CITY OF GRAND RAPIDS

GRAND RAPIDS, MICHIGAN

BUS STOP INVENTORY & IMPROVEMENT PROJECT

Green Rapids Transit Group (GRTG) in Partnership with the City of Grand Rapids
SS26 - UP 494 & 894 Planning Practicum
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April 24, 2026

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ACKNOWLEDGMENTS

The Green Rapids Transit Group would like to express sincere gratitude to the Grand Rapids Office of Sustainability, particularly Robert Cloy II, for serving as our primary community partner and for providing guidance and support throughout the duration of this project.

We also extend our appreciation to The Rapid, and Mobile GR, with special thanks to Steve Schipper and Ariana Jeske respectively, for their valuable contributions to this work. Their insights and perspectives were instrumental in informing our analysis and recommendations, in addition to strengthening the overall quality of this project.

We are grateful to Strong Towns GR, namely Andrew Carley, as well as the bus riders and transit operator who participated in interviews and shared their experiences. Their perspectives provided essential, real-world context that helped shape our understanding of transit conditions and user preferences. Their willingness to share candid feedback strengthened the relevance and applicability of our recommendations.

Planning Practicum receives support from our community clients. It is also financially aided by the generous contributions from the MSU Center for Community and Economic Development Regional Economic Initiative (REI). The opinions expressed in the statements, findings, conclusions, and recommendations are the authors' sole responsibility and do not necessarily reflect the views of Michigan State University or any federal or state agency.

Finally, we thank Dr. Jesus J. Lara, Professor of Urban and Regional Planning at Michigan State University and lead instructor of the practicum, along with Andrea Zeeb Polverento, co-instructor, for their mentorship and guidance throughout the practicum process. This project was completed as part of the Urban and Regional Planning Practicum in the School of Planning, Design and Construction at Michigan State University.

EXECUTIVE SUMMARY

This project was conducted in partnership with the Office of Sustainability at the City of Grand Rapids to address the condition of bus stops in priority locations referred to as Neighborhoods of Focus (NOFs). These NOFs represent census tracts with a high percentage of black, indigenous, and people of color (BIPOC) residents and the greatest disparities across all quality-of-life indicators such as education, wealth and employment. In summer of 2025, the City of Grand Rapids passed their Climate Action and Adaptation Plan (CAAP), which serves as a roadmap for the Grand Rapids community to reduce greenhouse gas emissions and prepare for the impacts of climate change on people, the environment, and infrastructure. The goal of this project is to improve accessibility and comfort in public transit through the evaluation of the transit system, specifically bus stop conditions, and develop planning recommendations to support future decision making as the city commits to accomplishing the goals set forth in the CAAP.

In order to understand existing conditions and identify opportunities for improvement the project team conducted interviews with stakeholder groups including transit service providers, city staff, community advocates, bus drivers, and users. Through these interviews the team and analyzed the findings into themes and key challenges. The project team conducted several site visits throughout the project area to understand the site context. Spatial analysis and policy review tools were also employed to inform the final recommendations and to create an index measure that allows for amenity improvement suitability analysis of all bus stops within the NOFs.

Figure 1: A bus user waiting at a bus stop without a bench.

The analysis identified several important findings, including unique structural barriers to infrastructure improvement, the opportunity for stakeholder and community partnership, and a universal desire for increased route frequency amongst all stakeholder groups. These insights informed the development of the project's planning priorities.

Based on the analysis, the project proposes a series of recommendations focused on improving rider comfort, promotional activity, and implementing infrastructure improvement in an objective and equitable fashion. These strategies aim to support a strong public transit system in the City of Grand Rapids that holds the neighborhoods most in need of its services, at the center.

Recommendations include but are not limited to:

1. Developing a streamlined infrastructure approval process
2. Engaging in promotional strategies
3. Planting trees in lieu of shelters

In addition to the recommendations, the project team created the Infrastructure Priority Index (IPI) which is a bus infrastructure implementation site suitability tool. This tool takes into account demographic and census data in the NOFs, current bus stop infrastructure status, and urban heat analysis allowing for the identification of equitable and sustainable improvements. The tool selects priority bus stops that are best suited for a variety of improvements including shelters, benches, and trees. This tool can be used by individuals or focus groups to create a priority index based on adjustable factors.

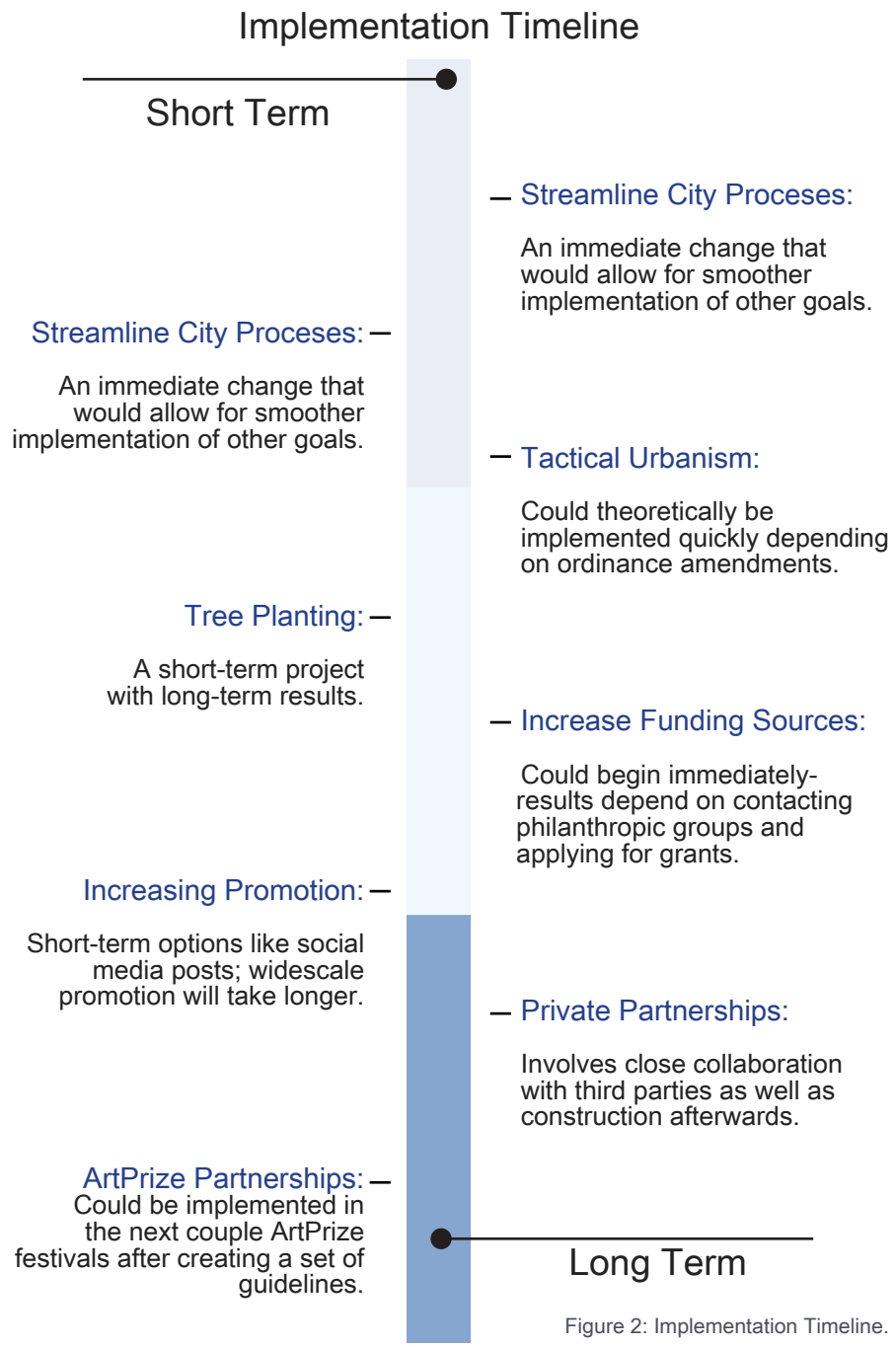


Figure 2: Implementation Timeline.

TABLE OF CONTENTS

FIGURES & TABLES

INTRODUCTION

This project is the culmination of all qualitative, quantitative, community engagement, conceptual planning, and precedent analysis conducted by the GRTG between January and April of 2026. The project was initiated by the Grand Rapids Office of Sustainability to address accessibility and comfort in the public transit system, specifically regarding shade coverage at bus stops. The project is linked to the passing of the Grand Rapids Climate Action and Adaptation Plan (CAAP) in the summer of 2025, which serves as a roadmap for the Grand Rapids community to reduce greenhouse gas (GHG) emissions and prepare for the impacts of climate change on people, the environment, and infrastructure. The CAAP identifies six key sectors through which to address community-wide emissions and prepare for the impacts of climate change. One of these key sectors is transportation. The City is aiming to reduce reliance on single-occupancy vehicle usage and increase active and shared modes of transportation. With transportation representing 30% of the city's total GHG emissions, there is room for unique and innovative solutions to reducing the city's carbon footprint within this sector. One of the strategies and actions within the CAAP specifically calls for expanding and protecting pedestrian networks and amenities by increasing bus stop amenities to promote accessibility.

The project site encompasses a preselected area within the city of Grand Rapids that was identified in the 2024 Community Master Plan known as the Neighborhoods of Focus (NOFs). These NOFs, many of which were historically redlined, represent census tracts with a high percentage of Black, Indigenous, People of Color (BIPOC) residents and the greatest disparities across all quality-of-life indicators such as education, wealth and employment. According to a U.S. Environmental Protection Agency (EPA) report, the impacts of climate change will be felt heaviest by these vulnerable communities due to a range of social, economic, historical, and political favors. Recognizing this fact, the CAAP centers equity in climate solutions for a safe and healthy community.

Figure 3: A typical Grand Rapids streetscape.

The project objectives include identifying the benefits of bus stop amenities to increase accessibility, comfort and the overall use of public transit, the barriers to the implementation of these amenities, and the solutions to these barriers. In order to accomplish these objectives, the project team conducted site visits, stakeholder interviews, spatial analysis, conceptual planning, and created an index measure that allows for amenity improvement suitability analysis of all bus stops within the NOFs.

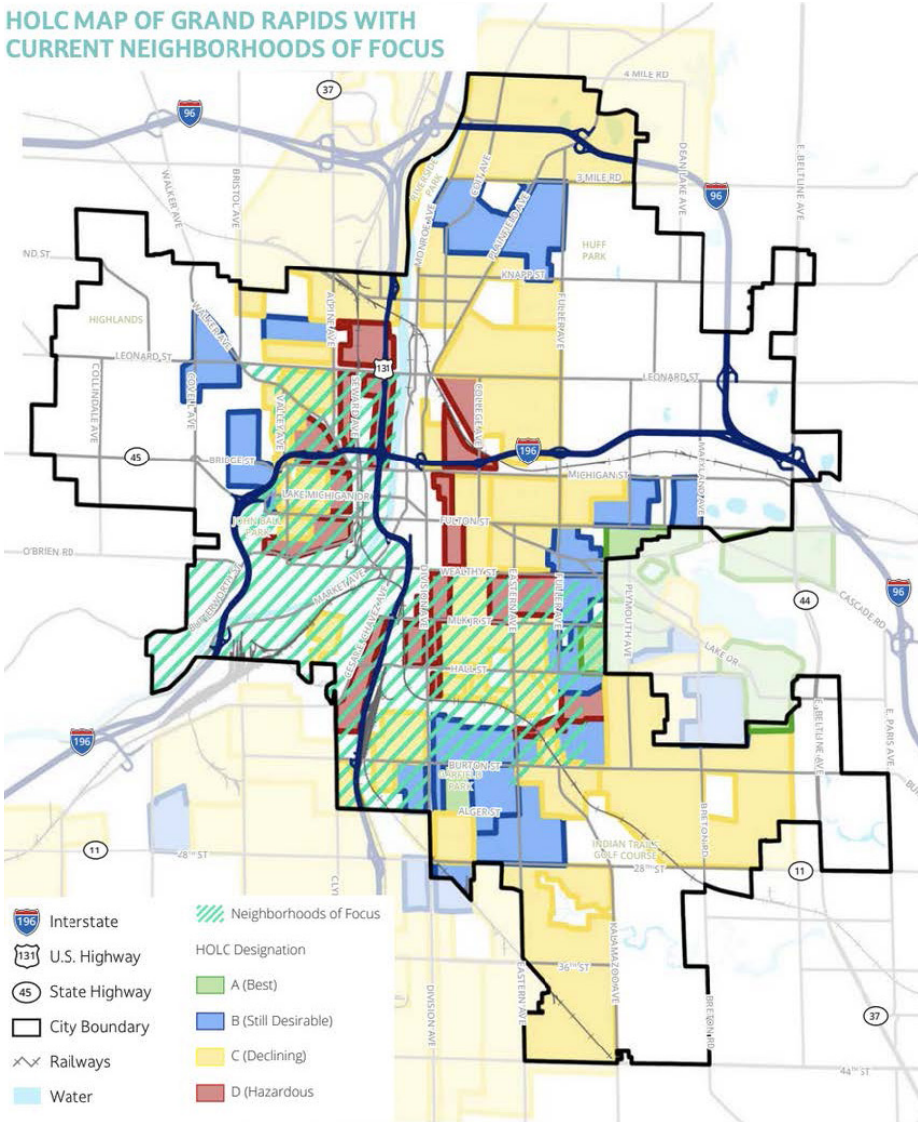


Figure 4: Community Master Plan Home Owner's Loan Corporation (HOLC) Map of Grand Rapids with NOFs Overlay.

PHASE 1:

QUALITATIVE ANALYSIS

QUALITATIVE ANALYSIS INTRODUCTION

In August of 2025, The City of Grand Rapids passed the Climate Action & Adaptation Plan (CAAP) which will serve as a roadmap for how the community will reduce greenhouse gas emissions and prepare for future impacts of climate change on residents, environment, and infrastructure. The plan centers around equitable low carbon solutions for a safer and healthier community. Key sectors of focus include energy systems, residential homes, buildings and infrastructure, transportation, nature based solutions, and food systems. The City of Grand Rapids' Office of Sustainability, which serves as a community partner and educational resource in supporting the city in its climate action and adaptation goals, has partnered with the Urban and Regional Planning practicum course at Michigan State University to aid them in addressing climate resiliency and equity within the transportation sector.

Figure 5: A user utilizing The Rapid.

The City has identified neighborhoods of focus (NOFs) which are Grand Rapids census tracts with the highest percentage of Black, Indigenous & People of Color (BIPOC) residents and the greatest disparities across all quality-of-life indicators. The NOFs are pictured within the greater Grand Rapids area in Figure 6. This bus stop inventory will be conducted within the predetermined NOFs and will present data that reflects the current conditions, as well as suggestions for improvements conducted within the predetermined NOFs. The data presented will reflect the current conditions as well as suggest areas for improvements.

Over the course of the next few months, members of the Green Rapids Transit Group (GRTG) practicum team will be working to collect, analyze, and provide meaningful data that identifies gaps in the current system and provide solutions to the communities most in need. The results and findings of this project will be used by the Grand Rapids Office of Sustainability to better understand the current bus stop infrastructure in order to help guide The City in creating the future transportation system it desires for the community.

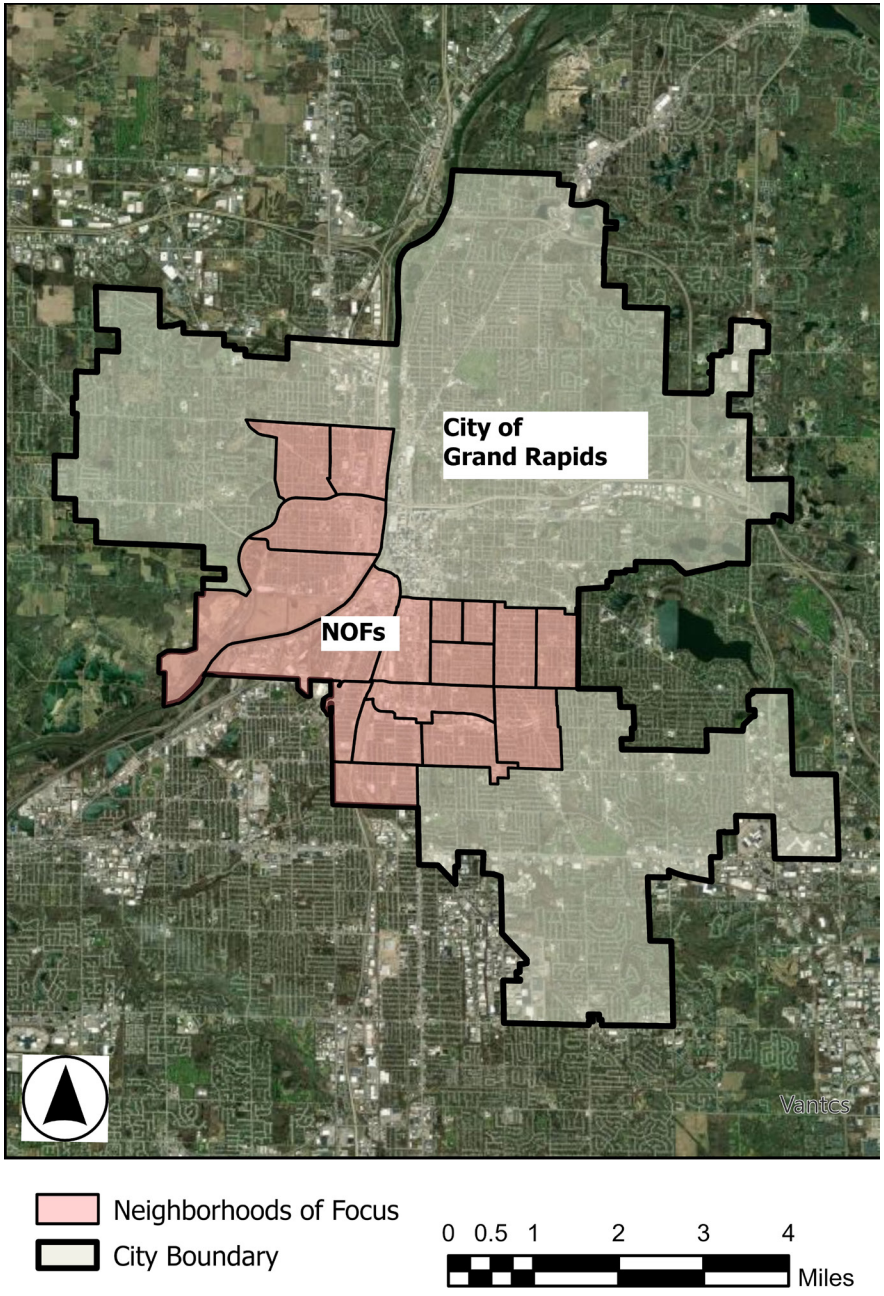


FIgure 6: The Grand Rapids NOFs in relation to the rest of the City.

BACKGROUND INFORMATION

There are three distinct types of bus systems within the city and NOFs. These include the normal Rapid lines, the Bus Rapid Transit (BRT) lines, and the Downtown Area Shuttle (DASH). Each of these lines provided the standard service of transportation, but varied in other characteristics.

The Rapid Lines

The Rapid Lines: These lines are the standard bus lines that service the greatest amount of stops within the NOFs. This bus service tended to be least impressive. Stops are generally uncovered signposts with route map and minimal amenities, such as occasional trash cans, benches, concrete pads.

Figure 7: One of many uncovered Rapid line bus stops.

Bus Rapid Transit Lines (BRT)

These lines featured bus stop amenities of the highest degree in comparison to the other two lines featuring dedicated lanes, traffic signal priority, and enhanced, elevated stations for fast boarding.

The BRT service has two lines: the Laker Line and the Silverline. Primarily servicing students of Grand Valley State University, The Laker Line tends to have the shortest wait times. It seemed that more people used this line than the normal bus service during the day; however, stops did not seem particularly busy outside of typical class hours.

Figure 8: A Silver Line bus stop with great coverage.

Downtown Area Shuttle (DASH)

The DASH offers a free service line that runs clockwise and counter clockwise around downtown Grand Rapids. According to our observations, these stops feature uncovered signposts with minimal amenities.

Figure 9: A line of people getting onto the DASH for the Rapid Art Movement Event.

PHASE 1: QUALITATIVE ANALYSIS OBJECTIVES & GOALS

To gain a better understanding of the unique circumstances that Grand Rapids presents, it was important for GRTG to be exposed to the context of the study area. This step is essential moving forward because in order to make equitable recommendations for improvement, an understanding of the space must be established. Collecting qualitative data reveals context and themes that may not be immediately apparent to the researcher. This context can be used to guide the development of further research that generates meaningful and useful data that drives change. These insights are important as they help guide how future data is interpreted and which improvements are prioritized in later phases.

PHASE 1 GOALS:

1.) Observe conditions of bus stops in NOFs at multiple times of day

2.) Identify themes throughout the neighborhoods of focus

3.) Document study area through photos

4.) Collect stories about climate vulnerability, transit dependency, and mobility barriers

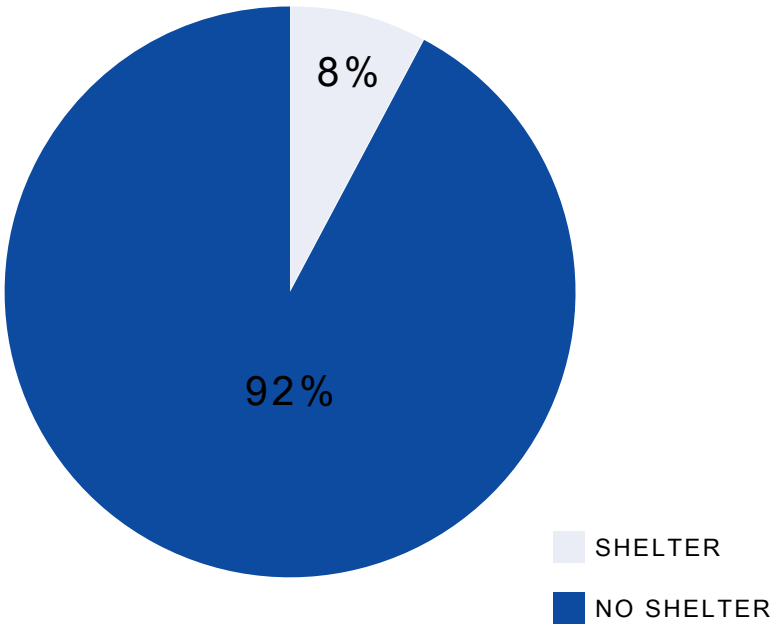


Figure 10: Current bus stop conditions.

METHODS

GRTG visited the site on multiple occasions. On January 16, 2026, the team sent two subgroups to study the NOFs. This visit was conducted between the hours of 1:30 pm to 4:00 pm. The routes that were traveled by each group can be seen in Figure 11 and Figure 12. These routes were chosen to allow the team to observe a significant amount of bus stops throughout the entirety of the study area. On January 20, 2026, members of GRTG conducted a second site visit between the evening hours of 6:00 pm and 8:00 pm. The route traveled during this visit is pictured in Figure 13. The second site visit allowed for an alternative perspective on the public transport system at a later time of day when travel patterns and other conditions are different. Finally a third site visit was conducted on January 22, 2026 between 2:00pm and 3:00 pm. This visit centered on the user experience with one of the GRTG members riding the extent of The Rapid's Eastern bus line that runs through the NOFs.

Group A: This route focused on bus stops on Leonard St., Walker Ave., Alpine Ave., Bridge St., Seward Ave., Lane Ave., and Garfield Ave.

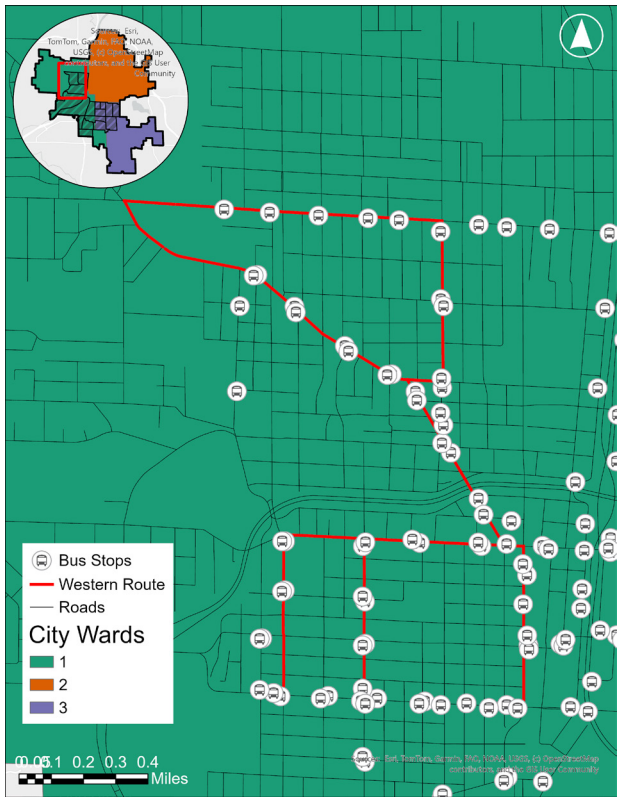


Figure 11: Group A's bus stop evaluation route.

Group B Route: This route focused on bus stops on Wealthy St., M.L.K. Jr St., Division Ave., Madison Ave., Eastern Ave., and Burton St.

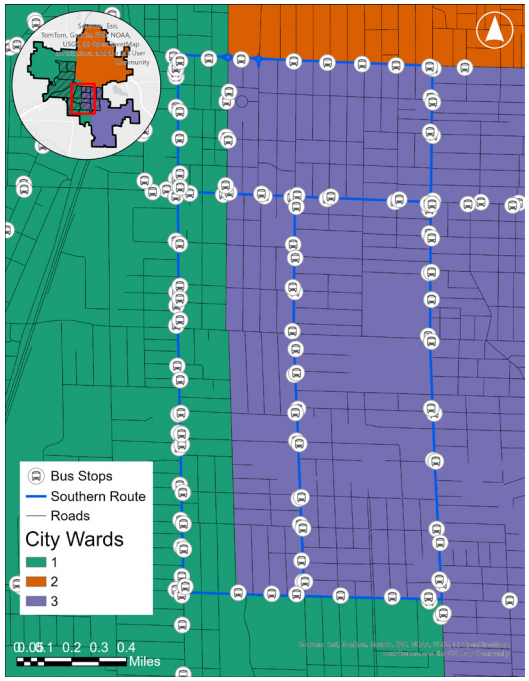


Figure 12: Group B's bus stop evaluation route.

1/20 Evening visit Route: This route focused on bus stops on Fulton St., Valley Ave., Bridge St., and MT Vernon Ave.

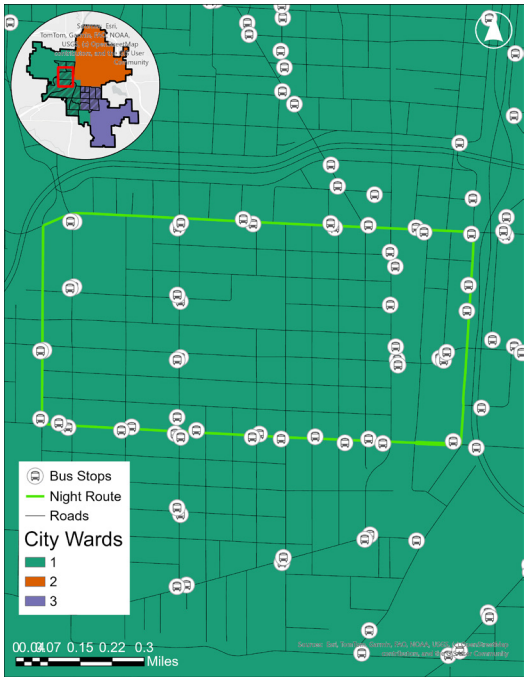


Figure 13: Group C's bus stop evaluation route.

The aim of these visits was to familiarize GRTG with the City's bus system and to collect baseline observations and themes that will inform the future of the study. The groups observed the general condition of bus stops in the NOFs including, but not limited to: shelters type, seating, and barriers to accessibility. All groups took physical notes on what amenities were present at each bus stop as well as took pictures documenting the conditions. During the visit on January 16, a brief interview with three public transit users was conducted. Following the visits, members of GRTG convened to discuss what was observed during the site visits. With qualitative observations in hand, the GRTG developed key themes from the site visits. The synthesis of qualitative data was conducted through the comparison of notes taken by all group members who participated in site visits. Group members took note of patterns among bus stops in the NOFs. This included taking note of the present amenities, conditions of the surrounding built environment, and the waiting behavior of transit riders if present. Interviews conducted on 1/20 were used to gain a preliminary understanding of community perceptions around bus stop infrastructure and the public transit system in general. Themes were generated predominantly through the recurrence of observations in team members notes, while the interviews conducted in this phase were considered preliminary and less heavily weighted than team observations. The team then put these themes into context by reviewing key documents of Grand Rapids, such as the community Master Plan and CAAP.

FINDINGS

LAND USE IN NEIGHBORHOOD OF FOCUS

The NOFs are primarily residential with detached housing, medium density mixed-use structures, and medium density apartment buildings. Certain avenues within the NOFs are commercially oriented with shops, convenience stores, businesses, and restaurants. The neighborhoods contain well-kept architecture that indicates a budget for maintenance and there are clear signs of development occurring within the NOFs. It tended to be quiet enough to have conversation, with occasional pedestrian passerby even during inclement weather.

INTERVIEW

Interviewees on Alpine Ave. expressed that they wished the bus routes ran more frequently and later into the night. With the current route times the interviewees stated that they were able to take the bus to work, but had to walk home. When asked about bus infrastructure they expressed that coverage from the wind and weather would be an improvement, but had mixed feelings about introducing seating due to concerns about the unhoused population. The interviewees were more interested in the ways that the buses operate over the infrastructure at the stops. This is likely because as they noted, bus transit is their primary form of transportation making efficiency more important than the waiting space. The interview ended as a bus came and picked them up.

