CAPSTONE PROJECT REPORT

UCLA Institute of Transportation Studies

Mobility Hubs:

Lessons Learned from Early Adopters

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16. Abstract
As city and regional officials aspire to promote multimodal transportation, meet environmental sustainability goals, and reduce personal vehicle dependence, mobility hubs are gaining in popularity. Mobility hubs are centralized locations where travelers can conveniently access a growing number of public and private mobility options – including shared bicycles, scooters, and cars, and shared rides delivered by ridehailing and microtransit services. These hubs extend the reach of public transportation networks, safely connect people from one travel mode to another, and make it easier to consider options other than driving alone. Featuring people-focused infrastructure design, these hubs can also serve as focal points for accessing goods and services by centering safety and accessibility for vulnerable travelers, including women, people with disabilities, and BIPOC travelers. This report details lessons learned from mobility hub programs in four geographic areas – Columbus, Ohio; Hamburg, Germany; Minneapolis, Minnesota; and San Diego County, California. Applying lessons learned from these early adopters, I recommend principles to guide FASTLinkDTLA's approach to the mobility hub program design and development in Los Angeles County. These recommendations include: developing public-private sector champions; piloting multiple hub design and operational models; layering digital platforms onto exceptional physical amenities; conducting public engagement throughout design, testing, and operations; and securing local funding for hub network expansion and operations.

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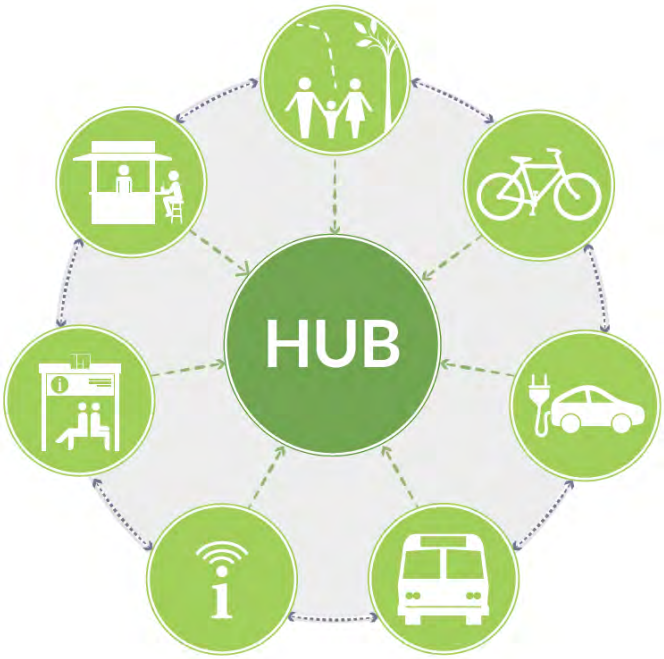
MOBILITY HUBS:

LESSONS LEARNED FROM EARLY ADOPTERS



Source: Los Angeles Urban Design Studio

A comprehensive project submitted in partial satisfaction of the requirements for the degree of Master of Urban & Regional Planning

By Doug Arseneault

Client: FASTLinkDTLA
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Disclaimer

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Abstract

As city and regional officials aspire to promote multimodal transportation, meet environmental sustainability goals, and reduce personal vehicle dependence, mobility hubs are gaining in popularity. Mobility hubs are centralized locations where travelers can conveniently access a growing number of public and private mobility options – including shared bicycles, scooters, and cars, and shared rides delivered by ridehailing and microtransit services. These hubs extend the reach of public transportation networks, safely connect people from one travel mode to another, and make it easier to consider options other than driving alone. Featuring people-focused infrastructure design, these hubs can also serve as focal points for accessing goods and services by centering safety and accessibility for vulnerable travelers, including women, people with disabilities, and BIPOC travelers. This report details lessons learned from mobility hub programs in four geographic areas – Columbus, Ohio; Hamburg, Germany; Minneapolis, Minnesota; and San Diego County, California. Applying lessons learned from these early adopters, I recommend principles to guide FASTLinkDTLA's approach to the mobility hub program design and development in Los Angeles County. These recommendations include: developing public-private sector champions; piloting multiple hub design and operational models; layering digital platforms onto exceptional physical amenities; conducting public engagement throughout design, testing, and operations; and securing local funding for hub network expansion and operations.

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Executive Summary

Mobility hubs are physical locations where shared mobility services – like public transit, ridehailing, and bike- and scooter-share – converge in a centralized location, "a place where people can seamlessly connect…in a safe, comfortable, and accessible environment" (Shared-Use Mobility Center (SUMC), 2019). Mobility hubs range from a transit stop with a bikeshare station and information kiosk to a destination in its own right (Anderson et al., 2017). Featuring infrastructure designed for all ages and abilities, these hubs also serve as anchors for commercial activity and social gathering in safe and accessible spaces for vulnerable traveler populations, including women, children, people with disabilities, and black, indigenous, and people of color.

Figure 1. SANDAG Mobility Hub Concept

Source: SANDAG

In 2010, the Federal Transit Administration awarded $8.3 million to the Los Angeles Metropolitan Transportation Authority (LA Metro) to support mobility hub development in the cities of Los Angeles and Long Beach. However, city officials have yet to implement their hub programs. In the years since, multiple mobility options emerged in Los Angeles (LA) County and across the country, including micromobility, carshare, and microtransit providers.

To guide mobility hub development in LA County, I sought lessons learned from mobility hub programs in Columbus, Ohio; Hamburg, Germany; Minneapolis, Minnesota; and San Diego County, California. While city staff lead the Columbus and Minneapolis' programs, Hamburg's transit agency Hamburger Hochbahn (Hochbahn) leads the hub program in the German city-sate and the San Diego Association of Governments (SANDAG) spearheads hub design in San Diego County. I interviewed their project managers and reviewed their documentation to determine designs and operational models suitable to LA County. I analyzed the projects with respect to six themes: accessibility, community engagement, equity, funding, partnerships, and safety. I drew on these interviews and documents to recommend approaches to mobility, placemaking, and leadership and governance.

Mobility-related findings included:

1. **Agencies share common goals and design principles.** Shared goals included transit and shared mobility use; alignment of transportation, public health, sustainability, and equity goals; technological advancements; and building partnerships with private mobility providers. National thinktanks, academia, transit agencies, private mobility providers, and technology consultants contributed to hub designs. While the Minneapolis and SANDAG teams conducted extensive data analysis to determine initial sites, all agencies' teams engaged community stakeholders to finalize their site list.

2. **Hub designers prioritize infrastructure that supports transit and active transportation, but differ on their approach to ride-sharing and parking.** Project teams identified three core elements: transit stations, micromobility parking, and pedestrian infrastructure. Teams located hubs along rail, Bus Rapid Transit (BRT), or frequent bus lines. They prioritized bikeshare docks and e-scooter corrals, along with well-maintained sidewalks and safe street crossings. Notably, Minneapolis' team worked with their state department of transportation to install bollard bump-outs and hardened centerlines to improve pedestrian safety (Rasp et al, 2021).

   Columbus and SANDAG teams incorporated ride-share pickup and drop-off zones. This feature was partially to prepare for autonomous vehicles. The Hochbahn team centered carsharing, supporting their rapid expansion to nearly 100 hubs over the past decade (HVV Switch 2022). Minneapolis transitioned on-street parking into scooter corrals. Project teams also prioritized parking for electric vehicles (EV) including charging infrastructure.

All agencies installed wayfinding signage, information kiosks, and seating to support a comfortable waiting experience. The defining characteristic of Columbus' hubs is interactive digital kiosks (Columbus, 2021). The Minneapolis team emphasized the importance of seating, and experimented with modular furniture (Rasp, 2020, 2021).

3. **Agencies refined hub designs by engaging stakeholders throughout the process.** The project teams agencies engaged current and potential users throughout siting, design, and operation. Strategies ranged from meetings with elected leaders to cooperative planning with mobility providers and neighborhood groups. The Minneapolis team used hubs to "create a platform for interactive community engagement," including pop-up tabling with provider partners, surveys, and an Ambassador program in partnership with civic and business associations (Rasp et al, 2020, 7).

4. **Program managers stressed that partnerships with mobility providers are the determining factor of whether hubs are successful.** Public transit, micromobility, and locally owned mobility providers tend to be the most enthusiastic partners. Project managers noted inconsistent support by national ride-hailing companies like Lyft and Uber, even though the companies are also involved in micromobility. Trip data sharing is a conflict point between public agencies and private mobility providers.

In terms of placemaking, agencies offered the following insights:

1. **Hub developers typically leverage existing multimodal activity centers, but neighborhood hubs with destinations may have a greater benefit.** Project teams are divided on whether to prioritize sites that maximize multi-modal connections or improve access to neighborhood-serving retailers, health care, and community gathering spaces. Hochbahn found a balance by initially building in densely developed areas, then expanding to neighborhoods in response to public requests for stations.

2. **Program managers espoused the benefits of technology, while recognizing that physical features are essential.** Hochbahn and Columbus' teams integrated their mobile application with their hub experience. But, digital assets should compliment, not replace, physical features like lighting, seating, and signage. Digital signage and emergency call buttons are high demand technology-based features.

3. **Agencies worked with advocates to ensure hubs are accessible to people with disabilities and limited language proficiency.** Hubs should be spaces that exceed baseline requirements for accessibility. Signage should be primarily icon-based and incorporate locally spoken languages.

4. **Travelers and hub-adjacent businesses need to see and experience the hubs to fully understand their value.** Hub teams used detailed diagrams and 3-D videos to educate during design. However, stakeholders were not excited until hubs were operating, leading to vocal support for network expansion among both users and surrounding businesses. SANDAG's team seeks out private developers to incorporate hub features into new projects (Kochman, interview, March 15, 2022).

Lessons learned concerning governance and leadership include:

1. **Strong champions are vital to move hubs from concept to implementation.** All hub teams expressed deep-seeded passion for mobility hubs. They acknowledged transit agency staff and local general managers of mobility providers as their strongest allies. SANDAG's program supervisor noted some true believers among real estate developers; she is developing a toolkit to support their partnerships with mobility providers and seeking funding (Kochman, interview, March 15, 2022). The Twin Cities Shared Mobility Collaborative (SMC) is a model for cross-sector partnership (University of Minnesota, 2021).

2. **Agencies scaled their hub programs depending on organizational capacity, governance structure, and jurisdictional powers.** Hochbahn's program rapidly scaled as a transit agency with existing permits. Minneapolis' team benefited from right-of-way control and permitting authority over micromobility. Columbus' team faced challenges with federal bureaucracy. SANDAG's program was limited to planning, but will use its funding authority to build an expansive, $2.4-billion hub by 2035 (SANDAG, 2021).

3. **Hub programs are sparked by grant funding, but reliance on grants undercuts their sustainability and evolution.** Local funding is needed for long-term operation and network expansion. SANDAG's Implementation Memo recommends hyperlocal sources like development impact fees, Enhanced Infrastructure Financing Districts, and revenues from parking benefit districts and High-Occupancy Toll Lanes (SANDAG, 2017b).

4. **Agencies adopted innovative approaches to contracting and procurement practices.** Project teams leveraged internal expertise or capacity, but contracted outside firms for support when needed. Minneapolis' program benefitted from a local placemaking firm (Rasp et al, 2021).

Based on these lessons learned, I recommend that FASTLinkDTLA work with public and private hub developers to:

Mobility

1. **Collaborate with mobility providers, community partners, and users to align priorities and develop hub designs and operational practices.** Hub partners must establish clear goals that balance profitability and community needs. FASTLinkDTLA is perfectly suited to be a convener, given their leadership's long-standing relationships. Hub operators should follow Minneapolis' hub management model of active site management and ongoing engagement.

2. **Prioritize micromobility parking and accessible ride-share pick-up/drop-off areas, while allocating flexible space for emerging first-last mile modes.** Micromobility – bike- and scooter-share – is fundamental. Hub designers should design passenger pickup and drop-off zones with sufficient space for travelers using wheelchairs. Passengers should not cross traffic lanes, including dedicated bicycle and bus lanes. Curb uses should flex with traveler patterns.

3. **Think beyond the hub.** Hubs cannot exist in isolation. LADOT, LA Metro, and other public agencies should invest in pedestrian and walking/scooting paths to hubs, including reforms to on-street parking. Private hub developers should be rewarded with zoning flexibility and expediting. FASTLinkDTLA should advocate for these investments.

Placemaking

1. **Leverage existing activity centers and new development.** LA Metro, LADOT, and SCAG should maintain plans for the first hubs at Metro Red, Blue, and Gold Line stations, but consider neighborhood-serving hubs – particularly in historically disadvantaged communities – during the second phase. Private hub developers could occur through joint development or subsidies. As a TMO, FASTLinkDTLA is well-positioned to guide these public-private partnerships.

2. **Create safe and welcoming environments, with particular attention to women, BIPOC, and people with limited mobility.** Mobility hubs should feel safe, welcoming, and easy to navigate. Hub developers should prioritize lighting, emergency calls buttons, and wayfinding signage, as well as ambassadors or trained security personnel to provide eyes on the street. Landscaping and art elements enhance the aesthetic of the hubs, in turn creating a welcoming space that feels safe. FASTLinkDTLA should advocate for a safe environment.

3. **Layer digital infrastructure on top of high-quality physical amenities.** Hub operators should embrace post-pandemic demand for goods and food delivery at the touch of a button. The physical experience at the hub should extend digitally through mobile applications, interactive kiosks, and Wi-Fi hotspots. Costs can be offset by the Justice 40 Initiative. Hub operators should use these platforms to collect data on user preferences and travel patterns, and leverage this data to attract retailers and service providers including ride-hailing services.

Leadership & Governance

1. **Identify and support champions.** Hub developers – particularly public agencies – need vocal and passionate advocates – both internally and externally – to advocate for the inclusion of hub features in infrastructure projects as well as private development. These allies could come from transit agencies, private mobility providers, business organizations, private developers, community benefit organizations, neighborhood associations, advocacy groups, individual businesses, healthcare providers, higher education institutions, foundations, and libraries. FASTLinkDTLA should facilitate conversations between potential champions and look to the Twin Cities Shared Mobility Collaborative (SMC) as a partnership model.

2. **Pilot multiple hub design types, then scale to create a network.** Achieving a successful network requires iteration. Hub developers should be prepared to pilot different models: a single site (Hochbahn), a single corridor (Columbus), multiple corridors (Minneapolis), or an entire community (SANDAG). FASTLinkDTLA should support developers in identifying which model suits their goals, capacity, and resources.

3. **Seek planning grants, but dedicate local funding for operation and expansion.** Public agencies in LA County are well positioned to pursue mobility hub planning, between the Integrated Mobility Hubs Pilot Program, Caltrans Sustainable Transportation Planning Strategic Partnerships Grant, and availability of the FTA Transit-Oriented Community grant. However, hub developers will need to pursue other sources to build a regional network and fund operations. Hub developers should seek reliable local sources, like development impact fees, Enhanced Infrastructure Financing Districts (EIFD), and revenues from parking benefit districts and Metro ExpressLanes. FASTLinkDTLA should support private developers in accessing these public funding sources.

With FASTLinkDTLA's support and by implementing the recommendations outlined in this report, public agencies and private developers can design a mobility hub network that could serve as a model for other regions. The mobility hub revolution is already underway. The Los Angeles region has the potential to be a pivotal leader in establishing mobility hubs as the foundation for traffic reduction, innovation, economic recovery, placemaking, and environmental resiliency.

Introduction

Coordination between transportation providers has been a federal goal since at least 1991 with the passage of the Surface Transportation Efficiency Act (ISTEA) (Henry & Marsh, 2008). In a report by the National Commission on Intermodal Transportation (NCIT), established under ISTEA, the NCIT asserted that coordination can lower transportation costs, generate successful public-private partnerships, and improve mobility for disadvantaged communities (NCIT 1994). Over the past 30 years, transportation options have expanded significantly to incorporate new technologies and achieve economic, environmental, and social goals (Shaheen et al., 2020).

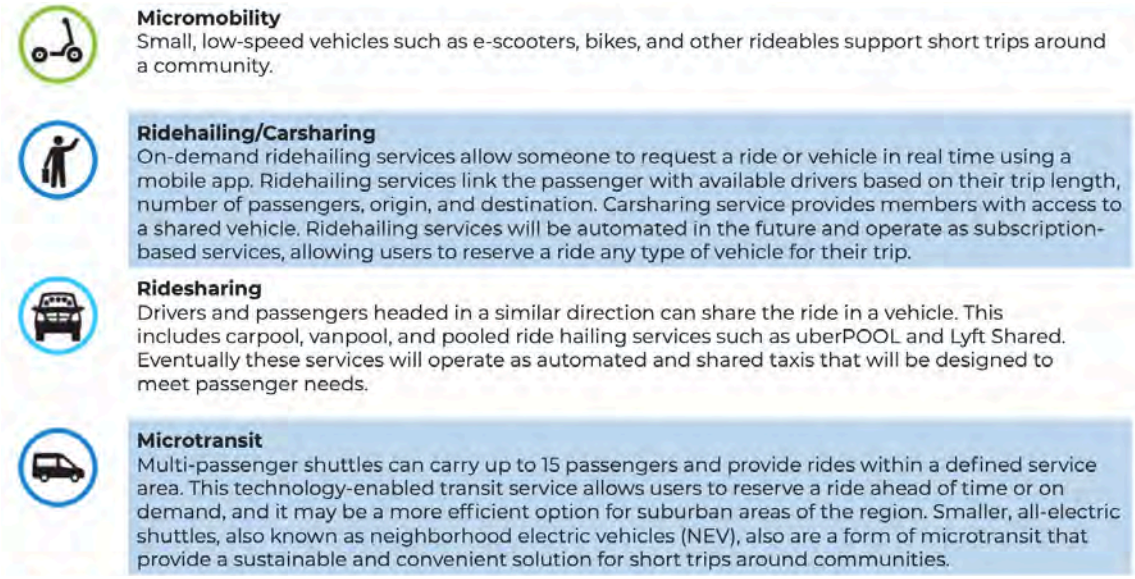
As city and regional officials aspire to promote multimodal transportation, meet environmental sustainability goals, and reduce personal vehicle dependence, mobility hubs are gaining in popularity. Mobility hubs are physical locations for intermodal cooperation that integrates these conventional and emerging shared mobility services in a centralized location, "a place where people can seamlessly connect…in a safe, comfortable, and accessible environment" (Shared-Use Mobility Center (SUMC), 2019). Also called "mobility centers" or "mobility points," these locations can range from as simple as a transit stop with a bikeshare station and information kiosk to a destination in its own right with an expansive footprint (Anderson et al., 2017). Featuring infrastructure designed for all ages and abilities, these hubs can also serve as anchors for commercial activity and social community. safe and accessible space for vulnerable populations, including women, children, people with disabilities, and BIPOC travelers.

In 2010, the Federal Transit Administration (FTA) awarded $8.3 million to LA Metro to fund a 3-year "Integrated Mobility Hubs" pilot program led by the Los Angeles Department of Transportation (LADOT) in partnership with the City of Long Beach. FASTLinkDTLA's predecessor organization, Fixing Angelenos Stuck in Traffic (FAST), was a member of the grant-writing team. The program is intended to support development of thirteen "Primary" hubs in Downtown Los Angeles, Hollywood, and Long Beach at Metro Red and Blue Line stations with 85 satellite hubs within a 1-mile radius of the primary hubs (Los Angeles, 2010). The Wilshire Grand Center was designated in 2015 as the first "Primary" hub site (Tranzito, 2022). Located in Downtown Los Angeles across the street from the 7th Street/Metro Center rail station, the Wilshire Grand Center offers a prime location for connections between the Metro rail system and other shared modes of transportation. To guide implementation of the program and assist private developers and community

members, the Los Angeles City Planning Department's (LACP) Urban Design Studio subsequently published a guide for mobility hub development in 2016. The "Mobility Hubs Reader's Guide" (**Appendix A**) outlines types of hubs and various infrastructure and programmatic improvements to support multimodal connections (LACP, 2016).

Over the past dozen years since the FTA grant award, new mobility options – both publicly- and privately-owned – emerged in Los Angeles (LA) County and across the country. To manage these "Mobility-as-a-Service" modes (**Figure 1**) – particularly the rapid proliferation of dockless e-scooters since 2018 – many cities across the United States are aggressively pursuing the mobility hub concept. In 2019, the cities of Minneapolis and Austin launched pilot projects to test mobility hubs, with subsequent iterations in 2020 (Minneapolis, 2022; Austin, 2022). The City of Columbus launched "Smart Mobility Hubs" in 2020 as part of the USDOT $40 million Smart Cities Challenge grant (Columbus, 2022). In 2021, the City of Pittsburgh launched their mobility hub program, now totaling 50 sites (Move PGH, 2022). City and regional government officials across California, including in San Diego County and the San Francisco Bay Area, are actively developing mobility hub plans and programs to launch in the next few years, with many other cities incorporating the concept into their short-range and long-range transportation plans (SANDAG, 2022a, b; MTC, 2022).

Figure 1. Mobility-as-a-Service Modes (SANDAG "Flexible Fleet Services")



Source: SANDAG

The time to implement a network of mobility hubs in LA has never been better. LA County is an epicenter of mobility innovation, with nearly every mode deployed in at least part of the county. Significant public and private investments are flowing through thinktanks like Urban Movement Labs. LADOT is a thought leader on intelligent transportation systems including the development of the Mobility Data Specification (MDS) for open-source data-sharing that is ubiquitous around the country. The Los Angeles Department of City Planning (LACP) and LADOT staff are developing the language for a Transportation Demand Management ordinance, requiring new property development to incorporate infrastructure and programs to reduce single occupancy vehicle travel (LACP, 2021). LA Metro is rolling out its NextGen Bus Plan, which simplifies routes to offer faster and more reliable transit service but requires expanded first-last mile access to transit stops to be successful (Honor & Jager, 2021). LA Metro also continues to expand its microtransit service, Metro Micro, to new areas of LA County (Honor & Jager, 2021).

In Downtown LA, private microtransit provider evolgo plans to launch a service – dubbed "GoDTLA" – with an all-electric fleet in partnership with FASTLinkDTLA's Transportation Management Organization (TMO) (Norton, personal communication, June 14, 2022). This GoDTLA service will implement lessons learned from FASTLinkDTLA's 2020 microtransit pilot, "FlexLA" (FASTLinkDTLA, 2020). Handicap-accessible microtransit provider ButterFLi's on-demand service is also expanding through grant funding from LA City Council District 14, enhancing access to opportunities for people with disabilities and support Downtown LA residents with "aging in place" (FASTLinkDTLA, 2022). Funding opportunities for multimodal infrastructure improvements are increasing through LA County Measure M local option sales tax transportation revenues, numerous state programs (particularly to support vehicle electrification), and the federal Build Back Better infrastructure funding package (White House, 2021; Metro, 2022; CPUC, 2022).

Despite this encouraging progress, however, the path forward for mobility hub development in LA County is unclear. The "Mobility Hub @ Wilshire Grand" was scheduled to launch by the end of 2021, but neither infrastructure improvements nor detailed program plans have been publicized. The Southern California Association of Governments (SCAG) is moving forward with a 710 North Mobility Hub Plan, but operational funding has yet to be secured (Alta Planning + Design, 2022). Our gradual emergence from the COVID-19 pandemic poses new challenges. As traveler patterns, needs, and expectations have shifted, mobility providers are re-evaluating the tactics needed to deliver travel planning information as well as how best to organize and deliver their services. The City of LA's 2016 Mobility Hubs Reader's Guide is

becoming increasingly outdated. Once the guiding document for hub development around the country, the guide needs updates to incorporate the expansion of public and private mobility options and travel tools since it was published as well as expanded focus on access for low-income and black, indigenous, and people of color (BIPOC) travelers, women, and people with disabilities.

In order to support FASTLinkDTLA's efforts to guide mobility hub development in LA County, this report summarizes lessons learned from mobility hub programs in four metropolitan areas – Columbus, Ohio; Hamburg, Germany; Minneapolis, Minnesota; and San Diego County, California. Drawing on interviews with project managers and documentation of their programs, I recommend principles and strategies for development of hubs as safe, accessible points to connect between transportation modes and places to access goods and services.

Mobility Hub Conceptual Overview and Past Research

Figure 2. "Mobility Point" Design (2014)

Source: Sophia von Berg

Pioneered in Bremen, Germany in 2003 and found today throughout Europe, the mobility hub concept has not progressed significantly in the United States (CoMoUK, 2021; Tran & Draeger, 2021; SUMC, 2019). Government agencies question their role in promoting and providing even in-kind support for privately owned services that may compete with traditional fixed-route, fixed-schedule public transit (Shaheen & Christensen, 2014). Private providers struggle with whether integrating their services with other modes will lead to more users and revenue (Tran & Draeger, 2021). Real estate developers and private property owners are wary to open their properties to public access without a clear return on investment (Coenegrachts et al., 2021).

Yet, mobility hubs have the potential to achieve economic, social, and environmental goals that benefit all participants (Coenegrachts et al., 2021; Shaheen et al., 2020; SUMC, 2019).

Hub developers – whether public or private – must simultaneously determine how to achieve functionality in four categories: operations, technology, information, and land use (Anderson et al., 2017). This functionality includes:

- Operations – coordination between mobility providers; site management and maintenance
- Technology – consistent traveler experience between on-site digital assets, mobile applications, and web-based tools for trip planning and payment
- Information – where to locate vehicles and services and how to use them; vehicle locations; on-site amenities; directions to surrounding destinations
- Land Use – public spaces and private development at and surrounding the hub

While limited research has been done on best practices for mobility hubs, some trends have emerged from both research on and practical experience with hub implementation in the United States and around the world.

Features

By integrating infrastructure, services, and information, mobility hubs create a "one-stop shop" for transportation options to access goods and services (Monzon et al., 2016; Gray, 2017).

Mobility hubs are primarily anchored by shared use mobility services, typically a minimum of three modes, such as public transit (bus or rail), bikeshare, and carshare (SUMC, 2019; Miramontes et al., 2017; Marsden et al., 2019). However, two modes are acceptable in cases of significant presence of each mode and other placemaking amenities that attract visitors, such as retail stores or public spaces (Bosehaus, 2021; Gray, 2017).

Figure 3. Mobility Hub Features

Source: SANDAG

The “backbone of a mobility hub” (SUMC, 2017) is a bus stop or rail station, offering high-frequency rail or bus service (Miramontes et al., 2017; Gray, 2017). Public transit typically offers the most affordable travel option, particularly for long-distance trips and daily commuting (Shaheen et al., 2020; SUMC, 2019; Miramontes et al., 2017).

Complementing transit, hubs usually incorporate parking for personal and shared micromobility vehicles (Anderson et al., 2017; Shaheen et al., 2020). Docked bikeshare is the most predominant Mobility-as-a-Service (MaaS) mode offered at hubs, but the dramatic expansion of dockless bicycles and e-scooters provides new potential for first- and last-mile connections (Tran & Draeger, 2021; Anderson et al., 2017). These dockless micromobility vehicles are most often organized into parking areas, designated by a metal rack or “corrals" defined physically by signage or ground paint (**Figure 4**) and/or digitally by a “geo-fence” using GPS displayed on mobile applications (Anderson et al., 2017; SUMC, 2019). Parking areas may also incorporate charging stations, bridging the difference between docked and dockless micromobility (Coenegrachts et al., 2021). These parking areas bring order to what can be the chaotic parking of these vehicles (SUMC, 2019).

Figure 4. Scooter Corral

Source: Minneapolis Public Works

Along with transit stops and micromobility parking, ridehailing pickup and drop-off zones are common (Shaheen et al., 2020; Anderson et al., 2017). These pickup and drop-off zones also support microtransit shuttles, offering a flexible, cost-effective option that extends the reach of fixed-route transit beyond walking distance (Mayaud et al., 2021; Blumenberg & Manville, 2004).

While limited and/or priced car parking can serve as a behavioral stick to incentivize users to prefer shared mobility services at hubs (Gray, 2017), many hubs incorporate dedicated off-street parking spaces for both carshare vehicles and personal vehicles (Navrátilová et al., 2021; Shaheen et al., 2020; Anderson et al., 2017). To be consistent with environmental goals and to enable park-and-ride multimodal transfers, parking is often prioritized for car- and vanpools and electric vehicles (Anderson et al., 2017; Shaheen et al., 2020; SUMC, 2019). These parking spaces often incorporate electric vehicle (EV) charging stations (Coenegrachts et al., 2021; Shaheen et al., 2020; SUMC, 2019). A recent advancement, the UrbanSmartPark program in Germany, the Czech Republic, and the Netherlands is experimenting with on-street automated parking systems, wherein users drop their vehicle at a hub and the system finds parking (Navrátilová et al., 2021). This technology could build upon

automated valet parking systems operating in Los Angeles (Welk, 2021; Nimmo et al., 2020).
Given that most shared mobility trips begin with walking, mobility hubs should offer a welcoming pedestrian experience, including space for rest (National Association of City Transportation Officials (NACTO), 2016). On-site seating and weather protection – such as shelters and trees – complement traffic-calming elements in the hubs (SUMC, 2019). Organized parking of dockless micromobility vehicles eliminates obstructions that interfere with safe paths for pedestrians, particularly those with limited mobility such as seniors and people with disabilities (Bell, 2019).

Placemaking features can elevate hubs from transportation centers to community assets. By creating a sense of place for users, the hubs can offer a welcoming and useful experience to the surrounding community. Such placemaking features include landscaping/greenspace, art installations, restaurants, retailers, community gathering spaces for cultural events like festivals or farmers markets, and public amenities like bathrooms and drinking fountains (Shaheen et al., 2020; SUMC, 2019; Anderson et al., 2017). In addition, the incorporation of storage and package lockers can make it easier for travelers with large items to forego personal vehicles for shared travel modes (SUMC, 2019). Hubs can also incorporate features to tactically support access to basic users' needs, including private bathrooms, fresh food delivery, health fairs, and other social services (Bell, 2019).

Lighting within and on pedestrian approaches can increase hub function, safety, and aesthetics (SUMC, 2019). This is important because hubs must promote actual and perceived safety, particularly to attract women, seniors, and people with disabilities (SUMC, 2019; Gray, 2017; Anderson et al., 2017). Toward that end, emergency call buttons are a common hub feature (Shaheen et al., 2020; SUMC, 2019). These clearly marked spaces can also encourage people to travel together. For example, travelers may be more willing to transfer from a public bus or train to a shared ridehail trip, or bike, scoot, or walk together to their destination.

Because mobility hubs are a relatively new concept and multiple transportation services are available at them, hubs often incorporate clear wayfinding and directions of how to use those modes. Interactive kiosks and physical maps support wayfinding and route navigation, both for the mobility options (particularly the transit system) and destinations (including businesses and landmarks) within the hub's immediate vicinity (Shaheen et al., 2020; SUMC, 2019). Real-time transit arrival/departure information is generally available for all available modes, as well as digital or physical information on how to sign up for and use the modes.

To create inclusive spaces, language accessibility features – including multilingual signage, audio announcements, and large and easy-to-read text and symbols – ensure accessibility for people with limited English proficiency, seniors, and people with disabilities (Shaheen et al., 2020; Bell, 2019; Anderson et al., 2017). Payment stations are generally available that offer cash-based options (Shaheen et al., 2020; SUMC, 2019). These options are particularly important in ensuring low-income travelers can access micromobility and carshare services that primarily rely on credit cards and smartphones with data plans (Palm et al., 2020; Brown & Taylor, 2018). To further support equitable access to mobility services, public Wi-Fi is often available to facilitate purchase of tickets or sign-ups for transportation services (Shaheen et al., 2020; SUMC, 2019; Anderson et al., 2017). Wherever possible, this technology is complemented by staffing – either in-person or at call centers – to explain how to use the various services and navigate their service areas (Shaheen et al., 2020; Gray, 2017).

Clear and prominent branding of the hub network is paramount (Bell, 2019; SUMC, 2019; Miramontes et al., 2017; Gray, 2017; Anderson et al., 2017). According to Michael Glotz-Richter of Bremen, Germany, one of the longest serving project managers of hubs: "The most important thing is awareness, awareness, awareness" (Gray, 2017). Branding creates a sense of reliability and routine, ensuring users can expect consistent features at any hub (SUMC, 2019).

Coupled with branding, "[e]ngagement is crucial throughout the process of creating mobility hubs (SUMC, 2019)." This engagement includes regular communication between hub designers and operators, neighborhood leaders and current and potential users of the mobility services and amenities available at the hub, including opportunities to provide feedback on the hub design, services available at the hub, and issues arising from the hub or affecting the surrounding community (Bell, 2019; Anderson et al., 2017). Even the most well-designed hub is useless without attracting users and supporting their needs.

Types

U.S.-based thinktank the Shared Use Mobility Center (2019) classifies hubs into a four-sector matrix, based on their survey of pilot programs across the country and permanent networks of mobility hubs in Europe. These classifications are based on the type of transit service (Branch or Trunk) at the hub and the context of the surrounding community (a regional Destination or a Local place of importance).

"Branch" hubs center around points of entry into a high-frequency transit network and are typically located outside of a region's core. "Trunk" hubs, on the other hand, are located within the core of transit networks, including urban centers or dense suburbs. A Destination hub "stands on its own," at points-of-interest where people travel to and gather for reasons beyond accessing transportation options (SUMC, 2019). Local hubs are located at places without a clear destination or regional significance. See **Figure 5** for examples of these hub types.

Figure 5. Hub Typology (SUMC)

<table>
<tr>
<td>Branch-Destination
 

• Airports
• Stadiums
• Shopping malls</td>
<td>Trunk-Destination
 
• Educational Institutions
• Hospitals
• Cultural Attractions</td>
</tr>
<tr>
<td>Branch-Local
 
A single, large multi-family housing complex or commercial center served by a rail or Bus Rapid Transit (BRT) station</td>
<td>Trunk-Local
 
Commercial area at the intersection of several rail or bus lines</td>
</tr>
</table>

Source: Shared Use Mobility Center

The Los Angeles Urban Design Center (2016) outlines three categories of mobility hubs that are consistent with the Shared Use Mobility Center's typology: Neighborhood, Central, and Regional. Neighborhood hubs center on bus stops located in low-density neighborhoods and offer basic amenities.

Reflecting the Branch-Local typology, the features at Neighborhood hubs typically include a docked bikeshare station and wayfinding but can range depending on the mobility and commercial needs of nearby residents and local visitors. Central hubs encapsulate both Trunk typologies and are typically located at light rail or Bus Rapid Transit (BRT) stations in dense areas.

Prioritizing residents and visitors of dense areas, Central hubs build on services and amenities available at Neighborhood hubs (micromobility parking, wayfinding) by incorporating passenger pick-up and drop-off zones and parking to support connections to auto-based modes like ridehail and carshare services.

Regional hubs are the largest scale sites and are typically located at large-scale rail stations in high-activity commercial areas. Consistent with the Branch-Destination types, these hubs balance a broad diversity of users including both tourists and longer-distance commuters. In addition to wayfinding, passenger pickup and drop-off zones, and micromobility and carshare parking, these Regional hubs require pedestrian-centered placemaking amenities – such as seating, landscaping, public open space, quick-serve dining, or mobile retail spaces. See **Table 2** for examples of these hub types.

Table 2. Hub Typology (Los Angeles Urban Design Center)

Neighborhood

Bagley/Venice Bus Stop

Photo: Google Map

Central

Wilshire/ Vermont Metro Station

Photo: Metro

Regional

North Hollywood Station

Photo: Wikimedia

Source: Los Angeles Urban Design Studio

Siting

At the simplest level of analysis, hub developers – primarily city and transit agency officials – locate hubs based on proximity to high-capacity transit, walkability, and nearby development density (Miramontes et al., 2017; Shaheen & Chan, 2016; SUMC, 2019).

Hub developers use a variety of data to quantitatively determine the best locations for hubs, including:

- Databases of existing shared mobility infrastructure, including rail stations, bus stop, bikeshare docking stations, and bicycle racks (Anderson et al., 2017)
- Citywide spatial data related to transportation functions, such as street curb space use and designation, loading and unloading zones for for-hire services, and parking facilities (Anderson et al., 2017)
- Housing and economic agglomeration, including both current population and job density as well as projected or planned growth (Anderson et al., 2017; Marsden et al., 2019)
- New housing developments (Marsden et al., 2019)
- Destinations such as parks and service-oriented businesses like retail stores and restaurants (Anderson et al., 2017)
- walkability studies (Anderson et al., 2017)

Tran & Draeger (2021) developed three siting models based on high-capacity transit routes (Model 1), transit stops with high ridership (Model 2), and the prevalence of multiple existing transportation modes including transit, bikeshare, and carshare stations (Model 3). Applying their models to Vancouver, Seattle, and Portland, they found that siting based on high-capacity routes (Model 1) and multimodal options (Model 3) resulted in the most equitable distribution of hubs in terms of access for low-income households. These two models indicate potential demand, while the model using high-ridership stops (Model 2) evaluates current demand. [what about mobility hubs increasing ridership – do you have any data to support that?]

While these indicators can guide cities and other developers towards potential mobility hub sites, hub developers also prioritize sites in areas with high land use intensity but low transportation connectivity (Anderson et al., 2017; Gray, 2017). Households without personal vehicles or household members without driver's licenses serve as strong indicators of demand for the mobility services available at hubs. In the context of California, resiliency to natural hazards and terrain (particularly inclines) are worth considering (Anderson et al., 2017).

Anderson et al (2017) highlights the importance of considering equity in mobility hub siting. They assert that hub developers – particularly public agencies – consider:

- household income
- employment status
- household size
- percentages of minority, low- income, and elderly residents
- kindergarten to 12th grade students
- direct measures of vehicle ownership (Anderson et al., 2017)

Beyond individual siting, mobility hubs prove most effective and sustainable as part of a network of hubs (Coenegrachts et al., 2021). Mobility hubs also complement transit-oriented housing and commercial centers (Shaheen et al., 2020; SUMC, 2019; Anderson et al., 2017). Hubs can help to maximize the value of infrastructure investments that support and prioritize shared mobility, such as bus lanes, protected bicycle lanes or "cycle tracks" (Shaheen et al., 2020; Marsden et al., 2019; NACTO, 2016).

Ultimately, data can only provide so much insight. By launching pilots or demonstration projects, city and transit officials can determine the viability of a potential hub site by implementing temporary improvements before investing in the full build-out of the hub (SUMC, 2019).

Benefits

As centralized points for accessing shared mobility services, mobility hubs can offer many public benefits by extending the reach of public transit, reducing congestion, supporting economic development, and expanding equitable access to mobility options.

The most direct benefit of hubs is expanding the geographic area of places accessible by public transit. Rather than relying on walking (or rolling using a wheelchair), travelers can reliably access vehicles and services at hubs, helping to bridge "last-mile" gaps between transit stops and the end point of their trip. Consequently, these vehicles are distributed throughout the surrounding area, helping to ease "first-mile" gaps between transit stops and their starting point (Coenegrachts et al., 2021; Shaheen & Chan, 2016; Shaheen & Christensen, 2014). While people dislike transferring, mobility hubs "make transfers between modes as seamless as possible" (Gray, 2017). By expanding access to shared mobility choices, hubs can also support opportunities for new trips not previously accessible by traditional public transit and provide alternative mobility options when transit service encounters challenges (Coenegrachts et al., 2021; SUMC, 2019).

By making it easier for travelers to navigate public transportation systems and locate other alternatives to driving alone, mobility hubs can help to reduce traffic congestion by lowering personal vehicle usage (Shaheen et al., 2020). Dedicated space for ridehail vehicles creates natural off-street meeting points that centralize these fundamentally decentralized services (Anderson et al., 2017). As a result, hubs can relieve the congestion and safety issues associated with unlimited pickup and drop-off points on surrounding city streets (Shaheen et al., 2020). By providing off-street parking and supporting automated parking systems (like UrbanSmartPark), hubs can also reduce traffic caused by cruising for on-street parking and its significant impact on urban congestion (Shoup, 2011). Mobility hubs can advance government environmental sustainability goals by increasing the use of low-emission travel options including electric-powered transit and micromobility vehicles (Bell, 2019; Tran & Draeger, 2021).

Hubs can promote increased economic activity in their surrounding area and facilitate transit-oriented development, making them "more than transportation" (Henry & Marsh, 2008). By making it easier to access shared mobility options, hubs can decrease the need for a personal vehicle and therefore parking spots to store the vehicle (Bosehaus et al, 2021; Tran & Draeger, 2021). As a result, hubs support higher density and mixed-use land development that encourage multimodal living, not just individual multimodal trips (Gray, 2017; Monzon et al., 2016). Through placemaking strategies like public space and co-locating with commercial development, hubs can both form and complement points of interest that integrate mobility and access to goods and services that attract both commuters and leisure visitors (Coenegrachts et al., 2021; Anderson et al., 2017). By creating and supporting destinations, real estate developers find value in hubs and can leverage public agencies as conveners and mobility experts. These public-private partnerships are the "most opportune to achieve sustainable mobility" (Coenegrachts et al., 2021).

From an equity perspective, hubs offer cost-effective access to a variety of modes even in areas without the density or demographics to traditionally support private mobility services (Anderson et al., 2017; Henry & Marsh, 2008). Hubs further the fundamental role of mobility as enabling access to essential services like healthcare and socioeconomic opportunities, which in turn improves quality of life (Tran & Draeger, 2021). By enhancing technology access through payment stations and public wi-fi, hubs remove barriers to accessing private mobility options that rely on smartphones and credit cards (Palm et al., 2020; Shaheen et al., 2020; SUMC, 2019; Brown & Taylor, 2018; Anderson et al., 2017). As public spaces centered around public transit – which is predominately used by low-income travelers – mobility hubs can curb actual and perceived gentrification (Anderson et al., 2017; Tran & Draeger, 2021). Hubs also increase access to public spaces, which can typically be accessed free of cost. This equitable approach can best be achieved by

developing hubs in close collaboration with nearby residents throughout the planning and implementation process (Bell, 2019; Anderson et al., 2017).

Barriers to Hub Development

Funding is the primary barrier to mobility hub proliferation. Hubs can be multi-million-dollar projects, between the upfront development funding and ongoing maintenance and operational costs (Tran & Draeger, 2021; Coenegrachts et al., 2021). The Federal Transit Administration's Transit-Oriented Development Program may offer the best source for funding these improvements, but the cumbersome grant award and monitoring process can stifle innovation (Shaheen et al., 2020).

Beyond funding, coordination between the many players involved in hub development – city and public transit officials, private mobility providers, and property owners – can prove difficult. Public and private service providers may have competing interests and approaches, while public agencies must often resolve interjurisdictional issues and even internal departmental disagreements (Shaheen et al., 2020; Shaheen & Christensen, 2014). Nevertheless, mobility hubs can improve upon the status quo of disjointed mobility services that inhibit multimodal travel. In particular, the establishment of hub networks help to "overcome the barriers related to sustainable innovation, such as high uncertainty about the potential outcome, high dependence on specific assets and knowledge of others due to the high complexity of the solution and the unwillingness of (financially) investing in such system" (Coenegrachts et al., 2021). Coordination and integration can be best achieved through local leadership particularly "a champion — somebody willing to step up as a facilitator to put the pieces together" (Shaheen & Christensen, 2014).

Data-sharing and management remains a consistent source of tension between governments and private mobility providers (Bösehans et al., 2021; Shaheen et al., 2020; Shaheen & Christensen, 2014). To evaluate hub viability and operational sustainability, these actors must determine how to balance data sharing and privacy (Bösehans et al., 2021). Mode agnostic applications, such as Transit App, offer promise to facilitate these data management agreements (Shaheen et al., 2020).

Even after overcoming barriers to funding, coordination, and data sharing, hub developers and operators must develop and implement community engagement and marketing strategies that attract a broad range of users (SUMC, 2019). To ensure equitable adoption, operators engage in market segmentation to approach each audience with culturally sensitive strategies and materials (Shaheen & Christensen,

2014). Ultimately, each participating mobility provider should contribute, either directly or in-kind, towards a coordinated engagement and marketing campaign (Bösehans et al., 2021; SUMC, 2019; Gray, 2017). These engagement efforts can also be packed by financial incentives, including efforts to extend commuter benefits that cover public transit to include complementary private mobility options (Shaheen & Christensen, 2014).

The success of mobility hubs depends on a unified effort between all stakeholders that meets the challenges of funding, multimodal coordination, data-sharing, and engagement. A strong champion can lead the way, so long as those involved shared a willingness to adapt to the emerging issues that are implicit in the innovation nature of hub development.

Methodology

My goal with the preceding literature review and the insights from interviews and documentation reported on below is to offer guidance to FASTLinkDTLA and its partners on developing actionable steps toward mobility hub implementation in LA County.

Because mobility hubs are a relatively new in the US and comprehensive data on them are not available, I determined that interviews were the best research method for studying mobility hubs. Limited quantitative data are available on these projects and are not available in consistent formats that allow for practical comparisons. Interviews also provide insights missing from official reports and other documentation. These interviews explored how the concept of mobility hubs is working in practice. I supplemented these interviews by reviewing program documentation available through March 2022.

I interviewed the project leads of mobility hub pilot project/programs in four geographic areas – the US cities of Columbus, Ohio and Minneapolis, Minnesota; the city-state of Hamburg, Germany; and the County of San Diego, California. Interviews were conducted between March 7-15, 2022. All interviews were conducted via web conferencing.

My interview questions focused on the *mobility* role of hubs as centers for multimodal transfers and the *access* role of hubs in connecting travelers to destinations including commercial development and public facilities (Anderson et al 2017). Interviews covered all stages of project development from planning and design to pilot implementation, including plans for long-term operation.

My interviews centered on three aspects of mobility hubs: mobility, placemaking, and leadership and governance. Mobility topics included site planning, infrastructure improvements, travel guidance strategies, trip planning tools (including technology solutions), and shared mode use. Placemaking topics incorporated site design, retail and commercial development, engagement, and feedback. Leadership and governance questions focused on partnership formation, operations, funding, and marketing. I also asked about the programs' approaches toward improving the travel experience and access to essential goods and services for mobility-disadvantaged populations, including women, children, people with limited mobility, seniors, and Black, Indigenous, and People of Color (BIPOC).

Case Studies

The mobility hub programs in Columbus, Hamburg, Minneapolis, and San Diego County were selected as relevant cases to LA County based upon:

- their unique governance models and the program priorities of the agencies leading mobility hub development;
- the commitment of government officials to the long-term operation of mobility hubs and expansion to a multi-hub network (rather than one-time pilots or demonstration projects);
- their similarities to LA County in land use patterns and ethnic diversity; and
- my familiarity with their projects based on my professional experience.

The City of Columbus launched the first federally backed mobility hubs in the United States, which were funded as part of the United States Department of Transportation's (USDOT's) Smart Cities Challenge grant program between 2016 and 2021. Known as "Smart Mobility Hubs," Columbus' program offers a case for the potential for federal investment and oversight of future hubs, as well as technology aspects. From the project inception through launch in 2020, I served as the liaison to the program on behalf of the Central Ohio Transit Authority, the public transportation agency for the Columbus Metropolitan Statistical Area. I remain in regular contact with city officials, consultants, and project partners, including my former agency. For this project, I interviewed Andrew Wolpert, the Deputy Program Manager for the city's "Smart Columbus" program and former project manager for Smart Mobility Hubs.

The City of Minneapolis launched the first multi-site mobility hub pilot in the United States in 2019, which was expanded from 13 to 25 sites in 2020. Designed with equity as a central goal, Minneapolis' program offers insight into siting and engagement in mobility-disadvantaged areas. The Shared Use Mobility Center, the leading U.S. thinktank on mobility hubs, often features Minneapolis' program as demonstrating best practices for other cities. I interviewed Danielle Elkins, Mobility Manager for the City of Minneapolis Department of Public Works. Danielle has been involved with the mobility hubs program since its inception and currently serves as its project manager.

In the city-state of Hamburg, the transit agency Hamburger Hochbahn AG (Hochbahn) operates the mobility hubs program, one of the most-established hub networks in the world. Launched in 2013, their hub program known as "Switch" is the

most featured international example in mobility hub design guides by cities, regional agencies, and thinktanks in the United States. With over 90 hubs in operation and a goal of 103 hubs by the end of 2022, the Hamburg case explores scalability and integration with carshare and microtransit services – modes missing from the three featured US metropolitan areas. As a legacy mobility hub program, Hamburg can also guide the evolution of hubs to adapt to emerging MaaS modes and companies. Hamburg also provides unique insights as an international city, with a large, diverse population and a rapidly growing technology sector. With a population of nearly 2 million people, Hamburg is the largest city in the European Union that is not a national capital. Hamburg is also home to large non-European diaspora populations, including Afghan and Japanese immigrants. To garner insights from their program, I interviewed Tina Marie Lesch, Hochbahn's Expert for Public Affairs and Strategy. Tina has been involved with the Switch program since 2016.

San Diego County shares many qualities with LA County including demographics, modal variety, and state regulations and financing tools. The San Diego Association of Governments (SANDAG) is leading development of their region's mobility hub strategy, which will provide context into development of regional hub networks across multiple cities and the potential role of regional agencies to guide mobility hub development and program design. Their Regional Mobility Hub Strategy earned the American Planning Association's 2020 National Planning Achievement Award for Transportation. While SANDAG has not constructed any hubs yet, their planning process is advancing more rapidly than LA County agencies and can provide insight into overcoming barriers indicative of Southern California. I interviewed SANDAG's Mobility Planning Manager Danielle Kochman, who has overseen their mobility hub planning since 2018.

Analysis Framework

I analyzed the projects with respect to six themes: accessibility, community engagement, equity, funding, partnerships, and safety.

I drew on these interviews to recommend approaches to mobility, placemaking, and leadership and governance, in order to inform and support site design, program design, infrastructure investments, and partnership structures for mobility hub projects and programs in LA County.

Limitations & Tradeoffs

LA County is fundamentally unique as the center of the densest urbanized area in the United States with the second most populous city and 14th largest city by land area in the United States (US Census 2010; US Census 2020). To maximize the generalizability of my findings, I selected the four geographic areas of Columbus, Hamburg, Minneapolis, and San Diego as case studies due to their relatively similar development patterns to LA County, with multiple high-density areas separated by diverse socioeconomic and ethnic neighborhoods.

Like LA County, local and regional government officials in each of the selected areas publicly committed to supporting innovation in the transportation sector, including and beyond the development of mobility hubs. Most, if not all, modes offered in LA County are available in these cities, including expansive, legacy bikeshare systems and rapid transit lines that form the backbone of their mobility hub networks (SUMC 2019; Anderson et al 2017). The lead agencies of the four mobility hub programs have strong intergovernmental partnerships, with city governments, transit agencies and metropolitan transportation organizations closely involved in the projects.

Given the significant role of the private mobility providers in mobility hubs, the participation of technology and infrastructure providers and MaaS providers is essential to the success of hubs. Some of the leading private companies involved in mobility hubs are Transit App (trip planning application), Tranzito (infrastructure and fleet management provider), Via (microtransit), Bird, Lime, Spin, and Superpedestrian (micromobility), Lyft and Uber (ridehailing), and Zipcar (carshare). However, given time limitations, interviews with these companies were beyond the scope of this project. All the lead agency interviewees are involved in the public-private partnerships that contribute to their mobility hub program, so I asked each interviewee for their insights on the role of these companies in the pilots.

Findings

Mobility

1. **Agencies share common goals and design principles.**

All four lead agencies – the cities of Columbus and Minneapolis, Hochbahn, and SANDAG – set similar goals. Across project documentation and interviews, the most consistent goal is to increase ridership on transit and other shared mobility options in order to reduce neighborhood congestion and dependence on personal automobiles (Columbus, 2021; Lesch, interview, March 14, 2022; Rasp et al, 2020; SANDAG & ICTC, 2017a). Project documentation by SANDAG and the cities of Columbus and Minneapolis' project teams also highlight a common goal of aligning these transportation goals with city, regional, state, and federal public health, sustainability, and equity goals (Columbus, 2021; Rasp et al, 2020; SANDAG & ICTC, 2017a). The interviewees viewed mobility hubs as testing grounds for innovative technology and infrastructure improvements that enhance the safety and convenience of shared modes (Elkins, interview, March 14, 2022; Lesch, interview, March 14, 2022; Kochman, interview, March 15, 2022; Wolpert, interview, March 7, 2022). Opportunities to build partnerships with other government agencies and private mobility providers were also consistently highlighted by the project teams, including aligning policies and investments and building trusting relationships between public agencies and private providers (Columbus, 2021; Elkins, interview, March 14, 2022; Lesch, interview, March 14, 2022; Kochman, interview, March 15, 2022; Rasp et al, 2020; SANDAG & ICTC, 2017a; Wolpert, interview, March 7, 2022).

While the project documentation and interviewed agency staff shared many common programmatic goals, the agencies differ on the priority of these goals. Each agency prioritized their program goals based on regional context and consistency with related plans and programs. The City of Columbus' team focused on integrating hub users' physical and digital travel experience and enhancing transportation access to healthcare and jobs. These goals are consistent with the broader objectives of the Smart Columbus program (Columbus, 2021; Wolpert, interview, March 7, 2022). The City of Minneapolis team prioritizes transportation safety and equitable distribution of hub sites and shared mobility vehicles, in alignment with the 2017 Twin Cities Mobility Action Plan, and the City's Transportation Action Plan (TAP) and Vision Zero commitment (Elkins, interview, March 14, 2022; Rasp et al, 2020). The SANDAG team emphasizes sustainability and regional connectivity, pursuant to their San Diego

Forward Regional Plan (SANDAG, 2021a). The Hochbahn team focuses on transit ridership growth to support their operational goals as a public transportation operator (Lesch, interview, March 14, 2022).

Drawing from these various goals, the agencies developed design concepts based on extensive research on MaaS trends and regional conditions. For example, the project teams from SANDAG and the cities of Columbus and Minneapolis engaged national thinktanks, academia, public transportation operators, private providers, and technology consultants to research best practices for managing modes and improving the travel experience (Columbus, 2019; Rasp et al, 2020; SANDAG, 2021b). The City of Minneapolis and SANDAG teams supplemented this research with quantitative data analysis to identify potential hub locations. In Minneapolis' case, the program team commissioned a data analysis that included 32 data categories (Figure 6) reflecting physical, economic, demographic, access, and behavioral factors (Rasp et al, 2020).

Figure 6. Minneapolis Site Analysis – Data Categories (Minneapolis)

A. Physical	B. Economic	C. Demographic	D. Access	E. Behavior
Transport Facilities: - Bus stations - Bus routes - Rail stations - Shared bike docks - Bike lanes - Major roads - EV chargers - Airport **Major Public Facilities:** - Public attractions - Schools - Hospitals - Shopping centers - Senior & public housing - Disability services access **Other:** - Parking lots - Underutilized land	- Employment density - Economic development zones	- Population density - Household income - Education level - Non-English speaking - Race - Vehicles ownershipw	- Employment access - Recreational access - Current commute time - Healthy food access	- Current intermodal activities - Congestion friction - Parking friction

Source: Minneapolis Public Works

The SANDAG team conducted an analysis to determine potential demand for mobility hubs based on land use, employment, and travel patterns as well as demographics (SANDAG, 2020; Kochman, interview, March 15, 2022). Once SANDAG and City of Minneapolis planners identified potential sites, the project

teams engaged community stakeholders to refine the list of potential hub sites (Rasp et al, 2020; SANDAG, 2015). The Columbus project team, on the other hand, identified sites by starting with community focus groups (Columbus, 2019; Wolpert, interview, March 7, 2022). According to the interviewees at all four agencies, the project teams supplemented data analyses with site visits to determine what design features could fit within the space available at the sites (Elkins, interview, March 14, 2022; Lesch, interview, March 14, 2022; Kochman, interview, March 15, 2022; Wolpert, interview, March 7, 2022). All agencies combined the insights from data analysis, stakeholder input, and site visits to develop site-specific designs.

2. **Hub designers prioritize infrastructure that supports transit and active transportation, but differ on their approach to ridesharing and parking.**

According to project documentation, the Minneapolis, Columbus, and SANDAG project teams identified three core elements for their mobility hubs: transit stations, micromobility parking, and safe pedestrian infrastructure (Columbus, 2019; Rasp et al, 2020; SANDAG & ICTC, 2017a). Hochbahn's first hubs were designed around rail stations and carshare parking at launch in 2013, but expanded to include micromobility parking by 2017 (HVV Switch, 2022a; Lesch, interview, March 14, 2022). Tina Lesch – the interviewee from Hochbahn – stressed safe pedestrian infrastructure is a prerequisite for any transit station in their network (Lesch, interview, March 14, 2022).

Consistent with the literature reviewed above, the foundation for all hub plans are public transportation stops serving rapid transit systems, as "places where people are already using [shared] modes" (Rasp et al, 2020, 7). The Minneapolis and Columbus project teams located their hubs along Bus Rapid Transit (BRT) lines and high-frequency bus lines (Columbus, 2020; Rasp et al, 2020, 2020). Hamburg's hubs are served by heavy and light rail service, while SANDAG's hub plans center around both BRT and rail, including commuter, light rail, and trolley systems (HVV Switch, 2022a; SANDAG & ICTC, 2017a, 2021).

Bicycle racks are ubiquitous in the agencies' hub designs. Hochbahn's and Minneapolis' hubs also incorporate both docked bikeshare stations and dockless micromobility corrals at all hubs (Lesch, interview, March 15, 2022; Minneapolis 2019, 2020). Columbus' hubs include dockless micromobility corrals, as well as docked bikeshare stations at all but one hub (which is outside their bikeshare service areas) (Columbus, 2020). Both the Columbus and Minneapolis program managers noted that a major aspect of their programs is expanding bike- and scooter-share

service areas in low-income communities (Elkins, interview, March 14, 2022; Wolpert, interview, March 7, 2022). In fact, Columbus is considering bikeshare stations as anchors for future mobility hubs with equal or greater weight than transit stations, due to the drop in transit ridership during the COVID-19 pandemic (Columbus, 2021; Wolpert, interview, March 7, 2022). SANDAG's hub plans include docked bikeshare parking at hubs in dense areas, while encouraging the expansion of bikeshare systems in less dense areas (SANDAG & ICTC, 2019a). All three U.S. agencies highlighted the need for additional bicycle infrastructure, including protected bicycle lanes, in their project documentation (Columbus, 2019, 2021; Rasp et al, 2020; SANDAG & ICTC, 2017a, 2017b). Hamburg staff noted that bicycling infrastructure is necessary for any multimodal system, and that all hubs are already connected to safe bicycle paths, primarily dedicated lanes (Lesch, interview, March 15, 2022).

Across all four agencies' mobility hub planning documents, the project teams consistently highlight the need for pedestrian infrastructure improvements. The SANDAG Mobility Hub Features Catalog calls for wide and well-maintained sidewalks and safe street crossings and outlines the National Association of City Transportation Officials (NACTO) Urban Street Design Guide as best practices for pedestrian amenities (SANDAG, 2017a).

Figure 7. NACTO Urban Street Design Guide

Source: NACTO

The Minneapolis team's project documents include parallel recommendations concerning pedestrian-centered roadway design (Rasp et al, 2020, 2021). In 2020, the Minneapolis project team worked with the Minnesota Department of Transportation (MnDOT) to add bollard bump-outs and hardened centerlines at three hubs, in order to discourage dangerous driving behavior (**Figure 8**). According to Minneapolis' 2020 pilot report, these changes increase the visibility of pedestrians to drivers, lower the speed of turning motorists, and reduce the distance pedestrians must cover to cross at intersections (Rasp et al, 2021). Project staff plans to prioritize funding for improvements at intersections surrounding other hubs (Elkins, interview, March 14, 2022; Rasp et al, 2021). The Columbus and Hochbahn interviewees said that their project teams simply prioritized sites that already had high quality sidewalks and were located near intersections with strong safety records (Wolpert, interview, March 7, 2022).

Figure 8. Roadway Safety Improvements (Minneapolis)

Source: Minneapolis Public Works

Passenger pick-up and drop-off areas for ride-sharing feature prominently in Columbus' and SANDAG's mobility hub designs (Columbus, 2020; SANDAG, 2017). Consistent with what is reported in the literature, Columbus and SANDAG staff noted during their interviews that ride-hailing companies – like Uber and Lyft – are apprehensive about serving mobility hubs. However, they highlighted that, even

without Uber and Lyft, pick-up and drop-off areas will be necessary to meet increasing demand for microtransit, neighborhood electric vehicles, and paratransit services, as well as taxi and locally owned ridehailing providers (Kochman, interview, March 15, 2022; Wolpert, interview, March 5, 2022). The SANDAG and Columbus project documents also note that these pick-up and drop-off areas will become necessary to accommodate autonomous vehicles, in which all travelers will be passengers even in personal vehicles (Columbus, 2021; SANDAG & ICTC, 2017a, 2021). In both my interview with the Columbus project manager and their documentation, the project team highlighted that pickup and drop-off areas supported their autonomous shuttle pilot that connected the BRT station at one hub to a community center and healthcare facility at another hub (Columbus, 2020; Wolpert, interview, March 5, 2022).

While both Minneapolis and Hochbahn staff acknowledged ridesharing as a component of their shared mobility networks, the interviewees stressed that their mobility hub programs are centered around transit (Elkins, interview, March 14, 2022; Lesch, interview, March 14, 2022). According to the interviewees, the project teams do not consider ride-hailing as a significant mode for connecting to transit but are open to incorporating pick-up and drop-off areas for ridesharing into future hubs (Elkins, interview, March 14, 2022; Lesch, interview, March 14, 2022). Notably, microtransit service provider, MOIA, is a partner in Hochbahn's program and serves many of the hubs (Lesch, interview, March 14, 2022). In Minneapolis, transit provider Metro Transit is launching microtransit service in summer 2022 (Metro Transit, 2022).

For the two agencies that included ride-sharing pick-up and drop-off zones in their mobility hub designs, SANDAG and Columbus staff used both a mix of on-street curb areas and off-street parking for these zones. In SANDAG's Mobility Hub Features Catalog, their project team recommends multiple pick-up and drop-off areas throughout the mobility hub (SANDAG & ICTC, 2017a). In their Implementation Memo, they also call on transit agencies serving mobility hubs to designate curb space at their stations for pickup and drop-off areas (SANDAG & ICTC, 2017b). Their conceptual designs for mobility hubs (**Figure 9**) reflect these recommendations with multiple pick-up and drop-off zones (SANDAG, 2022a, 2022b). Columbus staff designated zones on side streets for pick-up and drop-off areas as not to interfere with transit operations on main roads, as detailed in their Smart Mobility Hub Operations and Maintenance Plan (Columbus, 2020, 2021).

Figure 9. Passenger Pickup/Drop-Off Zone (Oceanside Transit Center)

Source: SANDAG

The four agencies differed the most on their approach to car parking. SANDAG and Columbus staff highlighted throughout their project documentation the importance of incorporating personal vehicle parking into their hub designs (Columbus, 2019, 2020; Kochman, interview, March 15, 2022; Wolpert, interview, March 7, 2022; SANDAG & ICTC, 2017a). The SANDAG interviewee emphasized that driving remains an important way for people to access transit stations, particularly in low density areas (Kochman, interview, March 15, 2022). SANDAG's Mobility Hub Features Catalog outlines smart parking technology, including parking reservation systems, in-street sensors, and demand-responsive parking meters (SANDAG & ICTC, 2017a). Most of SANDAG's conceptual designs incorporate personal vehicle parking (SANDAG, 2022). Columbus' hub designs also include personal vehicle parking, but only at three of their six hubs (Columbus, 2020). The Columbus interviewee noted significant challenges with designating parking for the hubs, due to limited space and existing high demand at the sites prior to being designated as hubs (Wolpert, interview, March 7, 2022).

In both their interviews and project documentation, the SANDAG and Columbus project teams noted that parking at mobility hubs is prioritized for electric vehicles, with charging infrastructure as an amenity (Columbus, 2020; Kochman, interview, March 15, 2022; Wolpert, interview, March 7, 2022; SANDAG & ICTC, 2017a). Many

of SANDAG's conceptual designs call for EV charging to be installed at proposed mobility hub sites (SANDAG, 2022). In Columbus' project documentation, the project team notes that EV charging was a priority for their mobility hub network and broader Smart Columbus program (Columbus, 2019, 2020, 2021). However, due to limited funding, EV charging was only installed at one site at the time of their system launch (Columbus, 2021). The Columbus project manager noted that they are actively pursuing EV charging at the other sites (Wolpert, interview, March 7, 2022).

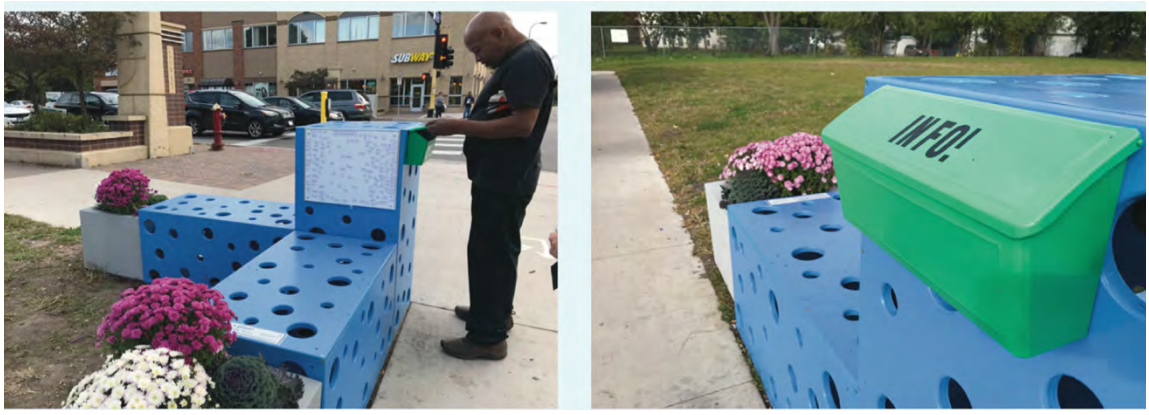
While personal car parking is not part of Hochbahn's hub system, carshare parking is the centerpiece of their mobility hub program. According to their project documentation and their interviewee, carshare providers are their most significant hub partners with four companies currently participating in the program (HVV Switch, 2022a; Lesch, interview, March 14, 2022). Two of these companies use EVs, and charging infrastructure is available at many of Hochbahn's hubs (HVV Switch, 2022b). Columbus' program incorporates carshare parking spots into 4 of their 6 hubs, with the existing parking demand at the other two again preventing inclusion of carshare parking (Columbus, 2021; Wolpert, interview, March 7, 2022). SANDAG's hub concepts also feature carshare parking, and their Mobility Hub Features Catalog offers guidance on planning considerations for incorporating carshare into future hubs (SANDAG & ICTC, 2017a, 2022a, 2022b).

Minneapolis's mobility hub program takes a distinctly different approach to car parking. According to their project manager and documentation, their program includes reallocating on-street car parking spots for dockless micromobility vehicle parking at several hubs (Rasp et al, 2020; Elkins, interview, March 15, 2022). Their 2019 mobility hub pilot report notes that this reallocation is intended to relieve the pressure to fit micromobility vehicles in the limited sidewalk space and encourage on-street riding of these vehicles (Rasp et al, 2020). HOURCAR, a non-profit carsharing provider, is a partner in Minneapolis' mobility hub program, and HOURCAR vehicles are staged near many mobility hubs in the city (Rasp et al, 2020). Of note, the Minnesota Department of Transportation rebranded their three large parking structures – with more than 6,000 parking spots – in downtown Minneapolis as a mobility hub in 2019 (MPLS Parking, 2022). The ABC Ramp Mobility Hub is not part of the city's mobility hub program, but they have designated scooter parking and EV charging spots (MPLS Parking, 2022).

While the project teams differed on the mix of mobility options incorporated into their mobility hub programs, they highlighted three necessary features to connect travelers across all modes offered at their hubs: clear wayfinding, information kiosks,

and multiple seating options. In Minneapolis' 2019 pilot report and during my interview with their project manager, the Minneapolis project team emphasized the importance of consistent wayfinding system across all hubs. This wayfinding system included signs that communicate uniform systemwide branding, even when hubs differed in configuration to fit community context (Elkins, interview, March 14, 2022; Minneapolis 2020, 2021). As part of their 2019 and 2020 pilots, the Minneapolis project team used temporary signage that featured directions to nearby destinations (Rasp et al, 2020, 2021). The Columbus and Hochbahn teams installed permanent signs to direct users within the hub, as outlined in their project documentation and discussed during interviews (Columbus, 2021; HVV Switch, 2022a; Wolpert, interview, March 7, 2022).

Figure 10. Information Box (Minneapolis)



Similarly, interviewees espoused the benefits of information kiosks that serve multiple functions as assets where users can access trip planning resources, instruction guides for new modes, and community information (Columbus, 2020; Rasp et al, 2020, 2021; SANDAG & ICTC, 2017a). The Minneapolis project team used physical information boxes (**Figure 10**), while Columbus' hub feature interactive digital kiosks (**Figure 11**) (Rasp et al, 2020, 2021; Columbus, 2021; Wolpert, interview, March 7, 2022). SANDAG's Mobility Hubs Features Catalog calls for interactive digital kiosks (SANDAG & ICTC, 2017a).

Figure 11. Interactive Kiosk Rendering

Source: City of Columbus

Seating is the third physical asset highlighted by those interviewed and in project documentation. Seating serves as both as a place for rest and a designator for where to wait for pick-up by transit or private service providers (Rasp et al, 2020; SANDAG & ICTC, 2017a). While signs serve as a basic marker for where to wait for pick-up, the presence of seating further defines the hub area as a transportation station (Rasp et al, 2020; SANDAG & ICTC, 2017a).

