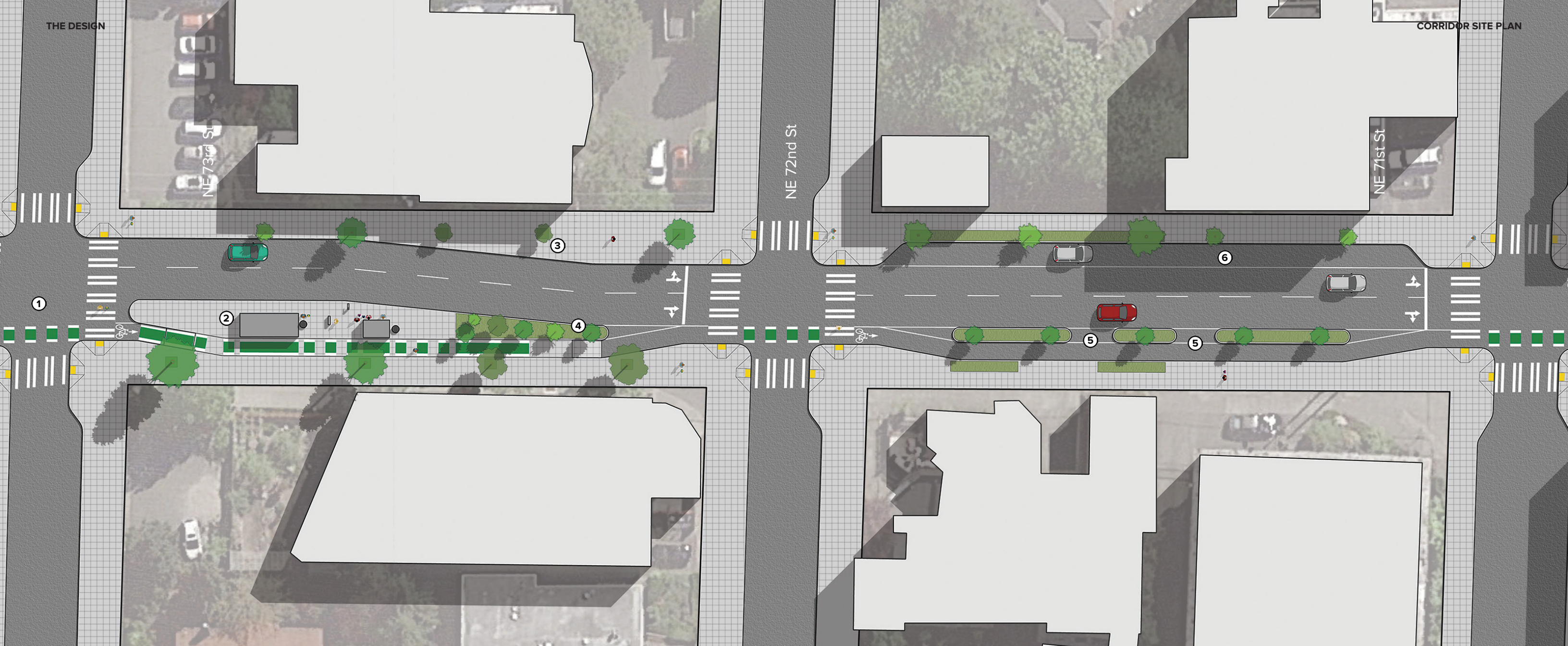


Roosevelt Way NE, NE 69th St to NE 71st St



- ① Lanes within blocks containing transit queue jumps jog to the left to allow for dedicated transit waiting space before the traffic light.
- ② Typical blocks with queue jumps require that all parking along the block is removed, to allow space for transit to wait separately.
- ③ These blocks still maintain a raised buffer for protected bike lanes, though parts are as narrow as 3' instead of 5'.
- ④ A queue jump just before the intersection at NE 70th St provides added reliability for new RapidRide service.
- ⑤ Crosswalks at otherwise misaligned blocks are shifted to a diagonal to reflect pedestrian desire-lines.
- ⑥ Lanes shift slightly at the beginning of the block following a queue jump to allow traffic to realign with typical lane locations.
- ⑦ Protected bike lanes extend the length of the corridor.
- ⑧ Additional parking is maintained to provide an added amenity to neighborhood residents and individuals visiting the area.





Roosevelt Way NE, NE 71st St to NE 73rd St



- ① A queue jump provided immediately before a transit stop allows for quick and reliable loading and unloading (see next page).
- ② An expanded transit stop provides ample room for boardings and alightings, and service to local neighborhood businesses.
- ③ As with other blocks with transit stops, all parking is removed in order to maintain two travel lanes.

- ④ Added trees and green space help improve the quality of the transit stop and the corridor as a whole.
- ⑤ Breaks in the protected bike lane buffer are provided where needed to maintain access to existing, single driveways.
- ⑥ Parking in close proximity to business and neighborhood amenities is kept to maintain access for vehicles.