> "LIGHTING COULD BE USEFUL, ESPECIALLY BECAUSE OF HOW EARLY IT GETS DARK IN THE WINTER."

Figure 14: A GRTG team member conducting a group intercept interview at a bus stop.

EMERGING THEMES

COMFORT

Maximizing bus stop comfort means considering all seasons and weather conditions. Frequency of transit service could be equally as important as design of bus stops. While shade is a priority for summer, shade-only structures without side walls provide little protection in winter, reducing shelter effectiveness against wind and weather. The vast majority of the bus stops observed during the site visits provided very little comfort in terms of weather protection, often having no shelter or seating options.

ACCESSIBILITY

Ideally, bus stops should be accessible to all users and in all weather. GRTG's observations indicate that weather greatly affects usability of bus stops throughout the neighborhood. For example, during snowy conditions the stops are generally hard to access because of snow piles impeding on street access. This is because snow plows had pushed snow to the edge of the road, creating a large step between the bus stop and platform. This makes for extremely limited access for mobility limited users in the winter, as well as a general inconvenience and safety concern for all users.

INEQUITIES AND DISPARITIES

Even in harsh winter conditions, we observed people using the bus system. Interviews indicated that some residents rely on buses as their main form of transportation, making service reliability and comfort especially critical. For such users, adequate protection against inclement weather is critical. Additionally, differences in bus frequency, service hours, and shelter quality create unequal transit experiences across neighborhoods.

Another inequity lies in the neighborhood economic structure itself. The NOFs is largely residential, with commercial corridors showing signs of gentrification. A plethora of new construction and well-maintained buildings are raising concerns about how transit and infrastructure investments are distributed. Development changes along corridors and uneven service levels suggest that improvements may not be evenly shared, potentially reinforcing existing inequities. Furthermore, because many residents rely on buses as their primary transportation, service and comfort gaps disproportionately affect those with limited mobility options. This reinforces the need for equity centered prioritization in future decisions.

QUALITATIVE ANALYSIS SUMMARY

The qualitative analysis of the study area has produced informative details that provide context for next steps. It is clear that there is a wide array of bus stop service qualities throughout the NOFs and that there is a large opportunity for improvement surrounding comfort, accessibility, and addressing disparities. It should be noted that our data collection during this phase was influenced by extreme weather conditions. That being said, climate resilience is a large focus of the Grand Rapids Climate Action & Adaptation Plan (CAAP) and harsh winter conditions need to be accounted for in any midwestern public transit system going into the future. GRTG conducted three site visits. Within these site visits observations on behavioral patterns, site conditions, and bus transit activity was recorded. This information proved to be helpful in narrowing in the focus on what the future site visits will entail. By observing what bus stop conditions looked like during a snow storm our team realized that the recommendations that we will make in the future have to be adaptable to all four seasons.

KEY TAKEAWAYS

There is room for improvement in the areas of comfort and accessibility within current Grand Rapids bus stop infrastructure. Protection from climate vulnerability presents an important area to be addressed.

The Rapid bus system is a reliable service used by many.

It was clear during the initial site visit that The Rapids transit service was being frequently used suggesting that improvements will be beneficial to improving equity

In Phase 2 GRTG will be focusing on the quantitative data within the study area. The project team plans to look closely at demographic data, surrounding land use, rent prices, income levels, public transit reliance, and additional factors that may provide further insight into the study area. This will provide context to the City on how addressing the transportation infrastructure in these areas can aid in their mission to address equality gaps. This will also help GRTG to develop a system of identifying which bus stops and routes should be on the City's highest priority for improvements.

PHASE 2:

QUANTITATIVE ANALYSIS

QUANTITATIVE ANALYSIS INTRODUCTION

This phase summarizes and interprets insightful quantitative data from the NOFs. Quantitative data such as demographics, socioeconomic status, land use, and state of infrastructure were analyzed by census tract to depict the current spatial trends, disparities, and relationships as they relate to transit usage and bus stop conditions. Building upon the qualitative data gathered in Phase 1, the quantitative data collected in this phase strengthens and builds upon themes identified through the addition of metrics which allow for stronger interpretations and storytelling about the NOFs.

This data will be used to inform future community engagement and strategic planning strategies through highlighting significant representative corridors for a more focused area of study, as well as revealing what type of improvements should be made. The data will also be used to inform our Infrastructure Priority Index (IPI) which will combine multiple measurable factors such as demographics, ridership, and shade coverage to identify what bus stops should be prioritized for receiving improvements should funding be available. This ensures that quantitative findings directly inform engagement and planning strategies.

Figure 15: A bus stop in the NOFs that will be analyzed.

METHODS

Data for the following analysis was collected from several sources including ESRI, the U.S. Census Bureau, Grand Rapids open source data, and the Grand Rapids Action and Adaptation Plan. From these sources, data was collected on demographics, socioeconomics, and the built environment.

Demographic data was collected for the following categories by census tract for the City of Grand Rapids:
Population Density, Median Household Income, Transportation to Work by Bus, Bus Transit Usage, Renters, Ethnicity, and Age

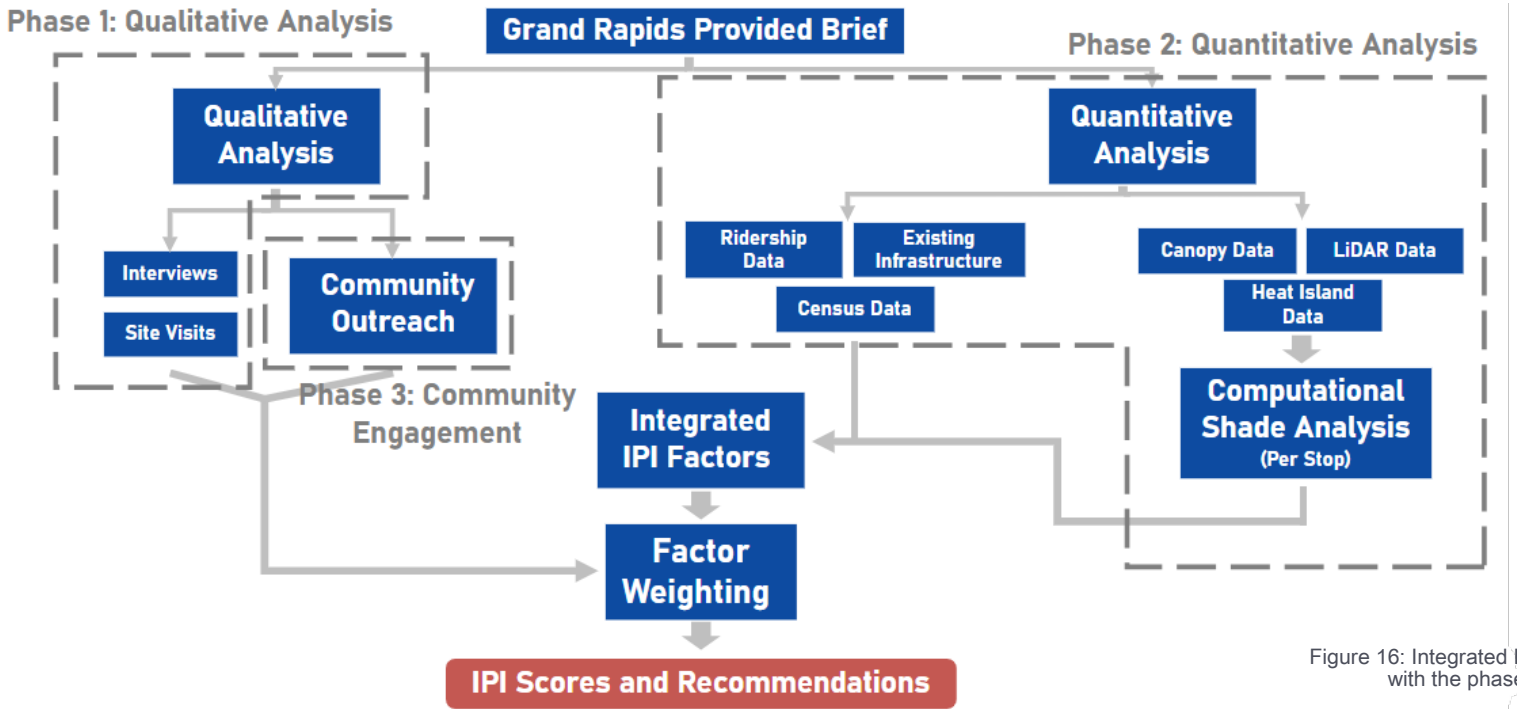


Figure 16: Integrated IPI methodology chart with the phase 2 scope highlighted.

Grand Rapids aspires to be a resilient, low-carbon city that centers equity in climate solutions to ensure a safe and healthy community (City Commission Resolution of Approval, 2025 CAAP). Demographic data, such as those displayed using the factors above, reveal where disparities and inequities exist within the City as well as particular areas of high inequities within the NOFs. Identifying these areas is essential to the implementation of equity-centered improvements. Data for all census tracts within the City of Grand Rapids was sourced and used to contrast disparities that exist within the NOFs. This information will help identify key representative corridors for future research and will be used to inform the IPI.

Population density will inform where high concentrations of individuals live. This will be an important factor in the Infrastructure Priority Index influencing improvements to be made at bus stops where there is a higher density of people potentially riding the bus.

Median household income will highlight census tracts within the NOFs where the highest levels of income disparities exist. Households who experience higher levels of financial disadvantage are more likely to rely on public transit on a daily basis, making bus stop improvements along corridors in these tracts a higher priority (Xize Wang, John L. Renne. 2023).

Figure 17: Riders waiting at a comfortable bus stop.

Data on transportation to work by bus provides valuable information on the census tracts within the NOFs where the highest number of people are using the bus as their main form of transportation to get to and from work. This is essential information for equity-based improvements. The ability to reliably get to work on-time is essential for maintaining steady employment. Barriers to transit usage including poor quality or inaccessible bus stops play a role in obstructing an individual's ability to reach their employment location. This factor will be weighted into the IPI and used to inform our selection of representative corridors of interest.

Overall, bus transit usage is an important factor to observe for mapping areas of disparities as well. Not only do individuals take the bus to and from places of employment, but they also rely on buses for other essential needs such as transportation to school, the doctor, or the supermarket. This data was collected by census tract and displayed spatially using Geographic Information Systems (GIS), and will be weighted into the IPI and used to inform our selection of corridors of interest.

Similarly to median household income, data on rentership portrays an informative picture of the NOFs that can be used to inform future research and engagement for this study. A high prevalence of renters suggests potential wealth disparities and financial strain on a given population, and shifts demographics towards a younger population.

Studies have shown that one's race or ethnicity affects how one experiences opportunity, power, and life outcomes (Allen, W. R., & Chung, A. Y., 2000). Communities with a larger population of BIPOC (Black, Indigenous, and people of color) residents are often presented with fewer opportunities. A targeted approach for improvements in these communities will move the city towards equity centered actions and adaptations. Corridors boarding tracts with a diverse make-up of residents will factor into the identification of bus stops targeted for improvement.

Non census-based data was collected for the following factors:

Land Use

Tree Canopy

Bus Stop Conditions

Land Use

Land use is another important consideration as conditions can vary depending on the type of development. Densely developed areas, like industrial areas or commercial corridors, tend to have high levels of impervious surfaces, heavy traffic, and limited vegetation. Comparatively, lower density areas like single-family neighborhoods will generally have fewer impervious surfaces and less traffic, with larger vegetation coverage. As a result, during the warmer months, cities can experience higher temperatures than their rural counterparts due to heat absorption and wind ventilation. This phenomenon is called the urban heat island effect. For transit users, coverage and amenities can greatly reduce these effects and improve comfort by lowering heat exposure and reducing the risk of heat-related illness. This can also be paired with vegetation to reduce the heat island effect.

Tree Canopy

Tree canopy coverage is another aspect to keep in mind. As stated before, new vegetation can be beneficial to transit users. Canopy coverage and increased vegetation can provide environmental cooling and reduce pollution. Tree canopy coverage can do more however, as it can provide shade and protection from the elements for transit users. It can also reduce stormwater runoff by intercepting rain and slowing it down, so it has time to infiltrate the ground. Not only can the canopy protect people, but it can also protect city infrastructure by reducing environmental wear and tear on roads and sidewalks. Disparities in tree coverage will factor into the IPI and play a role in the selection of representative corridors through revealing where gaps in shade coverage exist.

Bus Stop Conditions

Using Grand Rapids bus data, all 337 bus stops in the NOFs were analyzed and ranked based on amenities present at each stop including shelters, lighting, seating, trash bins, and bike racks. Stops were categorized as having all, some, or none of these amenities. This analysis allowed for identification of what stops are of the lowest quality at the current moment and are in the greatest need of improvement. This will be used to inform key corridors for improvement and will factor into the IPI. However, while improving the quality of bus stops with the least amenities may seem like the most straightforward solution, it is not necessarily the most equitable. Identifying bus stops that serve large, racially diverse, or low-income communities (among other factors) will also inform the index. Together, these tools support more informed and data-driven decision-making.

Analysis Tools

Data was analyzed using GIS and Excel. GIS allowed for the spatial analysis of demographics and socioeconomic factors by census tract within the NOFs and the larger Grand Rapids area for comparison purposes. Through mapping, data was visualized and interpreted to identify relationships, patterns, and trends within the NOFs. This tool will also be used to create the IPI from relevant factors. Similarly, excel was used to analyze census and bus stop infrastructure datasets in order to organize them into tables and charts that display insights and trends.

Figure 18: A bus stop that is lacking amenities.

FINDINGS

Population Density

Census tracts within the NOFs have a relatively higher population density per square kilometer than the rest of the city overall. Out of the 17 census tracts within the NOFs, 13 fall in the two highest density categories.

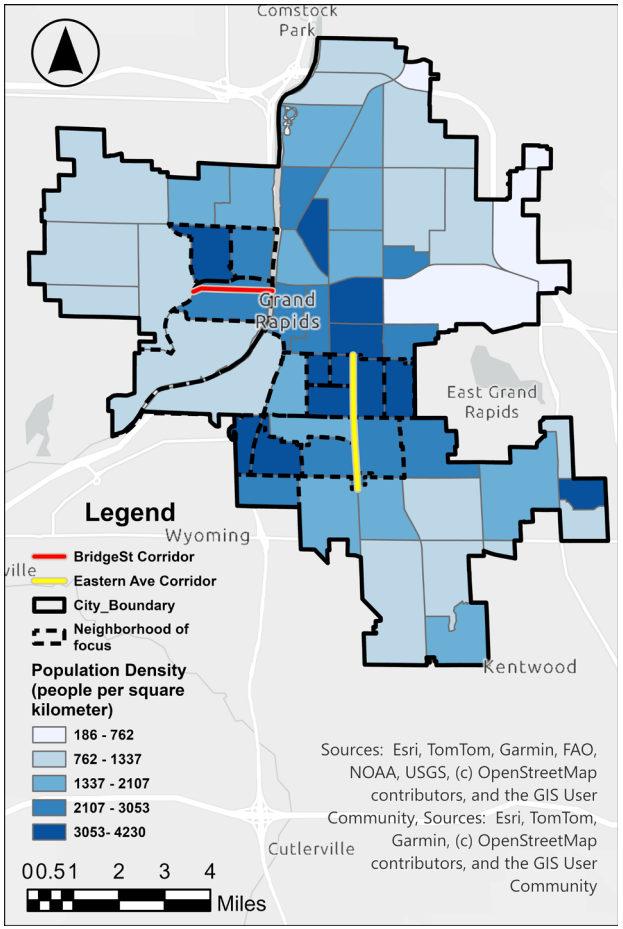


Figure 19: Population density by census tract.

Median Household Income

Census tracts within the NOFs generally display a lower median household income compared to the rest of Grand Rapids. This is pictured in Figure 20. In 14 out of 17 tracts in the NOFs, the median household income is below $75,000 a year. A total of four tracts within the NOFs have a median household income below $50,000, and in one tract, the median income is below $25,000.

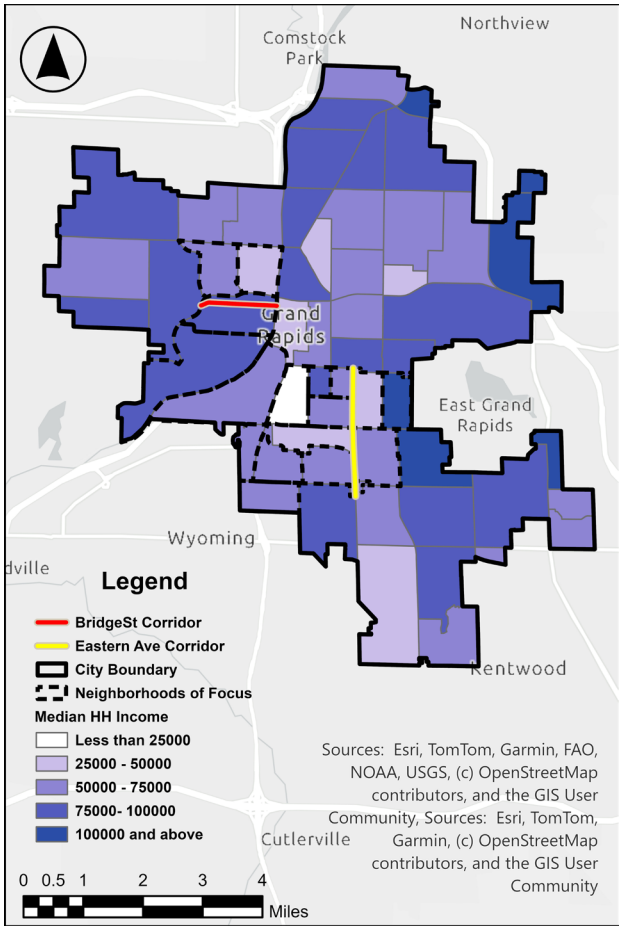


Figure 20: Median household income by census tract.

Transportation to Work by Bus

Figure 21 displays the amount of residents who rely on the bus as their main source of transportation to work in each census tract. In this case, reliance on the bus for transportation to work is not much more common within the NOFs compared to the rest of the city. However, there are a number of census tracts in the NOFs in which the bus is used heavily by work commuters.

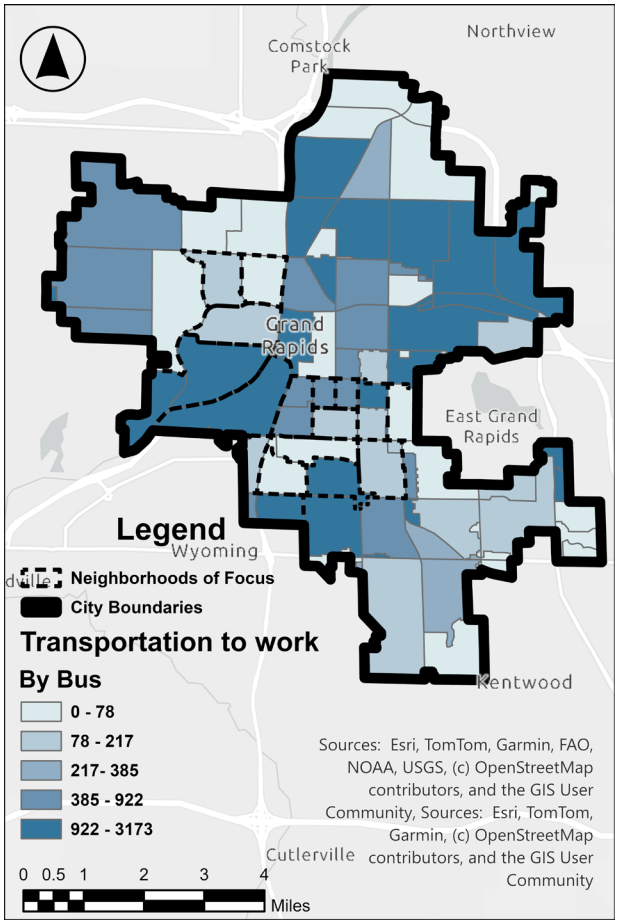


Figure 21: Bus transit usage for transportation to work by census tract.

Bus Transit Usage

Figure 22 displays bus transit usage by census tract in the NOFs and the greater Grand Rapids area. It is clear that there is a significant amount of bus transit usage in tracts within the NOFs compared to the rest of the city.

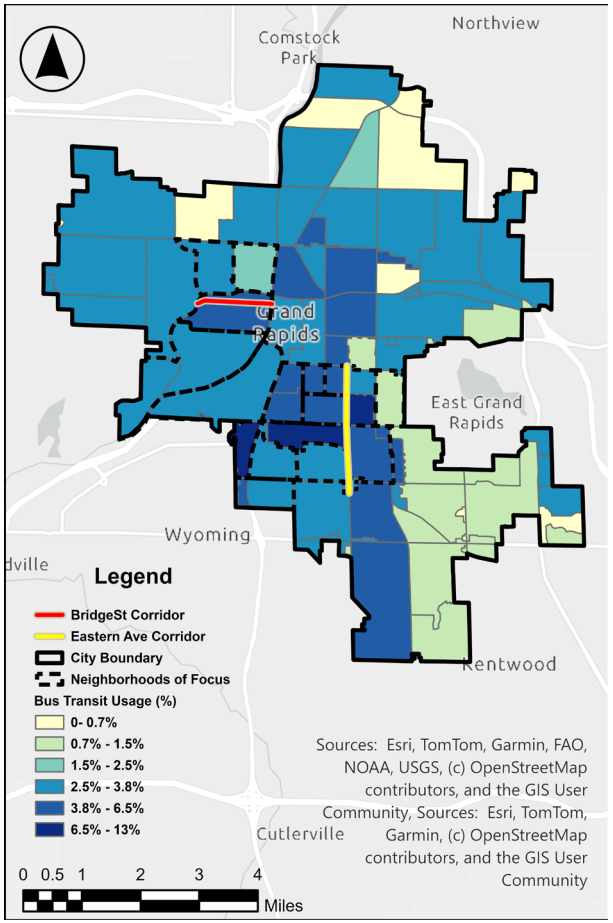


Figure 22: Bus transit usage by census tract.

Rentership

Figure 23 depicts the percentage of owner-occupied homes by census tract in the NOFs and in the greater Grand Rapids area. There is a clear disparity within the NOFs with no tracts exceeding 44.6% in owner occupied homes.

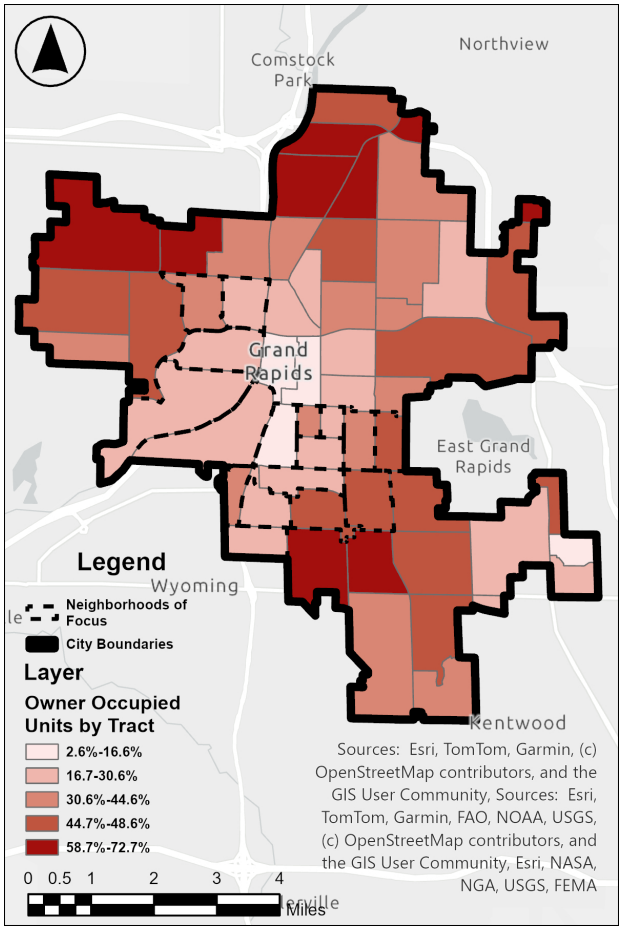


Figure 23: Owner occupied units by census tract.

Ethnicity

Figure 24 displays the percentage of non-white residents in the NOFs by census tract. There is a high percentage of non-white individuals living in the NOFs, particularly in the southern NOFs tracts.

Land Use - GRDATA

The most prominent land uses within the NOFs are residential, mixed use, and industrial. There are several commercial corridors within the NOFs along Division Ave., Bridge St., Alpine Ave., and Eastern Ave.

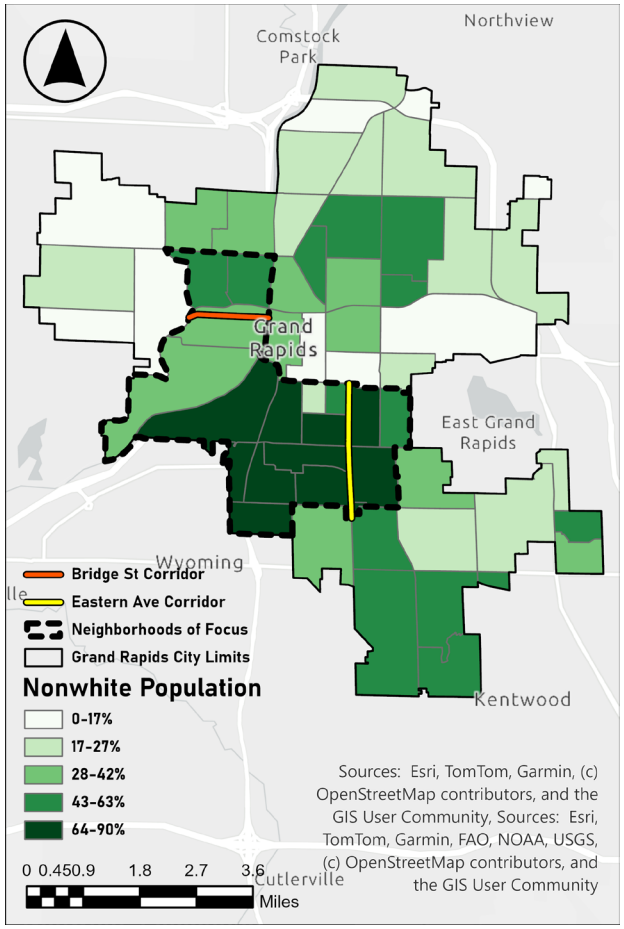


Figure 24: Nonwhite population by census tract.

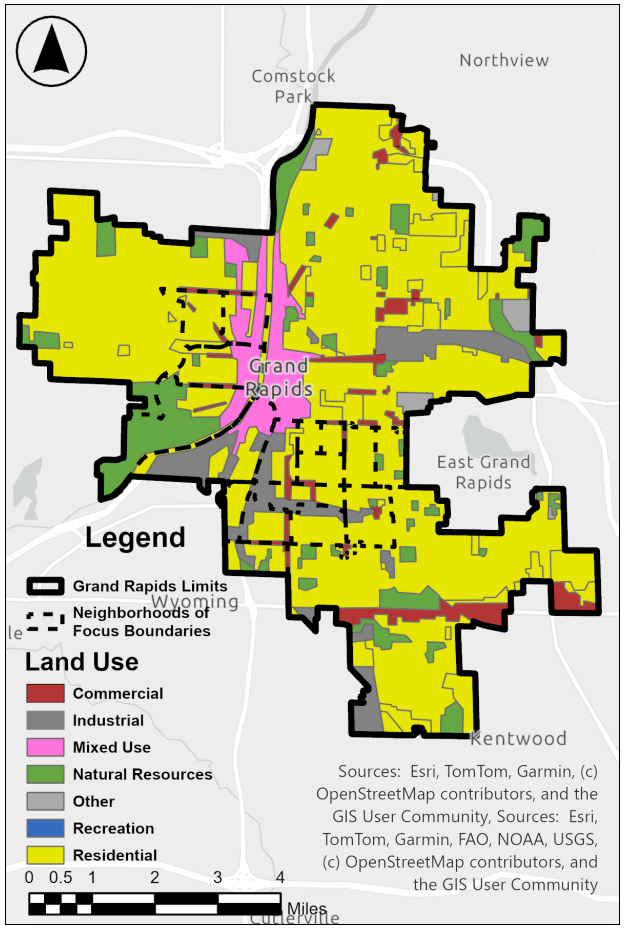


Figure 25: Land Use

Tree Canopy - GOOGLE EIE

Figure 26 displays the tree canopy throughout the NOFs. There are certain gaps in coverage, particularly in the middle of the NOFs, closer to Grand Rapids' urban core. Overall canopy coverage is lacking throughout the NOFs.

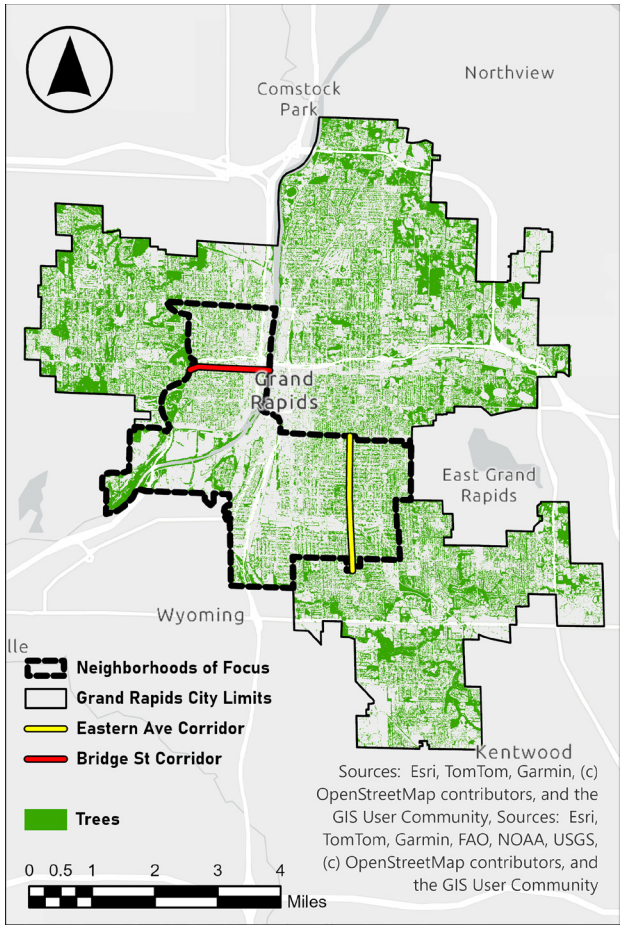


Figure 26: Tree canopy coverage in relation to key corridors.