Agency staff also discussed hub features that support their utility into the future, as new technology becomes available. In their project documentation, the Minneapolis and SANDAG project teams recommend allocating flexible curb space where different modes can use the curb at different times. For instance, ridesharing pick-up and drop-off may be allowed during evenings when transit service is less frequent, or on-street car parking could transition to a micromobility corrals. These spaces can continue to evolve over time to fit the needs of users from the surrounding community, as demand shifts between modes and new modes become available

(Rasp et al, 2020; SANDAG & ICTC, 2017a). In their project documentation, the Columbus and SANDAG project teams discuss how hubs can serve as testing ground for vehicle-to-infrastructure technology (**Figure 12**) (Columbus, 2021; SANDAG & ICTC, 2017a).

Figure 12. Vehicle-to-Infrastructure Technology

Source: SANDAG

The SANDAG Mobility Hub Features Catalog notes the potential of information "beacons" that send transit information wirelessly to users who have Bluetooth-enabled smartphones (SANDAG & ICTC, 2017a). Both in documentation and during interviews, Columbus, Minneapolis and SANDAG staff highlighted the movement towards combining people and goods movement by integrating passenger travel and package delivery (Columbus, 2020; Kochman, interview, March 15, 2022; Rasp et al, 2020; SANDAG, 2017; Wolpert, interview, March 7, 2022). For example, Minneapolis experimented with package lockers at hubs during the 2020 pilot, which they reported to be a great success (Rasp et al, 2021).

In project documents and during the interviews, all project teams mentioned the importance of design and operational flexibility and looking for opportunities to implement hub features within existing projects (Columbus, 2021; Elkins, interview, March 15, 2022; Lesch, interview, March 14, 2022; Kochman, interview, March 15, 2022; SANDAG & ICTC, 2017a; Wolpert, interview, March 7, 2022). The SANDAG Mobility Hub Features Catalog notes that hub features – micromobility parking, passenger pickup and drop-off zones, information kiosks, seating, etc. – could be part

of the design or rehabilitation of transit stations and Park & Ride facilities (SANDAG & ICTC, 2017a). As “an art and a science,” the SANDAG mobility hub project supervisor emphasized that planning documents need flexibility for change in response to technological innovations (Kochman, interview, March 15, 2022).

3. **Agencies refine hub designs by engaging stakeholders throughout the process.**

In both their documentation and in my interviews with staff, the agencies emphasized that mobility hubs are ultimately about serving people. Even a hub with quality features in a prime location will be underutilized if the design does not meet the needs of residents and visitors. To maximize the success of hubs, the agencies responsible for mobility hubs in my four case studies reported engaging both current and potential users throughout the siting, design, and operational phases.

Despite this shared commitment to engagement, each agency took a different approach to collect external feedback on potential hub locations and design. These strategies ranged from high-level meetings with local elected leaders to in-depth cooperative planning sessions with representatives from mobility providers and neighborhood groups.

Hochbahn took the simplest approach. Their staff engaged the borough parliament with jurisdiction over their first Switch station at Berliner Tor station in central Hamburg. According to the Hochbahn interviewee, the 52 parliamentary members serve as “multipliers” of community input (Lesch, interview, March 14, 2022). Residents received mailed notifications of the minor construction to designate parking spots for carshare vehicles. As the Switch station concept gained popularity and additional travel modes were added to the hub, Hochbahn continued to rely on borough parliaments to garner feedback. Hochbahn reported receiving little pushback as they rolled out the system now consisting of 91 stations (Lesch, interview, March 14, 2022).

The City of Columbus followed a similar approach to Hochbahn. Staff conducted a two-day workshop with community leaders in the Linden community, which formed the Linden Working Group. The working group provided input on desired hub locations. Based on these recommendations, city staff reported back to the Linden Working Group, as well as local area commissions and civic groups, about which sites were selected (Columbus, 2019; Wolpert, interview, March 7, 2022).

Figure 13. Linden Working Group

Source: City of Columbus

In contrast, SANDAG implemented more in-depth engagement processes. To develop their Regional Mobility Hub Strategy in conjunction with the Imperial County Transportation Commission, SANDAG held online public meetings in which participants could recommend hub locations. Pop-up events were later held at the proposed hub sites (SANDAG, 2015).

For the Mid-Coast Regional Hub Strategy focused on trolley stations then under-construction, SANDAG staff and project consultants presented the hub concept at pre-existing community-specific planning groups and ad hoc stakeholder meetings (SANDAG, 2017, 2022). During these sessions, participants provided verbal input on potential features and issues of concern at sites in their area, as well as completed a voting exercise and individual written surveys. Common themes from these conversations were concerns about safety and security and the need to design hubs to support senior mobility. Staff also collected feedback via an online survey distributed to the general public through multiple channels and existing mailing lists (SANDAG, 2017c). SANDAG staff and project consultants used this input to developed site plans for eight station areas.

However, for the ninth station – the Pepper Canyon Mobility Hub located on the University of California San Diego (UCSD) campus – staff took a unique approach. SANDAG formed a partnership with the UCSD Design Lab to launch a two-day "designathon" that brought together more than 250 students, professionals, and community members (SANDAG 2019d). Teams developed concepts for the hub (**Figure 14**), creating a sense of ownership over the hub and encouraging them to become champions for the project. As part of their 2021 Regional Plan process, SANDAG formed the Vision Advisory Panel, consisting of industry experts on emerging technology, as well as conducted interviews with public transit and private providers (SANDAG, 2021). This multi-phase engagement informed the development of conceptual site plans and cost projections in the 2021 Regional Plan.

Figure 14. Pepper Canyon Mobility Hub Designathon

Source: SANDAG

While Hamburg, Columbus, and SANDAG followed more traditional approaches to engagement, Minneapolis set out for hubs to "create a platform for interactive community engagement" (Rasp et al, 2020, 7). The Minneapolis project team directly engaged neighborhood groups in the site selection and design process, in order to leverage local expertise and better understand barriers to adopting shared modes. Feedback from neighborhood leaders led to multiple changes to the city's initial plan for mobility hub site locations. In addition, the mobility hub pilots were extended from one-month to the entire micromobility season, from spring into early winter.

City staff also coordinated with regional and state agencies as well as private mobility providers to maximize the value of the 13 selected pilot sites, including re-dedicating right-of-way and increasing the number of micromobility vehicles deployed (Rasp et al, 2020).

As the Minneapolis pilot moved into operation, the project team continued to proactively engage these public, private, and neighborhood partners. At pop-up events held in partnership with private mobility providers (**Figure 15**), attendees could test mobility options in a safe, controlled environment and learn about both general pricing discounts and each mobility hub service providers' equity pricing programs (Rasp et al, 2020). Through this engagement, the project team looked to build trust with neighborhood leaders, as well as build capacity within communities to participate in visioning for the design of the future mobility hub sites (Rasp et al, 2020).

Figure 15. Mobility Provider Engagement Event (Minneapolis)

Source: Minneapolis Public Works

As the program team developed their 2020 pilot, the project team launched an Ambassador Program through community-based organizations to hire nearby residents to conduct outreach and manage the hubs. The project team formed two regional teams led by established community leaders with engagement backgrounds (Rasp et al, 2021). Mixing seniors and youth, the ambassadors engaged in cross-

generational conversations and helped to build trust between the project team and residents (Rasp et al, 2021). Minneapolis staff noted that the ambassadors were able to engage in more authentic conversations about safety and community needs than the project team would have (Elkins, interview, March 14, 2022; Rasp et al, 2021). Between the pop-up events and Ambassador Program, the Minneapolis project team engaged low-income, minority, and senior travelers (Rasp et al, 2020, 2021). This engagement strategy elevated the voices of populations that tend to be underrepresented in transportation decision-making, despite being the most likely to use transit and other alternatives to driving alone.

Figure 15. Mobility Hub Ambassadors

Source: Minneapolis Public Works

4. **Program managers stressed that partnerships with mobility providers are the determining factor of whether hubs are successful.**

Mobility hubs simply do not work without a mix of public and private providers, according to staff interviewed at all four agencies. They noted that public transit providers, micromobility companies, and locally owned mobility providers tend to be the most enthusiastic partners.

The Hochbahn and Minneapolis project teams particularly set out to form their hubs around supporting the success of private mobility providers. Hochbahn's first and strongest partner remains carsharing company ShareNow (Lesch, interview, March 14, 2022). Similarly, the proliferation of micromobility in Minneapolis spurred the city to act on the hub concept. During the engagement process for the city's Transportation Action Plan, Minneapolis residents supported the city expanding its role in shaping the use of electric scooters and docked bikeshare system (Rasp et al,

2020). The Minneapolis project team found that micromobility companies were grateful for the creation of hubs, which improved the cost efficiency of complying with equity requirements by deploying their devices at centralized, high activity locations in historically underserved communities (Elkins, interview, March 14, 2022; Rasp et al, 2020). Under the city's 2022 regional micromobility permitting program, micromobility providers in Minneapolis can fund hub infrastructure as an attributed portion of their permitting fees (Elkins, interview, March 14, 2022). The Columbus project team also experienced strong commitments from e-scooter companies Spin and Lime, as did Hochbahn with TIER – which recently acquired Spin (Lesch, interview, March 14, 2022; Wolpert, interview, March 7, 2022).

Beyond specific travel modes, interviewees reported that locally owned providers tended to jump at the opportunity to serve the hubs. In Columbus, Yellow Cab was an eager participant, as the hubs provide operational efficiencies while also offering a space where their national competitors, Lyft and Uber, chose not to direct vehicles (Wolpert, interview, March 7, 2022). In Minneapolis, the local non-profit carshare operator HOURCAR were early partners of their hub pilot (Rasp et al, 2020). The Hochbahn interviewee also noted their strong partnership with the microtransit provider MOIA, which is a locally operated subsidiary of Berlin-based Volkswagen Group (Lesch, interview, March 14, 2022).

In contrast, the Columbus and Minneapolis project managers noted inconsistent support by national ride-hailing companies like Lyft and Uber for their mobility hub programs. Of note, Lyft operates the bikeshare systems in both Minneapolis and Columbus. While local system managers often served as major advocates for the hubs, my interviewees reported that corporate leadership did not actively support their deployment (Elkins, interview, March 14, 2022; Wolpert, interview, March 5, 2022).

Barriers and Opportunities

Trip data sharing is a common barrier to participation in mobility hub programs by private mobility providers, according to the project teams. This is a particular problem because their agencies seek to facilitate seamless multimodal transfers at the hubs via a consistent digital experience that integrates trip planning, scheduling, and payment across multiple modes (Columbus, 2021; Lesch, interview, March 14, 2022; Rasp et al, 2020; SANDAG & ICTC, 2017a). For project managers, trip data are also needed to evaluate hub use and the impact of infrastructure improvements.

To address these needs, each agency employs data methodologies that protect user privacy and proprietary data. For example, the Columbus project team implemented the Shared Streets methodology, which anonymizes all trip data and only captures site-specific information if at least three providers of the same mode serve the site (Columbus, 2021; Wolpert, interview, March 7, 2022). The SANDAG interviewee reported progress by employing the Mobility Data Specification (MDS) approach and hiring an IT specialist to negotiate data sharing agreements with scooter companies Bird, Spin, LINK, and Veo (Kochman, interview, March 14, 2022). The Minneapolis project team developed their own data collection and monitoring system, as they could not use the MDS standard due to state laws concerning data privacy (Elkins, interview, March 14, 2022). Micromobility companies in Minneapolis are required to submit data under their operational permit (Elkins, interview, March 14, 2022). Hochbahn found the most organic success by creating spaces in such high demand that providers are willing to compete for inclusion. Hochbahn requires all service providers to openly share data, in order to access their Switch stations (Lesch, interview, March 14, 2022).

SANDAG planning documents suggest a way to build on strong public-private partnerships, attract new mobility providers including ride-hailing companies, and (potentially) collect data: operational pilots. According to SANDAG, the hubs can serve as testing grounds for piloting public-private operational models (SANDAG, 2017). SANDAG recommends creating a "Mobility Sandbox," in which private companies submit proposals to demonstrate their technology and services at mobility hubs (SANDAG & ICTC, 2017b). Public agencies could also incentivize private mobility providers to fill gaps in public transit networks by funding their services or offering exclusive access to the hubs (SANDAG, 2017c).

Placemaking

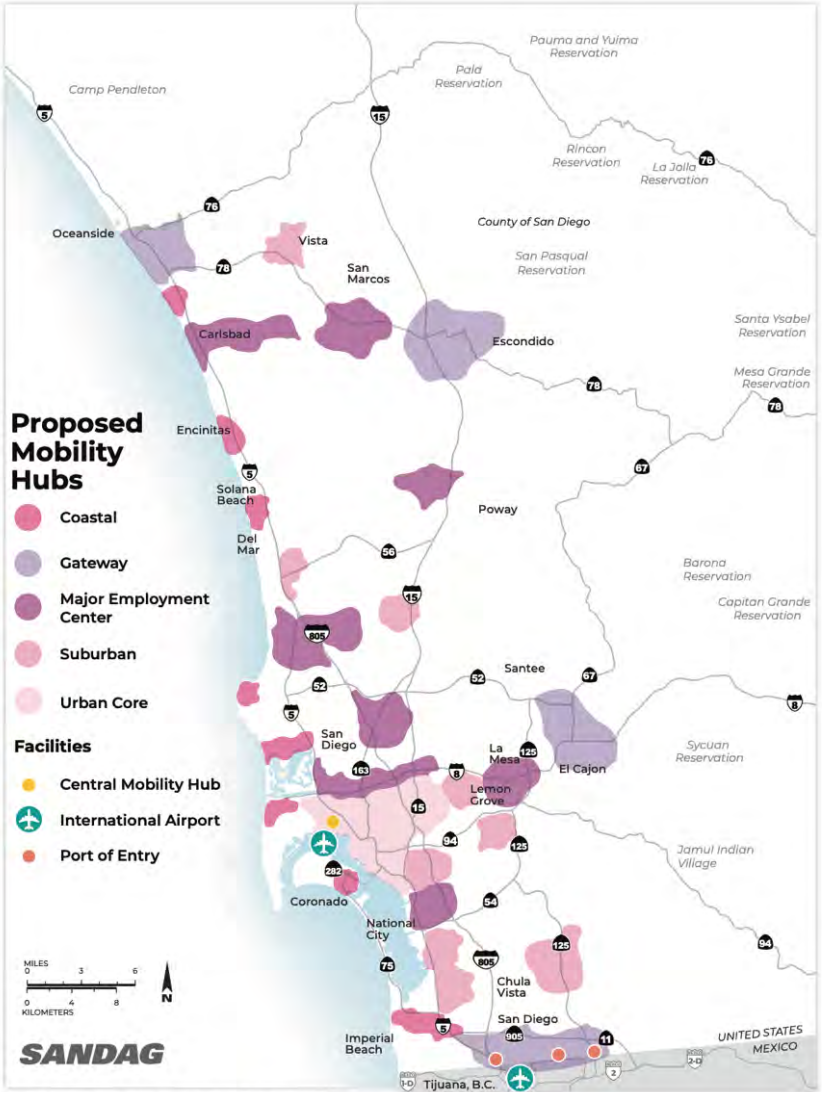
1. **Hub developers typically leverage existing multimodal activity centers, but neighborhood hubs with destinations may have a greater benefit**

The U.S. project teams reported that their agencies are divided on whether to prioritize sites that maximize multi-modal connections or to instead emphasize improving access to neighborhood-serving retail, health care, and community gathering spaces. While the SANDAG interviewee reported that her agency is favoring existing activity centers for their first hubs, the Columbus and Minneapolis

project teams outlined in their documentation and during their interviews the value of building demand in places with capacity to grow.

According to their 2021 Regional Plan, SANDAG is prioritizing hub development at major transportation stations like trolley stations, transit centers and the San Diego International Airport (SANDAG & ICTC, 2017a, 2021). The SANDAG interviewee also shared that her agency is focusing on "Gateway" hubs on the county borders with lots of transit service, but low amounts of housing or business development where travelers would begin or end their trips (Kochman, interview, March 15, 2022; SANDAG, 2021).

Figure 12. SANDAG Regional Mobility Hub Map



Source: SANDAG

The Minneapolis project manager, on the other hand, said that her team is focused on developing hub at locations that are significant to residents in historically underserved communities and could benefit from increased transit access. Among their most utilized sites are human service centers, libraries, and neighborhood retail districts (Elkins, interview, March 14, 2022; Rasp et al, 2021). Similarly, the Columbus project manager reported that their most successful sites are a library and a community center that houses a health clinic and daycare center (Wolpert, interview, March 7, 2022).

Hochbahn found a balance between these models for mobility hub siting. According to the Hochbahn interviewee and project documentation, the agency initially focused on densely developed areas in central Hamburg and quickly scaled their Switch station network throughout the first five years of their program (HVV Switch, 2022a; Lesch, interview, March 14, 2022). However, starting in 2018, public requests for stations grew to the point that Hochbahn began investing in smaller scale designs. Hochbahn's smaller hubs exchange space-consumptive carshare parking spots for micromobility corrals. As a result, these smaller hubs have only four parking spots, compared to 8-12 at the larger stations (Lesch, interview, March 14, 2022). These smaller stations also feature less distinctive branding, which the Hochbahn interviewee said allowed for better blending into residential areas and business districts (Lesch, interview, March 14, 2022).

Figure 13. HVV Switch Network (as of June 2022)

Source: Hamburger Hochbahn AG

2. **Program managers espoused the benefits of technology, while recognizing that physical features are essential**

As mobility providers, retailers, and other services rely increasingly on mobile applications, mobility hubs' digital aspects could one day supersede the physical features of the hubs. After all, digital assets specific to multi-modal transportation can be rapidly updated at little-to-no cost and can incorporate real-time information, marketing, and contactless payment options.

This technology focus is epitomized by the Smart Mobility Hubs in Columbus. Digital interactive kiosks (**Figure 14**) are the central amenity at these hubs, featuring the USDOT-backed trip planning app, Pivot, as well as information about destinations in the surrounding area (Columbus, 2021). Similarly, Hochbahn named its trip planning and payment app to match the Switch stations, establishing a path where the "Switch" brand could become more closely identified with the Switch app than the physical hubs (HVV Switch, 2022a). Minneapolis and SANDAG's project documents also highlight the potential for technology to enhance hubs in their regions by using digital kiosks and mobile applications to organize modes and direct travelers on where to find these modes (Rasp et al, 2020; SANDAG & ICTC, 2017a).

Figure 14. Traveler using Interactive Kiosk at Smart Mobility Hub

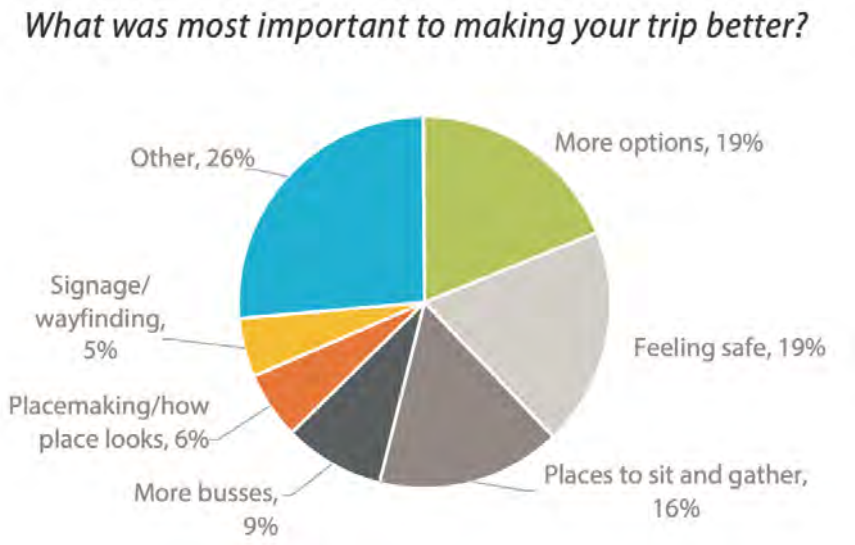
Source: City of Columbus

However, hubs that rely entirely on technology would pose equity concerns. Consistent with the literature review above, the Columbus, Minneapolis, and SANDAG project teams highlighted that low-income populations tend to have less

access to credit cards and smartphones – particularly with sufficient data plans (Columbus, 2020; Rasp et al, 2020; SANDAG & ICTC, 2017c). Digital literary may also be a challenge for seniors, people with limited English proficiency, and low-income travelers (Columbus, 2020; Rasp et al, 2020; SANDAG & ICTC, 2017c).

As such, project teams emphasized – both during interviews and in project documents – that digital assets can complement but not replace basic physical features like lighting, seating, and signage. During Minneapolis' initial 2019 pilot, hub users reported that safety is the most important factor shaping their experience (**Figure 15**) (Rasp et al, 2020). These users also expressed a desire for a security presence and proactive responses from hub management staff to negative behaviors (Rasp et al, 2020). Similarly, in Columbus, community members expressed a strong desire for emergency call buttons (Columbus, 2019). These safety concerns could not be resolved purely by technology.

Figure 15. Minneapolis Survey Results



Source: Minneapolis Public Works

Along with security features, surveyed users in Minneapolis highlighted the importance of places to sit and gather at the hubs, particularly for seniors, children, and people with heavy bags, physical mobility challenges, or chronic pain (Rasp et al, 2020). To meet this demand, the Minneapolis project team installed modular furniture that could serve multiple purposes: seating, gathering areas, enclosing micromobility parking (**Figure 15**), and creating a buffer between hub users and nearby car traffic (Rasp et al, 2020, 2021).

Also notable, the Minneapolis project team used the modular furniture as an engagement method. The project team observed where benches and moveable cubes were placed by users to determine where permanent improvements would be most beneficial (Elkins, interview, March 14, 2022). Digital tools could not replace this furniture, in terms of comfort, protection, or as an interactive planning tool.

Figure 15. Modular Furniture as Buffer (Minneapolis)

Source: Minneapolis Public Works

The Minneapolis team also partnered with local businesses, artists, and neighborhood leaders to highlight the neighborhood identity surrounding each hub (Rasp et al, 2020, 2021). With a goal of creating "cohesive, inclusive spaces," the program's wayfinding system extended beyond mobility by incorporating signage that directed travelers to community assets within an accessible walking or biking/scooting distance from the hubs (Rasp et al, 2020). The project team also installed planters and artwork by local artists in order to enhance the aesthetic of the hubs and surrounding right-of-way (Rasp et al, 2020, 2020). Local artists produced the artwork and added

other aesthetic elements, funded by a mini-grant program established by the city government (Rasp et al, 2020). This artwork included painted seating and magnetic poetry (Rasp et al, 2020). While an interactive kiosk and/or mobile application could incorporate community art and wayfinding, the physical aspects of these features enhance the aesthetic of the hub and support a sense of community identity.

The Minneapolis project team also highlighted that the importance of consistent maintenance to attract users (Rasp et al, 2020, 2021). The geographic distribution of hubs posed logistical challenges to maintaining signage, seating, planters, and sidewalk and street markings (Rasp et al, 2020). With the 2020 pilot, they developed decentralized, community-based partnerships with neighborhood organizations and business coalitions, and they hired the previously discussed ambassadors to support maintenance and promote safety across the hubs (Rasp et al, 2021). See Figure __. Digital tools – such as video cameras and user satisfaction surveys on interactive kiosks – could alert hub operators to maintenance issues, but the maintenance work requires a physical presence.

Figure 16. Ambassador performing maintenance

Source: Minneapolis Public Works

3. Agencies worked with advocates to ensure hubs are accessible to people with disabilities and limited language proficiency

U.S. mobility hub program managers and hub designers acknowledge the importance of public infrastructure complying with Title VI of the Civil Rights Act and the Americans with Disabilities Act (ADA) Further, they stress that hubs can be spaces that go beyond these baseline requirements. They reported that input from advocacy groups, as well as transit agencies, informed their hub designs to ensure accessibility for all (Columbus, 2020; Rasp et al, 2020; Elkins, interview, March 14, 2022; Kochman, interview, March 15, 2022; SANDAG, 2017; Wolpert, interview, March 7, 2022).

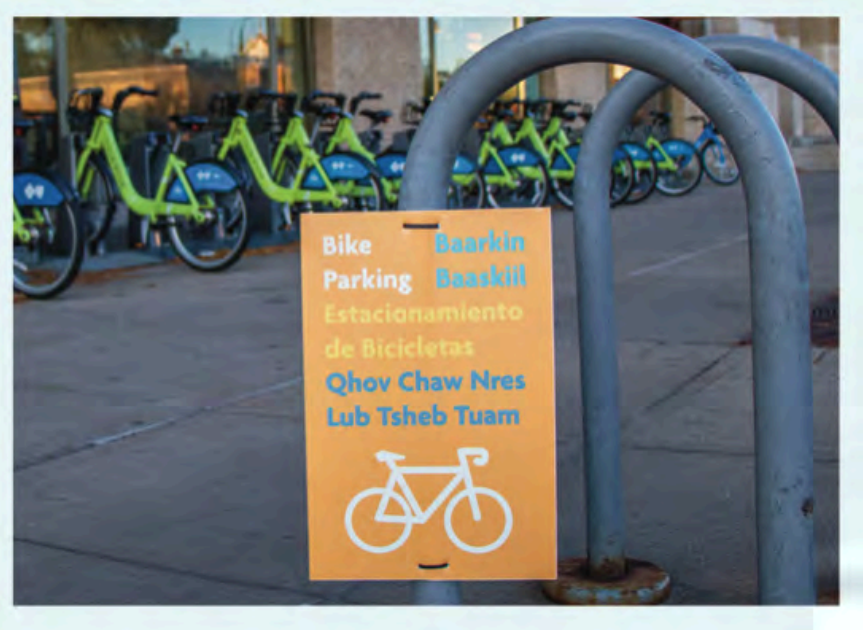
SANDAG and Minneapolis staff highlighted that transit vehicles and stations must be built for ADA compliance, including wheelchair ramps and audio signals (Elkins, interview, March 14, 2022; Kochman, interview, March 15, 2022; Rasp et al, 2020; SANDAG & ICTC, 2017a). Hochbahn staff also said that accessibility factored into their Switch station design (Lesch, interview, March 14, 2022). In project documentation, the program managers reported extending these features within the hubs and to the sidewalks and street crossings surrounding them, while also engaging disability advocates to address additional barriers to access (Rasp et al, 2020; SANDAG & ICTC, 2017a). Hub designs were reviewed by SANDAG's Social Services Transportation Advisory Council and Minnesota Council on Disability respectively (Elkins, interview, March 14, 2022; Kochman, interview, March 15, 2022). Columbus also incorporated accessibility elements in their digital interactive kiosks, which can be lowered to wheelchair level (Columbus, 2020).

Hub designers reported also considering language accessibility. The Minneapolis and Columbus project teams used primarily icon-based signage to promote language and literacy accessibility for users (Rasp et al, 2020; Columbus, 2020, 2021). The SANDAG interviewee also stressed the value of icon-based signage in their planning, which is detailed in their Equity Considerations memorandum (SANDAG, 2017c). As part of Columbus' mobility hubs program, the digital interactive kiosks also offered translation of information into multiple languages (Columbus, 2020; Wolpert, interview, March 7, 2022).

Where words were used at the Minneapolis hubs, signs incorporated languages spoken by the surrounding community, including Somali, Spanish, and Hmong (**Figure 17**) (Rasp et al, 2020). These languages were selected based on input from outreach specialists at the city's Neighborhood and Community Relations Department (Rasp et

al, 2020). For the 2022 pilot, the Minneapolis team is exploring digital light projections as signage to both enhance accessibility for vulnerable populations and potentially reduce maintenance costs related to inclement weather.

Figure 17. Multilingual Bike Parking Sign



Source: Minneapolis Public Works

4. **Travelers and hub-adjacent businesses need to see and experience the hubs to fully understand their value**

As part of their pre-development outreach, the Columbus, Minneapolis, and SANDAG project teams all developed detailed diagrams of potential hub sites (Columbus, 2020; Rasp et al, 2020; SANDAG 2022a, 2022b). SANDAG went so far as to create animated 3-D versions of the site plans for four proposed hubs as part of creating their Mid-Coast Mobility Strategy (**Figure 18**) (SANDAG, 2018, 2019). However, the Columbus and Minneapolis project managers explained that community stakeholders did not truly understand the mobility hub concept until they saw and used them first-hand (Rasp et al, 2020; Elkins, interview, March 14, 2022; Wolpert, interview, March 7, 2022).

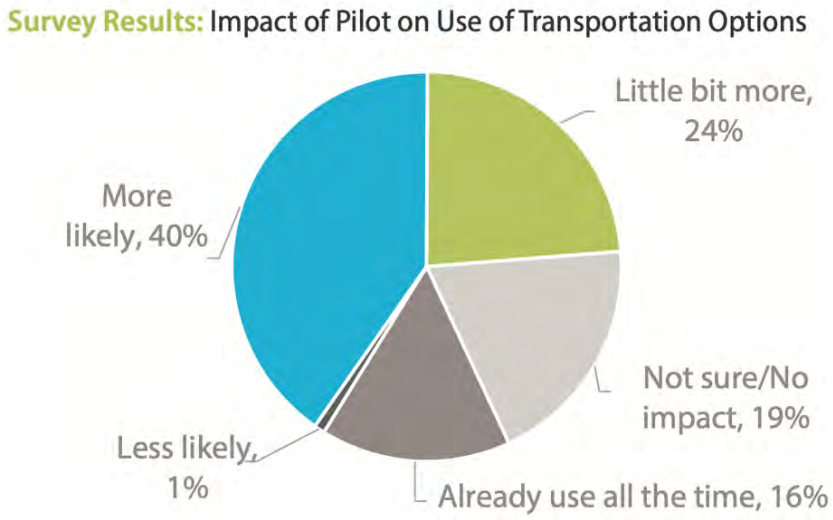
Figure 18. Animated 3-D Rendering of Proposed Mobility Hub (Screenshot)

Source: SANDAG

The Hochbahn interviewee also reported that the first Switch station prompted community excitement which, in turn, drove demand for the rapid deployment of additional sites (Lesch, interview, March 14, 2022). She explained that residents typically request a new Switch station in response to almost any new development (Lesch, interview, March 14, 2022). The Minneapolis and Columbus project teams noted in their documentation and interviews that, after launching their first hubs, previously skeptical residents became vocal supporters for the hubs, particularly in low-income communities with low levels of trust in city government due to historical underinvestment (Columbus, 2020; Rasp et al, 2020; Wolpert, interview, March 7, 2020).

In-person intercept surveys at events during Minneapolis' 2019 pilot found that 64 percent of users reported the improvements encouraged more use of transportation options at hub locations (**Figure 19**) (Rasp et al, 2020). During my interview, the Minneapolis project manager also shared that affluent seniors liked the hubs because the hubs helped to reduce sidewalk clutter caused by dockless scooters (Elkins, interview, March 14, 2022). This enthusiasm for hubs once they were up-and-running often extended beyond users to the surrounding business community, with business owners eager to leverage the increased activity caused by the hubs to attract customers (Elkins, interview, March 14, 2022; Rasp et al, 2021).

Figure 19. 2019 Minneapolis Mobility Hub Pilot Survey – Impact of Pilot



Source: Minneapolis Public Works

According to Columbus' project manager, their six-site network also generated excitement among community members, leading to tentative plans to include hub elements, like interactive kiosks, signage, bikeshare stations, and micromobility corrals, at all future high-capacity transit stations (Wolpert, interview, March 7, 2022).

The SANDAG interviewee noted that her project team recognizes that travelers, community members, and business owners need to experience the hubs first-hand in order to fully grasp the concept. The project team is actively pursuing opportunities to build prototype sites. In particular, staff are working closely with developers to implement hub features into new private development, such as wayfinding signage, lighting, passenger pickup and drop-off zones (with seating), EV charging, and bicycle and pedestrian improvements (Kochman, interview, March 15, 2022; SANDAG & ICTC, 2017b). SANDAG is also advocating for cities to integrate these hub features into the development approval process and transit agencies to add these features as part of joint development projects (SANDAG & ICTC, 2017b).

Leadership & Governance

1. **Strong champions are vital to move hubs from concept to implementation**

Throughout my review of project documentation and interviews with their project teams, the most consistent theme raised was the importance of vocal and passionate people driving forward their hub programs. These advocates came from within their agencies, partner organizations, and the public.

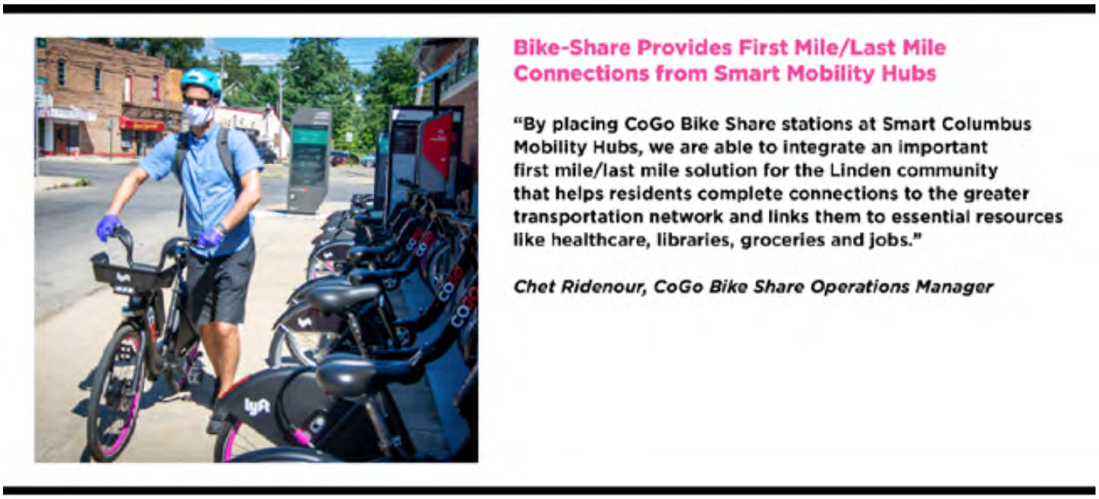
All four program managers expressed passion for the hub concept during their interviews and mentioned colleagues who were willing to go above and beyond to make these programs successful (Elkins, interview, March 14, 2022; Lesch, interview, March 15, 2022; Kochman, interview, March 15, 2022; Wolpert, interview, March 7, 2022). Danielle Kochman of SANDAG noted that several of her colleagues contributed to hub design and promotion efforts, based on their lived experiences as daily users of transit and other shared modes. Kochman also commended her team member Marisa Mangan for building relationships with staff at other public agencies and private developers to advocate for hub features to be incorporated into their projects (Kochman, interview, March 15, 2022). Andy Wolpert of the City of Columbus' team highlighted that his department's leadership adopted new practices for infrastructure improvements to meet the program's budget constraints (Wolpert, interview, March 7, 2022). This achievement was also documented in the Smart Columbus final report section on Smart Mobility Hubs (Columbus, 2021).

The importance of internal champions was followed closely in the views of those interviewed by partnerships between transit agency and city staff. According to the City of Minneapolis' Danielle Elkins, her project team works collaboratively with her counterpart at Metro Transit, Meredith Klekotka, to support the city's hub program, including grant writing. Similarly, Hochbahn's Tina Lesch highlighted that the Hamburg city staff are "100 percent supportive" and always direct new transportation service providers to Hochbahn to discuss participation in the Switch stations and associated app. Wolpert of the City of Columbus highlighted the City's strong partnership with the Central Ohio Transit Authority, which operates the regional bus system. Kochman of SANDAG also noted that the North County Transit District and the cities of Carlsbad, Chula Vista, National City, Imperial Beach, and San Diego are active mobility hub champions. Kochman also acknowledged the Imperial County Transportation Commission, which is their co-lead and co-grantee for the Regional Mobility Hub Strategy (SANDAG, 2022b). Some other public agencies also proved to be strong mobility hub partners. For instance, the Minneapolis project team

worked with their state and county transportation departments to identify opportunities for funding and infrastructure improvements surrounding the mobility hubs (Rasp et al, 2020, 2021).

Beyond the public sector, private mobility providers proved to be key partners, particularly local managers of national companies who must balance corporate goals and local priorities. For example, the Columbus and Minneapolis program managers highlighted Lyft Bikes and Spin; SANDAG staff also mentioned Ford Mobility, the former parent company of Spin (Elkins, interview, March 14, 2022; Kochman, interview, March 15, 2022; Wolpert, interview, March 7, 2022).

Figure 20. Partner Testimonial (COGO/Lyft)



Source: City of Columbus

Public-private partnerships in the agencies' mobility hub programs extend beyond private mobility providers. Columbus' co-lead on the broader Smart Columbus program was the Columbus Partnership, a coalition of the City's top businesses and institution CEO's (Columbus, 2021). Through the Columbus Partnership, the region's major employers contributed millions in pro bono assistance to the Smart Columbus program – including the Smart Mobility Hubs project – as well as access to their employees and members (Columbus, 2021).

SANDAG's Kochman highlighted real estate developers as key partners. Their project team is working directly with several developers to integrate hub features and services into new development, such as reduced parking, enhanced signals, and private microtransit services (Kochman, interview, March 15, 2022). SANDAG is also developing a hubs toolkit for the broader developer community. This toolkit will

include best practices for forming partnerships with mobility providers and designing amenities that support shared mobility services, as well as funding opportunities to support these partnerships and amenities (Kochman, interview, March 15, 2022).

The Minneapolis project team provided a particularly interesting public-private-nonprofit partnership model: the Twin Cities Shared Mobility Collaborative (SMC). Following the city's bid for the USDOT Smart Cities Challenge that Columbus was awarded, Minnesota-based private charity The McKnight Foundation commissioned national thinktank the Shared Use Mobility Center to develop a regional shared mobility plan developed by (SUMC, 2017). Among several strategies, this plan outlines the mobility hub concept – of which the Shared Use Mobility Center is the leading national proponent. The SMC was formed to implement the plan, including the development of mobility hubs. Administered by the University of Minnesota Center for Transportation Studies, this SMC is "a group of transportation leaders, public agencies, private companies, city officials, and nonprofit organizations" (University of Minnesota, 2021a). The SMC further developed the mobility hub concept into policy guidance (University of Minnesota, 2021b). When the city was selected for national foundation Bloomberg Philanthropies' American Climate Challenge, the city's Public Works department used the SMC guidance as the basis for their hub pilot (Rasp et al, 2020). This series of partnerships demonstrates the potential for a coalition of champions to implement hubs.

Finally, interviewees also said that their mobility hub programs have current and potential champions at transportation management organizations (like FASTLinkDTLA), business improvement districts, local business associations, community benefit organizations, neighborhood associations, advocacy groups, individual businesses, healthcare providers, higher education institutions, and libraries (Columbus, 2020; HVV Switch, 2022a; Rasp et al, 2020, 2021; SANDAG & ICTC, 2017a).

2. **Agencies scaled their hub programs depending on organizational capacity, governance structure, and jurisdictional powers**

Hochbahn conceptualized and launched their first hub – or "Switch" station – in 2013 (HVV Switch, 2022a). Consisting of eight carshare parking spots, the Switch station was conceived with relatively few amenities compared to more recent hubs developed in the United States. As a public transit operator with existing right-of-way use permits and rail stations, Hochbahn was able to expand their network of hubs rapidly to 17 stations by 2017 (Lesch, interview, March 14, 2022). The agency set a

goal of developing three stations per year, but more than tripled deployment to a network of 91 stations as of 2021 (HVV Switch, 2022a; Lesch, interview, March 14, 2022). Current plans call for Hochbahn to reach 103 hubs by the end of 2022 and 130 by 2024 (Lesch, interview, March 14, 2022).

Minneapolis launched the first mobility hub network in the United States, with 13 sites in 2019 (Rasp et al, 2020). As a municipality, Minneapolis maintains control over the street rights-of-way and is the permitting authority for all travel modes except for ride-hailing. Minneapolis developed conceptual layouts for each site over the course of a year, and then launched seasonal pilots over three months to test and refine their mobility hub strategy. This planning process – from analysis to build-out – took approximately a year and half (Rasp et al, 2020). Temporary seating, wayfinding signage, and parklets were removed during the winter months and then reinstalled in summer 2020 with improved designs across the larger network. The project team doubled their network to 25 hubs in 2020 and tested additional amenities like bicycle repair stations and storage lockers. The project team prioritized geographic distribution, with the 25 hubs in the 2020 pilot spread across 14 neighborhoods (Rasp et al, 2021). The 2022 phase will include 31 stations (Elkins, interview, March 14, 2022). From the program outset in 2019, the Minneapolis pilot was intended to lay the foundation for a long-term approach of implementing a citywide hub network (Elkins, interview, March 14, 2022; Minneapolis 2019, 2020). The 2022 phase of hub development will introduce permanent seating and wayfinding, as well as test additional features and technologies, such as light projected signs. Minneapolis' project team is also exploring a joint program with its "twin city" Saint Paul, pursuant to a new regional micromobility permitting program (Elkins, interview, March 14, 2022).

Part of the Smart Columbus initiative funded by the USDOT Smart City Challenge grant, Columbus' "Smart Mobility Hub" program included six hubs centered around the historically underinvested Linden community (Columbus, 2020; Wolpert, interview, March 7, 2022). Like Minneapolis, the project team was led by city employees and benefitted from the municipal government's broad jurisdiction over the street right-of-way. Locations were selected based on places of interest to Linden residents and the region's first BRT line, which runs through Linden (Columbus, 2020). As a result, the project team needed to work with the transit agency and private property owners at the selected sites. Columbus' planning processes took place over four years (2016-2020), and features were concurrently installed in 2020 following design approval by USDOT (Columbus, 2020, 2021). Columbus developed a series of technical documents to meet the requirements of the federal Smart City

Challenge grant (Columbus, 2020). This documentation began with a concept of operations, and continued with system requirements, an interface control document, system design, master test plan, test report, and an operations and maintenance plan (Columbus, 2021).[1] These documents went through several iterations to address USDOT questions and comments (Columbus, 2020, 2021). The city's project team does not plan to install any additional hubs until planned high-capacity transit systems are built in the future (Wolpert, interview, March 7, 2022).

SANDAG took a distinctly different approach than the other mobility hub programs. As a metropolitan planning organization without zoning authority or right-of-way control, SANDAG staff created toolkits to guide cities, transit agencies, and private developers on best practices for hub development, including a features catalog and memos on implementation strategies and equity considerations[2] (SANDAG & ICTC, 2017a, 2017b, 2017c). SANDAG also developed site-specific recommendations under two related projects, the Regional Mobility Hub Strategy (2017) and Mid-Coast Mobility Hub Strategy (2019) (SANDAG, 2022a, 2022b).

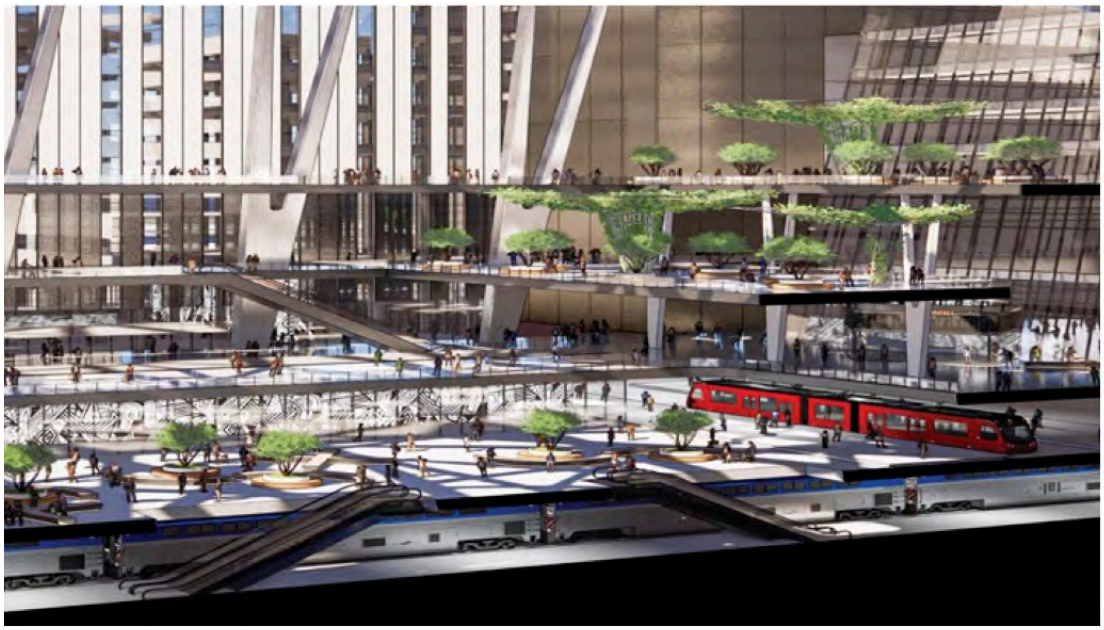
SANDAG leadership envisions hubs as ranging from single parcels to whole communities – "a continuum" – and developed prototype plans for 30 areas between the two strategy documents (SANDAG & ICTC, 2017a, 2019a; Kochman, interview, March 14, 2022). According to SANDAG staff, "There will never be a design-build.[3] [Hubs] slowly evolve (Kochman, interview, March 14, 2022)." While none of the hubs are yet up and running, their Mid-Coast Mobility Hub Strategy led to installation of hub features at 9 trolley stations that opened in November 2021 (SANDAG 2019, 2021a). A Central Mobility Hub (**Figure 21**) adjacent to the San Diego International Airport entered the environmental review process in late 2021, with a projected cost of $2.4 billion by 2035 (SANDAG, 2021). This Central Mobility Hub will incorporate infrastructure improvements across five districts of the City of San Diego that link multiple rail, trolley, and bus lines (SANDAG, 2021). This hub will be a far larger development than Hochbahn, Columbus, or Minneapolis hubs that are centered around a single transit stop or station.

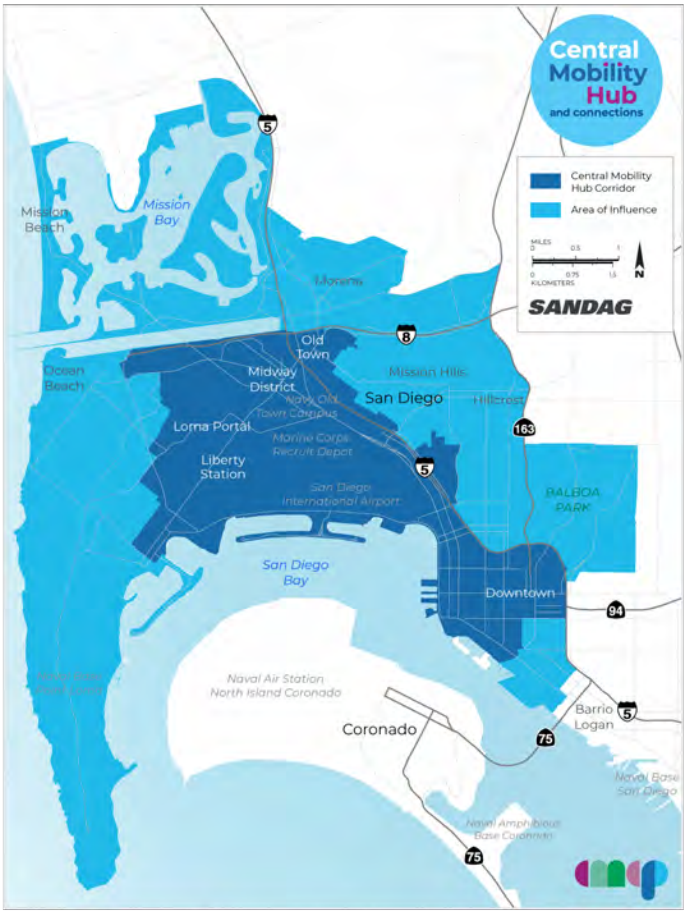
[1] See Appendices G and H.

[2] See Appendices B, C, and D.

[3] A construction method in which the design and construction are done by a single entity, though often with multiple contractors

Figure 21. Central Mobility Hub (SANDAG)





Note: The area of influence represents the demographic and travel analysis developed from a larger census tract based area. Transportation solutions will be focused within the study area boundary.

Source: SANDAG

3. Hub programs are sparked by grant funding, but reliance on grants undercuts their sustainability and evolution

The concept of mobility hubs aligns with federal and state climate and transportation goals to facilitate travel by means other than driving personal vehicles. However, mobility hub features often include temporary improvements, emerging technology, off-street infrastructure, and/or support of private providers – all which can disqualify hubs from federal formula grant funding. Accordingly, the interviewees from the project teams highlighted successes with grants for hub planning and piloting, but reported struggling with operational and infrastructure funding.

SANDAG's efforts exemplify this challenge. The Regional Mobility Hub Strategy was funded by the California Department of Transportation (Caltrans) Emerging Priorities Program, while the Mid-Coast Mobility Strategy was funded through the USDOT Pilot Program on Transit-Oriented Development (SANDAG, 2022b, 2022c). Both grants support planning, but not implementation.

Intragovernmental grants are also subject to delays, as was the case with a Minnesota Department of Transportation (MnDOT) to fund Minneapolis' 2021 pilot. Due to grant disbursement delays, Minneapolis has to cancel their 2021 pilot and shift plans to 2022 (Elkins, interview, March 14, 2022).

Private foundations offer an alternative to federal and state grant funding, but foundation grants are typically insufficient to fund programs over the longer-term. Minneapolis received grant funding from The Energy Foundation, the Carbon Neutral Cities Alliance, and the NACTO Streets for Pandemic Response and Recovery Program for their pilots (Rasp et al., 2020, 2021). Unfortunately, these grants only provided enough funding for one-year pilots (Elkins, interview, March 14, 2022).

SANDAG staff identified several federal and state funding sources in their Regional Mobility Hub Strategy Implementation Memorandum (Kochman, interview, March 15, 2022; SANDAG & ICTC, 2017b).

Ultimately, regional and local funding may be the most appropriate sources. SANDAG staff recommend that jurisdictions in the San Diego area pursue regional funding through their Capital Improvement Program or so-called "hyperlocal" sources like development impact fees, Enhanced Infrastructure Financing Districts (EIFD), and revenues from parking benefit districts and High-Occupancy Toll (HOT) lanes (SANDAG 2017b). See **Table 2** for descriptions of these funding tools.

Table 2. Funding Mechanisms

Type of Mechanism	Description
Development Impact Fee	Fee charged to an applicant in connection with approval of a development project by a local government agency
Enhanced Infrastructure Financing District	Designated area in which property tax revenues are dedicated to pay for infrastructure improvements within the area, according to a pre-determined Infrastructure Financing Plan
Parking Benefit District	Designated area in which metered parking and other parking fees are reinvested into infrastructure or services within the area
High-Occupancy Toll Lane	Traffic lane in which drivers traveling alone pay a variable fee that is adjusted in response to demand. Drivers of vehicles with passengers are exempt from the fee or pay a lower fee. Known as ExpressLanes in LA County, operated by LA Metro.

4. Agencies adopted innovative approaches to contracting and procurement practices

In both project documentation and interviews, the project teams from the U.S. case study agencies identified opportunities to complete planning, construction, and operations where agency staff had expertise or capacity. However, they also contracted outside firms for support when activities exceeded internal expertise or capacity.

When SANDAG staff determined that they lacked sufficient expertise in data management, the team hired an IT specialist to negotiate data-sharing agreements with private mobility providers (Kochman, interview, March 15, 2022).

The City of Columbus team engaged multiple consultants for planning and operational design, including development of the technical components for the interactive kiosks. However, when the City of Columbus team received no external bids for infrastructure installation based on their limited budget, the project team worked with their internal street construction and maintenance crews in the city's Public Service department to install some features themselves, including signage and the ground decal for the scooter corral (Wolpert, interview, March 7, 2020). However, the team limited their long-term liability – both legal and financial – by working with property owners at the mobility hub sites to take over responsibility for infrastructure maintenance after the first year of operation.

While developing their 2019 pilot, Minneapolis project team saw the opportunity to combine engagement with site management by entrusted local placemaking firm, The Musicant Group, with leading the day-to-day operation. For the 2020 pilot, they incorporated The Musicant Group's recommendation to expand these engagement and site management responsibilities to incorporate the Ambassador Program, which as described above hired local residents to maintain the sites and engage their fellow community members. By supporting a feeling of local identity and sense of neighborhood ownership of the hubs, Minneapolis "test[ed] a new model for the care of neighborhood-level infrastructure" that focused on neighborhood resilience (Rasp et al, 2021).
—

These insights from my interviews and project documentation have significant implications on the potential opportunities for hub development in LA County.

Policy & Planning Recommendations for Mobility Hub Development and Operation

Based on the lessons learned from the documentation of these mobility hub programs and interviews with their project teams, FASTLinkDTLA should work with LA Metro, LADOT, SCAG, other public agencies, and private developers to:

Mobility

1. **Collaborate with mobility providers, community partners, and users to align priorities and develop hub designs and operational practices**

To remain at the forefront of the MaaS movement, Los Angeles County's government agencies must work closely with mobility providers, developers, property owners, and community organizations to test design and operational models for mobility hubs that expand mobility access and choice to all types of travelers. Hubs can be the showcase of multimodal partnerships between public transit, micromobility, microtransit, and ridehailing providers.

Hub developers should work with transit agencies, mobility providers, property owners, employers, and community groups to establish clear goals for hub development with specific metrics that support the financial viability of private providers while addressing community needs. FASTLinkDTLA is perfectly suited to be a convener to support these partnerships between public and private entities to develop and operate mobility hubs, given their leadership's long-standing relationships with many of these entities. As a TMO, FASTLinkDTLA can guide public and private sector partners in goal prioritization.

The program goals of Columbus, Hochbahn, Minneapolis, and SANDAG's programs should be used as guidance for hub objectives in LA County. Ridership goals should extend beyond public transit to include increasing micromobility and carshare trips delivered by private companies, consistent with Hochbahn's and Minneapolis' programs. LA Metro's Vision 2028 Strategic Plan lays the foundation for these shared mobility partnerships with the goal of "doubl[ing] the percent usage of transportation modes other than solo driving" (Metro, 2021, 2).

While hub developers and operators in LA County should design their hubs around site-specific conditions and features, the hub designs by the four agencies offer guidance. The Switch network operated by Hochbahn demonstrate SUMC's Trunk-Destination or Urban Design Center's Central type, consisting primarily of medium-scale rail stations in the dense city center (Figure 22). SANDAG's hub designs for their Mid-Coast Mobility Hub Strategy focus on single rail stations that fit the Trunk-Local and Central types that expand the hub design to incorporate the surrounding area including roadways. Columbus' and Minneapolis' hub designs offer examples of hubs centered around BRT stops with neighborhood-serving commercial development, consistent with SUMC's Branch-Local type of hub and Los Angeles Urban Design Center's Neighborhood hub type. Hub designs in SANDAG's Regional Mobility Hub Strategy reflect the Branch-Destination or Regional types, the most expansive designs encapsulating large sites or multiple individual destinations.

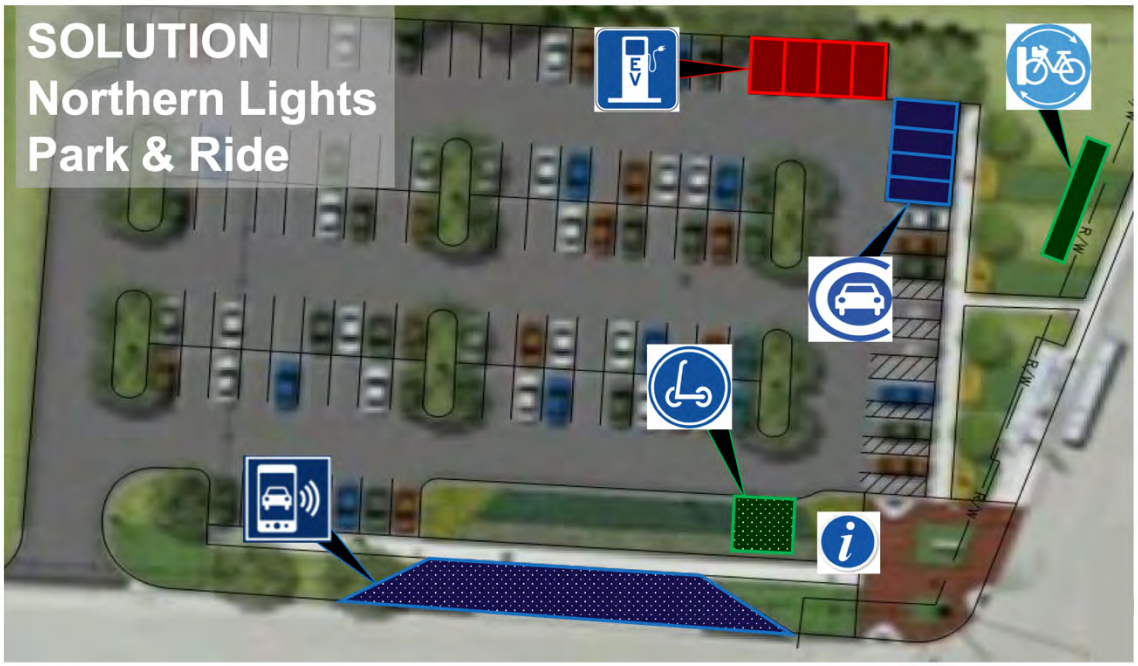
Figure 22. HVV Switch Station (Hamburg)

Source: Hamburger Hochbahn AG

While their hub programs generally suit these categories, all four agencies experimented with multiple hub types. A prime example is Hochbahn building smaller stations in lower-density neighborhoods that could fit Branch-Local or Neighborhood types. The agencies also engaged in hub siting and design that deviate from the land

use conditions outlined by the SUMC and the Urban Design Studio typologies. For example, Columbus' hub site at the Northern Lights Park & Ride (**Figure 23**) is outside the core of the transit network, which would fall under the Branch-Local or Neighborhood types. However, the site's design is far more expansive than a usual Neighborhood hub with designated space for all modes, suiting the Trunk-Local or Central design type. Columbus and its transit partner COTA saw the opportunity to create a prototype hub at this location, in order to support future redevelopment of the aging strip-malls surrounding the site into a shopping and housing district. Notably, COTA owns the empty parcel adjoining the hub which could be developed into multiple-family housing or neighborhood-serving retail space through a joint development project with a private developer (Columbus, 2020; Wolpert, interview, March 7, 2022).

Figure 23. Northern Lights Park & Ride Site Map



Source: City of Columbus

In conjunction with determining sites, hub developers should establish a baseline set of features available at all sites through collaboration with providers, property owners, and community organizations. By creating a consistent experience at all sites, hub developers and operators can build trust with travelers leading to lasting mode shift from private vehicles to these shared services. To ensure these features meet travelers' needs, hub designer and operators should conduct on-site engagement

throughout design and operation, in partnership with providers and neighborhood businesses and groups.

Operationally, Minneapolis' hub management is an exemplary model. Their hub operations incorporate active management of the sites – through the Musicant Group contract and Ambassador program – and ongoing engagement events in partnership with mobility providers. (See Figure 16.) If operational funding is limited, hub operators could use the Columbus' hub model centered around the interactive kiosk for mobility needs. Strong relationships with site property owners at existing destinations also support maintenance of placemaking amenities that attract travelers to shared mobility services. Commercial property owners and their tenants can benefit from the increased activity at these sites that attracts new customers and clients. Residential property owners can also feature improved access to mobility services as a resident amenity.

2. Prioritize micromobility parking and accessible ride-share pick-up/drop-off areas, while allocating flexible space for emerging modes

Micromobility – bike- and scooter-share – is a central component of mobility hubs. Past research and all four of the studied agencies consistently feature micromobility parking along with public transit stations. Micromobility providers are active participants in all four studied programs, and their local general managers are among the most enthusiastic champions for hub development. The growth of e-scooters in Minneapolis even prompted the creation of the Minneapolis' hub program. Columbus' project team is prioritizing bikeshare stations in siting future hubs.

Hub developers in LA County should actively incorporate both docked and dockless micromobility into their programs. As the Metro Bike system expands, hub developers should include bikeshare stations as part of their designs. Mobility hubs could even form around these bikeshare stations at sites without a Metro rail or BRT stations, particularly those sites within a 5-minute biking or scooting distance to these transit stations. Similarly, scooter corrals can provide order to these vehicles, which inevitably arrive on sidewalks at properties surrounding Metro stations. With some simple ground paint, a decal, or a small metal rack, hub operators can direct travelers to these vehicles and maintain an orderly site. Following Minneapolis' model, LADOT and other city transportation departments should consider transitioning on-street parking to docking stations and corrals, in an effort to reduce sidewalk clutter and encourage on-street riding of micromobility vehicles.

Passenger pick-up and drop-off zones are also an essential feature. While the featured agencies varied on their approach to pick-up and drop-off areas, all four project teams recognize the long-term need for creating safe spaces for passengers to depart and arrive on these services. With the expanding network of Metro Micro and other microtransit and ridesharing services, these pick-up and drop-off zones can foster a comfortable experience for travelers. By creating these safe zones, LADOT and LA Metro can also guide ride-hail vehicles to the hubs. Vulnerable travelers, particularly those using wheelchairs and other mobility aids, need these spaces to allow for safe pick-up and drop-off zones in high-traffic areas. As ridesharing providers serving at wheelchair users like ButterFLi expand in dense areas like Downtown LA, pick-up and drop-off zones will need to be essential features of mobility hubs. As noted by both the Columbus and SANDAG teams, these spaces will become increasingly important as autonomous vehicles become prevalent.

These zones should be off-street or at least in curb areas where passengers do not need to cross traffic lanes, including dedicated bicycle and bus lanes. The centralized nature of mobility hubs will result in longer passenger loading and unloading time than current single-passenger ridehail services as multiple travelers access these ridesharing vehicles. Extended loading times are also necessary for loading and unloading wheelchair users and parents with children. Hub designers and operators could follow the Columbus program's approach of pick-up and drop-off zones on side streets with lower vehicle traffic, as long as these zones are near the transit stop to facilitate easy connections. Wayfinding signage between the transit stop and rideshare pick-up and drop-off zones can ease the frustration and confusion associated with transferring between these modes.

Hub operators in LA County should also consider flexible curb space, as recommended by Minneapolis and SANDAG's project teams. Bus stops or on-street parking could be used for pick-up and drop-off zones or micromobility parking during certain times of the day. Using digital signage, operators can maximize the utility and value to users, while also encouraging a flexible mindset among travelers about how curb space is used particularly on-street car parking. LADOT is actively rethinking curb management, and mobility hubs could be a prime location for testing these strategies. Again, this flexible space could evolve over time as autonomous vehicles and shared mobility technology become available.

3. Think beyond the hub

Mobility hubs should exemplify people-centered design with amenities for safe walking, rolling, and waiting to transit and ridesharing services. However, these sites should not exist in isolation. Safe paths and high-quality roadway infrastructure should extend to the surrounding areas. Further, city leaders should pursue policies that support the success of shared mobility services, both to support their hub development and incentivize hub development by private developers.

These improvements should start with intersections and road designs that prioritize pedestrian safety on streets connected to the hubs. Hub developers could develop sites in areas with existing high quality pedestrian infrastructure, including wide and well-maintained sidewalks, consistent with the approaches by the hub program teams at the City of Columbus and Hochbahn. Minneapolis' program establishes a prudent model of working with state and regional transportation agencies to make roadway design improvements like hardened centerlines and bollard bump-outs that shorten the distance that pedestrians need to cross. Hub developers could also implement the Minneapolis team's use of modular furniture to test placement of barriers to guide permanent installation.

Hub developers should work with city officials to implement best practices from NACTO's Urban Street Design Guide and Transit Street Design Guide, as suggested by SANDAG. Street crossings are particularly important, and improvements like curb extensions at street corners and signal timing that provides pedestrians with lead time before turning vehicles. Mid-block crossings and pedestrian islands across wide intersections could also improve the pedestrian experience. LADOT is already leading the way with the Livable Streets effort, which aims to add these pedestrian improvements across the City of Los Angeles. Encapsulating their Great Streets, Slow Streets, Safe Routes to School, and Safe Routes for Seniors programs, the Livable Streets effort should prioritize intersections and roadways surrounding mobility hubs.

Hub developers should also pursue dedicated lanes for buses and bicycles through LA Metro and LADOT and other city transportation agencies in LA County, either directly as public agency developers or through advocacy by private developers. SANDAG's hub designs can provide a guide, extending hub designs beyond single sites to surrounding roadways. Public agencies should work with property owners along these lanes to maintain building access, particularly driveways. In dense, high-traffic areas conducive to mobility hubs, agencies should incorporate police management during the immediate post-launch period. Private hub developers

should work with public agencies to pursue photo enforcement of these dedicated lanes, with hubs providing a prime location for installing cameras. FASTLinkDTLA should continue advocacy efforts that support public-private partnerships in developing and designing these lanes.

City officials should review citywide curb management policies and strategies to guide shared mobility services to hubs. LADOT's Code the Curb initiative sets the stage for this review, by developing a digital map of the City's traffic signs and painted curbs. Other cities in LA County should follow suit. In particular, cities should review their parking restrictions in the blocks surrounding Metro rail stations and high-ridership bus stops to support the development of hubs. City agencies should consider the City of Minneapolis' approach of designating on-street parking for scooter corrals and the City of Columbus team's implementation of passenger pick-up and drop-off zones for ride-hailing companies. As the BlueLA network expands, LADOT should also look to the Hochbahn approach of prioritizing on-street parking for carshare around hubs.

Private hub developers can support these city policy reforms by seeking parking restrictions that prioritize pick-up and drop-off zones in their site design. Public agencies could also actively incentivize off-street pick-up and drop-off zones during the development approval process, as recommended in SANDAG's Regional Mobility Hub Strategy Implementation Memorandum. As previously detailed, these incentives could take the form of fee reductions, expedited design review, and/or a density bonus to allow for additional residential units that exceed the site's zoning designation.

By investing in intersection improvements and dedicated lanes as well as reforming curb management policies, city officials can support the development of a hub network by both public and private property owners.

Placemaking

1. **Leverage existing activity centers and new development**

LA Metro, LADOT, and SCAG should continue to pursue current plans to initiate the mobility hub network at the high-traffic mobility activity centers of Metro Red, Blue, and Gold Line stations. This approach is consistent with the successful initial approach of Hochbahn and proposed strategy of SANDAG. However, the second phase of hub development should incorporate neighborhood bus stops. The

Minneapolis and Columbus' programs prioritized neighborhood-serving hubs as focused investments in historically disadvantaged communities, aimed at expanding private mobility service networks in these areas. Hochbahn's post-2017 hub expansion also pursued this strategy, in order to create a dense network of hubs that facilitates reliable and consistent access to private mobility providers throughout their service area.

Public agencies could also support expansion of the hub network by encouraging private developers to incorporate hub features into new projects. LA Metro and SCAG could design site plans, consistent with what was done by the Columbus and SANDAG project teams. LA Metro could also incorporate hub designs into joint development projects, which facilitate public-private partnerships by their nature. Columbus' Smart Mobility Hub program upgraded their regional transit agency partner COTA's Linden and Easton transit centers – which were originally built as joint development projects[4] – and laid the foundation for future joint development at the COTA-owned parcel adjacent to their Northern Lights Park & Ride. LADOT and other city officials could also incentivize developers to incorporate hub features into their projects and invest in shared mobility services for employees like microtransit shuttles and micromobility credit programs, as recommended by SANDAG.

FASTLinkDTLA should facilitate these conversations between public and private entities, contribute to hub designs, and support with financing guidance. As a TMO representing business improvement districts and building owners, FASTLinkDTLA is well-positioned to guide these public-private partnerships.

2. **Create safe and welcoming environments, with particular attention to women, BIPOC, and people with limited mobility**

Mobility hubs should feel safe, welcoming, and easy to navigate. As such, hub developers should prioritize physical improvements, such as lighting, emergency calls buttons, and wayfinding signage. The presence of ambassadors or trained security personnel also supports a sense of safety by providing eyes on the street.

Hub developers should follow Minneapolis' model of creating "cohesive, inclusive spaces." Their project team found that users reported lighting and seating as the most important elements for feeling safe. Lighting provides a dual benefit of both traveler

[4] Metro's real estate development program in which the agency collaborates with qualified developers to build transit-oriented developments on Metro-owned properties

and bystander safety. Enhanced lighting ensures that hub users can be seen by drivers to reduce the risk of crashes. Well-lit spaces also deter negative behavior like harassment, which is predominately experienced by women travelers. Columbus' project team incorporated emergency call buttons based on early feedback, because users want to know that they can call for help in dangerous situations. These features act as a deterrent against the risk of harassment.

Wayfinding signage also supports users in knowing that safe spaces are nearby. As demonstrated by Minneapolis' program, wayfinding signs should be primarily icon-based to ensure accessibility for users with limited English proficiency. Any words should incorporate languages spoken by the surrounding community. Hub developers should also engage disability advocates to address additional barriers to access.

In addition to safety-supporting infrastructure creating a welcoming environment, the physical presence of other people enhances both actual and perceived safety. Project teams across the three U.S. case study agencies highlighted the importance of designated staff that users can rely upon to address concerns, including safety. Police officers can both enhance safety, while also creating a tenuous environment, particularly among BIPOC travelers. The preferred approach is to have ambassadors or unarmed security personnel available to users. Hub operators should incorporate these eyes on the street into their site management plans.

Figure 24. 2020 Minneapolis Mobility Hub Pilot Survey – Safety

Source: Minneapolis Public Works

A welcoming experience can also be created through aesthetic improvements. Public agencies and private developers should partner with local businesses, artists, and neighborhood leaders to highlight the neighborhood identity surrounding each hub. The agencies should install landscaping and art elements that enhance the aesthetic of the hubs and surrounding right-of-way. A community art mini-grant program like Minneapolis should be considered.

3. Layer digital infrastructure on top of high-quality physical amenities

Increasingly, our lived experiences extend from the physical to digital space. The COVID-19 pandemic deepened that connection, as people relied on mobile applications to order goods – including food. While mobility hubs are intrinsically physical spaces where in-person activity occurs, hubs can serve as a centralized place for connecting to the digital experience of accessing goods and services.