Roosevelt Way NE, NE 73rd St to NE 75th St



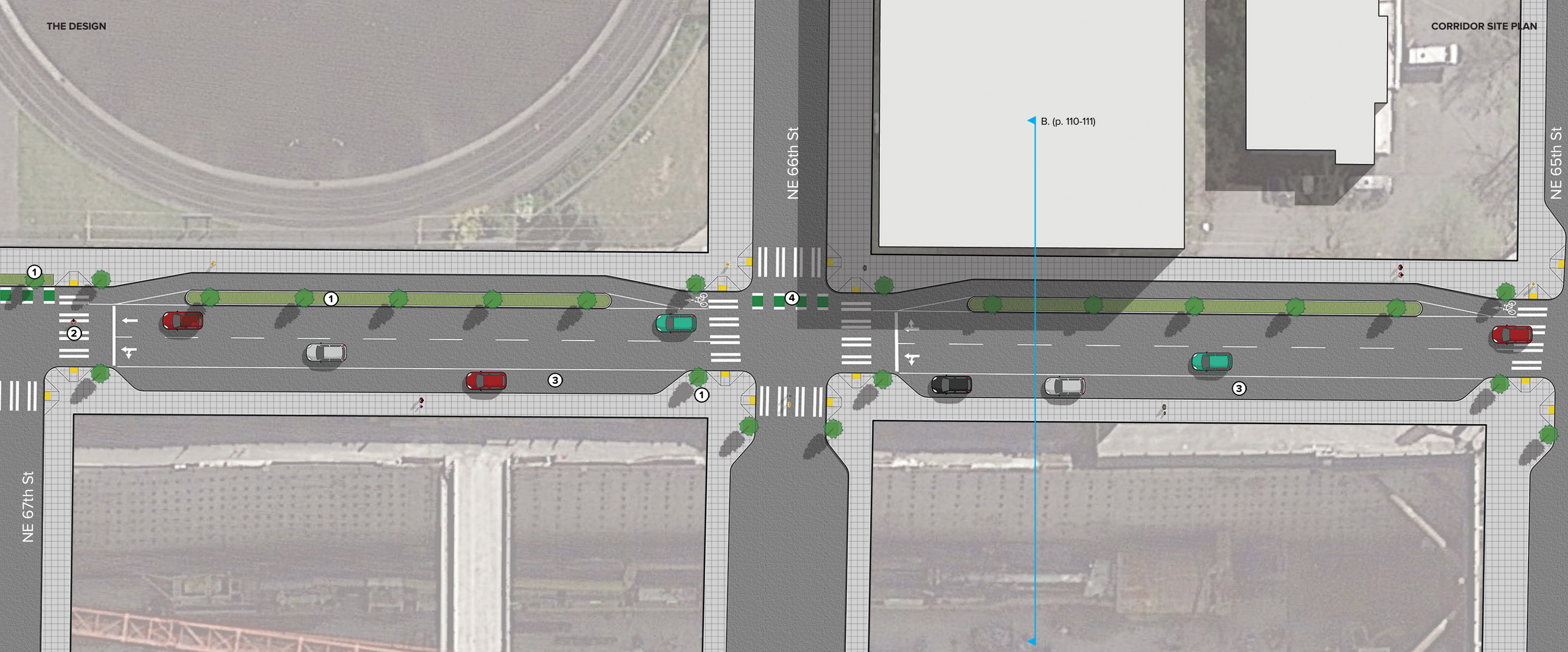
- ① Median triangle is expanded to provide open space and more trees.
- ② Lake City Way NE connection is narrowed slightly to reduce instances of speeding and improve safety for all users.
- ③ Connection from Roosevelt Way NE to Lake City Way NE is closed to address potential safety concerns with blindly merging vehicles.

- ④ On-street parking is maintained to improve accessibility and usability of the area.
- ⑤ Roosevelt & 74th is one of the few intersections without marked crosswalks in each direction, due to conflict with the Safeway parking lot entrance.

- ⑥ A mid-block crossing, with curb bulbs on each side, is provided to ensure pedestrian connectivity between signalized intersections at 73rd and 75th.
- ⑦ The west side of Roosevelt from 73rd to 74th has existing driveway entrances that prevent a raised buffer of any usable length or continuity. Future development should include alternate vehicle access strategies, at which point a buffer can be provided.

- ⑧ A typical queue jump is provided to help improve transit speed and reliability.