Bus Stop Conditions - GRDATA

Bus stops within the NOFs were evaluated using five previously mentioned amenities important to riders: shelters, benches, trash bins, lighting, and bike racks. Stops were categorized as having all, some, or none of these amenities. A visual depiction of this can be found in Figure 27. Within the NOFs there are a total of 337 bus stops. Out of those bus stops, only 12 have all the amenities listed. A total of 41 bus stops have no amenities at all, and 284 fall somewhere in between.

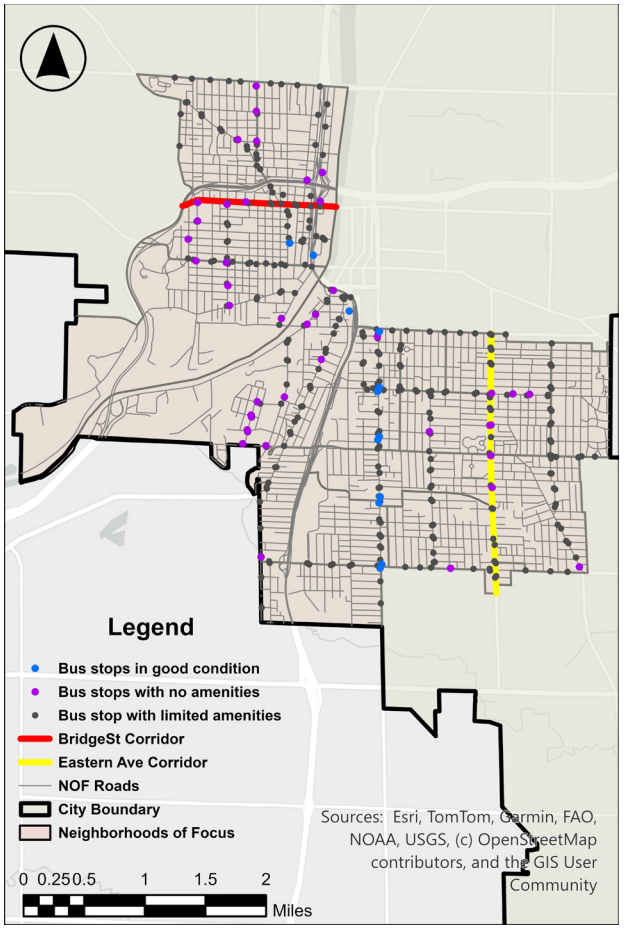


Figure 27: Bus stop conditions in relation to key corridors.

DISCUSSION

From the data collected, two corridors were identified to focus on for further analysis. One being Eastern Ave NE, south of Grand Rapids, and the other being Bridge St NW on the western side of Grand Rapids. Eastern proved to be a valuable corridor to study due to its bisection of the south side of the NOFs. Along this avenue there is a mix of uses (see Figure 25) and bus stop infrastructure conditions (see Figure 27). The bus route that is along this corridor also leads to a major commercial district outside of Grand Rapids. Figure 27 shows that along Eastern there is a higher density of bus stops that are lacking shelters and amenities; one out of the twenty seven stops along eastern has a shelter. Figure 19 shows high population density, and Figure 20 shows that median household income is low along this corridor contributing to the reason why this corridor was selected as a focus area for future study within the NOFs. High non-white populations and high ridership can also be seen in the surrounding census tracts (Figure 22 and 24).

The Bridge St corridor emerged as a site of focus because of its popularity among residents within the NOFs, and outside. The street is an economic hub of the area hosting many restaurants of varying price ranges, nightlife, varying housing, a grocery store, a library, and a park. Two bus routes travel along Bridge St and four bus routes cross it. Similarly to Eastern Ave, Bridge street displays high population density, low median household income, high non-white population, low owner occupation, and high ridership along the corridor.

These corridors differ in key ways, serving different purposes, Eastern being a thoroughfare, and bridge being a destination, with Bridge St. already having higher investment. Along Eastern Ave. (the yellow corridor) in Figure 27 there are a total of 26 bus stops, five of which have no amenities, and 21 of which have limited amenities. Bridge St., pictured in red, has a total of 10 bus stops, one of which has no amenities, and nine of which have limited amenities. These differences, along with the demographic differences, make these corridors important spaces to study going forward.

QUANTITATIVE ANALYSIS SUMMARY

The NOFs are characterized by a young, diverse population which makes slightly below the average income of the City of Grand Rapids as a whole. With this in mind, GRTG is looking forward to continuing investigation into the area through interviews with residents and meetings with local stakeholders. The information gathered in this phase will be important for making comparisons between perceptions of bus stop quality and the realities of the space.

OVERALL THEMES

Two corridors stood out as spaces that need to be studied further: Eastern Ave SE and Bridge St NW. These spaces stand out because of their representation of different user experiences of the public transit system that they provide, and the differing structure in their built environment.

Most of the bus stops within the NOFs lack a shelter, bench, trash can, and adequate lighting. This knowledge highlights the need for improvements and allows for specific recommendations in the future.

The NOFs area is made up of a young population. This is important because younger generations are more likely to adopt public transportation and utilize the infrastructure. However, they don't currently use the transit system to the level that it can sustain.

1,664 people in the NOFs take the public transit system to get to work. This shows the importance of creating a safe and equitable system.

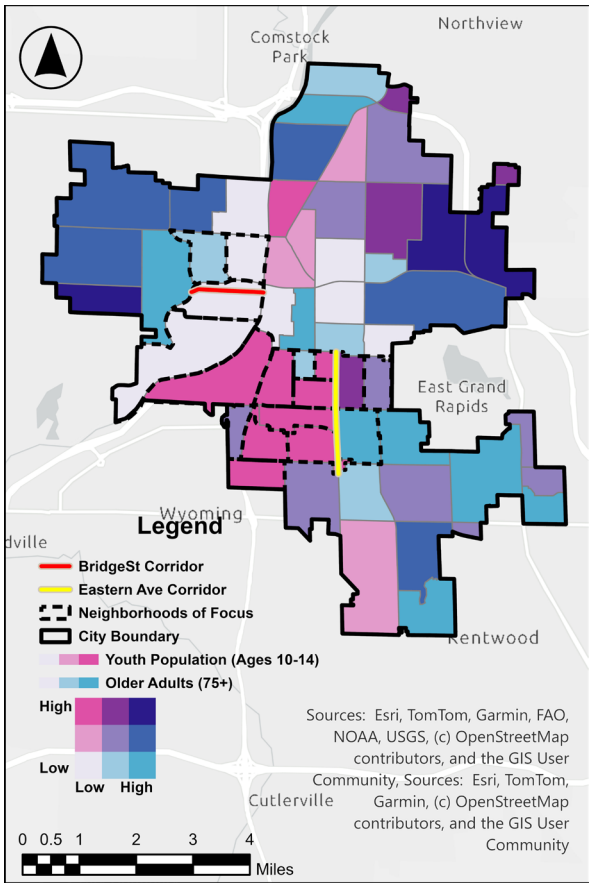


Figure 28: Age analysis by census tract.

PHASE 3:

COMMUNITY OUTREACH & ENGAGEMENT

COMMUNITY OUTREACH & ENGAGEMENT INTRODUCTION

This phase emphasizes community engagement strategies and participatory methods of planning. Insights and themes gleaned from the qualitative and quantitative analysis completed in Phase 1 and 2 were refined through conversations with bus users, community partners, city government employees, and representatives from The Rapid. The goal was to better understand the priorities, needs, and barriers of the various stakeholders in the Grand Rapids transit system through direct engagement.

In the qualitative and quantitative phases, GRTG identified themes within the NOFs having to do with a high level of disparities, high ridership levels, and poor quality of bus stops. Through structured interviews with project stakeholders, findings and themes from previous phases were validated or adjusted to show the development of themes following deliberate public engagement.

During this phase, GRTG validated themes from previous phases having to do with disparities and lack of amenities. New topics of interest were also brought up as the community engagement revealed a deeper understanding as to how the system functions in terms of implementation of bus stop amenities, funding sources, current projects, and barriers to improvement amongst stakeholders. One of the biggest concerns amongst all stakeholders is the topic of frequency. Riders were quick to note in interviews that their number one improvement to the system would be faster and more convenient service. Community organizations and partners communicated that they were aware of this concern and affirmed that it is a top priority improvement, but that there are barriers to accomplishing this goal. This, and other things learned through the engagement process, have illustrated a complex picture of the transportation infrastructure within the City of Grand Rapids and how equity based improvements can be prioritized. These insights help ensure that future strategies reflect both data and lived experience.

Figure 29: A DASH bus approaching its stop.

METHODS

During this phase, a series of interviews were conducted with stakeholders in the bus stop inventory project. Stakeholders were selected to represent the different roles within the scope of the project from patron to provider. Stakeholders included most importantly riders who use the bus on a regular basis for daily needs, facilitators of the services including Mobile GR and The Rapid, and one community group Strong Towns GR who shares a mutual interest in creating a more equitable and sustainable future for the City of Grand Rapids.

GRTG found that rider interviews would prove to be the most effective way at capturing community perceptions on the bus stop infrastructure and the system as a whole. Conducting interviews with patrons at bus stops, and on the bus allows for us to capture real emotion and unfiltered thoughts on the topic. Beyond users, we wanted to gain an understanding of the perceptions and goals of those who play a key role in operating and maintaining the system, that being the Mobile GR department, and The Rapid. Our team also wanted to tap into the breadth of knowledge that is within the Strong Towns GR organization. GRTG conducted formal interviews with these three groups and gained valuable information on operations, goals for the future, grassroots initiatives, and how the community is moving forward.

Figure 30: GRTG team members waiting for The Rapid.

A social media study was conducted in addition to the three formal interviews for preliminary insight into public perception of the Grand Rapids bus system. Two Reddit discussion threads were analyzed, with comments organized into a document and grouped into recurring themes and categories. Incorporating social media analysis and findings into this phase of the project is important as it captures informal user experiences that are often not reflected in structured interviews or data findings. These platforms can provide real-time feedback from riders, allowing us to identify everyday issues that influence how people interact with public transportation.

STAKEHOLDERS

The Rapid:

The Rapid is the operator behind the bus system in Grand Rapids and six other neighboring municipalities. The Rapid has a close relationship with the city and partners with Mobile GR on the DASH. They are responsible for the design of the route system, bus stop infrastructure maintenance, scheduling, and for training and employing bus drivers. The Rapid keeps a close eye on their ridership data and uses that to inform and provide their services. Their input was sought out to inform GRTG on the process of how the bus system functions, how improvement decisions are made, and what barriers exist to improvements.

Riders:

As patrons of the service, riders are the local experts on the system. Riders were prioritized in the interview process and considered the most knowledgeable on the current physical conditions. For this reason, their input was most valuable in determining which improvements were considered and identifying themes.

Figure 31: GRTG team conducting an interview on the bus.

Strong Towns GR:

Strong Towns GR represents a passionate and engaged group of Grand Rapids residents who are committed to making the city better for all through advocating for better urban design and policy. They focus on issues such as affordable housing, streetscape, and public transit. As citizen advocates who are deeply engaged in the ongoings of the city, their input was sought out to inform our understanding of the big picture and to help brainstorm unique solutions to the issues at hand.

Figure 32: GRTG team members interviewing Andrew Carley from Strong Towns GR.

Mobile GR:

Mobile GR provides safe, reliable, affordable, and diverse transportation options to support the City's economic and quality of life goals. Mobile GR receives funding from the city's parking fund and uses them to operate things such as the DASH route and make improvements to the general transit experience within the city. Their input was sought out because it reveals the strengths of the current system as well as barriers to improvements. This aided GRTG in researching and suggesting solutions.

Figure 33: A BRT bus stop with full amenities.

PROCESS

After stakeholders were identified, GRTG strategized on how to best engage with them to receive valuable feedback. Interviews with Rapid riders were meant to reveal how the users experienced their use of the bus, specifically their experience of waiting for the bus to arrive at the bus stop. Questions were designed to prompt users to share their experiences.

The following are examples of questions posed to users:

1.) Is there a certain season that you dislike waiting at the bus stop more than other seasons?

2.) What is one change you would make to bus stops in Grand Rapids?

3.) What are the one to two most important features of a bus stop (e.g.: shelter, seating, bike rack, lighting, trash bin, trees)?

4.) What would you like to see changed with the bus system?

Interviews were conducted with riders on multiple days and times of day. For this phase GRTG visited Grand Rapids on February 6, February 17 and February 20 to conduct interviews with patrons. All interviews during this phase were conducted at Central Station, Eastern Ave, Bridge St, and while riding on the buses. The Rapid Central Station was selected for its high traffic volume while Eastern Ave. and Bridge St. were identified as corridors of interest in a previous phase for their characteristics as being important commercial corridors with surrounding census tracts having higher levels of disparities. Responses from previous interviews with riders outside of this phase were also included and valued for their responses in the findings. These interviews were conducted quickly, often under five minutes due to the riders having to get on or off the bus.

In total three site visits were made with 16 riders being interviewed for their input. All interviews took place within the NOF. Of the interviews, two took place on the bus, three took place on Eastern Ave. corridor, two took place on Bridge St. corridor, and nine were conducted at the Rapid Central Station.

Rider interviews were used to identify themes that related to infrastructure and amenities using a ranking scheme. The other stakeholder interviews with Mobile GR, The Rapid, and Strong Towns GR served the alternative purpose of revealing system and service based factors that can not be provided in user interviews. Interviews with the three organizations provided a detailed picture of how the system functions in terms of responsibility, partnerships, decision making, and barriers. The information provided during these interviews were used to piece together a systematic understanding that will allow GRTG to move forward in researching and recommending solutions in future phases.

Interviews with other stakeholders were formal meetings conducted with representatives from Mobile GR, The Rapid, and Strong Town GR. These interviews were conducted over Zoom in the case with Mobile GR and The Rapid. Strong Towns GR representative Andrew Carley met with members of GRTG at Last Mile Coffee within the NOF. For each interview a set of questions were designed based on each entity's perceived role in transit operation as funder, operator, or advocate. As stated previously, these questions were designed to reveal strengths of the current system, barriers to improvements, work that is already underway, and start the conversation on possible solutions. All interviews with the representatives were recorded with permission from the representatives and detailed notes were taken by two to three team members in attendance of the meeting. Following the interviews, GRTG members who were present discussed what was said and reviewed notes from the interview. Later, interviews were summarized using the recordings to confirm anything that was missed.

Interviews were recorded with permission from the interviewee. Hand written or typed responses were taken regardless of recording. Following the site visits, interviews were synthesized and sorted in a spreadsheet based on perceived interviewee demographics, interview location, issues discussed, and stand out quotes. Using quantitative analysis, interview responses were categorized and counted based on the issues each interviewee brought up. Issues were ranked from the number of times they were brought up. Each interview was also summarized in greater detail by the GRTG interviewer for a deeper understanding of the big picture.

FINDINGS

Rider Interview Findings:

In interviews with riders, GRTG found that frequency of bus routes was the most important factor. When prompted to speak to improvements to the rider experience, frequency was mentioned most often. GRTG interviewers attempted to steer conversation toward physical improvements regarding bus stop infrastructure and comfortability; however, frequency was at the forefront of most riders' interests. During some interviews, when the user mentioned bus shelters, they brought up maintenance and the issue of broken glass walls. Many also mentioned benches with one interviewee sitting on a tipped over shopping cart because there was no bench to sit at. Improvements such as lighting and trash cans were considered nice additions to the bus stops, but only after being prompted about their inclusion.

Issue Ranking

1. Frequency
2. Routes
3. Hours of Operation
4. Shelter
5. Seating
6. Lighting

Bus Driver:

Bus Driver: While at the Rapid Central Station, GRTG had the opportunity to interview a bus driver who has been driving buses in Grand Rapids for over 17 years. He showed off his upgraded bus, with leather seats, outlets, and cameras, and mentioned that roughly 30% of The Rapid fleet has been updated to this package. The driver mentioned that in recent years, crowds on the bus seem to be rowdier, but even with the increased passenger counts, the security features on the new buses meant that he had no concerns over his or other riders safety. Passengers on the bus joined in the conversation and highlighted the good rapport he has with riders and how important it is to him as a driver to have that community.

Mobile GR:

For our first interview, GRTG met with the assistant director of Mobile GR, Ariana Jeske over Zoom. Mobile GR uses the city's parking fund to make transportation based improvements throughout the city. With many demands on this funding source, bus stop infrastructure is just one of many possibilities.

During the interview, Jeske spoke about the strong partnership between themselves and The Rapid. As creators and funders of the DASH, the free bus route that runs clockwise and counterclockwise around the downtown area, they partner with The Rapid for the operation, but manage the promotion and routes themselves. She also mentioned that the two entities communicate consistently regarding how they can support each other especially with the developments happening in and around the city, such as the new amphitheater and soccer stadium.

Jeske sees an issue with the lack of promotion surrounding the bus system. Getting the word out about the ease of taking the bus with its many routes and tap to pay option has been lacking. Jeske also mentioned that many people do not know that the DASH is free. This sentiment was echoed in one of our rider interviews where first time DASH riders stated "We didn't know about it" when asked why they had not taken the bus before then.

Besides funding and promotional issues, Jeske brought up the complexity of implementing bus stop improvements. Implementing improvements often involves the approval of multiple city agencies. This goes for trees, benches, and shelters. When a shelter is implemented Jeske pointed out that they prioritize stops that are already ADA friendly so extra steps do not need to be taken. Frequency was mentioned throughout the interview regarding the proposed decision to shorten the DASH route, improving upon perception of the bus, increasing ridership, and improving rider experience.

Strong Towns GR:

The second interview was with Andrew Carley from Strong Towns GR. Members of GRTG met with Carley at Last Mile Cafe, a black and women owned coffee shop within the NOF. Carley provided valuable insights during the interview. Carley emphasized that while amenities such as shade trees and bus shelters are beneficial, service frequency is what determines how comfortable a route is for the user. If buses run only every 30 to 60 minutes, the route becomes less convenient to people, making it a less attractive option. Riders prioritize frequent and consistent service above additional amenities. They identified limited operating hours as a barrier to ridership. Many routes do not run late into the evening, restricting access for individuals who work late shifts or are traveling home at night. Most routes currently stop operating

roughly between 7:00pm to 11:00pm, which limits the system's overall utility, especially to those who need late night transportation. Carley further noted that park-and-ride lots are underutilized. When ample parking is available at both ends of a route, people will be more likely to drive instead. Additionally, they highlighted the ongoing challenge of negative public perception surrounding bus transportation. Despite improvements and system investments, misconceptions remain about who transit is for. In reality, the bus system is intended to serve everyone in the community. He emphasized the importance of reinforcing that message and educating the population on why the system is good and should be used. Carley was aware of how long it can take for improvements to be implemented through traditional routes of approval, and voiced his interest in alternative solutions for making the improvements the riders want to see such as community groups placing their own benches at bus stops.

The Rapid:

To end our community engagement, GRTG interviewed the Chief Operating Officer at The Rapid, Steve Schipper. Schipper shared with the team how The Rapid functions and how they go about implementing amenities such as shelters. The Rapid creates routes using ridership data and expert engineering to think through ideal placement for stops. Currently, The Rapid implements bus stop shelters through a federal grant program. This funding source requires an approval process at the federal level, including environmental studies for the location. This process can take 12-18 months.

Schipper stated that The Rapid is aware that patrons desire changes to the service including shorter wait times and extended hours, but that funding, and employment, place limitations on doing so. He noted that it is important to keep in mind that The Rapid services not only Grand Rapids, but six other neighboring municipalities.

When asked if The Rapid engages in promotional activity for increasing ridership, Schipper said that they do not currently do any promotional work. This could be a potential avenue for addressing funding and perception issues, something that Mobile GR also is interested in seeing.

An interesting fact that Schipper mentioned is that bus stops can be funded and designed by private citizens or businesses. This opportunity has been taken advantage of by several Grand Rapids entities such as Meijer, Disability Advocates of Kent County, and the Van Andel Arena all of which have customized their stops with unique shelters. This is an opportunity that GRTG is interested in exploring moving forward.

Figure 35: Two interviewees awaiting their first ride on The Rapid.

Social Media Findings:

This social media study was conducted using Reddit threads where users of the platform voice their opinions anonymously, and can converse with each other on the topic. GRTG looked into threads pertaining to the public transportation system of Grand Rapids. From the first thread, recurring themes, and how many times they were mentioned were documented, with the most common observations were concerning service frequency, hours of operation, and the practicality of routing. From this, the percentage of general sentiment was calculated: 58% of the comments were Neutral / Informational, 15% were Positive / Mixed, and 27% were Negative. The second thread showed a more balanced distribution of sentiment, with 31% of comments classified as Neutral / Informational, 39% as Positive / Mixed, and 30% as Negative, showing the same themes as the first thread.

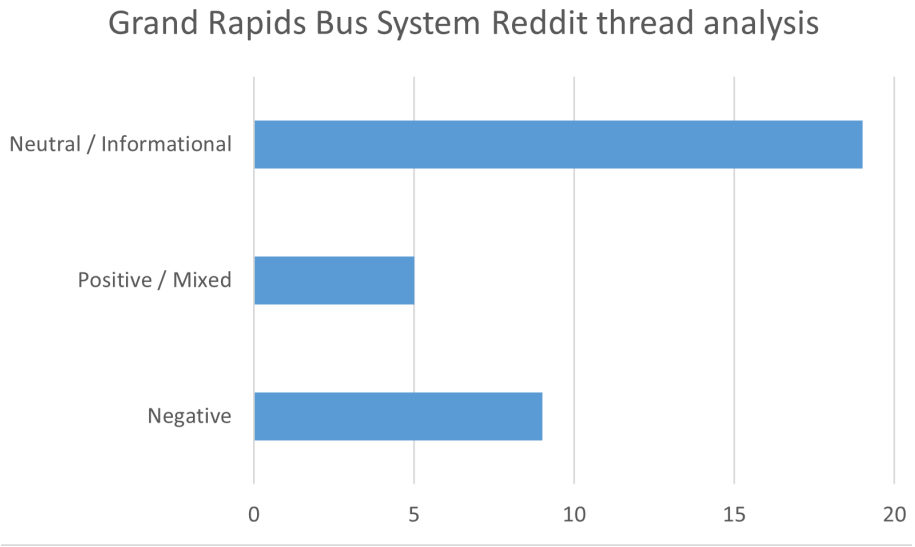


Figure 36: Grand Rapids bus system Reddit analysis.

STUDY QUOTES

"Not where it should be for the population and ridership numbers."
- From Study 1 (Reddit)

"It's not good. It's getting better but slowly"
- From Study 1 (Reddit)

"The Rapid is a wonderful option for public transportation!"
- From Study 1 (Reddit)

"If you live, work, shop and otherwise travel to specific parts which are near the bus lines…..it's okay, not great."
- From Study 1 (Reddit)

"It's always upset me that the bus didn't run late"
- From Study 1 (Reddit)

"honestly it's fine"
- From Study 1 (Reddit)

https://www.reddit.com/r/grandrapids/comments/1e2pldk/hows_public_transportation_in_grand_rapids/

EMERGING FINDINGS & NEW THEMES

Social Media Findings:

During this phase, GRTG discovered that improving bus stops was a far more complex issue than it initially appeared. Originally, our team set out to make recommendations towards physical infrastructure based improvements to make the riding experience more pleasant. However, through community outreach and engagement two interesting discoveries were made. One is that physical infrastructure improvements are not the most important thing to the most important stakeholder group, bus riders. The second is that there are various operational barriers to implementing physical improvements. These barriers include frequency of routes, funding, promotion, and streamlining administrative processes. Addressing these underlying barriers is key to implementing the physical improvements. Moving forward GRTG will be analyzing how to provide solutions for operational barriers alongside physical improvements.

Promotional Issues:

A second emerging issue from Mobile GR and Strong Towns GR is the issue attracting new riders. Ariana Jeske said that one of the largest barriers is getting the word out about the convenience of the bus, while Andrew Carley stated that the perception from the public is that “the bus is for poor people.” From a current user perspective, the bus is simply “just transportation.” In general there is a lack of excitement surrounding the bus ranging from poor to mediocre.

This ties into the issue of funding as more ridership would mean more funds for The Rapid to work with. Promoting the bus as a convenient, safe, and inexpensive alternative to driving may be a fruitful path for stakeholders such as The Rapid to pursue, especially since they do not currently do so. GRTG will research other cities similar to Grand Rapids who have successfully increased their ridership through promotional activities.

Frequency:

In past site visits during the qualitative and quantitative analysis phases, GRTG had received responses from Rapid riders that were most concerned about the frequency of the bus. With our inventory project centering around bus stop infrastructure, GRTG attempted to guide the rider interviews during this phase towards amenity based issues at bus stops such as shelters and lighting through question prompting. Despite this, riders almost always mentioned frequency as their top issue. This was seconded in our interviews with Mobile GR and Strong Towns GR who both commented on the importance of frequency. Andrew Carley, Strong Towns GR representative, stated "Shelters and trees at bus stops are nice, but if the bus comes every 30 minutes then it's not that usable and people don't want to wait." Ariana Jeske from Mobile GR mentioned that the DASH route is currently being reimagined, partially in order to shrink down wait times. These sentiments were also echoed by a group of patrons that stated, "Bus service is more of a priority over bus stops."

While bus stops improvement remains central to the purposes of the project, the concern over frequency among riders and other stakeholders should be noted. Comfort and shade at bus stops is an important factor to consider and wait time is another factor that feeds into comfortability. Moving forward GRTG will research ways to decrease wait time along with improving infrastructure, as the two are no doubt related.

Figure 37: A rider waiting comfortably at a stop with a bench

Funding:

The issue of funding came up in the interviews with Mobile GR, The Rapid, and Strong Towns GR. Improving bus stop conditions is high on all stakeholder priority lists, but there is little money to do so. The Rapid implements new shelters through a federal grant program while Mobile GR receives a limited amount of money from the city's parking fund to make transportation improvements, not limited to bus stops, in the city. Alternative funding sources and/or alternative strategies for implementation may be necessary to make the improvements that stakeholders want to see. One thing that was mentioned during The Rapid interview is that business owners with bus stops on their properties can work with The Rapid to customize their own stop. An example of this is the stop outside of Van Andel Arena. This may be a unique solution to the improvement of certain stops, particularly in the downtown area.

Administrative Processes:

Improvements take time and often must go through multiple entities before they are approved. In terms of the shelters that The Rapid implements through a federal grant program, each location must go through approval at the federal level taking up to 18 months. Introducing a tree at a stop could take multiple months as departments may have to give their approval such as forestry, fire, and engineering. While avoiding the slow moving of administrative processes may be altogether unavoidable, there may be opportunities to streamline certain improvements on the city's side.

Figure 38: A unique bus stop outside of Van Andel Arena.

REFLECTIONS

GRTG faced certain challenges in the community engagement process having to do with time constraints and weather. Rider interviews were conducted under time constraints due to the fact that the interviewee was waiting on the bus. This meant that interviews had to occur quickly, often under five minutes. This was a limited amount of time for the interviewer to introduce themselves, the project, and to ask questions. Many riders were not interested in being interviewed, likely due to the hastiness of the situation. Poor weather conditions were also a factor that potentially got in the way of interviews. During multiple site visits in this phase the weather was quite poor meaning that individuals were not out and about riding the bus unless it was essential that they be doing so.

The information that came from the community engagement in this phase is incredibly valuable for moving forward with the inventory project. Interviews proved that the stakeholders share similar opinions on improvements. Interviews with Mobile GR and The Rapid representatives displayed a secure partnership, and similar barriers in the cases of funding and administrative processes. Strong Towns GR shared their strong commitment to building a stronger community and pursuing unique solutions to doing so.

GRTG was most surprised to hear from riders that amenities at bus stops were not a very important factor to their experience. Frequency was disproportionately the highest concern among users, because of this it was a challenge to engage users with questions about infrastructure without using leading questions. Riders shared that amenities often break or are vandalized. They pointed out that they would feel more comfortable if they had shorter wait times which would increase the convenience of having to ride the bus. On the side of Mobile GR and The Rapid, shorter wait times are difficult to produce because of funding and employee shortages.

The qualitative and quantitative phases previously identified themes of disparity, high ridership, and poor bus stop quality within the NOFs. What GRTG learned through community engagement did not disprove any of these findings; however, they do suggest that there must be discernment regarding what improvements make an actual difference in the experience of riders. As GRTG moves forward with the IPI, the team will also be researching multiple paths forward to achieving the goal of equity based improvements. As mentioned before, these paths will include providing solutions for operational challenges and physical improvements. GRTG sees the operational challenges and physical improvements as two sides of the same coin. Addressing operational challenges will allow for easier implementation and more innovative physical improvements to be made. Solutions to barriers will be addressed in the following phase.