Hub developers should pursue the installation of interactive kiosks and Wi-Fi hotspots. Columbus' mobility hub program can particularly serve as a guide for connecting the hub to "smart" technology features. Physical hubs can also be connected to digital hubs through mobile applications, as pursued by Columbus and Hamburg's programs. All of these features can be leveraged to collect data on hub use, both for assessment of their use and provide justification for attracting additional services including ride-hailing providers.

Interactive kiosks can help to link hubs to surrounding destinations. In combination with wayfinding signage, these kiosks can support wayfinding within the hub as well as guide travelers to surrounding destinations. As demonstrated by Columbus, interactive kiosks can also serve as a centralizing marker for the hub location. Kiosks can also offer a feedback platform for users to rate current features and request additional amenities and services. Hub users could communicate with human support using the kiosks, to troubleshoot challenges they face and report issues. By connecting users to centralized support teams, hub operators could reduce operational costs through smaller customer experience and response teams.

Hub developers should incorporate Wi-Fi hotspots into their design. As centralized locations where digital-backed services are found, hubs provide a prime location for hotspots. This Wi-Fi access can also attract retailers and other community-serving businesses, who can feature the hotspot as a customer amenity. The Minneapolis and Columbus project teams found that insufficient data plans are a significant barrier to

shared mobility services as well as other aspects of modern life among low-income households. Wi-Fi access at the hubs can support digital access and promote digital literacy. This amenity can also help to attract youth, supporting inter-generational spaces at hubs. Public funding is available through the Justice 40 Initiative aimed at eradicating inequities in infrastructure investments.

Beyond the digital infrastructure on the ground, mobile applications can create a unified experience between the physical and digital experience of the hubs. Hochbahn and Columbus pursued mobile applications tied to their hubs. These mobile applications can share a common platform with the interactive kiosks to create a consistent experience while traveling to and from the hubs. As both transportation and retail services increasingly rely on digital platforms, these mobile applications can combine these experiences for a fully integrated user experience.

These digital-backed physical features and mobile applications can track activity at hubs and during the broader journey. Hub operations could use the data to determine use of services and amenities at the hub, in order to determine where to make further investments that increase activity at the hub. Data can also be an asset in efforts to attract additional vendors, service providers, and investors. In particular, hub operators – particularly public agencies, can leverage this data to encourage apprehensive partners, like ridehailing services, to serve the hubs.

Leadership & Governance

1. **Identify and support champions**

Hub developers – particularly public agencies – will need vocal and passionate champions, both internally and externally, to support the success of their programs. Public agency hub program teams should include cross-functional and inter-agency teams, who will advocate for the inclusion of hub features in infrastructure projects as well as private development. These teams should also work with state agencies to identify opportunities for infrastructure improvements and funding.

Private mobility providers, business organizations, and private developers will be key partners. Additional potential champions could be leaders from community benefit organizations, neighborhood associations, advocacy groups, individual businesses, healthcare providers, higher education institutions, and libraries. FASTLinkDTLA could facilitate authentic conversations potential champions between public and private entities.

FASTLinkDTLA should look to the Twin Cities Shared Mobility Collaborative (SMC) as a public-private-nonprofit partnership model. The Shared-Use Mobility Center and national foundations could be valuable partners to guide the formation of a similar entity.

2. **Pilot multiple hub design types, then scale to create a network**

The four case study agencies offer different models for scaling. The Hochbahn team launched a single site with two private sector providers offering the same mode (carshare), in order to build public demand for future sites and attract additional partners. Ultimately, this model led to rapid expansion of their network. The Minneapolis approach consisted of temporary improvements at a small group of sites to test designs before major infrastructure changes. Their team focused on micromobility connections to transit and committed to active site management, including extensive community engagement. The Minneapolis project team followed the most traditional pilot model by launching a short-term installation; evaluating its successes and gaps; iterating their hub design and operational model; and then launching subsequently larger programs. Columbus' "Smart Mobility Hub" program offers a design model of a limited hub network in partnership with private property owners and an operational model of using technology in lieu of active site management. The City of Columbus project team continues to evaluate the project over a longer timeframe than Minneapolis, in preparation for instituting best practices as part of future transit development. SANDAG's project team committed to extensive site planning to lay the foundation for an extensive countywide network of hubs. SANDAG's project team also developed toolkits to encourage private development of mobility hubs and actively supports private development. Their program lays the foundation for more significant investments with multiple public and private sector partners. Hub developers in LA County could adapt these models to fit their site-specific or network goals.

3. **Seek planning grants, but dedicate local funding for operation and expansion**

Public agencies in LA County are well positioned to pursue mobility hub planning. The federal funding for the Integrated Mobility Hubs Pilot Program will kickstart mobility hub funding in the cities of Los Angeles and Long Beach. The Caltrans Sustainable Transportation Planning Strategic Partnerships Grant supports SCAG's 710 North Mobility Hub project. Public and private developers should work together to secure

further grant funding from the FTA Transit-Oriented Community grant to pursue planning.

However, hub developers will need to pursue other sources to build a regional network and fund operations. As discussed by the Columbus and Minneapolis project teams, local funding streams are necessary. Hub developers should seek reliable local sources highlighted by SANDAG to fund hub development and operations, like development impact fees, Enhanced Infrastructure Financing Districts (EIFD), and revenues from parking benefit districts and Metro ExpressLanes. (See Table 2.) FASTLinkDTLA should support private developers in accessing these public funding sources.

Conclusion

Public agencies and private developers should leverage the lessons learned from the Columbus, Hochbahn, Minneapolis, and SANDAG programs. Their programs offer diverse approaches to hub conceptualization, design, and operation. But the most consistent element across the four case studies was strong partnerships. Toward that end, FASTLinkDTLA will be an essential partner to hub developers to advise, convene, and advocate for their success.

This report offers key findings and recommendations for the mobility and placemaking aspects of mobility hubs, as well as guidance on governance and leadership models. By implementing these lessons learned from the four case study agencies and devising strategies to overcome the other programs' challenges, hub developers in LA County can develop a program that will serve as a model for other cities.

Mobility Hubs are a relatively new concept – particularly in the United States – and future research is needed to evaluate the scale, timeline, financing, and market potential for hub development. As public and private entities pursue mobility hub pilots and programs, evaluation will be necessary to determine successful long-term models and best practices. This report was somewhat limited by the number and variety of those interviewed. Mobility hubs involve a broad range of stakeholders, including mobility providers, technology companies, and community organizations, not all of whom were interviewed for this report. Future research should incorporate their perspectives and approaches to hub development and operation. In particular, the evolving role of ride-hailing companies within the shared mobility network could provide insight to incorporate these providers into future hubs. Data management remains a significant topic, as mobility hubs extend from the physical to digital space.

Despite these outstanding questions, hub development in LA County should not delay any longer. FASTLinkDTLA should a key part in the design, development, and operation of a regional hub network created by LA Metro, LADOT, SCAG, and private developers. The mobility hub revolution is underway, and the LA County has the potential to be at the forefront.

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Appendices

Appendix A – Mobility Hubs: A Reader's Guide (Los Angeles Urban Design Center)

Appendix B – SANDAG Regional Mobility Hub Strategy: Mobility Hubs Feature Catalog (SANDAG)

Appendix C –Regional Mobility Hub Strategy: Implementation Considerations (SANDAG)

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Appendix E – 2019 Minneapolis Mobility Hub Pilot Report

Appendix F – 2020 Minneapolis Mobility Hub Pilot Report

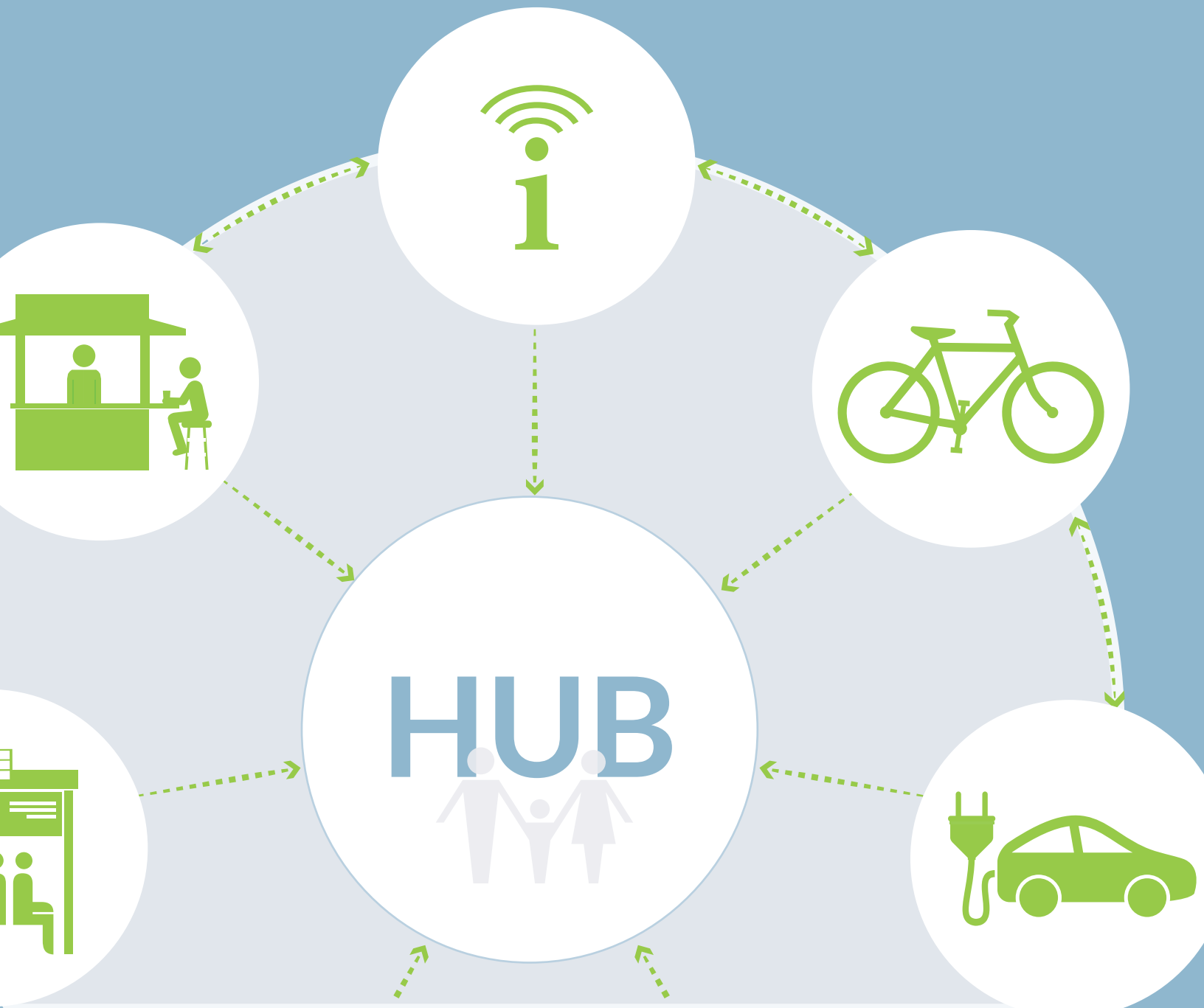
Appendix G – Smart Mobility Hubs Operations and Maintenance Plan (Columbus)

Appendix H – Final Report for Smart Columbus Demonstration Program, Chapter 11: Smart Mobility Hubs

APPENDIX A

Mobility Hubs

A Reader's Guide



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CONTENTS

OVERVIEW

CHAPTER 1

Introduction to Mobility Hub

Mobility Hubs provide a focal point in the transportation network that seamlessly integrates different modes of transportation, multi-modal supportive infrastructure, and place–making strategies to create activity centers that maximize first–mile last mile connectivity.

Supporting first–last mile solutions by providing multi-modal transportation services and activities around transit stations to maximize connectivity and access for transit riders is the main goal of Mobility Hubs. Amenities include but are not limited to adequate bus stop and layover zones, transit shelters with real-time arrival information, bike share stations, car share facilities, taxi-waiting/ call areas, WI-FI service, bicycle storage, repair facilities, retail, and open space. By providing a robust array of options at Mobility Hubs, a variety of different needs can be accommodated, greatly increasing the number of destinations reachable by transit.

The ability of the Hub to function successfully depends on flexibility. It is the interaction and balance between transportation, land use, and placemaking functions. Flexibility for change should be incorporated in developing Mobility Hubs to accommodate possible future growth, expansion, and changes as new technologies evolve.

A city as diverse as Los Angeles requires a transportation system that offers equally diverse and viable mobility choices to accommodate all users. With Mobility Hubs, an integrated suite of mobility services are provided at defined locations around existing and new transit stations, allowing transit riders to seamlessly access other modes of transportation once they arrive at the station. The strategies range from simply enhancing the public realm around the existing or new transit stations to encourage walking (sidewalks, street trees, street lights, wayfinding), to providing racks for bicycles on buses and trains, to supporting bicycle share programs, ride share and car share, as well as high-frequency local shuttle services, and other regional and local transit connections.

Collectively, this integrated suite of mobility services are intended to meet first-last mile needs of transit users.

"First Last Mile Strategic Plan" is a joint effort between Los Angeles County Metropolitan Transportation Authority (Metro) and Southern California Association of Governments (SCAG) to improve transit user experience to and from the station. Public transportation agencies typically provide bus and rail services that may frame the core of the trips, but users must complete the first and last portion on their own. This is referred to as the first-last mile of the user's trip, even though actual distances vary by users.

The Mobility Hubs program is an extension of the Mobility Plan 2035 of the Los Angeles Department of City Planning in coordination with the Los Angeles Department of Transportation and the Los Angeles County Metropolitan Transportation Authority.

How to use the Reader's Guide

The Mobility Hub Reader's Guide is meant to provide guidance and inspiration for city staff, property owners, developers, designers, transit agencies, and community members for enhancing project developments and public right-of-way improvements in proximity to existing or new transit stations with amenities, activities, and programs to support multi-modal connectivity and access.

The essence of the Reader's Guide lies in its seven topic areas and the accompanying amenities that are described under each topic. Each topic area is defined around the City's high-level mobility priorities and is represented by a chapter: bicycle connections, vehicle connections, bus infrastructure, information/ signage, support services, active uses, and pedestrian connections. Two to four amenities are then described under each topic area.

Each chapter includes a paragraph introducing the topic and lays out specific objectives that would be achieved by enhancing the Mobility Hubs with any number of amenities. Each amenity includes information that guides users in determining the suitability for a particular amenity at a given location. A Best Practices section is also included that provides images and text describing how these amenities have been included in Mobility Hubs in other regions.

Chapter 2: Bike connections focuses on topics related to facilitating and encouraging bikeability such as: bike share, bike parking and bicycle supportive facilities.

Chapter 3: Vehicle connections focuses on topics related to encouraging and developing ride share, car share, and adoption of alternative fuel sources and green technology such as electric vehicles.

Chapter 4: Bus infrastructure focuses on topics related to bus ridership and bus layover zones in particular.

Chapter 5: Information/ signage focuses on topics related to improving wayfinding, real-time information and enabling WI-FI connectivity.

Chapter 6: Support services focuses on topics related to ensuring safe and comfortable environment for users such as ambassadors, waiting areas and improved safety and security.

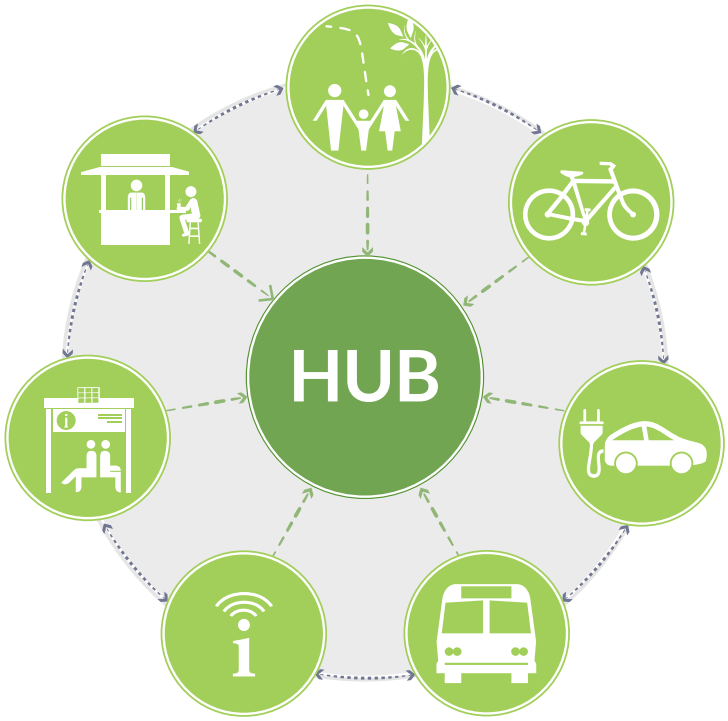
Chapter 7: Active uses focuses on topics related to supporting a vibrant and mixed-use environment such as retail uses and quality public space

Chapter 8: Pedestrian connections focuses on topics related to walkability and pedestrian connections supporting easy access to and at the Mobility Hub.

Mobility Hubs Typologies

With a city as broad and diverse as Los Angeles, transit stations range in size, amenities, and context. Since each location presents unique opportunities and challenges based on its context and transportation functions, there is not a single definition or description for a Mobility Hub. In order to reflect the varying needs of transit users and the realities of the existing built environment, there are three general tiers of Mobility Hubs: Neighborhood, Central, and Regional. The tiers are differentiated by scale, amenities, and context.

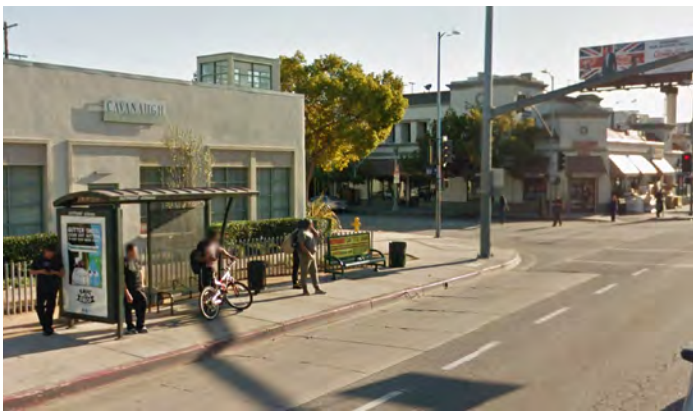
Amenities are designated "Vital", "Recommended", or "Optional" based on applicability at certain Mobility Hub types.



Mobility Hub Amenities	Bicycle Connections			Vehicle Connections			Bus Infrastructure		Information–Signange			Support Services				Active Uses		Pedestrian Connections	
	2.1. Bike Share	2.2. Bike Parking	2.3. Bicycling Facilities	3.1. Ride Share/Pick up-Drop off	3.2. Car Share	3.3. EV Charging Stations	4.1. Bus Layover Zone	4.2. Bus Shelters	5.1. Wayfinding	5.2. Real-time Information	5.3. Wi-Fi / Smartphone Connectivity	6.1. Ambassadors	6.2. Waiting Area	6.3. Safety and Security	6.4. Sustainable Approach	7.1. Retail	7.2. Public Space	8.1. To the Mobility Hub	8.2. At the Mobility Hub
(N) Neighborhood	●	●	■	■	○	○	■	○	●	○	○	■	○	○	○	■	■	○	○
(C) Central	●	●	○	●	●	●	○	●	●	●	●	○	○	●	●	○	●	●	●
(R) Regional	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●
Legend:	Vital: ●			Recommended: ○			Optional: ■												

Neighborhood Mobility Hub

Neighborhood Mobility Hubs are smaller ancillary station areas generally found in lower density neighborhoods. They offer a few basic amenities essential to every transit area including wayfinding, bike share and bike parking. All these amenities are generally immediately visible from the station stop- generally across the street or within the same block. Examples of the Neighborhood Mobility Hub would be Bagley/ Venice bus stop or Vermont/Venice bus stop.



Bagley/Venice Bus Stop

Photo: Google Map

Central Mobility Hub

Central Mobility Hubs are typically located in a more urban context, and encompass one or more stations/ bus stops. They offer many amenities in addition to the baseline features including car share, bus shelter, and next bus information. The amenities are generally spread throughout the surrounding intersection and integrated into the neighborhood. Generally, these amenities are within easy walking distance from the station itself. Examples of the Central Mobility Hub would be 7th Street/ Figueroa Metro Station or Wilshire/ Vermont Metro Station.

Wilshire/ Vermont Metro Station

Photo: Metro

Regional Mobility Hub

Regional Mobility Hubs are the largest scale station areas in either dense urban areas or end of line stations where they connect to other regional transit providers. The Regional Mobility Hub offers the most amenities including secured bike parking and a bus layover zone along with important amenities and infrastructure built into the station itself. Regional Mobility Hubs can be as large as an acre. Examples of Regional Mobility Hubs include North Hollywood Station and Harbor Gateway Transit Center.

North Hollywood Station

Photo: Wikimedia

BICYCLE CONNECTIONS

CHAPTER 2

Discussion

Encouraging the adoption of bicycling as a viable alternative to private vehicle use is an important goal for the city and region. Bicycles can serve as an appealing mode to access other transit services and stations especially if bike parking and other supportive facilities are available to use. The inclusion of bicycling supportive amenities at Mobility Hubs is one step towards achieving a healthy transportation system and allowing people to make choices that are more environmentally sustainable and physically beneficial. Improving the bicycling experience can incentivize many potential riders to use their bicycles for their daily trips. First-last mile connectivity can be further enhanced through the implementation of a bike sharing program, to be available at all Mobility Hubs, by making bicycles accessible for those whose destination is out of the typical pedestrian range of a ½ mile. Improving connections to the potential or existing bike paths near the Mobility Hub is essential in advocating use of bicycles and public transportation.

Objectives

- Enhance first-last mile connectivity through the implementation of a bike sharing program.
- Increase availability of bike parking and secure bike rooms.
- Provide safe and comfortable bicycling supportive facilities.

Relevant Agencies

- LA Department of Transportation
- LA Department of Public Works
- Metro
- For requesting bike racks: Contact LADOT Bicycle Services to submit Bicycle rack and parking request form online.
- For Metro bike lockers visit https://www.metro.net/bikes/

2.1. BIKE SHARE

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Bike sharing is a transportation service typically structured to provide users point-to-point transportation for short trips. Employees, residents, and visitors will be able to hop on a bicycle at one station and return it to any other station in the system. Bike share stations will be located in streets, on sidewalks, and in plazas and parks.

Dense station spacing is critical to creating a convenient system. It is important to strategically locate bike share facilities along transit corridors, existing or proposed bikeways, popular destinations, and retail job centers to ensure that users can easily pick up/drop off bicycles. The vision is to provide new and existing transit users with an accessible, reliable, and efficient mobility option as an integrated part of Los Angeles world class transportation system.

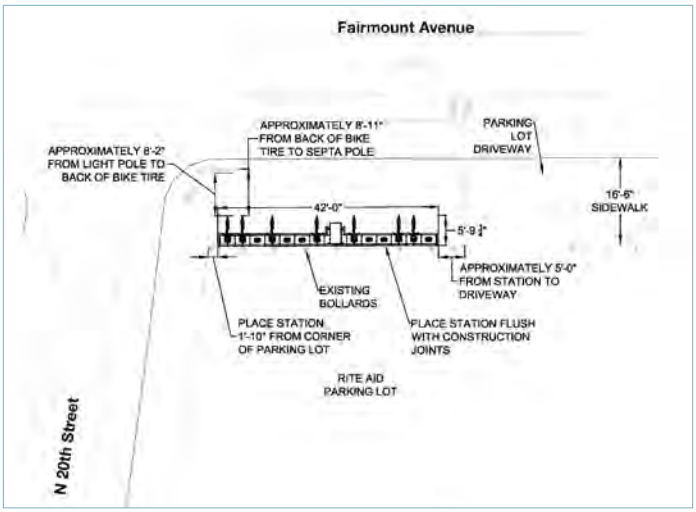
The two most important factors considered when designing a successful bike share system are safety and convenience. Stations must be strategically located to suit people's needs for quick and opportune trips. Proper siting of bike share stations can activate public spaces, boost local businesses, and increase mobility and accessibility. Ultimate station locations will be determined by City of Los Angeles, Metro, and bike share operator based on the following considerations.

Guides

- **Network:** Stations must be adjacent or within walking distance to activity centers, transit stations, places of employment and residences. Ideal station spacing is within ¼- ½ mile of another station. In locations with fewer hubs and destinations, station size should be reduced rather than station spacing.
- **Physical Space:** The physical space must meet the LADOT street design regulations and criteria in addition to the designs and physical dimension requirements.
- **Clearance Requirements:** Stations may not obstruct the pedestrian path of travel and must adhere to all American with Disabilities Act (ADA) requirements.
- **Visibility:** Stations must be visible to passersby and stations shall not interfere with pedestrian sight lines. Station placement on the departure is preferred. Ad panels and kiosks must be strategically placed to maintain sight lines. Bike sharing stations should be located in highly-visible areas at or near Mobility Hubs.
- **Accessibility:** Stations must be well lit at night and accessible 24 hours a day.
- **Demand and Support:** Popular demand and stakeholder support may weigh into bike share station location placement, but shall not be the ultimate deciding factor. Station locations must be sited to enhance safety and connectivity in order to serve the needs of all users.
- **Solar:** Stations run on solar power and must be strategically located to minimize shade cover.
- Major new developments should contribute to the expansion of a bicycle share program, where one exists.
- Co-locating and co-branding (if possible) bike share and car share increases visibility and re-enforces the concept and adoption of shared vehicles.
- The 13 docks, 90 degrees standard flat bike back station is usually 42'0" by 6'0".
- The station should be placed at least approximately 5'0" from the potential adjacent driveway cut.

Sites must comply with the following checklist items

- Meets all LADOT design guidelines
- Does not interfere with or block a driveway or a catch basin
- Does not overlap with maintenance hole, signal box, or utility access
- Is unobstructed by sidewalk furniture, benches, newsstands, or bus shelters
- Is unobstructed by trees, tree wells, or other landscaping
- Is not located in or directly adjacent to a bus zone
- Is not located within 15 feet of a fire hydrant
- Does not block building standpipe or pedestrian sight lines
- Locations on State Highways will be evaluated on a case by case basis
- Streets with a posted speed limit 35mph or more will be evaluated on a case by case basis



Philadelphia Bike share, *Site plan configuration for the Standard bike share stations; the equipment is the same as what will be implemented in Downtown Los Angeles.*

Photo: Toole Design Group

Milwaukee's Bublr Bike share program, *B-cycle Now app tells you how many bikes and open docks are at each station so it's easy to plan your trip. The app even maps a route from your current location to the chosen station.*

Photo: Bublr bikes Website

Santa Monica Bike share program (Breeze), *Bikes are equipped with GPS and a fare validator that will handle payment. The bikes can, in theory, be left anywhere in the city - although users will be charged extra if they don't return the bikes to a special Breeze rack.*

Photo: Jason Islas/Santa Monica Next

San Diego Bike share program (Decobike), *Stations are solar-powered and automated. They will operate 24 hours a day, 7 days a week. They are modular in design and can be easily expanded to meet demand.*

Photo: DecoBike

Union Station Metro Bike Share Station - Los Angeles, *The program, which will allow users to rent a bike, ride it, and return to any other Metro bike share kiosk, will bring 1,000 bikes to 65 hubs around Downtown, Chinatown, and the Arts District.*

Photo: Metro

2.2. BIKE PARKING

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Among the necessary supports for bicycle transportation, bike parking is both vital and relatively easy to implement. Short-term and long-term parking serve different needs. If users will typically be parking for two hours or longer, they are likely to value security and shelter above the convenience and ease that characterizes short-term parking. Still, it requires policies and detail-oriented attention to get it right. Bike parking may go unused, or worse yet result in vandalized bicycles, if it's not designed and placed in highly visible and appealing locations.

Outdoor bicycle racks are the most basic and common "short-term" bike parking option and the installation can be requested from business owners or citizens. The City of Los Angeles Department of Transportation Sidewalk Bike Parking Program installs an inverted-U bicycle rack. It is 36" high constructed of 2 3/8" galvanized pipe and holds two bikes. There is no fee for a LADOT bicycle parking rack installation if your location qualifies for the program. On street Bike Corrals located in the street area adjacent to the curb can be used for areas with limited sidewalk spaces to make use of on-street areas that are unsuitable for auto parking.

Bicycle lockers that are pre-reserved, key operated, or bike rooms are considered the best protection against bicycle theft and are ideally suited for "long-term" bike parking application. A bicycle locker rental program that is low cost and convenient will encourage use by bicycle commuters. Operations and maintenance needs should be enhanced at Mobility Hubs.

Guides

- Bicycle parking should be located as close as possible and visible to the Mobility Hub users, as well as building entrances, without obstructing pedestrian pathways and without any conflict with vehicular traffic.
- When installing sidewalk racks, maintain the pedestrian through zone. Racks should be placed in line with existing sidewalk furniture to maintain a clear line of travel for all sidewalk users.
- Sidewalk racks adjacent to on-street auto parking should be placed between parking stalls to avoid conflicts with opening car doors.
- Parking should be visible and secure, clean, sheltered or covered, and sufficiently illuminated.
- Bicycle racks may be installed near bus stops or loading zones only if they do not interfere with boarding and loading.
- It is important to provide access to common and shared use bike lockers, bike rooms, or storage facilities that offer a greater level of security where long-term bike parking is needed.
- Install bicycle racks and lockers, especially in multi-tenant commercial or mixed-use buildings where bike routes are existing or planned. Ensure bicycle racks are placed in a safe, convenient, and well-lit location to encourage alternative modes of transport for employees and consumers with small purchases.
- It is also important to provide education and information about how best practices for securing one's bike would help prevent theft.
- Areas with high incidence of bicycle theft may justify specific security features such as specialty racks, tamper-proof mounting techniques, or active surveillance.
- Implementing electronic lockers is encouraged. Unlike older generations of keyed lockers, which had one user per locker, the electronic lockers allow multiple users.

Best Practices

Los Angeles, *Bike Corrals are an on-street bicycle parking facility that can accommodate up to 16 bicycles in the same area as a single vehicle parking space.*

Photo: LADOT Bike Blog

To use the electronic lockers a cyclist needs to purchase a BikeLink card which works like a debit card at retail locations.

Photo: Wikimedia

Santa Monica, *Bike room and parking facility is located at the ground floor of the parking structure feature almost 5,300 sf of space and nearly 360 secure bike parking spaces.*

Photo: Santa Monica Next–Jason Islas

2.3. BICYCLING SUPPORTIVE FACILITIES

Providing bicycling supportive facilities and amenities, such as personal lockers, changing rooms, and bike repair stations, will encourage bicycling as a viable mode of transportation for users.

In an effort to provide more supportive resources to users Metro began opening "Metro Bike Hubs" in 2015, the first of which is located at El Monte Station. Metro Bike Hubs are facilities which will provide secure indoor parking along with repair stands, air pumps, and other tools and resources. Depending on typology and context, Mobility Hubs will coordinate and may feature either full Bike Hubs or some of the supportive amenities.

The El Monte Station Metro Bike Hub is located in prime ground floor retail space and provides a full suite of bicycle-related services, including controlled entry for 56 bicycles under closed-circuit TV surveillance, peak-hour staff availability, folding bike rentals, same-day repairs, accessory sales, and bike-related classes. Hollywood/Vine Metro Red Line station, Culver City Expo Line station, and Union Station North Arcade are some of the new bike hubs coming soon to Los Angeles.

Guides

- Depending on typology and context, Mobility Hubs will feature either full Bike Hubs or some of the supportive amenities.

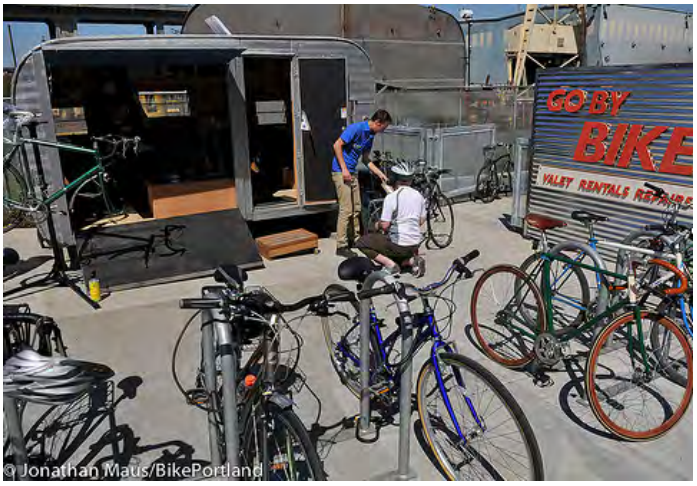
Best Practices

Bike repair station - Downtown Los Angeles, *Main street, Bicycle Repair Stations, provide the tools necessary to keep people on their bikes even when they have hiccups like a flat tire*

Photo: LADOT Bike Blog

El Monte Station Bike Hub - Los Angeles, *Provides access to secured parking, retail sales, bike repairs, and rentals.*

Photo: Metro



Go By Bike PDX - Portland, *The bicycle valet at the Portland tram is free and open to the public.*

Photo: BikePortland Website, Jonathan Maus

Bike Fixtation - Minneapolis, *designs and manufactures public work stands, pumps, and vending machines for bicycle infrastructure projects.*
Bike Fixtation operates self-service kiosks on an extended-hours basis for bicyclists in the Minneapolis/St. Paul metropolitan area.

Photo: Bike Fixtation Website

VEHICLE CONNECTIONS

CHAPTER 3

Discussion

Vehicle movement has had a significant impact on the development history of Los Angeles and it will continue to play a critical role in the City's future. Freeway infrastructure built during the 1950s as part of the Federal Highway Act established private vehicles as the dominant mode of transportation in the region. However, current excessive automobile dependency has affected our environment, public health quality, and even our lifestyle. Additionally, the efficient movement of people, goods, and services is strained by traffic congestion.

Providing transportation modes, other than privately owned vehicles, to meet the needs of a thriving growing city will allow users to give up one or more vehicles per household and eventually mitigate some of the negative impacts. Adding car share and ride share opportunities at Mobility Hubs will enhance first-last mile connections and accessibility to public transit. However in order to reduce greenhouse gas emissions and air pollution even further the adoption of low-emissions vehicles should be encouraged by providing supportive infrastructure such as Electric Vehicle (EV) charging stations.

Internal circulation of Mobility Hubs (or any transit station) should be enhanced by providing designated pick up/drop off zones and facilitating access to ride share and car share opportunities. Easy access is critical for encouraging reluctant users to become transit riders. Designated zones make it quick and easy for both passengers and those picking up/dropping off to navigate Mobility Hubs without confusion or congestion.

Objectives:

- Improve accessibility at Mobility Hubs through providing ride share opportunities and designated pick up/drop off zones.
- Provide car share services easy access to improve direct connections to and from transit stations and major destinations.
- Reduce greenhouse gas (GHG) emissions by encouraging the adoption of alternative fuel sources and green technology such as Electric Vehicles

Relevant Agencies:

- LA Department of Transportation
- LA Department of Public Works
- Metro

3.1. RIDE SHARE/ PICK UP-DROP OFF

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"Ride share "refers to sharing vehicles of rides or transportation that uses an online enabled platform (such as a smartphone app) to connect passengers with drivers using their personal, non-commercial, vehicles. The convenience of requesting a ride via an app and the competitive pricing for services have made ride sourcing a very common option for many people. Companies like Uber, Lyft, and SideCar are doing a successful job leading ride share possibilities.

One common type of pick up/drop off zone is the "Kiss & Ride". Kiss & Rides usually have designated time limits and are separated from taxi queues in order to maximize vehicle turnover, facilitate traffic flow, and avoid traffic conflicts. Kiss & Rides that are too congested, remote, or have poor visibility will encourage users to find another location closer to the station for picking up/dropping off which may result in traffic conflicts.

Guides

- Ride share and pick up/drop off zones should be located in a highly visible and convenient location accessible to the Mobility Hub users.
- Providing adequate capacity to prevent taxis and vehicles from blocking roadways and pedestrian paths in designing pick up zone is essential.
- The Kiss & Ride zone should have a direct visual connection with the station so drivers waiting in cars can quickly locate their passengers exiting.
- Where space is limited near station entrances, consider sites in the station vicinity. Pick up/drop off spaces for passengers of transit, ride sharing, and car sharing should be located at clearly marked location within direct sight and at close proximity to station entrances.

Best Practices

Utrecht Central Station–Netherlands, *is providing Kiss and Ride area at the front of the busy station and is encouraging commuters to fast and smooch goodbye.*

Photo: Wikimedia

Schofield Railway Station - Sydney, *designated separate spaces for pick up/ drop off of private vehicles, taxis, and ride share.*

Photo: Wikimedia

3.2. CAR SHARE

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"Car sharing" refers to rental services designed to provide a substitute for vehicle ownership and to expand modal opportunities for those that are transit dependent. It makes the occasional use of a car affordable and allows users to drive less, reduce traffic and rely more on alternative modes of transportation. By providing access to car sharing services at Mobility Hubs, users are better able to complete their daily trips without relying on their private vehicles. Car sharing is proven to reduce congestion and help alleviate parking challenges in cities. Accommodating short term parking for car share users not only make this service more attractive, but also diminishes the need to purchase one's own car.

LA County Metro, in cooperation with ZipCar, has already introduced car sharing at several transit locations throughout the region. Central and Regional Mobility Hubs would require that car sharing services be available, while it would be a recommended amenity at Neighborhood Mobility Hubs.

Guides

- Whenever possible, car share vehicles should be grouped together into "pods" of at least two or three vehicles per location on site.
- Scattered vehicle pods throughout the Mobility Hubs are preferable; because they make it more likely a vehicle will be available at any given location, simplify parking acquisition, facilitate on-site maintenance, and make it easier for users to find vehicles.
- In order to inform the transit riders of car share option, pick up/drop off zones should be located in highly visible location and wayfinding signage should be incorporated on site directing public to and from the Mobility Hub.

Vehicle Sharing Kiosk Guides

- Major development projects in proximity to the Regional or Central Mobility Hub should provide rent-free space for a certain period of time, not less than three years, to accommodate the vehicle sharing kiosk within the project site.
- Vehicle sharing kiosk should not be less than 250 - 300 square feet and should be placed at the strategic location that is clearly visible to the users.
- The space provided by the project would accommodate bicycle parking, lockers, and sharing bicycles.
- The project should provide up to at least ten parking spaces for a certain year period, not less than three years, to support the car share program.

Best Practices

ZipCar Charging Station - San Francisco, *For profit private vehicle rental companies oriented toward local residential use, such as Zipcar, Flexcar, and Car2Go.*

Pods make locating car share vehicles easier.

Car sharing and electric vehicle charging infrastructure can be combined.

Photo: Nuenergen Website

City Car share - Berkeley, *launched by transportation visionaries as a Bay Area nonprofit with a goal to make its community a more livable place. Car sharing means fewer cars on the road, less congestion, and less pollution plus significant savings for users.*

Photo: Wikipedia

Option Zones - Portland, *Designated on-street car share parking incorporates public art into wayfinding and signage.*

These "option zones" designed as an on-street parking for car share vehicles, with iconic signpost that doubles as a bike rack.

Photo: StreetsBlog LA

CARHOPPER drivy TURO

Peer-to-peer Carsharing Services, *It is a from of person to person lending or collaborative consumption. Car Hopper, Turo, and Drivy are some of these services that allow owners to list their vehicles for short periods, typically using Internet or mobile app.*

Photo: Wikipedia

3.3. ELECTRIC VEHICLE INFRASTRUCTURE

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Transportation is the largest source of greenhouse gas emissions, the largest consumer of energy, and has significant impacts on air, water, and noise pollution. Encouraging the use of electric vehicles is one step towards mitigating those side effects. A significant hurdle to the adoption of electric vehicles has been the lack of supportive infrastructure available. Currently Union Station, Willow St Station, Universal City/Studio City Station, El Segundo Station, and Sierra Madre Villa Station have EV charging stations already available for riders in Los Angeles. The Mobility Plan outlines a goal to install more than 1,000 new publicly available EV charging stations throughout the City.

Guides

- When locating EV charging stations consider adjacency to accessible parking spaces and accessible route to the Mobility Hub.
- Wayfinding signage should be incorporated to and from the Mobility Hub.
- As with car sharing it is recommended that EV stations be grouped into pods with possible shelters.
- Consider providing EV ready infrastructure for possible future expansion.
- Provide adequate charging station information including maintenance requirements, station status, cost to change, and signage and provisions of emergency contact information.

Best Practices

Park & Ride Lots - LA County Metro, *The stations were selected because of their proximity to major transportation hubs and busy traffic arteries.*

Use its app to scan the station's QR code. Or, touch the key fob on the reader pad to start charging. Key fobs can be purchased from EV Connect.

Photo: Department of Public Works, Los Angeles

Red/Purple Line Westlake – MacArthur Park, *Los Angeles, Metro is currently developing flywheel energy projects at some of the stations. This flywheel energy storage system is able to capture energy generated by trains as they brake into a station.*

Photo:Metro

BUS INFRASTRUCTURE

CHAPTER 4

Discussion

One of the most important elements of first-last mile connectivity is enhancing access to a variety of transit options. By improving transit access, more users will likely opt into public transportation which in turn will reduce vehicle miles traveled, integrate physical activity into daily commute patterns, and improve economic vitality by connecting people to regional markets. In order to encourage transit use as a viable alternative to private vehicles, it should be reliable, efficient, convenient, and safe. The more that our regional transit system meets this description, the better it will serve its existing customer base as well as new riders.

Though there are several elements that can further facilitate transit ridership, bus infrastructure will vary based on the size and scale of the Mobility Hub. As critical nodes in the transportation system, Regional Mobility Hubs shall be designed as world-class infrastructure with transit supportive infrastructure and amenities including loading/unloading zones, bus layover zones, and restrooms for transit staff.

While smaller scaled Mobility Hubs may not be able to accommodate these infrastructural elements, incorporation of transit supportive amenities can assist in improving performance, convenience, and comfort – key factors in improving the transportation experience for both transit users and transit staff. Integration of these transit infrastructure investments with the identity of the surrounding area will make significant contributions to the region's Transit Enhanced Network.

Objectives:

- Bus Loading/Unloading Zones that create safe areas for transit ridership.
- Bus Layover Zones that contribute to efficient bus service and reduce congestion.
- Bus Shelter

Relevant Agencies:

- Los Angeles Department of Transportation
- Metro
- Culver City Bus
- Santa Monica Big Blue Bus

4.1. BUS LAYOVER ZONES

Bus Layover Zones are designated areas typically at the end of any bus route where buses may wait on standby between trips. The purpose of Bus Layover Zones is to ensure buses may depart on time for the next trip, and to provide bus drivers a break area before the next trip. Bus Layover Zones should be located near the end or start of any bus route, and be equipped with break areas and restrooms for transit staff.

Though **Off-Street Bus Layover Zones** are preferred, their spatial requirements are typically difficult to implement at project sites in urban centers. However, when incorporated into larger development projects, they become permanent infrastructural elements and may be expanded into full Mobility Hubs. Off-Street Bus Layover Zones should be strategically located to accommodate overlapping bus lines, and accommodate multiple buses. They are typically permanent for use as Layover Zones, and can be expanded into full Mobility Hubs in the future.

On-Street Bus Layover Zones are generally more easily accommodated in urban contexts as they can be accommodated by reclaiming curb space within the public right-of-way near transit stations. Depending on existing constraints within the right-of-way, they typically only accommodate a small number of buses at one time. On-Street Bus Layover Zones should be strategically located to minimize impacts on any sensitive surrounding uses.

Overall, the positioning of a bus layover zone is a critical element of a city's bus system. Strategically-located facilities contribute to efficient bus service and the reduction of congestion and greenhouse gas emissions, accommodate for future increases in buses accessing the city, and meanwhile reduce conflicts between buses and surrounding uses.

Guides

- Centrally located near the end or start of bus lines will minimize 'dead running' and maximize service hours.
- Bus layover zones should be shared between transit agencies and lines.
- The design should depend on the bus size, number of buses overlaying at the same time, and the general turnover. Typically, bus layover zones are required to be twice the length of the bus with an added 10' for maneuvering.
- Damage on the roadway should be prevented by providing concrete bus pads along the length of layover zones. Typically, bus pads are roughly 90' long by 12' deep.
- Bus layover zones should be incorporated into the transit station area with minimal conflicts or impacts on the surrounding area and should accommodate various sizes of buses.
- It should provide adequate space for buses to maneuver and park safely.
- Bathrooms or "comfort zones" for use by transit staff should be located within easy walking distance (no more than one block away) so that staff may easily access the facilities during their allotted layover period. Bathrooms can range from bus-only bathrooms, public restrooms, or neighboring private restrooms with contractual agreements for regular staff use.

Best Practices

ARTIC - Anaheim, *Orange County, provided adequate bus layover zones as part of the transit hub design. It links commuter and regional rail service and intercity bus systems including Amtrak, Metrolink, OCTA bus service, Anaheim Resort Transportation (ART), and Greyhound.*

Photo: Google Map

Transfer Station of Curitiba, RTL – Brazil, *These glass-covered platforms, bus stations, are similar to what would be the metro station under ground elsewhere. They allow the bus company to have the all the passengers ready to board as the bus arrives.*

Photo: Google Map

Transit Center - El Monte, *Regional bus facility incorporating Off Street bus layover zone, energy-producing photovoltaic panels, use of natural, local resources and materials, and exemplary storm water management system.*

Photo: Metro

INFORMATION/ SIGNAGE

CHAPTER 5

Discussion

Enhancing the user experience by providing branding and information for ease of wayfinding is a core objective of the Mobility Hubs. Wayfinding and signage support the efficient movement of users and should be developed as integral components of a Mobility Hub. The importance of signage and information comes from the need to create informed users, which in turn help create a cleaner, smarter, and more efficient transportation system. As the Mobility Plan's wayfinding goals include providing real-time information at all major transit stations by 2020, coordinating wayfinding at all major transit stations by 2035, and coordinating communication with regional transportation agencies and neighboring jurisdictions, Mobility Hubs will play an integral role making this possible.

Information amenities at Mobility Hubs help both first time visitors and long-time residents to depend on navigate to and from the Hub. This is central to enhancing first-last mile connectivity. When designed well, wayfinding can enhance one's surroundings and contribute to a neighborhood's civic pride and unique sense of place. Additionally, smartphones play a significant role in providing real-time transit information enabling users to customize wayfinding and discover local, place-based information at anytime.

Objectives:

- Provide wayfinding information and services at Mobility Hubs.
- Increase the use of technology to provide Real-Time Transit Information.
- Increase smartphone connectivity to create awareness of multi-modal options.

Relevant Agencies:

- LA Department of Transportation
- Metro
- LA Information Technology Agency

5.1. WAYFINDING

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The essential function of wayfinding is to facilitate users reaching their destinations by indicating the direction of and distance to and from a Mobility Hub. Cluttered and inconsistent directional signage can confuse users. The most effective wayfinding also provides information on alternative routes while highlighting additional points of interest along the way. Wayfinding should be a ubiquitous element of the cityscape so as to always be readily accessible; however, it is especially vital in and around key destinations, along major corridors, and at transit stations and Mobility Hubs.

Wayfinding signage can enhance Mobility Hubs and local areas by including public art, lighting, and landscaping, improving the visual environment. One important aspect of wayfinding signage for Mobility Hubs is the inclusion of the Mobility Hub Icon to reinforce branding and placemaking. The Icon will increase visibility and awareness of Mobility Hubs by highlighting their proximity to the users and local attractions.

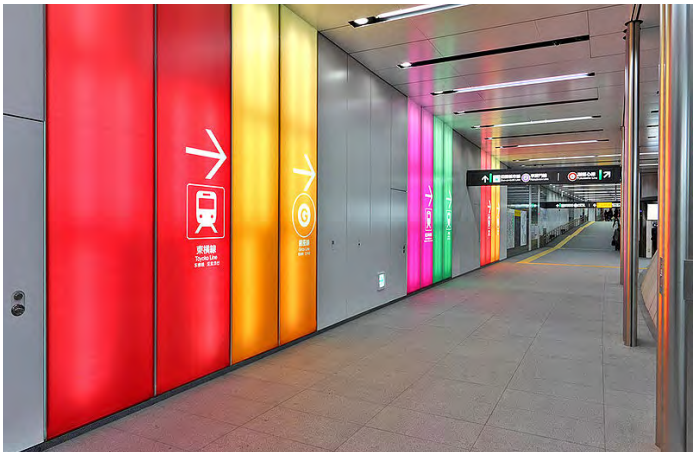
Guides

- Signage should be placed at and immediately adjacent to Mobility Hubs of all sizes.
- Provide widespread, user-friendly information about mobility options and local destinations, delivered through a variety of channels including traditional signage and digital platforms.
- Implement a minimum standard of wayfinding signage in transit stations, including identification signage, direction signage, and accessible wayfinding features.
- Locate directional signage at junctions along walkways, at station entrances/exits, and at navigational barriers.
- Signage at transit stops should be well marked, provide schedule and service information and area maps.
- Highlight station programs, such as car sharing or bike sharing in station areas and provide information on sustainable transportation amenities and networks.
- Use signage as educational tools to demonstrate innovative design features in stations and station areas, such as environmental or conservation efforts in a facility.

Best Practices

Metro, Bike, Hub Signage - Los Angeles, *City of Los Angeles is implementing unified branding wayfinding signage across the city.*

Photo: Metro, Los Angeles



Transfer Corridor of Tokyo Metro Fukutoshin Line - Shibuya Station, *Toyoko, Uses public art, lighting, and landscaping to improve the visual environment.*

Photo: Wikimedia

Raleigh-based Walk [Your City], *The main strategy is to tell pedestrians how many minutes of walking it takes to access amenities. Practical initiatives to increase walkability and wayfinding, temporary movement, which can be grown and implemented as a permanent fixture in neighborhoods in time.*

Photo: Walk [Your City] website

Walk! Philadelphia, *simplified, diagrammatic maps of Center City are located mid-block on both sides of the street. They utilize a "heads-up" orientation which always place the direction the viewer is facing at the top of the map.*

Photo: Wikimedia

Legible London, *A prototype wayfinding system for London that has been initiated in strategic locations in the heart of the city.*

Photo: Wikimedia

5.2. REAL-TIME INFORMATION

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New technologies will continue to help ease our day-to-day mobility. Real-time information services facilitates transfers between transit modes and allows active transportation users to pick the best transit option in real-time. Real-time information also warns users of expected delays or changes in transit service and can help improve the customer experience, particularly when waiting for transit services. This information affords individuals more flexibility to adjust their travel choices as changes occur in real-time. Based on research, for riders without real-time information, perceived wait time is greater than measured wait time. But having real-time information brings perceived wait time in line with actual wait time.

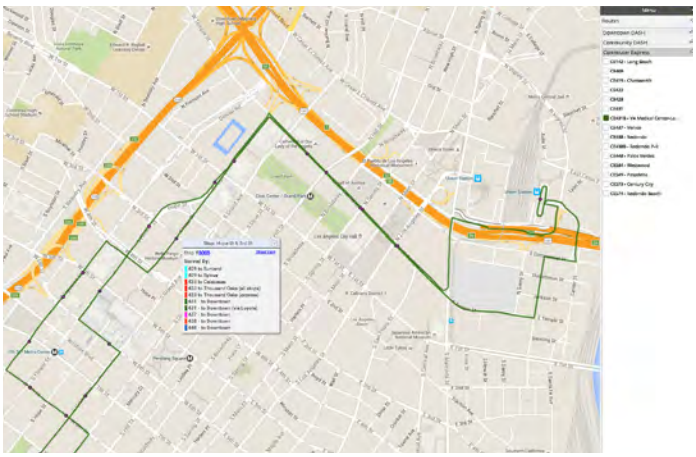
Guides

- Provide accessible real-time information on service information, including arrivals, delays and service alternatives, throughout the transit station and at major transit stops and transfer locations in Mobility Hub areas.
- Integrate community information, such as news, event listings, and public service messages into real-time information program.
- Ensure information is provided in accessible formats for persons with disabilities, such as visual and audible platforms.

Best Practices

NYC MTA Real Time Interactive Information Kiosk,
Designed to deliver the most relevant information to the greatest number of people, the kiosks provide countdown to arrival, one-touch visual directions based on real-time train status, neighborhood maps, and context-relevant advertising.

Photo: Intersection Website



LADOT Commuter Express Real Time Bus Information,
Live map, estimated arrival times, mobile maps providing real time information are available for Dash and Commuter Express routes.

Photo: LA DOT Transit map

5.3. WI-FI/ SMARTPHONE CONNECTIVITY

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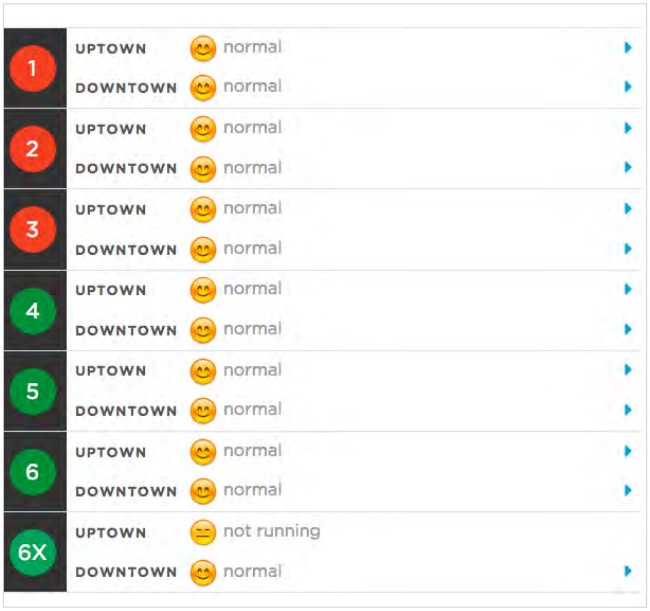
A wide variety of relevant transportation data and information already exist, but for a long time this level of amenity was not easily available and accessible to enhance customer service. The advent of smartphones, however, has created the opportunity for users to have convenient access to information and data via WI-FI anytime they need. Providing free and easy WI-FI connections at Mobility Hubs would make many types of data available and accessible for transit users. Smartphone apps can also provide detailed service advisories for delayed transit, traffic, and safety issues.

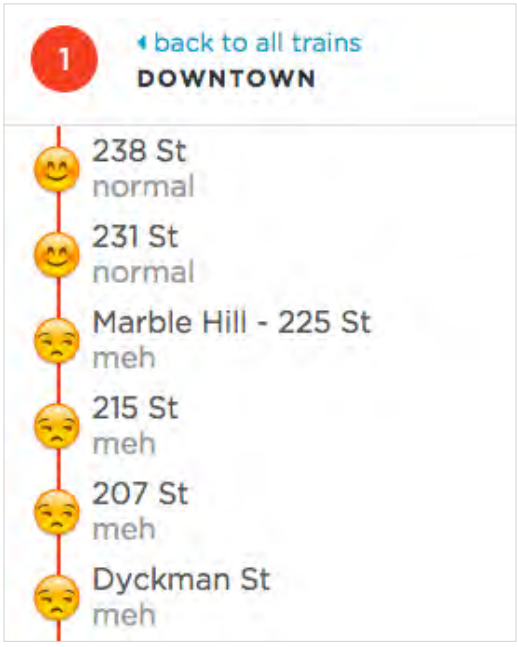
New signage and traditional forms of media will continue to play an important role in wayfinding and providing place-based information for different services such as parking availability, bike facilities, and local destinations. Developing a GIS based marker and locator to designate Mobility Hubs for display on such mobile applications will improve safety and accessibility to different programs. A GIS locator would support wayfinding by assisting users in finding stations or their destinations especially in areas where local wayfinding signage is not readily available. Based on research, some of the effects of using such tools are increased satisfaction with public transportation and feeling of safety. The perception of reliability can definitely be shifted.

Guides

- Free public WI-FI access within a specified distance should be incorporated into Mobility Hubs.
- Developing an open platform/app to display where and what Mobility Hub assets are available is essential in inviting people to the Hubs.

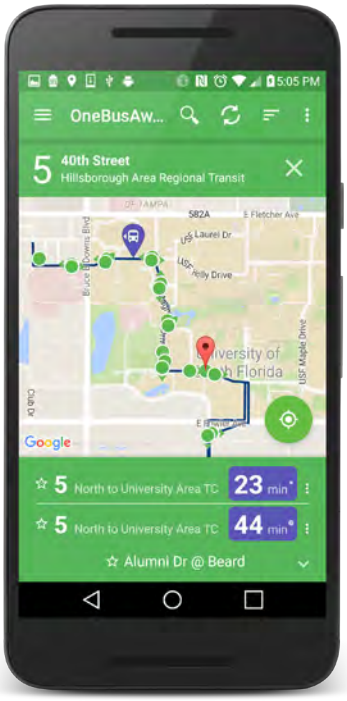
Best Practices





Live Subway Agony Index, *According to WNYC, the Live Agony Index attempts to measure "agony" by monitoring times between trains and adding unhappy points for stations typically crowded at rush hour.*

Photo: screengrab: WNYC



One Bus Away, *is an open source platform for real time transit information. The share of riders frustrated with bus waits fell from 25 percent to 18 percent for those using real-time apps.*

Photo: OneBusAway

LinkNYC, *New York to start replacing payphones with optic fiber WI-FI kiosks.*

It offers an array of free services including high speed Internet, web browsing, cell phone charging and phone calls to anywhere in the U.S.

Photo: City Bridge

SUPPORT SERVICES

CHAPTER 6

Discussion

Support services should be incorporated, especially in the Central and Regional Mobility Hubs, in order to promote a shift in mobility behavior and to provide an attractive pedestrian environment with a high degree of priority, safety and amenities. For many users, safety is a key factor when deciding whether to walk, bike, drive, or take public transit. Therefore, enhancing customer comfort, safety, assistance and information at Mobility Hubs is essential. Children, seniors and people with disabilities must have the same level of access to Mobility Hubs as any other user.

Increasing the comfort of users, providing shelter and waiting areas, increasing accessibility and visibility at day or night, and providing information are all elements of a well-programmed Mobility Hub and will serve to enhance first-last mile connectivity. All these efforts should prioritize and implement innovative sustainable energy, water and waste management practices.

Objectives:

- Establish ambassador programs to assist transit riders at Mobility Hubs.
- Provide rental lockers, shelters with seating, trash receptacles, restrooms, lighting, and other supportive amenities for waiting areas.
- Ensure safety and security of all Mobility Hubs.
- Prioritize implementation of sustainable approach including solar and other renewable sources of energy.

Relevant Agencies:

- LA Department of Transportation
- Metro
- LA Police Department
- LA Department of Public Works

6.1. AMBASSADORS

Placing ambassadors at Mobility Hubs can have a very positive influence on educating community members about transit and increasing their comfort level. Ambassadors are trained personnel, students, or volunteers, knowledgeable of the local area, amenities, services, and the mobility options. An ambassador's goal is to teach users how to feel confident and safe using Mobility Hubs amenities and the transit system as a whole. Mobility Hub Ambassadors may assist users with reading schedules and routes, wayfinding, planning a trip, fare questions, or other special requests (such as wheelchair assistance).

Ambassadors can also play a helpful role in correcting unsafe behavior along the transit lines. Safety Ambassadors work to encourage the community to adopt safe behaviors; intervening when they observe unsafe behavior; and educating the public about the meaning of warning signs installed at the light rail crossings.

Guides

- Depending on the size and context of a Mobility Hub on-site support staff or Mobility Hub Ambassadors should be established to assist transit customers.
- Ambassadors program is critical to be incorporated as part of the Regional Mobility Hubs.
- Placing ambassadors at Mobility Hubs is encouraged and can be especially helpful during special public/ private events, school days and rush hours to broaden awareness and provide safety information.

Best Practices

LA Metro Safety Ambassador Program, *along the Blue, Gold, and Expo lines. For the past 10 years, Metro has enlisted the aid of retired bus and rail operators to serve as "Rail Safety Ambassadors".*

Photo: Metro

6.2. WAITING AREAS

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Comfortable, easily accessible, and well-designed waiting areas should be incorporated into all Mobility Hubs to varying degrees. Waiting areas can be located in the public right of way, or on private property developed privately or publicly.

A Mobility Hub's waiting area may be the first element of the overall network encountered by users and therefore can have significant impacts on their willingness to adopt transit use in place of driving. Amenities available at waiting areas differ depending on Mobility Hub typology and include, but are not limited to, bus shelters, weather protection, seating, trash receptacles, lighting, landscaping, retail, bike amenities, personal lockers, and real-time transit information, charging stations for devices.

Bus shelters are an especially important waiting area amenity. Neighborhood Mobility Hubs are primarily found in areas that do not have rail, but rather several bus and rapid bus services. Neighborhood Hubs generally function as first-last mile connections to Central and Regional Mobility Hubs. Therefore, enhanced bus waiting areas are necessary to improve safety, user comfort, and security at Mobility Hubs. Bus shelters should provide seating, shading, lighting, real-time transit information, charging stations, and wayfinding signage. Additionally, where applicable, introduce transit boarding islands to allocate more space for bus boarding.

Guides

- Waiting areas should be designed to ensure safe access for all users, regardless of age, ability, or transportation mode of choice.
- Waiting areas should not conflict with the main movement areas and should offer clear views and sight lines between them and boarding areas and surrounding neighborhoods.
- Locate vulnerable activities, such as waiting at night, in safe locations with good natural surveillance and street-level activity, such as along mixed-use streets or retail plazas.
- Provide shade in summer; and provide protection from wind, rain with plant screens, walls and canopies.
- Emphasize the use of color, light, street furniture and natural materials to counter dreary effects of winter days and nights.
- Real-time service information should be provided at waiting areas.
- Incorporate coordinated street furniture programs that reflect the vision and character of Mobility Hubs that provide seating, sheltered waiting areas for transit, light standards and waste/recycling receptacles.
- In some cases, building lobbies should be designed as interior waiting areas for transit users. These lobbies should be located within close proximity of the transit and face the service area. For passenger comfort, seating should be provided in the lobby.
- Personal lockers should be provided especially as part of the Regional Mobility Hubs
- Public restrooms should be incorporated especially to the Central and Regional Mobility Hubs.

Rapid Transit - Curitiba, *Brazil, Seating and clear sight lines provide a more enjoyable experience to travelers.*

Photo: Wikimedia

Union Station - Los Angeles, *is providing enough lighting, seating areas, retail, free WI-FI, real-time information, and restaurants nearby.*

Photo: Metrolink

Spring/ First Street Enhanced Bus Shelter - Los Angeles, *provides various amenities such as real-time next bus information, WI-FI, bus shelter, USB port for charging phones, shelter and seating area.*

6.3. SAFETY AND SECURITY

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Safety at Mobility Hubs is enhanced by protected facilities, improved street crossings, strategic lighting, and slower vehicular speeds. Pedestrian infrastructure at Mobility Hubs should be designed to create a barrier-free, accessible pedestrian network. Pedestrian/vehicular conflicts around Mobility Hubs should be identified so that mitigation strategies can be implemented to ensure a safe and comfortable pedestrian experience. Additionally, providing more than one access point will ensure that persons with disabilities have safe and direct access to or from Mobility Hubs.

Finally, depending on typology and area context different security options can be implemented at Mobility Hubs. These can include: on-site security personnel, security cameras, panic button apps for smart phones, etc. Maintaining clear sight lines between waiting areas and the surrounding neighborhood can also facilitate natural surveillance (also known as 'eyes on the street') at Mobility Hubs.

6.4. SUSTAINABLE APPROACH

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Transportation energy use and emissions could be reduced significantly by improving transit service and concentrating people and jobs around transit nodes. There is an opportunity to make Mobility Hubs best practice examples of environmental sustainability by implementing strategies for minimizing their environmental footprint, both in terms of design and operation of facilities.

Implementing innovative strategies for energy efficiency, waste management and storm water run-off management would minimize the Mobility Hub's environmental footprint. Transit facilities and public buildings should be designed and retrofitted to meet high standards of energy conservation through existing green building standards and strategies. Solar and other renewable sources of energy should be prioritized and implemented.

Guides

- High-performance building envelope systems should be incorporated as part of the building design.
- Operable and controllable systems should be included for user comfort.
- Buildings should be designed "solar ready" including adaptable roof surfaces, effective building orientation and assess solar suitability on site.
- Solar powered lighting and LED lighting should be implemented to optimize energy consumption for building and landscape design.
- Incorporate stormwater management techniques into streetscape and landscape design that encourage infiltration and water reuse, such as bio-retention areas, bioswales to reduce the amount of storm water run-off.
- Provide shade and reduce heat island effects by planting shade mature trees with large canopy.
- Use native and drought tolerant landscaping to minimize irrigation.
- Minimize impermeable surfaces by utilizing permeable pavers and soft landscaped areas.

Best Practices

PV Stop Bus Pole – East Los Angeles, *to improve safety and security for Patrons waiting for buses at night over 200 solar light poles at various Metro and Foothill Transit bus stops were installed.*

Photo: Department of Public Works

Green Streets stormwater program - Elmer Avenue, *Los Angeles, This is a perfect example of how function and form can be accomplished successfully. The function of the streets, sidewalk, and garden is to decrease the urban runoff pollution in California which is the number one source of pollution in southern California.*

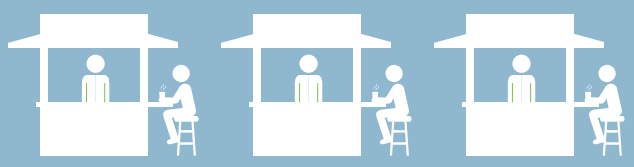
Photo: Green Streets

Bus Stop - Los Angeles, *Great Streets will be getting bus stops with smart benches, bus shelters with free WI-FI, and solar-powered USB phone charges.*

Photo: Great Streets

ACTIVE USES

CHAPTER 7



Discussion

As the city continues to expand and invest in its infrastructure, improvements must also be made to enhance the streetscape, creating attractive environments for walking, biking, and transit to create an integrated transportation system. Mobility Hubs provide unique opportunities to inject active uses at transit stations and help transform the street life of the neighborhood.

Mobility Hubs should be designed as attractive and walkable destinations in the private and public realm, providing a suite of active uses and programming to support the core transit infrastructure and facilitate transit ridership. With a vibrant mix of uses including retail, public space, and connections to other active uses, Mobility Hubs make the transit system more attractive to potential users, providing places for residents to gather, congregate, sit, watch, and interact. When clustered together, these active uses make it convenient for transit riders to run errands by walking or biking along their daily commutes to and from work. When done successfully, these practical uses can help contribute to an active street life, ensuring a public area that is safe, attractive, and comfortable. Pedestrian and retail activity along street corridors is vital to the economic health of neighborhoods.

Active uses within Mobility Hubs serve a variety of benefits essential to city life. In addition to promoting transit ridership, they can increase access to healthy food, and encourage small business interaction.

Objectives:

- Retail Uses to activate transit areas and provide convenient shopping and services.
- Public Spaces to activate transit areas and provide opportunities to gather or pause.

Relevant Agencies:

- Department of City Planning
- Department of Building and Safety
- Metro

7.1. RETAIL

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Neighborhoods with frequent and reliable transit service are the ideal place to cluster uses and services, enabling residents and/or employees to complete a variety of errands within a single trip. Mobility Hubs enhance the first-last mile connections for users by providing opportunities for incidental shopping and increasing access to needed goods and services. By concentrating a variety of fixed and temporary retail uses near a Mobility Hub, users can pick up dinner, drop off their dry-cleaning, or use the ATM on their way home without additional vehicular trips. Through mobile markets, farmers markets, and food vendors, there are unique opportunities to also inject locally produced, nutritious foods in neighborhoods that may typically have limited easy access to healthy food. Retail can be provided on-site at transit stations or at nearby sites within walking distance, and may range from temporary structures, such as carts, kiosks, or other flexible structures, to fixed permanent retail spaces. Collectively, a healthy mix of uses generates a vibrant assortment of people who go about their business at many hours of the day, while also promoting local economy, creating great destinations, and fostering social gatherings.

Guides

- Activate ground floor uses along sidewalks, plazas, paseos, and station platforms to accommodate vibrant pedestrian activity.
- Ground-floor active uses should be designed with a high level of transparency. Generally, 75 percent of facades of ground floor retail uses should be devoted to pedestrian entrances and display windows.
- On-site carts, kiosks, or other temporary/ permanent structures ranging from 1,500 to 7,500 square feet with amenities including convenience store, drug store, coffee shop, newsstand, bookstore, produce or food market should be provided to activate existing transit stations.
- Establish small markets, shops selling healthy foods, and restaurants serving healthy food options.
- Regular farmers' markets should be programmed to provide direct farm-to-plate opportunities where local producers can interact with consumers and provide food options tailored to local customs and cultures.

Best Practices

Famima! was a one-stop-shop convenience store offering food, *products, and services for transit users. Most stores are located around transit stations and include a fresh-food deli, magazines, ATMs, greeting cards, alcohol, and TAP cards.*

Photo: DTLA Rising website

Metro kiosks - New York, *can be leased and adapted into retail spaces. The Zine Newsstand became a popular stop in selling magazines, independent books, records, artwork to transit users.*

Photo: Untapped Cities by Michelle Young

Pershing Square Farmers Market - Los Angeles, *is located just one block away from the Pershing Square Station and meets weekly to provide food, flowers, baked goods, and crafts to passersby.*

Photo: LA Downtown News, Wikipedia

Western / Vermont Metro Station - Los Angeles, *incorporates ground-floor retail in a primarily residential building to activate the transit area and street life.*

Photo: Wikipedia

7.2. PUBLIC SPACE

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A Mobility Hub should plan for a high-quality public realm and incorporate a diversity of public spaces, ranging from plazas, parks, courtyards, and landscaped seating areas that are highly visible, convenient, and accessible from the public street and the transit station. A variety of public spaces encourages social interaction and community participation.