12th Ave NE, NE 65th St to NE 67th St

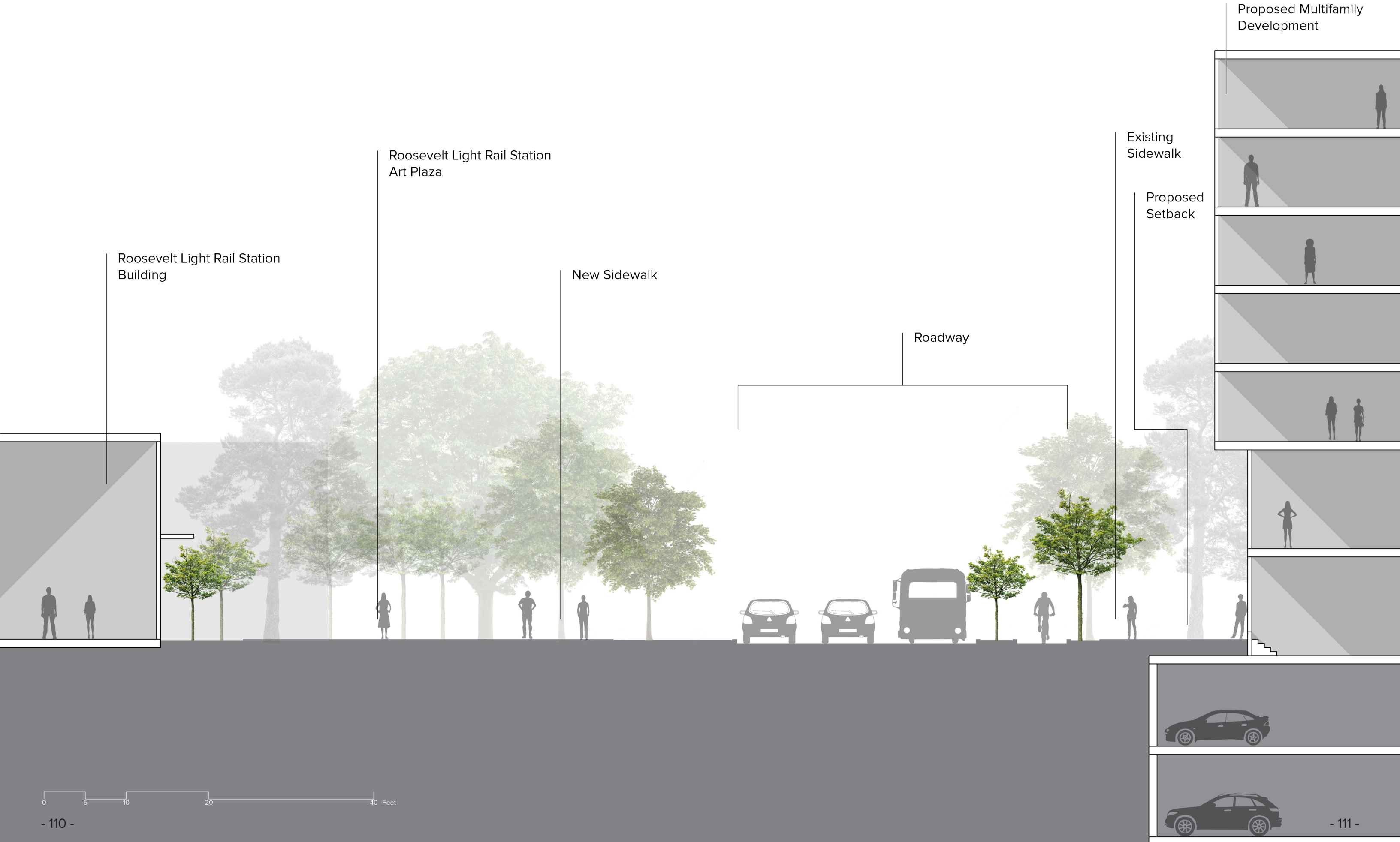


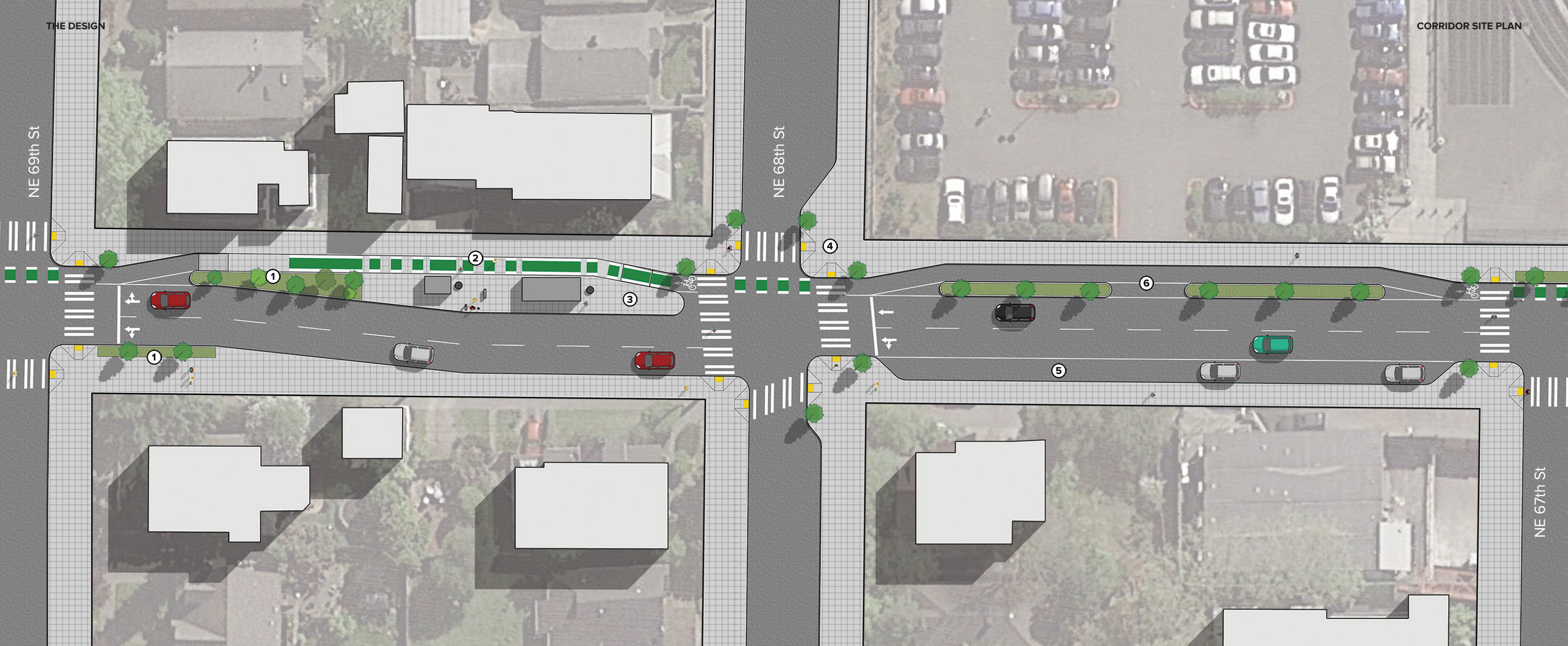
- ① A general lack of street trees along the corridor make the addition of trees - both in protected bike lane buffers and new sidewalk tree pits - even more critical.
- ② Added mid-block crosswalks and accompanying curb extensions provide new safe crossing points for high school students, light rail riders, and all other pedestrians.