PHASE 4:

CONCEPT PLAN & STRATEGIC FRAMEWORK

CONCEPT PLAN & STRATEGIC FRAMEWORK INTRODUCTION

This phase emphasizes the development of conceptual strategies and frameworks that will lead to, and inform bus stop infrastructure improvement in the neighborhoods of focus. These strategies and frameworks are informed by the previous phases which involved quantitative and qualitative analysis, as well as community engagement. In previous phases centered around qualitative and quantitative analysis, GRTG identified and illustrated the themes of rider comfort, accessibility, inequalities, and disparities at bus stops within the NOFs. During the community engagement phase, GRTG spoke to stakeholder groups including The Rapid, Mobile GR, Strong Towns GR, and riders. During this phase, themes regarding operational challenges to implementing improvements became apparent including funding, promotion, and administrative processes. In addition to this, the theme of bus frequency was also highlighted in the team's rider interviews during the community engagement phase.

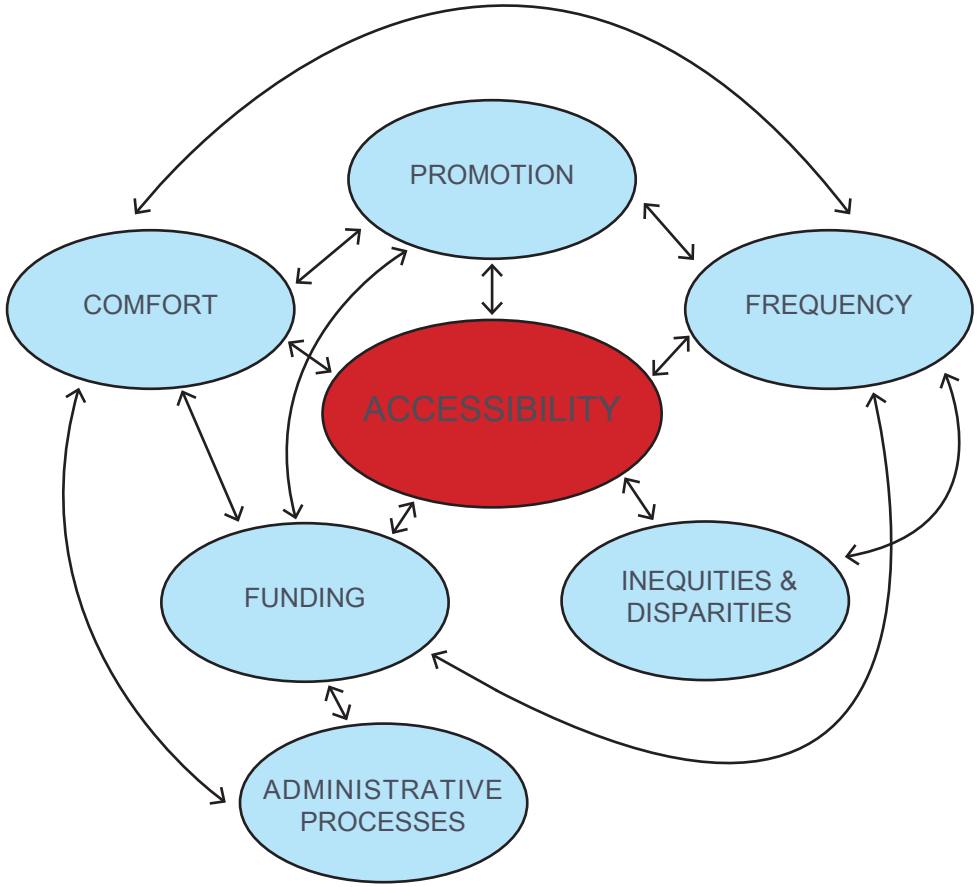


Figure 39: Concept Planning mapping.

The themes identified point to current physical infrastructure issues such as a lack of climate protection and seating at stops, while also encapsulating big picture issues such as a lack of funding to implement improvements and long time frames for the introduction of improvements. GRTG sees all themes as being related and interdependent, and their importance as fluctuating depending on who is being asked. For example, rider comfort at bus stops is influenced by a lack of coverage, however, implementing structures such as shelters can be extremely expensive and time consuming due to administrative time frames. Addressing funding issues and administrative processes therefore becomes potential avenues for addressing comfort. Alternatively, promotional activities and campaigns, something that the Grand Rapids bus system currently lacks, could make a meaningful difference in funding and lead to increased rider comfort down the line with more funds to spend on improvements. However, as many riders noted, frequency is a high priority improvement that can trump comfort, regarding amenities, all together. Here it is possible to recognize that comfort and frequency are not two completely separate issues. Investing in solutions that address frequency and make the bus more convenient can potentially increase ridership–procuring funds for infrastructure improvements down the road.

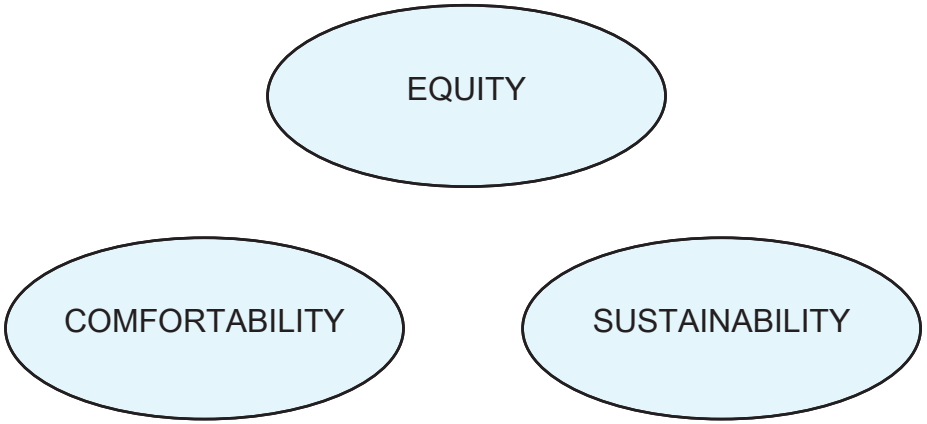
With this perspective we have identified physical and operational solutions that will lead to bus stop improvements in the short term and long term, as well as developed an interactive IPI that will inform where improvements should be made based on customizable criteria. The following conceptual strategies and frameworks include direct physical improvements as well as operational improvements, all of which interrelate to each other.

Figure 40: Bridge St. and Seward Ave. DASH stop.

SUMMARY OF FINDINGS & INFORMED GUIDING PRINCIPLES

From research and stakeholders input, GRTG identified three guiding principles to direct the development of solutions. Principles from the project proposal, which have been fundamental to the project from the beginning, include equity, comfortability, and sustainability. In 2025, the City of Grand Rapids passed the CAAP which places equity at the center of climate action. The city also identified several neighborhoods, which encompass our inventory's NOFs, which represent census tracts with the highest percentage of BIPOC residents and the greatest disparities across all quality-of-life indicators such as education, wealth, and employment. Within the CAAP, transportation is a key sector where the city aims to reduce emissions.

Comfort is included as a key guiding principle because of its influencing effect on ridership as a whole. Comfort encompasses a wide variety of factors affecting the rider experience including physical infrastructure, waiting times, and perception of public transportation as a whole. Interviews with riders and other stakeholders revealed issues and desires for improvement regarding all three of these factors. Addressing comfort in all of its aspects paves the way to sustainability goals as the level of comfort a rider feels plays a large role in getting more individuals out of automobiles and onto public transportation. Together the three principles of equity, sustainability, and comfortability have informed GRTG's strategies moving forward.



EQUITY

A core theme of this project is addressing the future effects of climate change and adapting to the changing conditions. Climate change disproportionately affects low income and marginalized communities because tools and resources may not be allocated equally. With this in mind, GRTG aims to provide evidence-based solutions that address this inequity and work towards climate adaptation. Equity looks like providing infrastructure improvements into areas that have received a smaller portion of transportation investment.

GRTG sees the Bus Stop Inventory & Improvement Plan as fitting directly within the scope of the CAAP as it seeks to improve an essential service, public transportation, which supports both disadvantaged communities and sustainable principles. GRTG's IPI will allow the bus stop improvement solutions we suggest to target disadvantaged communities such as low-income communities, ethnically diverse communities, and communities with high bus ridership.

COMFORTABILITY

Through interviews with riders and community members, comfort became key in guiding the team's recommendations. Riders mentioned that seating, bus stop coverage, and bus stop frequency all contributed to their overall comfort while using the Rapid. GRTG aims to take the perspectives of the users and implement those qualities into the team's recommendations.

Making the rider experience pleasant is essential to accomplishing the guiding principles. If the rider experience is not pleasant, increasing ridership and therefore sustainability is unlikely. GRTG will be looking towards community feedback to address what kinds of physical improvements should be made, prioritized, and where they should be implemented.

SUSTAINABILITY

Preparing for climate change is a goal of the City of Grand Rapids, in which the City aims to reduce greenhouse gas emissions by 85% by 2030 (CAAP 2025). Reducing car dependency is a part of this plan. GRTG is aiming to provide suggestions that will improve the bus experience for riders including physical improvements to bus stops and increased promotion of the service to produce higher ridership which will aid the city in accomplishing its climate adaptation goals.

Limited resources emerged as a theme during the team's conversations with community groups and organizations. With this in mind, GRTG is focusing on infrastructure improvements that are made to last. While being physically sustainable, it is also important to stay financially sustainable to ensure these improvements will last into the future.

INFRASTRUCTURE PRIORITY INDEX EXPLANATION

Upon evaluating the planning goals of the City and meeting with stakeholders, GRTG identified a way to help make data driven planning decisions for bus stop infrastructure by developing a priority list of bus stops within the NOFs that are the best candidates for infrastructure improvement. It immediately became obvious that a host of qualitative and quantitative factors would have to be considered to create this priority list. The qualitative, quantitative, and community engagement phases allowed GRTG to identify factors that are important to various stakeholders in the identification and prioritization of bus stops within the NOFs.

With these factors in mind, GRTG developed the Infrastructure Priority Index which is a customizable index that allows users to prioritize different infrastructure improvements and indicators of disparities to identify stops that are most in need of improvement within the NOFs. As mentioned previously, different groups have different values, priorities, and capabilities when it comes to bus stop improvements. This tool will allow for identification of stops that are best suited for several types of infrastructure improvements based on the personal prioritization of several demographic and disparity-based factors.

Figure 41: The IPI can identify and prioritize stops like this which lack amenities.

INFRASTRUCTURE PRIORITY FACTORS

The IPI factor table contains 17 factors. These can be divided into three major categories: existing infrastructure data sourced from Grand Rapids' GRData portal, data derived from the US Census, and a shade analysis that utilizes data from National Oceanic and Atmospheric Administration (NOAA), United States Geological Survey (USGS), OpenStreetMap (OSM) and Microsoft GlobalML. Each datapoint is stored in one of two forms. If it is a binary indicator (yes or no), the value is stored as a zero or a one, with zero representing "no" and one representing "yes." This is applicable in conditions such as whether a given bus stop has a piece of infrastructure (shelter, bench, etc.). If it is an indicator that is stored as a discrete value (census indicators, heat island data sourced from Michigan's Environment Great Lakes and Energy (EGLE)), the data was normalized on a continuous scale from zero-one, with zero representing the lowest value in the set and one representing the highest value in the set. This allows for calculations with each of the 17 factors on a consistent scale, ensuring all variables contribute comparably to the overall Infrastructure Priority Index without any single metric dominating the results due to differences in units or swing.

The table (Figure 42 (right)) displays each variable in the dataset, its source and what form it is in.

Indicator	Data Source	Data Type
Route number	GRData	List, Normalized to 0-1 index
Transit sign	GRData	Binary
Shelter	GRData	Binary
Stop pad	GRData	Binary
Bench	GRData	Binary
Trash bin	GRData	Binary
Lighting	GRData	String, converted to binary
ADA	GRData	Binary
Canopy coverage	Google EIE	Raster converted to binary
Heat island	EGLE	Value, normalized to 0-1 index
Boardings per day	GRData	Value, normalized to 0-1 index
Sidewalk condition	GRData	String, converted to binary
Population density	US Census	Value, normalized to 0-1 index
% Nonwhite population	US Census	Value, normalized to 0-1 index
Income	US Census	Value, normalized to 0-1 index
People who bus to work	US Census	Value, normalized to 0-1 index
Shade score	NOAA, EGLE, OSM, Microsoft, GR Planning	0-1 Index

Figure 42: Infrastructure Priority Factors data sources and types.

While most indicators followed the same normalization process, three of them followed different methodology to bring them into compliance including route number, canopy coverage, and shade score.

Route number (ROUTE_NUMB) was originally a list of routes, separated by semicolons (e.g. 1; 4; 14; 15). It was decided that whether the stop was a transfer point was the best use of this data, not the specific routes that each stop serves. To display this value, an expression was written to count how many semicolons were in each cell, with one added to gather an accurate count. This gave a count of how many routes were served by each stop, and then these values were normalized on the standard zero to one scale. Outliers had to be considered in this formula, as the main hubs of The Rapid's system contained far more routes than even the highest-served general-purpose stop. These values were simply omitted from the calculation and thus everything above the standard threshold of routes are pegged at "1".

Canopy coverage data was provided by Google Environmental Insights Explorer (EIE) and came in the form of a raster dataset; cells with a value of "1" represent canopy. This dataset is unique in its sheer level of detail, as most canopy datasets only represent a percentage of coverage per census tract. This data is generated by deep learning algorithms trained on Google Earth's extensive data and is only available on a by-request basis. Once we had this raster file processed, buffers of a reasonable distance (five meters) around each bus stop were drawn, and if cells of tree canopy fell within these buffers, a stop was awarded a "1" (meaning yes) for canopy coverage.

The process for generating a shade analysis can take many forms, but for the team's needs, an accurate but fairly low-detail approach was deemed acceptable. First, hand-drawn building footprint data was sourced from OSM. While these footprints are traced by a real OSM user and are thus the most accurate, there are large pockets of missing footprint data within the NOFs. OSM is one of the only platforms that stores metadata for building height and floor count, but as this data is also manually entered, these datapoints are few and far between. Microsoft's "GlobalMLBuildingFootprints" project was used to fill in the gaps where OSM buildings did not exist, but this data does not have any building height metadata. As building heights are necessary to calculate shade, Grand Rapid's zoning map was sourced and placed under the data; Reasonable building heights were assigned to all buildings that fell within a given zoning class. To add some accuracy, a Digital Terrain Model (DTM) was calculated based on NOAA LiDAR data to give a realistic Z (height) value for ground level that varies by location in the city.

Detailed shade modeling can be an extremely computationally-intensive process, and thus a year-round shade model was deemed impractical. Instead, the decision to render two times on one day of the year was reached. August 1st was selected for its usual characteristics of being a day of the year with near maximum temperatures and minimal cloud temperatures. 12pm and 5pm were selected as the representative times for this day because sunlight can be most intense at noon, while the day's hottest temperatures can lag until the early evening. Through an azimuth-based calculation, the sun's angle and building heights yield a shadow length and direction, and the footprints of all buildings were then shifted along this path to represent a shadow. This data was then converted into rasters; cells that experience shade at one of the two times receive a ".5" value, while cells that experience shade at both times receive a "1" value. Buffers of three meters were drawn around

each bus stop, and utilizing a zonal mean calculation yielded the mean of all cell values that fall within these buffers. This leaves us with a continuous shade score value of zero to one for each bus stop entry.

FACTOR WEIGHING

When creating an index value, it is imperative to assign weighting to each of the composite attributes; this determines how much each subfactor contributes to the final index value. In the GRTG IPI model, the relative weighting of each factor is sourced through community outreach and the city's planning goals.

Based on the five potential infrastructure items of shelters, benches, trash bins, lighting and trees, an interactive process was created that populates an interface referred to as the infrastructure needs assessor (INA). This interface allows planners, or others, to calibrate the model by selecting both geographic preferences and overall infrastructure priorities, enabling the model to respond to different planning scenarios while maintaining a consistent dataset and methodology.

The first component of the interface determines how important each type of infrastructure is relative to the others. Users assign values to shelters, benches, trash bins, lights, and trees, adding up to one hundred (see Figure 43). These values represent the relative importance of each amenity within the scenario being modeled. The values are then normalized and incorporated into the calculation so that infrastructure types receiving higher scores contribute more strongly to the final priority results.

The second component of this process determines where a given type of infrastructure should be prioritized geographically. For each infrastructure type, users are presented with a prompt asking what factors should determine where that amenity is placed. This step operates largely independent of the scenario description and instead reflects general priorities identified through stakeholder conversations and community outreach. In this way, the geographic weighting represents the baseline understanding of what conditions typically justify infrastructure investment at a bus stop.

On a scale of 1-100, how important is each bus stop amenity?

	Shelters	Benches	Trash Bins	Light	Trees	Total
This Scenario	66	70	69	69	75	349
Survey Results	25	20	10	15	15	85

Figure 43: IPI preferences scenario table.

Users are presented with a list of factors describing the conditions at a stop or within the surrounding neighborhood. These include the presence of existing infrastructure, ridership levels, transfer activity, sidewalk quality, heat island exposure, population density, income levels, and other demographic indicators derived from census data (Figure 44). Each factor can be assigned a relevance level ranging from "Not Relevant" to "Crucial Factor," allowing the model to represent the relative importance of each condition when determining where infrastructure should be placed. In some cases, variables may also be inverted so that the absence of a condition becomes the priority indicator. For example, when determining where a new bench should be installed, stops that already contain benches can be treated as lower priority locations.

Let's say Grand Rapids has already purchased a shelter. What factors should determine where it goes?

Put a stop at...	Factor Importance	Invert Variables
With a stop pad	4. Extremely Relevant	
With a bench	1. Slightly Relevant	
With a trash bin	1. Slightly Relevant	
With a shelter	5. Crucial Factor	X
With lighting	0. Not Relevant	
With good sidewalk conditions	1. Slightly Relevant	
With a lot of transfer points	4. Extremely Relevant	
With high ridership	4. Extremely Relevant	
With heat island effect	3. Very Relevant	
With high population density	3. Very Relevant	
With high racial diversity	2. Decently Relevant	
With low income	3. Very Relevant	
High ridership to work	4. Extremely Relevant	
Without a tree nearby	2. Decently Relevant	
No shade from nearby buildings	2. Decently Relevant	

Figure 44: Factor relevancy

Because this step reflects the preferences identified through outreach and stakeholder input, these settings generally remain relatively consistent across scenarios. The primary exception occurs when modeling equity-focused scenarios, where demographic indicators may be weighted more heavily than in the baseline configuration. Since equity is not itself an infrastructure type, these adjustments must occur within the geographic weighting step rather than through the infrastructure preference controls.

The results of these two steps are combined within the infrastructure needs assessor to generate IPI scores for each bus stop. The model produces five separate IPI values, one corresponding to each infrastructure category, as well as a single "executive IPI score" that averages the five together. The executive IPI provides a high-level indicator of which stops within the network have the greatest overall need for improvement, while the individual infrastructure scores provide additional detail, identifying what type of improvement would be most beneficial at each stop. In practice, this allows planners to first identify which stops require attention and then determine which specific amenities should be prioritized at those locations.

To make the weighting process accessible during outreach activities, a simplified physical version of the interface was also developed that can be printed and cut out (see index). In this exercise, participants are provided with paper factor labels that can be arranged and ranked according to perceived importance. Participants place each factor beneath relevance categories ranging from "Not Relevant" to "Extremely Relevant," mirroring the digital interface used in the model. The results can then be transferred into the spreadsheet interface to generate a scenario reflecting those preferences. This format allows the activity

to function as a small group exercise or workshop tool and makes the weighting process easier to understand for participants who may not be familiar with the technical components of the model.

Because the weighting system is scenario-based, the model can be recalibrated to reflect different planning priorities. For example, a scenario emphasizing climate resilience may assign higher importance to heat island exposure and shade availability, which may result in tree planting or shade infrastructure being prioritized. A scenario focused on equity may increase the importance of demographic indicators such as income or transit reliance, directing improvements toward neighborhoods where residents are more dependent on public transportation. Other scenarios may prioritize rider comfort by emphasizing shelters or focus on tactical urbanism strategies by prioritizing benches and other relatively low-cost interventions that can be deployed quickly.

This approach allows the IPI to function not only as an analytical model but also as a planning tool that can support ongoing decision-making. By adjusting weights and testing new scenarios, the City of Grand Rapids can evaluate how different priorities affect the distribution of infrastructure investments across the city. The same framework can also be adapted for community engagement, allowing residents, advocacy groups, or planning staff to participate in shaping how the model evaluates need. Survey tools such as Google Forms could be used to collect preferences from a larger group of participants, with the results translated into model weights to generate new scenarios. In this way, the IPI provides a transparent method for exploring how different priorities influence infrastructure decisions while maintaining a consistent and data-driven analytical framework.

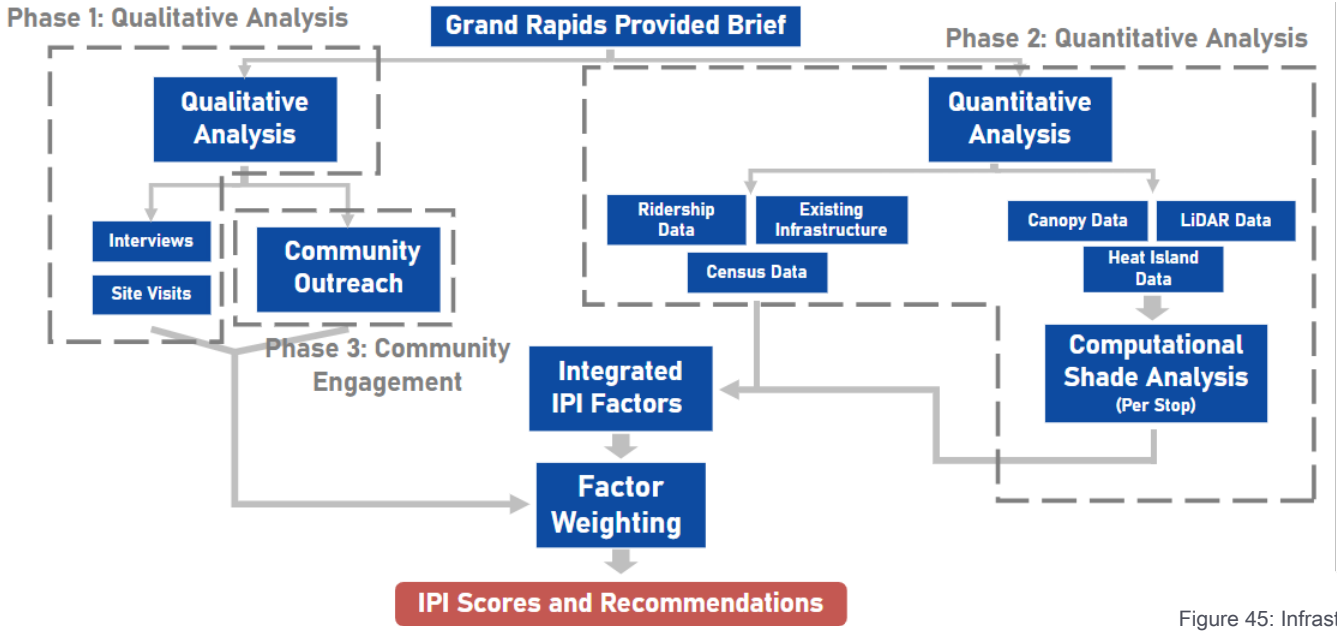


Figure 45: Infrastructure Priority Index flow chart

OPERATIONAL CHALLENGES

STREAMLINING ADMINISTRATIVE PROCESSES

TIME FRAME: 1 to 2 YEARS

Stakeholder interviews with The Rapid, Mobile GR, and Strong Towns GR revealed that administrative processes is a barrier to bus stop infrastructure improvement. Steve Schipper, COO of The Rapid, said that it can take anywhere from 12 to 18 months to implement a shelter due to the current federal grant system they use to fund implementation. Similarly, Ariana Jeske from Mobile GR spoke to prolonged time to implementation for bus stop improvements due to the multiple agencies that must approve physical changes.

With time to shelter implementation being the most involved, drawn-out, and most expensive approval process, GRTG sees this information as an opportunity to focus on alternative solutions to bus stop improvements. Introducing trees for shade coverage and/or benches for seating are both meaningful alternatives to shelters and take less time to implement. The City of Grand Rapids is aiming to increase the city's tree canopy to 40%, implementing trees near bus stops that most need them would be a prime opportunity for the city to accomplish this goal in an equity centered way. GRTG's IPI will allow Grand Rapids to prioritize where to place trees and benches by prioritizing factors such as heat index, low income, and any other of our 14 weighting factors. Prioritizing alternative improvements such as trees and benches does involve the trade-off of the higher quality weather protection of a structure like a shelter. Trees only provide shade for half of the year, and benches do not offer protection from the elements. While this may seem like a highly uneven trade-off, GRTG found in rider interviews a general lack of concern over shelter-based improvements. As mentioned in Phase 3 reporting, frequency was the largest concern amongst riders. In two rider interviews shelters were explicitly mentioned as being undesirable due to their ability to be vandalized.

The Grand Rapids Office of Sustainability should consider options for streamlining approval for multiple types of infrastructure improvements. While trees and benches have faster implementation times to shelters, all three can take multiple months to complete. One way to streamline the process would be to seek out redundancies within the ordinance that can be altered to speed up the process. Another opportunity would be to create a focus group that meets on a regular basis to approve small scale improvements such as these. Rather than handing off an application for approval to one city agency at a time, a focus group of this nature would include a member from multiple city agencies with the authority to approve the necessary change made in a single meeting session.

FUNDING

TIME FRAME: 1 YEAR

A major issue The Rapid noted during the team's interview was funding. The 12-year millage that is currently in place for funding is set to expire in 2029, and they expressed dissatisfaction with the application process and competitiveness for federal and state grant programs. The Rapid also explained that even when grants of this nature are secured, the stipulations that accompany them make it hard to make improvements, as the environmental studies required can cause a six to eight month delay. To solve this problem, private investments can be made to help combat the roadblocks accompanied by grant programs.

Bus stops that are on or adjacent to land owned by businesses can be modified by the business. This would produce an improved stop, as well as benefit the business with increased foot traffic and ridership numbers, leading to more business. Another option for larger, more full-scale, improvements would be to secure funding from investors with heavy ties to the city. Because these investors supported previous philanthropic projects and have major real estate and development interests in the city, there could be incentives for private investment in the public transit system. Investing in the NOFs transit infrastructure would increase mobility as well as benefit properties and businesses along the route. An example of this is the new amphitheater which is located within the NOFs. The Rapid could lean into securing investment from the development investors in order to expand bus infrastructure in the area. This would support event traffic, while improving the transit experience for the everyday user at the same time. Private investment can also be framed through existing philanthropic programs focused on community and economic development. The Richard and Helen DeVos foundation already has initiatives in this realm, and improving infrastructure can be shown as a way to improve community and economic development to secure funding. Improving public transit also retains and attracts young professionals, which improves the labor force and increases local spending, strengthening the local economy. Securing investment from private investors can be done through framing it as philanthropic, economic and community based, or that improved transit infrastructure brings potential for increased commercial activity around investor-owned properties.

Figure 46: A Rapid bus stop outside of a local business.

PROMOTION

TIME FRAME: 1 YEAR

Promotion of the bus system is a key issue that the City of Grand Rapids faces when it comes to increasing transit use and striving for its broader sustainability goals. Through interviews with The Rapid, Mobile GR, and Strong Towns GR, a clear contrast emerged between the current level of promotion of the bus system and the level of awareness needed for wider public adoption and support. Improving awareness of the system can help more residents understand and access this transit system, supporting larger city goals related to equitable access, sustainable transportation choices, and a more comfortable user experience.

During the interview with Rapid COO Steve Schipper, he explained that no promotional work is currently done to increase ridership, stating that "transit is not sexy, it's necessary." This perspective reflects an operational focus on maintaining service rather than marketing it. While this does display a clear focus on maintaining core service of the system, it could also limit opportunities to improve public awareness of the system. Other stakeholders emphasized that awareness is one of the primary barriers to transit use. During the Mobile GR interview, Ariana Jeske stated that "one of the largest things is getting the word out" noting that many residents do not realize that the DASH is free or that riders can pay on other routes by simply tapping a credit card. This lack of knowledge suggests that many potential riders may not understand when buses operate, where they run, or how to use the system. This relates back to the guiding principles of sustainability and comfort. Improving promotion addresses the principles of sustainability and comfort as it can increase ridership through things such as awareness campaigns that highlight the ease of using the bus.

Public perception also plays a role in limiting ridership. The interview with Strong Towns GR highlighted the stigma that still exists around bus use, with Andrew explaining that people often claim, "the bus is for poor people or the bus is for black people or "those people"" even though "the bus is for everyone." These perceptions contribute to lower ridership and reinforce the idea that buses cannot be a mainstream or preferred transportation option. Addressing this stigma is important not only for increasing ridership but also for supporting equitable and inclusive mobility options.

Improving promotion could support several sustainability objectives identified in the Grand Rapids CAAP. Increasing transit ridership can reduce reliance on private vehicles, lower emissions, and support more sustainable transportation choices. Promotion strategies could take both physical and digital forms. Physical promotion could include informational signage at key corridors and cross over points, flyers at stops with guidance as well as visible wayfinding that makes transit stops easier to identify. Digital promotion could include an enhanced social media presence, clear online route information, promotion of their app service, and informational campaigns explaining how to use the system.

However, promotion efforts involve trade-offs. The Rapid currently operates within significant financial constraints and faces limited funding options for expansion or new programs. Increasing promotional efforts could add additional costs to a system that already faces operational pressures. At the same time, promotional investments can also be viewed as a risk-reward strategy. While they require upfront spending, increased awareness and ridership could generate additional fare revenue and strengthen the system's long-term financial sustainability.

ArtPrize COLLABORATION

TIME FRAME: 1 YEAR

ArtPrize is a yearly event in Grand Rapids that draws artists from all over the state and beyond, to bring art into the city. A collaboration between these artists and the transit system would bring attention to, support, and bring excitement to the transit system. This collaboration can take many forms, from murals at stops, an integrated art tour using buses, or sculptures providing seating or forms of shade. The current bus system does not get the exposure and usage that it can maintain. Leveraging the community's love for art can be a way to break the stigma that public transit holds. ArtPrize, and the collaboration with artists leaves the door open for creative solutions to the infrastructure issue, lack of promotion, and potential lack of funding, while bringing uniqueness and attention to these underserved communities. The teams interviews revealed that citizens of Grand Rapids have pride for their city, and creating more spaces of character can increase this connection.