Increasing the availability of, and access to, open space is an important part of the Mobility Plan. Just as with increased access to goods and services through convenient retail access, open spaces within or nearby Mobility Hubs further enhance first-last mile connectivity. Open spaces enhanced with shade trees provide places for users to gather, meet, wait and exercise. Public spaces within Mobility Hubs should be flexible spaces to accommodate a variety of uses ranging from seating, conversing, art walks, vendor fairs, mobile markets, or Farmers Markets.

Guides

- Design attractive and functional public gathering spaces, including parks, plazas, courtyards, forecourts, and sidewalks to create the desired ambience and complement the proposed land uses within Mobility Hub.
- Public spaces should be activated by using water features, pedestrian-level lighting, murals or artwork, benches, landscaping, or special paving so that they are safe and visually interesting places.
- Situate active ground-floor uses on elevations facing plazas and public spaces, such as restaurant seating, reception and waiting areas, lobbies, and retail, where they are visible to passersby.
- Where possible, include overhead architectural features, such as awnings, canopies, trellises, or cornice treatments to provide shade and reduce heat gain.
- Create a sense of enclosure with a mature tree canopy and landscaping.
- Maintain a sense of openness around public spaces with minimal obstructions, fencing, or deterrents. If provided, bollards and fencing should be low in height and movable.
- Streetscape improvements should blend seamlessly from the sidewalk to the public space.
- Art should be integrated into public spaces and around transit stations, especially in neighborhoods of special heritage or community significance.
- Building mass and height should minimize negative environmental effects, such as overshadowing of public spaces.
- Creating temporary or permanent parklets is encouraged close or within the Mobility Hub. A parklet is an expansion of the sidewalk into one or more on-street parking spaces to create people-oriented places. Parklets encourage pedestrian activity by offering human scale amenities which is especially beneficial in areas that lack sufficient sidewalk width or access to public space.

Best Practices

Del Mar Station Transit Village in - Pasadena, *links the Gold Line transit platform with residential, retail, and an integrated plaza.*

Photo: Wikipedia

Grand Park Station - Los Angeles, *is centered in the heart of Grand Park, which provides unique opportunities for passive lounging, eating, playing, and active fitness.*

Photo: Wikimedia

Bryant Park Station – New York, *The station is located in the heart of the Bryant Park, which provides a comfortable place to relax and have fun with free WI-FI and solar powered charging stations. Bryant Park is one of the busiest public spaces featuring movable chairs, shady and sunny areas, good food, ping pong tables, an outdoor reading room, juggling, knitting, and language classes.*

Photo: Wikimedia

Hope Street Parklet - Los Angeles, *People Street program is building a parklet at the southwest corner of Hope and 11th Street, just a few blocks south of the Metro Pico Station, STAPLES Center, and L.A. Live.*

Photo: South Park website

PEDESTRIAN CONNECTIONS

CHAPTER 8

Discussion

Streets infrastructure not only influences our mobility choices, but it also affects the safety and quality of life in our neighborhoods. Pedestrians are at risk within environments surrounding transit stations, primarily from automobile traffic. Whether in a mixed use commercial or residential area, a safe, interesting, and engaging public realm and sidewalks encourage walking or cycling and make the transit system more attractive to potential users. While pedestrian amenities are particularly important in close proximity to the station, an attractive pedestrian environment should be provided throughout the different Mobility Hub zones.

Objectives:

- Enhance pedestrian connections from surrounding to the Mobility Hub.
- Improve pedestrian connections at the Mobility Hub to support a walkable station area and promote the use of transit.

Relevant Agencies:

- LA Department of Transportation
- LA Department of Public Works
- Metro
- Great Streets programs
- Green Streets programs
- People Street programs

8.1. TO THE Mobility Hub

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Federal transit law explicitly recognizes the need to ensure that active transportation networks connect with public transit. Unfortunately in Los Angeles, there are physical constraints that deter pedestrian activity. In some cases sidewalks are physically constrained or literally broken and heaved, or even more surprisingly, discontinuous. Long blocks and large parking lots create circuitous access routes for pedestrians. Lack of adequate lighting, dark freeway underpasses and general neglect all challenge users' sense of personal security. In some areas, the existing right-of-way is severely constrained. Pedestrian movement is often impeded just a few blocks from transit stations due to overlay wide streets and freeway undercrossings that are dimly lit and poorly maintained.

All of these existing conditions represent challenges to transit system access, system efficiency, user experience and safety. A strategy that addresses these issues directly will increase transit ridership, improve user experience, and contribute to meeting Metro, regional and state policy goals relating to sustainability, clean air, and health.

Guides

- Provide enhanced paving materials (colored, stamped, permeable pavers, patterned) to identify proximity to Mobility Hubs, high pedestrian traffic zones or community elements such as commercial areas, schools and parks.
- The choice of paving material and design should minimize uneven surfaces to ensure pedestrian comfort, safety and ease especially for people with physical disabilities.
- Pedestrian connections between the Mobility Hub and the surrounding neighborhoods and communities should be improved. Appropriately locate street crossings in response to the anticipated traffic flow and convenience of the pedestrian.
- Locate private driveways off of main public streets to side streets and alleys whenever feasible to minimize conflicts to pedestrian circulation routes.
- Incorporate such features as white markings, signage and lighting so that pedestrian crossings are visible to moving vehicles during the day and night.
- Improve visibility for pedestrians in crosswalks by installing curb extensions/bump outs and advance stop bars, and eliminating on-street parking spaces adjacent to the crossing.
- Create the shortest possible crossing distance at pedestrian crossings on wide streets. Devices that decrease the crossing distance may include a mid-street crossing island, an area of refuge between a right-turn lane and through lane, a curb extension/bump out and a minimal curb radius.
- Provide angled or parallel on-street parking wherever possible to slow down the traffic.
- Design or maintain clear view corridors along sidewalks connecting to the transit station and important civic buildings and landmarks.

Best Practices

NoHo Plaza - Los Angeles, *is located in an underutilized alley west of Lankershim Boulevard and north of Magnolia Boulevard in the heart of the North Hollywood Arts District. This portion of alley has been repurposed as a public plaza space with tables, chairs, and umbrellas for people to enjoy. A colorful surface treatment and perimeter planters define the Plaza bounds.*

Photo: People Street Flickr

Hollywood and Highland Crosswalks - Los Angeles, *Great Streets program is improving pedestrian realm near the Hollywood/ Highland Metro Station by developing a scramble crosswalk. A 'scramble' is a crossing system that allows everyone to cross from each corner, in all directions, including diagonally, at the same time.*

Photo: Great Streets • Photo: Jeremiah Cox

8.2. AT THE Mobility Hub

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Providing visual interest at the pedestrian scale through thoughtful landscaping and building design will encourage people to use the Mobility Hub, help contribute an active street life, and support a walkable station area. Placemaking within a Mobility Hub while supporting convenient, safe, and enjoyable pedestrian linkages to and from all transit options should build upon a neighborhood's unique character through context sensitive architecture and landscaping. Although each Mobility Hub will have a unique set of characteristics, it is important that they all promote a well-defined sense of place and provide comfortable, safe, and attractive streets and pedestrian walkways.

The provision of high quality public sidewalks on all streets will help contribute to the liveliness of the Mobility Hub area as they are important spaces for social interaction. On key pedestrian corridors, the sidewalk design should prioritize the pedestrian by providing an attractive, interesting and comfortable walking experience, while accommodating a balance between movement and amenities.

Guides

- Universal design principles should inform station area design to ensure accessibility for all segments of the population.
- Sidewalk width should relate to its function and be designed to accommodate the anticipated amount of pedestrian traffic.
- A well-defined street and a sense of enclosure with a tree canopy and landscaping should be incorporated. Street trees should be placed at uniform intervals in the buffer zone of the sidewalk.
- Provide buffer between pedestrians and moving vehicles by the use of landscape and street furniture (benches, newspaper racks, pedestrian information kiosks, bicycle racks, bus shelters, and pedestrian lighting).
- Street furniture, such as benches, bike racks, waste bins, artwork, signage and information kiosks should be placed in the buffer zone of the sidewalk.
- Signage along primary pedestrian routes should be scaled and located for the pedestrian. Provide direct paths of travel for pedestrian destinations within large developments. Especially near transit lines, create primary entrances for pedestrians that are safe, easily accessible, and a short distance from transit stops.
- Optimize natural surveillance for "eyes-on-the-street" sense of safety. Design strategies include: adequate site lighting; mixed-use development with retail at-grade and residential or office development above; avoiding blank walls; and low level fencing or vegetation that allows visual surveillance of semi-private areas and parking lots.
- Locate buildings close to the street to create a sense of enclosure and comfort for pedestrians. Limit the building setback from the road right of way.
- Building elevations surrounding transit stations should be articulated with different textures, colors, materials, and architectural features to add visual interest and celebrate the transit station presence.
- An appropriate street wall height will help maintain a human scale at the sidewalk, ensuring adequate sunlight, sky view and ventilation.
- Adopt goods movement strategies within Mobility Hubs that support complete streets while ensuring the efficient delivery of goods and services.

Best Practices

Liverpool Street Station - London, *Movement areas within stations should be free of obstacles and provide clear routes between station activity areas. Attractive, efficient, and understandable station spaces are key to a high-quality user experience.*

Photo: Wikimedia


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APPENDIX B

REGIONAL MOBILITY HUB IMPLEMENTATION STRATEGY

Mobility Hub Features Catalog

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IMPERIAL COUNTY TRANSPORTATION COMMISSION

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INTRODUCTION

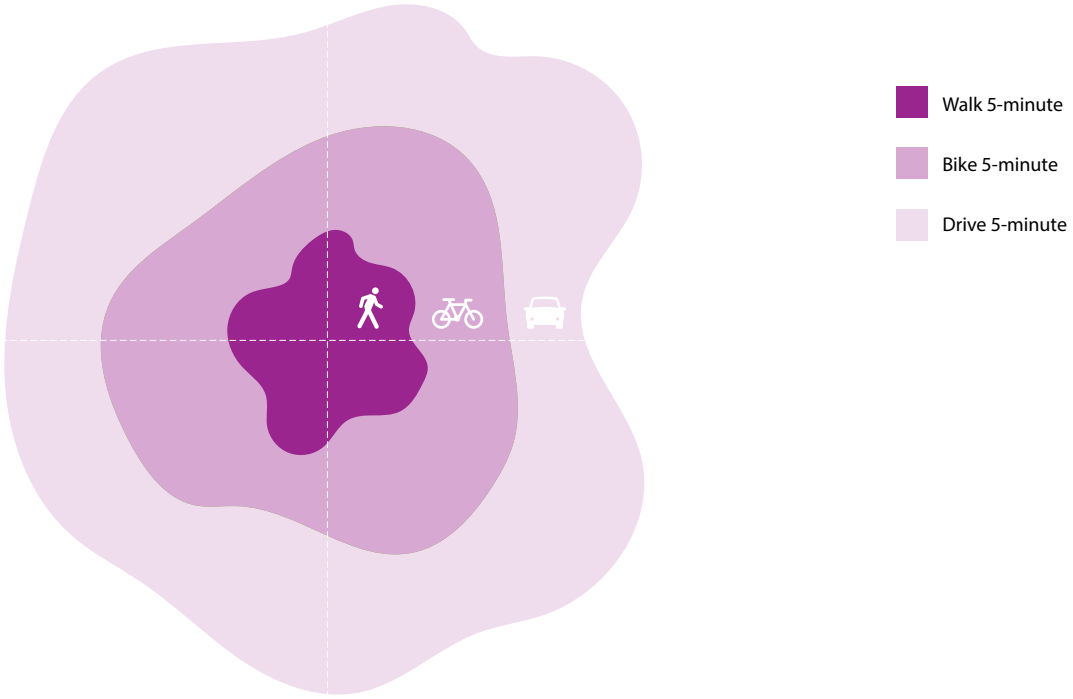
As the San Diego region and the Imperial Valley continue to grow, it will be vital to manage the increasing demands on our transportation system in ways that make it more efficient while also offering people viable alternatives to driving alone. Mobility hubs will be an important part of this effort. They are places of connectivity where different modes of travel — walking, biking, transit, and shared mobility options — come together in one place to help people make connections quickly and get to where they need to go.

This Mobility Hub Features Catalog is a resource for regional agencies, local jurisdictions, transit operators, and private service providers as they collaborate to design and implement mobility hubs around the region. It describes the kinds of services, amenities, and technologies that can work together to make it easier for people to connect to transit, while also providing them with more transportation options overall. These mobility hub features may include various transit station improvements such as enhanced waiting areas with landscaping and lighting, complimentary WiFi and real-time travel information; wider sidewalks, pedestrian lighting and trees for shade; bike paths, designated bike lanes, and bike parking options; dedicated bus lanes and supporting signal improvements; service facilities for shared cars, scooters, and electric vehicles; smart parking technology; and more. Each feature can be tailored to the unique needs of an individual community.

The mobility choices that people have in their communities are constantly evolving as their needs and preferences change. For example, some services described in the pages that follow could be fully automated within the next decade. This catalog isn't intended to describe all the possible features of a successful mobility hub. Rather, it considers the evolving collection of mobility services and technologies that will help shape how we move around our region in the future.

MOBILITY HUB ACCESS

Mobility hubs, at their core, are places where people can make seamless connections between public transit and other travel options. Each mobility hub can be designed specifically for the surrounding community it serves, ultimately making it easier for residents, employees, and visitors to use transit to travel from home to work and a wide variety of destinations in between. A mobility hub area includes not just the transit station itself but all those services and destinations that are accessible within a 5-min walk, bike, or drive to/from high-frequency transit.



The Regional Mobility Hub Implementation Strategy identifies the following types of services and amenities that may be found within the access zones. Some features may be concentrated within a short walk to transit, while others may serve people better who have to bike or use a motorized service to reach a transit stop:

TRANSIT AMENITIES

These are features located in the immediate transit station area to help riders plan their trips and make connections while offering them a safe and comfortable place to wait for their ride.

PEDESTRIAN AMENITIES

These features are located within a five-minute walk to transit and may include safe and convenient walkways and crossings.

BIKE AMENITIES

These features are located within a five-minute bike ride to transit and may include an efficient network of bikeways, secure options for parking a bike, and conveniently located options for bikeshare.

MOTORIZED SERVICES AMENITIES

These features are located within a five-minute drive to transit and may include on-demand, motorized shared services and infrastructure improvements that support their efficient operation.

SUPPORT SERVICES & AMENITIES

These features may exist within all mobility hub access zones and can include wayfinding, mobile retail services, and integrated trip planning and payment options.

CONTENTS

The Mobility Hub Features Catalog is organized by the five categories of services and amenities listed below. All mobility hub icons are interactive, allowing a reader to click through to that specific catalog entry. At any time, a reader may click the gray house icon featured at the bottom of each catalog entry page and return to this mobility hub icon table of contents. Each catalog entry includes a definition, implementation considerations, and an "Element in Action" section that describes how the feature has worked successfully in real-world situations. Look for the autonomous vehicle icon to learn how mobility hub features may be influenced by future mobility changes.

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TRANSIT AMENITIES

1 TRANSIT AMENITIES

ENHANCED TRANSIT WAITING AREAS

DEFINITION

Waiting areas provide a safe and comfortable place for passengers to wait for their transit or shared mobility ride. Area enhancements may include seating, landscaping, lighting, shade and rain cover, trash receptacles, complimentary WiFi, real-time transit arrival alerts, and daily schedule information. These amenities support the mobility hub concept by improving a passenger's overall transit riding experience, encouraging new riders to try transit, and increasing a passenger's sense of security.

IMPLEMENTATION CONSIDERATIONS

- Consider how people use transit stops in order to select which features get priority. For example, if people transfer between transit and other modes of travel at a location, an interactive kiosk and enhanced wayfinding may be higher priorities.
- Determine which enhancements will provide the most benefits. Improving aesthetics with landscaping or public art may be desirable. At the same time, functional enhancements such as fare payment kiosks, real-time arrival information, and interactive trip planning kiosks may give transit users a better experience overall.
- When designing amenities, make transit service efficiency a top priority. Any travel delays along routes can add up, frustrating passengers and costing transit agencies money.
- Consider other amenities that will make a waiting area more comfortable and convenient. These may include seating or lean bars, water fountains, trash and recycle bins, complimentary WiFi, USB charging ports, and shade structures and screens.
- If space allows, consider adding transit boarding islands, bulb-outs, and other physical improvements. These can ease connections between a transit stop and the adjacent mobility network, streamline transit service by allowing vehicles to make in-lane stops, preserve valuable space for pedestrian walkways, and add space for waiting transit customers.
- Provide shade at ticket machine kiosks so people can more easily read the screens.
- Consider providing special event kiosks to help people who are buying tickets on busy days when there are special events.
- Consider incorporating placemaking elements into transit stop design to integrate transit service into the surrounding community. Public art, listings of upcoming neighborhood events, and local business highlights can help personalize a transit waiting area. Other features such as swings, gardens, and interactive games also can make waiting more enjoyable.
- Local development regulations and the Americans with Disabilities Act (ADA) may guide the design of certain enhancements in a transit waiting area, including interactive kiosks, sidewalks, and seating.
- Maintaining transit waiting areas can require a significant amount of time and money. A custom designed shelter, for example, may require extra effort, funding, and even an inventory of custom replacement parts. A standard shelter may be more affordable.
- The Transit Street Design Guide from the National Association of City Transportation Officials (NACTO) provides additional transit waiting area design guidance.

ELEMENT IN ACTION

Ventura Bus Home – Ventura, CA

Photo courtesy of Dennis Oppenheim

The City of Ventura Public Art Program, in collaboration with the Public Works Department, commissioned a "bus home" architectural installation – the first artist-designed public facility in Ventura. It depicts the metamorphosis of a bus transforming into a home, while also serving as a functional bus transfer stop at the Pacific View Mall. The waiting area provides seating, trash bins, and shade. As a public art installation, the bus stop provides visual entertainment for transit riders, pedestrians, and other travelers.

1 TRANSIT AMENITIES

ELEMENT IN ACTION (continued)

Spring Street Bus Stop – Los Angeles, CA

The Spring Street bus station across the street from Los Angeles City Hall is a "smart shelter" equipped with LED lighting, USB charging ports, complimentary WiFi, real-time arrival information, and a push-to-talk button for the visually impaired. This station is one example of the city's innovative public-private partnership (P3) with Outfront Media and JCDecaux North America to enrich the urban transit experience and revitalize public spaces. Advertising media panels generate revenue for the P3 program, and a portion is shared with the city annually.

Photos courtesy of JC Decaux

Caribou Coffee Bus Shelters – Minneapolis, MN

Photo courtesy of Colle McVoy

Three downtown Minneapolis bus shelters were transformed into life-size toaster ovens to keep transit riders warm during cold Minnesota winters and market the Caribou Coffee chain. The shelters are situated near Caribou coffeehouses in high traffic areas close to downtown. Overhead heat lamps radiate heat and glow red, adding to the toaster oven design.

Osmose Station - Paris, France

The Osmose experimental bus station on Boulevard Diderot has made waiting for a transit ride enjoyable. People can access real-time bus arrival information, explore the area with an interactive touch-screen map, locate local businesses and services, charge a device, connect to WiFi, purchase tickets to events, rent a bike, buy a cup of coffee, and even borrow a book for their bus ride from a self-serving lending library.

Photos courtesy of Aurel Design Urbain and Régie Autonome des Transports Parisiens (RATP)

1 TRANSIT AMENITIES

PASSENGER LOADING ZONES

DEFINITION

Passenger loading zones are places where passengers can be dropped off or picked up, conveniently and safely. They are typically marked as designated curb spaces that can be used by a wide variety of shared mobility services – shuttles, taxis, carpools, vanpools, and on-demand rideshare services.

IMPLEMENTATION CONSIDERATIONS

- Carefully consider where to situate loading zones throughout the mobility hub area, not just at the transit station.
- Make sure loading zone signs clearly communicate what's allowed and not allowed, and place those signs where they're easily visible.
- Determine whether painting a curb and/or installing signs are sufficient to designate passenger loading zones. If not, consider using dynamic signs to better capture people's attention and inform them.
- If local jurisdictions do not allow idling, consider installing signs to inform drivers and devoting resources to enforcing those rules.
- Consider Americans with Disabilities Act (ADA) requirements when designing loading zones.
- Carefully estimate how many vehicles will use passenger loading zones at various times of day, how long drivers will stop, and how this activity will impact traffic.
- Work with service providers to balance the needs of drivers using passenger loading zones and transit vehicles using operational and commercial loading and unloading zones with the needs of transit stop loading and unloading zones.
- During off-peak hours, consider using passenger loading zones for commercial loading, freight delivery, and other purposes besides dropping off and picking up people. Allowing these other uses can ensure that passenger loading zones are put to use around the clock.
- Loading zones designated for taxis and shuttles have existed for decades. But the growing popularity of on-demand ridesharing services is requiring local jurisdictions to develop new policies that accommodate these services without slowing the flow of traffic and safe passenger loading and unloading. These policies should consider the needs of a diverse group of users. For example, "kiss & ride" vehicles may only need the space for a minute or two while taxis may occupy the space for several hours.
- Work with on-demand rideshare services to develop in-app prompts, so drivers and riders know where to find dedicated passenger loading zones.
- Trip planning applications soon will integrate transit options with rideshare and shuttle services. Track this progress and consider any implications for designing passenger loading zones.

The need for convenient passenger loading spaces will increase as more people use shared autonomous vehicles. Meanwhile, less space for parking may be needed as more people use autonomous shuttles and ridehailing services to connect to transit.

ELEMENT IN ACTION

Crawley, West Sussex, England

Taxi passenger loading zones are conveniently located at the Crawley Towne Centre in West Sussex. Riders may also connect to a nearby railway station and two dozen bus routes, which makes this location a multimodal hub for commuters and others.

Photo courtesy of Livable City and Tom Radulovich

4th and King Caltrain Station, San Francisco

The 4th and King Caltrain Station is one of San Francisco's busiest hubs for transit, taxis, rideshare services, and employer shuttles. Designated passenger loading zones for rideshare services were installed using clear signs, curb treatments, and in-app prompts that alert riders and drivers to proceed to designated areas.

1 TRANSIT AMENITIES

REAL-TIME TRAVEL INFORMATION

DEFINITION

Real-time travel information helps passengers make informed travel choices based on the availability of nearby mobility options. People can plan their time more effectively, wait less for transit options, and ultimately become happier with alternatives to driving alone. Real-time travel information also may work in combination with other transit station improvements, improving the overall transit experience.

IMPLEMENTATION CONSIDERATIONS

- Developers of real-time travel information should consider what transit customers want to make their trips more efficient.
- In addition to real-time vehicle location data, real-time information may include current traffic conditions, transit real-time operations, historical traffic conditions, and historical transit operations data.
- Designing real-time passenger information should be coordinated with relevant transit agencies, or those agencies should design it directly.
- Signs should adhere to universal design standards. Signs may include an audio option for visually impaired people. Traditionally, this option was limited to wide-area passenger annunciators, which were limited in the length and frequency of announcements. Smartphone apps and beacon technology now enable more targeted and detailed audio information to be delivered.
- A common way to provide real-time information is through variable message signs that indicate transit arrival times at a stop or station.
- Current information also can be displayed on LED screens situated at high-volume transit stations. These screens provide live updates on transit arrival times, and on the availability of nearby shared mobility services such as carshare, bikeshare, and on-demand rideshare. Information offered could include the time until the next transit service arrives, the distance to the nearest carshare vehicle or bikeshare station, and the availability of rideshare services.
- Displays are updated in real-time to account for traffic, weather, and other delays.
- Beacon technology can be installed in a transit station to guide riders to mobility services and other amenities. This tool transmits transit information wirelessly to users with Bluetooth-enabled smartphones. Services may range from turn-by-turn wayfinding instructions to real-time transit service updates at stations and stops. These beacons even could provide messages in various languages, provide directions to wheelchair accessible facilities within the station area, and assist patrons with cognitive disabilities.
- To establish system connectivity, redundancy, and reliability, integrating real-time information with a regional data hub such as the Transportation Management Center San Diego County is recommended.
- Real-time information on transit and shared mobility services that is transmitted to smartphones either as texts or through apps can supplement physical displays mounted at transit stations.
- Consider policies related to the local sign code. Americans with Disabilities Act (ADA) requirements dictate specific fonts and colors for signs.
- Consider Title VI regulations impacting information provided in English.
- Federal and state grants can fund the installation of real-time technologies.

SAMPLE REAL-TIME TRAVEL INFORMATION IMPROVEMENTS

Real-Time Transit Arrival Information

Nostrand Avenue-Rogers Avenue Select Bus Service close up © 2014 available under CC BY-NC-ND 2.0

Real-time transit arrival information lets riders know exactly when a bus, train, or Trolley will arrive at a given stop. In San Diego, *Rapid* and local bus patrons can text a transit stop ID (located at the bottom of each bus stop sign) to "GOMTS" and immediately receive a text message with the latest arrival information. Physical displays with real-time arrival information, meanwhile, can keep any rider up to date – whether or not they have a smartphone. These physical displays also can integrate wayfinding tools. Overall, real-time information makes riders more satisfied customers, and more willing to use public transit again instead of driving alone.

1 TRANSIT AMENITIES

SAMPLE REAL-TIME TRAVEL INFORMATION IMPROVEMENTS (continued)

Real-Time Travel Information Displays

Photo courtesy of TransitScreen

A comprehensive display of transportation services informs travelers of their options in real time. A simple display using standard LED technology with one or two colors is typical. Some displays are durable for outdoor environments; however, LCD technology housed in protective casings are becoming more common. TransitScreen is an example of a real-time display that offers transit arrival times and information on shared mobility service options. These displays can be placed in residential areas or in places where people work, in addition to transit stations. A power source, internet access, and a large display (40 inches to 70 inches) are typically required.

Photo courtesy of Metro

Interactive, touchscreen kiosks may be located at key destinations or in high pedestrian traffic areas, including transit stations. Users can access transit schedules and maps, plan a trip based on real-time arrival information, learn about the availability of shared mobility services, and obtain information about nearby destinations, including local history.

Real-Time Travel Apps

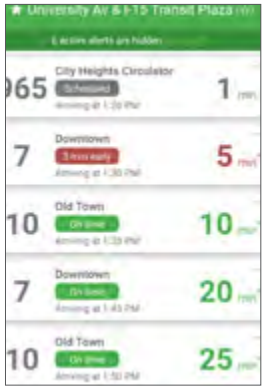

Photo courtesy of OneBusAway

Photo courtesy of OneBusAway

Real-time applications such as OneBusAway provide transit arrival information to anyone with a smartphone. These applications can use a person's current location, preferred transit stop, or specific route and combine that data with real-time information from transit agencies.

Photo courtesy of Transit

Photo courtesy of Transit

Other tools such as the Transit app integrate real-time transit arrival information with information on alternative mobility options such as bikeshare and Uber. Both of these applications help riders make informed decisions about their trips and save time.

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2

PEDESTRIAN AMENITIES

2 PEDESTRIAN AMENITIES

WALKWAYS

DEFINITION

Pedestrians walking to and from public transit and other mobility services want a safe, attractive walking environment. Wide walkways, landscaping, pedestrian scale lighting, enhanced paving, pedestrian cut-throughs, and other urban design enhancements all can serve to make walking safe and attractive.

IMPLEMENTATION CONSIDERATIONS

- The National Association of City Transportation Officials (NACTO) recommends a minimum sidewalk cross-section of five feet to accommodate two people walking side by side. This sidewalk width does not include other space reserved for seating, lighting, and sidewalk cafes.
- Municipal development codes and Americans with Disabilities Act (ADA) regulations can influence the design of pedestrian paths.
- Maintenance responsibilities, operating costs for lights and other expenses, and liability considerations should be addressed as part of the design.
- Design shortcut paths with special paving, lighting, furnishings (such as seating), and shade so they are inviting to people of varying ages and abilities.
- Design shortcut paths to accommodate people who ride bikes, as well as others who engage in active transportation and need a sufficiently wide and smooth pathway.
- If a walkway is situated in the middle of a block, design shortcut paths where feasible that lead to a mid-block crossing for easier access across streets.
- Make sure that pathways are maintained well, lit well, and situated in "people-friendly" places that are well-traveled, highly visible, and oriented for pedestrians.
- Maintain existing cut-throughs and add safety enhancements.
- Use signs at entrances and decision points to guide people who are heading to transit stops and other mobility services. Coordinate the design and placement of new signs with existing sign features.
- The NACTO Urban Street Design Guide provides additional walkway design guidance, including descriptions of all sidewalk zones.

SAMPLE WALKWAY IMPROVEMENTS

Sidewalk Widening

Photo courtesy of NACTO

Widening sidewalks creates a pedestrian-friendly environment, particularly in commercial or transit station areas. Safety and comfort are enhanced, and sidewalks also may provide opportunities for more economic activity such as sidewalk cafes with outdoor restaurant seating. Utility boxes, lighting, street trees, and other infrastructure should not block the flow of pedestrians. NACTO recommends that the portion of the sidewalk dedicated to pedestrians, also referred to as the "pedestrian through zone," be up to 12 feet wide in downtown or commercial areas.

Improved Landscaping

Photo courtesy of NACTO

Walkway landscaping offers pedestrians shade as they wait for a ride. Street trees and shrubs also may help separate pedestrians from fast moving traffic and filter the air. Trees, shrubs, and other plants may have unique space requirements, and tree grates may be needed to protect landscaping situated in heavily trafficked walkways. Native landscaping is recommended.

2 PEDESTRIAN AMENITIES

SAMPLE WALKWAY IMPROVEMENTS (continued)

Improved Lighting

Lighting in transit areas and along walkways improves safety and helps people find their way at night. Ideally, lighting should illuminate spaces with people in mind. Lights should be placed about every 30 feet along a walkway. Lights should not be obscured within tree canopies. Motion-activated lights in areas where light isn't needed continuously can save energy.

Pedestrian Bridge Enhancements

Bridges and overpasses offer pedestrians a safe and direct path above highways or other busy arterials. Overpasses also may provide pedestrian connections when on-street walkways aren't available. Minimal overpass widths should be eight feet, but the width should be increased to 14 feet if bike riders are also accommodated, according to the AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities. Clear wayfinding signs near entrances and exits to overpasses also may be incorporated.

Pedestrian Underpass Enhancements

Pedestrian underpasses allow people to safely cross beneath a freeway, railway, or other busy corridor. Underpass entrances and exits should be visible to all pedestrians. Lighting should illuminate the underpass at all hours. Other enhancements may include public art, landscaping, special paving, bollards, and space accommodations for bike riders. Minimal underpass widths should be between 14 and 16 feet, but they should be increased if the underpass is more than 60 feet long, according to the AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities.

Enhanced Paving

Photo courtesy of NACTO

Improvements to the surface of sidewalks make it easier to walk to and from transit as well as other destinations within the five-minute walk zone. Different paving treatments, including textures and color patterns, may identify areas for different types of active transportation for enhanced safety. Make sure the walking surface is smooth, slip resistant, and without bumps. Permeable pavement materials allow storm water to pass through to the soil below rather than overwhelm a city's sewer system.

Street Furniture

Photo courtesy of NACTO

Photo courtesy of NACTO

Street furniture makes traveling by foot more comfortable and enjoyable. Benches, trash bins, lighting, wayfinding signs, and other amenities such as charging stations and bike racks all are examples of street furniture. NACTO recommends that street furniture elements be placed in the space between the curb and the pedestrian through zone in order to help maintain a clear path of sidewalk travel. Some street furniture elements may be sited in regular intervals to promote a sense of continuity. Additionally, the conversion of a curbside parking space into public spaces such as a parklet and pedestrian plaza may feature street furniture

2 PEDESTRIAN AMENITIES

CROSSINGS

DEFINITION

Pedestrian crossings help keep people safe. The most effective ones keep walking distances to a minimum, make pedestrians and others more visible to drivers, and include signals to stop traffic so people can cross the street easily and safely. Existing crossings may be enhanced to provide a safer environment for people, or improvements may be incorporated into newly designed facilities. Many transit riders are pedestrians at some point during their trip, so enhancing crossings can improve safety for transit customers while also making transit vehicle operations more efficient.

IMPLEMENTATION CONSIDERATIONS

- Decisions about designing and building crossings are based on several factors, including how land is used, the volume and speed of traffic, the history of vehicle crashes in the area, the current and anticipated demand for crossings, and the degree to which pedestrians follow traffic rules.
- In places where traffic is high and moving fast, crossings with signals may be warranted. Crossings without signals may be sufficient where it's less busy or crossing distances are shorter.
- Provide crossings around and next to freeway overpasses and underpasses, so that pedestrians can navigate these areas more easily and more safely.
- Where it's possible, provide people with crossings that are situated behind a transit vehicle stop. This allows the transit vehicle to pull away without having to wait for crossing pedestrians.
- There is no absolute rule for how frequently crossings should be provided. Several factors determine this, including the length of blocks, the width of streets, the position of entrances to buildings, and where traffic signals are situated, according to the National Association of City Transportation Officials (NACTO) Urban Street Design Guide. In most cases, it's sufficient to provide crossings every 120 feet to 200 feet.
- The Americans with Disabilities Act (ADA) requires curb ramps to help all users, including the elderly as well as people pushing carts or strollers.
- The NACTO Urban Street Design Guide offers additional guidance on designing pedestrian crossings.

Autonomous vehicle technology must readily detect pedestrians, whether or not there is a designated crossing.

SAMPLE CROSSING IMPROVEMENTS

Signal Timing Treatments

Traffic signals can be designed to improve pedestrian safety at intersections. Pedestrians can be given lead time so they can enter an intersection before vehicles; as a result, they'll be more visible to drivers. Meanwhile, shorter signal cycles can reduce the amount of time that pedestrians wait to cross; this can reduce delays and discourage people from crossing against the light. Traffic signals that prevent vehicles from turning right on red also may help prevent conflicts between drivers and pedestrians at crowded intersections. Traffic signals furthermore can be aligned with transit headways; this can help prioritize crossing for pedestrians.

Curb Extensions / Bulb-Outs

Photo courtesy of NACTO

Curb extensions, or bulb-outs, extend a sidewalk into the street at the corners of intersections. Bulb-outs reduce crossing distances, increase pedestrian visibility, clearly identify parking lanes for vehicles, and can help slow traffic. They also can be enhanced with landscaping, seating, and other so-called "street furnishings." Bulb-out widths should be as large as possible, while also accommodating space needed for adjacent vehicle lanes and bikeways. Curb extensions in general narrow the roadway and slow traffic, so the local fire department, a public utility, or another agency may provide comments on how these improvements could impact their ability to operate effectively. For bulb-outs at transit stations or stops, design landing pads and pedestrian access areas for people in wheelchairs and using walkers.

2 PEDESTRIAN AMENITIES

SAMPLE CROSSING IMPROVEMENTS (continued)

Mid-Block Crossings

Mid-block crossings provide convenient and safe places where people can cross the street in the middle of a long block. Crossings should use clear markings and signs that alert drivers to yield for pedestrians. Rectangular rapid flash beacons (RRFB), in-road flashers, and pedestrian hybrid beacons activated by a pedestrian push button are other ways to alert drivers to people using a mid-block crossing.

Refuge Islands

Median refuge islands offer people safe places to wait as they cross busy multi-lane streets with traffic traveling in both directions. These islands may include curbs, bollards, or other features to protect people who are waiting. NACTO recommends that pedestrian safety islands have a minimum width of six feet, although a width of eight to ten feet is preferred. However, a narrower raised median is better than no median at all.

Pedestrian Hybrid Beacon

Photo courtesy of Mike Cynecki

These improvements, also known as High-Intensity Activated crossWalK (HAWK) beacons, are typically situated at minor intersections and mid-block crossings so that vehicles stop only when pedestrians need to cross the street. A 2010 study by the Federal Highway Administration (FHWA) found that after a HAWK signal was installed, pedestrian crashes were reduced by 69 percent (Report No. FHWA-HRT-10-042).

Rectangular Rapid Flash Beacons

Photo courtesy of NACTO

Rectangular Rapid Flash Beacons (RRFBs) feature amber LED lights that are activated by pushing a button or through technology that automatically detects a pedestrian's presence. RRFBs may provide a lower cost alternative to traditional traffic signals and pedestrian hybrid beacons. The irregular LED flash pattern is similar to emergency flashers on police vehicles, capturing the attention of drivers more readily than conventional traffic signals.

2 PEDESTRIAN AMENITIES

SAMPLE CROSSING IMPROVEMENTS (continued)

Raised Crossing

Elevating a crossing to the level of connecting sidewalks can encourage motorists to yield to pedestrians while also making the crossing ADA accessible. Where traffic speeds and conditions allow, raise crossings so they are flush with the connecting sidewalk and use special paving material to differentiate them from the roadway. Raised crossings may not be appropriate on streets with bus routes, because they can slow and impede the flow of bus traffic.

Pedestrian Scramble

A pedestrian scramble consists of striped pedestrian crossings across both intersecting streets, as well as diagonally from each street corner. Vehicle traffic is stopped in all directions so pedestrians can cross all at once. Existing intersection infrastructure and signal timing is used. Scrambles work well in busy urban areas where there are a lot of pedestrians. Install informational signs that inform pedestrians how to safely navigate intersections with scramble crossings.

Pedestrian Detection

Integrating technology at crossings to detect pedestrians can provide transportation agencies with data on the number of people that use a given crossings, and when during the day they're used the most. This can help agencies prioritize walkway and crossings improvements to increase safety and convenience. Wireless technology that detects pedestrians is also being integrated into vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communication systems.

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3

BIKE AMENITIES

3 BIKE AMENITIES

BIKEWAYS

DEFINITION

Bikeways can encourage cycling to, from, and within a mobility hub, offering bike riders easier access to transit and other nearby destinations (e.g., work, shopping, recreation). They provide a safe and comfortable riding experience for people of all ages and abilities, and alert drivers to the presence of bike riders on or near the roadway. Bikeways make cycling a priority on certain routes, and an important part of the local and regional travel network.

IMPLEMENTATION CONSIDERATIONS

- Consider existing bicycle plans for local and regional jurisdictions There may exist policies to guide development around facilities like mobility hubs. For cities that have Bike Master Plans, ensure that those plans prioritize bike infrastructure that connects to transit and major destinations.
- Several improvements can enhance the local environment for people who ride bikes. Bikeways can be designated with colored pavement and special markings, as well as simple signs that identify routes. Bike cut-throughs, rolling lanes, and shared transit bike lanes can also help bike riders.
- Biking is a popular way to travel to and from transit stops, but bike lanes to the right of vehicle traffic lanes often can conflict with buses that need to stop to let passengers board or exit. During the design process, extensive thought should be given to the most appropriate bike facility along existing or future transit corridors. This will help ensure that bike riders remain as safe as possible, and that buses or right-turning vehicles do not impact the flow of bike traffic.
- Plans to reduce the width of traffic lanes to accommodate people who ride bikes should be coordinated with transit and emergency responders. A typical lane for transit buses is roughly 8.5 feet wide, with some additional space needed for rear view mirrors that extend beyond the body of a bus. Transit, fire, and police operations should be considered when there are plans to reduce the width of vehicle traffic lanes in order to fit in a bike lane or to reduce traffic speeds
- Technology can help make biking more attractive.
  - For example, bike signals can be incorporated into existing traffic signals to allow cyclists some lead time to cross an intersection.
  - Signals for vehicle traffic and bikes also can be situated near each other so both are visible to drivers and bike riders at the same time.
  - Bike sensors, meanwhile, can trigger signals that alert drivers to the presence of one or more bike riders.
  - Bike counters can tally how many people are using a bikeway, enabling planners and local leaders to make more informed decisions about future bike improvements.
- The National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide provides additional guidance on bikeways.

Similar to pedestrian detection, autonomous vehicles must detect all users of the road including cyclists, ensuring that roadways are safe for cyclists and those traveling in an automated vehicle.

SAMPLE BIKEWAY FACILITIES AND AMENITIES

Class I Bike Path

Bike paths are physically separated from vehicle traffic by curbs, bollards, or landscaping. Also known as shared-use paths, bike paths accommodate bike, pedestrian, and other non-motorized forms travel. Bike paths can be constructed in roadway right-of-way through road diets, which refers to the removal of a traffic lane to accommodate another transportation mode such as biking, or through the removal of on-street parking. They also can be constructed in independent right-of-way. Bike paths provide critical mobility connections where roadways are absent or not conducive to biking.

Class II Bike Lane

Bike lanes are defined by pavement markings and signs that designate a portion of a roadway for exclusive or preferential bike travel. Bike lanes typically are defined by a thin line of paint or a wider painted buffer to give bike riders extra protection on the road. They also can be enhanced with innovative signs, intersection treatments, and bike loop detectors – all of which aim to improve safety and connectivity.

3 BIKE AMENITIES

SAMPLE BIKEWAY FACILITIES AND AMENITIES (continued)

Class III Bike Route

Bike routes are located on shared roadways that accommodate vehicles and bikes in the same travel lane. They are designated by signs or painted markings (e.g., sharrows). Bike routes can provide continuity to other bikeways, or designate preferred routes through high-demand corridors.

Class IV Cycle Tracks

Photo courtesy of NACTO

Cycle tracks, exclusively for bike use, offer one-way bike travel in each direction and are situated adjacent to vehicular travel lanes. They exist in the roadway right-of-way, but they are separated from vehicle lanes by physical barriers or buffers.

Median Refuge

Photo courtesy of NACTO

A median refuge island provides bike riders with a protected space to wait while crossing the street. On a two-way street, median refuge islands allow people on bikes to pause after crossing one direction of traffic and wait safely until it's clear to cross the other direction of traffic. These islands are helpful where there are few acceptable places to cross a two-way street.

Bike Signals

Bike signals give bike riders the ability to safely move through busy intersections. Dedicated bike signals also help avoid right-turn conflicts with moving vehicles. Bike signals can be timed to accommodate typical biking speeds.

SAMPLE BIKEWAY FACILITIES AND AMENITIES (continued)

Bike Boxes

Photo courtesy of City of National City

Bike boxes are green-colored spaces painted on the pavement that appear in front of a vehicle stop bar and behind a pedestrian crossing. These spaces allow bike riders to ride in front of queued vehicles, making them more visible as they enter an intersection first.

Bike Channels

A bicycle escalator in Tokyo (Tamachi Station) © 2014 Stephen-L-Johnson available under CC BY 2.0

Bike channels provide a convenient way for bike riders to walk their bikes up or down a stairway. This amenity may be found at large, multi-level transit stations or at any point within a mobility hub bike access shed where they're needed.

Bike Footrest

Bike footrests allow bike riders to keep their balance as they're resting or waiting for the light to change at an intersection. A handrail also may be provided for added convenience and comfort.

Bike and Pedestrian Counters

Photo courtesy of SFMTA via NACTO

Bike and pedestrian counters may include underground sensors and a display that shows the number of bike riders and pedestrians traveling through the area. The information helps planners and other officials better understand general trends in biking and walking over time and space, and therefore plan for future improvements. Counters also help the general public become more aware of the popularity of walking and biking in their neighborhoods.

3 BIKE AMENITIES

BIKE PARKING

DEFINITION

Offering people places to park and lock up their bikes goes a long way toward encouraging biking as a transportation choice for short trips. That's especially true for people biking to and from transit stops. Mobility hubs can offer bike riders a variety of bike parking options, and secure and convenient bike parking facilities provide transit riders with an alternative to bringing their bikes onto transit. Parking options that are highly visible, convenient, and secure make mobility hubs an attractive destination for people who choose biking over driving alone.

IMPLEMENTATION CONSIDERATIONS

- Consider customer demand, space availability, and operational costs when locating bike storage or lockers near transit.
- Transit customers may leave their bikes near stops or stations for significant periods of time, so many would prefer more secure bike storage, if it's available.
- Consider setback and access requirements during the design of bike parking facilities.
- Pricing policies should be responsive to the market and provide options for low-income customers.
- Consider the overall needs for the operation, staffing, maintenance, and security of bike parking facilities.
- Consider whether or not there is a need or desire within a mobility hub to incorporate charging facilities for electric bikes.
- Real-time information on available bike parking should be integrated into a universal transportation account, with which users can find, access, and pay for a variety of mobility services.
- The Association of Pedestrian and Bicycle Professionals (APBP) resource, Essentials of Bike Parking provides additional guidance on bike parking principles.

BIKE PARKING IMPROVEMENTS

Bike Racks

Bike racks are stationary fixtures where cyclists can lock up their bikes for short periods of time. They can be situated at transit stations or on sidewalks close to building entrances. Each jurisdiction may have standards for bike rack type and placement, but the National Association of City Transportation Officials (NACTO) recommends placing bike racks at least three feet apart for convenient access. Also, short-term bike parking options should be situated within 50 feet of a transit stop or station entrance. Additional guidance on bike rack placement near transit is provided by the NACTO Transit Street Design Guide.

Bike Corrals

Bike corrals refer to a group of bike racks placed on a street directly in front of a business or other high-traffic destination. They provide parking spaces for several bikes while taking up no more space than a single vehicle. They are best suited for areas with narrow sidewalks, and also places that are typically busy with bike riders. Bike corrals situated near street corners are more visible to cyclists and vehicle traffic, and they help separate pedestrians from moving traffic.

Bike Lockers

Bike lockers are individual storage units for securing bikes for longer periods of time near transit stations or large residential and employment areas. While they provide protection from weather and pedestrian traffic, they do take up more space than conventional bike racks. Bike locker technology has been moving from mechanical options that require a key or padlock to access assigned locker spaces to electronic lockers accessible by a key card. Electronic bike lockers within the San Diego region are battery operated and charged by solar power.

BIKE PARKING IMPROVEMENTS (continued)

Secure Group Bike Parking

Secure group bike parking facilities accommodate a larger number of bikes, compared with bike racks and lockers. These facilities also may provide amenities such as bike repair tools, tire pumps, and electric bike charging stations. Enclosures may be free-standing structures or separated spaces within buildings or vehicle parking structures.

Sabre Springs/Peñasquitos Transit Station (San Diego, CA)

Plaza Saltillo Station (Austin, TX)

Bike Hut (Santa Ana, CA)

Photo courtesy of BikeConnect

Bikestation (Long Beach, CA)

Photo courtesy of Bikestation

Bike & Ride (Malmö, Sweden)

Radstation Malmö Central © 2016 adfc.sachsen available under CC BY-SA 2.0

Bike Valet

Photo courtesy of El Cajon Boulevard Business Improvement Association

A bike valet service provides a safe and convenient bike parking option near frequent, high-ridership transit services. When this service is offered, a group bike parking facility is staffed during specified time periods to offer cyclists a seamless bike-to-transit experience. A bike valet service may be suitable in densely populated communities where bike demand is high and/or where secure group bike parking options near transit are limited. Transit riders who have trouble bringing their bikes onto transit vehicles because of space constraints may also benefit from a bike valet service. In addition, the service may be valuable during special events that draw large crowds.

Other Amenities Provided Near Bike Parking Facilities

Bike Repair Stand

Electric Bike Charging Station

Cycling Supply Vending Machine

Trek Stop: Cycling Convenience © 2008 Hugger Industries available under CC BY-NC-SA 2.0

Bike Washing Station

Photo courtesy of OneTen Cycles

3 BIKE AMENITIES

BIKESHARE

DEFINITION

Bikeshare aims to provide convenient, affordable, on-demand access to bikes for short-term use in urban areas while enhancing access to transit. Bikeshare stations typically are situated near transit stops and major residential and commercial destinations. Bikeshare programs can help reduce traffic congestion, air pollution, and the demand for vehicle parking. Bikeshare also may be attractive to people who'd rather not own a bike because of the risk of theft and vandalism, a lack of parking or storage, and maintenance costs.

SAMPLE BIKESHARE MODELS

The following are types of bikeshare systems that serve the varying needs and demands of users:

- **Station-based bikeshare** features automated kiosks that electronically secure and release bikes during each rental. Kiosks may be installed on- or off-street within a neighborhood or large facility or campus. Each kiosk has its own space and power requirements. Examples of station-based bikeshare systems include: Capital Bikeshare (Washington, D.C.), Citi Bike (New York City), DecoBike (San Diego), and Divvy (Chicago). The NACTO Bike Share Station Siting Guide provides additional guidance on siting bikeshare kiosks.
- **Dockless bikeshare** services allow each GPS-enabled bike with integrated locks to be accessed using a smartphone app. Bikes typically may be parked anywhere within a pre-determined service area (or geo-fence). A hybrid system comprised of stations and dockless parking options also may be provided. Incentives could be offered to encourage users to park bikes at stations or at specific locations within a service area. Bluegogo, LimeBike, Ofo, and Spin are examples of fully dockless bikeshare systems.
- **Employee bikeshare programs** offer a shared pool of bikes for employee business and/or personal use. Varying levels of management, maintenance, and security may be implemented, but more informal programs rely on the integrity of individuals to use and care for the bikes in an appropriate way. Similar forms of internal bikeshare also may be implemented in large residential communities and hotels/resorts.
- **Peer-to-peer bikeshare** facilitates bike rentals between individuals through a website or smartphone app. This model may depend on face-to-face customer interaction and may not be ideal for implementation by a public agency. However, jurisdictions and private entities looking to encourage biking may consider providing a common space with surveillance for peer-to-peer bikeshare transactions to increase safety. Spinlister is a peer-to-peer platform for users to borrow bikes as well as surfboards and snowboards.

IMPLEMENTATION CONSIDERATIONS

- Various bikeshare implementation models exist, and there could be several parties or companies involved. One may produce the bikes, another may operate the program, and a city or private entity may own the bikeshare system.
- All systems strike a balance between serving occasional/recreational/tourist markets versus more frequent commute trips. With varying systems come varied outcomes regarding cost and potential revenue. Bikeshare program objectives need to be clearly defined upfront to ensure that the option implemented closely aligns with those objectives.
- Bikeshare ridership increases exponentially with increases in station density, according to a National Association of City Transportation Officials (NACTO) analysis of U.S. bikeshare system data. Stations separated by walkable distances (e.g., every 1,000 feet) is fundamental for providing an equitable bikeshare program that features convenient, on-demand mobility.
- Bikeshare stations should be situated at transit stops or within one block of the stops, and they should be made highly visible with signs. Integrating bikeshare stations with transit greatly extends the mobility network by offering people a way to reach destinations that are not directly served by scheduled transit.
- Bikeshare operators typically move bikes between kiosks or within the service area to balance demand and supply. Mobility hub kiosks always should have an ample supply of bikes, especially during peak travel times.
- Situating bikeshare options near existing or planned bikeways will further enhance the program's success.
- Consider integrating adaptive bikes to accommodate people with disabilities and seniors.
- Consider potential funding options for a bikeshare system, including federal and local grants, government subsidies, corporate sponsorships, private investment, etc. Advertising revenues or other sponsorships can help pay for launching a bikeshare service and funding its ongoing operations.
- Implementation in low-income areas could require subsidized/discounted rates, as well as alternative payment options such as payment without smartphones or credit cards.
- Consider offering a joint transit-bikeshare pass or coordinating with a regional transportation fare payment program. Integration with the region's universal transportation account is an option, if one is available. Barriers to implementation include data and fare-payment integration, pricing structures, challenges to compatible infrastructure, and the complexity in allocating profits.

3 BIKE AMENITIES

ELEMENT IN ACTION

DecoBike – San Diego, CA

Photo courtesy of DecoBike San Diego

DecoBike launched in 2015 in partnership with the City of San Diego with a goal of offering 1,800 bikes at 180 stations Downtown, Uptown, and in some beach communities. Stations are solar-powered, automated and operate 24 hours a day, seven days a week. They are modular in design and can be easily expanded or reduced to align with demand. Each station features a map indicating its location. The location of stations also can be viewed via the DecoBike website and mobile app. Infrequent users or tourists pay only for the time they use DecoBike, while regular users can purchase an annual membership (a credit or debit card is needed).

Divvy Bikes – Chicago, IL

Divvy is a bikeshare program owned by the Chicago Department of Transportation and operated by Motivate. About 5,800 bikes at 580 stations are available 24/7. The Divvy for Everyone program offers assistance to people who otherwise wouldn't have the financial resources to participate. Qualifying residents can make a one-time $5 payment for an annual membership. No credit card is required, and cash payments can be made at participating 7-Eleven and Family Dollar stores.

Spin – Seattle, WA

Photo courtesy of Spin

Spin is a dockless bikeshare system that allows users to scan a QR code with a mobile app to unlock a bike for use. Trips cost $1 up to 30 minutes, and $1 every 30 minutes thereafter. Spin bikes can be parked anywhere, just as one would park their personal bike. Spin's approach is to work closely with city governments to implement this model, while minimizing safety and other potential transportation impacts of a kiosk-free bikeshare program. Spin is now active in Seattle, and in March 2017 it piloted dockless bikeshare in Austin, Texas during South by Southwest®.

Adaptive Bicycling Pilot Project – Portland, OR

The Portland Bureau of Transportation (PBOT) is working to add an adaptive bicycling service to the city's local bikeshare program, in order to make it more accessible to disabled people. Biketown launched in the summer of 2016, but some critics argued that the bikeshare system did not equitably accommodate all users. PBOT plans to make adaptive bikes available through existing bike rental shops located near popular bikeways. The expanded bikeshare program will aim to provide both hand bikes and three wheeled bikes.

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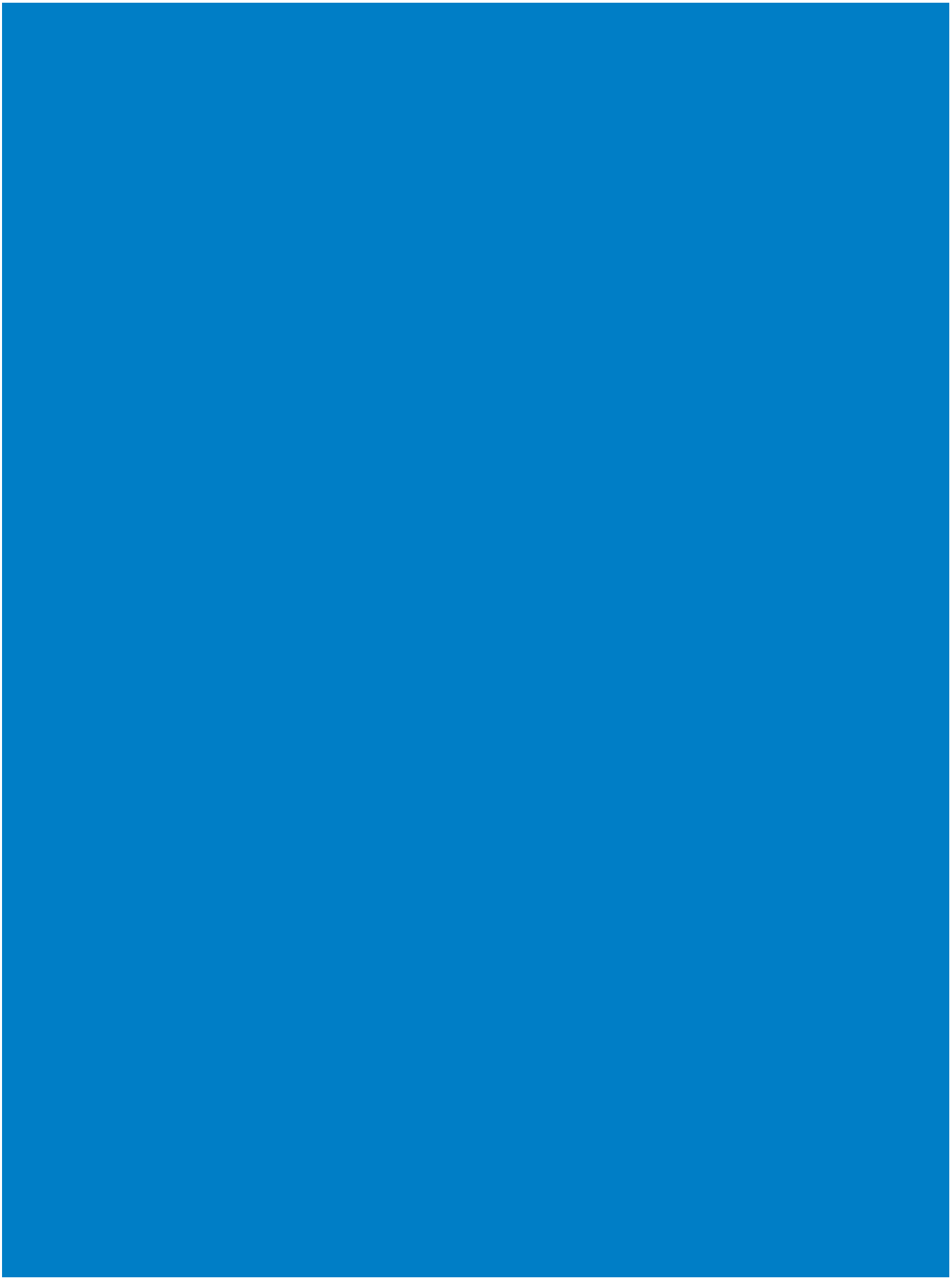
MOTORIZED SERVICES & AMENITIES

Photo courtesy of car2go



4 MOTORIZED SERVICES AMENITIES

DEDICATED TRANSIT LANES

DEFINITION

Dedicated transit lanes typically are provided for major routes offering frequent service or where congestion may significantly impact service reliability. These lanes may be physically separated from traffic with curbs or paint to discourage drivers from entering them. Prioritizing transit service with dedicated transit lanes can help make transit more convenient for people than driving alone.

SAMPLE DEDICATED TRANSIT LANE TREATMENTS

Multiple design approaches can be used for dedicated transit lanes, based on available space and needs, according to the National Association of City Transportation Officials (NACTO) Transit Street Design Guide:

Offset transit lane

Photo courtesy of NACTO Transit Street Design Guide

Also known as "floating" or "parking-adjacent" lanes, these direct transit vehicles to the right-most moving lane. They may be offset from the curb by street parking, curb extensions, or raised cycle tracks.

Peak-only bus lane

Photo courtesy of NACTO Transit Street Design Guide

These operate during peak travel periods. Mixed traffic or other curbside uses are permitted during non-peak periods. These lanes also help transit stay on schedule when traffic congestion is high.

Curbside transit lane

Photo courtesy of NACTO Transit Street Design Guide

The lane adjacent to the curb can be dedicated for transit vehicles, especially on through-corridors where parking isn't provided or not well used.

Center transit lane

Photo courtesy of NACTO Transit Street Design Guide

Traditionally found on streetcar or light rail routes, these can be added as part of a rapid bus line or any bus route with suitable stations. Other features such as left turn restrictions, leading transit intervals, and all-door boarding allow center transit lanes to reduce the sources of transit delays.

Shared bus-bike lanes

Photo courtesy of NACTO Transit Street Design Guide

These accommodate buses and cyclists traveling at lower speeds. Buses are discouraged from passing, and cyclists may pass buses only at stops. Shared bus-bike lanes may be suitable where there's not enough room for high-volume bus routes and separated bikeways.

Contraflow transit lane

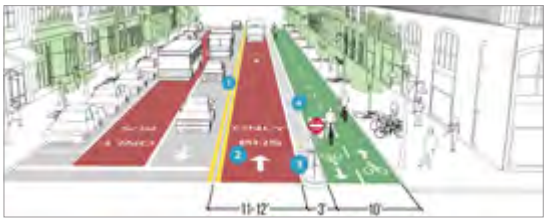


Photo courtesy of NACTO Transit Street Design Guide

This can be thought of as a conventional two-way street, but one in which non-transit vehicles are prohibited from traveling in the contraflow direction. These lanes may be used on streets where general traffic is limited to travel in one direction, but transit operations would benefit from routes heading in both directions.

4 MOTORIZED SERVICES AMENITIES

IMPLEMENTATION CONSIDERATIONS

- Consider any local precedence for transit-only lanes. If none exists, then a concerted effort may be needed to educate the general public about the new traffic rules and make sure they're enforced as the community adjusts to the new road design.
- Determine whether the lanes should allow only transit traffic, or if automobiles should be allowed to use the lanes to access businesses. Also determine whether or not bikes should be permitted to access the lanes.
- Consider the hours of operation for dedicated transit lanes. If they're needed primarily during peak periods, then the lanes could be opened to general traffic during off-peak hours.
- How transit stations are designed and accessed will determine how dedicated transit lanes are planned. If lanes are operating in an outside or inside lane, evaluate the most effective design for passenger access and safety.
- Signs should be specific and clearly communicate what's allowed – transit only, transit and right turns only, transit only between certain hours, etc. Clearly communicate what fines drivers will face if they violate rules governing dedicated transit lanes.
- Conduct a transit operational analysis and traffic review to determine the needs, costs, and benefits of adding dedicated transit lanes.
- The National Association of City Transportation Officials (NACTO) Transit Street Design Guide provides additional guidance on dedicated transit lanes.

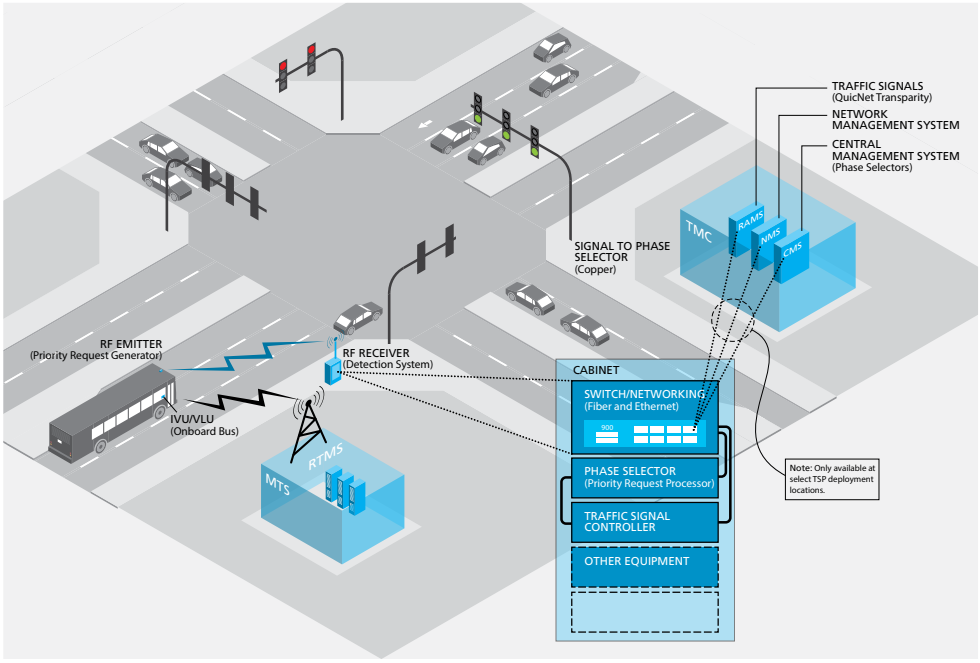
Autonomous rapid transit vehicles could request other autonomous vehicles shift out of a short-term dedicated transit lane, to provide increased service during high traffic times.

SUPPORTING TRANSIT LANE IMPROVEMENTS

Transit signal priority (TSP) helps improve transit reliability and efficiency within a mobility hub area by providing transit vehicles with more green light time. An emitter on a bus sends a signal to a receiver as the bus approaches an intersection. If the TSP request is granted, the bus will receive an early green signal or additional green time. TSP can operate independently at the signal level, connect with multiple signals in a corridor, or be integrated in a regional traffic management control system.

TSP CONSIDERATIONS

- Jurisdictions may require a transit vehicle to meet certain requirements before granting signal priority. For example, a bus may be required to be running late by a certain number of minutes and/or have at least ten passengers on board to be granted signal priority. There also may be restrictions on the frequency of TSP events allowed. Transit agencies and municipal transportation planners and engineers need to agree on these policy decisions.
- Transit and emergency vehicles have been connected to signals for decades. However, private automobiles now have the capability to be connected. Consider how emergency, transit, and private vehicles should be interconnected, and how they relate to one another at intersections.
- Consider options, features, and interoperability of onboard transit vehicle equipment for the TSP solution to be effective.



4 MOTORIZED SERVICES AMENITIES

SUPPORTING TRANSIT LANE IMPROVEMENTS (continued)

Overhead signs Overhead signs can alert drivers and other travelers to important information about dedicated transit lanes. Flashing beacons also can be used to draw attention to signs during specific travel periods.

Transit-only signals can be designed as transit-specific signal heads or be visible only to the vehicles traveling in the dedicated transit lane. They may be integrated as part of the design of dedicated transit lanes to indicate when transit vehicles operating in mixed-traffic lanes have exclusive phases, or to provide transit vehicles with a head start at an intersection.

Photo courtesy of NACTO Transit Street Design Guide

Queue jumpers refer to short stretches of dedicated transit lanes that are combined with TSP to enable buses to bypass a waiting queue of automobile traffic. Buses must have clear access to the dedicated lane, and the ability to reach the front of the traffic queue at the beginning of the signal cycle. A bus-only signal may be used to indicate when a transit vehicle can proceed before general traffic. Queue jumpers also can improve bus performance and service reliability.

ELEMENT IN ACTION

Mid-City Centerline *Rapid* Transit – San Diego, CA

Scheduled to open in 2018, this project will provide the San Diego region's first freeway-level transit stations along State Route 15 at University Avenue and El Cajon Boulevard. Transit-only lanes will operate within the existing median from I-805 to I-8. This investment aims to improve the on-time performance of existing *Rapid* service, while supporting an integrated network of *Rapid* and local bus routes linking Downtown and Mid-City to job centers to the north.

Wilshire Bus Rapid Transit – Los Angeles, CA

Peak hour bus lanes were designated on Wilshire Boulevard to help reduce transit commute times on the busy thoroughfare. The improvement created 7.7 miles of dedicated lanes between South Park View Street and Centinela Avenue and 9.9 miles of street, signal, and sign improvements along the corridor. The facility prohibits vehicles from driving or parking in the dedicated lanes from 7 to 9 a.m. and from 4 to 7 p.m. Monday through Friday. Vehicles may enter the bus lanes only near intersections to make right turns. Cyclists are permitted to use the curbside bus lanes.

sbX Rapid Transit – San Bernardino, CA

The Omnitrans sbX Green Line is the Inland Empire's first rapid bus service. The 15.7-mile line runs on a busy corridor between San Bernardino and Loma Linda, includes 5.4 miles of dedicated lanes, and stops at schools, job centers, and other points of interest. Buses have traffic signal priority, reducing commute times. The line aims to cut traffic on freeways, improve air quality, and increase bus ridership. More than half a million people rode the bus line during its first year, and ridership continues to grow, according to Omnitrans.

Photo courtesy of Rick Sforza, The Sun/SCNG

4 MOTORIZED SERVICES AMENITIES

RIDEABLES

DEFINITION

A rideable is a portable device with wheels that makes people more mobile. Non-motorized skateboards and scooters have existed for decades, but a new generation of small, electric travel options are available for people of all ages. Motorized rideables typically use an electric power source and feature a floorboard for the rider to stand on. Scooters, electric skateboards, hoverboards, and self-balancing boards with one or two wheels are all examples of rideables.

SAMPLE RIDEABLE DEVICES

IMPLEMENTATION CONSIDERATIONS

- Rideables can encourage people to connect to a transit stop that otherwise might be too far to reach by walking.
- Widened sidewalks may allow walkers and people using rideables to share the space.
- Rideables can help reduce auto traffic and emissions in busy travel corridors.
- Charging outlets can be situated near transit waiting areas to offer people who are using electric-powered rideables a convenient power source.
- Many rideables are portable and easy to carry aboard transit, but some may need to be left behind and stored securely.
- Wayfinding and/or dynamic signs can inform people about where and how rideables are permitted.
- Some rideables may be synced with smartphones to allow locking and unlocking.
- Some rideables feature LED lighting for enhanced visibility.
- California legislation (Assembly Bill 604, Olsen) defines electrically motorized boards and how they can be used:
    - An electrically motorized board is any wheeled device that has a floorboard that is not greater than 60 inches deep and 18 inches wide, is designed to transport only one person, and does not exceed 20 miles per hour.
    - A motorized skateboard is not considered an electrically motorized board.
    - Riders must be 16 years or older.
    - Electrically motorized boards are not allowed to operate on roadways with speed limits that exceed 35 miles per hour, unless they operate entirely within a designated Class II or Class IV bikeway.
    - Electrically motorized boards can use bikeways, but riders must travel at a reasonable speed, wear a fastened bicycle helmet, and yield to pedestrians.
    - Local governments are authorized to adopt rules and regulations by ordinance or resolution to prohibit or restrict people from riding or propelling electrically motorized boards on highways, sidewalks, or roadways.
    - Other agencies such as transit development boards or universities also may adopt ordinances, rules, or regulations to restrict the use of bicycles, motorized bicycles, skateboards, electrically motorized boards, and roller skates on any property they control.

Autonomous vehicles will be equipped to detect people using rideables within a mobility hub area, as well as others walking and riding bikes.

4 MOTORIZED SERVICES AMENITIES

ELECTRIC BIKE & SCOOTERSHARE

DEFINITION

A shared fleet of electric bikes (e-bikes) or motorized scooters can make it easier for people to travel to work or other destinations when topography is challenging or parking is scarce. While there are different business models, the service may operate much like bikeshare: electric bikes or scooters are docked at a station, and they can be released after check-in and payment at a kiosk. Members are typically charged by the hour, day, or month if they use the service regularly. Given the typical speeds of electric bikes and scooters, they are well suited for short trips of 2-3 miles – too far for many to walk.