- ③ Retained parking provides accesibility and proximity to neighborhood businesses on Roosevelt and other amenities along 12th and 65th.
- ④ Bike paint to indicate locations of conflict is even more crucial for cyclists traveling in the uphill direction.



B. 12th Ave NE, between NE 65th St & NE 66th St - Looking North





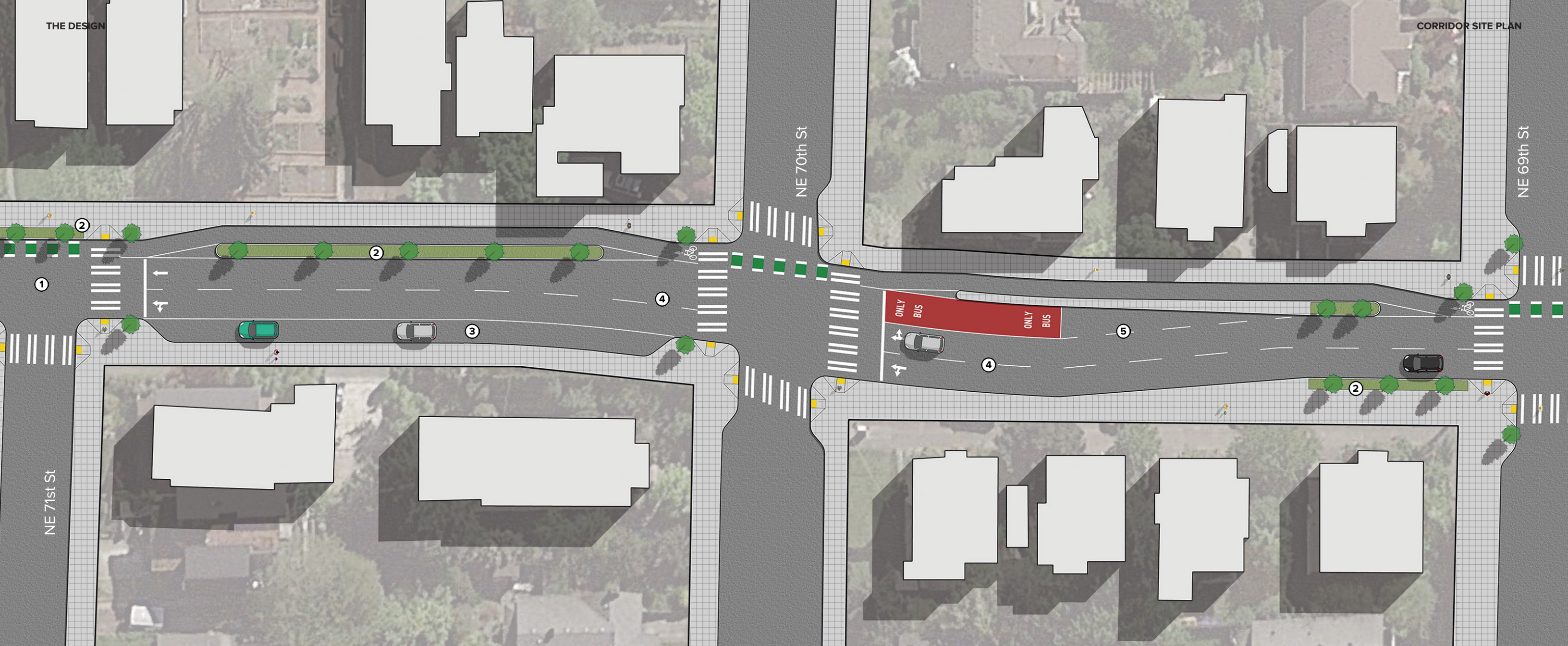
12th Ave NE, NE 67th St to NE 69th St



- ① Added street trees help make up for a current lack along the corridor.
- ② Protected bike lanes become raised for full the extent of transit islands to help facilitate pedestrian crossing to and from transit waiting areas.
- ③ Added transit island provides close proximity to incoming Roosevelt light rail station. Stop location after the station allows for crossing behind buses, reducing conflict.

- ④ Corners for which curb extensions are provided on both edges become potential new public spaces.
- ⑤ Parking is retained along blocks which have neither transit stops nor transit queue jumps.
- ⑥ A break in the protected bike lane buffer is provided to maintain access to the parking lot for Roosevelt High School, though the narrow break ensures slow moving vehicles.