A collaboration with ArtPrize can extend beyond the dedicated time frame of the event, and can become a City and Artist initiative. There are a lot of creatives within the City of Grand Rapids, and many would love for the opportunity to create meaningful and lasting changes in their communities. A collaboration with artists will not only improve the bus transit system, but bring character and uniqueness into the urban realm.

Figure 47: An ArtPrize installation on public infrastructure.

FREQUENCY

TIME FRAME: 5 YEARS

Frequency emerged as a high priority for both users and operators when conducting this research. When GRTG conducted interviews, one of the first issues an interviewee would mention was frequency, even when prompted to speak to physical infrastructure issues. Due to the level of concern regarding bus frequency, it is important to address that working towards decreasing route times can serve as an alternative solution to the shade issue. When

Figure 48: A DASH bus en route.

PHYSICAL SOLUTIONS

PRIVATE PARTNERSHIPS

TIME FRAME: 1 to 2 YEARS

Partnerships with businesses and private property owners present a promising opportunity for The Rapid and DASH to expedite bus stop improvements that might otherwise face long implementation timelines due to administrative processes tied to federal funding requirements. While shelters funded by federal programs can take anywhere from 12-18 months for installation, partnerships with businesses and private owners near bus stops would allow for faster implementation timelines. In addition to improving rider comfort through seating and shelter, these partnerships also create opportunities for businesses to contribute to the visual character of their neighborhood by supporting bus stop designs that reflect the identity and vibrancy of the surrounding area. This would also be an opportunity for a business to advertise themselves through a clear commitment to community improvement and unique design that reflects something of their brand and product. Partnerships are something that The Rapid and DASH look towards for improved infrastructure improvements. The Grand Rapids Office of Sustainability can aid in this project through creating an initiative and application for businesses that may be interested and supporting them in the process.

Figure 49: A Rapid bus stop sponsored by Meijer.

Another notable partnership is that of The Rapid and the Van Andel Arena. This partnership demonstrates how transit infrastructure can also function as a tool for visibility and place-making. Because Van Andel Arena hosts hundreds of thousands of visitors for concerts, sporting events, and community gatherings throughout the year, the bus stop serves as a highly visible entry for attendees arriving by transit. Given Grand Rapids' strong culture of public art, transit stops should incorporate artist-designed elements, murals, or decorative panels that reflect the city's creative identity. Collaborations with local artists and ArtPrize would not only enhance the visual quality of bus stops but also create a sense of place that aligns with a given area or community. By promoting and expanding partnerships like this, The Rapid could demonstrate how transit infrastructure can support community engagement, celebrate local creativity, and contribute to the vibrancy of downtown public spaces.

To further explore these opportunities, GRTG have identified five locations throughout the NOFs within Grand Rapids which present promising opportunities for future bus stop partnerships:

New Holland Brewing/Kawa Sushi & Bar—Bridge Street

The stop located near New Holland Brewing Co. and Kawa Sushi & Bar on Bridge Street, sits within one of the area's most active restaurant corridors, where foot traffic and evening activity are consistently high. Although the available sidewalk space cannot accommodate a full shelter, a partnership between one or both adjacent businesses could support the installation and design of a bench that reflects the character of the surrounding area. By contributing to the design and funding of a bench at this location, these businesses could help create a more comfortable waiting space for transit riders while also reinforcing the vibrant identity of the Bridge Street corridor.

Figure 50: New Holland Brewing.

Bridge Street Market—Bridge Street

Bridge Street Market is a major grocery destination and a frequent stop for transit riders. Currently, there are no formal amenities at the nearby stop, though people can choose to sit on the stairs leading up to Bridge Street Market or on the nearby raised streetscape planter while waiting on the bus. Because this stop serves Bridge Street Market and other nearby businesses, many riders are likely waiting with shopping bags. Installing a shelter and bench would provide riders with a more comfortable and practical waiting space protecting their groceries from the elements and providing a place for the user to sit and rest. Additionally, if Bridge Street Market incorporated their branding into the shelter design, the stop could also enhance the visibility of the store while contributing to the aesthetics of the surrounding area.

Figure 51: Bridge Street Market.

Chartreuse Sisters, Wellspring Church of Grand Rapids, The Counting House—Intersection of Eastern Avenue and Wealthy Street

This intersection contains four bus stops currently with no amenities and is surrounded by small businesses and community-oriented organizations such as the Chartreuse Sisters, Wellspring Church of Grand Rapids, and The Counting House. These businesses and organizations could potentially participate in designing or hiring local artists to design bus stop amenities; each stop incorporating artwork or visual themes reflecting the adjacent building or the broader neighborhood identity. While space limitations may restrict some stops to benches rather than shelters, artistic collaboration could transform these stops into small pieces of community expression.

Figure 52: Chartreuse Sisters.

Oxford Food Center—Oxford Street; Black Hills

Oxford Food Center is a local grocery store in a majority non-white neighborhood where riders frequently board the bus while carrying groceries. While a full shelter may be difficult to fund, a simple bench would significantly improve comfort for riders waiting with their groceries. Oxford Food Center may not have the financial capacity to fund bus stop improvements themselves; however, this location is a strong candidate for tactical urbanism initiatives, where community groups, artists, and donors could collaborate to assist this underserved neighborhood.

Figure 53: Oxford Food Center.

YMCA of Greater Grand Rapids—Lake Michigan Drive

YMCA of Greater Grand Rapids serves a wide range of residents through youth programs, childcare, fitness facilities, and community events, making reliable transit access important for individuals who may not have access to a personal vehicle. Improving both DASH stops here would help ensure that riders have a safe and comfortable place to wait between buses. Currently, each stop has overhead lighting, a trash bin, and a large concrete pad that would be capable of accommodating a shelter and a bench.

Figure 54: Grand Rapids YMCA.

TACTICAL URBANISM & TEST STOPS

TIME FRAME: 5 MONTHS TO 1 YEAR

Tactical urbanism is a strategy used for low-cost, small-scale interventions to test ideas for improving the built environment before making permanent, expensive investments. If successful, these projects can promote permanent policy or infrastructure improvements. The approach emphasizes community participation and quick implementation rather than waiting years for municipalities to be able to approve projects. In many cases, these interventions are intentionally temporary so that communities can evaluate what works and make adjustments before committing to long-term infrastructure changes. Because tactical urbanism relies on inexpensive materials and community labor, it can allow neighborhoods to address immediate needs even when municipal budgets or administrative processes slow down projects.

This strategy was mentioned as a possible solution during a meeting with a local community organization. As stated in the team's interview with Andrew from Strong Towns GR, "The big challenge in getting a shelter somewhere is that, so if you're a municipality, you've got to do your environmental study. So you come in, you do your environmental study–that takes 12 to 18 months and then you've got to get a contractor. That takes another couple of months. So it basically takes like two years to put a shelter out before you even have the shelter". This example highlights why tactical urbanism approaches can be valuable. Riders may be waiting years for improvements to basic infrastructure such as benches or shelters, even when the need is clearly visible. Tactical urbanism is a way for communities to respond more quickly by implementing small improvements that improve the transit user experience.

There are multiple ways tactical urbanism can be used in Grand Rapids. One example is installing benches at bus stops where riders currently have to stand while waiting. Even a simple bench can make a stop more accessible for older adults, people with disabilities, or riders carrying bags. Similarly, installing trash cans at busier stops can help keep the surrounding area clean and reduce litter that often accumulates in high-traffic transit locations. Additionally, improvements to signage and wayfinding can also be implemented through tactical methods. Clear signage, route maps, or temporary markers can help riders identify bus stops and understand how routes connect, especially in locations where existing information is limited. These types of small interventions can improve the rider's experience without the red tape and long lead times of waiting for the city to make these improvements.

The IPI will be used to prioritize which stops to make these improvements at. By identifying stops with the greatest need, such as those with high ridership but limited amenities, tactical urbanism interventions can be focused on where they will have the greatest impact. Over time, these small improvements will help demonstrate demand for better transit infrastructure and support the case for more permanent investments by the city.

Figure 55: Citizens in San Jose, CA engaging in Parking Day, an annual tactical urbanism event.

PLANTING TREES

TIME FRAME: 3 TO 15 YEARS

Tree planting is a long-term solution, as the full benefits of urban trees are realized once they reach maturity. The bus stop project started with the initial direction of planting shade trees as a potential amenity to attract more ridership, however the benefits of tree planting go well beyond that scope. Even the city of Grand Rapids has recognized the importance of planting new trees. The Grand Rapids' CAAP, ForestryPlan and Community Plan have all stated that the city is looking to increase urban forest canopy coverage to 40%. This goal aims to improve the city by reducing the impact of greenhouse gases (GHG's), provide shade to residents, improve walkability and minimize the impacts of urban heat island effect.

Planting trees will work to achieve multiple goals the city has such as the greenhouse gas reduction targets, the protection of overall community health, and creating resiliency to climate change impacts. Planting trees has many benefits, they can improve the environment, health, resiliency, and the economy of communities. Trees improve the environment by reducing GHGs as well as provide natural habitats to wildlife and cool down the local environment. When planting trees, there is an opportunity to improve community health by removing pollution from the surrounding environment. The cooling effect that trees produce via shade and transpiration also reduce the health impacts from urban heat island effect and reduce the likelihood of heat related illnesses, this also benefits climate resilience. Other ways trees contribute to climate resiliency is by reducing and intercepting stormwater runoff while also improving the quality of the water. Planting trees at bus stops will also benefit the local economy by improving the aesthetic and beauty of the city, which in turn increases property values and it can aid in tourism as well. Trees that reach the end of their life can be recycled into many different wood products, for example, be used in building new park benches for the city. Another good example for this would be Michigan State University's Sustainable Wood Recovery Initiative which takes trees that had to be removed from campus and repurposes them into works of art.

Figure 56: A pleasant Laker Line bus stop with mature trees providing shade.

CONCEPT PLAN & STRATEGIC FRAMEWORK CONCLUSION

Equity, sustainability, and comfortability emerged as themes throughout the project, thus guiding the team's recommendations. Through qualitative analysis, quantitative data and community input, both spatial and non spatial methods need to be employed for cohesive progress towards improving the Grand Rapids transit system. Partner collaborations with businesses, city events, philanthropists, and local groups can work towards solutions to barriers that arise when looking at addressing infrastructure at bus stops. As a way to guide development, the infrastructure priority index can be used to help decide where improvements can be made. The IPI allows for nonprofessional community opinions and values to be translated into an empirical based selection of bus stops to prioritize. GRTG has recommended solutions to barriers that are both operational and physical. Across the board different organizations play separate and sometimes overlapping roles in relation to bus stop infrastructure. The Grand Rapids Office of Sustainability can advance avenues for infrastructure improvement through suggesting ways to streamline infrastructure improvements to the City, as well as partnering and supporting agencies who deal directly with implementing and promoting the bus service.

Figure 57: An activity allowing participants to influence IPI factors for different scenarios.

PHASE 5:

PRECEDENT STUDIES

PRECEDENT STUDIES INTRODUCTION

In the concept plan and strategic framework in the previous phase, GRTG curated actionable recommendations to improve the transit experience. These recommendations were carefully selected considering existing conditions, community feedback, and planning goals found in previous project phases. However, it is likely no action will be taken to realize such improvements without clear implementation strategies informed by case studies of successful municipalities. Accordingly, the objective of Phase 5 is to validate each significant recommendation using case study analysis.

GRTG selected six municipalities with implementation tools and strategies that can be applied in Grand Rapids: City of Takoma Park, Maryland; New York City, New York; Dublin, Ireland; Athens, Georgia; Austin, Texas; and Burlington, Vermont. First in the analysis, the City of Takoma Park has implemented a bus stop improvements prioritization system similar to the IPI developed in this report. Tokoma Park considers several geographic strategies for implementation, such as a corridor-by-corridor approach and a ridership-based approach. Such strategies could build upon the Grand Rapids' IPI, creating a detailed implementation plan for bus stop improvements. Next, a zoning amendment passed in New York City allowed builders in Manhattan to build at higher densities in exchange for additional fees used to fund the subway system. Grand Rapids should consider adopting a similar incentive bonus, which would raise funds to increase frequency, a top priority noted in community engagement. In Dublin, a myriad of promotional strategies are used to improve community perception of transit and increase ridership. Although it is impractical for Grand Rapids to advertise at the same scale as a major European city, Dublin's promotional strategies could be scaled down and still have a positive impact. Athens-Clarke demonstrates an alternative promotional model: artistic shelters. Under a public-private partnership, Athens-Clarke collaborates with local artists to design appealing bus stops. In a similar way, Grand Rapids could collaborate with ArtPrize, steadily developing an inventory of unique and interesting bus stops. In Austin, researchers found that bus stops that were well-shaded experienced smaller declines in ridership on hot days than poorly-shaded bus stops. The same principle likely applies in Grand Rapids, reinforcing the importance of providing the shade structures designated by the IPI.

Finally, Burlington has implemented a legal framework for community members to implement various types of infrastructure, such as curb extensions, bike lanes, and wayfinding signs. This corresponds to tactical urbanism recommendations developed in the previous phase of this report. Grand Rapids should consider developing a legal framework allowing community members to design and install their own bus stop benches.

CASE STUDY MATRIX

Case	Strategy	Design Principles	Implementation Tools	Outcomes	Transferability	Lesson
City of Takoma Park, Maryland	Infrastructure Prioritization Strategies	Transit Equity	Bus Stop Inventory and Prioritization System	Efficient and purposeful resource allocation Increased ridership	High	Prioritizing bus stops results in areas of need being addressed
New York City, New York	District Improvement Bonus (DIB)	Transit Oriented Development	Zoning Amendment	Increased funding for transit improvements through leveraging development incentives	Medium	Special zones, districts, or other tools can be leveraged by municipalities to make infrastructure improvements
Dublin, Ireland	Promotion and Advertising	Outreach	Advertising and Physical Infrastructure Improvement	Increase in bus ridership due to increased knowledge of the service Illustration of the circular relationship between promotion and funding	High	Effective promotion of the bus network can vastly improve the bus system
Athens, Georgia	Artistic Bus Stops	Rider Comfort	Public-Private Partnership	Illustration of how unique and artistic infrastructure can serve as its own form of promotion	High	Visual appeal plays a role in attracting new riders and improving rider comfort
Austin, Texas	Tree Planting around Bus Stops	Rider Comfort	Physical Infrastructure Improvement	Increased Ridership	High	Planting trees around bus stops increases ridership
Burlington, Vermont	Tactical Urbanism	Bottom-Up Planning	Community led Infrastructure improvements	Implementation of Infrastructure	Medium	Community based initiatives are viable short-term alternatives to government based infrastructure improvements

Figure 58: Case Study Matrix.

CASE STUDY #1

TAKOMA PARK, MARYLAND - BUS STOP IMPROVEMENT PROJECT

The Takoma Park Bus Stop Improvement plan is a comprehensive case study that focuses on improving bus stop infrastructure by addressing accessibility, safety, and user experience. The study provides a detailed inventory and analysis of a field survey of 138 bus stops and identifies key issues such as lack of ADA compliant boarding areas, proper pedestrian connection and amenities including shelter, seating, and light. All these factors directly impact user experience and transit ridership and highlights that improving bus stops is not only about transportation but also encourages more people to use transit. The improvement plan incorporates multiple factors such as safety, cost, ridership, climate impact and racial equity.

This study is directly connected to the Grand Rapids project because both have the same priorities as well as following a similar methodology and developing recommendations based on real factors.

The process begins with a detailed field survey, further supported by GIS and spatial analysis to map all bus stop locations and identify patterns across the city, such as areas with higher services needed. The analysis considers important factors such as accessibility conditions, sidewalks connectivity, ridership and surrounding land use. One of the major issues identified in the Takoma Park study is the lack of accessibility across bus stops. The report shows that only about 39% of bus stops are ADA compliant, meaning the majority do not meet basic accessibility standards. The study also highlights the lack of basic amenities, with only a small percentage of stops having shelters and about 40% providing seating, while lighting, although more common, is still not available everywhere. Based on this data, a prioritization system was developed where each bus stop was given a score which helps rank bus stops and decide which one should be improved first.

Figure 59: A unique bus stop in Takoma Park.

After finding gaps, the city outlines a set of structured improvement approaches that help prioritize and implement bus stop improvements in a more efficient and user-focused way. These approaches can be adapted by City of Grand Rapid's project.

1. Corridor-by-Corridor Approach - This approach focuses on improving bus stops along major corridors instead of isolated locations.

2. Amenity-by-Amenity Approach - This approach focuses on improving bus stops step by step by prioritizing essential features first. For example, in areas where transit is provided during early-morning and late-night hours, a focus may be placed on ensuring that there is adequate lighting for waiting passengers.

3. Ridership-Based Approach - This approach prioritizes improvements based on how frequently bus stops are used, ensuring that investments benefit the largest number of users. Prioritizing lower ridership stops will increase the visibility of transit in lower density residential areas, while prioritizing higher ridership stops will see increased amenities on large commercial corridors and higher-density neighborhoods.

4. Community-Based Approaches - This approach focuses on involving local communities and enhancing the character of bus stops as part of the public space. The study highlights that Takoma Park bus stops are unique and reflect local identity.

Community institutions such as schools, businesses, and neighborhood groups can also play an important role in this process.

For example, St. Mary's Transit in Southern Maryland runs an Adopt-A-Stop program, where local businesses help with maintenance in exchange for advertising space. Similarly, in Bethesda, the Bethesda Urban Partnership operates a free shuttle service and has installed unique benches at bus stops, many of which are shared with Ride On services.

These examples show how public–private partnerships can improve both the quality and maintenance of bus stops. This is similar to what our team is planning to propose, where private businesses can be involved in supporting bus stop improvements. These real-world examples function as proof that such partnerships can not only improve infrastructure but also increase ridership and create benefits for local businesses.

Overall, Takoma Park is smaller in scale and has a lower population than the City of Grand Rapids. This case study strongly supports our recommendations for improving bus stop conditions in Grand Rapids. Our project identifies key issues such as lack of seating, shelter, and accessibility, which are also highlighted in the case study. In the previous phase on the development of conceptual strategies and frameworks, GRTG proposes solutions such as private partnerships, tactical urbanism, and infrastructure prioritization, which closely align with the approaches used in the case study. Additionally, our use of the IPI reflects a similar data-driven approach, where multiple factors such as ridership, accessibility, and surrounding conditions are used to prioritize improvements. The case study also emphasizes prioritization and efficient resource allocation, which validates our method of identifying high-need locations. Furthermore, the City of Grand Rapids focus on equity, comfort, and sustainability is directly supported by both the case study and our findings.

CASE STUDY #2

NEW YORK CITY, NEW YORK - HUDSON YARDS DISTRICT IMPROVEMENT BONUS

The Hudson Yards development in Manhattan, New York City, was a large development consisting of retail and residential projects. As part of the development, the city council approved a rezoning of the area to promote economic growth and high-density development. As part of the rezoning, the council implemented a District Improvement Bonus (DIB). This DIB allowed developers to exceed the normal maximum floor area ratio (FAR) in exchange for financial contributions to a public infrastructure fund, which was used to conduct infrastructure projects serving the development area. The purpose of this fund was to ensure that the infrastructure could handle increased stress from the increased density of the development. The contribution to the fund was in relation to the size of the development. The most significant outcome of the DIB fund was the extension of the #7 subway line by two miles, which served the Hudson Yards neighborhood. The fund also supported public amenities such as parks, open space, and streetscape improvements, which enhanced the accessibility of the development.

A similar approach could be adapted and applied in Grand Rapids, particularly along the Eastern Ave and Bridge Street corridors, which are already experiencing new development, and are in proximity to downtown. In this context, transit upgrades could be tied to development through urban planning tools such as tax increment financing (TIF) conditions, conditional rezoning, or density bonuses similar to the Hudson Yards model. These tools would allow the city to capture some of the value created by new development and reinvest it into transit infrastructure.

The main focus of these investments would likely be on physical infrastructure, such as new or improved bus stops, shelters, benches, or lighting. Improved physical infrastructure can make public transit more accessible, comfortable, and reliable, which could lead to better ridership numbers, which is a large problem post-COVID that The Rapid highlighted in their interview. With increased ridership from improved infrastructure, The Rapid may be able to justify operational improvements such as increased frequency or expanded routes.

Also, these transit investments align with the goals of the department of sustainability. Increasing transit ridership reduces vehicle emissions,

and improved bus stops can address issues such as lack of shade coverage. These improvements contribute not only to environmental sustainability, but also to equity by making transit more accessible to a wider range of users.

Although the scale of development in Manhattan is much larger than that of Grand Rapids, the principle behind the Hudson Yards model is still applicable. The principle is to leverage development incentives to fund public infrastructure proportionally to the density of the development. By focusing on the team's Bridge Street and Eastern Ave corridors, Grand Rapids can implement an approach that aligns transit improvements with areas experiencing growth. This allows the city to leverage the impact of new developments to address the funding issues The Rapid expressed. Application of the Hudson Yards model could help create a more sustainable, equitable transit system by using development interests to improve the public transit system.

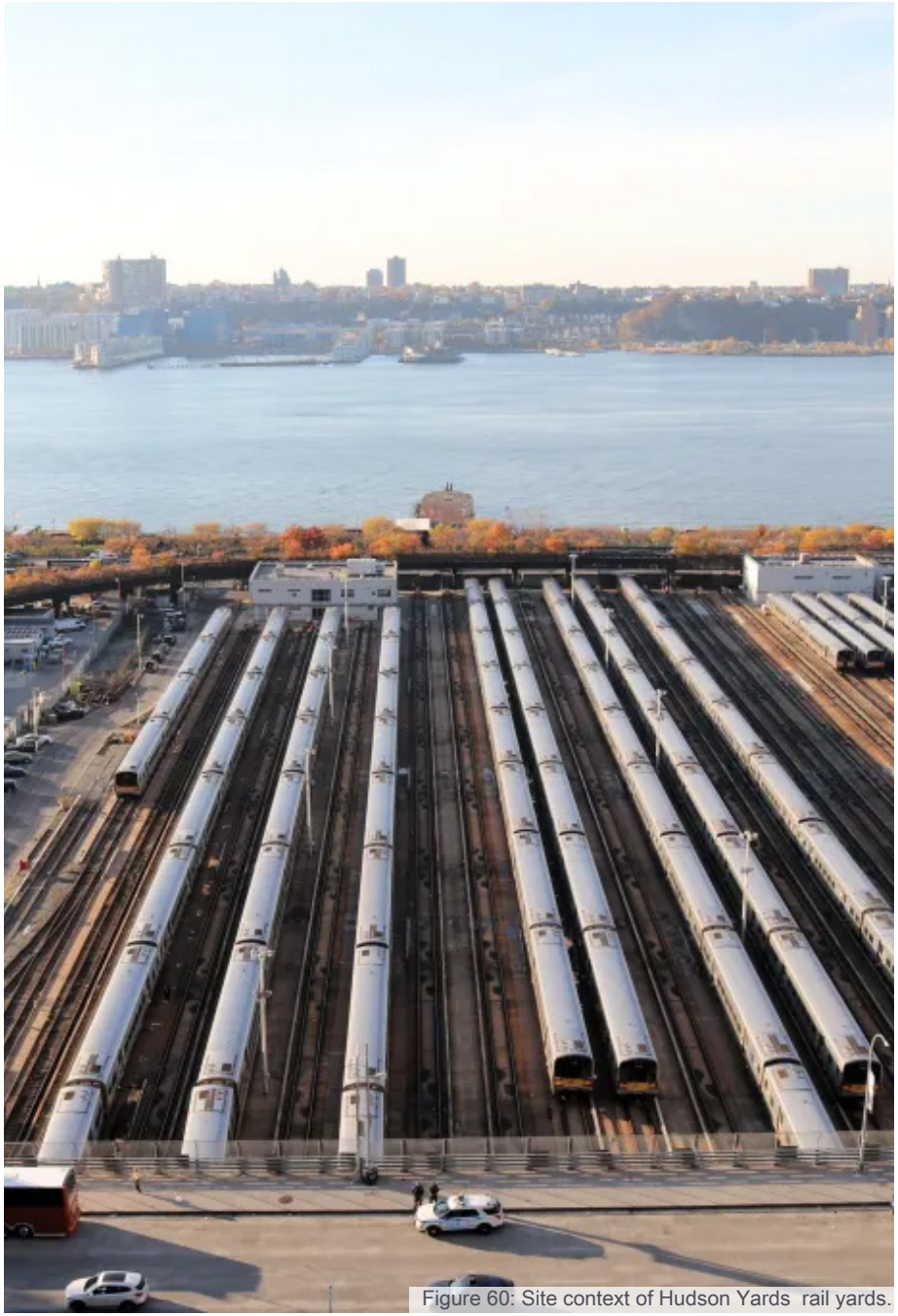


Figure 60: Site context of Hudson Yards rail yards.

CASE STUDY #3

DUBLIN, IRELAND - PULIC TRANSIT PROMOTION AND ADVERTISING

Dublin's bus system, operated by Dublin Bus under Transport for Ireland, serves over 130 routes and carries over 160 million passengers annually. With limited infrastructure and room to expand, buses are the primary form of public transport in the city. In response to congestion and sustainability goals, Dublin Bus has used branding, advertising, public awareness campaigns, and infrastructure improvements to promote bus use as an alternative to private automobiles. This case study shows how coordinated promotion and system improvements can increase ridership and improve public perception, while offering lessons for the City of Grand Rapids and its bus network. In contrast, interview findings suggest that The Rapid does not place much emphasis on promotion. This reflects a focus on maintaining service rather than marketing it, which may limit opportunities to improve public awareness and ridership.

One of the most significant strategies is the BusConnects program, which combines network redesign with strong public communication. This included simplified routes, high-frequency corridors, and advertising campaigns explaining how to use the system. These efforts, supported by clear branding, made the network easier to understand and more visible. Passenger boardings increased by 48% in areas served by BusConnects routes. While large-scale investment may not be feasible in Grand Rapids, the core principle remains relevant. Improving clarity through better maps, consistent branding, and communication could help address knowledge gaps and improve accessibility. Clear communication plays an important role in helping people understand and use public transport systems. Even small improvements to maps, branding, and information could improve awareness and accessibility in Grand Rapids.

Dublin Bus has also implemented targeted campaigns to address user needs and improve comfortability. Campaigns promoting nighttime and 24/7 services position buses as a safe alternative to driving, while etiquette campaigns encourage respectful behavior. These strategies align with findings from interviews in Grand Rapids, where concerns about late-night service and rider behavior were identified. Although Grand Rapids has a smaller nightlife economy, these shared concerns suggest that targeted campaigns and limited late-night service could

help address barriers to ridership. Messaging focused on safety, convenience, and comfort tends to resonate across countries and cultures, suggesting that similar approaches could be relevant on the Grand Rapids network.

Dublin also supports bus use through infrastructure such as Quality Bus Corridors, which improves speed and reliability through dedicated lanes and signal priority. In many U.S. cities, buses compete with private vehicles for road space, reducing efficiency. While large-scale infrastructure may not be feasible in Grand Rapids, targeted improvements along key routes could still improve reliability and attractiveness. This suggests that improving travel time and reliability can act as a form of promotion by shaping user experience.

Overall, Dublin demonstrates that effective bus promotion involves clear communication, targeted campaigns, improved user experience, and supportive infrastructure. While the scale differs, the underlying ideas are applicable. Rather than replicating Dublin's system, this case study highlights approaches that could inform how the City of Grand Rapids can improve communication, visibility, user experience and comfortability within its own bus network. By adapting some of these strategies, Grand Rapids could improve both perception and ridership while supporting broader sustainability and equity goals.

Figure 61: Easy to read advert against place bags on seats.

CASE STUDY #4

ATHENS - CLARK COUNTY, GEORGIA - ART SHELTER PROGRAM

The Art Shelter Program led by the Athens-Clarke County Unified Government (ACCUG) has partnered with the Athens Area Art Council and the Athens Cultural Affairs Commission with the goal of serving transit riders with bus shelters that also function as public art, bringing creativity to the built environment. A total of 44 Art Shelters have been installed in Athens over three phases: in 2005, where artists were invited to submit designs conveying themes of movement, transportation, and people, in 2011, where artists honored the musical heritage of Athens, and in 2020, where there was no specific theme. To help fund these art shelter projects, a referendum for a Special Purpose Local Options Sales Tax (SPLOST) was approved by voters which allows local jurisdictions to use sales tax proceeds for funding capital improvement projects. The SPLOST Program provides an opportunity to use the sales tax dollars that nonresidents provide to ease the burden on funding from local taxpayers. SPLOST has provided a fair way for regional citizens and visitors to support the services and infrastructure they utilize in Athens-Clarke County. While for Grand Rapids, a SPLOST is not currently possible as it would require amending Michigan's Constitution per Citizens Research Council of Michigan, collaboration with ArtPrize's sponsors such as: DeVos Place, Kent County, and local academic institutions like Ferris State University's Kendall College of Art and Design, could help offset the costs and administrative hardships associated with the implementation of bus shelters. In addition, partnerships with community artists would help provide Grand Rapids with an opportunity to deepen its roots in the arts while providing shelters that lessen the barrier of entry to using The Rapid and DASH.

Grand Rapids' ArtPrize provides a unique platform to design bus stop shelters that are both functional and creative. The competition currently recognizes one winner in each of six categories: 2D, 3D, Time-Based, Installation, New Media, and Design. An art shelter concept could be incorporated within the Installation or Design categories, or alternatively, a dedicated category could be established specifically for art shelter design. In addition to ArtPrize's panel of experts, representatives from key departments within Grand Rapids such as the Office of Sustainability, Engineering, Mobile GR and The Rapid could participate in the evaluation process. Their involvement would ensure that the selected design is not only innovative but also feasible for real-world implementation.