IMPLEMENTATION CONSIDERATIONS

- Revise municipal regulations to designate on-street parking locations for e-bikes or scooters, if applicable, including areas previously restricted by residential parking permit programs.
- Determine whether e-bikes should be restricted to parking at bikeshare kiosks or at other designated locations. Determine if e-bikes may use bike racks or other publicly accessible bike parking options.
- Determine if scooters can park in existing on-street motorcycle spaces, designated off-street parking lots, and other specific locations used by other vehicles. Determine where scooters are permitted to park during trip stopovers (e.g., on-street in between two parked cars, areas of a curb that are too small for a car)
- Situate electric bike and scooter charging stations, as well as dedicated parking facilities, near transit stations and other major destinations.
- Review existing policies to determine if helmets are required. Work with local agencies and e-bike or scootershare vendors to ensure that people are following helmet requirements.
- Consider integrating e-bike or pedal-assist bikes into a non-motorized bikeshare program. For example, nearly half of Baltimore Bike Share's bikes have an electric pedal-assist feature known as Pedelec that gives riders an extra "boost" when they're heading uphill. No gears or buttons are required. Pedelec bikes are identified by a white lightning bolt on the back fender.
- The battery range of e-bikes depends on a number of factors including the size of the battery, how much effort riders put into pedaling, the topography, wind resistance, road surface conditions, and the rider's weight.
- Integrate the e-bike and scootershare into real-time travel information apps or a universal transportation account so that users can find, access, and pay for the services as they need them.

ELEMENT IN ACTION

Scoot - San Francisco, CA

Photo courtesy of Untitled © 2013 Marcin Wichary available under CC BY 2.0

Scoot offers a fleet of 500 shared electric scooters that can go up to 30 mph and travel an average range of 20-25 miles on a single charge. Scoot also offers mini cars called quads, which can go up to 25 mph and travel up to 40 miles. Scoots may be rented for as little as one hour and up to 48 hours, making it a flexible travel option for many people. Each Scoot comes with two sizes of helmets stowed in the back. Scoot also features a mobile app for reservations and a cashless payment feature.

Cityscoot - Paris, France

Photo courtesy of Cityscoot

More than 1,000 Cityscoot scooters are available to rent in Paris between 7 a.m. and 12 a.m. everyday. No membership is required, and Cityscoot handles all charging needs. The booking system is fully integrated; no keys, cards, or recharge terminals are used. A 4-digit PIN provided by the Cityscoot app unlocks each scooter for use. The rental base rate is 28 cents (Euro) per minute, but Cityscoot offers packages of 25 Euros for 100 minutes or 100 Euros for 500 minutes. An approved helmet with a single-use hygiene cap is provided beneath the seat, but riders may use their own helmet.

4 MOTORIZED SERVICES AMENITIES

CARSHARE

DEFINITION

Carshare services offer access to vehicles 24 hours a day, seven days a week. These cars can be found within a specified service area, at transit stations, and other locations, and people can find them by using a smartphone app. Users are typically charged according to how long they use the cars or how far they drive. Fees cover car insurance, parking, emergency roadside service, and other car-related expenses. Carsharing offers people a convenient way to make connections beyond the first and last mile of a public transit stop. It also offers an alternative to owning a vehicle.

SAMPLE CARSHARE MODELS

- **Round-trip carshare** services, such as Maven and Zipcar, require users to return a vehicle to the same designated location.
- **Free-floating carshare** services such as car2go, ReachNow, WaiveCar allow users to pick up and then park a vehicle anywhere within a designated service area. Permitted parking opportunities may include on-street and/or metered parking in addition to off-street designated carshare spots).
- **One-way carshare** services, such as BlueIndy, Maven, and Zipcar, allow users to pick up a vehicle from one designated location and return it to another branded carshare station. Maven and Zipcar offer both round-trip and one-way carshare.
- **Peer-to-peer carshare** services such as Croove and Getaround allow private vehicle owners to rent their car by the hour to others within their community).

IMPLEMENTATION CONSIDERATIONS

- Assess the local market to see if there's demand for carshare. Work with municipal governments and transit agencies to understand where these services would serve people best.
- Review existing municipal codes and policies to determine whether carshare can operate in the public right-of-way.
- Provide dedicated parking for carshare vehicles. This first requires learning whether carshare parking can be provided at major transit stations; creating carshare vehicle "drop zones" within the mobility hub drive shed that are convenient for major destinations or special events; and identifying on-street locations for dedicated carshare parking within walking distance of transit stops. Overall, dedicated spaces help increase the visibility of carshare services, and make it more likely people will use them.
- Update parking enforcement guidelines, and educate parking enforcement staff on all carshare regulations.
- Determine whether transit agencies and/or local jurisdictions need to subsidize the carshare service. If it's economically feasible to operate independently, consider whether users should be charged a fee for parking spaces within the mobility hub area.
- Accessibility, equity, and environmental policies should be considered.
- Consider integrating alternative fuel vehicles into the program, based on existing and/or planned infrastructure such as electric vehicle charging stations.
- Partner with carsharing companies to identify needs and establish formal operating agreements.
- Identify opportunities to offer fare discounts to people who use both transit and carshare for their trips.
- Real-time carshare information should be integrated into a universal transportation account, with which users can find, access, and pay for a variety of mobility services. This will make it more convenient for people to use carshare as part of their multimodal trip.
- Provide clear wayfinding between transit and carshare services to make it easier and less stressful for people to find a vehicle.

Autonomous and/or connected vehicle carshare programs will need to be considered, possibly in partnership with ridehailing services such as Lyft or Uber. The carshare industry may evolve to become a shared-use, self-driving vehicle network.

ELEMENT IN ACTION

car2go – Austin, TX

In Austin, the carshare company car2go offers a large fleet of smart "fortwo" electric vehicles, available on-demand in the city center. Using a mobile app, members can locate and unlock a vehicle, drive it to any destination within the Home Area, and park it for another member to use. Several on-street parking spaces are provided exclusively to car2go users across the street from the MetroRail Red Line Downtown Station. In 2017, car2go Austin added two Mercedes-Benz models to the fleet – 25 CLA four-door coupes and 25 GLA five-door SUVs – to cater to families, small groups, and others who may need to transport more cargo.

4 MOTORIZED SERVICES AMENITIES

ON-DEMAND RIDESHARE

DEFINITION

On-demand rideshare services allow someone to request a ride in real-time using a mobile app. They link passengers with available drivers based on a trip's origin and destination, while also identifying the quickest route.

ON-DEMAND RIDESHARE MODELS

- **Dynamic ridesharing** is essentially carpooling, where drivers are matched with passengers who are traveling in the same direction. For people whose schedules and destinations match up in the morning and evening, dynamic ridesharing is a convenient and reliable transportation option. Ridesharing that uses mobile apps to match drivers and passengers can quickly fill empty seats, reducing congestion and auto emissions. Participating drivers can be reimbursed up to 54 cents per mile, an IRS limit that differentiates income from reimbursement for gas mileage and wear-and-tear. Examples of dynamic ridesharing services include Carma, Ryde, Scoop, Waze Carpool, and Zimride.
- **Ridehailing**, also known as ridesourcing, allows people to request rides in real-time from drivers who provide the ride in their personal vehicle in exchange for payment. These services have evolved to offer both pre-scheduled rides and ride-splitting, so that several passengers who are matched with the same driver may split the cost of the trip. In California, these services are classified as Transportation Network Companies (TNCs). Examples include Lyft and Uber.

IMPLEMENTATION CONSIDERATIONS

- Consider partnerships with dynamic rideshare services to promote carpooling to transit stations, particularly those that are experiencing a high demand for parking.
- Traditionally, TNCs have employed a rideshare model in which drivers sign on as independent contractors and use personal vehicles to transport passengers. This model has evolved to offer ridehailing drivers the opportunity to lease a vehicle as a result of partnerships between automobile companies and TNCs
- Determine which on-demand rideshare service feature may best assist mobility hub users:
  - A point-to-point ridehailing service, such as Lyft and uberX, provides a private ride from point A to point B for up to four people. The option to request a six-passenger vehicle, luxury car, or bilingual driver also may be included.
  - A pooled ride combines up to four passengers headed in the same direction, and each pays less than they would for a point-to-point ride offered by services such as Lyft Line and uberPOOL.
  - ADA accessible vehicles may better assist riders with wheelchairs, seniors, or others needing help entering and exiting. Services such as uberWAV and uberASSIST offer this. Additionally, web or concierge services are being incorporated into ridehailing services.
  - Employers may sponsor rides on behalf of their employees to better connect them between their employment site and transit, the airport, or other approved locations. Examples include Lyft for Work and Uber for Business.
- On busy urban streets, consider allowing shared or flexible curb space so that different mobility hub services such as microtransit, regular transit, carshare, and mobile retail can use curbs at different peak times, or so they can share the same space during specified hours.
- Designate curb space for passenger loading and unloading to help make rideshare services more efficient, while also reducing instances of double-parking or idling in red, blue, or other prohibitive curbside zones.
  - Designated on-demand rideshare pick-up/drop-off areas should be accompanied by wayfinding signs to clearly communicate the location to both passengers and drivers. Adequate lighting promotes safety for passengers and drivers.
  - Work with on-demand rideshare service providers to create in-app prompts that direct passengers to go to a dedicated pick-up area to meet the driver.
  - Consider creating a clear hierarchy of modes to help manage curb chaos and better allocate where each type of service should operate. This may require prioritizing on-demand rideshare pick-up/drop-off zones over the ability of personal vehicles to park, similar to prioritizing transit vehicle stops at curb space.

The on-demand ridesharing industry is expected to feature fleets of shared autonomous vehicles (SAVs) as autonomous vehicle technology becomes more prevalent. Driverless vehicles are expected to need efficient passenger loading areas, as well as "resting areas" for cars not in service.

4 MOTORIZED SERVICES AMENITIES

IMPLEMENTATION CONSIDERATIONS (continued)

- Incorporate on-demand rideshare services in a bundle of subsidized multimodal travel options that is offered to multifamily development tenants where no parking is provided.
- Taxi cab companies are starting to offer technology-based options for hailing a ride. Mobile apps such as Curb, Hailo, and FlyWheel, and SIM-card enabled push buttons such as Ride Yellow, are being placed in San Diego hotels, restaurants, and hospitals. Partnering with services that already may have dedicated passenger pick-up zones or be regulated by the local transit agency can help people better access transit and other locations in a mobility hub.
- Subsidize on-demand rideshare services that increase the use of challenged or under-performing transit routes.
- Partnerships with local governments and transit agencies can help encourage on-demand ridesharing as an alternative to driving alone to transit stations. This type of public-private partnership can help reduce parking demand at high-volume transit stations.
- Partnerships between TNCs and major employers can provide convenient and affordable commute alternatives for employees. For example, several commuter benefit programs now classify certain uberPOOL rides to be eligible for pre-tax transportation costs.
- Partnerships between rideshare technology providers, vehicle manufacturers, and public agencies will be key to ensuring that on-demand mobility services meet climate goals.
- Real-time information about on-demand ridesharing services should be integrated into a universal transportation account, with which users can find, access, and pay for a variety of mobility options.
- Increase local awareness of all the potential benefits of on-demand rideshare services.

ELEMENT IN ACTION

Scoop to BART Station Partnership – Pleasanton, CA

Photo courtesy of Scoop

In January 2017, Bay Area Rapid Transit (BART) and the Metropolitan Transportation Commission partnered with Scoop to deliver a new option for securing parking at the Dublin/Pleasanton station. Commuters who use Scoop to carpool to the station are guaranteed parking until 10 a.m. High parking demand is an issue at many BART stations, as 99 percent of passengers drive alone to a station. The project was made possible through a $358,000 Mobility on Demand Sandbox grant from the Federal Transit Administration. The program has since expanded to several other BART stations.

Lyft/San Clemente Partnership – San Clemente, CA

Photo courtesy of Lyft

In October 2016, the City of San Clemente partnered with Lyft to offer reduced price on-demand rides in response to the discontinuation of two local bus routes. Given the challenges of operating fixed route transit service in suburban communities, on-demand rideshare was seen as a way to help residents get around without having to own a car. Eligible rides are taken between 6 a.m. and 8 p.m., and passengers must be picked up and dropped off along the discontinued bus corridors. Helpful signs were also installed at participating bus stops.

Uber/MTS Partnership – San Diego, CA

Photo courtesy of MTS

Between July 8-24, 2016, the San Diego Metropolitan Transit System (MTS) and Uber partnered to offer one-time discounts of $5 for uberPOOL riders who arrived at or departed from one of 20 selected transit centers. The promotion was designed to encourage people to leave their cars at home, catch a transit ride, and then reverse the trip to get back home. It also provided people with an easy way to travel downtown during Comic-Con International and the Major League Baseball All-Star Game.

4 MOTORIZED SERVICES AMENITIES

MICROTRANSIT

DEFINITION

Microtransit often targets peak period commute travel, offering a flexible, on-demand option for small groups of people. It's ideal in places where high-frequency transit isn't warranted, or where or it's too costly to operate. Microtransit can be particularly convenient when traditional fixed-route transit options are full or when they simply don't serve certain destinations. Microtransit services use smaller vehicles that carry between five and 12 passengers, and riders typically can order service through a mobile app that directs them to gather at common locations along the service route for pick-up.

IMPLEMENTATION CONSIDERATIONS

- Microtransit, flex service, and employer-provided shuttle services should complement one another. Schedules can be coordinated, agreements to share fares can be made, wayfinding can be offered between services, and loading zones can be strategically situated so services don't conflict with one another.
- Microtransit can make larger transit services more attractive by extending their reach into areas that don't receive frequent all-day service. To help coordinate these services, transit authorities can provide space adjacent key transit stops so people can transfer easily to and from microtransit.
- Consider whether any priority will be given to microtransit vehicles that use a passenger loading zone, and if so, how much.
- Determine whether microtransit services can share curb space at specific transit stops as part of a formal agreement.
- Decisions about where to situate dedicated and shared curb spaces should be coordinated with local jurisdictions, transit agencies, and shared mobility services like microtransit.
- Determine if microtransit services should pay to use curbside space at a mobility hub. For example, the San Francisco Municipal Transportation Agency (SFMTA) is conducting a pilot program that requires commuter shuttles to obtain permits to use the City's limited curbside space.
- Consider granting microtransit vehicles access or partial access to dedicated transit lanes.
- Ridehailing services such as Lyft and Uber may increase traffic and crowd loading zones. Consider the impact of adding microtransit into the mix.
- Evaluate any ADA regulations that may influence how microtransit vehicles are designed and how those vehicles use passenger loading curb spaces.
- Microtransit vehicles may operate on alternative fuels such as renewable natural gas, electricity, and biodiesel. Which one to choose depends on several factors, including the kinds of daily operations expected, the cost of maintenance, and the demand for vehicle replacements over time.
- Leverage innovative funding sources such as grants, parking meter revenue, development impact fees, and private sponsorships to subsidize microtransit services in a community.
- Public transit operators may leverage microtransit technology to integrate on-demand services into the existing transit network.
- Real-time information on microtransit should be integrated into a universal transportation account, with which users can find, access, and pay for a variety of mobility services.

ELEMENT IN ACTION

Some microtransit services have recently ceased operations, but others are finding their niche:

Free Ride Everywhere Downtown (FRED) – San Diego, CA

FRED is a microtransit option available at no cost to anyone needing a ride within Downtown San Diego. Funded by a combination of downtown parking revenues and corporate sponsors, FRED's all-electric vehicles provide an on-demand mobility option as early as 7 a.m. on weekdays and as late as midnight on weekends. Rides can be hailed from the street or by using the FRED mobile app. Each low speed vehicle is equipped to carry five passengers and provides a convenient way to move around downtown neighborhoods and connect to Trolley or heavy rail services. Additionally, the service aims to reduce parking demand, traffic congestion, noise pollution, and air pollution.

Photo courtesy of MTS

Via

Via is an on-demand microtransit service operating in many cities including Chicago, New York, Washington, D.C., and West Sacramento. Hours of operation differ by service area, but the mission of Via remains the same – to provide a convenient and reliable travel option. An app is used to book a ride, and passengers are matched with a vehicle traveling in the same direction within seconds. The average wait time is five minutes, and an estimate of the vehicle arrival time is provided. As a bonus, transportation benefit debit cards can be used to pay for trips, assuming the vehicle seats six or more people.

4 MOTORIZED SERVICES AMENITIES

NEIGHBORHOOD ELECTRIC VEHICLES (NEVs)

DEFINITION

Neighborhood electric vehicles (NEVs) offer a low speed, zero-emission motorized travel option for some mobility hub applications. NEVs typically have a maximum speed of 25 miles per hour (mph) and a maximum driving range of 40 miles on a single charge. Models range in size accommodating one to six people and may be used on local roads with posted speed limits of 35 mph or less (regulations differ by state). NEVs are used mostly for local trips in self-contained areas such as planned communities, resorts, college campuses, and industrial parks. They offer older adults and other licensed drivers who don't want to use a conventional auto but may not be able to walk or ride bikes easily a way to get around.

IMPLEMENTATION CONSIDERATIONS

- If cities intend to operate low-speed vehicles on streets that have posted limits above 35 mph, then state legislation and a transportation plan are needed. For example, AB 61 (2011) authorized the County of Riverside and cities within the county to establish a NEV transportation plan.
- California state law requires NEV drivers to have a valid driver's license and insurance.
- For NEVs to be a viable option for people, the local road network must be designed to accommodate them. NEVs are smaller, lighter, and slower than traditional cars, so drivers and their occupants are especially vulnerable in crashes. At the same time, NEVs may be too large and fast to safely share narrow lanes and off-road trails with cyclists and pedestrians.
- A road network for NEVs can be designed for continuous, direct, and relatively flat routes throughout a community. The dedicated paths or streets must have speed limits of 35 mph or less.
- Dedicated paths that accommodate NEVs can be considered in newer, lower-density suburban communities where road widths or adjacent greenspace permit them. They must be at least nine feet wide to allow for unidirectional travel, and 18 feet wide for bi-directional travel.
- NEVs can operate in dedicated on-street lanes (including bike lanes) if these lanes are at least seven feet wide.
- NEV networks should avoid crossings at major intersections. Whether the network is dedicated or in mixed traffic, an efficient NEV network around a mobility hub should be designed to provide as direct a route as possible to employment centers, retail centers, and other points of concentrated activity within a five-minute drive of the hub.
- A fleet of NEVs could be owned by a company, and operated by employees so they could make short trips within the corporate campus. Parking, charging stations, striping, signs, and educational tools should be provided.
- To safely incorporate NEVs into a mobility hub, a transportation network already should be in place or planned for the area. On-street parking may be repurposed for NEV lanes or charging spaces.
- Most dedicated NEV plans and infrastructure investments are found in suburban areas with large and often age-restricted planned communities. NEVs also can be used in urban areas, but they are less common. As a result, there is less information available about how to effectively design, establish, and operate NEVs in urban areas. Furthermore, the cost may be high to create complete NEV networks in urban areas that already have street networks unsuited for NEVs.
- Transit station parking lots that have space for NEVs also should provide charging facilities. At busy transit parking lots, planners will have to consider how many NEV spaces with charging stations to install, whether to limit parking hours for charging, and how to regulate pricing.
- NEV charging stations have different siting considerations and electrical needs than conventional plug-in electric vehicle (PEV) charging stations. Refer to the Electric Vehicle Charging Stations chapter for more information.
- There are currently few if any areas in the San Diego region with large numbers of individually owned NEVs. Consider contracting with a private operator to provide a shared fleet of NEVs at suitable mobility hubs.
- NEV and PEV technology is advancing. Compact, electric vehicles are being manufactured to reach much higher speeds (examples include Renault Twizy and Toyota i-Road), while also offering more flexible options for personal mobility.
- Real-time information on shared NEVs should be integrated into a universal transportation account, with which users can find, access, and pay for a variety of mobility services.

RESOURCES

- The National Highway Transportation Safety Administration (NHTSA) classifies any four-wheeled motor vehicle with top speeds of 20 to 25 miles per hour as a "low-speed vehicle."
- Regulations governing low-speed vehicles differ by state, but the California Vehicle Code (CVC) classifies NEVs as low-speed vehicles that may operate on any street that has a posted speed limit of 35 mph or less. Vehicles can cross streets with higher speed limits if the intersections are controlled and the cross streets are approximately at right angles.
- California Streets and Highways Code, Division 2.5 (City Streets), Chapters 7 and 8 allow for local NEV transportation plans.

  Examples include:

  - Chapter 7, Section 1962 amended to allow the County of Riverside or any city within the county to prepare a NEV transportation plan. Refer to AB 61 (2011).
  - Chapter 7, Section 1963 amended to allow the City of Lincoln and the City of Rocklin in the County of Placer to prepare a NEV transportation plan.
  - Chapter 8 allows for a NEV transportation plan for the Ranch Plan Planned Community in Orange County

4 MOTORIZED SERVICES AMENITIES

ELEMENT IN ACTION

Photo courtesy of Coachella Valley Association of Governments

CV Link Master Plan Volume 4: NEV Transportation Plan - Coachella Valley, CA

Authorized by AB 61 (2011), the Coachella Valley Association of Governments developed a neighborhood electric vehicle plan to identify priority NEV routes and needed improvements. Considerations include traffic speeds and volumes, road widths, and public charging facilities. The plan also includes design guidelines for NEV paths, lanes, and parking spots, and it discusses next steps for implementation. The plan contributes to the development of a multimodal vision for the Coachella Valley, also referred to as CV Link.

Otay Ranch Trail/Path System – Chula Vista, CA

The Otay Ranch master planned community was designed with an extensive Village Pathway network that connects villages with major community destinations and local transit routes. Existing and planned pathways are either 10 or 15 feet wide to accommodate pedestrians, casual cyclists, and NEVs. These pathways could accommodate a shared fleet of NEVs for residents and visitors, helping to reduce traffic congestion and also the demand for parking.

The GEM © 2008 miheco available under CC BY-SA 2.0

Polaris GEM Neighborhood Electric Vehicle

The Polaris GEM is a neighborhood electric vehicle that can be used for personal transportation, shuttle service, and other campus or business park needs such as security or hospitality. The low-speed vehicles can carry between two and six people, based on the vehicle model. The GEM is an example of an emission-free mobility option that could be incorporated into an NEV transportation network.

4 MOTORIZED SERVICES AMENITIES

ELECTRIC VEHICLE CHARGING

DEFINITION

An electric vehicle charging station (EVCS) gives people the opportunity to charge plug-in electric vehicles (PEVs) at a mobility hub. Battery-powered electric vehicles, plug-in hybrid electric vehicles, and electric vehicle conversions of hybrid or internal combustion engine vehicles are examples of PEVs. Passenger cars, microtransit vehicles, shuttles, and large transit buses can all be PEVs. They are critical to California's zero emission vehicle (ZEV) planning.

SAMPLE EV CHARGING TECHNOLOGIES[1]

The types and configuration of charging stations depend on how people use PEVs at a given location. Stations can be sited in specific areas of a transit station, or within the greater mobility hub zone. In addition to EVCS options that are available today, advanced technologies for EV charging such as wireless induction could be considered for future mobility hubs as they become available and vehicles become compatible for wireless charging.

CHARGING TYPE	MILES OF RANGE PER HOUR OF CHARGE[2]	MOBILITY HUB APPLICATION
Level 1 (L1)	~3-6 miles/hour	• Slowest charging method • PEVs recharge using an L1 charger, or by plugging into a standard 110/120-volt outlet • Electric bikes, mopeds, scooters, and neighborhood electric vehicles (NEVs) recharge using a 110/120-volt outlet
Level 2 (L2) 3.3kW (low) 6.6kW (medium) 9.6kW (high) 19.2kW (highest)	8-12 miles/hour 16-24 miles/hour 32-48 miles/hour > 60 miles/hour	• Home, office, and public applications • All PEVs can use Level 2 chargers • Each charging station can have 1 to 4 ports • Supports PEVs of parked transit riders, waiting ridehailing services, microtransit, and passing drivers who may stop at a mobility hub to charge up on their way to their ultimate destination
DC Fast and Super-Fast Charging (50kW to 350kW)	~80% of battery charged in 15-30 minutes	• Preferred method for corridor/freeway charging • Quick charge for transit riders, TNCs or other microtransit, shuttles, and for passing drivers to continue trips on electric • Not compatible with all PEVs, so typically installed along with L2 chargers • Superfast charging was exclusive to Tesla, but it's becoming an option for more PEVs
Wireless and future advanced charging technologies	TBD; Likely similar to ranges identified above	• Cater to new and future PEV models ranging from cars to buses • Allow vehicles to charge without plugging in • Older vehicle models not compatible with wireless

1 Table adapted from: Electric Vehicle Charging Station Installation Best Practices: A Guide for San Diego Region Local Governments and Contractors Report (SANDAG 2016)
2 Electric vehicles have battery packs in various sizes; the size determines the amount of energy stored in the vehicle and the actual time to charge.

4 MOTORIZED SERVICES AMENITIES

IMPLEMENTATION CONSIDERATIONS

- Consider how electric vehicle charging at a mobility hub fits in with the overall network of public charging stations in the region.
- Statewide data show a need for more charging stations within disadvantaged communities. Consider measures that help encourage people in disadvantaged communities to buy PEVs and/or use electric carsharing services.
- When installing charging stations at mobility hubs, consider the following:
  - Add wayfinding signs to direct PEV drivers to station locations and increase awareness about public charging stations.
  - If parking is limited, assess whether charging stations can be installed at nearby properties to accommodate transit riders, TNCs, and other shuttles.
  - If electrical capacity is limited, consider installing onsite electricity storage and/or renewable sources of energy.
  - Bollards and/or curbs can protect charging equipment from collisions.
  - Determine the distance between planned charging stations and electrical connections. Where possible, site charging stations nearby the electrical substations.
  - Provide a dedicated electric meter for charging stations at a hub.
  - Provide a network connection to track overall usage and show real-time availability at each station through phone apps and other networks.
  - Install stations with multiple ports between stalls, to increase access to charging equipment from multiple stalls. Do this where physical configuration, vendor technologies, accessibility requirements, and other design constraints allow.
- Consider how charging stations will be managed, operated, monitored, and maintained. Local agencies or jurisdictions that partner with vendors to provide stations may pay a fee to the vendor to install, manage, operate, and maintain it.
- A variety of smartphone applications and websites provide information on how to locate charging stations. This could be integrated with other trip planning websites, applications, and kiosks to encourage EV charging at mobility hubs.
- Universal transportation accounts could be expanded to allow users to pay for charging fees.
- Funding opportunities are available to support the purchase of charging stations for some types of installations and each program has its own eligibility requirement:
  - The San Diego Gas & Electric program, Power Your Drive, provides charging stations for workplaces and multi-family dwellings, if they meet certain qualifications. SDG&E aims to deploy up to 3,500 charging stations in its service territory, and the utility will pilot a project that will feature chargers at eight park-and-ride stations in the San Diego region.
  - Electrify America will invest $800 million in California for EV charging over the next ten years, and a San Diego Metro Area program will be a beneficiary. Funding comes from a $1.2 billion federal settlement with Volkswagen over emission violations.
  - SANDAG is developing a regional charging program to offer incentives to agencies and businesses for the purchase and installation of publicly accessible charging stations. The program is expected to be available in 2021.

RESOURCES

- **State policies and resources** that support the increased deployment of EVCSs include:
  - Executive Order B-16-12 calls for 1 million ZEVs by 2020 and 1.5 million by 2025, including required infrastructure to support these vehicles. Senate Bill 1275 (2014) extended the 2020 ZEV deadline to 2023.
  - The California Energy Commission Alternative and Renewable Fuel and Vehicle Technology Program provides grants to support vehicle deployments; regional EVCS planning; and research, development, and demonstration of emerging technologies.
  - The 2016 California Building Standards Code includes EVCS requirements that apply to new construction and to alterations of existing structures.
  - The California Green Building Standards Code (CALGreen), includes information on voluntary and mandatory requirements for EV charging stations.
  - The California Electrical Code (Title 24, Part 3, Article 625) specifies required methods for wiring, equipment construction, and safety [shock] protection systems and overcurrent control and protection. It also covers proper equipment marking, placement, orientation, and location.
  - For proper signage and pavement markings, refer to Caltrans Traffic Operations Policy Directive 13-01 or the California Manual on Uniform Traffic Control Devices (MUTCD).
- **Regional and local policies and resources** that support the increased deployment of EVCSs include:
  - San Diego Forward: The Regional Plan and its Environmental Impact Report identify several measures supporting the electrification of transportation. Among them:
    - Prepare a regional alternative fuels readiness plan.
    - Develop a regional charger incentive program.
    - Integrate EV charging infrastructure into new transportation projects that include parking lots and/or facilities.
  - Plug-in SD Electric Vehicle Charging Station Installation Best Practices: A Guide for San Diego Region Local Governments and Contractors Report (2016), prepared by SANDAG with CSE, includes:
    - A review of codes and standards relating to EVCS installations
    - An overview of common installation challenges in different scenarios
    - EVSC installation checklists and other best practices to help local building departments and electrical contractor

4 MOTORIZED SERVICES AMENITIES

ELEMENT IN ACTION

Del Lago Transit Station – Escondido, CA

Located off Interstate 15, the Del Lago Transit Station provides access to five Level 2 chargers and a DC Fast Charger with two ports. The Level 2 chargers are compatible with all PEVs and provide a full charge in four to six hours. The DC Fast Charger works well for users who need a quick charge before continuing their trip. Only electric vehicles are permitted to park in these charging spots.

Sabre Springs/Peñasquitos Transit Station – San Diego, CA

Located off the intersection of Interstate 15 and Ted Williams Parkway, this station provides access to ten Level 2 chargers and is pre-plumbed for 20 more. The chargers are compatible with all PEVs and provide a full charge in four to six hours. Only electric vehicles are permitted to park in these charging spots. This transit station incorporated other mobility hub features including smart parking, bike lockers, and solar shading for rooftop parking.

Metro Charge Stations – Los Angeles County

Metro has installed 62 EV charge stations at 15 rail station parking lots throughout Los Angeles County. The charge stations allow users to charge their vehicles while they ride Metro. Charge stations are available for $1 per hour with a $3 daily max to riders who sign up for an account through Metro's website. There is no monthly or start-up fee. An app-based system is used to initiate a charge, and a user can receive an email, text, or a mobile app notification when the charging session is completed or if it's experienced any interruptions.

EVCS Portals

The U.S. Department of Energy's Alternative Fuel Data Center station locator provides information on alternative fueling station locations and features, and the infrastructure is verified by the Clean Cities Coalition. PlugShare and ChargeHub are crowd-sourced tools that allow users to find electric vehicle charging stations. These resources are available online or via a mobile app.

PacNW Electric Vehicle Recharging © 2013 Dennis S. Hurd available under CC BY-NC-ND 2.0

4 MOTORIZED SERVICES AMENITIES

SMART PARKING

DEFINITION

Smart parking uses technology to make searching and paying for parking more convenient and efficient. Smart parking solutions can be used to better inform people of available parking, streamline enforcement and maintenance, provide data on parking patterns within the community, and give people a better parking experience overall.

SAMPLE SMART PARKING SOLUTIONS

- **Smart meters** support a wide variety of payment options, and they can be implemented using single-space meters or pay stations that serve multiple parking spaces on a single block. Parking rates may be adjusted based on demand, the time of day, and the length of stay.
- **Pay-by-phone** options, whether a voice call, text, or smartphone app, can offer customers flexibility and save them time and money because they only pay for the actual time parked.
- **In-street sensors** can keep track of how many parking spaces are filled at any given moment. This data can be used by a parking management system to optimize rates, time limits, and hours of operation.
- **Real-time information** on available parking spaces, delivered to a person's smartphone or on mounted signs, can help motorists find a parking spot faster. Online applications that include mapping can show the location of parking lots, how many spaces are currently available in those lots, parking rates, and other pertinent information.
- **Parking guidance systems** typically consist of dynamic signs that direct motorists to available parking spaces. These systems require a significant investment in data collection technology, including loop detection systems or camera detection systems.
- **Parking reservations systems** allow motorists to book a space online and often pay for it in advance, reducing the time it takes park.

IMPLEMENTATION CONSIDERATIONS

- Technology can make parking easier for drivers and easier for those who manage the parking system.
  - Keep up with the latest parking technology. Outdated technology can limit the capabilities of a parking system and may no longer serve drivers' needs. Communities should do their best to stay ahead of the trends, so investments in technology are not wasted or updates are required sooner than anticipated.
  - At the same time, too much of the latest technology can become overwhelming or confusing for drivers, and it won't necessarily improve parking management. One type of technology used efficiently can make more of a difference than a handful of various technologies.
- Smart parking technology that indicates in real-time when a parking supply can be used by different individuals – employees vs. residents, for example – can help achieve shared parking goals. Parking spaces also can be allocated based on demands by shared mobility services such as carshare and scootershare.
- Before implementing any smart parking technology, conduct a comprehensive study that examines community characteristics, parking inventory, occupancy, and turnover.
- Smart parking technology should be integrated in a way that fits the needs of the local community, makes it easier for people to use multiple transportation options, and makes the entire parking system run more smoothly.
- Consider why smart parking is needed at a mobility hub. Reasons might include customer convenience, improving access to commerce, reducing congestion, and generating revenue. These and other reasons will drive which technological solution to pursue.
- Look for opportunities to integrate smart parking technology with transit applications, particularly those that offer real-time information. This could help people better plan their trips as they check the availability of parking spaces in advance, reserve parking spaces before their trip, and even pay in advance.
- Consider developing a policy for managing curb lanes, to help planners and parking managers establish priorities along the curb that make sense for their community. This effort can help decision-makers better balance competing needs for curb space.
- Consider demand-based pricing that can be updated in real-time to improve the availability of parking and reduce congestion generated by people looking for a place to park.
- Consider the advantages of public versus private parking facilities, as well as different management strategies, standards, and regulations that can best serve the organization's goals for parking.
- Consider how much performance-based data is needed to be compatible with regional data systems – as well as the required type and format – in order to integrate it with other regional datasets such as the Integrated Corridor Management (ICM) in San Diego County.
- Smart parking information should be integrated into a universal transportation account, with which users can find, access, and pay for a variety of mobility services.
- The SANDAG Regional Parking Management Toolbox has additional guidance on implementing smart parking technology.

4 MOTORIZED SERVICES AMENITIES

ELEMENT IN ACTION

City of San Diego

In 2014, the City of San Diego began upgrading about 5,000 on-street parking meters so drivers could use their credit cards and pay-by-phone, as well as paying with coins. The ability to collect real-time data is helping to streamline operations for the back-office system, and providing better insight into how meters are used. Additionally, Civic San Diego unveiled a comprehensive map of real-time parking information, which drivers can access with a mobile app. ParkItDTSD aims to simplify the parking experience for people who visit, live, and work in downtown San Diego.

Photo courtesy of SFMTA

SFpark– San Francisco, CA

SFpark uses smart pricing to help drivers quickly find open spaces. To help achieve the right level of parking availability, SFpark periodically adjusts on-street meter and garage pricing up or down to match existing demand. Demand-responsive pricing encourages drivers to park in underused areas and garages, reducing demand in overused areas. Through SFpark, demand-responsive pricing works to re-adjust parking patterns in the city so people can find parking spots more easily.

Photo courtesy of LADOT

LA Express Park – Los Angeles, CA

LA Express Park combines technology and demand-based pricing to better manage parking. Parking meter technology, a parking guidance system, in-ground vehicle sensors, and a parking management control center all help the city achieve its goals of maximizing the use of a limited number of parking spaces, reducing traffic congestion and air pollution, and encouraging people to use alternative modes of transportation.

4 MOTORIZED SERVICES AMENITIES

FLEXIBLE CURB SPACE

DEFINITION

For a wide variety of transit, shared mobility, and supporting services to operate efficiently within a mobility hub, curb space should be used flexibly. For example, specific curb space can be designated for some mobility services during their peak demand periods, while the same space can be designated for other uses during off-peak periods. "Flexible curb space" allows the mobility network to better balance street demands as they change throughout the day.

IMPLEMENTATION CONSIDERATIONS

- Clear curb markings and signs could designate how curbs can be reserved for a variety of uses. This information should indicate the type of use allowed such as mobility service, mobile retail, and passenger loading; restrictions on uses during certain times of the day, certain days of the week, and the type of uses allowed; and how to make a reservation (if applicable).
- On-street parking policies can impact a community aesthetically, environmentally, financially, and with traffic. Dynamic parking policies should not be set in a vacuum, and they must be open to small adjustments as needed.
- Some flexible curb space zones may require supporting urban, civil, and safety design elements. These may include a physical separation from traffic/safety barriers, traffic calming, electrical service, and urban design elements such as colored or special pavement treatments and landscaping treatments to distinguish different use areas.
- Designating flexible curb space can conflict with the needs of transit, delivery trucks, and other large vehicles that may need more space to maneuver into and out of a loading zone or parking space. Consider extending the length of loading zones
- to accommodate all types of vehicles, and avoid high traffic areas if possible.
- Extended loading zones may eliminate through-traffic lanes and street parking.
- Shared mobility services can efficiently use flexible curb space if passenger loading is restricted to hours when transit service is light and excess space is available.
- If a particular flexible curb space is used intensively by various groups, notifications can be sent to managers of those groups and mobility hub management so everyone can plan for times of peak use. For example, extra bicycles can be placed at key locations to let people know that bikeshare is an option.
- Notify people of the various uses of curb space at or near mobility hubs. Offer this information through wayfinding.
- Deploy dynamic signs and mobile app alerts to let people know in real time how curbs are being used.
- Determine whether fees for occupying flexible curb space will be collected; this can support its continued use.
- Flexible curb space should be actively monitored and managed in order to operate successfully.

Shared mobility services using autonomous and connected vehicles may leverage 'real-time' information to recognize when curb space has changed from passenger pick-up/drop-off to allow mobile retail services and goods movement activity.

ELEMENT IN ACTION

Fifth Avenue Passenger Loading Zone – San Diego, CA

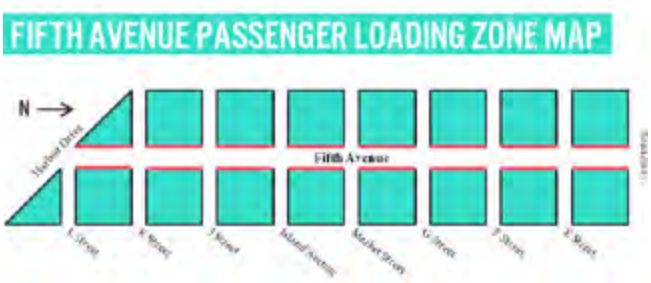


Photo courtesy of Gaslamp Quarter Association

Demand for curb space is exceptionally high in downtown San Diego. Taxis, Uber/Lyft vehicles, valet parking stations, tourist shuttles, commercial deliveries, pedicabs, bikeshare, and an on-demand microtransit service all are competing for curb space at various times of day and night. In 2016, the San Diego City Council approved a Fifth Avenue Passenger Loading Zone as a two-year pilot program along the main artery of San Diego's Gaslamp Quarter. The zone prohibits vehicles from parking on-street between 8 p.m. and 3 a.m. on Friday and Saturday evenings, so that a wide variety of shared mobility services can access the limited curb space. The flexible curb space pilot aims to improve traffic flow, decrease congestion, and improve pedestrian safety.

4 MOTORIZED SERVICES AMENITIES

ELEMENT IN ACTION (continued)

Shared Transit Stop Pilot – Seattle, WA

Photo courtesy of The Seattle Times

In April 2017, the City of Seattle and King County Metro partnered with the Seattle Children's Hospital and Microsoft to conduct a six-month pilot program to allow employee shuttles to share 11 transit stops with King County Metro buses. The pilot will evaluate the feasibility of allowing employer-provided shuttles to use public transit stops, while minimizing impacts to public transit operations. If the pilot is successful, the program could be expanded to include additional employer-provided shuttles and more transit stops. Special signs will designate the select transit stops as shuttle pick-up/drop-off locations.

King Street – Kitchener, Ontario, Canada

Photo courtesy of City of Kitchener and IBI Group

In 2010, the City of Kitchener redesigned King Street to give priority to pedestrians while still meeting the needs of other users. A variety of traffic calming measures were implemented, such as wider sidewalks, lower curbs, planter beds, enhanced lighting, and seating. The most notable features are removable, European-style bollards that provide greater flexibility to accommodate events and festivals. The bollards can be used to delineate on-street parking spaces, close off portions of the street to traffic, or convert on-street parking spaces into areas for outdoor cafes and patios. Due to these improvements, a more flexible curb space was created to better align with time-specific demands.

5

SUPPORT SERVICES & AMENITIES

5 SUPPORT SERVICES & AMENITIES

WAYFINDING

DEFINITION

Wayfinding is a tool that helps people navigate from place to place. In the context of a mobility hub, these places might include transit stations, civic and community buildings, parks, and more. Static and interactive signs can provide maps and directions to points of interest, transit schedules and routes, and other information on available mobility services and facilities. This mobility hub feature can exist throughout the five-minute walk, bike, and drive access sheds and be customized based on user type and travel mode.

IMPLEMENTATION CONSIDERATIONS

- The development of a successful wayfinding program requires extensive participation from the public, local jurisdictions, business owners, and civic groups.
- Develop a comprehensive strategy for wayfinding. Consider whom the wayfinding effort is designed to help, how far people are attempting to travel, and where they want to go.
- Use wayfinding signs to develop and promote a distinct identity for the area. Branding can help create a strong sense of place. However, work with transit properties to ensure that branding is compatible. Often, it can be a challenge to incorporate a transit agency's branding into a business district or a city's wayfinding branding.
- Integrating important information about transit and shared mobility service into wayfinding tools can help improve mobility for locals and visitors.
- Coordinate with transit services to ensure that future service changes or enhancements are integrated smoothly into the wayfinding system.
- Consider how the wayfinding program will be funded and maintained.
- Consider whether wayfinding signs should be open to advertising or to promoting some locations over others through fees or contracts.
- Consider all accessibility guidelines to ensure that people with visual, physical, or hearing impairments can access information.

Enhanced wayfinding technology will enhance access for seniors, young people, and those with disabilities, as these populations use autonomous vehicles for everyday trips.

ELEMENT IN ACTION

Downtown San Diego Wayfinding Project – San Diego, CA

Civic San Diego spearheaded an effort to install more than 200 static wayfinding signs throughout the downtown parking district to help drivers and pedestrians navigate the urban core. Each category of signs shared a similar color scheme and font for consistency. The project was funded through a combination of downtown on-street parking meter revenues, downtown parking garage revenues, and a grant from the San Diego Association of Governments (SANDAG).

LinkNYC – New York, NY

LinkNYC is replacing more than 7,500 pay phones around New York City with free, high-tech interactive kiosks called Links. LinkNYC is funded through advertising, and it provides the public with free communication and wayfinding services. Links are ADA-compliant design, and they provide the public with maps and directions, free domestic phone calls including emergency 911 communications, WiFi, a USB port for device charging, and an interactive tablet with information on city services and travel updates.

5 SUPPORT SERVICES & AMENITIES

PACKAGE DELIVERY

DEFINITION

Package delivery stations are secure lockers in which online orders can be held for pick up at any time of day. They can be conveniently situated at retail centers or transit stations. Offering package delivery services within a mobility hub can save people an extra trip by car to pick up a package – offering them one more reason to embrace an alternative to driving alone.

IMPLEMENTATION CONSIDERATIONS

- Situating package delivery services near high-volume transit stations, dense employment centers, and commercial areas is recommended. This can help people avoid making an extra stop on the way to their primary destination.
- Consider incorporating privacy and security features at package delivery stations within a mobility hub.
- Consider municipal business and regulation policies that govern for-profit businesses in a public right-of-way.
- Anticipate the demand for package delivery stations in different communities by analyzing data gathered from existing stations.
- Develop memoranda of understanding (MOUs) or other agreements between package delivery services such as Amazon, USPS, UPS, and FedEx.
- Situate package delivery stations in retail locations in a way that makes it convenient for people to access them but doesn't create inconveniences for other people shopping in the area.
- Package delivery lockers actually may reduce a parcel company's reliance on delivery trucks, because independent contractors can help deliver goods using smaller vehicles.
- The package delivery industry always is looking for ways to streamline its operations. For example, drones and robots are being tested to deliver packages.
- Packages could be delivered using the same vehicles that people use to get around. For example, ridehailing services also could deliver food, groceries, flowers, and other goods as part of their business model.
- Many parcel delivery companies struggle with failed deliveries, and package delivery stations may help alleviate this problem while also helping those companies reduce their greenhouse gas emissions.
- Parcel delivery companies are exploring the idea of allowing customers to pick up their packages while on-board public transit. Transit agencies could partner with parcel delivery companies to ensure that this business model is trouble-free for transit drivers and convenient for riders.

Logistics companies are evaluating autonomous vehicles to deliver packages more quickly and efficiently. In the future, vehicles may be equipped with an attachment for parcel loading and unloading at package delivery stations. Package delivery stations themselves may autonomously travel closer to customers.

ELEMENT IN ACTION

Amazon Lockers

Amazon customers can now pick up their online orders from an Amazon locker, instead of relying on home or office delivery. Upon ordering, customers choose the locker location that is most convenient, and then they stop by within three days of delivery. A unique pick-up code is provided for each order. Lockers are situated at a variety of locations such as 7-Eleven stores, college campuses, and multifamily housing complexes.

Grocery Distribution Lockers

Similar to Amazon lockers, grocery distribution lockers allow customers to place an online order and pick up their groceries while in route to another destination. Lockers may include temperature control features to keep perishables chilled until a customer arrives. Siting these lockers at a transit or ferry station makes it a convenient amenity at mobility hubs.

5 SUPPORT SERVICES & AMENITIES

MOBILE RETAIL SERVICES

DEFINITION

Mobile retail services can offer people a convenient way to complete regular errands without relying on a personal car. In other words, businesses come directly to customers, instead of the other way around. What's more, when mobile vendors are situated at a mobility hub people may be more willing to choose public transit over driving alone to get their errands done. Examples of mobile vendors include food trucks, mobile dry cleaning, grocery delivery, salon services, and florists. Many of these services operate during normal business hours, so people visit them when they're heading to work, during lunch, or when they're on their way home.

IMPLEMENTATION CONSIDERATIONS

- Mobile vendors can be situated at business parks, within individual company buildings, and near transit stations:
  - Providing services that are attractive to employees can help make transit a more attractive option for commuting.
  - Vendors can occupy a designated space inside a business or parking lot, or operate out of vehicles.
  - Mobile vendors partnered with courier companies, with the approval of property managers, can offer services such as dry cleaning.
- Mobile vendors can be allowed to use flexible curb space at designated times to make shopping more convenient for customers.
- Where feasible, mobile food vendors can position their vehicles in pedestrian-oriented locations with safe pedestrian walkways, adequate lighting, seating, and shade. These locations could have designated food truck zones with specified time limits along curbs. The zones would be designed to encourage mobile vendors to park their vehicles.
- Underused parking lots could be repurposed as places where mobile vendors could park near transit stations. For example, commuters could use a mobile dry cleaning service situated at a transit station, saving themselves a trip later.
- Mobile vendors must comply with local city laws that apply to the services or goods they deliver. A vendor also must work with local government to obtain required permits.
- Mobile vendors may fill gaps in the shopping environment that a mobility hub already offers, or introduce new shopping opportunities to a community that lacks retail options. On the other hand, local jurisdictions should consider whether new mobile vendors would add shopping options or duplicate what's already available.
- Clear and easily understood signs can inform mobile vendors where they can park and when, and also provide them with directions.

ELEMENT IN ACTION

Photo courtesy of STERLINGS Mobile Salon & Barber Co.

STERLINGS Mobile Salon – San Diego, CA

STERLINGS Mobile Salon & Barber Co. provides men and women on-site haircuts at many locations throughout San Diego, saving people a trip to the salon. Customers can schedule a haircut online. STERLINGS' mobile salons are self-contained, climate controlled units that do not require any hookups to local facilities. Revolving locations include Downtown San Diego, Mission Valley, and UTC. Local employers can partner with STERLINGS as a benefit to their employees.

Food Trucks Near Transit - Baltimore, MD

In April 2017, the City of Baltimore expanded its food truck program by adding ten new mobile food zones across the city. The zones are situated near transit stations and other areas with high foot traffic such as hospitals and college campuses. The zones include space for two trucks to operate everyday between 9 a.m. and 3 p.m. Food truck zones were established in 2014 to help prevent mobile vendors from operating within 300 feet of a brick-and-mortar business that sells similar products. The city plans to build a more robust food truck program such as those in Portland, Oregon and Austin, Texas.

5 SUPPORT SERVICES & AMENITIES

UNIVERSAL TRANSPORTATION ACCOUNT

DEFINITION

The vision for a universal transportation account (UTA) is to provide people with an integrated payment solution for a wide variety of mobility services. A single smartphone app can be used to find, access, and pay for transit, parking, tolling, shared mobility services, EV charging, and more. The UTA also can be used to administer travel-based incentives to reward people who seek alternatives to driving alone.

IMPLEMENTATION CONSIDERATIONS

- Assess the technological challenges and consumer benefits of the program.
- Identify who will manage, maintain, and support the program. Clearly identify roles and responsibilities.
- Develop a phased plan for testing, piloting, and long-term implementation.
- Every aspect, including farebox and communications equipment, customer service, training, maintenance, operations, fare policies, and marketing must be considered during implementation.
- Determine which public agencies and which private mobility and technology service providers will be included in the payment program. There must be a strong effort to coordinate with transit agencies and private vendors.
- Different interests among stakeholders may make launching a UTA system challenging. Develop a marketing strategy to educate the public on UTA benefits, and allow people to provide meaningful feedback that is incorporated into the program.
- People may be encouraged to set up a universal transportation account and use public transit if they are rewarded with toll credits, free shared mobility credits, or other incentives.
- Consider offering people discounted fares on long trips, or when public transit is combined with privately operated shared mobility solutions.
- Incorporate services and amenities that are not related to mobility, such as retail purchases, into the UTA. This way, incentives for using a UTA can expand beyond increased mobility.
- Work to create a UTA that works with all mobility options in the region, and work toward inter-regional compatibility.
- Integrated payment plans can encourage people to use alternatives to driving alone. Consider offering people fare discounts to reward them for using alternative forms of travel such as public transit. This can be done on one leg of a multimodal trip, or within a specified time period.
- Consider policies related to financial regulations and privacy protection policies that are associated with integrated payment systems.
- Anticipate future technologies, and define policies to effectively incorporate them into a UTA.

ELEMENT IN ACTION

NextCity

Cubic Transportation Systems, which specializes in transportation revenue collections systems, is developing an app called NextCity that is expected to consolidate all forms of transportation into one account. This app is being designed to show travel times, offer the fastest routes, and provide pricing information. Before launch, however, Cubic Transportation Systems must acquire massive amounts of data to predict travel times accurately across modes. The timing of deployment is expected to vary from city to city.

5 SUPPORT SERVICES & AMENITIES

ELEMENT IN ACTION (continued)

Photo courtesy of MaaS Global

Whim

Available in the Helsinki region, the Whim app offers convenient access to a variety of shared mobility options – transit, taxi, and rental cars - with bikeshare to be added in 2018. Whim includes convenient payment options, including two monthly subscription plans for frequent users. The flexibility of Whim allows for a seamless travel experience while reducing reliance on the private automobile.

APPENDIX C

REGIONAL MOBILITY HUB IMPLEMENTATION STRATEGY

Implementation Memo

SANDAG

IMPERIAL COUNTY TRANSPORTATION COMMISSION

I. ENABLING MOBILITY HUB IMPLEMENTATION

In a perfect world, mobility hubs would be fully operational everywhere they are needed, offering people numerous alternatives to driving alone. Some mobility hub services and amenities can be provided in the near-term with a limited amount of investment, agency approval, and oversight. Others take longer to implement, requiring more substantial investment, planning, policy changes, and complex partnerships. What's more, some of the technology necessary for realizing a community's vision for a new mobility hub is still not ready for prime time. It may be several years before this technology is available commercially and proved to be effective in the real world.

However, agencies and organizations involved in establishing mobility hubs can take steps to phase them in over time. Planning in innovative ways and developing progressive policies are good places to start. For example, as people increasingly use on-demand mobility services, the need for safe and efficient passenger pick-up and drop-off areas also will increase. Successful mobility hubs have space allocated to support shared mobility services, and local jurisdictions can start planning for this now. Cities will need to analyze current management policies and practices for curb lanes as they plan for more flexible curb spaces – spaces that can be used safely by a growing number of ridesharing services, mobile retail, bike riders, and pedestrians.

A. The Importance of Public–Private Partnerships

It is becoming more and more difficult for public transportation agencies to entirely finance and build infrastructure, programs, and services. Agencies are increasingly collaborating with private partners including developers, property managers, employers, and transportation and technology service providers. Mobility hubs can benefit from these collaborations, partly because they incorporate a variety of emerging privately-operated transportation services such as carshare, bikeshare, shuttles, and on-demand rideshare services. Mobility hubs also vary according to the circumstances of the local community they serve and location-specific opportunities for development – both of these factors also make public-private partnerships useful. Public agencies should begin exploring opportunities to partner with the private sector and collaborate on pilot projects that aim to solve real-world mobility challenges. These types of partnerships will require public agencies to assess their traditional procurement practices and to identify innovative ways to pilot new mobility services that enhance access to transit and give people attractive alternatives to driving alone.

B. Using Big Data

We live in a world increasingly informed by "Big Data," and the success of a mobility hub will hinge on integrating public and private transportation services by collecting, aggregating, managing, and acting on data from a wide variety of sources. Agencies should develop open data policies to enhance government efficiency and transparency. Likewise, data from transportation service providers in the private sector will be greatly needed to integrate trip planning, scheduling, and payment. Both partners should proactively establish partnerships and data-sharing agreements that support the success of mobility hubs.

C. Our Autonomous Future

Many shared mobility services will soon become fully automated. Uber and Lyft are heavily invested in autonomous vehicle technologies, and autonomous microtransit already is being piloted in the State of California. Local agencies need to determine if their infrastructure is prepared to accommodate shared services that are connected and autonomous. Traffic signals and other infrastructure, for example, may need to be updated to support wireless connectivity. Wireless connectivity networks will allow vehicles to communicate with infrastructure and transportation management systems in real time, which will optimize routing and improve the reliability of services. Agencies also should consider planning for a network of wireless charging infrastructure to support shared autonomous vehicles, and the mobility hub concept overall.

D. Memo Organization

Table 1 on the following page highlights data-sharing and other important considerations for the San Diego Association of Governments (SANDAG), the Imperial County Transportation Commission (ICTC), and other agencies that are involved in establishing mobility hubs. It is intended to be an overview and does not constitute an exhaustive list.

Section II offers guidance on establishing mobility hubs in existing developments.

Section III offers guidance on establishing mobility hubs in new developments.

Section IV reviews examples of how public-private partnerships can help launch mobility hub services and amenities.

Section V briefly describes how local plans can support establishing a mobility hub.

Section VI highlights the importance of equity in establishing a new mobility hub.

Section VII identifies more specific early actions that lay the groundwork for establishing a mobility hub.

Table 1: Mobility Hub Implementation Considerations

	SANDAG and ICTC	Transit Operators	Local Governments
Planning			
Evaluate and amend existing planning documents and programs to better incorporate the mobility hub concept and to provide flexibility for change in response to technological innovations. Identify opportunities for new plans and programs.	Regional Transportation Plans and supporting Sustainable Communities Strategies Corridor studies and transit plans Develop toolboxes and other resources for local jurisdictions, and provide them with technical support: • Help local jurisdictions develop shared mobility strategic plans. • Help local jurisdictions integrate shared mobility and parking management strategies into the development process.	Transit planning documents Transit design manuals	Land use and transportation plans: • General plans, community plans, specific plans • Mobility and corridor studies • Street design manuals • Climate action plans • Parking management studies and plans • Neighborhood electric vehicle (NEV) plans
Policy			
Develop new policies and/or amend existing policies and ordinances to ensure that they support the mobility hub concept.	Seek countywide legislation for neighborhood electric vehicles (NEVs) so that local jurisdictions can develop NEV transportation plans. Develop policies to support open data sharing. Identify opportunities in the procurement process to streamline the implementation of mobility hub features.	Evaluate ordinances related to fare pricing. Evaluate policies related to transit parking regulations to identify ways to support shared mobility services. Review ordinances that license and regulate other transportation services to ensure they are aligned with the goals of the mobility hub concept.	Evaluate local regulations and municipal codes to ensure that they enable the mobility hub concept. Develop complete streets policies that consider shared and autonomous mobility options. Integrate mobility hub planning into the entitlement process (e.g., land development codes and building codes). • Require and/or incentivize developers to incorporate mobility hub features as part of their proposed projects.
Funding			
Seek competitive funding opportunities to support establishing a mobility hub. Better integrate the effort into existing funding streams and grant programs.	Pursue federal and state grant programs such as the Pilot Program for Transit-Oriented Development Planning. Revise existing criteria for the regional grant program to consider mobility hub elements for funding. Account for mobility hub improvements within Capital Improvement Programs (CIPs).	Pursue federal and state grant programs such as the Mobility on Demand Sandbox Demonstration Program in partnership with local agencies. Explore and pilot operational models that leverage public-private partnerships that help reduce costs.	Pursue state and regional grant programs such as the Smart Growth Incentive Grant Program. Account for mobility hub improvements within CIPs. Incorporate mobility hubs as an eligible expenditure under existing funding streams such as parking district revenues and development impact fees.
Allocation of Space			
Consider how the current allocation of space within the public right-of-way can incorporate mobility hub elements and design projects and infrastructure with mobility hubs in mind.	Identify potential showcase projects based on existing and planned high-frequency transit services, supporting land uses, population and employment density, and other features that support mobility hubs. Incorporate mobility hub features as part of the design or rehabilitation of transit stations and Park & Ride facilities (e.g., secure bike parking, electric vehicle (EV) charging infrastructure). Design and build regional bikeways that connect to transit while supporting the local bike network.	Dedicate parking space at transit stations for carpools, vanpools, and carshare. Allocate transit station curb space for loading and unloading passengers of on-demand shuttles, rideshare companies, and other shared services. Dedicate transit station space for bike services and amenities such as bikeshare and secure group bike parking. Allocate transit station space for EV charging infrastructure.	Encourage and incentivize developers and landowners near transit hubs to dedicate right-of-way for mobility hub features and services. Encourage and incentivize developers and landowners near transit hubs to build and/or contribute toward the operation of mobility hub services and amenities such as on-demand shuttle services, EV charging infrastructure, wayfinding signage, and bike and pedestrian improvements. Allocate street lane space for mobility hub features such as dedicated transit lanes, shared transit lanes, and cycle tracks. Allocate curb space for mobility hub features such as dedicated carshare parking and passenger loading zones.
Data Sharing and Technology			
Share and aggregate data so that mobility services, trip planning, and payment options can be integrated. The goal: a seamless transportation experience.	Collaborate with the private sector to develop shared data agreements, and aggregate data on transportation modes and related travel to facilitate real-time trip planning across modes. Develop a fully integrated payment platform, also known as a Universal Transportation Account. Leverage the San Diego Regional Proving Ground designation to test technologies that support innovative on-demand mobility solutions.		
Public–Private Partnerships			
Review procurement practices and foster innovative ways for the public and private sectors to collaborate to improve mobility hubs. Develop public-private partnerships to offer services and amenities historically provided by public agencies alone.	Create a "Mobility Sandbox" to allow the private sector to develop proposals for demonstrating technology and services that solve mobility challenges, and implement the mobility hub concept on an ongoing basis. Partner with private vendors to pilot different technologies and products that integrate mobility hub services. Explore partnership opportunities that facilitate the integration of mobility service payments. Encourage and incentivize shared mobility service providers to fill gaps in the transit network, or to enhance access to mobility hub sites.		

II. IMPLEMENTING MOBILITY HUBS IN EXISTING DEVELOPMENTS

Mobility hubs make sense in existing communities where public transit is already most active. But planning and implementing mobility hub features requires significant outreach to property owners, managers, and other stakeholders who will be impacted by mobility hub development. It is important to inform these parties that a minimal contribution of right-of-way, through an easement or through a minor infrastructure improvement, could be needed to support the success of a new mobility hub. It is worth noting that the community improvements a mobility hub brings can increase the value of properties in the immediate and surrounding areas. Below are just a few examples of how mobility hub planners, property owners, property managers, and other stakeholders can realize joint benefits from the establishment of a new mobility hub:

- An apartment building could provide an easement for a bikeshare station or enhanced features for transit waiting areas, and in exchange the apartment building could receive minor landscaping enhancements adjacent to the easement or elsewhere on the property.

- A shopping center near a transit station could designate parking spaces for carshare vehicles and/or install EV charging stations. In return, the shopping center could experience more customer activity.

- A business park or community college could operate a shuttle service to a mobility hub, and in return it could be permitted to redesignate on-street parking in front of their property for shuttle or passenger loading only.

III. IMPLEMENTING MOBILITY HUBS IN NEW DEVELOPMENTS

Local governments often require developers to provide public amenities in new projects or offer incentives for them to do so. This is an effective strategy for establishing mobility hubs, primarily because the majority of new development in the San Diego region is expected to occur in areas already served by high-frequency transit. This makes the mobility hub concept a natural feature of new developments. Another reason mobility hubs are natural fits for new developments is that one can be designed from the earliest stages with the other in mind.

The SANDAG Regional Transit Oriented Development Strategy describes several ways that local governments can work with developers to create compact, walkable communities near transit. Several of these strategies can apply to establishing mobility hubs, including:

- Requiring new and infill developments to complete connections for active transportation and public transit along the front of their properties, as well as off-site where appropriate.

- Integrating mobility hub elements into new and infill development projects, and requiring Transportation Demand Management measures that mitigate transportation impacts.

- Creating a checklist of potential mobility hub elements that a project can contribute to, based on the Mobility Hub Features Catalog, as part of the development review process.

- Providing developers with a variety of benefits such as density bonuses, reduced parking requirements, and project fast-tracking as incentives for installing and maintaining mobility hub features in their projects.

- Requiring all large-scale developments to provide phasing strategies related to density and mode-share targets, as well as requiring that monitoring of these strategies be connected to the establishment of infrastructure for public transit and other transportation.

- Creating a seamless process for private development projects to contribute to transit station improvements via the governing jurisdiction.

- Negotiating funding for or construction of mobility hub features and services as part of a development agreement.

Traffic mitigation measures will need to better support multimodal investments to expand opportunities for implementing mobility hubs through the development process. Agencies may need to modify policies as well as Transportation Impact Analysis guidelines in order to focus on measures that reduce transportation demand and prioritize improvements that support mobility hubs in lieu of increasing roadway capacity.

IV. LEVERAGING PARTNERSHIPS TO IMPLEMENT MOBILITY HUB FEATURES

The success of mobility hubs depends on a wide variety of organizations coordinating their efforts. Mobility hubs provide new opportunities for partnerships between transportation service providers and vendors that develop technologies and products to support mobility hubs. They also could involve special assessment districts such as business improvement districts and Parking Management Districts (PMDs) as well as corporate sponsors.

A. Mobility Service Providers

The Idea

Companies that provide mobility hub services and supporting amenities such as shuttle and microtransit services, on-demand rideshare options, bikeshare and carshare programs, and EV charging technologies may present different partnership opportunities to enhance mobility in San Diego and Imperial counties.

Where it has been done

The Santa Clara Valley Transportation Authority's FLEX pilot, which ended on July 1, 2016, provided an on-demand dynamically routed shuttle service to increase ridership in underserved markets. The software partner, RideCell, generated routes between predefined stops based on pick-up and drop-off requests. A single ride during off-peak hours cost $2, while a ride during peak hours cost $3.

In the greater Toronto area, the one-year GO Connect Pilot Program, which ended in April 2016, provided Metrolinx transit riders with shuttle service to and from transit stops to alleviate congestion at the Milton GO Station. Using the RideCo application (app), passengers selected their destination and requested a ride, and the app customized the route based on requests. The GO Connect service also allowed users without smartphones to reserve trips using Short Message Service text messaging. As opposed to traditional flat fare payments for shuttle service, GO Connect's dynamic pricing was demand-based and had a maximum fare of $1.95 per trip. According to the app developer, more than 105 riders switched from driving alone to ridesharing with RideCo during the pilot program.

Between August 2016 and February 2017 in Centennial, Colorado, the Go Centennial Pilot provided people who lived within the existing Regional Transportation District Call-n-Ride service area with free Lyft Line rides to and from the Dry Creek Light Rail Station. For users with limited mobility, Via Mobility Services provided accessible transportation services to Lyft passengers. The City of Centennial and the Denver South Transportation Management Association each contributed $200,000 to fund the six-month pilot.

In Pinellas County, Florida, the Pinellas Suncoast Transit Authority's Direct Connect program pays the first $5 of passengers' Uber and taxi bills for trips to and from bus stops in eight designated zones. Trips must begin or end at the designated stop and be within the zone. The service is available seven days a week from 6 a.m. to 11 p.m.

In 2016, Alamonte Springs, Florida began subsidizing 25 percent of the cost to use Uber between the city's commuter train station on Ronald Reagan Boulevard and any destination within the city. The pilot expanded to an inter-city partnership whereby Altamonte Springs, Lake Mary, Longwood, Maitland, and Sanford offered discounted Uber travel between the five cities. As part of this pilot expansion, each city pays 20 percent of Uber fares for trips that begin in another city but end in their city, 20 percent of Uber fares that end within their respective city limits, and 25 percent of the cost of rides that begin or end at the SunRail station inside of their city.

The City of Summit in New Jersey partnered with Uber to create a commuter ride-hail pilot program to ease parking and traffic congestion at the New Jersey Transit Summit Station. The program provided up to 100 existing parking permit holders with free Uber rides to and from the station. Non-permit holders were provided with discounted uberX rides costing the user $2 per trip or $4 daily – equal to the $4 daily rate for Transit Summit Station parking. The pilot program took place from October 3, 2016, to March 31, 2017.

Washington Metropolitan Area Transit Authority partnered with Enterprise Carshare in 2015 to allocate space for 125 carshare parking spaces at 45 Metrorail stations in Washington, District of Columbia.

The City and County of Denver now allow carshare operators to purchase parking permits to park in the right-of-way or at metered spots. Permit revenue pays for the loss of meter revenue, the value of on-street parking spaces, and administration costs.

In Seattle, the free-floating carshare service ReachNow offers two drop zones citywide for carshare vehicles in busy neighborhoods. As a result, shared mobility has become a more competitive alternative to driving alone for many people, and the demand for parking personal vehicles on the street has been reduced. As in Seattle, transit agencies could consider providing full-time or part-time drop zones as part of establishing a mobility hub.

Metro Transit in the Minneapolis–St. Paul area aimed to provide users with one transportation account to pay for bus and light rail and to access HOURCAR's carshare fleet. The transit agency partnered with the carshare service HOURCAR to enable users to use their Metro Transit Go-To Cards to unlock reserved vehicles by swiping the Go-To card on the reader. The companies used a United States Department of Transportation (U.S. DOT) grant to upgrade the technology in HOURCAR's vehicles to read Metro's Go-To Cards.

B. Special Assessment Districts

The idea

A Business Improvement District (BID) is an area in which a group of businesses elects to pay additional fees to fund services or improvements that will benefit all businesses equally. These can include public amenities such as street cleaning, pedestrian infrastructure, security, or lighting. They also can include private benefits such as advertising or events. There are many BIDs in the San Diego region, including 18 active districts within the City of San Diego. Similarly, PMDs are areas in which the revenues collected from parking fees (e.g., at meters and garages) are used to help manage demand for parking within the district. PMDs historically have served to increase parking for private automobiles, but are increasingly managing parking demand with multimodal and sustainable transportation solutions. Special assessment districts typically are used to fund low-cost mobility hub features that contribute to a district's overall identity, such as wayfinding. However, they also can fund mobility hub initiatives that are designed to help increase business patronage. These initiatives include microtransit service, bikeshare, and partnering with on-demand rideshare service providers to give people greater access to commercial retail.

Where it has been done

The City of San Diego recently partnered with The Free Ride to introduce a complimentary microtransit service known as Free Ride Everywhere Downtown, or FRED. The service provides complimentary rides within the Downtown Community Parking District boundaries using all-electric six-passenger vehicles. The service helps to promote "park once" behavior while also providing connections to and from major transit stations. Parking meter revenues and corporate sponsorships pay for the program.

C. General Sponsors

The idea

Corporate sponsorship of bikeshare and other transportation programs also is growing. Sponsors pay for large parts of the program and in exchange they can advertise their company on nearly every element of the system. In the case of bikeshare programs, sponsored components might include bikes, bikeshare stations, program materials, the program's website, and more.

Where it has been done

Launched in 2016, Portland's bikeshare system, Biketown, is operated by Motivate. Nike, Inc. entered into a partnership agreement with the City of Portland to sponsor Portland's bikeshare program for $10 million over five years.

Citigroup and MasterCard sponsor the New York City Citi Bike program with combined payments of $47.5 million over five years in exchange for having their brand names on bikeshare system infrastructure including bikes and stations.

D. Technology Companies

The idea

Public agencies have begun to partner with developers of various mobile apps and websites to support mobility through online payment systems, trip planning, and other services.

Where it has been done

In recent years, multiple partnerships have emerged to produce mobile payment apps, including partnerships between:

- Dallas Area Rapid Transit (DART) and Unwire
- New Jersey Transit and Xerox
- Nassau Inter-County Express and Masabi
- Central Midlands Regional Transit Authority and Passbort

- Chicago Transit Authority and GlobeSherpa

- In the San Diego region, the Metropolitan Transit System (MTS) partnered with moovel North America to produce Compass Cloud, an app that allows people to purchase trolley passes with their mobile phones. Compass Cash, a stored-value transit fare program, launched in June 2017.

Partnerships also have formed to help people plan their trips, for example:

- The Go–LA wayfinding app aggregates all available transportation modes and allows travelers to calculate the time, cost, and carbon footprint of each option for a particular route. The app was produced through a partnership between the City of Los Angeles and Xerox.