12th Ave NE, NE 69th St to NE 71st St

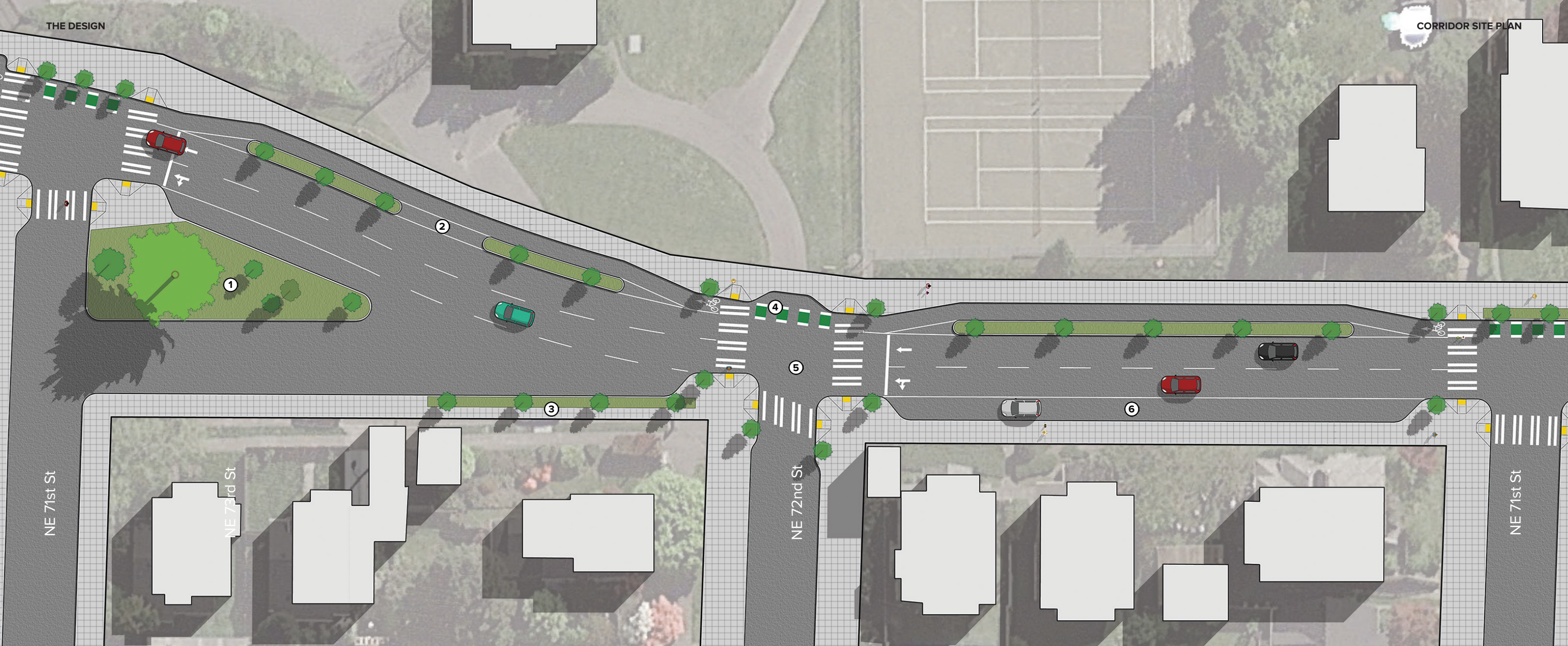


- ① Mid-block cross walks and curb extensions are placed at most intersections along the corridor that would otherwise have crosswalks in all four directions.
- ② Additional planted buffers and new street trees are placed to provide green space along the entire street.
- ③ Street parking is maintained, as with other blocks of a similar typology.

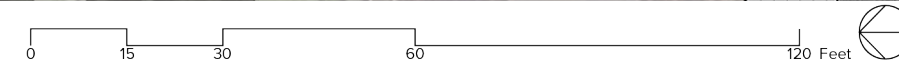
- ④ Lanes jog from left to right to accomodate existing right-of-way and topography, and to provide space for additional infrastructure elements.
- ⑤ Lanes adjust to the left over ~85 linear feet to allow spae for the transit queue jump.