Implementing art shelters in Grand Rapids would provide transportation and community benefits while emphasizing the city's identity as a hub for creativity. These bus stops help connect communities by improving accessibility and visibility of transit, which can lead to increased ridership, an outcome observed in Athens-Clarke County where enhanced shelter design improved the user experience and perception of safety. By placing creatively designed shelters in busy corridors as well as underserved or low-income neighborhoods, the initiative can spur development, encourage foot traffic, support nearby businesses, and foster a stronger sense of place. Beyond functionality, integrating public art into everyday infrastructure inspires creativity, promotes local artists, and strengthens local pride, resulting in broader community engagement and long-term cultural and economic impact.

The Athens-Clarke County Unified Government Art Shelter Program highlights the crucial role of community partnerships in delivering infrastructure that is functional, affordable and culturally significant. For Grand Rapids, leveraging public–private collaborations through ArtPrize, local institutions, and community stakeholders can create art shelters that enhance the transit experience while reinforcing the city's identity as a center for creativity and innovation.

Figure 62: Pillbug bus shelter.

Figure 63: Morton bus shelter.

One examples of a Art Shelter is the 'Morton' Bus Shelter. The concept of the Morton bus shelter is to celebrate the cultural and historical importance of the Morton Theater by reflecting the building's two most dramatic distinctive architectural features.

Another example is the Pillbug bus shelter. This shelter inspires laughter and double-takes as they ride / drive / walk past it. The VW style and bugs, especially roly-polies (aka Pill bugs-Armadillidiidae) becomes a surreal but comical mashup of the classic VW beetle and a local insect that most people are familiar with. The "bug" incorporates the front and back portions of an actual upcycled VW Beetle body stripped of its interior and engine parts, cut to become the abstracted "face" of the insect and the end of its "tail".

CASE STUDY #5

AUSTIN, TX - HEAT MODERATING EFFECTS ON PUBLIC TRANSPORT RIDERSHIP

A team of researchers from the University of Texas decided to investigate whether or not bus shelters and the tree canopy moderate the effects of temperatures on public transportation ridership during warm season months in the city of Austin, Texas. The researchers were also interested in whether bus shelters and tree canopy coverage was distributed equitably around the city. This case study demonstrates that investing in planting shade trees and installing bus shelters can be used as impactful climate resiliency strategies while also protecting the health of the community, ridership counts, and ridership comfort.

The University of Texas research team highlights past research done by multiple other universities around the world, those research teams found that temperature has either a significant positive or insignificant association with bus ridership, however, research on bus ridership that was done in Lane County, Oregon found that temperature extremes had a negative association with local ridership declining by 0.3% once air temperatures reached or exceeded 84.2°F. In a similar case researchers found that daily boardings at unsheltered bus stops declined by 0.4% when temperatures averaged 73.4°F or above in Salt Lake City, Utah. These past studies show that there have been similar findings in other areas of the country compared to the current research done in Texas. These findings strengthen the case that trees are reducing heat at bus stops.

The team looked at over 2,000 bus stops throughout the city from April 1st to September 30th in 2019. Each study day reviewed ridership between 1pm to 6pm. They used automatic passenger counter sensors built in on buses in order to get ridership counts and relied on a local weather station to acquire temperature data. Data for bus shelters came from Capital Metro, the local transit organization, while data for the tree canopy originated from shape files of bus stops, streets, buildings, and aerial images from 2018. In order to identify trees in the vicinity of bus stops, they used 25-meter buffers in mapping software to map out stops that had trees. The distribution of bus stops where 29% had shelter, tree canopy around bus stops averaged 14.29% and ranged from 0-74%.

The findings from the Austin research team highlights the trend that was shown in past research directly. They found a significant but modest negative association in the relationship between temperatures and ridership. Each 1.8°F increase in daily maximum air temperature resulted in a 0.2% decrease in boardings per bus when there was not a shelter and a greater decrease of 0.4% when there was a shelter. Shelters without trees also showed the same decline of 0.4% of boardings per bus. Each 1% increase in the tree canopy was associated with a lower decline percentage. On high temperature days, there was not a difference between stops with or without shelters. Shelters with no trees showed a decline of 1.7% while each one percent increase resulted in a lower decrease in boardings per bus.

These results make sense as trees have a localized cooling effect. Researchers in Houston, Texas have shown this in their research on heat stress mitigation strategies at bus stops. They found that shade in general made bus stops 4.68°F cooler on average. Stops under shade trees provided 5.94°F in cooling compared to bus shelters which only provided 2.88°F on average. Shelter types also made a difference as open air shelters were cooler than enclosed shelters. The study goes on to state that translucent enclosed shelters may create a greenhouse effect, making certain shelters hotter.

Overall, this research into reducing the risks of heat related illness highlights that climate resilience strategies like installing bus shelters and planting shade trees can work in warmer climates in places like the state of Texas. These strategies can be applied to the City of Grand Rapids to achieve similar results that will benefit the community. By reducing temperatures at bus stops, the city can improve ridership in the warmer months of the year while also improving the community by protecting people's health by reducing instances of heat related illness and reducing pollution.

Figure 64: Bus shelter in Austin used for the study.

CASE STUDY #6

BURLINGTON, VERMONT - TACTICAL URBANISM

Tactical urbanism is a community-led process often employed by citizens in collaboration with governments to advance long-term planning goals and improvements through short-term strategies. Citizens can build amenities, community spaces, and infrastructure on their own to fill in for the improvements they are looking for. Grassroots groups also engage in these projects to spark conversation about city-scape design changes. This can act as a trial-run or demonstration for the city to understand how these changes would function in real life. Sometimes, tactical urbanism projects can even end in permanent results, if executed successfully.

The City of Burlington, VT is a key example of a city that has successfully enabled many tactical urbanism projects to occur. This has resulted in a vibrantly engaged community that cares deeply about their neighborhoods. The City of Burlington has categorized tactical urbanism in their space into two types. A demonstration project is a "short-term street design project that lasts less than seven days and can be community-led". These projects are for community members to bring attention to a short coming in city design. These were enabled under the Demonstration Project Policy: "With the conditions set forth in this policy, the City of Burlington Public Works Department, Police Department, and Fire Department shall enable non-municipal groups and organizations, hereby known as Community Partners, to undertake short-term demonstration projects in public rights-of-way." A pilot project is a "temporary parking or transportation project created by the Department of Public Works." These types of projects are used to gauge public input on a potential concept by the city.

Through four phases: project development, permitting & review, notification & implementation, and thank yous & recap (feedback), the city has found a successful way of engaging the community and test-running potential projects, further increasing infrastructure improvements in their streets. Past examples in Burlington include wayfinding signs, curb extensions, parklets, bike corrals, median refuge islands, pedestrian plazas, and bike lanes. The city has also provided community members with a set of guidelines, tips, and examples to help them along the way as they plan tactical urbanism projects. They

Figure 65: An intersection before implementing tactical urbanism.

Figure 66: An intersection after implementing tactical urbanism.

attached permit applications, worksheets, and additional resources to aid in planning and implementation.

The City of Grand Rapids could employ these tactics for their bus stops to reduce administrative delays in installation, as well as test-run amenities it may be unsure of. Engaging community groups to install benches or other amenities is an effective approach, as it would completely eliminate the responsibility for the city, as well as allow for creativity and identity at each bus stop. This could also apply for businesses and artists, allowing them to create unique bus stops that feature their art or logos, not only bringing color to bus stops, but also promoting their brands. While this is already a reality in the city's policy for businesses, it could be further promoted to increase participation from local businesses, and also expanded to include artists, especially ArtPrize award winners. Allowing citizens to install their own bus stop amenities would be an inexpensive and effective way to improve Grand Rapids' bus system, and pilot projects are a practical way to gauge public feedback before fully implementing a concept.

PRECEDENT STUDIES CONCLUSION

The six case studies selected—Takoma Park, New York City, Dublin, Athens, Austin, and Burlington—provide baseline examples for implementing several recommended improvements in Grand Rapids. Takoma Park demonstrates a bus stop prioritization system that can be combined with an IPI to coordinate bus stop improvements. New York City shows how developer incentives can be used to increase transit funding. Dublin and Athens-Clarke exemplify effective promotion through advertising and artwork. Research in Austin proves the positive impacts of tree planting. Finally, tactical urbanism in Burlington shows how community directed improvements can tackle the challenge of infrastructure funding and approval. Ultimately, these strategies demonstrate the real opportunity for improvement of the Grand Rapids bus system; following suit in implementation strategies will be critical for success.

Figure 67: A Rapid bus in service

Case	Strategy	Implementation Tools	Outcome	Lesson	Grand Rapids Application
City of Takoma Park, Maryland	Infrastructure Prioritization	Bus Stop Inventory and Prioritization System	Community Needs Met, increased ridership	Prioritizing bus stops results in areas of need being addressed	Implement infrastructure priority system
New York City, New York	District Improvement Bonus	Zoning Amendment	Increased Funding	Developers can pay for density, increasing funding	Add incentives to zoning code
Dublin, Ireland	Promotion and Advertising	Advertising and Physical Infrastructure Improvement	Increased ridership, improved reliability, increased knowledge on the network	Effective promotion of the bus network can vastly improve the bus system	Increase promotion and advertising efforts
Athens, Georgia	Artistic Bus Stops	Public-Private Partnership	Increased Promotion	Art makes bus stops more interesting	Collaborate with Art Prize and other artists
Austin, Texas	Tree planting around Bus Stops	Physical Infrastructure Improvement	Increased Ridership	Planting trees around bus stops increases ridership	Plant trees near bus stops
Burlington, Vermont	Tactical Urbanism	Community led Infrastructure improvements	Implementation of Infrastructure	Government action is not needed to make desirable improve-ments	Permit and promote tactical urbanism efforts

Figure 68: Case Study Matrix.

PHASE 6:

PROGRAMMING, PLANNING, & IMPLEMENTATION STRATEGIES

FINDINGS SUMMARY

Three key insights were identified by the project team during the bus stop inventory analysis. These key insights were developed through analyzing the complex world of infrastructure improvement implementation pathways through interviewing primary stakeholders such as The Rapid and Mobile GR. Key insights were also informed through community engagement efforts involving speaking to bus riders, drivers, and speaking in depth with the community activist group, Strong Towns GR.

One key insight is that unique structural barriers exist to implementing bus stop infrastructure throughout the NOFs. This includes extended, time consuming processes for infrastructure implementation at bus stops due to the source of funding for bus shelter implementation on the side of The Rapid, and the multistep approval process on behalf of the city. Our interview with Steve Schipper, COO of The Rapid, revealed that the organization currently implements bus shelters through a federal grant program. While the program assists with funding, it requires extensive involvement at the federal level including environmental analyses. According to Schipper, this can cause shelter implementation to take between 12-18 months even though the shelters are prebuilt structures that the Rapid keeps on hand. Mobile GR, who also is qualified to initiate infrastructure improvements at bus stops, faces a similar extended time-related barrier. Ariana Jeske from Mobile GR mentioned that infrastructure improvements to bus stops require approval from multiple different agencies due to their proximity to the roadway. Determining what approvals are necessary, and obtaining approvals from all necessary departments can take many months. In addition to obstructed approval processes amongst stakeholders, The Rapid and Mobile GR representatives also mentioned weak standards or criteria for determining what bus stops should be prioritized for infrastructure improvements. Jeske mentioned that bus stops that are already ADA compliant receive priority on their end due to the fact that implementing further physical improvements is less expensive at these sites. Schipper mentioned that a priority list did exist, but there was no set criteria for what made a bus stop a high priority for improvement.

GRTG believes that addressing structural implementation barriers is key to the improvement of the transportation system. If the pathways to infrastructure improvement remain slow, redundant, and uniformed, proposed innovative solutions will not be implemented in a timely manner nor will they be based on informed data. Final recommendations are heavily informed by GRTG's knowledge of the structural barriers present within the current system and address these barriers in both direct and indirect fashions. The shortcomings of the current procedure for selecting where improvements are made are addressed through the use of our IPI tool.

The second key insight is the large opportunity for promotion of the transit system. GRTG identified many struggles in the transit system as a whole including a lack of funding, route frequency issues, hours of operation limitations, a lack of public knowledge of the system, and negative perceptions of public transportation. While all of these issues represent unique problems with individual solutions of their own, the project team believes that promotion is the best avenue for addressing all these issues simultaneously. Currently, The Rapid does not engage in any type of promotional activity to promote their services and increase ridership. Both Jeske from Mobile GR and Andrew Carley from Strong Towns GR mentioned that the public has negative attitudes towards public transit, or that the public simply does not know about the ease of using the service. This was echoed in an interview with two first time bus riders who stated they had no idea that a free bus service existed in the downtown area. Engaging in promotion of the service is a way to get the word out about the ease and accessibility of the service, as well as a way to improve comfortability for potential riders who have negative preconceived notions about the service. Considering the lack of current proportional activity being done, there is exciting potential for strides to be made in this area. Successful campaigns will lead to higher ridership which will in turn result in increased funding to expand on route frequency and operation hours. The project team has identified several promotional ideas unique to the strengths and characteristics of the City of Grand Rapids which are included in the final recommendations.

A final key insight of this project is the overarching desire, amongst all stakeholders, most importantly amongst users, for increased route frequency. The bus stop inventory project initially began as a study of comfort and accessibility at bus stops, particularly concerned with addressing shade coverage. The implementation of improvements at bus stops, including built structures and trees, in an informed fashion, remains a top priority and is addressed by the final recommendations. However, GRTG could not ignore the relevance of the topic of frequency as it relates to comfortability and accessibility. Similar to the barriers in regard to extending hours of operation, frequency is another concern that can be indirectly addressed through promotional activities. The issue of frequency frames the complexity of the pathway to transit improvement as it represents the ideal of a well functioning and used transit system. All recommendations are informed by this unanimous desire for increased route frequency and work to advance the transit system towards this goal, in particular GRTG's implementation strategies on private partnerships and canopy coverage expansion.

APPLICATION OF THE INFRASTRUCTURE PRIORITY INDEX - BUS STOP CONCEPTS

This section will guide city planners and other interested parties in the process of infrastructure prioritization, starting with scenario development and ultimately developing specific bus stop improvement concepts. At the end of the section, GRTG recommends three resultant, actionable recommendations yielded from the process: ideal locations for construction of an artistic shelter, a bench, and tree planting.

The first step in calculating the IPI is developing general infrastructure preferences. Which types of infrastructure are most important to build? The IPI Assessor Spreadsheet considers five infrastructure types to be implemented: shelters, benches, trees, trash bins, and lights (although this example omits the latter two for sake of simplicity). Each infrastructure is given a general priority number; this is a unitless measurement and only has meaning in the context of other priority numbers. For example, trees are assigned a priority number of 75, while benches are assigned a priority number of 70 (Figure 69). Resultantly, the IPI will generally assign higher priority to tree planting than bench construction, except where stops are in desperate need of a bench.

Still, how were the numbers 70 and 75 selected for these infrastructure types? First, a scenario needed to be developed: this is a general concept of which improvement types should be placed highest on the priority list. In this example, GRTG recognizes the administrative challenges of shelter installation, and therefore gives them the lowest prioritization number of 66. Consequently, shelter construction will only be recommended for stops that are in extremely high need of such. Conversely, planting trees involves less red tape and can be more affordable than shelter construction. Thus, this example gives trees a higher priority number of 75. Bench construction was decided to be a medium priority and assigned a priority number of 70.

To arrive at these particular priority numbers, GRTG used an iterative approach, which involved selecting numbers, viewing the results, and adjusting numbers accordingly. In this example, the priority index for tree planting was originally 80, but this meant that virtually all high priority improvements (as seen on the "OUTPUT:InfrastructurePriorityList" tab) involved tree planting. Thus, to obtain a more balanced priority list, the tree planting priority number was reduced to 75.

Shelters	Benches	Trees
66	70	75

Figure 69: Priority numbers for three infrastructure types in the IPI Assessor Spreadsheet. Trees are given the highest priority, followed by benches and shelters, respectively.

Still, general priority numbers for infrastructure types are insufficient for determining IPI: the question remains of which bus stops should be selected for improvements. This is where geography preferences must be selected.

First, on the "ShelterGeography" tab of the IPI Assessor Spreadsheet, the ideal factors for shelter selection must be determined. In this example, the stops in greatest need of shelters were those with many transfer points and high ridership (Figure 70). Importantly, the existence of a shelter is a critical factor in determining whether a bus stop needs a shelter. The variable is inverted to ensure that no bus stops with shelters are selected for shelter construction.

Let's say Grand Rapids has already purchased a shelter. What factors should determine where it goes?

Put it at a stop...	Factor Importance	Invert Variable
With a stop pad	4. Extremely Relevant	FALSE
With a bench	1. Slightly Relevant	FALSE
With a trash bin	1. Slightly Relevant	FALSE
With a shelter	5. Crucial Factor	TRUE
With lighting	0. Not Relevant	FALSE
With good sidewalk conditions	1. Slightly Relevant	FALSE
With a lot of transfer points	4. Extremely Relevant	FALSE
With high ridership	4. Extremely Relevant	FALSE
In an area experiencing heat island effect	3. Very Relevant	FALSE
In an area with high population density	3. Very Relevant	FALSE
In a racially diverse area	2. Decently Relevant	FALSE
In a low-income area	3. Very Relevant	FALSE
In an area where many people take the bus to work	4. Extremely Relevant	FALSE
In an area without a tree nearby	2. Decently Relevant	FALSE
In an area that has no shade from nearby buildings	2. Decently Relevant	FALSE

Figure 70: Shelter Geography Preferences.

Similarly, the geography selection process must occur for other infrastructure types in their respective spreadsheet locations, “BenchGeography” and “Tree Geography.” In this example, conditions ideal for bench construction and tree planting are similar to those for shelter construction (Figures 71 and 72). Notably different are the critical factors: bench construction should not occur at stops with a bench, and tree planting probably should not occur where there is already shade. Importantly, planning theory is used to guide the geography preferences here; however, community feedback could be used to guide this section, ensuring that recommendations strictly align with community needs.

Let’s say Grand Rapids has already purchased a bench. What factors should determine where it goes?

Put it at a stop...	Factor Importance	Invert Variable
With a stop pad	3. Very Relevant	FALSE
With a bench	5. Crucial Factor	FALSE
With a trash bin	3. Very Relevant	FALSE
With a shelter	3. Very Relevant	TRUE
With lighting	2. Decently Relevant	FALSE
With good sidewalk conditions	2. Decently Relevant	FALSE
With a lot of transfer points	4. Extremely Relevant	FALSE
With high ridership	4. Extremely Relevant	FALSE
In an area experiencing heat island effect	2. Decently Relevant	FALSE
In an area with high population density	4. Extremely Relevant	FALSE
In a racially diverse area	2. Decently Relevant	FALSE
In a low-income area	3. Very Relevant	FALSE
In an area where many people take the bus to work	4. Extremely Relevant	FALSE
In an area without a tree nearby	1. Slightly Relevant	FALSE
In an area that has no shade from nearby buildings	1. Slightly Relevant	FALSE

Figure 71: Bench Geography Preferences.

Let's say Grand Rapids has already purchased a tree. What factors should determine where it goes?

Put it at a stop...	Factor Importance	Invert Variable
With a stop pad	3. Very Relevant	FALSE
With a bench	3. Very Relevant	FALSE
With a trash bin	3. Very Relevant	FALSE
With a shelter	1. Slightly Relevant	TRUE
With lighting	2. Decently Relevant	FALSE
With good sidewalk conditions	0. Not Relevant	FALSE
With a lot of transfer points	4. Extremely Relevant	FALSE
With high ridership	4. Extremely Relevant	FALSE
In an area experiencing heat island effect	4. Extremely Relevant	FALSE
In an area with high population density	4. Extremely Relevant	FALSE
In a racially diverse area	2. Decently Relevant	FALSE
In a low-income area	3. Very Relevant	FALSE
In an area where many people take the bus to work	4. Extremely Relevant	FALSE
In an area without a tree nearby	5. Crucial Factor	FALSE
In an area that has no shade from nearby buildings	4. Extremely Relevant	FALSE

Figure 72: Tree Geography Preferences.

With general infrastructure priorities and infrastructure geographies selected, the IPI Assessor Spreadsheet yields a list of high priority infrastructure improvements, and which stops at which they should occur. In alignment with the objectives outlined in this plan, GRTG searches for the top bus stops for an artistic shelter, bench installation, and tree planting.

Of course, quantitative analysis has its limitations and cannot be the sole determiner of bus stop location. One problem is the age of the IPI's data sources (Last updated in 2019): Grand Rapids bus stops have frequently moved in recent years, meaning that many of the IPI recommendations apply to bus stops that no longer exist. Furthermore, some bus stops may need infrastructure improvements; however, they are not suitable for upgrade due to space limitations. This is why the IPI recommendations must be manually filtered, checking Google Earth street view data to determine whether the bus stop still exists and is suitable for upgrade. With this filtering process complete, the top selected bus stops for tree planting, bench installation, and shelter construction are determined.

Due to their importance in providing shade, advancing city tree canopy goals, as well as the simplicity of installation, tree planting is a top choice for infrastructure improvement. Ultimately, the top contender for tree planting in the NOFs is bus stop ID 4066 located on 4th St NW and Stocking Ave NW. The stop received a high tree build score of 85 due to several factors. First, at an average of 79 riders per day, this bus stop is one of the most used stops in Grand Rapids. It is also located in an area with very high population density and a moderate level of racial diversity. Additionally, the area has an average income of $26,000 per capita, which is extremely low for Grand Rapids. Therefore, planting a tree at this bus stop will both service large numbers of people as well as advance equity by investing in a low-income area (Figure 73).

Stop ID	Shelter	Bench	Trash	Lighting	Tree	Executive
4066	82	0	80	0	85	65

Figure 73: Stop 4066 IPI Scores.

4TH ST. NW & STOCKING AVE. NW

Figure 74: Before and after AI rendering of a tree planted at Stop ID 4066 located on 4th St NW and Stocking Ave NW. The stop was selected mostly due to its high ridership, as well as other factors such as high population density and a low-income population.

Artistic bus shelters can improve the aesthetic of the area while also protecting riders from sunlight, rain, and wind. In collaboration with ArtPrize, Grand Rapids could begin installing new artistic shelters in 2-3 years. In determining the ideal location for such an amenity, additional criterion was placed on the analysis that was not applied to tree planting or benches installation: the artistic shelter needed to be within 200 feet of the ArtPrize area in downtown Grand Rapids. Given this criteria, IPI calculations, and final qualitative selection, the top contender for the construction of an artistic shelter is bus stop ID 3226 located at Cherry St. SW and Cesar Chavez Ave. SW. The stop was selected because it is a transfer point of seven routes in a considerably low-income, racially diverse area suffering from a moderate degree heat island effect. Here, an artistic shelter could reflect the neighborhood's local artistry while also providing an effective amenity of comfort for riders who depend on the bus as their main form of transportation.

Stop ID	Shelter	Bench	Trash	Lighting	Tree	Executive
3226	68	79	59	0	0	54

Figure 75: Stop 3226 IPI Scores.

CHERRY ST. SW & CESAR CHAVEZ AVE. SW

Figure 76: Before and after AI rendering of an artistic shelter installed in collaboration with ArtPrize at stop ID 3226, which is located at Cherry St SW and Cesar Chavez Ave SW. The stop was selected because it is a transfer point of seven routes and because the area is low income, racially diverse, and suffers from a moderate degree of heat island effect.

Community driven tactical urbanism can be another effective method of improving bust stop infrastructure quickly. This plan recommends the installation of benches with such methods because of the simplicity of installation, which many community members are capable of doing. The top contender for bench construction via tactical urbanism is bus stop ID 3796 located on Stocking Ave NW between 3rd St and 4th St. The stop is in high need of a bench because it is a transfer point in an area where many people take the bus to work. It also has moderate ridership at 28 users per day and is already covered by a street light. Thus, the conditions for this bus stop are ideal for bench installation.

STOCKING AVE. NW BETWEEN 3RD AND 4TH STS.

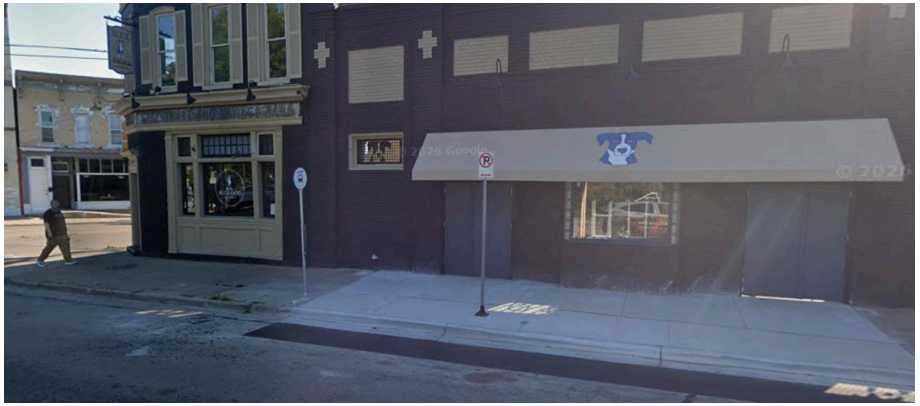


Figure 77: Before and after AI rendering of a bench installed via tactical urbanism at Stop ID 3796, which is on Stocking Ave between 3rd St and 4th St. The stop was selected via the IPI mainly because many people in the area take the bus to work.

Using the IPI Assessor Spreadsheet, this plan identified three bus stops in great need of tree planting, bench installation, and shelter installation, respectively. However, this is only a well-considered example. The IPI Assessor Spreadsheet can also be used to create a to-do list of all such infrastructure improvements such as lighting and trash bin installation. It generates Infrastructure Priority Indexes for each bus stop, showing how much need each bus stop has for each of these amenity types. Finally, by fine-tuning the general infrastructure preferences and geography preferences to the feedback of Grand Rapids' community members, planners can ensure that infrastructure improvements align with the real desires and needs of actual bus riders and stakeholders.

Stop ID	Shelter	Bench	Trash	Lighting	Tree	Executive
3796	79	84	64	0	81	81

Figure 78: Stop 4066 IPI Scores.

STREAMLINING ADMINISTRATIVE PROCESSES

Policy changes should focus on simplifying and speeding-up the approval process to address delays in the bus stop improvements. Approval processes increase the implementation time. Streamlining and collaboration can help shorten this time. It includes streamline approval processes through interdepartmental coordination, introducing joint review system, developing pre-approved design standards, and allowing tactical or temporary installation for faster implementation.

The City of Grand Rapids, along with The Rapid and associated departments, could collaborate to streamline approval processes by limiting the amount of reviews for small infrastructure such as benches, shelter, lighting and trees. Responsible entities include the City of Grand Rapids, Planning, Engineering, Sustainable department, The Rapid, Michigan Department of Transportation (MDOT), Mobile GR and other relevant permitting agencies. Currently, permits or applications for these things are often reviewed by separate departments. We could consider enabling a process where departments review the application together, as one package to make the process speedy.

Another approach would be creating standardized design guidelines for common bus stop improvements that can help reduce the need for repeated approvals. If designs are pre-approved, projects can directly move to implementation without lengthy process.

Additionally, allowing tactical and temporary installations through simplified permits would enable faster testing of improvements before permanent installation, reducing both time and risk.

This aligns with the city's goals of improving bus stops, mobility, and accessibility. It also relates directly to the findings, which shows a lack of amenities in many areas which need instant progress.

In the short term (0-1 year) the city should begin by identifying agencies involved followed by developing a unified approval framework and introducing a joint review system while launching pilot projects using streamlined approvals. In 1 to 2 years, pre-approved design standards can be established, and the streamlined process can be expanded to more bus stop improvements.

Furthermore, funding is a key factor which impacts the implementation and one of the major opportunities is public-private partnerships. These partnerships can benefit both transit users and business by increasing visibility, food traffic and accessibility. Additionally, the city can explore state and federal grants including transportation and infrastructure funding programs. These funds can help the city to improve bus stops and reduce financial burden.

Figure 79: A typical DASH stop with a bus approaching.

FUNDING

Successfully securing funding for transit improvements in Grand Rapids relies on navigating government channels, building partnerships and coordinating multiple funding mechanisms. These include federal and state grants, philanthropic partnerships, and locally generated revenue through development incentives. Each source plays a different role in GRTG's strategy, with grants providing large scale funding, philanthropic partners providing gap funding and matching funds, and planning tools providing an ongoing stream of revenue. Together, these approaches provide a framework for funding immediate and long-term improvements to transit infrastructure in Grand Rapids.

Obtaining higher funding for transit improvements can be done through federal and state grants, designed to support capital improvements such as bus stops, shelters, buses, and seating. This requires collaboration between The Rapid, the City of Grand Rapids, the Office of Sustainability and agencies such as MDOT, the Federal Transit Administration (FTA), and the USDOT. The lead applicant depends on the type of grant. Transit specific grants from the FTA are led by The Rapid, and broader USDOT grants are led by the city. Key steps the applicant takes toward securing a grant is to identify priority corridors, such as Eastern Ave and Bridge St, and then developing a detailed plan with cost estimates, scopes of work, and anticipated outcomes. The next step is submitting this plan to the correct agency. The most aligned grants for these grants are the FTA Bus and Bus Facilities grant, and United States Department of Transportation (USDSOT) Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grant. While The Rapid and the city act as lead applicants, the Office of Sustainability supports by evaluating proposal alignment with equity, climate and emission reduction goals. Many of these grants require matching funds, which can be obtained through philanthropic partners or local revenue sources. Once approved for the grant, implementation and maintenance is the responsibility of The Rapid and supported through its operating budget. This strengthens equity and sustainability through improving accessibility, reliability, and rider comfort in the underserved NOFs, all of which are goals of Grand Rapid's Office of Sustainability.