- A trip planning app called GoPass, created by DART, offers users the ability to access services such as Uber, Lyft, and Zipcar. Users can reserve and manage these trips to get to and from DART transit stations.

- The Central Texas Regional Mobility Authority created a Mobility Authority that partners with technology companies to address overburdened transportation networks and to apply new, multimodal solutions to transportation problems. Partners include Carma Carpooling, a carpooling app, and Metropia, a traffic-management system that helps motorists navigate construction closures and delays.

E. WiFi Hotspot Investments

The idea

Providing WiFi at a mobility hub can help travelers pass the time as they're waiting for their ride and give them increased access to important transit information. Across the United States, the demand for WiFi on public transit is high, and research suggests that providing WiFi may help increase ridership. There are a variety of ways to fund WiFi service on mass transit and at busy transit hubs, including through direct sponsorship by technology and advertising companies, advertisements that appear when accessing WiFi, and/or charging travelers for the service. Local communications companies and major cellular service providers are potential partners for offering WiFi service at mobility hubs in the SANDAG and ICTC regions.

Where it has been done

The Anaheim Regional Transportation Intermodal Center (ARTIC) serves as a regional transportation hub for a variety of transportation services including commuter rail, buses, shuttles, taxis, and bikes. ARTIC also provides retail and dining services, WiFi, charging ports, secure bike parking, lockers, and parking to make commuting more convenient and comfortable.

Chicago's Metra rail system contracted with Xentrans to provide free WiFi service at all of its downtown stations as well as on multiple rail lines. Metra hopes to expand this service and is currently seeking partners to reduce costs.

V. ESTABLISHING A FRAMEWORK FOR SUPPORTING MOBILITY HUBS THROUGH LOCAL PLANS, POLICIES, AND PROGRAMS

Local plans can guide the development of mobility hubs within cities and neighborhoods, outlining everything from broad policy goals for a city to specific design standards for a particular street. These documents can support mobility hub implementation in several ways, which are summarized in Table 2.

Table 2: Ways in which local plans and policies can support mobility hubs

Type of support	Definition	Examples
General support	High-level policies that define mobility hubs and encourage the development of mobility hubs at key locations.	Active support of Long Beach Transit's efforts to establish mini-transit hubs throughout the city. (City of Long Beach Circulation Element, Movement of People Implementation Measure 41)
Support for specific mobility hub features	Policies that generally encourage features such as improved waiting areas, bike parking and lockers, EV chargers, or first- and last-mile shuttle services at transit stations.	Provision of bike racks, lockers, and showers at city parks and at the future transit center downtown. (El Centro Bicycle Master Plan) Identification of how specific mobility hub features such as comfort stations, EV chargers, bikeshare, and parking management measures could be implemented over time. (Carlsbad Coastal Mobility Readiness Plan)
Improving connections to mobility hubs	Plans or policies that specify the location of new bike/pedestrian facilities and connecting transit services, making it safer and more convenient to travel to transit stations.	Encouraging and promoting quality pedestrian access to the COASTER and SPRINTER stations; working with North County Transit District (NCTD) to provide accessible pedestrian facilities at transit stops. (Oceanside Pedestrian Master Plan, Objective 5–Alternative Transportation)
Indirect support for mobility hubs	Land use policies that support transit and citywide measures to manage transportation demand.	Exercising flexibility in applying parking standards to support transit-oriented development. (Vista Circulation Element, CE Policy 8.5)

There is no "one size fits all" approach to supporting mobility hubs through local plans and policies. This is because there are overlapping opportunities to include policies that support mobility hubs in generalized planning documents that guide citywide development, as well as in specialized planning documents that focus on specific transportation modes or areas in a city. Local governments should take advantage of these opportunities as they update their plans and policies.

VI. EQUITABLE IMPLEMENTATION

When establishing mobility hubs, SANDAG, ICTC, and their partners must take special care to ensure that mobility hubs benefit low-income, minority, and senior residents of the region. These groups are more likely to rely on transit and other alternatives to driving alone and often are underrepresented in transportation decision-making. The Equity Considerations Memo provides a summary of key considerations for achieving social equity at mobility hubs that can be acted upon as mobility hubs are planned and established. Some best practices for considering social equity include:

A. Outreach and education

San Mateo County Transit District runs a Mobility Ambassador program that trains volunteers to help seniors and people with disabilities plan trips. The Mobility Ambassador Program in Centennial, Colorado, trains seniors to give seminars to their peers about using modern transportation tools and services. Portland, Chicago, and other cities include shared mobility options in their individualized marketing programs. These programs offer targeted populations personalized information on transportation options.

B. Serving low-income populations

A growing number of transportation stakeholders are experimenting with extending the benefits of shared mobility services to low-income communities and other disadvantaged populations. For example, the City of Los Angeles is now running a three-year EV carsharing pilot program focused on low-income communities. The program is funded by the California Greenhouse Gas Reduction Fund. To help people who do not have a bank account or credit card but want to use shared mobility services, agencies can work with shared-mode operators to ensure that payment options that do not require a bank card are accepted. More comprehensive approaches also can be taken, such as developing partnerships with local banks, credit unions, or nonprofit organizations to establish a system for prepaid cards or other payment options that don't require ATM or credit cards. An organization in Washington, District of Columbia created an escrow account to offer debit cards for users without bank accounts.

Public agencies and other organizations also can cover upfront costs to help low-income people access transit options at mobility hubs. For example, the bikeshare program in Chicago, managed by the Chicago Department of Transportation, subsidizes enrollment fees for low-income people through its Divvy for Everyone program. Qualified participants can go to a Local Initiatives Support Corporation Financial Opportunity Center and pay $5 for a one-year membership – a significant discount from the normal cost of $75 per year. Participants can pay use fees in cash at participating 7-Eleven and Family Dollar Stores.

C. Serving seniors

Some ride-sourcing partnerships are specifically aimed at improving mobility for seniors. Freedom in Motion, a subsidized on-demand program for seniors, is the product of collaboration among the City of Gainesville, Uber, ElderCare, and the Gainesville Area Chamber of Commerce. Riders receive a copay of up to $5 along with smartphones donated by Wells Fargo.

In the future, autonomous vehicle technology could enhance personal mobility for disadvantaged groups. Shared fleets of autonomous vehicles could be deployed to provide on-demand mobility options for seniors, the disabled, low-income people, and other populations that are dependent on transit.

VII. EARLY ACTIONS

This section presents a short list of early actions that can serve as catalysts for the full implementation of mobility hubs.

A. SANDAG and ICTC

- Identify potential showcase projects based on the density of transit service, compatible land uses, and existing mobility hub amenities.
- Provide guidance and technical support for establishing mobility hubs at the local level.
- Evaluate the criteria of current grant programs to support mobility hubs.
- Evaluate and amend procurement processes to reduce barriers to testing innovative partnerships while continuing to meet the regulatory needs of public agencies.
- Develop a "Mobility Sandbox" Request for Information to solicit innovative proposals for implementing mobility hub features.
- Partner with public and private entities to pursue sources of federal and state funding that are compatible with implementing mobility hubs.
- Leverage the U.S. DOT Autonomous Vehicle Proving Ground designation to carry out innovative mobility hub pilot projects. Help local cities plan for a connected and autonomous future.

B. MTS, NCTD, and Imperial Valley Transit

- Amend transit station design guidelines to support mobility hub implementation and provide flexibility for change as technology and travel behavior and patterns evolve over time.
- Allocate space for shared services such as on-demand shuttles and rideshare companies, and consider the flexible use of that space where necessary.

- Incorporate mobility hub elements in future joint development projects.
- Partner with shared mobility service providers to integrate shared mobility services into a platform for trip planning and payment.
- Conduct pilot projects that showcase the integration of shared mobility services with transit or that provide viable on-demand replacements for underperforming routes.

C. Local Government

- Amend the development review process to encourage developers to incorporate mobility hub features into their projects.
- Adapt off-street parking requirements to better align with mobility hub investments.
- Implement flexible curb space to meet the needs of shared mobility services and the changing demands of users.
- Educate developers, employers, BIDs, and other transportation stakeholders on the mobility hub concept and garner support.
- Account for a connected and autonomous future in local planning documents and policies.

D. Private Service Providers

- Communicate the value of prioritizing drop-off space over parking.
- Seek pilot projects that enhance transit and bring mobility options to commuters.
- Partner with government to test technologies and service concepts in real-world environments.

E. Special Assessment Districts

- Support mobility hub features that will directly benefit local business.
- Partner with private service providers to subsidize on-demand shared mobility where an unassisted market may not be able to sustain the service on its own.

APPENDIX D

REGIONAL MOBILITY HUB IMPLEMENTATION STRATEGY

Equity Considerations

SANDAG

IMPERIAL COUNTY TRANSPORTATION COMMISSION

I. INTRODUCTION

This memo represents a first step in assessing how mobility hubs can best serve disadvantaged communities in San Diego and Imperial counties. Some of the equity-related benefits, challenges, and best practices associated with different mobility hub features are identified. These findings are then used to recommend features that could benefit disadvantaged populations at 11 mobility hub design prototypes around San Diego County.

The analysis of equity is complex because it requires consideration of a variety of disadvantaged populations with different needs, which can sometimes conflict. For example, walking and bicycling are among the most affordable ways to get around, and are well-suited for short trips. At the same time, walking and bicycling may be challenging for seniors with limited mobility. In addition, many mobility hub features such as bikeshare, drop-off spots for on-demand ridesharing, and real-time travel information are relatively new in practice. Consequently, there is limited information on the impacts of these features on social equity. However, there is a growing body of research, which includes real-world examples, that can clearly guide planners toward establishing mobility hubs that promote social equity.

In the past, the San Diego Association of Governments (SANDAG) analyses of social equity have examined the impact of projects on a variety of disadvantaged groups, including people living in poverty, households with limited English proficiency, unemployed people, and people with less than a high school education. The current SANDAG analysis focuses on three key disadvantaged groups, highlighted below. These groups were the focus of the equity analysis for San Diego Forward: The Regional Plan, and we use the same definitions here:

- **Low-income**: People age 16 and over earning less than $25,000[1] per year. SANDAG has found that low incomes are correlated with unemployment, limited education, limited English proficiency, and many other indicators of disadvantage.

- **Minority**: People who are non-white, including Latinos, blacks, American Indians, Asians, and members of other or multiple races.

- **Seniors**: People age 75 and over. SANDAG stakeholders have identified 75 as an age at which seniors may become transit-dependent, but are still mobile.

[1] SANDAG has defined low-income households as households with incomes at or below 200 percent of the federal poverty level, in order to account for the high cost of living in the San Diego region. For example, $25,000 is roughly double the 2016 federal threshold for individual poverty status, which is $11,880. The income threshold in the American Community Survey that is closest to twice that value is used and the dollar threshold is adjusted based on the year and the number of people in a household.

II. OUR PROCESS

A. Equity impacts of mobility hub features

A literature review was used to assess the equity-related benefits, barriers, and best practices associated with different mobility hub features. The review also was used to identify which features are most appropriate for mobility hubs situated in different types of disadvantaged communities. Our work on mobility hubs considers the design and placement of specific features. However, research on equity tends to more generally focus on the impacts of different transportation modes. Consequently, we categorized mobility hub features into four modes: driving, transit, shared mobility services, and active transportation. Cost is a key factor for many disadvantaged communities, so the average cost – both upfront and per-mile – was estimated for each mode. The following three types of benefits and barriers that correspond to the three disadvantaged population groups used by SANDAG in equity analyses were then assessed:

1. **Cost and payment issues** that may impact low-income populations:

A number of mobility hub features require credit cards for payment in person or via smartphones to access services. Of all households in the San Diego region, 3.1 percent do not have access to a bank account and 20.6 percent have bank accounts but look outside of the financial system to meet some of their needs for payment and credit.[2] Meanwhile, more than one in three Americans do not have smartphones,[3] and only 50 percent of households earning less than $30,000 per year own one. In addition to examining the overall costs of each mode to determine whether it is more or less affordable than other modes, we assess barriers that people with limited access to banks and technology face, and best practices to help people overcome these barriers.

2. **Linguistic or cultural issues** that may affect minorities:

Many mobility hub features convey messages on signs or online, and such information may be inaccessible to people who are not proficient in English. Some communities may view certain mobility hub features, such as those related to shared mobility services, with some skepticism because they are not culturally familiar with these services. Also, a legacy of systemic underinvestment in minority communities has resulted in a lack of some services or infrastructure in those communities. SANDAG assesses these barriers, identifies instances in which minorities can especially benefit from certain features, and discusses best practices in overcoming linguistic and cultural barriers.

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[2] *2015 FDIC National Survey of Unbanked and Underbanked Households, Banking Status for San Diego-Carlsbad, CA Households*, Federal Deposit Insurance Corporation, 2015, https://www.economicinclusion.gov/surveys/place-data.html?where=San_Diego_Carlsbad_San_Marcos_CA&when=2015.

2013 FDIC National Survey of Unbanked and Underbanked Households, Federal Deposit Insurance Corporation, October 2014, https://www.fdic.gov/householdsurvey/2013report.pdf.

[3] Smith, A., "U.S. Smartphone Use in 2015," Pew Research Center, April 1, 2015, http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/.

3. **Physical or data access issues** that may impact mobility hub users:

Several mobility hub features pose potential challenges for seniors and people with disabilities, so vehicles and infrastructure should be designed to accommodate wheelchairs and other mobility aids. Some of these features, such as public transit, pedestrian paths, and other infrastructure, are required to comply with the Americans with Disabilities Act (ADA). Other features, such as most shared mobility services that are not publicly funded, are not required to comply with the ADA. People with disabilities, including seniors, can face a variety of mobility challenges. SANDAG assesses potential barriers associated with each mode of transportation, identifies benefits where modes are required to accommodate people with disabilities, and discusses best practices to ensure that people of all abilities have access. The challenges that many low-income households face accessing and paying for certain mobility hub features because they do not have smartphones also apply to seniors; only 27 percent of people older than age 65 own smartphones.[4]

4. **Demographic analysis**

A preliminary demographic analysis was conducted to screen for disadvantaged communities that are located near the 11 prototype mobility hub sites. The goal was to show how a social equity analysis could offer decision makers valuable information. These sites, chosen for illustrative purposes, exhibit potential for investing in mobility hubs. The purpose of this analysis is to show how SANDAG, moving forward, can identify disadvantaged populations that live near mobility hubs, as well as identifying what type of conclusions might be drawn.

The SANDAG analysis, focusing on low-income individuals, minorities, and seniors, used data from the 2014 American Community Survey (ACS) five-year estimates. The ACS estimated population characteristics for all residents, and outputs from the SANDAG regional travel model represent transit riders traveling to and from the stations around which mobility hubs will be centered. The goal was to determine if these data sources produced different results. Table 1 shows how SANDAG defines each population group, and how each definition was translated into the terms used by the ACS.

[4] Smith, A., "U.S. Smartphone Use in 2015," Pew Research Center, April 1, 2015, http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/.

Table 1: Population groups considered in the equity analysis

Population group	SANDAG definition	ACS definition
Low-income	People living below two times the federal poverty level	Population age 16 and over with earnings who earned less than $25,000*[5] in the past 12 months (table B20001)
Minority	People who are non-white	Population where ethnicity = Hispanic or race = Black, American Indian, Asian, Hawaiian/Pacific Islander, Other, or two or more races (tables B02001 and B03002)
Senior	People 75 and older	Population age 75 and over (2014 ACS five-year estimates, B01001)

Because mobility hubs enable people to travel to stations by different modes, we examined disadvantaged groups within different travelsheds:

1. The five-minute walkshed (about a quarter of a mile) around the station

2. The five-minute bikeshed (about three quarters of a mile) around the station

3. The five-minute driveshed (about two miles) around the station

For the eight mobility hub prototypes identified in the San Diego region, we mapped travelsheds based on network travel distances using detailed street network data from SANDAG. Street network data for Imperial County was unavailable, so "as the crow flies" buffers to map travelsheds were used. Demographic data were then joined to Census TIGER/ Line shapefiles to map ACS data at the block group scale. Demographic data also were joined to shapefiles from SANDAG in order to map travel model data at the Master Geographic Area (MGRA) scale. Next, all block groups or MGRAs that were touching each travelshed were selected. Finally, total households across all block groups and in each travelshed for each population group were summed.

III. EQUITY IMPACTS OF MOBILITY HUB FEATURES

Table 2 summarizes SANDAG recommendations to emphasize or de-emphasize certain mobility hub features in areas with different types of disadvantaged communities based on the information reviewed above. These are general recommendations based on whether research suggests that different disadvantaged populations would benefit from or face barriers to using the features in question. A key is provided below the table.

[5] The ACS provides data on people who are below the poverty line, but not people at or below 200 percent of the federal poverty level. Since the threshold for individual poverty status is $11,880, the income cut point in the ACS that is the closest to twice that value is used.

Table 2: Summary assessment of key mobility hub features

Mobility Hub Feature	Low-Income	Minority	Senior	Sample Best Practices
Driving				
Smart parking	↓		↓	
Electric vehicle (EV) charging	↔			Provide incentives to support EV purchases; offer shared mobility services that use EVs; conduct outreach to promote charging opportunities
Park & Ride Stations	↓		↓	
Transit				
Transit signal priority	↑	↑	↑	
Real-time travel information	↑	↔	↔	Ensure that information is provided via screens at stations and in locally-spoken languages; pilot beacon technology to target information on accessible features to seniors
Enhanced waiting areas	↑	↑	↑	
Dedicated transit lanes	↑	↑	↑	
Shared mobility services				
Shuttle service	↔		↑	Provide free or low-cost shuttles; subsidize service for low-income communities
Car, electric bike, and scootershare	↔	↔	↓	Subsidize service for low-income communities; conduct targeted outreach and education in low-income and minority communities; offer assistance for people without smartphones or bank accounts
Neighborhood electric vehicles (NEVs)	↔	↔	↑	Subsidize service for low-income communities; conduct targeted outreach and education in low-income and minority communities; offer assistance for people without smartphones or bank accounts
Bikeshare	↔	↔	↓	Subsidize service for low-income communities; conduct targeted outreach and education in low-income and minority communities; offer assistance for people without smartphones or bank accounts
On-demand rideshare	↔	↔	↔	Pilot projects to subsidize rides for users in low-income communities; conduct targeted outreach and education in low-income and minority communities; develop concierge services for people without smartphones; ensure that accessible vehicles and drivers trained to assist people with mobility issues are available
Active transportation				
Bike racks	↑		↓	
Bike lockers	↔		↓	Consider payment options for low-income individuals
Bike lanes/paths	↑	↑	↓	
Improved pedestrian facilities	↑	↑	↑	
Support services				
Universal transportation accounts	↔		↔	Offer assistance for people without smartphones or bank accounts

Key	
↑	This feature will likely benefit this disadvantaged population group.
↔	This feature may benefit this disadvantaged population group if best practices are implemented.
↓	This feature is unlikely to benefit this disadvantaged population group.
[blank]	No applicable research found.

A. Driving

Mobility hubs are centered on transit stations and include many features designed to enable car-free travel throughout the region. Nevertheless, driving remains an important way for people to access transit stations, particularly in suburban areas. Features such as Park & Ride stations and smart parking make it more convenient for drivers to access transit, while providing EV charging stations helps to promote the use of zero-emission vehicles.

Average costs

Purchasing a car can be expensive. The average used car costs roughly $18,000,[6] while a new car costs between $15,000 and $36,000.[7] According to the American Automobile Association, the average cost of driving is $0.49-$0.74 per mile.[8] Many EVs have higher purchase prices than their conventional vehicle equivalents, but EV buyers often can buy a vehicle at reduced cost by taking advantage of state-level incentives, federal tax credits, or special leasing arrangements offered by manufacturers. EVs also cost less to drive and maintain.

Barriers

Driving is significantly more expensive than transit or active transportation on a per-trip basis, and it can be more expensive than shared mobility services once the costs of owning a car are factored in. Twenty percent of people at or below the federal poverty line do not have access to a car, and car ownership rates are even lower for low-income minorities.[9] Older adults may have to give up driving due to visual impairment or other physical issues. As a result, mobility hub features that focus on driving may not provide proportional benefits to disadvantaged populations. Even though the price premium for EVs is not as high as sticker prices would suggest due to incentives and leasing arrangements, the cost remains a barrier for some low-income households. Another barrier to driving for disadvantaged populations is related to smart parking, which relies significantly on the use of smartphones. Low-income people and seniors make up a disproportionate number of those who do not have smartphones or bank access. Consequently, these groups may not be able to take advantage of some smart parking features.

[6] Sullivan, B., "Why 2016 Could Be a Great Year to Buy a Used Car," Time, March 28, 2016, http://time.com/money/4273696/buying-a-used-car/.

[7] Press Release, "New-Car Transaction Prices Up 2 Percent In March 2016, Along With Increases In Incentive Spend, According To Kelley Blue Book," Kelley Blue Book, April 1, 2016, http://mediaroom.kbb.com/new-car-transaction-prices-up-2-percent-march-2016.

[8] AAA Association Communication, "Your Driving Costs: How much are you really paying to drive?" (2017 Edition), American Automobile Association, http://newsroom.aaa.com/auto/your-driving-costs/.

[9] DeGood, K. and Schwartz, A., "Can New Transportation Technologies Improve Equity and Access to Opportunity?" Center for American Progress, April 2016, https://cdn.americanprogress.org/wpcontent/uploads/2016/04/20121438/TransportEquity1.pdf.

Benefits

Driving is more expensive than other modes of transportation, but it remains such an important option that the majority of low-income households still own at least one vehicle. Transit coverage and operating hours are limited, shared mobility services are not available in all areas of the San Diego region, and active transportation alone is typically not a viable option for longer-distance trips. Consequently, a private vehicle is the only mode of transportation that can guarantee reasonable access to any destination in the region. In areas with little transit service, private vehicles also are critical for connecting low-income travelers to jobs.[10] Private vehicles also can be the most convenient mode of transportation for some people with disabilities, although in other cases disabilities can prevent people from driving.

Best practices

The majority of recent best practices related to equity and driving are focused on extending the benefits of EVs to low-income communities. There are several initiatives to support EV ownership in low-income communities that could be deployed in conjunction with EV charging at mobility hubs. These include the Greenlining Institute's Equity Toolkit[11] and pilot programs that help low-income households purchase EVs.[12] There also are pilot efforts to offer EV access to disadvantaged communities through subsidized carshare programs. For example, the City of Los Angeles is currently running an EV carsharing pilot program focused on low-income communities.[13] The five-year pilot program is funded by the California Air Resources Board and the City of Los Angeles.

B. Transit

By definition, mobility hubs are focused on enhancing access to transit because they integrate other modes of transportation that make it easier for riders to travel to and from stations. A number of mobility hub features are focused exclusively on improving the transit experience as opposed to making it easier for people to reach a transit stop. These features include smart intersections with traffic signals that give priority to transit vehicles, availability of real-time travel information, and more comfortable waiting areas.

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[10] Onésimo Sandoval, J.S., Cervero, R., and Landis, J., "The transition from welfare-to-work: How cars and human capital facilitate employment for welfare recipients," Applied Geography 31 (2011): 352-362, http://www.pacific-gateway.org/the%20transition%20from%20welfare-to-work%20how%20cars%20and%20human%20capital%20facilitate%20employment%20for%20welfare%20recipients.pdf.

[11] *Electric Vehicles for All: An Equity Toolkit*, The Greenlining Institute, August 3, 2016, http://greenlining.org/publications/online-resources/2016/electric-vehicles-equity-toolkit/.

[12] *Making the Cleanest Cars Affordable*, Air Resources Board, California Environmental Protection Agency, Revised June 23, 2015, https://www.arb.ca.gov/newsrel/efmp_plus_up.pdf.

[13] Lee, P., "LA is bringing 100 electric carsharing vehicles to its poorest neighborhoods," Curbed Los Angeles, December 21, 2016, https://la.curbed.com/2016/12/21/14046080/electric-carsharing-los-angeles-bluecalifornia.

Average costs

Transit involves no upfront costs, and the average transit trip in the San Diego region costs between $0.41 and 0.45 per mile.[14] One-way fares for Metropolitan Transit System (MTS) bus and trolley rides are $2.25 or $2.50 for most routes, and $1.10 or $1.25 for seniors and disabled riders.

Barriers

Transit is affordable and operators have a mandate to accommodate all users, so it is an important mode of transportation for many disadvantaged groups. It can be challenging, however, to provide good transit service in suburban areas; plans for transit often focus on increasing ridership along major transportation corridors at the expense of reaching low-density, low-demand areas.[15] Providing shared mobility options that help connect people to transit, such as bikeshare stations or pick-up/drop-off spaces for on-demand ridesourcing services, may better benefit disadvantaged populations in suburban areas where space is limited.

Benefits

Transit is likely the mode of transportation that people most associate with equity. Public transit is more affordable than other long-distance modes of travel, and low-income households are generally more likely to rely on transit.[16] As public agencies, transit operators must provide reasonable accommodations for users of all ages and abilities. Transit vehicles and facilities also are required to be accessible to people with disabilities and to offer information in multiple languages.

Best practices

All transit features, particularly information that is given in real time, will need to address potential language barriers. This is especially important in communities with concentrated groups of people who speak a language not widely spoken throughout a service area. Transit agencies such as the Tri-County Metropolitan Transportation District of Oregon and Bay Area Rapid Transit have developed practices to meet the needs of riders with limited English proficiency (LEP). These include translating materials, using universal icons where possible, and establishing partnerships with community organizations that serve LEP populations.[17, 18]

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[14] Based on full-price fares for most MTS bus and train service ($2.25-$2.50, https://www.sdmts.com/fares-passes) divided by average transit trip length (5.5 miles, http://www.apta.com/resources/statistics/Documents/FactBook/2015-APTA-Fact-Book.pdf). Seniors/disabled people are eligible for half-price fares on most MTS services, and some rural/express services are significantly more expensive.

[15] Walker, J., *Human Transit: How Clearer Thinking about Public Transit Can Enrich Our Communities and Our Lives*, Island Press, 3rd Edition, Dec. 22, 2011, https://www.amazon.com/Human-Transit-Clearer-Thinking-Communities/dp/1597269727.

[16] *Why Creating and Preserving Affordable Homes Near Transit is a Highly Effective Climate Protection Strategy*, TransForm and California Housing Partnership Corporation, May 2014, http://www.transformca.org/sites/default/files/CHPC%20TF%20Affordable%20TOD%20Climate%20Strategy%20BOOKLET%20FORMAT.pdf.

[17] *Environmental Justice and Transit Equity*, TriMet, October 2010, https://trimet.org/pdfs/publications/transit-equity.pdf.

[18] Appendix F, BART's Language Assistance Services, BART Public Participation Plan, 2011, https://www.bart.gov/sites/default/files/docs/Appendices_D-G.pdf.

Transit agencies also can consider new technology to help patrons better access transit services. For example, information "beacons" are being tested by various agencies. These beacons send transit information wirelessly to users who have Bluetooth-enabled smartphones and can target notifications to patrons from disadvantaged groups. Agencies such as LA Metro,[19] TriMet,[20] Massachusetts Bay Transportation Authority,[21] and Santa Clara Valley Transportation Authority have partnered with various technology companies to provide turn-by-turn wayfinding instructions, real-time transit service updates at stations and stops, and other services. One could envision these beacons providing messages in various languages via phone, providing directions to wheelchair-accessible facilities at a station, and providing assistance for patrons with cognitive disabilities.[22] It has been proposed that people could wear devices such as wristbands or glasses that could interact with the beacons, enabling individuals to obtain localized information without holding a smartphone.[23] However, the deployment of beacons could raise privacy concerns, especially in cases in which public agencies partner with private companies to pair information about transit with marketing.

Real-time transit information can be provided through smartphone apps and cell phones, but it also should be displayed at transit waiting areas. An ever-increasing number of people have cell phones and smartphones, but low-income transit riders are less likely to have them and as a result be disproportionately unable to access the information. The best practice for providing information equitably is to provide "real-time information through at least two dissemination media and in both audio and visual formats."[24]

[19] Nelson, L., "Beacon technology to target Union Station visitors with help, commerce," Los Angeles Times, Feb 3, 2015, http://www.latimes.com/local/california/la-me-california-commute-20150203-story.html.

[20] TriMet News, "TriMet to provide riders with another way to access real-time transit information," Mar 9, 2015, http://news.trimet.org/2015/03/trimet-to-provide-riders-with-another-way-to-access-real-time-transit-information/.

[21] PRNewswire, "Intersection Pilots Beacon Technology in Select MBTA Rail Stations," Intersection, Sep 25, 2015, http://www.prnewswire.com/news-releases/intersection-pilots-beacon-technology-in-select-mbta-rail-stations-300149057.html.

[22] Poon, L., "How a 'Smart' Public Transit System Can Better Serve Riders With Disabilities," CityLab, Sep 23, 2016, http://www.citylab.com/commute/2016/09/rewiring-public-transit-to-better-serve-riders-with-disabilities-nsf-ibeacons/501065/.

[23] *Wearables and Beacons: Using Contextually-Aware Technology to Improve Navigation of Public Transportation Spaces for Customers with Visual, Language, and Aging Challenges*, TRB IDEA Project Proposal: "Wearables and Beacons for Public Transportation," Control Group, Sachs Insights, Cubic Transportation Systems, New York Metropolitan Transportation Authority, 2014, http://www.ecologyit.net/blog/wp-content/uploads/2014/05/IDEAProposal-Wearables-final.pdf.

[24] Schweiger, C., *Transit Cooperative Research Program (TRCP) Synthesis 91: Use and Deployment of Mobile Device Technology for Real-Time Transit Information*, Transportation Research Board of The National Academies, 2011, http://www.trb.org/Publications/Blurbs/166249.aspx.

C. Shared Mobility Services

Shared mobility services involve a range of modes of transportation such as cars, scooters, and bikes. They also involve a variety of operational models, including carshare and bikeshare, which make fleets of vehicles available to users, and peer-to-peer ridesourcing, in which drivers pick up passengers on demand. These services vary widely, but they all offer the ability to conveniently request, track, and pay for trips with mobile devices. Shared mobility services are growing in popularity as smartphone technology continues to improve. However, because shared mobility services rely increasingly on mobile technology, social equity is a concern.

Average costs

The cost of shared mobility services varies by transportation mode and operational model, and a given service can offer several different payment plans. Table 3 summarizes costs for carshare, bikeshare, and ridesourcing based on services offered in the San Diego region.

Table 3: Average costs of common shared mobility services

Shared Mobility Service	Upfront cost	Cost per mile
Carshare[25]	$25 – $95/year	$1.05 – $1.81
Bikeshare[26]	$99 – $199/year	$0.07 – $1.67
Ridesourcing[27]	None	$1.24 – $1.65

Barriers

The costs of shared mobility services vary widely, but such services are generally more expensive than transit, walking, biking, or even driving a car that is already paid off. Consequently, they are more likely to be used for occasional trips than for everyday travel. For example, people most frequently use ridesourcing for social trips during nighttime hours when many public transit services are not in operation.[28] People who regularly use shared mobility services in conjunction with transit and other options often do save money because they do not need a car. In theory, this could benefit low-income households, but in practice this has not been the case because shared mobility services are not widely available in low-income communities.

[25] Based on Zipcar rates for San Diego (http://www.zipcar.com/check-rates/sandiego). Annual costs are $70/year for an occasional driving plan and a $25 application fee. Hourly costs are $8.55-$10.50 per hour and assume two trips per hour of between 2.9 and 4.1 miles, based on trip lengths. From Cervero R., Golub, A., and Nee, B., "San Francisco City CarShare: Longer-Term Travel-Demand and Car Ownership Impacts," http://iurd.berkeley.edu/wp/2006-07.pdf.

[26] Based on Decobike rates (http://www.decobike.com/sandiego/pricing). Upper-end estimate assumes one three-mile trip for a single $5 half-hour use; lower-end assumes 500 three-mile trips over the course of a $99 annual membership.

[27] Based on Uber (https://www.uber.com/ride/) and Lyft (https://www.lyft.com/fare-estimate) costs for a sample trip from San Diego to Chula Vista. Costs reflect the range of services, from standard services to more affordable pooled services such as uberPOOL and Lyft Line during normal hours. Using the luxury services offered by these companies, or taking rides during times when surge pricing is in effect, will significantly increase costs above the amounts shown here.

[28] *Shared Mobility and the Transformation of Public Transit*, Shared Use Mobility Center, March 2016, https://www.apta.com/resources/reportsandpublications/Documents/APTA-Shared-Mobility.pdf.

Studies suggest that disadvantaged communities in cities that have bikeshare programs typically have less access to them.[29] The same studies also have identified cases in which carshare stations are concentrated in higher-income communities.[30]

The technology and payment requirements associated with shared mobility services also are significant barriers for low-income people and seniors. Shared mobility services often require users to make reservations and payment using a smartphone. Some carshare services – none that currently operate in San Diego – also require a user to have a smartphone to unlock a reserved vehicle. Furthermore, most shared mobility services require a credit card or bank account for payment. Shared mobility services also may face significant cultural resistance from some disadvantaged communities simply because they are unfamiliar.

Minority communities also may face several barriers to using shared mobility services. First, these services simply may not be widely available in these communities. Second, linguistic and cultural barriers may make it difficult for people in minority communities to navigate apps and instructional materials used for shared mobility services. Even in moderate- to high-income neighborhoods, minority communities have lower access to carshare or bikeshare than non-minority communities in many cities, according to a 2016 analysis by the Shared Use Mobility Center.[31] These disparities are particularly pronounced in San Diego: only about 40 percent of low-income minority communities have access to shared mobility services, while nearly 70 percent of low-income non-minority communities have access. Meanwhile, only about 10 percent of high-income minority communities have access to shared mobility services, while nearly 50 percent of high-income non-minority communities have access.

People with physical disabilities also face barriers to using shared mobility services, chiefly because privately-owned services are unlikely to spend money to accommodate them. Carshare services, for example, do not typically provide vehicles that can be used by disabled drivers. It is true, however, that some traditional car rental companies provide some accommodations. For on-demand ridesourcing, accessibility options have been increasing but are still limited. After initially resisting meeting ADA requirements, for example, ridesourcing services such as Uber and Lyft are now improving service for deaf and blind passengers, including passengers with guide dogs. A recent article, however, reported finding few if any drivers trained to help seniors or disabled passengers, or vehicles that can accommodate wheelchairs.[32] Despite these challenges, many disabled passengers can ride as passengers in conventional vehicles. The Massachusetts Bay Transportation Authority has partnered with Uber and Lyft to offer ridesourcing as an option to on-demand paratransit users.[33]

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[29] Ursaki, J. and Aultman-Hall, L., "Quantifying the Equity of Bikeshare Access in U.S. Cities," Transportation Research Board, August 1 2015, http://chi.streetsblog.org/wp-content/uploads/sites/4/2016/03/Bikeshare_TRB_submission.pdf.

[30] Shellooe, S., "Wheels When *Who* Wants Them: Assessing Social Equity and Access Implications of Carsharing in NYC," May 2013, http://academiccommons.columbia.edu/download/fedora_content/download/ac:161981/CONTENT/Shellooe_Final_Thesis.pdf.

[31] *Shared-Use Mobility Toolkit for Cities*, Shared Use Mobility Center, 2016, http://sharedusemobilitycenter.org/wp-content/uploads/2016/07/SUMC-Toolkit-Final-Report.pdf.

[32] Kelly, H., "Uber's services for the disabled lack actual cars," CNN, May 3, 2016, http://money.cnn.com/2016/05/02/technology/uber-access/.

[33] Lazo, L., "Uber, Lyft partner with transportation authority to offer paratransit customers service in Boston," The Washington Post, September 16, 2016, https://www.washingtonpost.com/news/dr-gridlock/wp/2016/09/16/uber-lyft-partner-with-city-to-offer-paratransit-customers-on-demand-service-in-boston/.

Several cities are either testing adaptive bikeshare bicycles or are already providing citizens with a small number of them, but there is no single type of adaptive bike that can accommodate the different needs of all riders. These cities also have found it challenging for shared mobility services to accommodate equipment such as wheelchairs.[34]

Benefits

Low-income people generally use shared mobility services less than more affluent people. Some studies have suggested that shared mobility services can save people money, suggesting that low-income people have much to gain from these services if they are expanded into disadvantaged communities. This will require a concentrated effort from public agencies, however. They will need to work with providers to bring services to disadvantaged communities, conduct outreach to residents, and potentially even subsidize the cost. Some best practices are discussed below.

Best practices

There are ways to help people who do not have a bank account and therefore access to a bank card to use shared mobility services. Agencies can work with shared-mode operators to ensure that non-card-based payment options are accepted or to take more comprehensive approaches, such as developing partnerships with local banks, credit unions, or nonprofit organizations to offer people prepaid cards or other payment options that do not require credit cards. An organization in Washington, District of Columbia, for example, created an escrow account to offer debit cards to people who did not have a bank account.[35] Public agencies and other organizations also can cover upfront costs for low-income users. For example, the bikeshare program in Chicago, managed by the Chicago Department of Transportation, subsidizes enrollment fees for low-income people through its Divvy for Everyone program. Qualified participants can go to a designated enrollment center and pay $5 for a one-year membership (memberships normally cost $75 annually). Usage fees can be paid in cash at participating 7-Eleven and Family Dollar Stores.[36, 37]

Outreach and support also can help promote shared mobility services in disadvantaged communities. In addition to online media, outreach programs should use billboards, other out-of-home advertisements, and/or fliers. These programs also should ensure that all informational materials are provided in the languages used by targeted populations. Language and cultural barriers may be best overcome by partnering with community organizations to develop outreach campaigns, or by enlisting the help of local residents.[38]

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[34] Editor, "Can Bikesharing Serve Disabled Riders?" Shared-Use Mobility Center, August 1, 2016, http://sharedusemobilitycenter.org/news/can-bikesharing-serve-disabled-riders/.

[35] *Philadelphia Bike Share Strategic Business Plan*, Toole Design Group, Aug. 22, 2013, http://www.bikesharephiladelphia.org/philastudy/completebusinessplan.pdf.

[36] Press Release: "Mayor Emanuel Announces Divvy Expanding Access to Popular Bike Share System through Divvy for Everyone (D4e) Program," Office of the Mayor, City of Chicago, July 7, 2015, https://www.cityofchicago.org/city/en/depts/mayor/press_room/press_releases/2015/july/mayor-emanuel-announces-divvy-expanding-access-to-popular-bike-s.html.

[37] Divvy for Everyone (D4E) webpage, https://www.divvybikes.com/pricing/d4e.

[38] *Philadelphia Bike Share Strategic Business Plan*, Toole Design Group, Aug. 22, 2013, http://www.bikesharephiladelphia.org/philastudy/completebusinessplan.pdf.

For example, the San Mateo County Transit District (SamTrans) runs a Mobility Ambassador program, which trains volunteers to help seniors and people with disabilities to plan trips.[39] Portland, Chicago, and other cities market shared mobility options to targeted populations.[40, 41] Agencies also can integrate phone support for shared mobility services with their main public transit support line.[42]

A growing number of transportation stakeholders are experimenting with extending the benefits of shared mobility services to low-income communities and other disadvantaged populations. Motivate, which operates Bay Area Bike Share, is discounting its $88 annual membership fee for riders who are eligible for their utility's low-income assistance program. Discounted memberships cost $5 for the first year and $60 thereafter.[43] The advocacy organization TransForm, also in the Bay Area, has been conducting extensive outreach to promote shared modes of transportation in low-income and minority communities and to collect feedback on how to make these modes work more equitably.[44] This effort is funded by Motivate and a grant from People for Bikes. The City of Los Angeles recently announced a pilot program, funded by the California Air Resources Board, to bring electric carsharing to low-income communities in Central Los Angeles. The program adds new vehicles and charging stations while recruiting new users.[45] This pilot project is the first step in implementing a policy described in the Shared Mobility Action Plan for Los Angeles County. The policy calls for extending public transit's focus on equity and accessibility to shared mobility.[46] Many cities are experimenting with partnerships with ridesourcing companies, in order to fund trips that connect to transit. Among them is Centennial, Colorado, a suburb of Denver, that partnered with Lyft to offer free rides to the city's light rail station. The goal is to help the city's growing number of seniors maintain their independence.[47] Centennial also runs a Mobility Ambassador Program, which developed a resource guide and trains seniors to lead hands-on seminars about how their peers can use modern transportation tools and services.[48] Pilot projects like this one could be models for establishing mobility hubs in suburban areas in a more equitable way.

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[39] Senior Mobility Initiative, Mobility Ambassadors webpage, SamTrans, http://www.seniormobility.org/ambassadors.html.

[40] SmartTrips website:, Portland Bureau of Transportation, http://www.portlandoregon.gov/transportation/43801.

[41] Greenfield, J., "Go Pilsen TDM Program Encourages Walking, Biking and Transit Use," StreetsBlog Chicago, July 7, 2014, http://chi.streetsblog.org/2014/07/07/go-pilsen-tdm-program-encourages-walking-biking-and-transit-use/.

[42] Espino, J. and Truong, V., *Electric Carsharing in Underserved Communities: Considerations for Program Success*, The Greenlining Institute, January 2015, http://greenlining.org/wp-content/uploads/2015/01/Electric-Carsharing-in-Underserved-Communities-spreads.pdf.

[43] Baldassari, E., "Bay Area Bike Share to offer cash payments, reduced fares to low-income cyclists," *East Bay Times*, October 19, 2016, http://www.eastbaytimes.com/2016/10/19/bay-area-bike-share-to-offer-cash-payments-reduced-fares-to-low-income-cyclists/.

[44] "New shared mobility choices shouldn't leave people behind," Shared Mobility website, TransForm, http://www.transformca.org/landing-page/shared-mobility-all.

[45] Editor, "SUMC to Help Lead $1.6 Million Low-Income Carsharing Pilot in LA," Shared Use Mobility Center, July 24, 2015, http://sharedusemobilitycenter.org/news/sumc-to-help-lead-1-6-million-low-income-carsharing-pilot-in-la/.

[46] *Los Angeles County Shared Mobility Action Plan*, Shared-Use Mobility Center, September 2016, https://assets.documentcloud.org/documents/3107597/LA-County-Shared-Mobility-Action-Plan.pdf.

[47] Bliss, L., "A Denver Suburb Bets Big on Free Lyft Rides to Light Rail," CityLab, August 9, 2016, http://www.citylab.com/commute/2016/08/centennial-lyft-transit-partnership/495080/.

[48] City of Centennial Senior Commission website: http://www.centennialco.gov/Government/senior-commission.aspx.

D. Active Transportation

At some point, all transit users are pedestrians, whether they are walking from their home to a station or from a parked car to a station. Many people also ride their bike to transit stations. Mobility hubs could offer many features that make it safer and more convenient to embrace active transportation to get to and from a transit stop. These features could include bike racks or lockers at stations, bike lanes, protected bikeways, or improved pedestrian facilities leading to and from stations.

Average costs

Active transportation is very affordable. Walking costs virtually nothing, and while some bikes can cost $1,300 or more (and a lock, helmet, and other supplies can add on to the cost),[49] many good commuter bicycles are available for well under $500. Furthermore, bikes typically cost less than ten cents per mile to maintain. [50]

Barriers

The main barrier to active transportation has less to do with equity and more to do with overall utility. Bicycling and walking are best suited for short-distance trips. The average length of a trip taken by walking (other than exercise) is 0.7 miles; for a bike trip, 2.26 miles. Many residents in urban areas are within walking distance of a transit station. Biking to transit, meanwhile, may be convenient in both urban and higher-density suburban areas. Nevertheless, getting to transit stations by active transportation may not be viable for people in less dense suburban areas.

Seniors and people with disabilities often have a more limited range of travel if they are walking or biking. This means that infrastructure geared toward active transportation is less likely to be useful in communities with many seniors.

Benefits

Infrastructure supporting bike and pedestrian activity generally provides benefits for all people, including those in disadvantaged communities. Researchers have found that disadvantaged populations rely on active transportation infrastructure more than other populations, and are often forced into unsafe trips because of unsafe or nonexistent bike and pedestrian lanes and paths.[51] A study by the Centers for Disease Control and Prevention found that the fatality rates for Hispanic and African-American bicyclists were 23 percent and 30 percent higher than white bicyclists respectively, and that better infrastructure could help reduce these disparities.[52]

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[49] Assumes no cost for walking and up to $1,000 for a commuter bike plus roughly $300 in parts and accessories. (Roth, J.D., The Costs and Savings of Bicycle Commuting," Forbes, June 15, 2011, http://www.forbes.com/sites/moneybuilder/2011/06/15/the-costs-and-savings-of-bicycle-commuting/#3d0f8c02c1da.)

[50] Lower end assumes no cost to walk; upper end assumes $100/year in bike maintenance over 1,000 miles of riding per year.

[51] Sandt, L., Combs, T., and Cohn, J., "Pursuing Equity in Pedestrian and Bicycle Planning," Federal Highway Administration, April 2016, https://www.fhwa.dot.gov/environment/bicycle_pedestrian/resources/equity_paper/.

[52] *The New Majority: Pedaling Towards Equity*, The League of American Bicyclists and Sierra Club, 2013, http://www.bikeleague.org/sites/default/files/equity_report.pdf.

Both walking and biking have little to no entry costs compared to other modes and help keep people healthy and more social, particularly in areas with built-in safety features and little car traffic. Improved infrastructure for pedestrians and bicyclists – including improved crossings – can help make active transportation inexpensive and safe for low-income people, disabled people, and seniors who are making short trips or connecting to other modes of transportation. A study by the League of American Bicyclists found that women and minorities are more likely to try biking if there is improved infrastructure.[53]

Best practices

The main challenge for connecting active transportation infrastructure to mobility hubs is knowing which investments to prioritize. This is especially true in cases where bicycle and pedestrian connectivity is poor. Some agencies, such as King County Metro in Washington State,[54] have conducted detailed connectivity analyses to prioritize active transportation projects near transit stations. While King County's analyses did not factor in equity populations, it would be feasible to consider them to give more weight to improvements that connect to low-income or minority neighborhoods.

One mobility feature, bike storage, may raise equity concerns if there are high usage costs or if payment requires going online or having a bank account.

IV. EQUITY IMPLEMENTATION PLAN

Our demographic analysis communicates which disadvantaged populations live near mobility hub prototype locations and what modes they are likely to use to travel to public transit. Our impact analysis identifies mobility hub features and best practices that will best promote equity. Table 4 considers both analyses in order to recommend key mobility hub features and best practices for equitable implementation at the design prototype sites. These recommendations provide guidance on what features to include at mobility hubs in different place-types – i.e., which features could most equitably serve a given population.

In addition to the location-specific strategies shown in Table 4, this review reveals several general best practices to implement mobility hubs that consider social equity:

- Partner with community-based organizations to conduct outreach on mobility hubs in disadvantaged communities, gather information about multimodal travel patterns and needs, and educate residents about different transportation services and opportunities.

- Establish regional policies to ensure the equitable provision of bicycle and pedestrian networks, shared mobility services, and other transportation modes that connect to mobility hubs.

- Prioritize pedestrian facilities and transit amenities at all mobility hub locations. These are affordable modes of transportation that low-income people, minorities, and seniors rely on.

[53] *The New Majority: Pedaling Towards Equity*, The League of American Bicyclists and Sierra Club, 2013, http://www.bikeleague.org/sites/default/files/equity_report.pdf.

[54] *Non-Motorized Connectivity Study*, Prepared for King County Metro and Sound Transit by Fehr & Peers, September 2014, http://metro.kingcounty.gov/programs-projects/nmcs/.

Table 4: Key equity features and best practices for potential mobility hubs

Mobility hub prototype sites	Disadvantaged communities near the prototypes (and likely travel modes)	Key mobility hub features to promote equity	Implementation best practices
Barrio Logan	Low-income (bike and walk)	• Bike racks and lockers • Improved bike lanes/paths • Improved pedestrian facilities • Bikeshare • Enhanced transit waiting areas	• Subsidize bikeshare service for low-income communities • Create payment options for people without smartphones/bank accounts • Conduct outreach and education to promote bikeshare in low-income communities
Brawley	Minority (walk, bike, drive) Senior (walk, bike, drive)	• Transit signal priority • Real-time travel information • Enhanced transit waiting areas • Shuttle service	• Ensure that transit information is available in locally-spoken languages • Pilot beacon technology to target information on accessible features to seniors
City Heights/ State Route 15	Low-income (walk, bike) Minority (walk, bike)	• Transit signal priority • Dedicated transit lanes • Bike racks and lockers • Improved bike lanes/paths • Improved pedestrian facilities • Bikeshare • Shuttle service • On-demand rideshare • Enhanced transit waiting areas	• Pilot projects to subsidize bikeshare and rideshare services for low-income communities • Pilot payment options for people without smartphones/bank accounts • Conduct targeted outreach and education to promote bikeshare and rideshare in minority communities • Provide free or subsidized shuttles or on-demand rideshare services for low-income communities
Grossmont	Senior (bike, drive)	• Enhanced transit waiting areas • Shuttle service • On-demand rideshare	• Pilot concierge services for people without smartphones
Imperial Valley College	Minority (walk, bike, drive)	• Transit signal priority • Real-time travel information • Enhanced transit waiting areas • Bike lanes/paths • Improved pedestrian facilities	• Provide transit information in locally-spoken languages
National City/ 8th Street	Low-income (bike, drive) Minority (drive)	• Enhanced transit waiting areas • Bikeshare • Shuttle service • Car/scooter/NEV share • On-demand rideshare • Bike racks and lockers • Improved bike lanes/paths	• Subsidize shared mobility services for low-income communities • Pilot payment options for people without smartphones/bank accounts • Conduct targeted outreach and education to promote bikeshare and rideshare in low-income and minority communities • Provide free or low-cost shuttles

Mobility hub prototype sites	Disadvantaged communities near the prototypes (and likely travel modes)	Key mobility hub features to promote equity	Implementation best practices
Oceanside Transit Center	Low-income (drive)	• Shuttle service • Car/scooter/NEV share • On-demand rideshare • Enhanced transit waiting areas	• Subsidize sharing services for low-income communities • Pilot payment options for people without smartphones/bank accounts • Conduct outreach and education to promote bikeshare and rideshare in minority communities • Provide free or low-cost shuttles
Otay Ranch	Minority (walk, bike, drive)	• Transit signal priority • Real-time travel information • Enhanced transit waiting areas • Bike lanes/paths • Improved pedestrian facilities • NEVs[55]	• Provide transit information in locally-spoken languages • Provide infrastructure that accommodates NEVs as a lower-speed travel solution for seniors completing short trips
Sorrento	None		
Vista Transit Center	Low-income (walk) Minority (walk)	• Transit signal priority • Real-time travel information • Enhanced transit waiting areas • Improved pedestrian facilities	• Provide transit information in locally-spoken languages

[55] Otay Ranch does not have a high concentration of seniors according to the thresholds that we are using for illustrative purposes, but the fact that it is a newer development that has also incorporated a NEV network into its general development plan makes it an opportune site for piloting NEVs to help seniors and other residents looking to complete short trips in other mobility hub locations.

APPENDIX E

2019 Minneapolis
Mobility Hubs Pilot

THE MUSICANT GROUP

Minneapolis
Public Works

Acknowledgements:

Grant Funding Provided by The Energy Foundation, through the American Cities Climate Challenge.

Project Team responsible for planning and execution of pilot includes The City of Minneapolis Public Works – Administration, Transportation Planning and Programming, and Traffic and Parking Services staff and The Musicant Group - Design and Planning staff

Cover Art by Sarah Nelson, 2020

Report assembled by Ella Rasp, Chris DesRoches (The Musicant Group), and Chrissy Lee

Thank you to our partners: Twin Cities Shared Mobility Collaborative (administered by the University of Minnesota Center for Transportation Studies), Metro Transit, Hennepin County, Hennepin County Library, Nice Ride, Lyft, Spin, Lime, HOURCAR, MnDOT, Powderhorn Park Neighborhood Association, Ashley Sartorius and Sally Nixon

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THE MUSICANT GROUP

Minneapolis
City of Lakes

2019 MINNEAPOLIS MOBILITY HUBS PILOT
EXECUTIVE SUMMARY

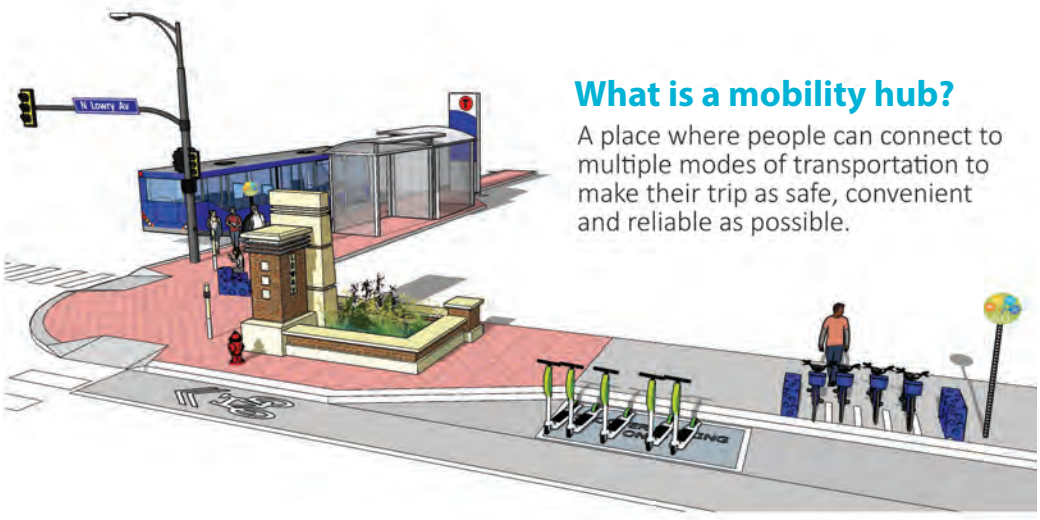
In 2019, the City of Minneapolis implemented a mobility hub pilot to increase access to convenient, low or no carbon transportation options, including transit, shared scooters and Nice Ride bicycles. This pilot was intended to introduce the concept of mobility hubs to the public, and help inform a long-term approach to implementing a larger mobility hub network in Minneapolis.

PILOT APPROACH

Since mobility hubs are a relatively new concept in the region, the piloting process provided an opportunity to:

- Test possible mobility hub interventions,
- Conduct interactive engagement around the concept, and
- Inform a long-term approach and larger strategic investments.

The mobility hub pilot was designed to create an interactive platform for community voice to shape the development and implementation of the basic mobility hub concept.



What is a mobility hub?

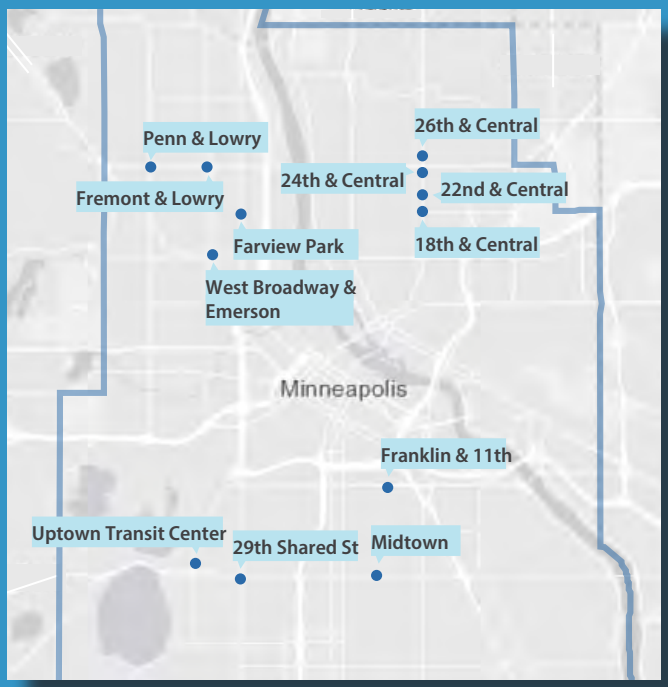
A place where people can connect to multiple modes of transportation to make their trip as safe, convenient and reliable as possible.

PILOT LOCATIONS

This map outlines all 12 locations for the 2019 Mobility Hub Pilot.

The City of Minneapolis worked with Transportation for America and Arcadis to identify potential mobility hub sites by combining 32 different layers of data. The data demonstrated strong opportunities in neighborhoods in the North, Northeast and South sections of Minneapolis.

Neighborhood groups were instrumental in filtering the data-driven location selections through local expertise on their community transportation needs.



IMPACT

Throughout the pilot, the project team conducted events where they conducted intercept surveys to gather feedback and evaluate the pilot.

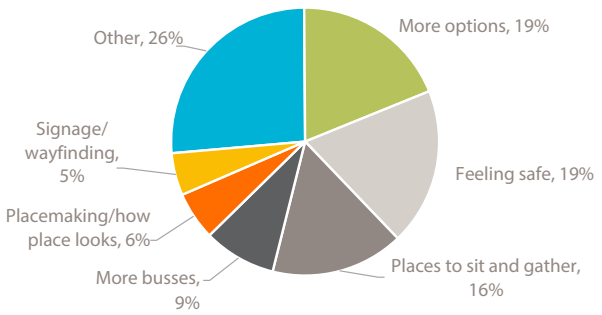
64% of users reported that pilot improvements make them more likely to use the transportation options at the hub.

Three key themes emerged when users were asked what would be most important to improve their trip:

- Access to more transportation options
- Feeling safe
- Places to sit and gather

Engagement events held at mobility hubs provided opportunity to distribute information on access and appropriate use of shared mobility, which included 285 helmets distributed, 60 test rides given, and over 200 flyers about low income programs distributed.

What was most important to making your trip better?



LESSONS

The 2019 mobility hub pilot revealed key themes, lessons and recommendations to inform the further development of mobility hubs:

Seating is especially important to facilitate comfortable journeys for older adults, children, and people with heavy bags, physical mobility challenges or chronic pain.

» **Recommendation:** Ensure more permanent accessible seating options at future mobility hubs.

Safety is a key driver of utilization of mobility hubs. The experience of safety is fostered through a variety of interconnected factors. Users shared how changes to the built environment, security presences, and proactive responses to negative behaviors would create a stronger sense of safety.

» **Recommendation:** Future mobility hubs should incorporate intersection improvements and resources for creating safer environments, such as curb bumpouts, on-site ambassadors, and activation of spaces.

Space on the sidewalk is a major constraint to providing the full range of placemaking and transportation options in a convenient, accessible layout at mobility hubs.

» **Recommendation:** Where available, utilizing on-street parking for mobility hubs could relieve pressure on sidewalk space and allow mobility hubs to have a more consistent layout.

Other barriers including vehicle accessibility and comfort are a barrier to using scooter- and bike-share. Financial and technological barriers also limit participation in app based systems that are primarily accessed via smartphone and with a credit/debit card.

» **Recommendation:** Pursue localized solutions including additional vehicle types to mitigate these barriers and enable broader use.

Maintenance is key to creating effective year-round spaces in the right-of-way, especially with elements like signage systems, benches, planters, and bright-colored paints. Users said these elements contributed to their increased interest in using the transportation options at hubs.

» **Recommendation:** Explore and develop new maintenance partnerships and assign maintenance responsibilities to less centralized entities.

Thank you to community, public sector, and mobility sector partners who collaborated on this pilot.

Powderhorn Park Neighborhood Association

Picture Wagon - Ashley Satorius & Sally Nixon

RECOMMENDED NEXT STEPS

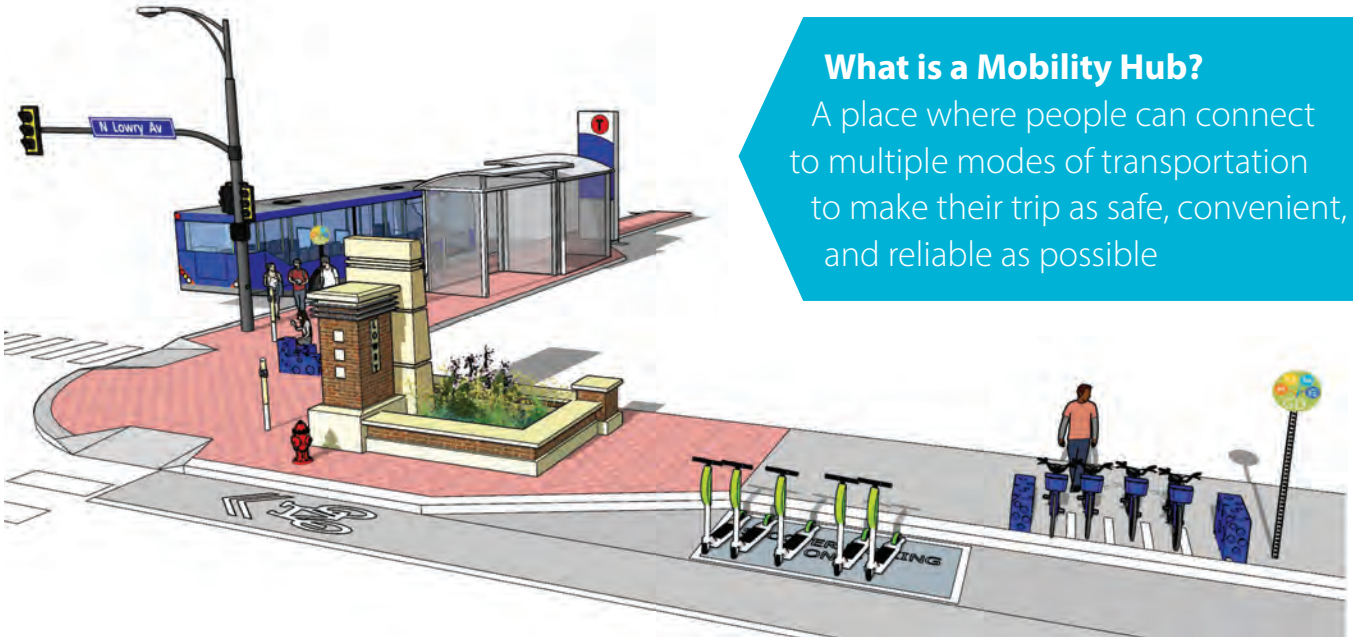
Recommendation	Why?	How?
Expand locations of mobility hub pilot	- Reach and engage more users in an interactive format - Users reported the features positively impacted their choice to use transportation options at the hubs, helping Minneapolis progress toward mode-share goals	- Replicate the location identification approach from 2019 pilot with modifications - Return and build momentum at 2019 sites and add other high-potential sites - Pursue grant funding and ongoing funding streams
Prioritize seating, safety and choice of mode	- Users surveyed identified these three features as most important to improving their trip at mobility hubs	- Test improved seating options in 2020 pilot - Test a hub ambassador approach to creating safe environment - Coordinate with Vision Zero efforts on safety and accessibility of sites - Expand on best practices in locating modes in tight configurations in public right-of-way - Incorporate Mobility as a Service Pilot to better facilitate access and payment among multiple modes
Develop a kit-based design primarily for underutilized on-street parking and sidewalk space	- On-street parking can provide cohesive base for replicating hub design - On-street space encourages riding bikes and scooters in on-street lanes. Relieves congestion on the sidewalk. - Kit encourages consistency in network	- Build on 2019 pilot layouts to create easily replicable packages that can still reflect community identity
Continue to build partnerships with agency partners, community groups, mobility providers, and artists	- Successful partnerships this season were built. Participation ensures better outcomes.	- Extend the micro-grant programming approach for 2020
Continue to build partnerships with public right of way owners and operators like Metro Transit, Hennepin County, and MnDOT	- Agency partnerships will be necessary for long-term placement of elements in right-of-way	- Work on provisional basis for placement of pilot elements in other right-of-way - Develop agreements for long-term mobility hub elements
Pilot on-site ambassadors to fulfill maintenance and safety functions	- Geographic distribution of mobility hubs presents logistical challenge for centralized maintenance - Enhanced maintenance and safety make the investment in a mobility hub more efficient at serving existing users and attracting drivers to non-car mode existing users and attracting drivers to non-car modes	- Approach neighborhood organizations and business coalitions to identify best fit for partnerships - Test community-based maintenance and safety approach through ambassadors at 2020 pilot sites

OVERVIEW

In summer of 2019, the City of Minneapolis launched a mobility hub pilot program to increase access to convenient, low or no carbon transportation options, including transit, shared scooters and Nice Ride bicycles.

The basis of a mobility hubs pilot in Minneapolis emerged due to its selection to participate in the American Cities Climate Challenge, and based on feedback during engagement for the City's 10-year Transportation Action Plan. As part of the American Cities Climate Challenge, the city has pledged to take bold action to reduce emissions from its transportation and building sectors.

This mobility hub pilot program is an important part of the City of Minneapolis's response to the challenge. In the Transportation Action Plan conversations, the City heard that Nice Ride bike share and electric scooter share were helping to reduce single occupancy vehicle trips and that the City should take an active role in shaping how those options are utilized. This pilot took a community-driven, iterative design approach to better understand how mobility hubs could be developed within the City of Minneapolis.



What is a Mobility Hub?

A place where people can connect to multiple modes of transportation to make their trip as safe, convenient, and reliable as possible

What is a mobility hub and why does it matter?

Using the definition established by the Twin Cities Shared Mobility Collaborative, a mobility hub is a place where people can connect with multiple modes of transportation in a safe, comfortable, and accessible environment, facilitating *convenient and reliable* travel. This pilot tested elements included in the characteristics listed below, which are essential to the success of mobility hubs.

This pilot also aligns with goals outlined in the City of Minneapolis Transportation Action Plan:

» **Climate** - Reshape the transportation system to address climate change, using technology, design, and mobility options to aggressively reduce greenhouse gas emissions caused by vehicles.

» **Safety** – Reach Vision Zero by prioritizing safety for all people and eliminate traffic fatalities and severe injuries by 2027.

» **Equity** - Build and operate a transportation system that contributes to equitable opportunities and outcomes for all people.

» **Prosperity** - Provide mobility options that move people and goods through reliable connections; retain top talent and grow Minneapolis as the economic engine of the region.

» **Mobility** - Embrace and enable innovation and advances in transportation to increase and improve mobility and access options for all.

» **Active Partnerships** - Create and seize opportunities to achieve shared goals and responsibilities through partnering and leveraging funding opportunities with national and regional partners and others who invest in the city.

Mobility hubs are a tool for improving the convenience of non-automobile transportation and supporting first- and last- mile connections to transit. This pilot serves to test how mobility hubs can work in our community and serve specific needs of people in Minneapolis.

Mobility Hub Characteristics:

1. Safe, accessible, and comfortable
2. Provide a welcoming and useful experience
3. Consistent design and clearly defined area
4. Seamless connections and reliable transportation options for all
5. Accurate and understandable trip/modal information

Pilot Approach

Since mobility hubs are a relatively new concept in the region, the piloting process provided an opportunity to:

» Test possible mobility hub interventions,
» Conduct interactive engagement around the concept; and
» Inform longer term approach and larger strategic investments.

The mobility hub pilot was designed to create an interactive platform for community voice to shape the development and implementation of the basic mobility hub concept. By piloting at existing transit stops, daily users have an opportunity to shape the implementation of the concept. Through programming opportunities for people to try transit, bikeshare and scooter share for the first time at pilot hubs, new multi-modal users are also engaged in co-creating this vision.

Piloting in this way serves as a targeted, interactive engagement method that can improve upon traditional forms of engagement. In many cases, it can be hard for individuals with limited time to go out of their way to attend an open house or community meeting. Meeting people where they are ensures that daily users' voices have a strong influence on the outcomes of the process.

Best Practices of Piloting

One of the additional considerations of pilot planning, especially in underserved neighborhoods, is ensuring that value is not produced only to be taken away. Since mobility hubs have the potential to add value for non-automobile users, it was important to put the hubs in places where people are already using those modes. It was also important to ensure that at the end of the pilot, those benefits didn't all disappear or negatively impact vulnerable users' travel patterns.

Early feedback from the City of Minneapolis' **Green Zones Initiative** members resulted in extending the pilot timeframe from one month in each community to a longer duration that would extend through the whole scooter/bikeshare season once deployed.

Furthermore, the project intentionally included elements that would be valuable to the participants beyond the duration of the pilot. Community connections generated from involving multiple aligned stakeholders, local artists, and individuals benefit participants beyond the pilot. People who participate in engagement also receive access to discounts and information about the mobility options at each hub, and positive experiences with the artists who work in their community.

A Green Zone is a place-based policy initiative aimed at improving health and supporting economic development using environmentally conscious efforts in communities that face the cumulative effects of environmental pollution, as well as social, political and economic vulnerability. For more information visit www.ci.minneapolis.mn.us/sustainability/policies/green-zones.

Goals

The goal of this pilot was to create a platform for demonstrating mobility hub concepts for users to interact and engage with, in order to inform a longer-term approach to mobility hubs. This approach would test components of a program that could support broader Minneapolis transportation goals and, if successful, build the foundations of a future long-term mobility hub network.

Goal 1: **Pilot strategies for co-locating mobility options in the public right-of-way.**

» Create a system for identifying optimal placement for mobility options in different contexts.
» Test multiple ways of placing modes to determine best practices.
» Work with mobility service providers to ensure their operational needs are understood and considered.
» Identify roadblocks/constraints to inter-agency right-of-way coordination.
» Activate underutilized right of way to enhance the experience of using active transportation.

Goal 2: **Understand barriers to utilizing shared modes and other non-automobile transportation options.**

» Create a platform for interactive community engagement.
» Build capacity within communities to participate in conversations about a future mobility hub strategy. Build stakeholder relationships with neighborhood leaders and daily users.
» Focus on the voices of people who are already using public transportation and seek out conversations with others who may not use these options now, but who could use mobility hubs in the future.
» Understand existing mobility gaps and barriers for bicyclists, pedestrians and pilot solutions to overcome these obstacles.
» Test active partnerships with mobility service providers to address known barriers like awareness of low-income user discount programs and safety while riding

Goal 3: **Create a system of visual cues to identify hubs as cohesive, inclusive spaces and centers of mobility options.**

» Pilot wayfinding methods that make multi-modal trips simple, easy and build awareness of community assets within an accessible distance from the hubs.
» Test wayfinding strategies that are accessible to as many users as possible.
» Highlight the neighborhood identity already present around the sites of hubs, destinations and along pathways through partnerships with local businesses, artists, and community members.