Extent Map



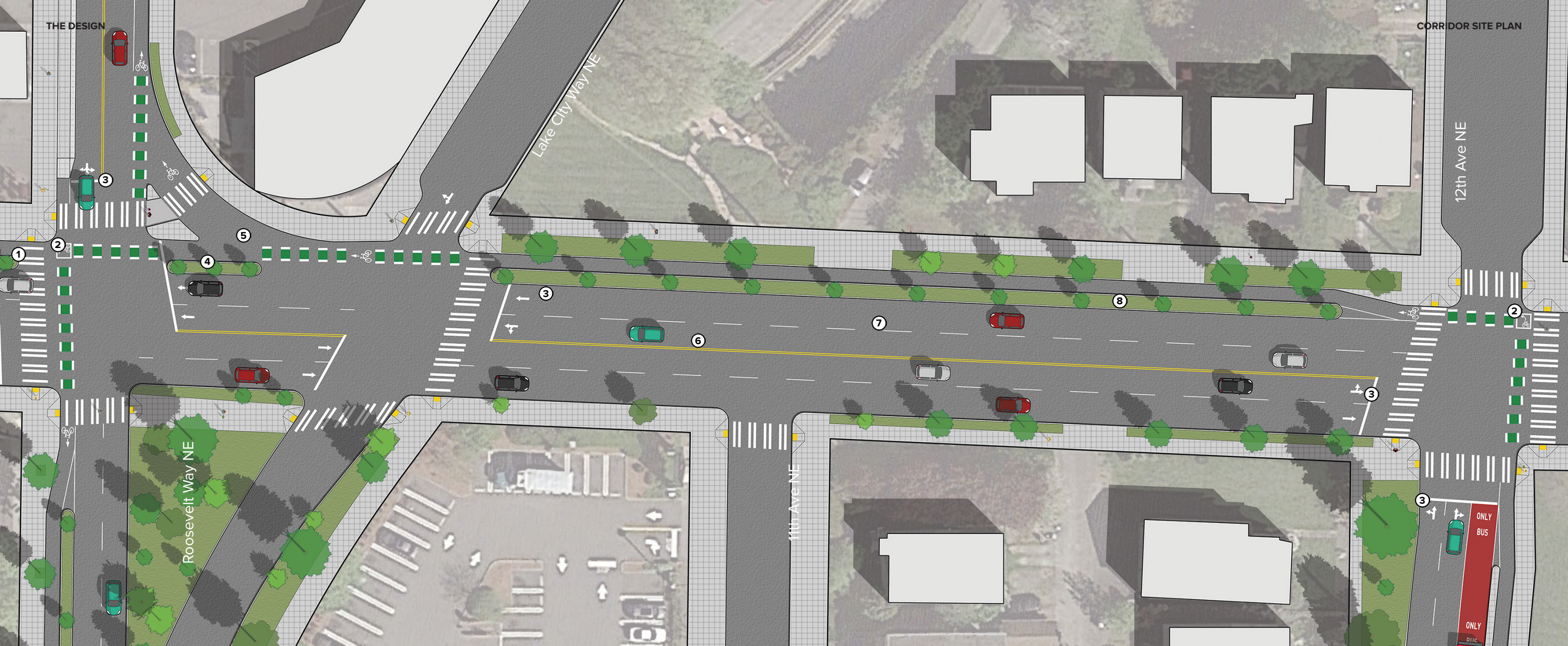
12th Ave NE, NE 71st St to NE 73rd St



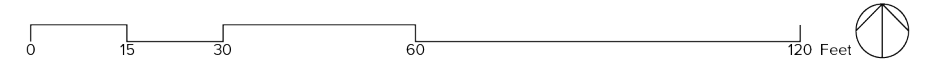
- ① The existing median triangle gains new trees to further enhance the environmental feeling of the corridor.
- ② As with other driveways, breaks in the buffer for protected bike lanes allow continued access.
- ② New street trees are placed in existing planting strips that don't already have them.

- ④ Breaks are also needed in pedestrian curb bulbs to provide access to existing driveways along the corridor.
- ⑤ Three-way intersections gain the same pedestrian connectivity and safety as typical all-way intersections.
- ⑥ Existing parking is retained.





NE 75th St, Roosevelt Way NE to 12th Ave NE



- ① Provided protected bike lane buffers can be extended beyond scope of the corridor to improve bicycle safety elsewhere.
- ② Two-stage bicycle left turn boxes allow cyclists to make safe left turns from 12th to 75th and from 75th to Roosevelt when necessary. At other times, transit signal priority can provide a green light for cyclists as well.

- ③ Advanced stop bars 8' prior to the intersection are additionally important on large, fast-moving arterial corridors.
- ④ Buffers for protected bike lanes are provided even in the middle of a complex, potentially dangerous intersection.
- ⑤ Northbound right turns from 75th to Roosevelt are consolidated to one lane - with priority for cyclists - to help reduce conflicts and improve safety.

- ⑥ The center turn lane on 75th is removed to allow space for a protected bike lane and buffer that mirrors other improvements along the corridor.
- ⑦ Lanes along 75th are narrowed to help provide needed improvements, and to encourage slower, safer driving - especially important for a street known for speeding vehicles.

- ⑧ A typical but long buffer provides maximum safety and comfort for cyclists who are traveling along a busy and otherwise potentially dangerous route.



Extent Map



Roosevelt Way NE, NE 75th St to NE 77th St



- ① Raised tables provide at-grade intersection crossing for both pedestrians and bikes, and require cars to slow as they cross the area.
- ② Travel lanes are maintained in each direction to maintain current operational conditions of this section of the corridor.
- ③ 5' raised bike lanes with 2' mountable curbs provide ample protection for cyclists while allowing them to pass one another if needed.

- ④ Parking on the east side of the street is removed and the center line is shifted over to continue to allow two travel lanes.
- ⑤ Existing planting strips provide a buffer between cyclists and pedestrians to help reduce potential conflicts between the two modes along the corridor.

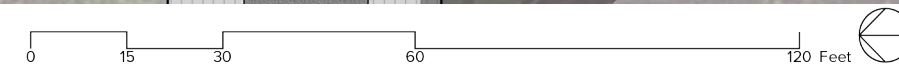
- ⑥ Appropriately sloped ramps provide a change of grade for cyclists from street-grade to sidewalk-grade amenities.
- ⑦ The northbound raised bike lanes start slightly further up the corridor to allow continued use of existing commercial and residential driveway access.