Philanthropic funding can support government grants by providing matching funds or by filling financial gaps. A potential partner for this support is the Richard and Helen Devos foundation. Coordination for this partnership would be led by the City of Grand Rapids along with The Rapid and relevant city departments. The city would be responsible for outreach to the foundation through existing relationships and framing the request for matching funds as community development and improved job access in underserved communities, which are main goals of the foundation. The foundation would then review the proposal, provide feedback, and determine alignment with its priorities. The Rapid would serve as the implementation agency for proposed improvements. These philanthropic partnerships are not meant to fully fund transit improvements, but to act as matching funds for government grants, or as gap financing. This leads to opportunities for larger projects that support community development, equity, and sustainability in the NOFs, as better transit leads to increased ridership, better rider experience, and reduced emissions due to the increased ridership.

Lastly, government grants supported by philanthropic partnerships address one-time capital investments, but long term transit funding can be addressed by development incentives along the Bridge St and Eastern Ave, where there are current private development interests. This approach requires collaboration between the planning commission, the City of Grand Rapids, The Rapid, and private developers. This mechanism requires planning tools such as tax increment financing (TIF) districts along GRTG highlighted corridors, density bonuses, and conditional rezoning. These tools need to be initiated and approved by the planning commission and city council. If implemented, these tools would create pathways for private investment in the public transit infrastructure. TIF districts capture the increase in property tax from new developments and reinvest a portion of that increase into infrastructure within the district, including but not limited to transit improvements. Density bonuses allow developers to exceed building limitations in the zoning code such as floor area ratio (FAR), which is the maximum floor area a building can have relative to its lot size, if the developer agrees to contribute to a fund designated for transit improvements in the area of the development. Conditional rezoning is the final tool used to encourage private investment in public transit. Under this approach, when a developer applies to rezone a parcel, particularly for a more intensive or profitable use, they may voluntarily propose conditions as part of the approval. These conditions can include constructing nearby bus infrastructure or contributing financially to a corridor improvement fund. While the conditions are offered by the developer, they are shaped through a negotiation process with the city, which retains the authority to approve, deny, or request modifications to ensure the proposed improvements align with public goals. This allows the city to leverage development activity along corridors such as Bridge Street and Eastern Avenue to improve transit infrastructure and mitigate the impacts of increased density. These methods can create a sustainable, ongoing funding source, not just a one-time grant payment. This aligns with GRTG and the Office of Sustainability's goals by improving equity through better accessibility to transit in the NOFs, sustainability by increasing density leading to more walkable communities, and leveraging this density to pay for better transit, increasing ridership and reducing emissions.

Improving transit funding in Grand Rapids requires combining federal and state grants, philanthropic partnerships, and leveraging development interests to secure private investment in the transit system. Grants provide a primary source of capital, while philanthropic partners help fill gaps and meet matching funding needs. Development incentives such as TIF districts, density bonuses, and conditional rezoning create ongoing funding from private development interests. Together, these strategies align with GRTG and the Office of Sustainability goals by improving transit access and rider comfort, improving equity in underserved communities, and reducing emissions through increased ridership numbers.

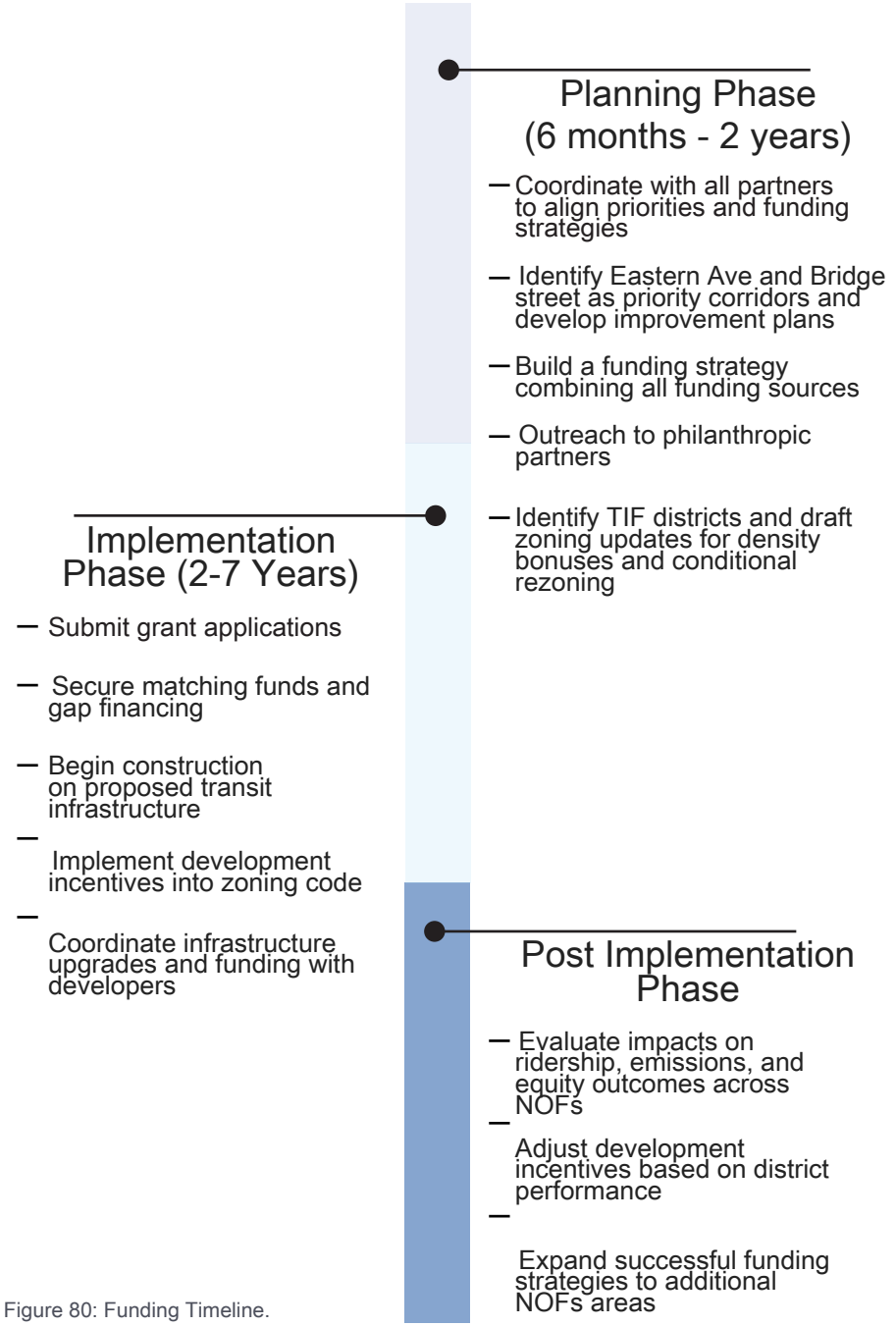


Figure 80: Funding Timeline.

PROMOTION

In order to improve ridership and public perception of the bus system in Grand Rapids, the city should aim to take a phased and realistic approach, focusing on clear communication, targeted promotions, and smaller but meaningful system improvements. Rather than trying to make large-scale changes all at once, these improvements can be rolled out over a three-to-five-year timeframe, starting with lower cost strategies and building overtime.

In the short term (1-12 months), the focus should be on improving awareness. An effective approach would be using the City of Grand Rapids' social media platforms, which can reach a wider audience than the rapids. Posts can explain how to use the system, highlight routes, and share updates that can help address the lack of awareness of the system. This could be supported by strategies like clear signage. Outreach should be tailored to key groups such as students, commuters, elderly residents, service workers, with messaging that reflects their specific needs.

In the medium term (1-3 years), the city can expand its promotional efforts through billboards, bus stop advertising, and more coordinated campaigns. Small physical improvements such as a limited late-night service or upgraded shelters can make the service more convenient and comfortable for existing and new riders. These improvements help reinforce the messaging and improve rider perception by improving the actual rider experience.

To fund these improvements, the City of Grand Rapids can pursue grants such as the Federal Transit Administration's Urbanized Area Formula Grants (Section 5307), and the U.S. DOT Better Utilizing Investments to Leverage Development (BUILD) Grant Program. However, the majority of funding should be allocated from the existing city budget to ensure that promotion efforts are consistent and sustained over time, rather than dependent on the uncertainty of external grants.

In the long term (3-5 years), the goal should be to combine promotion with physical system improvements, shifting towards consistency and visibility. As new routes or service adjustments are introduced, they

should always be paired with coordinated promotional campaigns that clearly explain changes and highlight their benefits, rather than being a one-time effort, promotion should become an ongoing part of how the city communicates. Campaigns should aim to make the bus feel like an everyday option for residents rather than an alternative.

Overall, these improvements are highly feasible as they begin with lower cost, scalable strategies such as clear communication and targeted promotion before moving into more resource intensive improvements. Many of the early term actions, particularly social media outreach and improved signage can be implemented using existing city resources and staff. Responsibility would primarily be on the City of Grand Rapids, especially departments involved in sustainability and communications, working in coordination with the rapid to ensure accurate information. This approach addresses key issues identified in earlier findings, especially the lack of public awareness of the bus system. By improving how information is shared and making the system more visible, these strategies can help reduce uncertainty and improve accessibility and comfort.

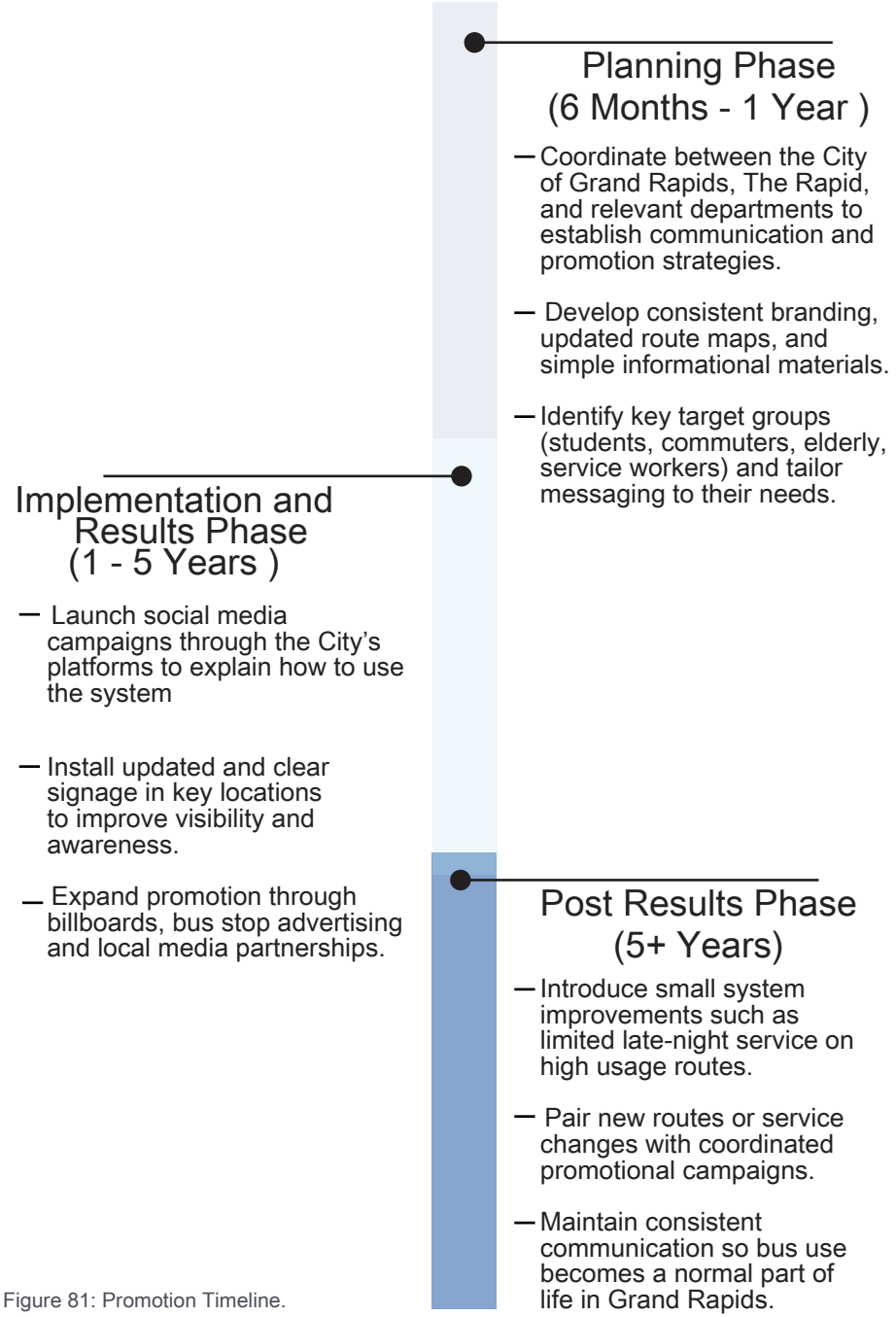


Figure 81: Promotion Timeline.

TACTICAL URBANISM

The City of Grand Rapids should invest in tactical urbanism guidelines and grants that could reduce administrative delays in bus stop improvements. Allowing citizens to engage in tactical urbanism could skip many barriers that would otherwise make improving bus stops too pricey or time consuming. These projects align with the goals of the city, as they could quickly improve bus stop conditions and amenities, without complete focus from the city. The city could engage in other strategies for improvements while community members work in tandem, increasing efficiency and involvement.

This would begin with an amendment to the zoning ordinance to clearly allow for tactical urbanism projects in the city. This could be proposed to the Planning and Zoning Department and the Planning Commission.

The Transportation Alternatives Program could be an attainable grant to help fund tactical urbanism projects in Grand Rapids. This grant is offered by the State of Michigan, and it aims to enhance the intermodal transportation system and provide safe alternative transportation options. It is allocated by congress and distributed by each state's department of transportation. The city could apply for this grant to fund community bus stop improvement projects.

The city could also explore forestry grants to fund community tree planting at bus stops. The Michigan Department of Natural Resources offers Urban and Community Forestry grants that would specifically help with tree planting. Eligible applicants include local units of government, like the City of Grand Rapids.

Finally, the State of Michigan also offers a Shared Streets and Spaces Grant Program that aims to support quick-build projects led by cities and transit agencies that improve plazas, sidewalks, curbs, streets, bus stops, parking areas, and other public spaces. This could be a great fund for improving bus stops in the NOFs, as it specifically outlines quick-build projects.

The City of Grand Rapids should collaborate with local initiative groups to develop a tactical urbanism handbook that would outline guidelines and strategies to help community groups begin a project and apply for a permit. The departments of Sustainability, Community Development, Engineering, and Planning could potentially be included to ensure a comprehensive handbook, as well as Mobile GR and local community groups like Strong Towns GR. The handbook would include an introduction, a walkthrough of the permit process (through phases), a detailed list of types of acceptable projects, an ideal materials list, a policy section enabling tactical urbanism projects, a planning worksheet, and an attached permit application. This could be posted on the City of Grand Rapids website to be easily accessible and also printed and distributed to local community groups that would be interested in engaging in tactical urbanism.

After projects are approved for permits, community members can begin work on installing amenities to bus stops in the NOFs. If completed projects are of a suitable quality and standard, they could remain long-term. Maintenance would fall on the City of Grand Rapids, with regular care. However, the city could choose to continue to engage with community groups and collaborate with them to begin a community bus stop maintenance program. These strategies could solve real issues that were identified in earlier phases of the project, namely underserved communities and bus stops with no amenities. This addresses the guiding principle of comfortability.

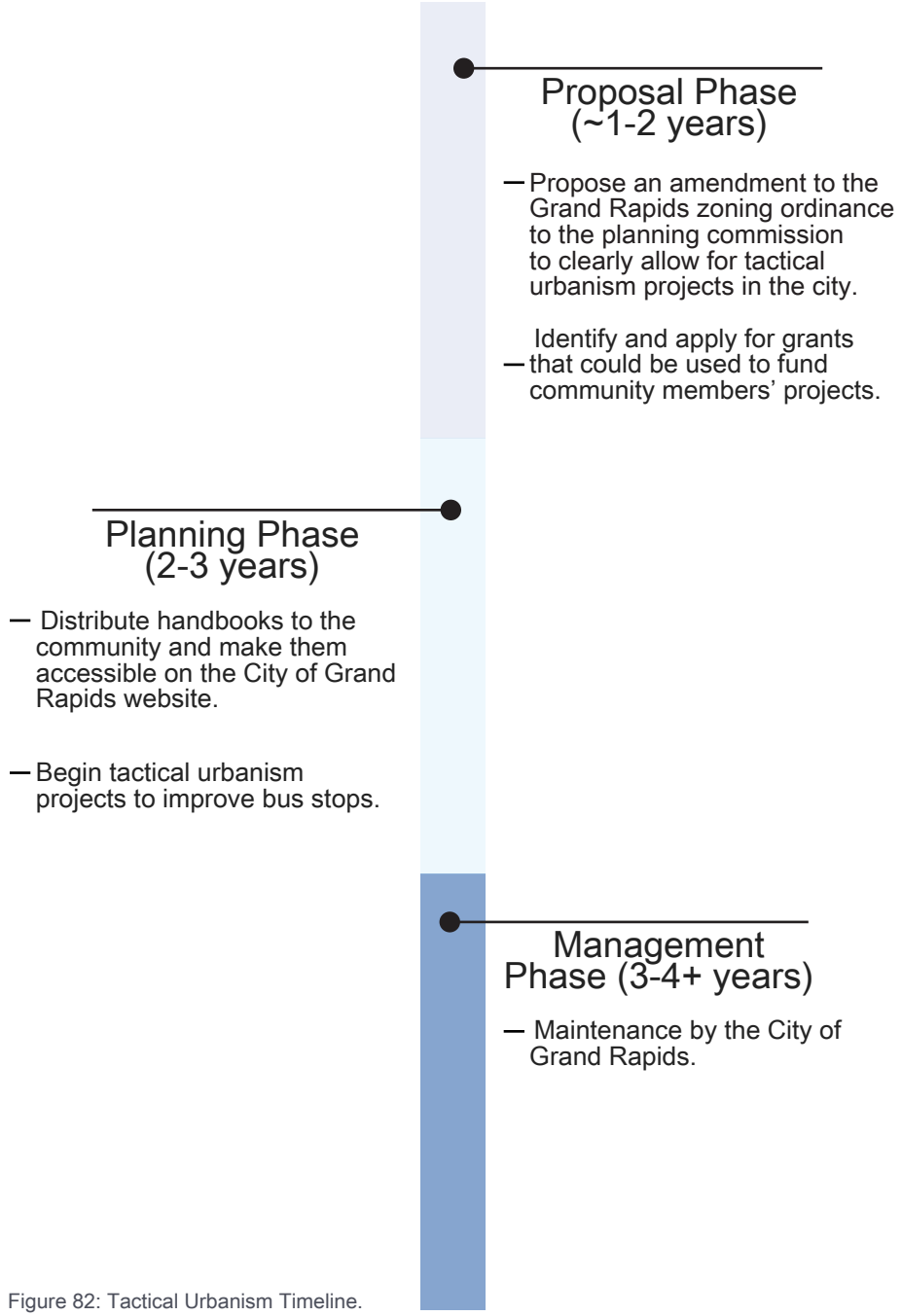


Figure 82: Tactical Urbanism Timeline.

ARTPRIZE COLLABORATION

GRTG PRIORITY IMPLEMENTATION STRATEGY

ArtPrize is a city-wide event that brings together artists from around the world into the city, to both create art, and enjoy art. Along with artists, around 800,000 people come to the city to enjoy the art. With this large influx of exposure to the City of Grand Rapids, and the money that it brings, ArtPrize can be a key partnership for moving towards a more complete bus stop infrastructure plan. To begin this partnership, meeting with the ArtPrize director and his team will be a great way to begin conversations around this project and gain their perspectives on how to move forward. In order for this partnership to work towards the final goal of using art to improve bus stop infrastructure, it will be important for a set of guidelines to be created. To make sure that art installations for the purposes of seating, lighting, and shelter are safe for the users, it will be important to talk with city engineers or a local design firm to create a set of standards for artists to work within. For example, how tall can shelter structures be and in what ways they will need to be secured to the concrete pad. Once the partnership is made, and guidelines are set, ArtPrize can use their network of artists to find people who would want to participate in this project.

Figure 83: An ArtPrize installation that could double as seating.

To incentivize, the bus stop infrastructure can become its own category for a prize in the ArtPrize competition. During ArtPrize, a dedicated bus route can be created so visitors can see the many bus stop art installations, while doing so, they will get acquainted with the bus system and potentially be more enticed to use it in the future. Once the event is over, conversations can be had with the maintenance crew at The Rapid to ensure that these can be maintained, if not, talks can be had with other transit groups in the area such as MAX transit in Holland, MI or CATA in the Lansing area to see if they would be able to use the infrastructure. The partnership with ArtPrize can take many forms and there are multiple avenues to a successful final product. The key to success is working with The Rapid, Mobile GR, and ArtPrize to come to a consensus on how to move forward. Maintaining a focus on equity, the environment, and comfortability will ensure that the final products will be accepted and used within the community.

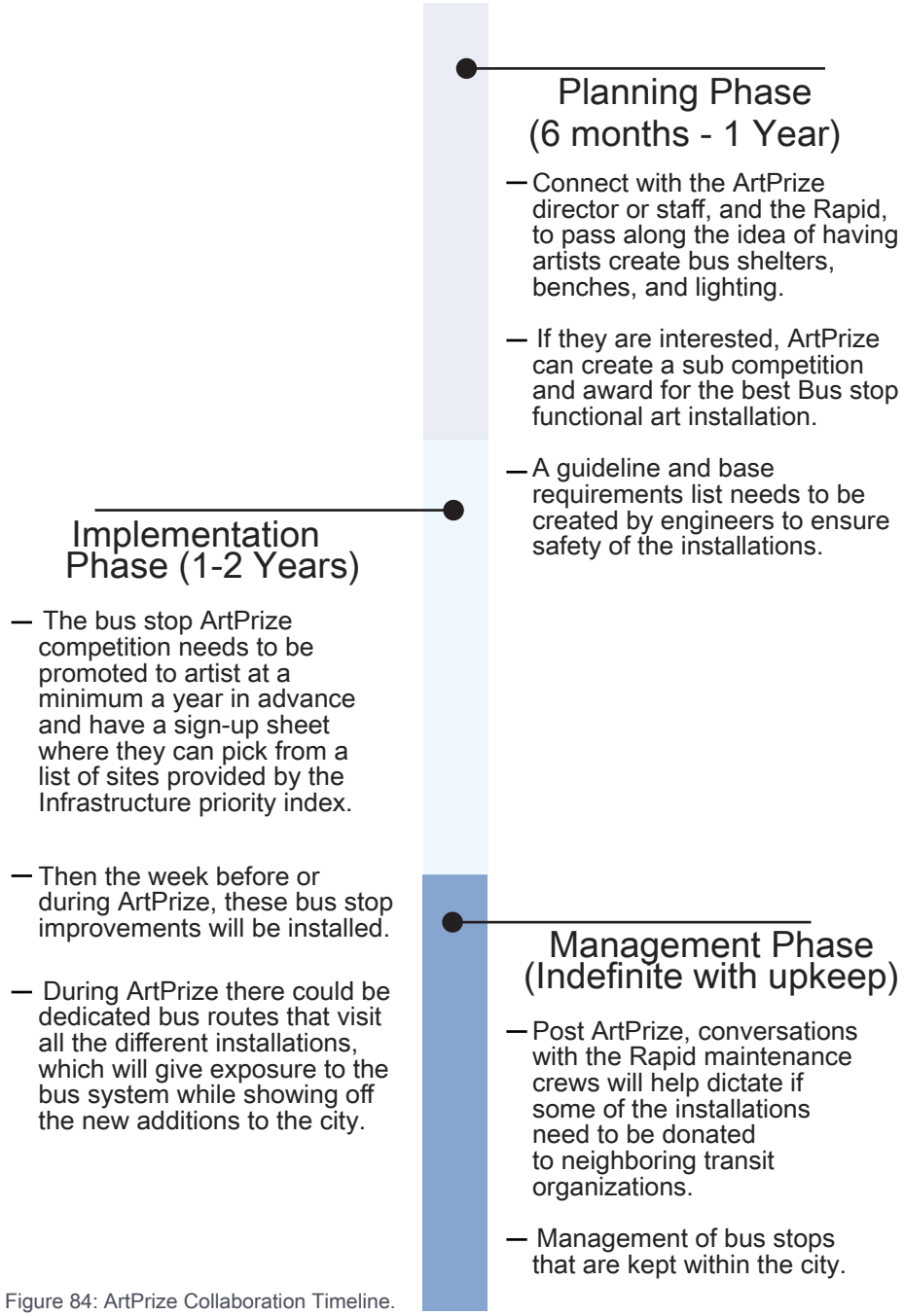


Figure 84: ArtPrize Collaboration Timeline.

PRIVATE PARTNERSHIPS

GRTG PRIORITY IMPLEMENTATION STRATEGY

Public–private partnerships with local businesses present a strategic opportunity for the City of Grand Rapids to expand bus stop infrastructure, enhance neighborhood vibrancy, and reduce the costs and implementation timelines typically associated with publicly and federally funded projects. Successful implementation will require the City's Office of Sustainability to collaborate with The Rapid and Mobile GR to facilitate the identification and engagement of potential business partners with the capacity and long-term commitment to support the installation and maintenance of a branded bus shelter, bench or both. The Rapid's Planning Department will be essential in evaluating and facilitating the successful implementation of bus stop infrastructure proposed by participating businesses. Their role will include ensuring that proposed shelter or bench installations align with safety standards, ADA compliance, and site-specific feasibility considerations. Because these installations would be located within the public right-of-way, any business seeking to install a shelter, bench, or other bus stop structure, must apply for and obtain an encroachment permit which is administered by the City of Grand Rapids Development Center.

To attract participation from potential businesses, a package of incentives should be offered, with advertising opportunities serving as the primary benefit. Participating businesses may design their shelter and bench in a manner that reflects their brand identity. Beyond on-site branding, additional incentives could include discounted or time-limited complimentary bus advertising, such as full or partial bus wraps, side or back panels, as well as interior bus signage. Advertising at Gerald R. Ford International Airport may also be considered, with subsidies given to a business to offset costs, which can vary significantly depending on the format and location of the advert. These incentives should be proportionate to a business's financial investment in bus stop infrastructure implementation, with additional compensation being given to amenities that incorporate design from local artists. Shelter and bench designs should incorporate adaptable features that allow for simple rebranding to The Rapid or Mobile GR in the event a partnership concludes, ensuring a seamless transition of ownership and continued public use.

A formalized program should be established to streamline the implementation process for business-owned shelters and benches. This program would provide clear, accessible guidance to interested businesses, including detailed information on the lifecycle costs associated with development, installation, and ongoing maintenance. The program should also outline shelter and bench acquisition options from qualified third-party manufacturers such as Tolar Manufacturing. By consolidating this information into a structured framework, the program would reduce administrative complexity, improve transparency, enabling businesses to make informed, confident decisions and more amenable to enter into a partnership with the City of Grand Rapids. The City of Grand Rapids has previously achieved successful outcomes through public-private partnerships, most notably in the development of a bus stop and plaza in collaboration with Van Andel Arena and MKSK, a planning, urban design, and landscape architecture firm. This bus stop helped in transforming a formerly underutilized plaza and alleyway into a vibrant and sustainable public space.

Public–private partnerships offer a strategic way for the City of Grand Rapids to expand bus stop infrastructure while advancing climate and mobility goals. By directing these partnerships toward high-ridership and historically underserved areas, the City can address gaps in transit investment, reducing car dependency and lowering greenhouse gas emissions, while also maximizing the impact of limited public resources.

Tolar Manufacturing bus shelter in Jacksonville, FL.

Partner Identification and Selection Phase

- Collaborate with The Rapid and Mobile GR to identify potential businesses with the capacity for implementing bus shelters with help from the IPI.
- Reach out to the potential businesses to gauge interest in a bus shelter partnership.
- Assess if interested businesses will be able to commit long term to this partnership and confirm selection.
- Determine the cost of developing and implementing the bus shelter, what incentives the business is most interested in, and if a local artist will be a part of the design of the bus shelter.
- Provide the business with ADA and city guidelines for bus shelter design.
- Apply and obtain an encroachment permit from the Development Center for structures in the right-of-way.
- Approve the design of the bus shelter.

Approval and Implementation Phase

- Approve the design of the bus shelter if all requirements from the guidelines are met.
- Construction and installation of the bus shelter.

Management Phase (Indefinite with upkeep)

- Management and maintenance of bus stops will be conducted by the businesses
- In the case of a partnership concluding, any affected bus infrastructure will be donated to The Rapid or Mobile GR for continual public use.

Figure 86: Private Partnerships Timeline.

TREE PLANTING

GRTG PRIORITY IMPLEMENTATION STRATEGY

GRTG proposes tree planting around bus stop infrastructure as a continuous medium to long term strategy. Using the tools the team has created, the city can identify which stops need trees and then plant trees that would best suit the location.

The Forestry Department will be the main group responsible for the trees because planting will be occurring in the right-of-way on city streets, the Forestry Department oversees maintenance of trees in the right-of-way and in public spaces like city parks. The Forestry Department has a list of approved street trees available online. The city has a track record of partnerships with local organizations like Friends of GR Parks for tree projects in the past. The Mayor's Greening Initiative is one of these partnerships that currently exist.

In order to implement the new tree planting, a new targeted program aimed at planting trees at bus stops can be created. Funding for this program could come from an increased or new budget from the city, or through the utilization of grant programs. Programs like the United States Department of Agriculture Forest Service's Urban and Community Forestry program, which the city received a grant from for the city's municipal forestry operation manual and urban wood utilization plan. Using the partnerships the Forestry Department has with local organizations like Friends of GR Parks, a new complementary program can be created that works alongside the goals of the Mayor's Greening Initiative, the goals of the city and the goal to improve public transportation ridership. Tree planting permits can be filed with the forestry department and utilities need to be surveyed using 811 Miss Dig before planting. After planting, the Forestry Department runs the maintenance and upkeep of trees.