PROCESS + TIMEFRAME

The pilot would take a community-driven, iterative design approach to implementing mobility hubs that are connected to and supported by community destinations.

Plan Pilot | June 2018-June 2019

The City of Minneapolis worked with Transportation for America and Arcadis to identify potential mobility hub sites by combining 32 different layers of data. Layers were grouped into five different layer groups as shown in the table below.

This initial data framework identified opportunities to implement mobility hubs in three areas:

- North Minneapolis (including the Folwell, McKinley, Jordan, and Hawthorne neighborhoods)
- South Minneapolis (including the Lowry Hill East, East Isles, Whittier, Lyndale, Ventura Village, Midtown Philips, and Powderhorn Park neighborhoods)
- Northeast Minneapolis (including Windom Park, Holland, Logan Park and Northeast Park neighborhoods)

Table 1: Fill Text

A. Physical	B. Economic	C. Demographic	D. Access	E. Behavior
Transport Facilities: - Bus stations - Bus routes - Rail stations - Shared bike docks - Bike lanes - Major roads - EV chargers - Airport **Major Public Facilities:** - Public attractions - Schools - Hospitals - Shopping centers - Senior & public housing - Disability services access **Other:** - Parking lots - Underutilized land	- Employment density - Economic development zones	- Population density - Household income - Education level - Non-English speaking - Race - Vehicles ownershipw	- Employment access - Recreational access - Current commute time - Healthy food access	- Current intermodal activities - Congestion friction - Parking friction

Identify Opportunities | May 2019-August 2019

The project team used regional guidance from the Twin Cities Shared Mobility Collaborative on mobility hubs to form the initial steps for a pilot. This included identifying sites within the selected neighborhoods, designing furniture and signage that could be deployed in multiple contexts, and reaching out to potential partners for the pilot. Sites were intentionally co-located in close proximity to human services, parks, libraries, community centers, commercial nodes and higher resident populations. This phase also included meeting with neighborhoods adjacent to proposed sites to invite their input on these developing plans.

Neighborhood groups were instrumental in filtering the data-driven location selections through local expertise on their community. For the North Minneapolis locations, the Jordan Area Community Council's feedback led to the shift of a planned hub location from a residential area to a higher-activity commercial location on West Broadway and Emerson Ave. Similarly, based on feedback from the Minneapolis Green Zones Task Force, a hub location shifted further east to better serve lower-income neighborhoods. Data was a useful lens to identify initial opportunities, but partner engagement ahead of implementation played a key role in the final site selections.

The early phase of the pilot also required building active partnerships with an array of interests in the project. Coordinating with other agencies allowed the project to activate underutilized right of way from multiple jurisdictions, such as Hennepin County right of way on Penn and Lowry. Mobility providers played an active role in shaping how the various mobility hub elements could be placed such that their operational requirements could be met. Community partners played a variety of roles, from participating in site layout to promotion and engagement.

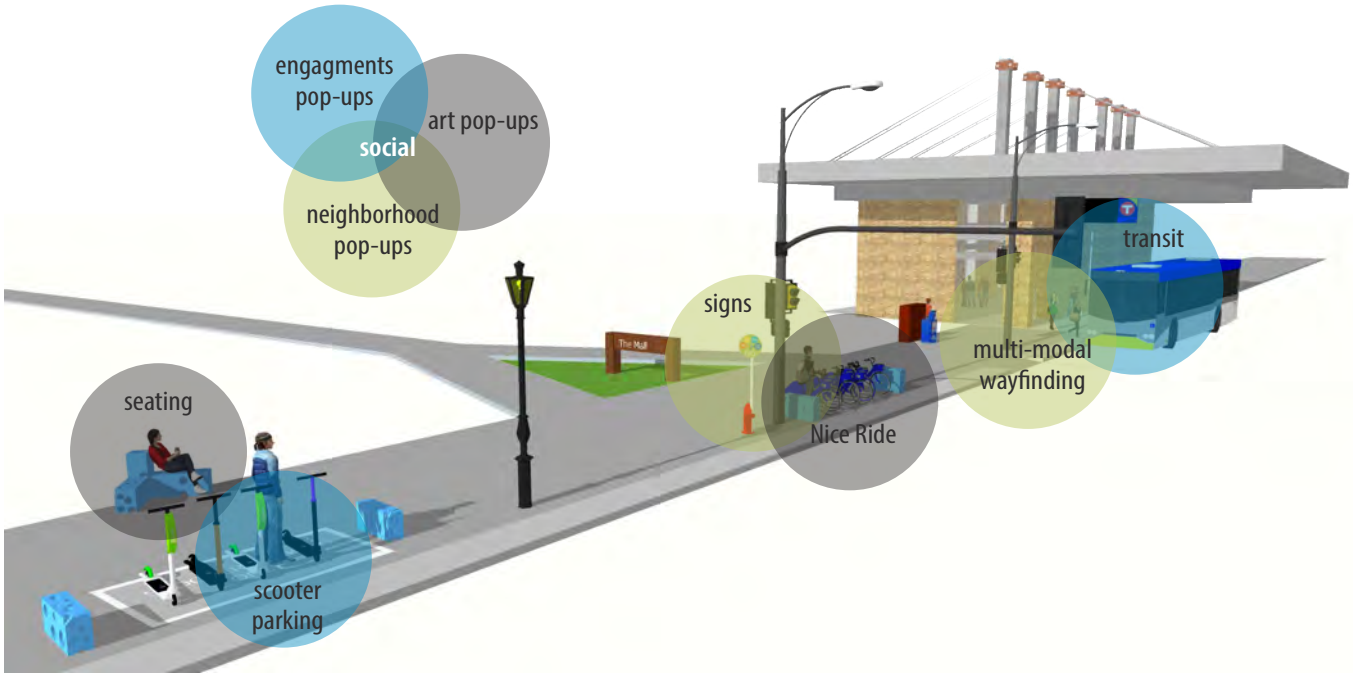
Partnerships

- Agency Partners - Hennepin County Community Works, Hennepin County Libraries, Minneapolis Park and Recreation Board, MnDOT
- Mobility Providers - Metro Transit, Nice Ride, HOURCAR, Lyft, Spin, Lime
- Community Partners - neighborhood associations, corridor businesses, public health organizations/health service providers, youth organizations, local artists

A community-driven, iterative design approach:

Build Out Pilot Hubs | September 2019-December 2019

After vetting with project partners, sites were then built out with unique layouts of mobility hub elements, including:



Furniture

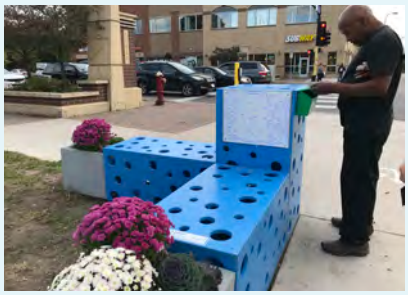
- Modular
- Designed to be reused at multiple locations
- Durable for short term use
- Colorful
- Multiple purposes: Seating, gathering area, to frame bike/scooter parking, or buffer from car traffic

Signage

» Wayfinding system to local destinations accessible via walk, bike and transit routes
» Beacon signs to denote hub location
» Landing signs to denote Nice Ride Hub, Scooter parking, Bike Parking, Seating + Info
» Multi-lingual and Icon based – languages selected in collaboration with outreach specialists at Neighborhood and Community Relations Department of City of Minneapolis
  - Somali
  - Spanish
  - Hmong

Enhancements

» Planters
» Solar phone charger
» Magnetic poetry
» Information Box



Activate and Iterate | September 2019 - December 2019

Based on user experience and feedback received through engagement at initial sites, changes were made to layout and design of hubs yet to be implemented. Mini-grants were also established for local artists to add elements of community expression and interest at key mobility hub sites. The implementation process also required the creation of an ongoing maintenance process executed by the project team.

Evaluate | December 2019-January 2020

In order to monitor the impact of the pilots, the project team used a number of strategies to gather data. This not only informed the iterative improvement of this pilot but provides valuable information to inform future mobility hub planning. Our evaluation strategies included:

- Online survey responses
- Intercept surveys at key mobility hub sites
- Partner participation and feedback
- Ask partners about their perception of mobility hubs and community impact
- Mode use data (via Metro Transit, Nice Ride and City of Minneapolis)
- Nice Ride trips with origins and destinations
- Scooter trips with origins and destinations
- Metro Transit boardings

Contribute and Expand | January 2020-present

During implementation, the project team regularly documented observations, and looked for ways to improve and adjust the pilot as it unfolded. The project team then worked to compile all of those on-the-ground learnings to make recommendations for a mobility hub strategy going forward. This report reflects those lessons from implementation and is a snapshot of our understanding in this complex landscape of evolving mobility options.

SITE ANALYSIS

Every street is a unique place. Factors such as current transportation conditions, neighborhood context, and demographics help inform the scale, purpose and design of the mobility hubs that were implemented.

Table 2: Site Characteristics	Existing Conditions			Neighborhood Context		
Pilot Sites	**Transit [1]**	**Bike + Ped [2]**	**Right of Way [3]**	**Public Institutions**	**Commercial**	**Residential**
Penn & Lowry Ave	**BRT:** C Line	●●○○○	●●●●●		✓	Low-mid density
Fremont & Lowry Ave	**HFB:** Rt 5	●●●●○	●●●○○	Library		Low-mid density
Farview Park	Rt 22	●●●○○	●○○○○	Park		Low-mid density
West Broadway & Emerson Ave	**HFB:** Rt 5; Rt 14, 22	●●○○○	●●●○○		✓	Mid-high density
Uptown Transit Center	Bus-Only Lane Pilot; **HFB:** Rt 6; Rt 12, 17, 21, 23, 53, 114, 612	●○○○○	●●○○○	Library	✓	Mid-high density
Midtown Global Market	Bus-Only Lane Pilot; **HFB:** Rt 5, 21	●●○○○	●●●●○		✓	Mid-high density
Lyndale & 29th Share Street		●●●○○	●●●○○		✓	Mid-high density
Franklin & 11th St		●●○○○	●●●●○		✓	Low-mid density
24th St & Central Ave	**HFB:** Rt 10	●●●○○	●●●○○		✓	Low-mid density
22nd St & Central Ave	**HFB:** Rt 10	●●●○○	●●●○○	Library	✓	Low-mid density
18th St & Central Ave	**HFB:** Rt 10	●●●●○	●●○○○	Senior Housing	✓	Low-mid density

[1] BRT= Bus Rapid Transit; HFB= High Frequency Bus service; Rt = Route

[2] 1=less safe, 5=most safe Considerations include pedestrian crossing safety, north/south bike connections, and east/west bike connections.

[3] 1=less Right-of-Way, 5=most Right-of-Way

North Pilot Sites Overview

Map + Demographics

In the North Minneapolis neighborhoods, the demographic data shows a higher population of residents of color than Minneapolis overall and a lower median household income. A greater proportion of people are primarily driving to work, but a high proportion of households also do not have access to a vehicle. In this pilot, that meant that access to economic opportunity was a theme to shape the understanding of existing transportation needs. Demographics also show a younger population and higher rates of residents with disabilities than in Minneapolis overall.

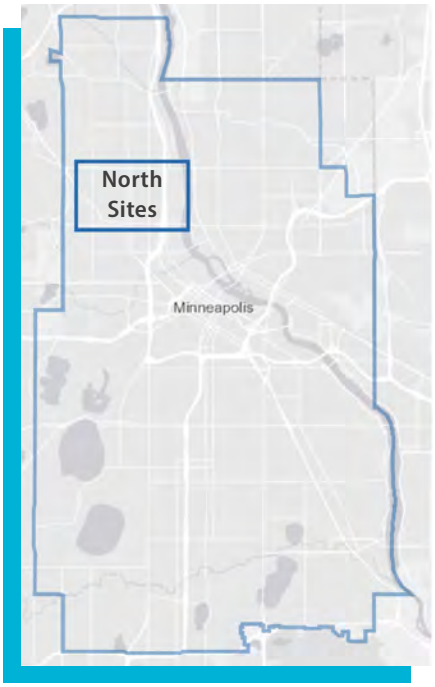
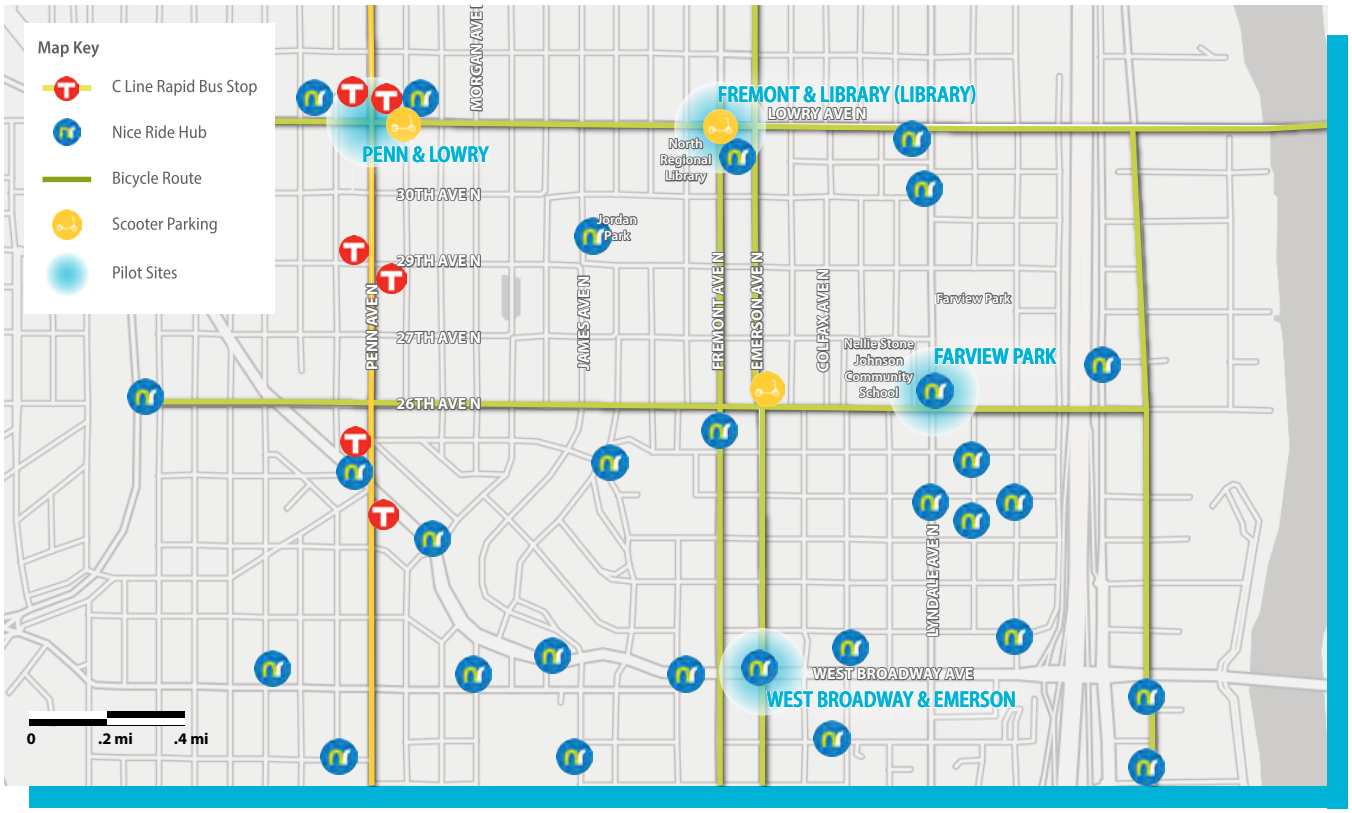


Table 3: North Pilot Area Demographics	North Pilot Neighborhoods	Minneapolis Overall
Race		
White	22.8%	59.9%
Of Color	77.2%	40.1%
Economics		
Median Household Income	$40,005	$55,720
Transportation to Work		
Car, Van or Truck	76.3%	68.8%
Public Transit	15.6%	13.4%
Walk, Bike, Work at Home, Other	8.0%	17.7%
Access to Vehicles		
No vehicle	21.1%	17.7%
1 Vehicle	39.5%	41.8%
2+ Vehicles	39.4%	40.6%
Age		
17 and younger	22.9%	19.9%
18-64	60.3%	70.9%
65+	5.9%	9.2%
Disability	14.5%	11.2%

Map 1: North Pilot Sites



Penn Ave & Lowry Ave

Strengths of the site: Strong transit investment in C Line station, recently redesigned Penn Avenue, high activity levels throughout the day, passengers transferring from the C Line/19 to the 32, flexible space to place mobility hub elements and corner elements, social capital that regulates some activity.

Challenges at the site: Intoxication, unpredictable aggressive behavior, litter, crossing the street can be dangerous, vacant lots have been underutilized, some reports of incidents of violence

Fremont & Lowry Ave (North Regional Library)

Strengths of the site: consistent activity at the bus stop and library patrons, potential for future partnerships at the library, sidewalk space is large enough to facilitate scooter parking and furniture, possible use of Library parking space(s)

Challenges at the site: Library closed for renovation, past reports of negative behavior, walking conditions due to sidewalk conditions, less on-street space available

Farview Park

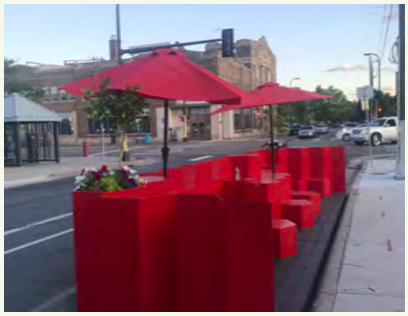
Strengths of the site: Connection to the Minneapolis Park system, connection to off-street bike path east-west

Challenges at the site: North-south bike connection is unpleasant and unsafe, minimal sidewalk width and on-street space created challenges for placing mobility hub features, pathway to community center needs to be enhanced, distance from pilot location to higher activity area of the park

West Broadway & Emerson Ave

Strengths of the site: Local business strength of West Broadway and high transit use makes this site a high foot-traffic area. Connection to Emerson Ave protected bike lane (on-street), Juxtaposition Arts future partnership potential.

Challenges at the site: Limited sidewalk width or on-street space for placement of elements, spread out transportation options, West Broadway is not safe for biking/ scootering, crossing the street as a pedestrian also can be dangerous.



Sidewalk art and parklet installed by nearby organization Juxtaposition Arts, not in association with the mobility hub pilot. See juxtapositionarts.org.

South-Central Pilot Sites Overview

Map + Demographics

The demographics of neighborhoods adjacent to South-Central Minneapolis mobility hub pilot locations show a notably higher proportion of residents of color and more households with one vehicle. Since the demographic comparison in many categories were similar to the city overall, they did not play a significant role in shaping the approach to these mobility hub sites.

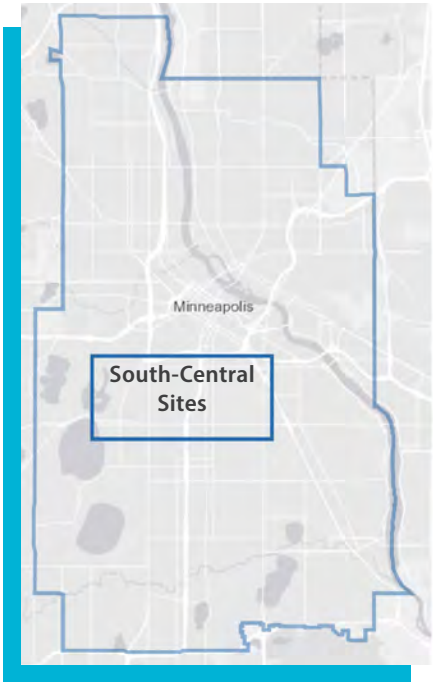
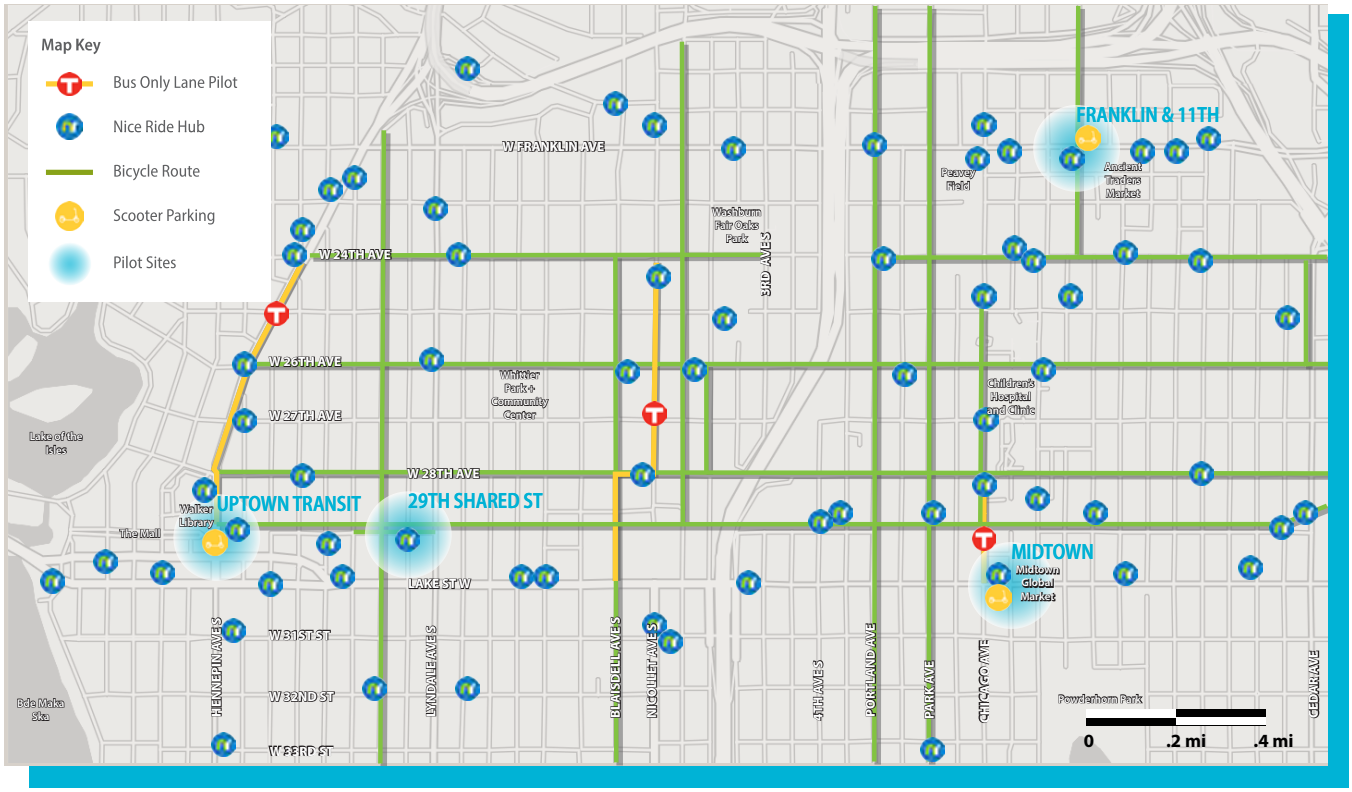


Table 4: South-Central Pilot Area Demographics	South-Central Pilot Neighborhoods	Minneapolis Overall
Race		
White	47.9%	59.9%
Of Color	52.1%	40.1%
Economics		
Median Household Income	$57,893	$55,720
Transportation to Work		
Car, Van or Truck	66.2%	68.8%
Public Transit	14.5%	13.4%
Walk, Bike, Work at Home, Other	19.3%	17.7%
Access to Vehicles		
No vehicle	17.2%	17.7%
1 Vehicle	45.6%	41.8%
2+ Vehicles	37.2%	40.6%
Age		
17 and younger	21.7%	19.9%
18-64	70.9%	70.9%
65+	7.4%	9.2%
Disability	10.4%	11.2%

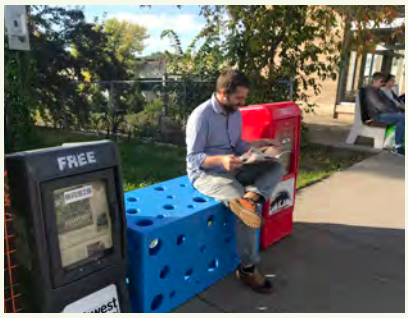
Map 2: South-Central Pilot Sites



Uptown Transit Center

Strengths of the site: Established transit hub in center of Uptown district, high activity level due to bus transfers, connectivity between transit center and Walker Library, proximity to greenway and "The Mall".

Challenges at the site: Hennepin Ave is not pedestrian, bike or scooter friendly, connectivity to the Greenway is not apparent or easily accessible, limited sidewalk space to place additional modes without congesting pedestrian flows or being on park property.



Midtown Global Market

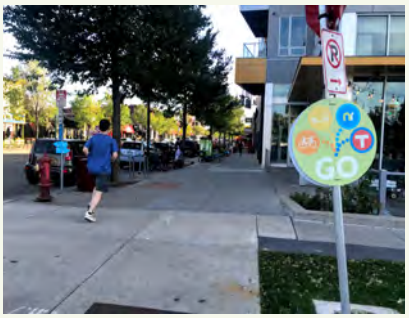
Strengths of the site: Multi-cultural connections and active neighborhood advocates, Market is already a hub of small business and community activities, adjacency to Midtown Greenway and future CEPRO Park site, flexible space to place hub elements

Challenges at the site: Less transit rider activity because most transfers happen at Chicago and Lake Transit Center, building buy-in with property owner, some challenging activities/behaviors in and around the site

29th Shared St

Strengths of the site: prioritization of non-car modes, existing art and traffic calming features, opportunities to expand/enhance the original design concept

Challenges at the site: Nearest transit stop is almost a block away, speed of cars still exceeds goal, barriers to accessing Hennepin from 29th as an alternative route to Lake St, compromises between visibility of being on Lyndale and enhanced environment of Shared St.



Franklin and 11th

Strengths of the site: Connectivity to 11th as north-south bike route, proximity to popular library and Aldi grocery, dense cultural assets in Native community, access and adjacency to downtown and HCMC.

Challenges at the site: Franklin Ave is not bike/scooter and pedestrian friendly, busses don't stop at this corner, few trips start or end at this location, on-street scooter parking feels exposed without further safety features

Northeast Pilot Sites Overview

Map + Demographics

The mobility hub sites in Northeast along the Central Avenue corridor are in a context of lower median household income, higher public transit commute share and lower walk/bike/other commute share. A greater proportion of households in these adjacent neighborhoods also have one or no vehicles, as compared to Minneapolis overall. For this pilot, that meant that these sites were approached with additional consideration of low-income individuals who rely on public transit year-round.

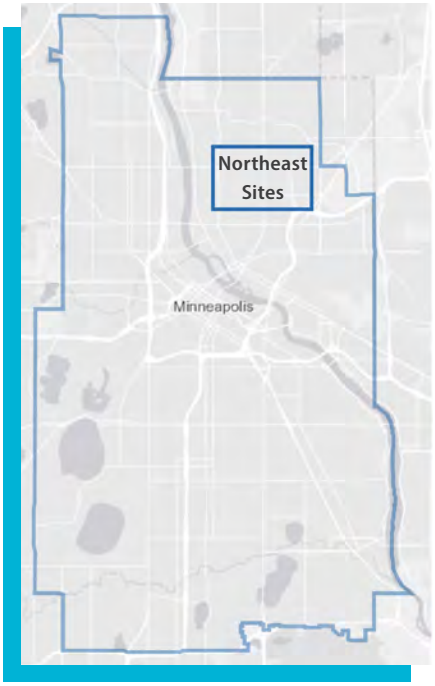
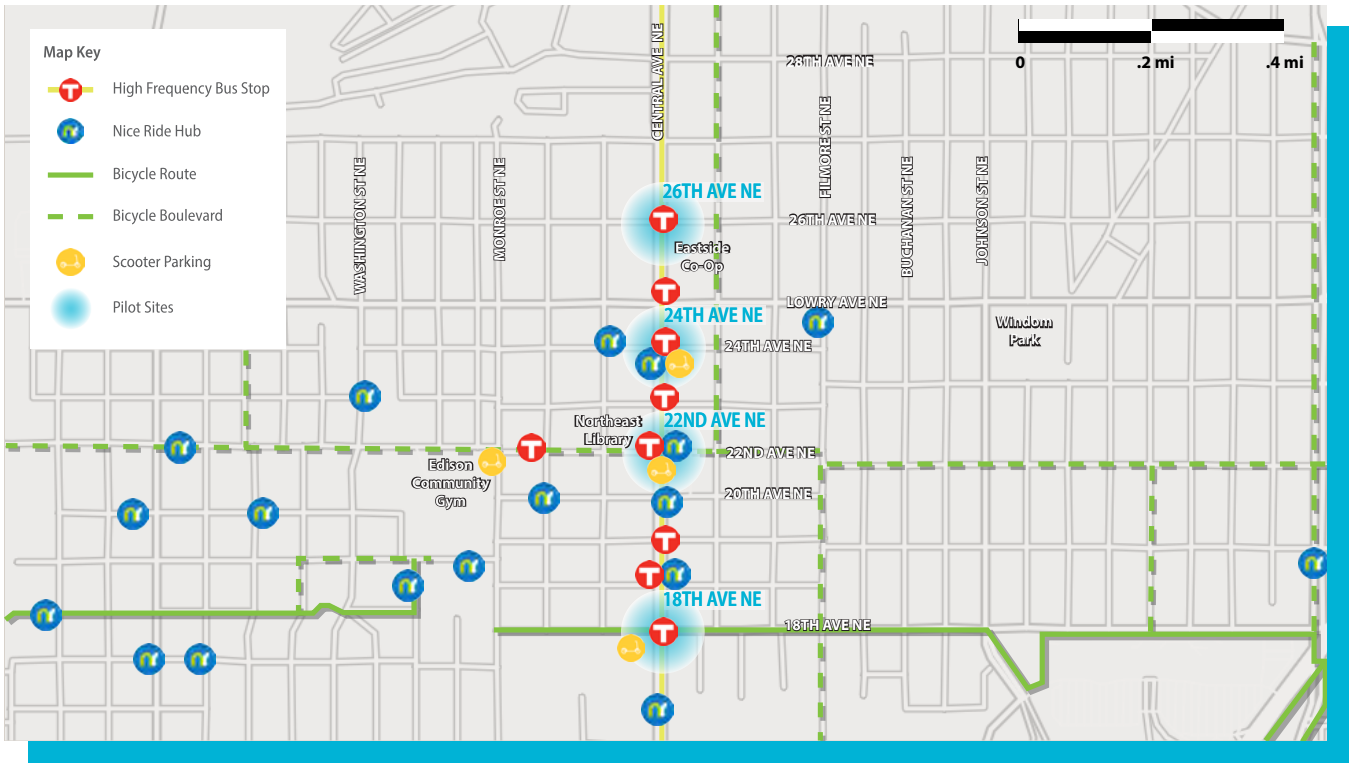


Table 5: Northeast Pilot Area Demographics

	Northeast Pilot Neighborhoods	Minneapolis Overall
Race		
White	61.7%	59.9%
Of Color	38.3%	40.1%
Economics		
Median Household Income	$52,322	$55,720
Transportation to Work		
Car, Van or Truck	70.7%	68.8%
Public Transit	16.5%	13.4%
Walk, Bike, Work at Home, Other	12.8%	17.7%
Access to Vehicles		
No vehicle	20.1%	17.7%
1 Vehicle	37.7%	41.8%
2+ Vehicles	42.3%	40.6%
Age		
17 and younger	19.1%	19.9%
18-64	71.7%	70.9%
65+	9.2%	9.2%
Disability	11.9%	11.2%

Map 3: Northeast Pilot Sites



24th and Central

Strengths of the site: Availability of flexible sidewalk and on-street space for elements, active bus stop, multicultural small-business hub

Challenges at the site: placing modes in a cohesive manner in tight boulevard, low foot traffic or space to support programming

22nd and Central (Library)

Strengths of the site: Proximity to Library and Edison High School, availability of on-street space to place hub elements

Challenges at the site: Minimal sidewalk space to place additional elements, low foot traffic level and space to have programming, Central Avenue is 4 lanes in most places with parking on both sides, but minimal bike infrastructure.

18th and Central

Strengths of the site: Connectivity to the 18th St Bikeway for east-west bike/scooter travel, availability of flexible space to place hub elements

Challenges at the site: Minimal sidewalk space to place additional elements, low foot traffic level and space to have programming, Central Avenue is 4 lanes in most places with parking on both sides, but minimal bike infrastructure. Senior public housing residents' needs may differ from the currently available modes, the location isn't within HOURCAR's range


GO
Penn and Lowry Ave
0.6 miles
13 minutes
2 minutes
4 minutes
26th Ave Bike Route
0.5 miles
10 minutes
3 minutes
Farview Park
0.8 miles
16 minutes
12 minutes
5 minutes
Patrick Henry High School
1.9 miles
38 minutes
12 minutes
10 minutes

TRIP DATA + ANALYSIS

Collecting trip data before and after the start of the mobility hub pilot is another tool for evaluating the pilot. Conclusions drawn from data will become more robust as additional data is collected.

Collecting trip data before and after the start of the mobility hub pilot is another tool for evaluating the pilot. Many variables impact transit ridership, for example weather, on-time arrival and time of year. Nice Ride and scooter data is also limited by the years both have been in service. This was only the second year that scooters were present in the city. Those factors make it very difficult at this phase to tie changes in the before and after data directly to the mobility hub pilot. However, the trips made at each of the pilot sites can be another indicator of how many people saw and/or interacted with the individual mobility hub locations. This data will serve as the start of a year-over-year comparison to establish more clear trends, should mobility hubs be continued to be located at these sites. This data methodology will also continue to evolve and guide future pilot data analysis for the City.

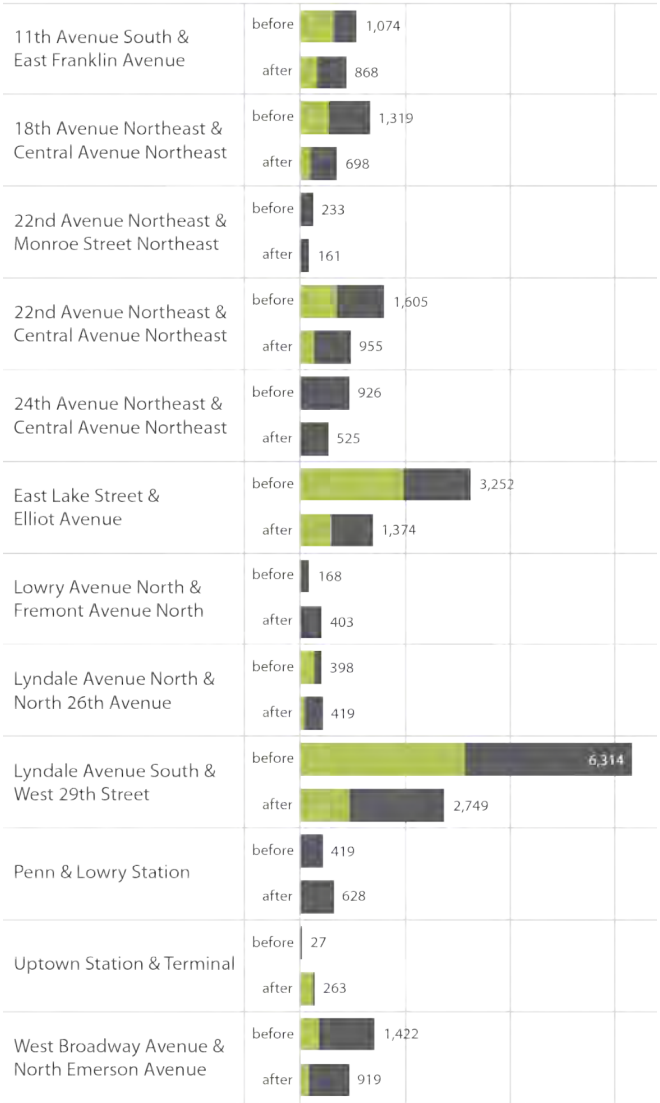
By this measure, over 800,000 trips were made at these sites, showing a large number of people have interacted with the mobility hub pilot elements.

For bike and scooter trips, there were some locations that clearly saw increases in use following the placement of new Nice Ride hubs and scooter parking. This uptick in scooter trips can be seen at sites like Penn Ave & Lowry Ave N, Lowry Ave & Fremont Ave N, and Franklin Ave & 11th St S. There are also a number that actually went down after pilot implementation, which was likely due to seasonality and reduced availability. This trend can be seen at sites like 18th St & Central Ave NE and Lake St & Elliot Ave S (Midtown Global Market).

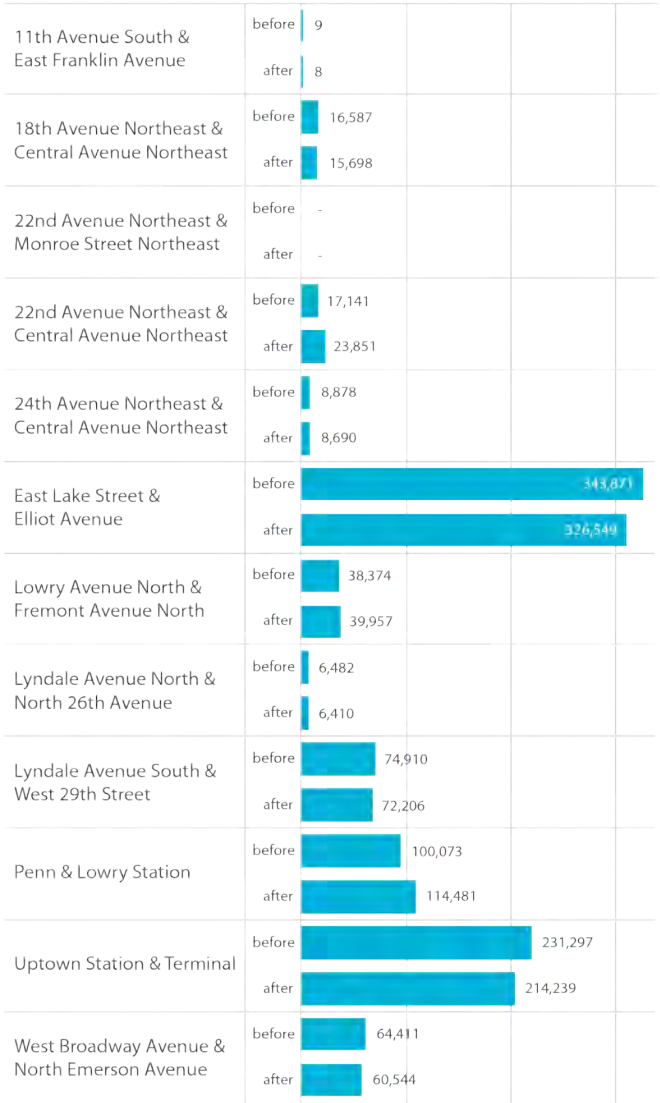
High transit ridership sites seem to have high use of bikes/scooter use. This points to how closely related the success of a mobility hub is to transit ridership. It is also important to note that adding Nice Ride and scooters close to bus stops did not make ridership plummet, which suggests that people are not substituting their whole trip for bike/scooter, but rather that they work together. An exception to that potential connection is where transit use is high, but bike/scooter riding infrastructure is limited. For example, Uptown Transit Center is a major transfer hub for busses, but Hennepin Ave and Lake Street offer limited bike/scooter connections. Future mobility hubs may test placement of elements closer to good riding streets, even if that means being less directly connected to the transit stop.

Table 6: Mobility Hub Before and After Trip Comparision

Nice Ride and Scooter:



Metro Transit Ridership:



ENGAGEMENT DATA + ANALYSIS

CONVERSATIONS on streets with everyday bus riders, bike riders, scooter riders and walkers. Data based conclusions driving iterations in design. The engagement approach combined both in-person and digital/paper surveying to integrate perspectives from a broad range of people into the project.

Survey

The survey addressed key elements of how users in each neighborhood interact with current transportation options and what barriers they experience. To manage survey length and keep language approachable to many audiences, the survey did not educate about what mobility hubs are or explain the design of the pilot at length. Future surveys can follow up to track the impact of the pilot and other City efforts on transportation users.

A note on survey data: Fifty-eight responses is a small data set to represent the complexity of people in Minneapolis and their transportation choices. Demographics collected also show that the survey respondents are not statistically representative of the neighborhoods we are piloting in - respondents skewed whiter, older, and income demographics were not collected . However, this is a common trend with online, longer surveys, which is why collecting in-person intercept data at the project sites was prioritized. With those limitations in mind, survey data can still provide a snapshot of the current attitudes and experiences of some Minneapolis residents regarding key mobility hub themes.

Work Trips

33 of the 52 respondents who work outside the home commute with multiple modes. This may mean people are taking multi-modal trips or take different modes on different days. While the sample size of this survey is small, it is clear many residents within the neighborhoods surveyed do rely on the non-car modes to get to work. Only 15% of the respondents said they drove alone as their only way of getting to work. Most of the respondents who said they drive said they also use other modes. If some drivers are already choosing non-car modes, there may be improvements that would help them shift more of those trips away from driving. This indicates that improving access to multi-modal options could help shift more of trips away from single-occupancy vehicle use.

Improving access to multi-modal options could shift more trips away from single-occupancy vehicle use.

Short Trips

Walking and biking were the most popular modes for short trips. Again, the most common denominator was that people are using many mode options to fit their different trip needs. While 50% of respondents said they drive themselves on some short trips, only 9% will only drive on short trips. Potential for mode shift is shown for short trips as well.

Trips to Bus Stop

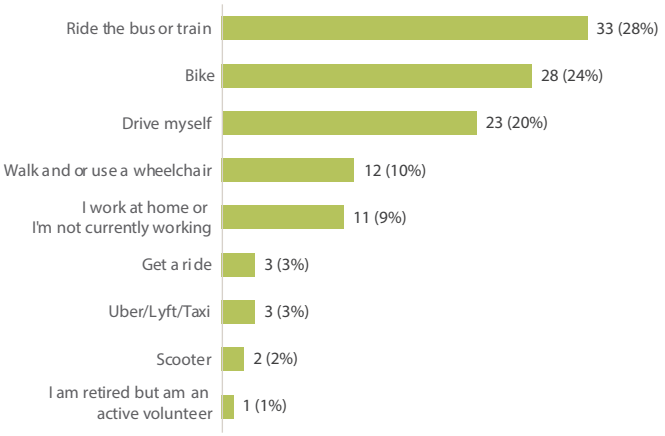
When accessing bus stops, this survey shows that the majority of respondents were walking and/or using a wheelchair to start and end their ride. This reinforces the premise that for mobility hubs to increase access to transit, they must incorporate walking connections. Ten percent or less of responses included use of Nice Ride or scooters to get to transit. This lower figure may point to lack of reliably available Nice Rides and scooters at bus stops or in places that would be conducive to serve for frequent first- and last- mile trips. Future phases of the Mobility Hub program should ask this question again to track impact over time, after piloting coordination of Nice Ride and scooter parking at transit hubs.

For mobility hubs to increase access to transit, they must incorporate walking connections.

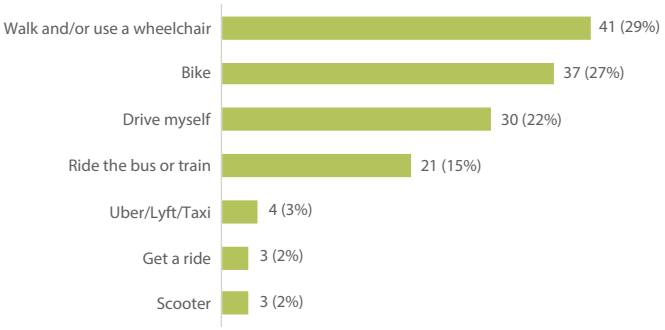
The survey asked people about their use of certain modes to attempt to identify specific barriers to different transportation modes. Among options of bus, Nice Ride, and electric scooter, respondents were most familiar with riding the bus. These findings underscore the importance of a strong transit network as the basis for any strong multi-modal ecosystem. 67% of respondents had not used an electric scooter and 44% had not used a Nice Ride bike before. This will be another point to track as these options become more established and convenient to use.

These findings underscore the importance of a strong transit network as the basis for any strong multi-modal ecosystem.

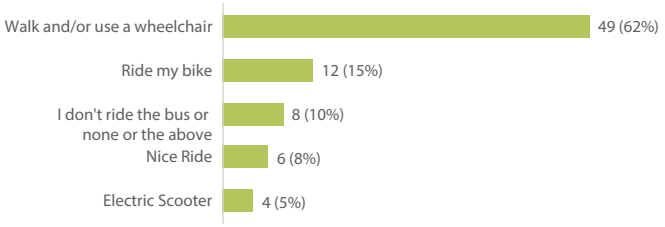
Survey Results: *How do you get to work?*



Survey Results: *For short trips, how do you travel to the location? (A short trip could be to grocery, shops, library, or any common place less than 3 miles away)*



Survey Results: *Do you use any of these transportation types to get to or from a bus stop?*



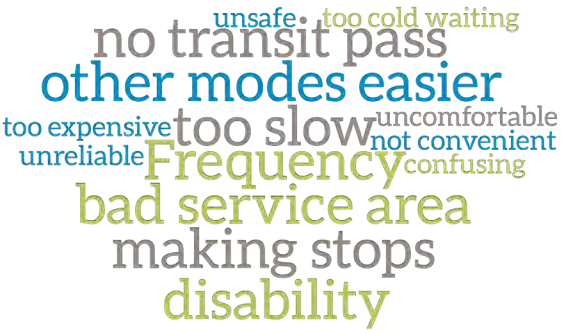
Transit Riding

When describing why respondents chose to use the bus, one common theme was bus service was convenient and inexpensive in comparison to owning a vehicle. Others who chose not to use the bus voiced that busses are too slow and too infrequent.

A barrier identified by a respondent who didn't use the bus was "I can get most of the regular places I need to go on a bike or by walking, and otherwise I'm running errands that are easier with a car. Taking the bus for a short trip where I don't have to pay for parking also feels more expensive than taking my car because I don't get a monthly transit pass." Paying per use on the bus felt to this person more expensive when compared to the distributed costs of using their car. Another user said a barrier to using transit more was that "transportation from my home to work is MUCH faster via car. Using the bus once at work would be alright, but since I don't use the bus on a regular basis, I don't have a metro card. I also find the bus routes confusing (as compared to other cities)." These comments express some of the perceived advantages of driving and the time/convenience costs involved with transit use for people who are used to driving their own car.

> "I ride the bus because its convenient, relatively fast and inexpensive.

Survey Results: Why Respondent Don't Take Transit



Survey Results: Why Respondents Do Take Transit

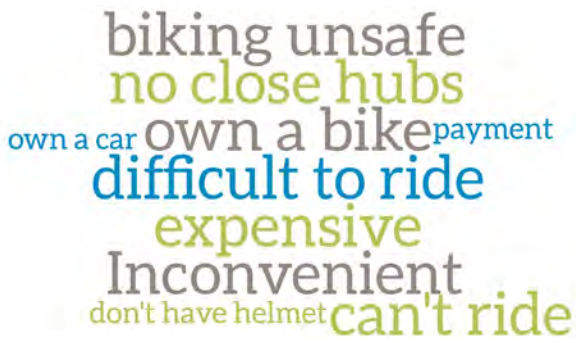
Nice Ride Use

When explaining why they use or don't use Nice Ride bike share, convenience is also a primary consideration. People who ride Nice Ride do it when hubs are convenient and as part of a flexible, multi-modal trip. The most common reason why people didn't use Nice Ride was owning their own bike, but beyond that, people felt the hubs were not close to their destination and the bikes were difficult to ride.

Another barrier that a respondent highlighted was "I'm very short & the bikes don't fit me well. Plus, I can't just use my GO-TO card to unlock them." Diminished range when Nice Ride suspended service in St. Paul was also cited as a barrier for another user. "My use has definitely gone down since Nice Ride left St. Paul, though, as that's where I work and where a significant number of my meetings are held. I used to use it to connect from light rail to my meeting locations." These comments helped shed light on how Nice Ride users want their trips to better integrate with their multi-modal, jurisdiction-crossing trips.

> "Bikes are great. I don't have the hassle of owning one with Nice Ride.

Survey Results: Why Respondents Don't Use Nice Ride



Survey Results: Why Respondents Do Use Nice Ride

Scooter Use

The main reason respondents choose not to use scooters was because of fear of injury while riding them. Those who do choose to use scooters found that they were quick, easy and convenient.

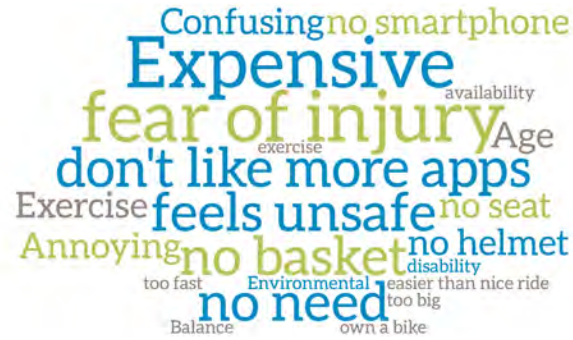
Responses also highlighted information barriers to using scooters more. One user said, "they still confuse me - can you ride them on the sidewalk or the road? Also they don't have a bike basket so it's not as good for errands." Another barrier is the inconvenience of each scooter company having their own app. "I don't like having to download additional apps in order to use these services," according to a comment. Some users may not have storage space on their phones for multiple, or the desire to open multiple apps in search of the closest vehicle.

Pop-up engagement events this season included scooter and Nice Ride demonstration rides with helmet giveaways and supporting new riders. Based on the barriers shared in these survey responses, engagement should continue to focus on safety education, and the City should work with providers to expand placement of scooters, as well as simplify the system for locating and paying for shared modes.

Engagement can continue to focus on safety education, and the City can work with providers to expand placement of scooters, as well as simplify the system for locating and paying for shared modes.

> "The scooter station is nice, it was frustrating when they were only downtown. Scooters are helpful for low-income people I think.

Survey Results: Why Respondents Don't Use Scooters

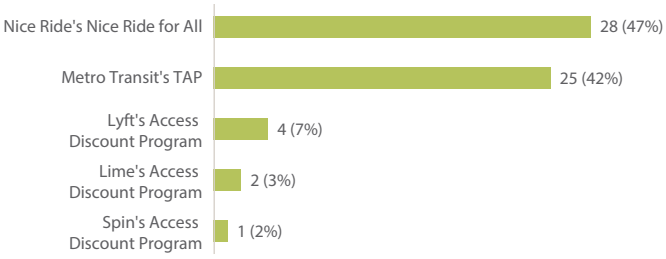


Survey Results: Why Respondents Do Use Scooters

Discount Program Awareness

The survey also revealed limited awareness in the community about equity programs that offer discounted access to scooters, with fewer than 15% of respondents knowing about these programs. Further potential exists to raise awareness and increase utilization of these programs by establishing local standards that must be incorporated into equity programs.

Survey Results: *Check the box for the discount programs you knew about before this survey.*



Engagement Events

Partnerships were a large part of the success of pop-up engagements. Every time engagement was being conducted on-site, a community group, artist, or mobility service provider was there as well. By offering this platform for other partners, this pilot produced community benefit as well as adding to our understanding of the next steps for mobility hubs. Bus riders had the chance to interact with scooter companies and get information about low-income programs available. Nice Ride came out to let people try the new electric bikes and show how to unlock new dockless bikes. Throughout the events, approximately 285 helmets were distributed, 60 demo rides given, and over 200 flyers about the low-income programs were provided. Nice Ride bikeshare saw 38 new enrollments in Nice Ride for All as a result of the events, as a result of their ability to enroll customers on the spot at events.

Throughout the events, approximately 285 helmets were distributed, 60 demo rides given, and over 200 flyers about the low-income programs were provided.

With the rapid pace of change occurring in Minneapolis' transportation system, this demonstrated the importance and success of connecting users with information through in-person, on-site engagements. The City of Minneapolis has made this type of participation in outreach an expectation of companies who receive licenses to operate mobility services in the city. This policy ensured that operators were enthusiastic participants in the mobility hub pilot. Mobility providers also received the benefit of building a positive relationship with new potential customers.

> "We had a great time at the event and would love to do more of these with you going forward! It really seemed like a lot of people were curious about the scooters and wanted to ride, they just needed the information about how."
>
> – Spin Management

Future phases of the mobility hub program should continue to engage alongside mobility service providers and build on these partnerships. Neighborhood organizations were also excited about a place where their messages can be communicated. Access to non-digital mechanisms for sharing information is a challenge, even for those already embedded in the community. During the pilot season (without being prompted by the project team), the Folwell Neighborhood Association put door hangers with community information in the Info Box placed at the Penn and Lowry mobility hub.

The platform to distribute information to people who could be eligible for equity programs was a key positive outcome of this phase of the pilot.

Partnerships were also formed with neighborhood groups and local artists. The two community partners who participated in the micro-grant program were the Powderhorn Park Neighborhood Association's Advocacy Booth and artists Sally Nixon and Ashley Satorius's Picture Wagon. Both community partners were compensated for their contributions.

Powderhorn Park Neighborhood Association's Advocacy Booth was an artist-designed engagement for neighborhood events to connect the voices and concerns of residents to the elected officials who serve them, overcoming barriers to advocacy for traditionally under-represented groups. PPNA also shared their advocacy on Community Safety initiatives, which provided insights into how neighborhood leaders envision addressing safety challenges like those we see at mobility hub sites.

Picture Wagon is a bicycle-pulled photobooth and interactive art piece by Ashley Satorius and Sally Nixon. Satorius and Nixon proposed a theme for the installation of "I Was Here Too," which prompted hub users to see themselves as connected to the other users of the site who are in the same place at different times. By taking playful portraits of subjects that would be printed and taken home and taking second portraits with uplifting messages to leave for the next person, Satorius and Nixon created a link between community members who may not otherwise meet. From families with kids who loved to dress up, to others who were touched to have a photo with their loved one, this piece impacted many in a positive way.

Future phases would benefit from more time to connect with potential grant recipients, especially to allow time for new work to be conceived around the program. Other opportunities to create art and community engagement were also open during the same period as the mobility hub pilot, which may have also factored into volume of responses to the mini-grant. Additionally, as was done during this phase of the pilot, community partners need to be compensated for their contributions to the mobility hub program.

Partnership over time could potentially build capacity within those organizations or individuals to respond more quickly to future opportunities that benefit the community, within and beyond the mobility hub program.

Engagement is a two-way street.

Partnerships enabled the mobility hub pilot to connect to users in a unique way and enabled local artists and rooted organizations to take part in shaping the project narrative.

Picture Wagon - Ashley Satorius and Sally Nixon

Advocacy Booth - Powderhorn Park Neighborhood Association

Pop-Up Engagements On-Site

The top priority of engagement was to understand how everyday users at the site experienced the current environment and responded to the pilot interventions. To capture this, we spent over 20 hours at mobility hub locations talking with users about their transportation experiences, and what they see as the most important improvements. Surveys were conducted at Penn and Lowry Avenue and at Uptown Transit Center.

Frequency of Use

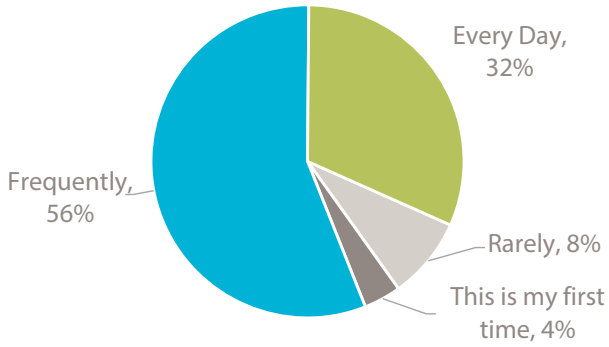
The majority of users surveyed (88%) were frequent or daily users of the hub. This helps us understand both the value of these experienced users' insights, and also understand that this intercept approach may under-represent the opinions of people for whom barriers limit or restrict their use of transit, bikes, or scooters.

Impact of Pilot on Use of Transportation Options

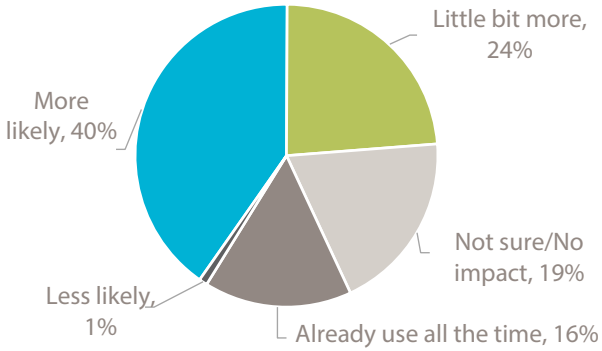
After giving a brief explanation of the pilot and pointing out the elements at the site, users were asked whether these pilot elements made them more or less likely to use the transportation options available at that hub, and they responded on a spectrum. This data shows that 64% of users reported that they would be more likely to use the transportation options at the hub. A total of 35% of users reported that they already use the services all the time or that there would be no impact on their travel choices. All but three of the people who said the hub features would have no impact on their travel choices (or weren't sure), were already using the available transportation options frequently or every day.

64% of users reported that they would be more likely to use the transportation options at the hub.

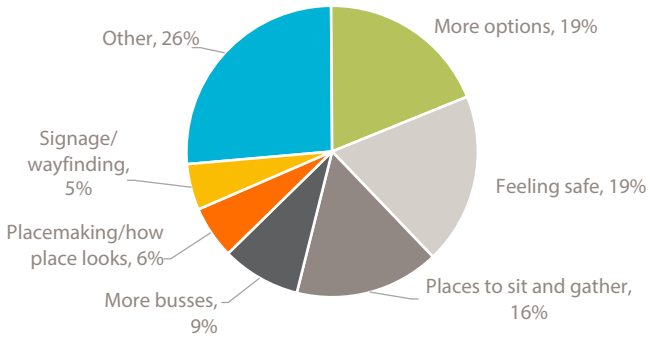
Survey Results: Frequency of Use



Survey Results: Impact of Pilot on Use of Transportation Options



Survey Results: Key Element at Mobility Hub



Important Element to Improve Trips

We also asked users about what would be most important to improve their trip, giving users an opportunity to talk about what impacts them most. Three key themes which people value most emerged from the responses: feeling safe, access to more transportation options, and places to sit and gather. Many other ideas arose, and some valuable insights were not common enough to make a category, but still warrant further exploration.

Three key themes which people value most emerged from the responses: feeling safe, access to more transportation options, and places to sit and gather.

- "[I][1] use the bus. The signs are really colorful and I like them. It's nice to have the other options close to the bus so that if I miss my bus I can take a scooter or bike. You should be able to pay for the scooters and bikes with a bus card."
- "Seating is helpful because I have bad knees."
- "Having a dedicated area for scooters, it's helpful to have a "parking spot" rather than knocked over, on the sidewalk, etc."
- "I meet people here, use the bus, and will use the scooters. You get tired of standing. Scooters [are nice] when you can't catch the bus. Winter's coming [and] the bus shelter is open and the wind is cold. It would be nice if there was a door to close so that the cold doesn't keep coming. Everything else is good."
- "[I] use the bus to get to work. If the seating was over here [near the 32 stop] so you can see the bus. The bus is always late. This one is nine minutes late and you're just standing here."

The project team moved the seats in response to this comment.

- "[I want] more places to sit, [I feel] scared, so [I want] more lighting, free monthly bus cards, barbeque in the lot."
- "[I go] to Penn and Lowry twice a day. Haven't tried scooters/bikes but seeing people around makes me want to try. Looks fun, especially for younger people. [I] like bright color[ed] signs. [They] look pleasant and inviting. [I] would want more planters and flowers. [It's] about community. [I] like all signs with good information. Seems like we're growing, like downtown."

In response to this comment and others like it, the project team added planters and planted them for the fall and winter at Penn and Lowry.

> "It's nice to have the other options close to the bus so that if I miss my bus I can take a scooter or bike. You should be able to pay for the scooters and bikes with a bus card.

> "I use the bus to get to work. If the seating was over here [near the 32 stop] so you can see the bus. The bus is always late. This one is nine minutes late and you're just standing here."

> "...Looks fun, especially for younger people. I like bright colored signs. They look pleasant and inviting. I would want more planters and flowers...

[1] Words in brackets were filled in after the conversation. The rest of the quotes were verbatim from the respondent.

Further Insights

The less quantifiable outcome of this intercept survey was the opportunity to have broader conversations with users at the hub. For several people, having furniture at their bus stop was more than just a convenience, it multiplied the possible uses of the hub for them. When the project team was on site for maintenance of the mobility hub, one person shared that the new seat had especially helped the other day when their knee flared up while they were walking. At the hub, they had a place to sit and call a friend for a ride from a hub that they could easily describe. Another person said how helpful it was to have something to set their grocery bags on, instead of the ground (see Snapshot #1). Some users at North Regional Library pulled a seat over to an outlet on the building so they could charge their phone (see Snapshot #2).

For several others, they wanted us to know that seeing these colorful, cared-for elements on their trip lifted them up and made them feel valued in a way they usually didn't while riding the bus or walking. Over and over people shared what they would envision being able to accomplish in their community with a hub like this.

While the core purpose of these spaces is to serve a transportation purpose, people who were engaged resonated with the potential for mobility hubs to make streets more social, and to celebrate neighborhood identity. Whether they were envisioning barbeque pits in adjacent vacant parcels, or distribution of leftover community garden produce, community members saw deeper potential for mobility hubs playing a role in restorative practices already being developed.

Snapshot #1

Snapshot #2


PARKING
PARKING
Midtown Exchange
niceride
Lime
MAX
965-706
SEGWAY

MOBILITY HUB PILOT LEARNINGS + OUTCOMES

The 2019 Mobility Hub Pilot provided a fruitful platform to plan by doing and engage by meeting people where they are. Stakeholders responded in ways that demonstrate that, though the concept of mobility hubs is new, potential exists for creating a space where multiple mobility options are available, convenient, and reliable, and where the surrounding community can connect and build. The 2019 mobility hub pilot revealed key themes, lessons and recommendations to inform the further development of mobility hubs.

Users prioritize seating, safety and choice at the hubs

Seating

Seating was commonly heard as an important piece of support infrastructure in the city's right of way, whether as a place to sit while waiting for a bus, a place to set your backpack while you find your bike key, or a place to rest while walking. Seating is especially important to facilitate comfortable journeys for older adults, children, and people with heavy bags, physical mobility challenges or chronic pain.

During the pilot, we encountered some situations where seating had been removed from a bus stop or sidewalk due to previous incidents of negative behavior. While it is important to take these concerns seriously, it is critical to understand and clarify the root cause of that behavior. The challenges communities face - such as substance abuse, unemployment, homelessness and poverty - exist and outside the presence of a bench. Removing a bench will not remove these challenges that underpin negative behaviors, but adding a bench will make many people's trip significantly better. A bench is just a bench, and a bench is good.

To fulfill the need for accessible seating at mobility hubs, features could include:

- More durable, permanent seating
- Seating options for enhanced comfort and accessibility, such as seat backs, arm rests, and cushioning
- Movable furnishings that can serve multiple purposes
- Partnership with Metro Transit to add seating in the bus stop shelters
- Partnership with local businesses or stakeholders to maintain seating elements

See Next Steps section for further discussion of a holistic mobility hubs approach.

Safety

Safety is a key driver of utilization of mobility hubs. The experience of safety is fostered through a variety of interconnected factors and differs based on the perception of the individuals interacting with the space. Safety consists of both personal interactions and physical space concerns from adjacent car traffic. Many people who were engaged with during this pilot brought up feeling unsafe. For some that meant wanting more lighting or bike lanes, for others that meant wanting more security or police present. For others, there was concern about experiencing harassment at transit stops. If in-person surveys had been conducted in the early morning or late night, these concerns may have come up even more. As we seek to eliminate barriers to accessing transit and shared mobility, a complex understanding of safety and what that means for each neighborhood around these sites needs to be considered.

> "Space in cities is not the sum of its infrastructural parts. While there is a critical aspect of safety composed of how we design and build streets, there is a multidimensional experiential safety that overlays that infrastructure."
>
> – The Untokening Collective

The mobility hub pilot site on E Lake St, demonstrated how a multi-dimensional experience of "safety" is present in the public realm. Metro Transit Police work diligently to remove dangerous objects from the Chicago & Lake Transit Station. However, community members described how increased police presence near transit puts neighbors who may not have documentation at risk. Partners at Powderhorn Park Neighborhood Association have already begun charting a path to a safer environment on Lake Street by advocating for resources for community-based outreach in response to livability crimes. And finally, Lake Street has also been identified as a high-crash corridor for pedestrians, bicyclists and vehicles, and therefore is being evaluated for infrastructural safety improvements by Hennepin County and the City of Minneapolis. This is the complex environment in which mobility hubs are being integrated.

It is likely that future mobility hubs will face similar safety challenges. Therefore, a future approach must incorporate resources to contribute to safer environments in order to successfully respond to concerns of current users and attract new users. Solutions will be chosen with an understanding that encouraging and facilitating positive activity helps to mitigate negative activity. Pushing people out of the space is not a humane approach and will only move the activity to another (and often nearby) location.

Working to create a stronger sense of safety could involve a variety of approaches, including:

- Adding enhanced lighting
- Providing phone charging stations
- Placing ambassadors to help facilitate positive activities and interactions at mobility hub sites
- Locating mobility hubs near existing hubs of activity, such as libraries, active parks, and commercial hubs
- Coordinating with Vision Zero efforts to improve the safety of walking, biking and riding scooters

See Next Steps section for further discussion of a holistic mobility hubs approach.

Choice (or Space)

Users want the flexibility and convenience of having multiple transportation options to fit their trip needs, yet the biggest constraint to providing these options at each hub is space. Placement of bike share, scooters, bus stops and other infrastructure in a constrained right-of-way, while maintaining a walkable and accessible sidewalk will be a challenge for some mobility hub locations.

This pilot demonstrated that close proximity of multiple mobility services is key to a cohesive hub. Proximity is especially important for hubs located on larger, multi-lane roads, where users may not see designated scooter or bike parking just across the intersection. When the pilot began, site layouts spanned two or even three out of four corners of an intersection, based on available space. Later in the pilot process, tighter configurations created a more recognizable presence in the streetscape, making it easier for people to quickly identify and access the full range of options available to them.

During this pilot, elements were placed on concrete sidewalks, in grass, and in preliminary layouts on-street. When it became clear that tighter proximity of elements was key, layouts were tested to utilize on-street space in the 20-30ft No Parking zone between an intersection and where on-street parking begins. However, it was observed that in many of the pilot locations, the most consistently available space for mobility hub elements was in on-street parking spaces.

Where available, utilizing on-street parking for mobility hub elements relieves pressure on congested sidewalk space, clearly indicates that the proper place to ride bikes or scooters is on-street, and provides a consistent template for co-location of mobility options.

To maximize transportation options available in space, future mobility hubs could use several strategies:

» Developing site layouts that preserve accessible, comfortable walking spaces and keep mobility hub options in a cohesive, tight arrangement
» Utilizing on-street parking spaces where practical to maximize available space for mobility hub elements
» Expanding the number of mobility hub sites so more mobility options are reliably available in more places
» Continuing work with mobility service providers to ensure mobility hubs are priority sites for distribution of shared vehicles

See Next Steps section for further discussion of a holistic mobility hubs approach.

Other Barriers

Age was a frequent factor in why people were disinterested in, or wary of, shared bikes and scooters. Follow-up engagement should target better understanding of how to reduce barriers to mobility experienced by those who don't see their needs met by the currently available mobility options. Future changes to vehicle types, such as inclusion of adaptive cycles or scooters, or additional modes such as carshare, ridehailing, or dynamic transit service may better accommodate those users.

> "I can't use [Nice Ride] bikes without a credit card. My friend was telling me about scooters but when they talked about paying for it in an app I removed myself from conversation.

Another consideration is the financial and technology barriers to access for shared mobility. Whether because of cost, lack of access to banking services, or lack of access to a smartphone and/or data plan, having app-based services leaves some Minneapolis residents behind. One person told us, "I can't use [Nice Ride] bikes without a credit card. My friend was telling me about scooters but when they talked about paying for it in an app I removed myself from conversation." Nice Ride is working with local non-profit Prepare and Prosper to connect people to basic banking services to fit their situations, but alternatives to app-based payments are still a necessity. The City is working to develop standards for equity programs which all mobility service providers may be required to incorporate.

Further Takeaways from Implementation Team

Maintenance

One of the challenges of building out a mobility hub network is the care necessary to keep these places functioning well, and projecting care and reliability into the community. The City of Minneapolis, Metro Transit and other property owners work diligently to maintain existing right-of-way and property. Coordination of these roles and responsibilities across the city is a complex logistical challenge. Adding elements to the right-of-way, especially when it expands beyond the services usually provided by existing maintenance staff, can increase costs without having a clear source of funding to cover it. With this in mind, it is important to account for maintenance services as a part of planning new infrastructure, such as mobility hubs.

Despite the additional maintenance required in implementing mobility hubs, there is an important case to be made for continuing to include elements like signage, benches, planters, and bright colored paints in the mobility hub system. Users called these elements out as impactful to their perception of the space and as a reason why they would use the transportation options at this hub more.