- ⑧ Typical conflict paint for cyclists warns drivers of merging cyclists turning left from eastbound 75th.





Roosevelt Way NE, NE 77th St to NE 80th St



- ① Bike paint is provided to indicate potential conflicts between cyclists and vehicles entering and exiting commercial parking lot.
- ② Additional street trees are provided in existing planting strips to help improve the natural feel of the space.
- ③ Similar to 77th, a raised table slows vehicles and provides additional safety for crossing pedestrians and cyclists.

- ④ Mountable curbs terminate prior to bus stops in each direction to allow buses to align more closely with the curb, and conduct proper loading/unloading.
- ⑤ Traditional, unmountable curbs also helps keep different modes separate near and around the stop - a potential conflict area.

- ⑥ Curb-side stops are provided - at the cost of existing street trees - instead of transit islands, due to a lack of available space. Loading/unloading occurs across the raised bike lane, changing the nature of the space during these times.
- ⑦ Advanced stop bars are provided to encourage cars to not enter the intersection while other modes are using the space.

- ⑧ Approaches to Roosevelt are also ramped to help slow motorists.
- ⑨ The entire intersection is raised to sidewalk grade, to accommodate proposed raised bike lanes and improve pedestrian safety near new RapidRide stops.



6. REFLECTION

LIMITATIONS

Despite my intent to present a comprehensive and all-encompassing design for the corridor, this project was not without its limitations, which at their core, all stem from a lack of time and resources. This is of course not unique to this project, as any planning project - or any academic or professional pursuit, for that matter - can always be pushed further or incorporate more data and analysis (though this reality may be magnified by the quick turn-around needed for a timely thesis project). These limitations served as an important lesson in where to draw boundaries, whether physically or pragmatically, and the potential compromises that may arise as a result.

In its most literal sense, one of the boundaries I had to draw was the boarder of my study area, inside which I would seek out characteristics and current conditions, and outside of which I would more or less ignore entirely. Given the strong linearity of the corridor, this was moderately successful at still creating a meaningful and functional area to study and design for, but was not without its drawbacks: Including only the two blocks of NE 75th St between Roosevelt Way NE and 12th Ave NE, for example, created a situation in which any design recommendations for the right-of-way were aimed at optimizing the conditions and goals set forth for Roosevelt and 12th, rather than the operational nature of 75th itself - a major arterial in its own right. As mentioned a couple of times in the report, these physical limits are important from a scope of work perspective, but can limit the comprehensiveness of the final recommendations.

One of the factors that prevented further study of areas outside of the physical boundary I drew was simply a lack of time - a factor that had implications for other steps in my design process as well. One of the pinnacles of any design process is the development of alternatives, which provide the opportunity to explore the effects of changing any number of variables, and can help to frame the identification of an alternative as “preferred.” At a professional level, each of these alternatives would likely be fleshed-out to the level that the final corridor design was presented in this report, which could require as much as three times the man-hours to complete. The conceptual alternatives presented at the beginning of the last section served a similar purpose for this project, and while they certainly allowed me to iteratively see how changing different variables might affect the nature and form of the corridor, not to the extent that full alternatives might.

In addition to time, I was limited in the resources available to me to properly gather data and draw conclusions about the operations of the corridor. Substantial changes to the channelization of a corridor are rarely made without first gathering data about how the corridor is currently used. This can include automatic vehicle counters to measure current volumes, cameras to record vehicle turning movements, and convoluted traffic models to predict the effects of certain changes (to say nothing of the additional man-hours to review and analyze this data). Although relatively recent traffic counts were available, I had to rely on my subjective interpretation of other conditions, such as level of on-street parking demand, where people seemed likely to travel to/from, and the speed with which cars were moving through the area.

Lastly, and perhaps most specifically, I was limited in my current knowledge of civil and traffic engineering principles. Although many of the modal requirements I collected and digested spoke to issues such as corner radii and lane widths, I made a conscious decision to not dive down the deep hole of traffic signals - a topic which, for an area of this size, could likely constitute a thesis project on its own. Answering such questions as “Where are new signals needed/where could they be taken away?” or “How will retiming them to incorporate transit signal priority affect corridor operations?” would allow for a more pragmatic and functional design, based not just on general multimodal best practices but also on the detailed current functionality of the corridor.

EFFECTS OF CURRENT PLANNING PROJECTS

The current projects occurring within the neighborhood that I reviewed in section three, “The Neighborhood,” ended up having a much larger effect on the design of my project than I had initially anticipated. As discussed earlier, I wanted to include a review of these projects in order to gain an understanding of the context in which I was conducting my project, and to hopefully better reflect on the overall nature of the corridor. However, more than anything else, the review and incorporation of these projects served as a source of stress and conflict throughout. This was especially true for the Transit Master Plan (TMP) Update and the Roosevelt to Downtown High Capacity Transit (RDHCT) project, both of which either occurred (in the case of the TMP update) or had major milestones (RDHCT) during the duration of my project. While first the TMP update solidified the specific routing and stop locations for the corridor (which had been left ambiguous in Move Seattle marketing materials), both in agreement and in conflict with how I envisioned the corridor, the RDHCT update included a shift in this specific routing through the area, in direct conflict with what I was proposing. My first reaction was a fear that my project was slowly losing any relevance to the real world (a personal goal I had set for myself at the beginning of the thesis process), followed quickly by a desire to take a stance about why the routing I had chose - and that was provided in the TMP update - was a better choice. To this end, I kept the routing along Roosevelt Way NE north NE 75th St, while the RDHCT update showed a new routing along 75th to Banner Way NE.