Planting trees at bus stops is another step towards Grand Rapid's 40% canopy coverage goal as well providing the benefits of trees like pollution reduction and cooling. This will also modestly improve ridership in the warmer months as found in case studies around the country.

For trees in the right-of-way of streets, the trees are required to be picked from the Forestry Department's list of approved trees, which is a list of trees that would work best as street trees. For the health of the tree canopy, it is recommended to avoid letting any single tree species from composing over 10% of tree canopy. Having over 10% opens up the canopy to increased disease and pest risks, similar to Emerald Ash Borer disease. One strategy would be to focus on native species of trees for planting, as planting native species supports local biodiversity, provides habitat for local wildlife and native species are more likely to thrive than non-native species. Another strategy would be a resiliency-based species focus, where the strongest and long-lived trees are prioritized, this would put the focus on the longevity of the trees. This would benefit by lowering planting replacement costs and reducing storm damage. Alternatively, a best fit approach can be used to find the best fit on this list in each circumstance, giving a more balanced outcome between strategies.

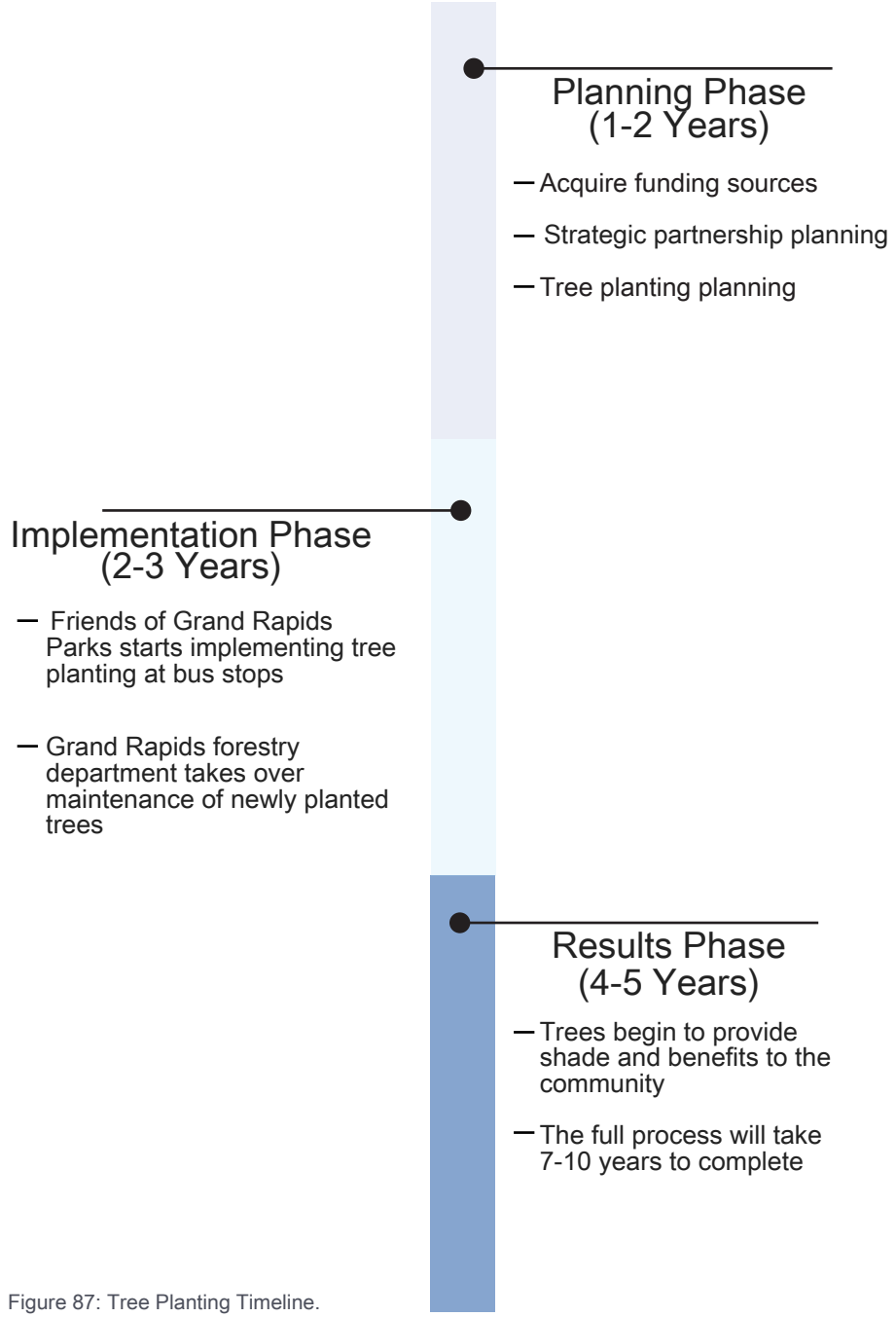


Figure 87: Tree Planting Timeline.

IMPLEMENTATION MATRIX

Action	Responsible Entities	Cost/Funding Pathway	Equity Impacts	Dependencies/ Prerequisites	Timeline
Streamline City Processes	GR Planning Department, MDOT, The Rapid, Mobile GR	Existing city budget	Infrastructure improvements accelerated	Requires interdepartmental coordination	0-2 years
Increase Transportation Funding	The Rapid, Devos Foundation, State and Federal Government	Donations and grants	Improved infrastructure and routing possible	Requires submission of applications	1-10 Years
Promote Bus Ridership	City of Grand Rapids	Existing city budget and grants	Promotion improves image, improving all riders' experiences	Promotion must be delegated to an entity	0-3 years
Plant trees at selected bus stops	Friends of GR parks, Grand Rapids Forestry Department, Community Members	Existing city budget; budget increase, federal, state, and organization grants	Shade benefits all bus users. New shade trees in underserved areas	Requires compatible bus stops, space for new trees	Can begin the process immediately; shade effects will be delayed.
Install benches at selected bus stops via tactical urbanism	Community Members	Self-funded/grants/ stipend	Benches improve accessibility for everyone, especially the disabled.	Requires compatible bus stops, and amendment to zoning ordinance.	2-3 years
Design art shelters for selected bus stops, sculptures being used to provide shade and seating.	ArtPrize and Collaborators, City Planning Dept., City Engineering Dept., GR Downtown Inc, Strong Towns	Artist funded, Community funded, ArtPrize Funded	Improved feeling of comfort and safety.	Requires city approval.	1-2 Years
Private partnerships for bus stop design	Business owners, Grand Rapids Office of Sustainability, The Rapid, Mobile GR	Business owners	Improved rider experience at selected stops, improved business	Encroachment permit through the Grand Rapids Development Center	1-2 years

Figure 88: Implementation Matrix.

CONCLUSION

In conclusion, there are many unique pathways to improving the transit system in the Neighborhoods of Focus and the City of Grand Rapids as a whole. As outlined at the beginning of this report, the City is aiming to improve rider accessibility and comfort in the public transit system in order to advance equity goals and to prepare for the impacts of climate change, as stated in the Grand Rapids Climate Action and Adaptation Plan. This project has identified the central challenges of getting infrastructure in place, most notably that both coordination amongst organizations and departments, as well as funding limitations set the pace and scale of improvements. Stakeholder engagement further revealed a deeper understanding of the origins of these challenges, presenting themselves in the form of the current funding sources and low ridership that is a result of both poor route frequency and public perceptions. Despite these constraints, the City of Grand Rapids is well positioned to address these challenges in unique ways. The Rapid already provides a reliable service that can be improved through targeted infrastructure improvements, expanded tree canopy, and strategic partnerships with local businesses, artists and community events. The IPI, along with other spatial and non-spatial solutions, offer a range of timelines and actionable pathways that guide the Grand Rapid's transit system in becoming more equitable, sustainable, and comfortable.

We would like to extend our sincere appreciation to our partners at the Grand Rapids Office of Sustainability, specifically our liaison, Robert Cloy II, for choosing Green Rapids Transit Group. We also thank our stakeholder groups, including bus riders who shared their experiences, as well as representatives from The Rapid, Mobile GR, and Strong Towns GR, for their valuable insights and contributions.

Figure 89: A bus departing Rapid Central Station.

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Data Sources:

- EGLE
- Google EIE
- GRData
- GR Planing
- Microsoft
- NOAA
-OSM
- US Census

APPENDIX

- 1: Interview Synthesis Part One
- 2: Interview Synthesis Part One
- 3: Interview Synthesis Part One
- 4: Interview Synthesis Part One
- 5: Mobile GR Interview
- 6: The Rapid Interview
- 7: Strong Towns GR Interview
- 8: Bus Stop Interview
- 9: Infrastructure Priority Index Spreadsheets
- 10: Public Private Partnership Example #1
- 11: Public Private Partnership Example #2
- 12: Field Notes

INTERVIEW SYNTHESIS PART ONE

Interview ID	Interviewee	Person Profile	Route	Bus Stop ID / Location	Date	Time
Rider 1 + 2	Zach	2 Young adults, male + female	East Fulton	#14 - Rapid Central Station	2/17	3:45 PM
Bus driver	Sam	Older White male (65)	Meijer - Plainfield	#11 - Rapid Central Station	2/17	4:00 PM
Rider 3	Zach + Sam	Middle aged, White, woman, nurse	Meijer - Plainfield	#11 - Rapid Central Station	2/17	4:00 PM
Rider 4	Neha	Lady with a child	Route 9 Alpine	Rapid Central Station	2/17	3:50 PM
Rider 5	Neha	4 adults, Black, 1 women, 3 males	Route 4 Eastern	Rapid Central Station	2/17	4:00 PM
Rider 6	Neha	White, male age 35 - 40	Route 2 Kalamazoo	Rapid Central Station	2/17	4:10 PM
Rider 7	Zach + Sam	Male, student, white	N/A	Rapid Central Station	2/17	3:50 PM
Rider 8 (Shawn)	Olivia + Ashton	Male, Black, middle age	Route 4	On the bus	2/6	1:00 PM
Rider 9	Sean + Ashton	Male, Latino, Young/student	N/A	Rapid Central Station	2/6	2:00 PM
Rider 10	John + Ashton	Male, Asian, Middle age	Route 4	On the bus	2/6	1:30 PM
Rider 11	Sean + John + Ashton	Male, White, elderly	Route 4	Bus stop on eastern and Grigg	2/20	2:00 PM
Rider 12	Olivia + Ashton + John	Male, Latino, Younger late 20's -30's	Route 4	Easten and Hall	2/20	2:10 PM
Rider 13	Olivia + Ashton + John	Male, Black, middle age	Route 4	Easten and cherry	2/20	2:25 PM
Rider 14	Sean + ashton	Male, Black, Older	Dash	Bridge st market	2/20	2:57 PM
Rider 15	Sean + ashton + olivia + j	Two males, White, middle age, wealt	Dash on bridge	Bridge st across from new hol	2/20	3:20 PM
Rider 16	Sean	Women, White, middle age	Central station	Central staiton	2/20	3:40 PM

INTERVIEW SYNTHESIS PART TWO

Interview ID	Conditions	Issue Category
Rider 1 + 2	Slightly overcast	Longer hours + Fare price
Bus driver	Slightly overcast	Disruptive ridership
Rider 3	Slightly overcast	Longer hours, more accessible to lower income, convenient
Rider 4	Slightly overcast	Longer wait/ Not a regular user
Rider 5	Slightly overcast	Fare price
Rider 6	Slightly overcast	Longer hours
Rider 7	Slightly overcast	Convenient, not preferred form of transport
Rider 8 (Shawn)	Cold, cloudy	
Rider 9	Cold, cloudy	Coverage, Heavy user, class work leasier
Rider 10	Cold, cloudy	Not a regular user
Rider 11	Rainy, cold, cloudy	coverge from elements, Maintinence (graffiti)
Rider 12	Rainy, cold, cloudy	Kind of conveninent, remove glass at stops, more lighting. to be seen by bus in the dark
Rider 13	Rainy, cold, cloudy	Shelter and frequencey.
Rider 14	Rainy, cold, cloudy	Seating, freqency, later at night, better maintinence
Rider 15	Rainy, cold, cloudy	Inconvient, un informed, Would have liked a shelter because of current weather.
Rider 16	Rainy, cold, cloudy	Safety

INTERVIEW SYNTHESIS PART THREE

Interview ID	Key Quote	Audio File
Rider 1 + 2	"Bus service is more of a priority over bus stops"	X
Bus driver	“I have good rapport with most of the riders and we know each other”	
Rider 3	"The bus acts like an ambulance, so it's good to see my patients using it"	X
Rider 4		X
Rider 5	"I think they should change where they can go back to the where we don't have to pay more"	yes
Rider 6	"I'm surprised that we're this far away from COVID, and they haven't gone back to the hours that they had before COVID" "That would be my only request is to bump up, like, start earlier and end later"	Yes
Rider 7	"Some stops are out in the open, and that can be annoying"	Yes
Rider 8 (Shawn)	" bus stops could have more seats, Being on the bus is a good way to get out of the sun."	yes (int 1-Sean.mp4)
Rider 9	" I think they should add more coverage (shelters)... I would find them more helpful in the winter"	
Rider 10	" I would like more routes to be added"	
Rider 11	" Ive been riding for 7 years, it would be nice to have more shelters and lighting" " Shelters at stops have been removed"	Yes
Rider 12	"Add lights to shelters or signs so the bus does not miss you"	X
Rider 13	" I would like to see a shelter added, Ive been riding riding my whole life, I don’t care about the time of the year"	yes
Rider 14	" Yeah I want better seating, Im sitting on a shopping cart" " I use the bus every other day"	X
Rider 15	" This is our first time getting on the bus, we don’t have much of an opinion yet, but a shelter today would be nice"	X
Rider 16	" This is a bad place to not pay attention to whats going on around you"	X

INTERVIEW SYNTHESIS PART FOUR

Interview ID	Photo IDs	Notes
Rider 1 + 2	X	
Bus driver		X
Rider 3	X	
Rider 4	X	
Rider 5	X	
Rider 6	X	
Rider 7		
Rider 8 (Shawn)	Yes, aston has it	
Rider 9		
Rider 10		
Rider 11	X	
Rider 12	X	
Rider 13	X	
Rider 14	X	Concrete seating was wet due to weather 7/10 experience, only uses dash every other day
Rider 15	yes	caught them waiting for their first ride on the bus
Rider 16	X	We are interpreting it as maybe you need to pay more attention to where busses are when they are coming, or as a crime and loitering issue.

NOF area highlighted by yellow outline; DASH routes within NOF highlighted in gray & Ariel view of Grand Rapids with NOF area highlighted by yellow outline (Maps below)

Introduce project First to Ariana

- mgilles@grand-rapids.mi.us community engagement

- How did DASH come about?
- What is your relationship with the Rapid system
- How were the routes decided?
- How is working with The Rapid? What is the best/worst part working with them?
- What are peak usership times? Does it differ within the NOF compared to the rest of the city?
- How often are shared scooters and bikes used within the NOF?
- What are the main trip purposes for DASH riders?
- What are some barriers that non-riders have that stop them from using DASH?
- Did the service expansion from 5 to 7 days attract primarily new riders or increase usage among existing riders?
- Were there any unexpected outcomes from the service expansion?
- Are there any new DASH stops looking to be added? If so, where and why?
- How is DASH able to work as a free service and how are improvements funded?
- Have there even been talking about making it a paid service? Will DASH ever transition to becoming a paid service?
- With no limitations, what are some changes that could be made to increase ridership?
- How does MobileGR see itself shaping travel behaviors in the downtown and within the NOF over the next 5-10 years?

Questions from The Rapid:

- Is there any survey data that you can share with us regarding bus stops, rider feedback, rider experiences, etc… in the NOF? (Not Grand Rapids as a whole)
- What is the ridership forecast for the next 5 years? If you are expecting ridership increases or decreases, what changes need to be made to accommodate that change if any?

- What are some areas/corridors in the NOF (map at bottom of document) that you and your team have found to be priority areas for improvements?
- Is there any survey data that you can share with us regarding bus stops, rider feedback, rider experiences, etc… in the NOF? (Not Grand Rapids as a whole)
- What is the ridership forecast for the next 5 years? If you are expecting ridership increases or decreases, what changes need to be made to accommodate that change if any?
- What is being done to encourage ridership?
- Are there any new routes or extensions to current routes that are being considered/planned within the NOF?
- Who is responsible for maintenance on the bus stops? How do you know when to service a bus stop? How frequently are the insides of the bus cleaned?
- What is being done to remedy/supplement the driver shortage?
- How has post COVID ridership growth been different from pre-COVID ridership growth?
- From rider feedback, what do people most often say *prevents* them from using transit more frequently?
- What do riders in the NOF consistently identify as the system's biggest strengths? Weaknesses?
- Do rider concerns differ between frequent, occasional, and first-time riders? If so, how do they differ?
- What complaints or issues come up most often regarding bus stops?
- How does The Rapid measure rider satisfaction?
- How do riders find out about service changes/maintenance/delays, and how effective is this communication?
- What feedback have you received about bus arrival/departure timeliness in the NOF? Does it differ significantly from non-NOF stops?
- What outreach methods are used to hear from riders who do not/cannot engage in surveys? Do their responses differ to those who take surveys?
- Are language/cultural barriers a challenge in collecting rider feedback?
- What is being done to fix stops that are currently ADA non-compliant?
- What determines whether a bus stop receives amenities like shelters and/or seating?
- How does The Rapid prioritize bus stop upgrades?
- When will the ArcGIS GR Data for bus stops be updated? (last updated in 2019)
- What types of improvements have historically led to the biggest ridership gains?
- Are there emerging mobility trends that are concerning/exciting?
- In an ideal scenario with no limiting factors, what improvements would you want to make and why?
- Is The Rapid open to ideas regarding new types of shelters/amenities at bus stops?
- Is improving core corridors or expanding coverage a bigger priority?
- Does The Rapid have a budget for improvements, or is expansion/upgrades largely grant based? If improvements are grant based, what type of projects are the most realistic to pursue (operation improvements, capital upgrades, pilot programs, etc)?

- What is Strong Towns as a whole and what is Strong Towns specifically in Grand Rapids?
- When did Strong Towns in Grand Rapids start?
- Who gets involved with Strong Towns GR?
- What sets Strong Towns GR apart from other advocacy groups?
- What do your day to day work/activities look like?
- How is Strong Towns GR funded? Is there any funding from Grand Rapids/other local governments?
- How has membership/participation with Strong Towns GR been over the last ~5 years
- Have you observed differences in participation across demographic groups such as age, ethnicity, gender, or income level?
- Can you share an example of a project, campaign, or event that was successful and why it was successful? i.e. resulted in policy changes or more people attending planning meetings.
- How do you collaborate with city officials, planners, or community organizations?
- Who do you currently collaborate/partner with? (Do you have a favorite(s))
- How were the 5 core campaign ideas decided on? Please give a short description for each. (SAFE & PRODUCTIVE STREETS, TRANSPARENT LOCAL ACCOUNTING, END HIGHWAY EXPANSIONS, END PARKING MANDATES AND SUBSIDIES, and INCREMENTAL HOUSING)
- Which campaign idea have you seen the most success with?
- What local barriers make advocacy for these campaign ideas difficult?
- Has there been any local/community push back on these campaign ideas?
- How do you measure success?
- If you were to add 1-2 more campaign ideas what would they be and why?
- Rate your level of optimism for the city of Grand Rapids 1-10 over the next 10 years

BUS STOP INTERVIEW

Directions:

1. Record bus stop ID, amenities, and conditions(number of people waiting, weather).
2. State your name. You are a Michigan State University student working with the City of Grand Rapids to study bus stop conditions and perceptions. Ask if they would like to participate in a brief interview.
3. Request permission to record audio.
4. Ask interview questions.
5. Ask participant for their photograph.
6. Record profile of the interviewee's approximate age, race, and gender.

Background Questions

- What is your name?
- What bus are you waiting for?
- Do you live in Grand Rapids? If so, what neighborhood(or what is a nearby landmark)?
- How often do you ride the bus? For what purpose do you ride the bus(i.e.: work, groceries)

Priority Questions

- How do you feel about the city's bus stops?
    - Are they comfortable?
    - Are they safe?
    - Are they convenient?
- What are the 1 or 2 most important features of a bus stop(ex: shelter, seating, bike rack, lighting, trash bin, trees)?
- Do bus stops do an adequate job at protecting you from the elements? Why or why not?
- What is one change you would make to bus stops in Grand Rapids?
- Do you ride the bus in the summer? If so, are the bus stops you use shady or exposed to the sun? How important is it that bus stops provide shade in the summer?
- Which is more important to you: improving bus stops or bus service?

Additional Questions (Time Permitting)

- Is the bus your preferred form of transportation? If not, what is?
- What is your favorite part of riding the bus in Grand Rapids?
- What is your least favorite part of riding the bus in Grand Rapids?
- What is one thing you would change about riding the bus in Grand Rapids?
- What is your least favorite season of the year to ride the bus?
- Does the presence of snow change your travel habits? If yes, how so?
- Are you aware of reduced fare programs for those with a disability or aged 65 or older?
- Do your friends and family ride the bus? Why or why not?

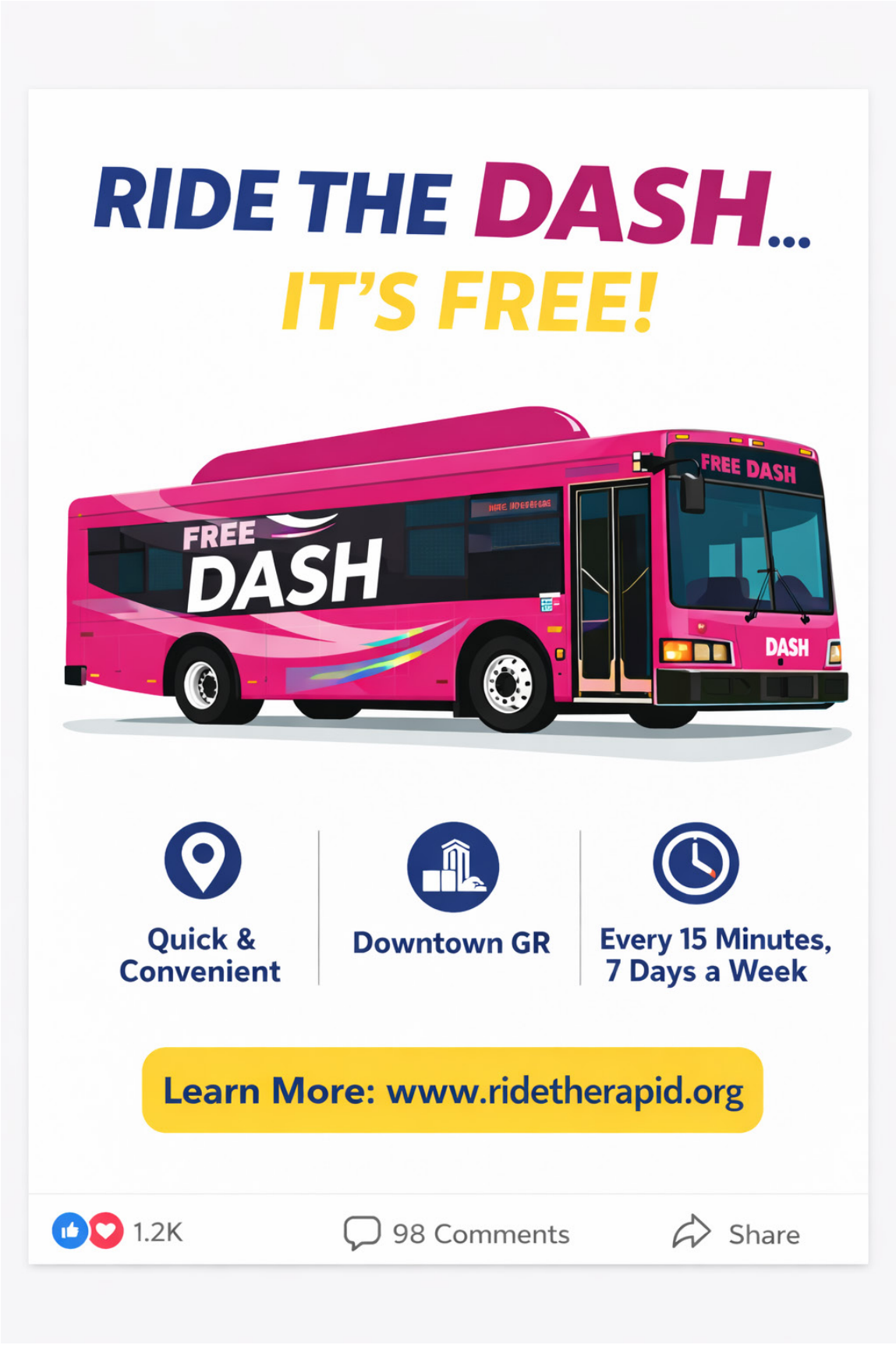
Priority questions asked on site visit 2/17/2026

INFRASTRUCTURE PRIORITY INDEX SPREADSHEETS

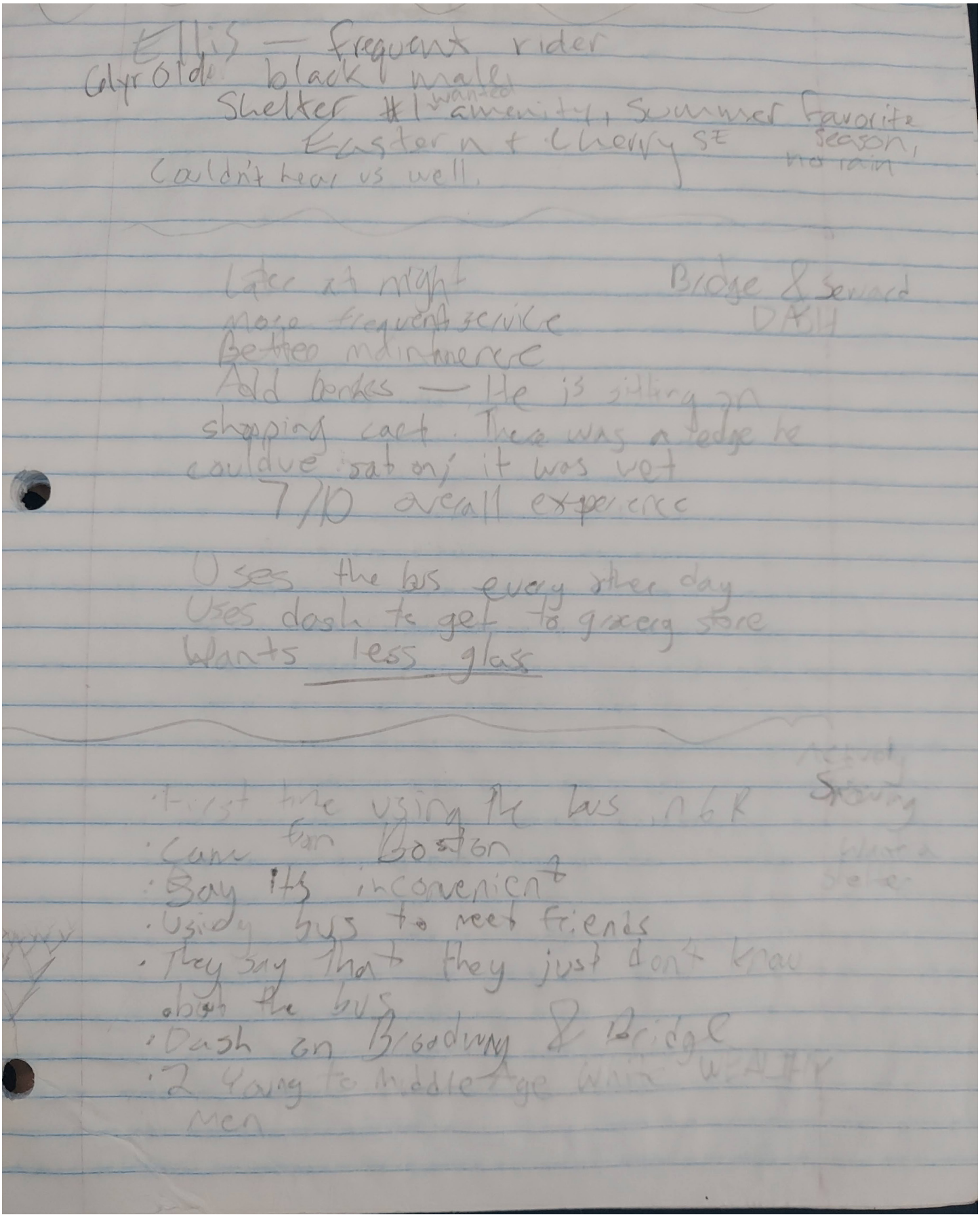
For access to the IPI Spreadsheet tool used in this project and a set of instructions, contact Ashton Gaishin at ashtongaishin@outlook.com or Corey Fein at coreyfein01@gmail.com

PUBLIC PRIVATE PARTNERSHIP EXAMPLE #1

DASH PROMOTION EXAMPLE #2



FIELD NOTES


Ellis — frequent rider
Glyrolde black male
Shelter #1 wanted amenity, Summer favorite season, no rain
Eastern + Cherry SE
Couldn't hear us well.

Later at night
more frequent service
Better maintenance
Add benches — He is sitting on shopping cart. There was a ledge he could've sat on; it was wet
7/10 overall experience

Bridge & Seward DASH

Uses the bus every other day
Uses dash to get to grocery store
Wants less glass

First time using the bus rn 6K
Came from Boston
Say its inconvenient
Using bus to meet friends
They say that they just don't know about the bus
Dash on Broadway & Bridge
2 Young to Middle Age men

CITY OF GRAND RAPIDS

GRAND RAPIDS, MICHIGAN

BUS STOP INVENTORY & IMPROVEMENT PROJECT