My review of the RDHCT update in section three indicates my reasons for maintaining the previous routing, but in the end, this part of the corridor felt like an afterthought in my final design. The lack of available space (which had likely caused the shift in the proposed routing) created a lack of opportunity to explore different options and alternatives, similar to what I had created for the rest of corridor. The improvements I did end up recommending were not only at their bare minimum size (or even less), but were crammed into the corridor in such a way as to likely prevent any functional use of the space. After completing my design, I understood fully why a switch in the routing had been made, as both NE 75th St and Banner Way NE provide much more room to explore alternatives and give the community the opportunity to incorporate their priorities for the corridor. Perhaps more importantly, however, I was brought back to the final point of my critical stance - that planners should do their best to implement the projects they plan (and as planned), and similarly, should only plan projects that they intend to implement. Even though this project - from an ambiguous blue line on the Move Seattle map, to a full-corridor routing utilizing the narrow, two-way part of Roosevelt, to a fundamental shift to 75th and Banner Way - was at no point more than

a “line on a map,” this doesn’t mean it couldn’t have been drawn more carefully. Each time the city develops and changes projects in public-facing documents, they will be seen as not having done their due diligence at best, and at worst, going back on their word. It is no wonder that the phrase “planners rank just above used car salesmen in terms of public trust” rings so true.

Another project that had important implications for my project - though in a very different way - was the Roosevelt Way NE Pavement and Safety Improvements Project. After exploring and understanding what these improvements were and what this project was providing for the neighborhood, I immediately found myself using it as a yardstick against which I could measure my own project, and what I was proposing for the neighborhood. They are, of course, similar in both goal (providing multimodal improvements, including a protected bike lane and transit islands) and concept (added pedestrian curb bulbs, maintaining the one-way directionality, and integrating a right-running bike lane with the provided transit amenities). However, they differ dramatically in the level to which these infrastructure improvements are provided - in the current project, for example, no raised buffer for the protected bike lane is provided and the transit islands are too small to incorporate the full suite of RapidRide furniture.

To this end, I think the design I’ve presented more closely meets the goals of creating multimodal corridors. What I’ve proposed incorporates industry best-practices, and meets the requirements of the modes that are planned for the corridor (admittedly, the lack of these best-practices in the current project, such as more robust buffers for the protected bike lane, are likely due to cost). Furthermore, my design responds better to the perceived mismatch between parking supply and demand (though see note above about the subjectivity of this data), while the current project (likely due to political pressures) maintains an incredible amount of the existing parking, at the cost of the width of bike lanes and transit islands. Perhaps most importantly, my design acknowledges the macro-level functionality of Roosevelt Way NE and 12th Ave NE as two parts of one-way couplet, noting that improvements to one necessitate improvements to the other in order to maintain functional operations of the corridor. Although providing similar improvements for 12th may be happening in the future, none of the planning documents for the current project note any recognition of the need to do so.

This last point speaks back to the importance of a systems-level analysis for these types of projects, as mentioned earlier in the reflection and throughout the report. Not only does the lack of coordination with 12th raise concerns about how holistic this project truly is, but the mismatch between the improvements being provided south of NE 65th St and those that I am recommending north of 65th may compromise the overall effectiveness of both sets of improvements. In many ways, a multimodal corridor is only as safe and comfortable as its least safe and comfortable portion. A robust protected bike lane on one part of the corridor is not enough to define the route as having robust bicycle infrastructure, for example, if the other part of the corridor is lacking in true physical separation and protection. Although this potential mismatch is not unique to this project (as the issue of where to draw project boundaries and how to coordinate with other current projects is omnipresent in the planning profession), it’s an important consideration as new multimodal corridors are planned and implemented.

FUTURE INVESTIGATIONS

There are many directions in which future research and efforts could take this project, some of which have been implied in the reflection above. First and foremost, as with any project, additional data could be gathered - whether on traffic volumes/movements, parking, or more qualitative use of the space - to better inform the overall design of the corridor. Similarly, an in-depth exploration into the issues of signals and signal timing would help ground the conceptual design further in the realm of corridor operations, providing an overall more robust recommendation for how to improve the corridor for all modes. The design could be expanded in physical scope, not only to study additional parts of the corridor in either direction (north towards Northgate and south towards Downtown), but also to investigate the extension or impacts of proposed improvements on other parts of the neighborhood (e.g. east and west along NE 65th St, NE 70th St, NE 75th St, or NE 80th St). The design could also be taken further down the design process, to start to look at issues such as water run-off, materials, and even preliminary costs. Incorporating the review of current projects, additional effort could be done to explore the new routing along NE 75th St and Banner Way NE, to help explore alternatives for what the city intends to do. Similarly, there's certainly room to brainstorm ways to build upon the incoming improvements along Roosevelt Way NE south of 65th, in an effort to try to bring them up to the level of the improvements proposed in this project. All of these would provide ample room for a thesis or professional project, and would greatly improve the impact and relevance of the proposal already presented in this report.

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