An effective mobility hub strategy must seek efficiencies and assign responsibilities for maintenance to entities whose proximity and incentives align them well for partnerships. Existing maintenance systems are centralized, where maintenance staff are housed within each jurisdiction's departments, making it a challenge to provide consistent care to elements that require small check-ins on a regular basis, over a large geographic range. Regular maintenance tasks at mobility hubs include collecting litter, tending plants, clearing snow, site repairs, managing artwork, and adjusting signage. These tasks can usually be handled by an individual or group close to the site with little or no training needed. Pursuing a more decentralized model through maintenance partnerships at future mobility hub sites could allow for greater efficiency in accomplishing good repair at mobility hub sites with robust features. As networks of mobility hubs grow, needs for ongoing maintenance and a safety presence could be rolled into an "ambassador" role.

To ensure mobility hubs are maintained as a welcoming and accessible space, the following strategies should be considered:

- Identifying maintenance responsibilities and allocating tasks to most efficient entity possible, exploring strategies for decentralized maintenance partnerships
- Allocating specific resources to maintenance if developing an ongoing mobility hub program
- Placing ambassadors to help facilitate ongoing maintenance of mobility hub elements

See Next Steps section for further discussion of a holistic mobility hubs approach.

Mobility Hubs in Winter

This year's pilot concluded fully in the second week of December, which provided a window into the operation of mobility hubs in winter conditions. Current census data shows that more than one in six households in Minneapolis do not have access to a car, a fact that necessitates consideration of mobility options that can be reliably available year-round.

The two big issues that came up during winter operation of the 2019 pilot sites were snow clearance and diminished transportation options. Upon the first major snow of the year, it was difficult and/or dangerous to get to transit stops at the hubs because of inconsistent or complete lack of snow clearing at bus stops and intersections. Although the Nice Ride and scooter season had been extended for this pilot, soon after the first significant snowfall, bikes and scooters were collected for the season.

The limited winter functionality of the currently available shared bikes and scooters is another barrier to their year-round usability. The City of Minneapolis can work with mobility service providers to identify and pilot modes and vehicle types which cater to this environment, allowing mobility hubs to be prepared to fully function year-round.

In the future, structured shelter and electrical connections would allow the addition of lighting, heat and weather protection, which would enhance the experience at mobility hub in winter conditions. Metro Transit's experience demonstrates that even these basic elements are difficult to keep operational, as is visible when station heaters and light fixtures fail and require frequent repair.

As such, a mobility hub strategy could include:

» Service standards for mobility hub snow clearance incorporated into a maintenance plan
» Partner with Metro Transit to build or enhance bus shelters at mobility hub sites
» Partner with mobility service providers to explore deployment of winter-ready vehicles
» Building out select hubs with electricity to enable addition of lighting and heating elements

See Next Steps section for further discussion of a holistic mobility hubs approach.

Winter Site Snapshots

This year, the project team was able to clear an accessible path to transit stops at mobility hub sites, clear crossings at adjacent intersections, and clear hub elements (seats, bike/scooter parking). The results were a clear shift in the usability of spaces for users.

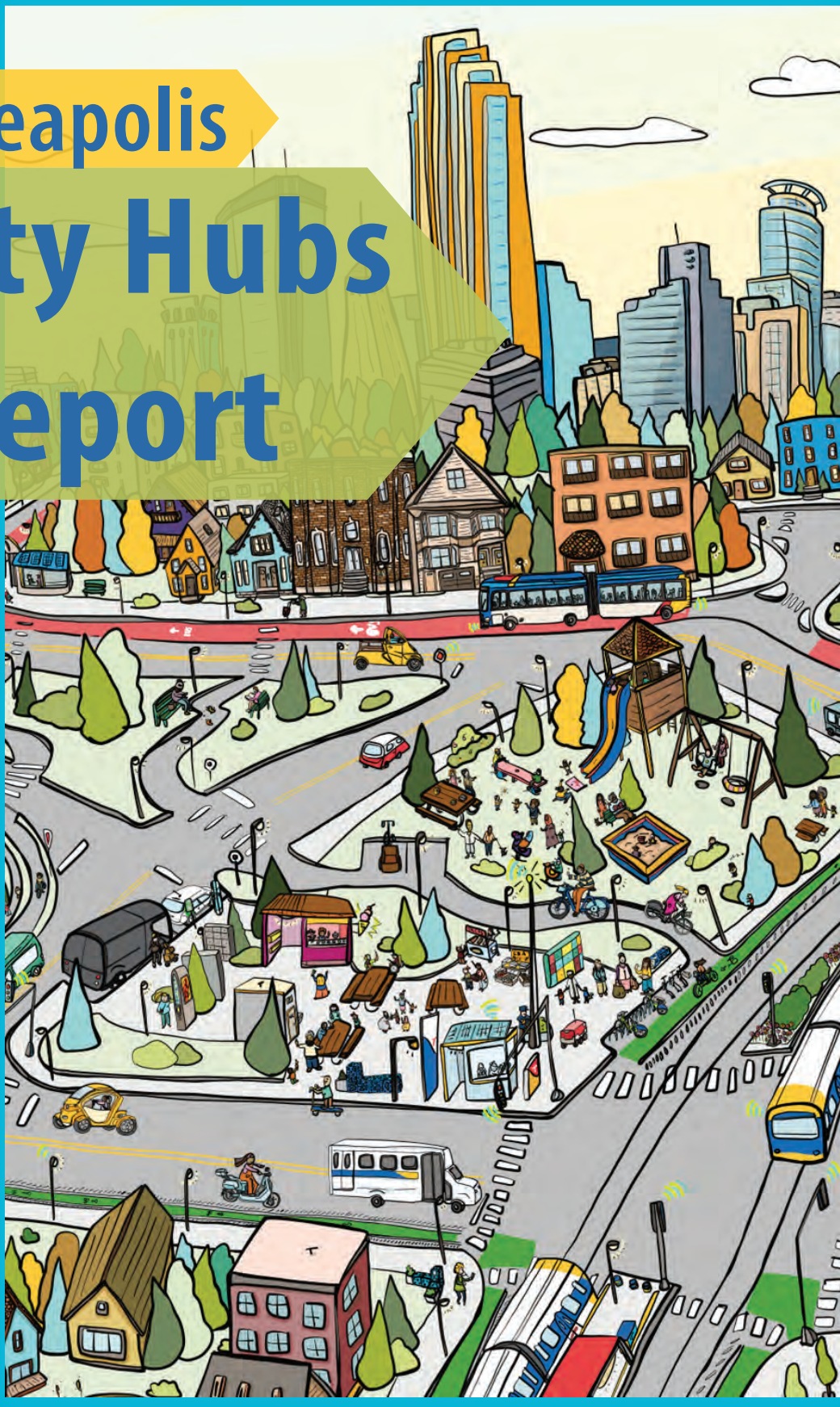
Next Steps for Minneapolis Mobility Hub Pilot

Table 6: Reccomendations from 2019 Pilot

Recommendation	Why?	How?
Expand locations of mobility hub pilot	- Reach and engage more users in an interactive format - Users reported the features positively impacted their choice to use transportation options at the hubs, helping Minneapolis progress toward mode-share goals	- Replicate the location identification approach from 2019 pilot with modifications - Return and build momentum at 2019 sites and add other high-potential sites - Pursue grant funding and ongoing funding streams
Prioritize seating, safety and choice of mode	- Users surveyed identified these three features as most important to improving their trip at mobility hubs	- Test improved seating options in 2020 pilot - Test a hub ambassador approach to creating safe environment - Coordinate with Vision Zero efforts on safety and accessibility of sites - Expand on best practices in locating modes in tight configurations in public right-of-way - Incorporate Mobility as a Service Pilot to better facilitate access and payment among multiple modes
Develop a kit-based design primarily for underutilized on-street parking and sidewalk space	- On-street parking can provide cohesive base for replicating hub design - On-street space encourages riding bikes and scooters in on-street lanes. Relieves congestion on the sidewalk. - Kit encourages consistency in network	- Build on 2019 pilot layouts to create easily replicable packages that can still reflect community identity
Continue to build partnerships with agency partners, community groups, mobility providers, and artists	- Successful partnerships this season were built. Participation ensures better outcomes.	- Extend the micro-grant programming approach for 2020
Continue to build partnerships with public right of way owners and operators like Metro Transit, Hennepin County, and MnDOT	- Agency partnerships will be necessary for long-term placement of elements in right-of-way	- Work on provisional basis for placement of pilot elements in other right-of-way - Develop agreements for long-term mobility hub elements
Pilot on-site ambassadors to fulfill maintenance and safety functions	- Geographic distribution of mobility hubs presents logistical challenge for centralized maintenance - Enhanced maintenance and safety make the investment in a mobility hub more efficient at serving existing users and attracting drivers to non-car mode existing users and attracting drivers to non-car modes	- Approach neighborhood organizations and business coalitions to identify best fit for partnerships - Test community-based maintenance and safety approach through ambassadors at 2020 pilot sites

APPENDIX F

2020 Minneapolis Mobility Hubs Pilot Report



THE MUSICANT GROUP

Minneapolis Public Works

Acknowledgements:

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Project Team responsible for planning and execution of pilot includes The City of Minneapolis Public Works – Administration, Transportation Planning and Programming, and Traffic and Parking Services staff and The Musicant Group - Design and Planning staff

Cover Art by Sarah Nelson, 2021

Report assembled by Ella Rasp, Max Musicant and Val Quarles (The Musicant Group), with Chrissy Lee

Thank you to our partners: Metro Transit, Hennepin County, Hennepin County Libraries, Nice Ride, Lyft, Bird, HOURCAR, MnDOT, St Anthony East Neighborhood Association, Marc Woods, Alexis Pennie, West Bank Business Association, Landrei Areial, and Native American Community Development Institute

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THE MUSICANT GROUP

Minneapolis
City of Lakes

AMBASSADOR PILOT PROGRAM

The ambassador approach was key to the overall success of creating people-centered spaces at mobility hubs in Minneapolis. Ambassador teams, as champions for care and programming of mobility hubs, have a multiplier effect on the positive impact of these spaces in the community.

What is the Ambassador Pilot?

Goals of the Ambassador Pilot Program

1. Provide community-based approaches to safety through a regular on-site personnel presence;
2. Create a decentralized, community-grounded maintenance approach for the mobility hub features;
3. Provide a holistic model that connects maintenance, public safety, resource distribution, and enhanced public realm features by capitalizing on the synergies between these often siloed conversations.

Ambassador Role

The core duties for a Mobility Hub Ambassador were to activate and maintain the mobility hubs and make users at each hub feel more safe and welcome. The Ambassador's responsibilities included:

» Performing light maintenance, such as litter pick up, tending plants, adjusting signs, snow removal, and artwork care at each mobility hub and monitor conditions as they walk between each site;
» Alerting Mobility Hub project staff about larger maintenance issues (i.e. broken or missing items);
» Interacting with people (while socially distanced due to COVID-19) at mobility hubs to establish positive relationships with frequent users and nearby businesses and residents;
» Connecting mobility hub users with Metro Transit's Transit Assistance Program, Nice Ride for All, Bird Access and Lyft Community Pass;
» Communicating safety issues occurring at the site to appropriate channels, intervene in minor unsafe activity (i.e. divert verbal street harassment, check in with individuals who are in distress);
» Supporting engagement efforts.

Why the Ambassador Model?

Community engagement during the 2019 Mobility Hub pilot illuminated that feeling unsafe at transit and mobility locations was a common and significant barrier to using these facilities and services. What "safety" meant for people varied - for some it meant traffic safety from cars as a person walking or biking, while for others it had more to do with personal safety while being at the site.

In addition to safety, the ambassador approach also filled the following needs that would improve the experience at mobility hubs:

» Establish a regular presence who can support positive activity and be a friendly face to frequent users
» Provide frequent maintenance for enhanced features distributed throughout neighborhoods
» Create a role that can advocate and raise on-site needs across the many jurisdictions and stakeholders with assets at mobility hubs spaces

How was the Ambassador Pilot Implemented?

An ambassador program, run in partnership with community organizations and small-scale entrepreneurs was developed to meet the needs identified. A model of having locally-hired ambassadors visibly and frequently caring for spaces in the public realm was chosen because it:

» Leveraged existing community relationships and interests to unearth new opportunities for partnership and improvements;

» Ambassadors could become familiar faces in these spaces, allowing them to build new relationships with users, making people feel both more comfortable and safe;

» Promoted well maintained spaces, and having that maintenance be highly visible communicates safety and community ownership;

» Supported community members to spend time on things that improve quality of life but are hard to efficiently deliver in a centralized maintenance system, such as snow removal and planting care.

The Ambassador partnerships were sought out through an open call supported by targeted outreach to BIPOC-led and community-based organizations where the project team had prior relationships. The City, through its project partner The Musicant Group, contracted with the West Bank Business Association to implement the Ambassador pilot for mobility hubs in West Bank/Cedar Riverside. To establish Ambassadors at mobility hubs in North Minneapolis, youth outreach entrepreneur Marc Woods was selected to lead a team. Funding was made available through the Energy Foundation via Bloomberg Philanthropies American Cities Climate Challenge.

Gratitude

The City of Minneapolis Public Works and the Musicant Group would like to thank Marc Woods and KJ Starr for their leadership in piloting the Ambassador Pilot Program with us.

Ambassador Pilot Partner Profile: West Bank/ Cedar Riverside

WEST BANK BUSINESS ASSOCIATION

Hiring local | Managed by the West Bank Business Association (WBBA), two neighborhood residents were hired to serve as ambassadors overseeing six mobility hubs in the neighborhood. Each worked 10 hours a week for 18 weeks. One of the two ambassadors spoke Somali, which opened the potential to connect with the significant East African community in Cedar Riverside.

Training | Provided by The Musicant Group around site care and WBBA around harm reduction and de-escalation.

Opportunities Supported | A campaign around promoting low-carbon transportation options among the Muslim community of Cedar Riverside.

> "This pilot would work very well with our organization's long-term priorities [to help] our businesses transition from reliance on parking and vehicular traffic... It will be wonderful to have a friendly face to help direct and welcome people."
>
> - At the outset of pilot: KJ Starr, West Bank Business Association

Impact

- 12 planters placed, maintained, and watered at mobility hubs
- 300+ maintenance/outreach hours logged on site and in the community
- 2 bright yellow vests with West Bank insignia that signal: "this is a person I can ask for help"
- 2 bus shelters that had the lighting and heating replaced when an ambassador noted it was broken
- Both ambassadors underwent de-escalation training during this project.

Funding | $11,700 for two part time ambassadors and administrative time. This covered an 18-week pilot of Ambassador service.

Ambassador Pilot Partner Profile: North Minneapolis

MARC WOODS + YOUTH SERVICE LEARNING

Hiring local | Marc Woods led the Northside Ambassador team, employing two youth workers and one adult to program and care for seven North Minneapolis mobility hub sites. Marc built on his past experience managing street outreach and youth mentorship programs with the Minneapolis Youth Congress and Youth Coordinating Board to build a business to consult on projects like this.

Training | Provided by The Musicant Group around site care. Additionally, team capacity grew around grant administration and event planning.

Opportunities Supported | New community artwork was installed on the parklet at the Penn and Lowry mobility hub, masks were distributed to community members, and volunteers provided care and maintenance services.

> "The number one thing that has developed from this mobility project for me is a sense of community. As I have used my light to give to others, reciprocity has followed. The mobility spaces have changed the community by giving familiar faces, allowing others to see youth in a positive light. It has given an outlet to the elders who don't have much hope to vent, and help, it has become a resource center with our [masks, water] giveaway. I've had so many people come to me asking for work ,it's overwhelming. The people who have come literally take so much pride in their work that there's very little for me to do outside of teach, and provide tangible ways to accomplish their desires. A highlight being the little boy with handmade business cards who asked to work."
>
> – Marc Woods, Ambassador Pilot Lead

Impact

- 12 planters placed, maintained, and watered at mobility hubs
- 260 hours logged on site and in the community
- Youth given opportunities to develop solutions to problems in their own community
- A coat drive
- A Halloween Trick-or-Treat event
- A community painting event
- A dozen resource distribution pop-ups
- National exposure in news article and webinar.

Funding | $11,700 for two part time youth ambassadors, one maintenance-focused ambassador, and Woods' administrative and mentorship time. The team also used their funding to do bi-weekly activations on site, from distributing masks and water, to painting the parklet on site.

Lessons Learned

1. Co-Creation and Adaptability

Given the many demands on community groups during the first half of 2020, one goal of the partnering process was to minimize administrative burdens and ensure that there were mutual benefits for all involved. The resulting partnerships were established around shared goals - the community partners were able to pursue their goals through the opportunity of the mobility hub ambassador pilot program. The first several weeks of the relationship focused on creating the framework for the ambassador program in collaboration - drawing from both the project team's experience operating hubs in 2019 and partners' experience running other similar programming. From this foundation, there was enough trust to be able to navigate the new terrain of operating the ambassador program, amid dynamic challenges of 2020.

Lessons Learned | Future iterations of the ambassador program should build on the success of this approach - establishing partnerships with a foundation in aligned goals, co-creation of the program details, and flexibility.

2. Open Communication

Establishing shared expectations for the communication pathways is important. The approach this season established communication channels from the Ambassadors through the Lead in each neighborhood. The Lead from both neighborhoods would communicate with the project team, who could then activate any other maintenance resources, permissions or changes needed across other departments. This approach minimized the need for Ambassador partners to attend weekly project team meetings and reduced demands on their time. Good communication also depends on building strong relationships and responsiveness in a short chain of communication.

Other communication tools that were tested during the program were a form that Ambassadors used during their shift to document the work they did, additional maintenance items, photos and insights from conversations/ observations during the shift. This opens up potential for an ongoing feedback loop and data gathering from the site to the project staff, reducing steps in the communication process. However, access to a Google Form while in the field caused trouble for some team members, and so communication then flowed only through the Lead in each neighborhood.

Lessons Learned | Future iterations of the Mobility Hub Ambassador program can use this insight to 1) develop the right input tools for simple data gathering/communication from the field and 2) consider hiring Ambassadors through the Local Lead but having them report directly to the Project team. This more direct communication chain would ensure insights from the site and in the neighborhood do not get delayed in the communication process.

3. Benefits of Localization

From the start of the ambassador pilot, the project team prioritized hiring people from the neighborhood to serve as ambassadors. A flexible model was established that could adapt in response to user feedback received and based on strengths of the partner running each team. West Bank Business Association and Marc Woods were the partner Leads on developing the ambassador approach. Since they came from different backgrounds, the model provided insights into how a business district-oriented approach and youth mentorship oriented approach contributes to the pilot objectives. The pilot was nimble enough to reflect the assets each partner brought to the approach and the context of their organization, while still being under the same umbrella of the Ambassador pilot goals and receiving support from the project team.

Both ambassador teams saw great benefit in an approach that was intentionally localized because it provided the opportunity to:

- Hire neighborhood residents
- Create authentic connections within the program to local culture and identity
- Offer avenues for other benefits like service learning, mental health outlets and community growth through events

The aspects of the program that could be streamlined through centralized administration:

- Communication of maintenance issues in need of further work, building stronger accountability into the system
- Shared training experiences for consistent service quality across neighborhoods
- Minimizing administrative burden at the local/grassroots level

Lessons Learned | As the ambassador approach evolves, the program can actualize benefits of both local participation and some enhanced centralized administration. A program structure could utilize a central Ambassador Pilot Lead (within the project team or through another partner with sufficient capacity), who is accountable for the outcomes across several Ambassador teams and who has direct communication with the Ambassadors on-site. Another local partnership could help direct potential Ambassador hires to the program, but wouldn't need to stay active in the day-to-day operation of the team.

> "Rewarding others for doing positive things became a reality after a follow up conversation with Ella and Max. Oftentimes people think that they should be given an opportunity before they can make an impact. In my opinion it's quite the opposite. I recruit those who are already doing the work. It becomes more natural and a bonus instead of a chore or punishment."
>
> - Marc Woods, Ambassador Lead

4. Building Youth Capacity

Both the Northside and West Bank Ambassador teams took the opportunity to fill at least one out of two of their ambassador roles with local youth. This created many benefits for both the youth and the project overall - generating earning opportunities, skill development, and infusing the program with their unique perspective on their neighborhood.

Lessons Learned | For the youth to be most successful, in the new role it was important for their managers to have a sense of the support they would need. As the program evolves, it could further support youth employment opportunities by allocating further resources toward staff capacity to support managing youth team members and investing in their growth and development.

JOY: A LIP SYNC BREAK

> ""When you invest in others they are more likely to support you in return."
>
> - Marc Woods, Ambassador Lead

PARKLET PAINTING

COMPLETED PARKLET AT PENN + LOWRY

5. Community Ownership

Success in the ambassador program came through the strongest when the partner organization, in several cases led by a youth member of the team, was given the opportunity to express their identity and vision through the mobility hub program.

One youth Ambassador led an event that demonstrated their ability to bring energy to the mobility hub spaces and make the space their own by painting the parklet at Penn and Lowry. The youth on the Northside Ambassador team organized this event, recruiting other youth from the Black Student Union in Minneapolis high schools to participate in painting the parklet black. The students then came up with ideas to further enhance the space, adding words like "Unity," "Equity" and "Community" in colorful letters.

In her own words, this is an excerpt of an event summary written by Landrei Areial, who led the Paint the Parklet event:

PARKLET PAINTING

Landrei Areial

"When the time came for us to paint our bench at the pilot on Lowry & Penn, multiple members of the community asked to join us and help paint. We quickly handed them paintbrushes and little bowls filled with black paint. As we painted the bench together we heard many stories, some which included the loss of loved ones, others which included a mini-series of those "back in the day" stories. I personally believe that specific project was probably one of the most meaningful as well as insightful moments out the pilot as a whole.

Our moments, presence and activities were therapeutic to the community. Giving others the ability to speak and be open with us about their personal hardships and obstacles that they have faced and are facing to this day, and being able to mutually relate to some stories and topics was all therapeutic.

Being able to come together for something positive yet so simple as painting, as a collective, which is something you don't see too often, I think not only gave some community members a glimpse of hope but also a positive staple in the community that many will now see whether their driving, biking, or walking by, it's a representation of community collectiveness which I believe is a huge factor in moving towards our next step as a people."

In the West Bank Ambassador team, one youth team member developed a communication campaign around the concept within the Islamic concept of "Sunnah," encouraging neighbors to participate in activities that emulate the Prophet Mohammed and benefit the community, like picking up litter or riding a bike. They designed posters around several messages and worked to distribute them around the community, including a shoutout in a local radio program.

Further Lessons Learned from Northside Ambassador Pilot

The following is an excerpt from the summary written by Marc Woods, lead of the Northside Ambassadors.

Marc Woods

"If I had to have steps to lead someone in this process again, I would list the steps in this order

- Meet people where they're at
- Make goals and agendas as transparent as possible
- Put others in a place where they can thrive (set them up for success not failure)
- Reflect daily and often for clarity
- When working with youth invest in them over the work, the work will be taken care of when staff/people are valued
- Be stern but redirect conflict by asking for possible solutions
- Trust the process
- Listen to what others say and facilitate instead of control.

Goals accomplished:

- Practice philanthropy
- Mentor youth and employ them
- Create safe spaces
- Provide resources to the community
- Create equity
- Model positive initiative
- Build community culture
- Give hope
- Allow outlets for mental health
- Represent community in a positive light no matter what it looked like"

Further Lessons Learned from West Bank Business Association Ambassador Pilot

The following is an excerpt from the summary written by KJ Starr, lead of the West Bank Ambassadors.

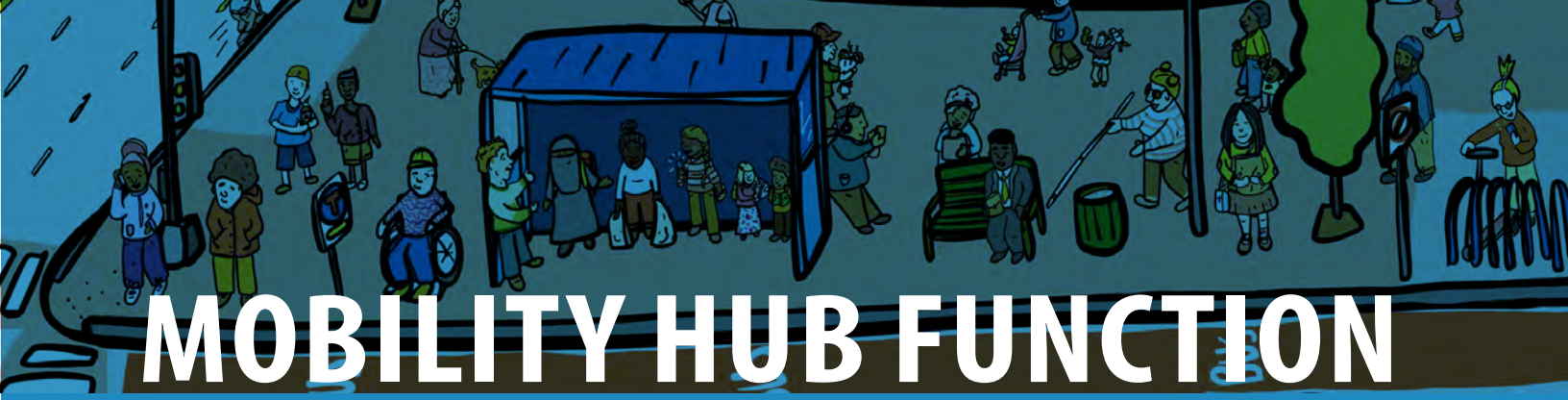
KJ Starr

"Having bikes and scooters in the neighborhood this year definitely increased ridership among our residents. I hope we will have them again next year and they will help tie together our transit with our bike friendly population that works, lives and plays on the West Bank.

Having ambassadors help with trash in the neighborhood was definitely beneficial. We will continue to work on both having systems in place so that our main commercial corridor is maintained and garbage cans are available and work on cultural messaging to care about our neighborhood.

We look forward to developing the safety work of the ambassadors this next year. The safety work will benefit from not being tied so much to the mobility hub locations.

As a short term, part time project, it was also always likely to be a challenge to hire individuals who were very committed to doing the work. In contrast to professional ambassadors downtown, I was unable to commit to more than providing a few months work to people. "



MOBILITY HUB FUNCTION + FEATURES

The frameworks below, developed over two years of piloting, outline key strategies for producing mobility hubs that provide an optimal experience for the user and maximize progress toward project goals.

Key Themes

Transit-Centric

The core service of a Minneapolis mobility hub is to connect people to the transit system, so proximity and visual relationship to that stop is critical to success. We have found that transit-centric mobility hubs are more successful than focusing on locations with less transit along bike infrastructure or other central features.

Why?

» **Transit stops generate mobility hub users** - This pilot has tested out a range of sites, including several that had the adjacent bus stop down the block. Examples of sites like this include Farview Park (North) and Franklin Ave & 11th St from 2019, two sites that were not extended to the 2020 season. At the center of this determination was a combination of trip data and feedback that many residents didn't see the value in locating mobility hub improvements so far from bus stops.

» **Mobility hubs need eyes on the space** - Even when people are not using transit at the mobility hub, transit riders help keep the space active throughout the day and help the space feel more safe. This positive activity and eyes on the space also helps diminish negative activity that can crop up in empty, isolated locations.

» **First/last-mile solutions break down as the tie to transit weakens** - For mobility hubs to be effective tools to connect people with transit stops, the transition between micro-mobility and transit needs to be as seamless as possible. Breaks in the user experience can cause confusion or frustration that leads people to default to what they're used to instead of taking advantage of new modes. Put simply, wouldn't you hate to be docking your bikeshare bike and watch your bus pull away less than a block from where you are?

Successful transit-centric mobility hub configurations can come in many forms, but one of the most commonly deployed for our sites was placing mobility hub features on the same corner of the intersection as the bus stop but on the alternative leg. This is especially useful in spaces where the bus boarding area is already built out or especially tight on a commercial corridor. In this arrangement it's important to still make sure seating is still available in the line of sight to see the bus coming and signage denotes the mobility hub features available around the corner.

Co-location

Locate all mobility options in a compact area, within view of the bus stop.

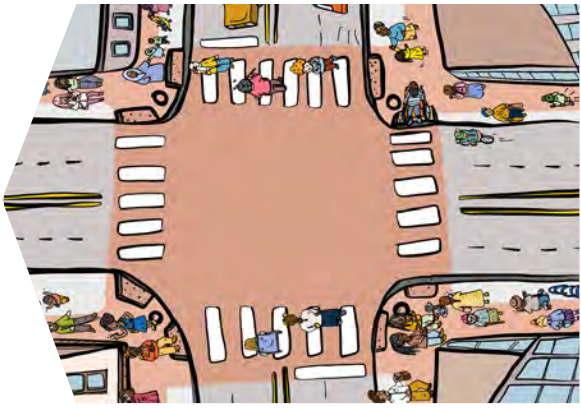
Location factors during a pilot are often dependent on the availability of right of way, whether that's on the sidewalk or in the street.

Why?

» **Visibility** - Multiple things in one place means the user understands all the options they have, without having to open multiple apps to check for available vehicles. It is also easier to clearly brand the space as a mobility hub if all elements are in a defined area.

» **Legibility** - If the public is to understand what a "mobility hub" is, it helps if it's a clear space with defined components and edges, instead of a conceptual idea that covers a whole city block or more. Co-location contributes to a cohesive "brand" or set of expectations about what you will find at any mobility hub, even when a user may not have been to that hub before.

» **Maintainability** - Maintenance is more efficient if workers don't have to cross the street multiple times to touch all the components. In the winter, tighter co-location means less space needs to be cleared of snow before a mobility hub is fully operational.



Common Cause

When possible use placement and form of mobility options to support other policy objectives on the street, like pedestrian safety, commercial and social activity generation, green infrastructure and traffic calming.

Why?

» **More project champions** - Mobility hubs can support multiple objectives toward making a people-friendly street, therefore expanding potential champions and funding opportunities for their implementation.

» **It's cost-effective and space-efficient** - The street is an environment where both space and funding have limitations. These synergies may increase coordination needed and complexity with syncing up project schedules, but ensure optimal utilization of limited space and funding.

For example, the bump out at Central & 26th St Mobility hub was extended to include space for a bike rack and the slip lane closure at 3rd & 12th St held space for mobility hub furniture and social spaces.

Boarding Bonus

Mobility hub features intended to support comfort and socializing should be located on the boarding-heavy (often the "inbound") direction.

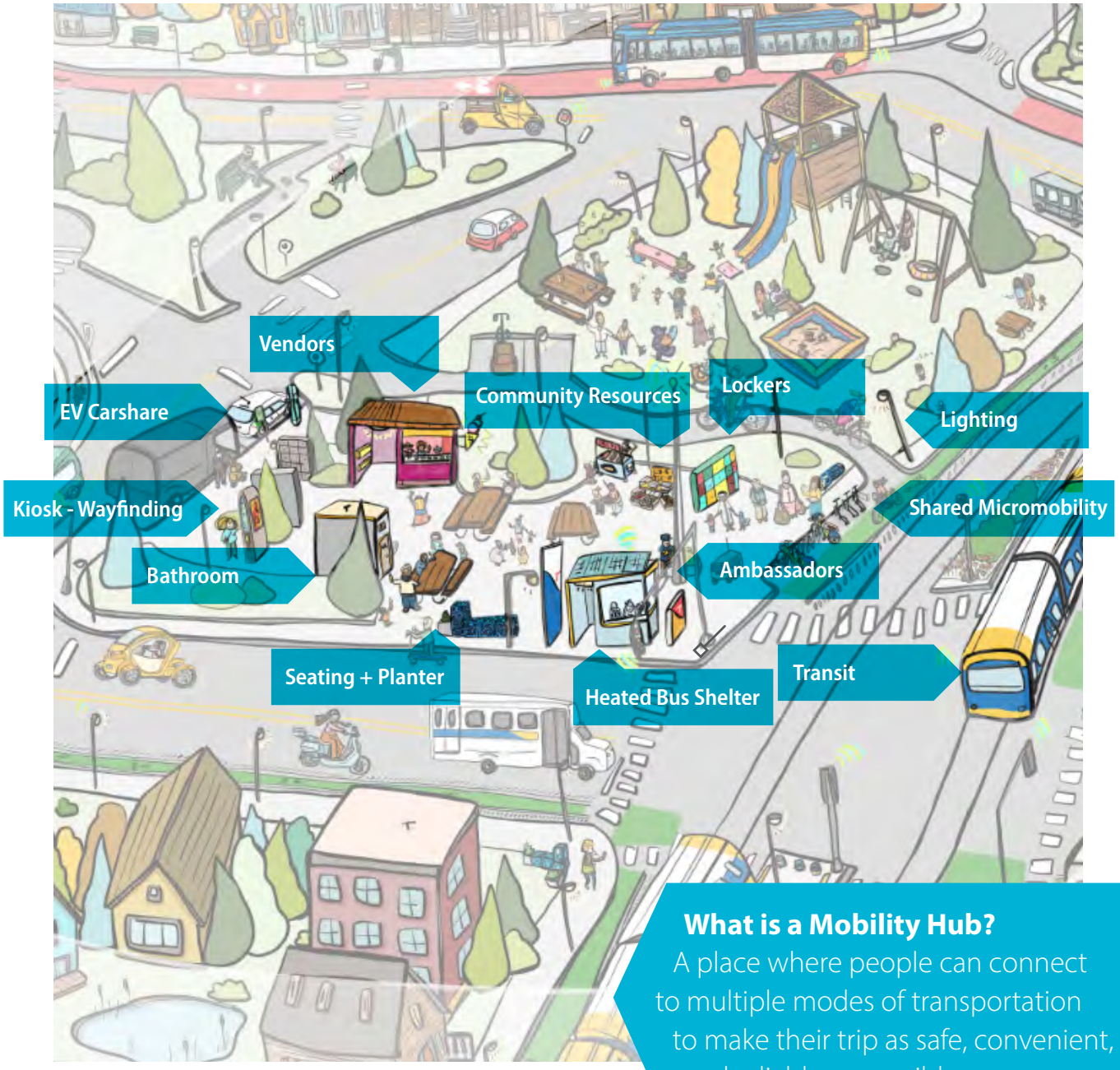
Why?

» When making the decision to concentrate mobility hub features on the inbound or outbound direction of transit travel, selecting the side with the most boardings will ensure that maximum benefit is derived from the elements as people spend time waiting for the bus.

» People accessing mobility hubs for their "first mile" have different needs than those using it for their "last mile trip." People using mobility hubs who travel to a mobility hub to access transit (first mile) benefit most from comfort, convenience and social features because they are spending more time at the hub while they wait. People accessing last mile options at the mobility hub primarily need access to convenient mobility options, getting oriented and simply transferring to the last mile mode.

Future Vision of Minneapolis Mobility Hubs

This illustration, created by artist Sarah Nelson, represents a future vision of what a fully built-out Minneapolis mobility hub could look like.



What is a Mobility Hub?

A place where people can connect to multiple modes of transportation to make their trip as safe, convenient, and reliable as possible.

2020 Pilot New Features

Infrastructure Safety Improvements

Why | Infrastructure Safety was identified as a priority improvement for 2020 during mobility hub pilot engagement in 2019 and is part of the the City of Minneapolis' Vision Zero implementation.

What | Three mobility hubs received quick-build safety improvements.

Through coordination with the City's Vision Zero 20 in 2020 Initiative, three mobility hub pilot sites received intersection improvements to enhance bike and pedestrian safety. The 20 in 2020 Initiative included implementation of quick-build infrastructure safety improvements at more than 20 intersections as part of the City's Vision Zero initiative to eliminate all traffic deaths and severe injuries on City streets.

Locations

Penn and Lowry

» The infrastructure improvements installed included hardened centerlines* and signal timing changes to improve pedestrian safety while crossing the street.

Central and 26th

» At this site, hardened centerlines and bollard bulb-outs were implemented, shortening the crossing distance and making pedestrians more visible.

Chicago and Lake Street

» Improvements included hardened centerlines and bollard bump outs. The mobility hub at Chicago and Lake Street is still in long term planning, however it was not an active pilot site in 2020, in part because of the more urgent conversations occurring with regard to rebuilding Lake Street.

01 Slow Turn Wedge
02 Bicycle Crossing
03 Painted Bump-out with Bollard
04 Zebra Crosswalk
05 Hardened Centerline with Bollards
06 Parklet

*What are hardened centerlines? The centerline is the marking (yellow in the image) that divides two lanes of opposing traffic. Bollards create a raised centerline near the crosswalk at an intersection to prevent drivers from "cutting" the corner at higher speeds while turning. This reduces the likelihood of crashes at intersections, including for pedestrians (as was found in a recent study).

Slip Lane Transformation at 3rd Ave & 12th St in Downtown Minneapolis

Why | A recommendation from 2019 was to pursue reallocation of street space for mobility hub improvements and slip lane closures in order to open up significant space while also improving pedestrian and bicyclist safety.

What | A mobility hub site at the gateway to downtown Minneapolis was selected to test reallocating slip lane space for mobility hub improvements. One slip lane was closed at 3rd Ave and 12th St for a pilot period of four months and furnished with pavement paint, movable seating and planters.

Impact | This site received the most positive email and social media feedback from users of any of the mobility hubs. Adjacent property owners were primarily neutral with a concern raised around limiting the free-right turning movement. Pedestrian counts were not taken due to the disruption of travel patterns during COVID.

The simple circle design for the pavement art was chosen to reinforce the connection between the pavement paint and the blue furniture boxes. Additionally, circles and bright colors are effective visual cues to communicate a sense of invitation and energy in a space. This kind of space demarcation could be used anywhere that mobility hubs are placed in-street, whether in bump outs, parking spaces, closed turn lanes or other right of way. The mobility hub project team maintained and cleared snow from the site and consolidated furniture into several snow-cleared patios along the main pathway. The closure signage was rented and the paint is being monitored to determine its condition after the winter.

Lessons Learned | This installation demonstrated successful use of paint as a way of denoting mobility hub spaces. This is another opportunity to integrate artists into the mobility hub program and express community identity while incorporating features that clearly tie together the network of mobility hubs.

*What is a slip lane? A slip lane, commonly also referred to as a free-right turn lane or "pork-chop" is a feature of roadway design intended to maximize vehicle speed at intersections. However, as a byproduct, they produce unnecessary conflicts and dangerous conditions for bicyclists and pedestrians when drivers fail to reduce their speed enough to look for these vulnerable users and yield to them.

Parklets at Mobility Hubs

Why | The City of Minneapolis received the de-commissioned parklet from a MnDOT program, and the 2019 engagement showed strong support for more seating at the Penn and Lowry mobility hub site. Penn and Lowry was also anticipated to continue being a central place for programming, which a parklet would support.

What | In cooperation with Hennepin County, the landowner of a vacant lot at Penn and Lowry, the parklet was placed as part of the 2020 mobility hub pilot and incorporated into the maintenance and programming run by the Mobility Hub Ambassadors. In the late fall and winter the Ambassadors held a painting event, turning the parklet black with words inscribed in many colors.

Impact | As a result of the parklet component of the mobility hub at Penn and Lowry, the space had more structure that allowed people to gather and connect. The parklet became a strong visual beacon identifying the improvements being made there. Thanks to the consistent, creative contributions of the Mobility Hub Ambassadors, the parklet was an active platform for small-scale, socially-distant community connections to occur.

Lessons Learned | As this parklet demonstrated the potential of having programmable space an anchor for the Northside network of mobility hubs, there would be significant benefits for each neighborhood network to include a similar anchor space under the care of Ambassadors to serve as a platform for community building around the hubs.

Thanks to the consistent, creative contributions of the Mobility Hub Ambassadors, the parklet was an active platform for small-scale, socially-distant community connections to occur.

Wayfinding that Speaks with Icons

Why | The wayfinding signage designed for the 2019 Mobility Hub pilot effectively directed people to several nearby destinations, but lacked more contextual information for planning trips and using new transportation options.

What | As a part of the pilot's iterative design approach, this year we tested two new wayfinding signage options: an orientation sign installed on the pavement and a neighborhood-level wayfinding map.

Impact | These signage options were easier to maintain and more cost effective than the 2019 wayfinding signage options and offered further opportunity to create a signage system based on icons and visual communication over text. However, they did have less space for multiple languages to be displayed.

Lessons Learned | As the system of wayfinding signage continues to evolve, there may be good applications of each signage type that has been tested. Additionally, more engagement can be incorporated to document residents' ideas for wayfinding destinations to call out on the sign.

Bike Fix Station

Why | The bike fix station idea was suggested by a leader of the Las Bici Chicas group as a feature that would make mobility hubs more useful to people who use their own bikes and rarely can afford to pay per ride on shared modes. The location was selected as it was in the West Bank Mobility Hub Ambassador area and those team members reported the Cedar Ave plaza hub as one of the most active hubs in their network.

What | One bike fix station was installed in October at the Cedar Ave plaza mobility hub. This included a bike tire pump, a bike stand and a set of tools.

Impact | The bike fix station was out for a short enough period of time that awareness of it wasn't yet high enough to assess its impact for users.

Lessons Learned | Next season, further work can go toward analyzing utilization and maintainability of the bike fix station.

The bike fix station idea was suggested by a leader of the Las Bici Chicas group as a feature that would make mobility hubs more useful to people who use their own bikes.

Lockers

Why | During engagement in South Minneapolis, some residents expressed interest in a personal storage locker system at mobility hubs, and several institutional partners saw utility in having places for people experiencing homelessness to temporarily store possessions. Bike lockers in other parts of the transportation system are geared toward regular commuters but are underutilized in many locations.

What | The Mobility Hub Pilot worked with a smart locker provider to explore implementation of a small-scale smart locker system operated through mobility hubs. The project team established connections with the Lowry Hill East Neighborhood Association and the Hennepin County Libraries to test and promote the installation of lockers, but ultimately ran out of time in the season to use smart lockers. To test a simpler system, the staff at Webber Library maintained a low-tech locker at the Humboldt & 44th Hub that operated as an extension of the library as a resource and community information hub at a mobility hub.

Impact | The Library Locker, as the project team called it, distributed 26 transit comfort kits (from December 11 to January 19) that contained:

- Crossword puzzle
- Blank Journal and pen
- Pencil
- Library contact info page
- Thinking putty
- Poem
- Self care on commute card
- One cold weather item, which could be handwarmers, stocking caps, or gloves

The initial one month pilot was extended to run three months due to the success of the initial run, and the librarians programming it reported steady usage. They also appreciated having an additional way to serve the community.

> "Thank you for helping to keep this going for a while beyond the pilot, it really has been a wonderful little addition for our library to be able to reach people during Covid and winter."
>
> - Elizabeth, Hennepin County Webber Library

Recommendation | This short term pilot and the other positive reception of the locker prospect shows excellent potential for further work to occur - both around the low-tech locker point as a platform for other entities like libraries to connect with mobility hub users, and implementation of a smart locker system that was explored.

Iterations on Mobility Hub Modular Furniture

Why | The 2019 mobility hub furniture was made completely from plywood, which was cost-effective and paintable for a pilot of limited duration. The 2020 pilot looked toward expansion and enhanced durability and comfort for furnishings. Furthermore, planters were successful at the Penn and Lowry site in 2019 and were called out by mobility hub users during engagement as a big draw to the space, so the project team wanted to expand their use. As a pilot, it was still important that the furniture remained multi-purpose and modular to adapt to many environments.

What | The 2020 mobility hub pilot utilized some 2019 furniture, but for the most part was built out using a new set of furnishings. These utilized HDPE, a recycled plastic material, for enhanced durability. Other features of the second iteration of pilot furniture included:

- Smaller dimensions to increase seating comfort
- Solid sheets of material on two sides of each piece, to make a "top" and "bottom" easier to sit on and harder to put liter inside, while maintaining the ability to place them vertically or horizontally
- Larger cut-out holes on the sides to make removing litter easier and faster
- 1"x1" HDPE planters that could be connected directly into the furnishing system
- Attachment system to be able to add more specialized features as site needs are identified
- Lighter, less cumbersome furniture sizes making moving pieces easier

Impact | These improvements vastly improved the maintenance system for the 2020 furniture - saving an estimated 50% of onsite management time throughout the system. The maintainer running hubs with both 2019 and 2020 hubs reported significantly easier maintenance of newer pieces - whether to remove litter, graffiti or move the boxes. Less litter over the whole season was reported by Ambassadors at the Northside hubs.

Recommendations | As mobility hubs look to advance beyond a pilot program and into capital improvements, we recommend selecting new more permanent seating options. While piloting, having furniture that is modular and flexible to respond to feedback from users on site is important. However for sites that have tested configurations, the furnishings selected no longer need to be as all-purpose. This opens up the opportunity to select furnishings that are even better at their main purpose - like selecting a seating option that has a back rest and limits the potential for debris to collect. User feedback supports continuing the colorfulness of current furniture, and carrying the City of Minneapolis blue theme through to new furnishings can help maintain continuity with the pilot improvements even as specific fixtures shift.

Lessons Learned

Connecting with People and Caring for the Public Realm

Anyone who has operated spaces in the public realm knows: people use spaces and sometimes the evidence is all too clear - litter, markings, stolen furniture, removed plants and the like. The key is to be responsive in caring for spaces and ultimately to build social connections that diminish the occurrence of them in the first place. In the words of Ambassador Team Leader Marc Woods, "connect before you correct." The project team frequently anchors our mobility hub approach in our shared goal: for people to use these spaces. The result of use is wear and tear. The goal is not to eliminate wear and tear, as that would entail discouraging use. If we are successful, wear and tear will occur and proper care and maintenance will be required.

People seeing sites being consistently cared for and feeling their own experience valued will over time be more impactful than design can be in diminishing negative outcomes.

Strong social connections between ambassadors and frequent users were an effective tool this season that made an impact on the frequency of these site issues. The Northside ambassador team reported strong social connections forming as their regular routine of maintenance and on-site activations unfolded. It was sites that were under their care that seemed to result in less litter at Northside hubs and fewer instances of plants being removed from their planters, according to feedback from the team. It's a small sample size, but this points to a well-documented point that people take better care of places that they feel connected to and ownership of.

Design can be part of the solution to address these common behavior-driven site issues - like how the furniture design for this year helped mitigate litter and make writing/markings easier to remove. But at the core of a mobility hub approach has to be an understanding that people who see sites being consistently cared for and who feel their own experience be valued will over time be more impactful than design can be in diminishing these outcomes.

Challenges

Overall, of 300+ units of furniture with none of it locked or bolted to the ground, a total of 15 units or about 5% went missing. One strategy exercised this year for a site that was losing pieces of folding chair furniture was clearly marking all the units as part of a City program. Whereas the standard had been to place "contact us" stickers on at least one furniture piece per site, having markings on all units might have diminished incidents where property managers who were not aware of the pilot removed furniture and diminished the removal of furniture that may have been seen as untended by members of the public. Given that public spaces were as in-active as they've ever been, one would expect fewer "eyes on the street" to have led to a spike in missing furniture. On the contrary, the situation remained consistent with 2019 results.

Safe Public Spaces for Everyone

The project team also wants to acknowledge the ways that community members utilized mobility hub features to meet their own most pressing needs. Ostensibly, our furniture became part of someone's emergency housing solution (encampment). It became part of several people's emergency income strategy (signing/panhandling). Both cases represent the kind of adaptation that, if playing out in other ways, would be celebrated as an insightful pilot design iteration, which is why the team took no actions to discourage users from participating in the pilot feedback process just like any other community member. We see it as a poignant reminder that in the lives of many community members, there isn't a line between infrastructure for housing, for transportation, or for work - your whole life unfolds in the public realm. It's our responsibility to ensure that as we shape a more human-centered public space, we emphasize that dignity for all can and should include the housing insecure and people experiencing homelessness.

It's our responsibility to ensure that as we shape a more human-centered public space, we emphasize that dignity for all can and should include the housing insecure and people experiencing homelessness.

2020 MOBILITY HUB PILOT
ENGAGEMENT SUMMARY

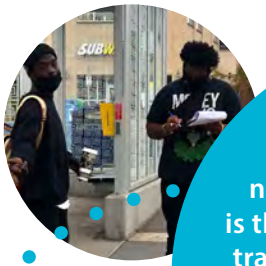
PARTNERSHIPS

This year's engagement results encompass responses from the following partnerships and methods. All partners were compensated for their work.

- **Saint Anthony East Neighborhood Association** (SAENA) phone survey
- Socially distant in-person survey and online focus group with **Alexis Pennie**
- Survey promotion through **Native American Community Development Institute and West Bank Business Association**
- Other online survey responses

Does having places to sit, bright colored signs, clear places to park scooters and bikes, and information about nearby places make you more or less likely to get around by bus, bike, scooter or walking?

69% RESPONDED "MORE LIKELY"



With COVID-19 and the unrest in our neighborhoods this year, is there anything about your transportation options that could be changed to make your trip easier during this time?

1. CLEANING
2. DISCOUNTS
3. SHUTTLES TO SERVICES

What makes you feel safe and comfortable while taking the bus, walking, or riding scooters now? What could be improved that would make you feel more safe and comfortable?

Good lighting 28%

Well maintained spaces 27%

Colorful, welcoming furnishings 21%

More non-police personnel 17%

ENGAGEMENT

» Engagement partnership grants ensured that opportunities for input came through groups who already had relationships and communication methods established to effectively communicate during this unprecedented time.

» When surveys that include demographic data are combined, the results mirror the demographics of the city as a whole: 68% White and 23% Black or African American, and slightly more female than male.

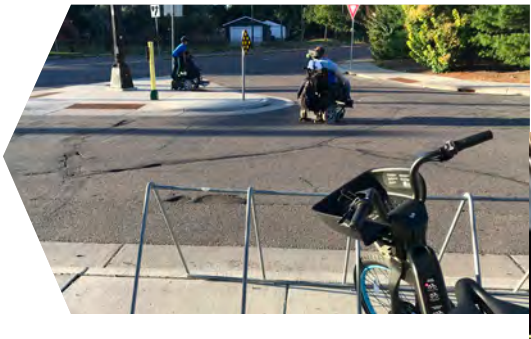
2020 Engagement Approach

With support from three partnering organizations, community engagement around the Mobility Hub Pilot expanded in 2020, even as the coronavirus pandemic dramatically reduced in-person engagement. Instead of trying to create new champions in this environment, we expanded our engagement partnership grants to ensure that groups who already had relationships and communication methods established could keep the conversation going in this unprecedented time.

Despite these limitations, 2020 engagement improved in both reach and quality through the partnership approach. This year's engagement results encompassed responses from the following partnerships and methods.

Partnerships and Key Insights

Northeast Minneapolis



Partner: St. Anthony East Neighborhood Association

Method: Compensated Phone Survey with postcard notification to residents of public housing + senior living complexes near Central + Spring Street mobility hub pilot site, online survey distribution through the neighborhood newsletter.

Outcomes: 64 responses, in-depth conversations on transportation needs, relationships built within SAENA to benefit future impact. SAENA's comprehensive report and survey analysis, linked **here**.

Key Themes + Findings: The SAENA partnership demonstrated the value of intensive engagement as a method for data collection. Longer, more in-depth, financially compensated phone surveys were well-suited to these residents. The phone interviews led to positive relationships between residents and the neighborhood organization, as well as more in-depth answers. SAENA

reported that this kind of outreach design is something they hope to replicate in their future projects. This partnership also allowed the overall engagement strategy to better capture the urban senior demographic.

Key Themes + Findings:

1. Respondents would like to see improvements at this intersection that make them feel more safe and comfortable while walking or rolling to the bus stop or waiting for the bus. Improvements in lighting, seating, and maintenance of the space are most important. Their transportation habits for work are largely unchanged as a result of the pandemic, but recreational trips are down.
2. Broader neighborhood feedback emphasized improved visual appeal and lighting, but also transit service for the area. As a result of Covid-19 and unrest this group has stayed home, walked more, and stopped using public transit to commute.
3. Central Avenue and Spring Street was not a welcome space for any mode of travel. The area was poorly lit and feels unsafe in its current condition.

North Minneapolis

Partner: Alexis Pennie

Method: Distributed survey at mobility hubs, to local businesses, hosted Virtual Community Conversation and Neighborhood Clean Up.

Outcomes: 150+ survey responses, greater awareness of pilot among neighborhood leaders, businesses

Key Themes + Findings: The Alexis Pennie partnership allowed the project team to recieve feedback from people who were continuing to ride transit despite the pandemic, and from people who were actively using mobility hub spaces over the summer and fall. These survey responses are reflected in the question-by-question results to follow.

Another component of the outreach led by partner Alexis Pennie was a focus group with members of the North Minneapolis community. As a resident of the Jordan Neighborhood and longtime Northside cycling advocate, Alexis gathered attendees through both this existing network and new participants who learned about the engagement through posters on-site. The following themes arose in the 1.5 hour conversation:

1. Vehicular and personal safety continues to be a major priority to address at mobility hubs and throughout the transportation system.
2. People are interested in seeing new approaches to make people feel safer. Three broad categories emerged: technology improvements, infrastructure improvements, better communication on rules/how to stay safe while biking, and activation/staffing (like ambassadors or through the existing City systems).

South/Central Minneapolis

Partner: Native American Community Development Institute (NACDI)

Method: Small-scale, outdoor popup on site to promote survey and gather feedback.

Outcomes: NACDI's deep ties in the Native American community around Franklin Avenue supported getting feedback in ways that felt relevant to community members while promoting civic participation.

Key Themes + Findings: NACDI discussed the mobility hub pilot with their participants and invited them to take the pilot survey. The following themes emerged from their conversations:

1. Community members were most interested in Nice Ride use as a way to access transit and as an alternative to driving.
2. Use was highest in the evening, typically for errands or returning from school/work.

3. Desire for larger, winter-ready tires on the bikes and for more of the bikes to be electric because it was useful to people who can't drive, don't want to pay for gas, and benefit the environment.
4. Desire for more mobility hubs on Franklin Ave.
5. Positive feedback about the mobility hub concept overall and feeling that Minneapolis was taking an innovative approach.
6. Desire for more free ride passes to encourage new riders to utilize other modes.

West Bank/Cedar Riverside

Partner: West Bank Business Association

Method: Ambassadors promoted the online survey through postcards shared on site and created input opportunities for WBBA member businesses.

Outcomes: Two bus stops with broken fixtures and safety issues prior to the mobility hub pilot were resolved and awareness of input opportunities increased.

Key Themes: WBBA incorporated some limited engagement opportunities into their Ambassador Pilot approach, highlighting future opportunities to have outreach to businesses inform a mobility hub approach in commercial centers.

1. An increased presence of Nice Ride bikes and scooters made residents feel positively about their ability to use those modes.
2. The Ambassador approach was well-received in the neighborhood by businesses and users. Positive feedback mostly centered around their contributions to keeping the streets clean and keeping planters.
3. One business owner noticed significant improvements to the safety of the mobility hub at Cedar and 3rd St. The project team was able to coordinate with Metro Transit to have a bus stop lighting fixture replaced.
4. Negative feedback from businesses on the West Bank focused on loitering concerns, from youth spending time there to people panhandling while using furniture at mobility hubs.

Other online survey responses

The survey was also accessible through QR codes on wayfinding maps and sent via several email distribution lists, though this was not a focus of the approach.

Who We Heard From

A total of 207 responses were collected.

The resulting survey groups capture multiple demographics. Alexis Pennie's respondents were not asked to provide demographic data, but were all transit users living and/or working in North Minneapolis. SAENA partially targeted their survey toward senior residents living near their neighborhood's mobility hub (Central Ave. and Spring St.). SAENA's respondents were 44% White and 55% Black or African American in total. The online survey was distributed to neighborhood groups and business associations throughout Minneapolis, but respondents were 83% White in total. When surveys that include demographic data are combined, the results mirror the demographics of the city as a whole: 68% White and 23% Black or African American, and slightly more female than male. Including Alexis Pennie's responses, the survey is generally representative of the transit-riding population of Minneapolis.

As needed, the survey questions were adapted to reflect the method of distribution, such as a phone or online survey needing to reference site details that a person taking the survey on site can see around them.

Further Input to Explore

Looking forward to future engagement, input on the following themes would be beneficial:

1. Identify future mobility hub sites
2. Identify barriers to using mobility hubs
3. Opportunities to foster community ownership over parts of mobility hubs

Survey Response Analysis

Short Trips

Respondents had the opportunity to choose multiple answers for this question, and the vast majority did--they ride transit, walk, bike, and/or drive. Different trips, whether they vary in purpose or length, are suited for different forms of transportation. Transit, walking and biking already have significant user bases in the neighborhoods where mobility hubs are piloted. To fulfill its role as a carbon reduction strategy, mobility hubs can seek to enhance the ease and reliability of these modes to seek to decrease the need to drive alone on short trips.

Trips to Bus Stop

With transit as a backbone for a mobility hub system, mobility hubs can be tailored in design toward how neighborhood residents want to access bus and light rail. Respondents to the survey primarily walk, use a wheelchair, and/or ride a bike or Nice Ride to the bus stop, which would suggest that prioritizing these modes at mobility hubs would best support transit use.

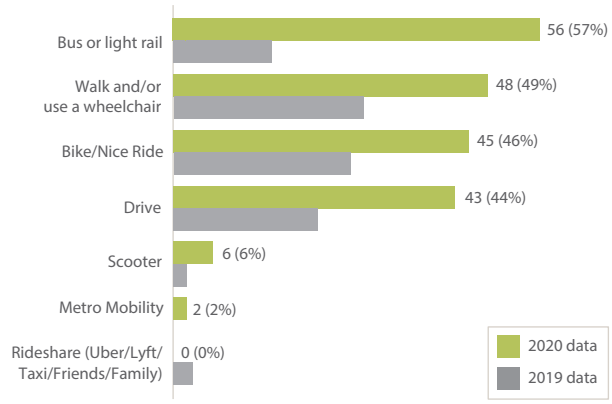
Transit Riding

Most online survey respondents currently ride or previously rode the bus pre-COVID, with varying degrees of frequency. However, the pandemic has had a significant impact on ridership. This illustrates the need for alternative transportation for transit riders as the effects of the pandemic continue.

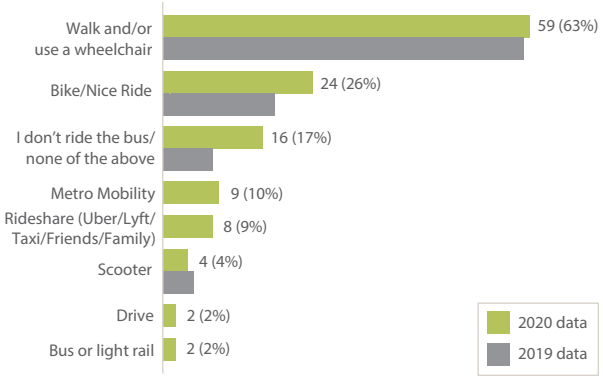
Respondents who rode/ride the bus do/did so because they perceive it to be convenient, environmentally sustainable, and inexpensive.

Those that do not ride the bus say it's because they prefer the train, that the trip is too slow, is inconvenient, expensive, unsafe (regarding crime and coronavirus), and because they drive instead. Despite the disruption of COVID-19, these rider desires are consistent with those of riders in the 2019 survey. To address some of these barriers to additional ridership, mobility hubs can incorporate rail station-like enhancements like lighting, heat, and real time signage, and continue to prioritize safety and convenience improvements.

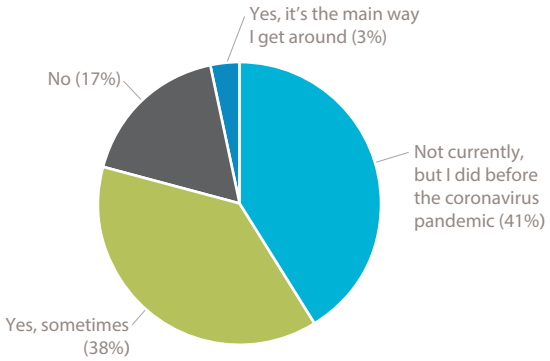
Survey Results: *For short trips, how do you travel to the location?*



Survey Results: *Do you use any of these transportation types to get to or from the bus stop?*



Survey Results: *Do you ride the bus?*



"Bus was my main mode of transport before covid but now seems too dangerous due to varying levels of compliance with social distancing, so I have become very limited in where I can go."

Nice Ride Use

The Nice Ride program, having just completed a decade in the Twin Cities, has achieved considerable reach among respondents to the online survey. The majority of respondents use Nice Ride because it's inexpensive and because it's a good backup option when primary modes are unavailable. Those who have not, or prefer not to, say it's because they have their own bikes, the Nice Ride system is too difficult, it's expensive, or it doesn't serve their neighborhood. Nice Ride has also proven to be more resilient in the face of the pandemic, losing fewer active users in 2020 than other transportation options discussed in the survey. Especially in neighborhoods where Nice Ride is not as familiar, mobility hubs can assist new users to understand how to use the service and further work to promote discount program options through programming and signage.

Unlike the transit system, many Nice Ride users don't make repeat trips using the service - they help fill in transportation needs for one-way trips or to substitute for their own bike on occasion. This information can help mobility hubs gear their Nice Ride support features toward things that help people orient themselves toward their destination and help them navigate a system they're less familiar with than transit.

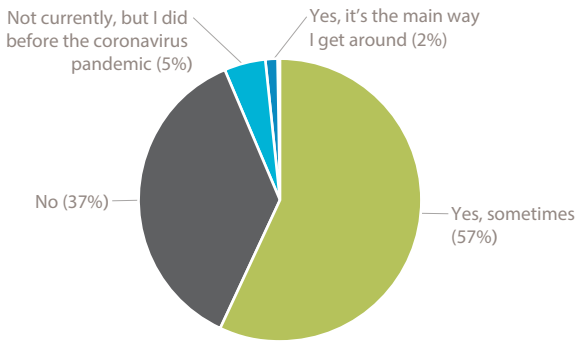
Nice Ride has also proven to be more resilient in the face of the pandemic, losing fewer active users in 2020 than other options discussed in the survey.

Scooter Use

Scooters showed continued support among occasional users, with some limitations for users who are older. People who avoid electric scooters do so because they own a bike or scooter, they see scooters as dangerous, too expensive, or they are hard to find in their neighborhood. People who do ride electric scooters say that they're fun and good for the occasional short trip. Ensuring that scooter parking and riding instructions are provided at mobility hubs can help enhance people's comfort with this mode, as it is still relatively new in Minneapolis.

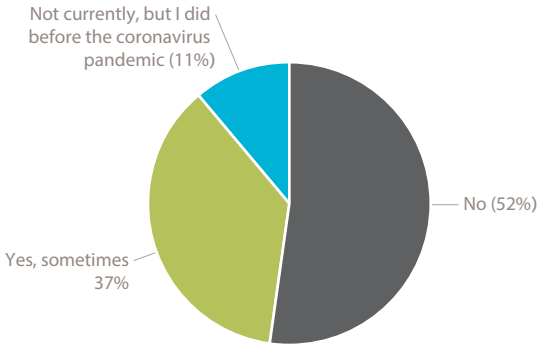
"Nice Rides are great when I need to make a 'one-way' trip. Otherwise I would use my own bike."

Survey Results: *Have you ever used a Nice Ride bike?*



"Expensive [and] anxiety producing trying to find or get to a place to park it."

Survey Results: *Have you ever used an electric scooter?*



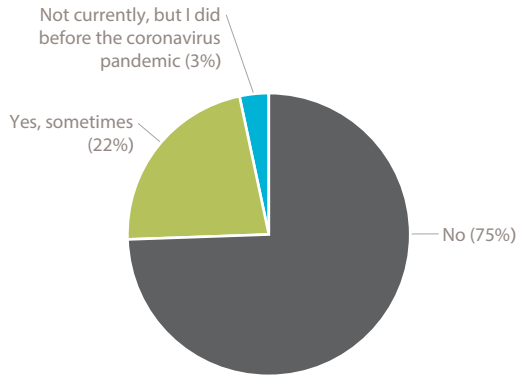
"It's fun. I can run someplace and scooter back home or to a bus stop."

HOURCAR Use

Approximately 22% of survey respondents reported that they use HOURCAR. Those that do say that it fits well with their lifestyle (college, young adult, etc). Those that don't say it's because they have their own vehicle, it's expensive, hard to find or understand, or it's completely unknown to them. Some stated that they are interested in the concept. This data suggests that there is a need for enhanced awareness of this mode, which could be supported at mobility hubs through consistent signage (wayfinding and landing signs, as some hourcar placements are not at the immediate hub corner) and partnered promotions at events.

75% of respondents had never used an HOURCAR.

Survey Results: *Have you ever used an HOURCAR (car share) ?*



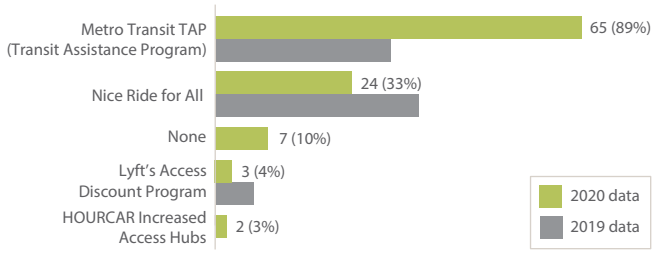
"I was in college and did not own a car. It was a great way to get around without the costs of owning and

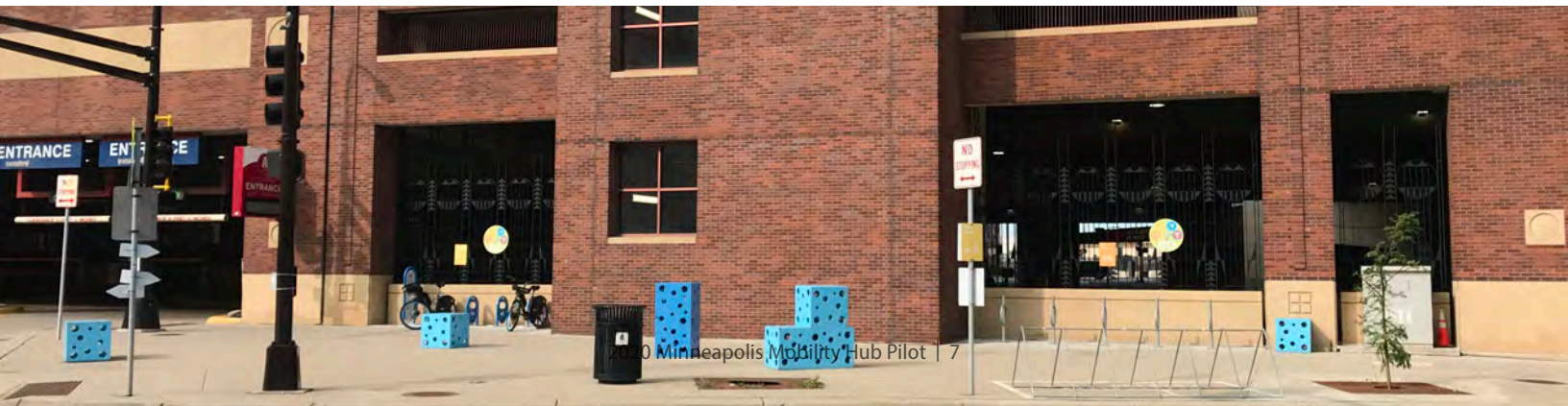
Discount Program Awareness

TAP is very well-known, while most other programs lack name recognition. However, this makes sense given the types of transportation respondents use the most. Among respondents to the survey from 2019 to 2020, the greatest increase in discount program awareness was for Metro Transit's TAP program - up by about 47%. Some of this change may be attributable to enhanced promotion of TAP during COVID and the expansion of eligibility to people who are unemployed. Awareness of other discount programs are still low and mobility hubs users would benefit from more opportunities to interact with these providers.

Between 2019 and 2020, awareness of the Metro Transit's TAP program went up by 47%.

Survey Results: *Check the box for the discount programs you knew about before this survey.*





Site Specific Questions

The on-site and phone surveys conducted by the St. Anthony East Neighborhood Association and North Minneapolis engagement partner Alexis Pennie explored the opportunity to talk with respondents more at length about their experience with the mobility hub pilot and the transportation system in 2020 overall. They are also conversations in the context of the hubs that the respondent is at or lives blocks away from, so they reflect a unique opportunity to get granular feedback on the program.

Experience at Mobility Hubs

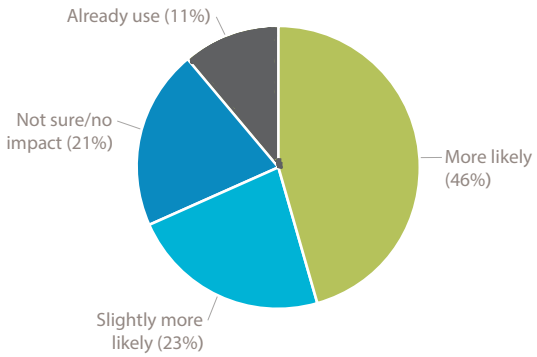
Nobody surveyed felt negatively about these additions (places to sit, bright colored signs, clear places to park scooters and bikes, and information about nearby places) to the public realm. 68% of respondents reported that mobility hub improvements impacted their mode choice. Their responses reflect a broad affirmation of the need for inclusive infrastructure in the streetscape to support multi-modal users.

69% of respondents reported that mobility hub improvements impacted their mode choice.

How have your mobility habits changed since COVID-19?

Respondents to the SAENA survey have generally reduced their trip volume due to the effects of the pandemic: whether that's due to the virus itself, loss of employment, or decreased opportunities to socialize. Some who are still making regular trips minimize their bus ridership, preferring to get rides from friends when possible. Others have maintained their normal trips, despite pandemic-related concerns. Overall, survey respondents were experiencing greater restrictions to their transportation options due to COVID-19 and were filling the gap through either support from their friends and family with cars or by eliminating their trips altogether.

Survey Results: *Does having places to sit, bright colored signs, clear places to park scooters and bikes, and information about nearby places make you more or less likely to get around by bus, bike, scooter or walking?*



"[I find it] more difficult getting around downtown especially when the bus schedule is so limited/stop running at all. Just restricted to being at home because they rely on public transportation."

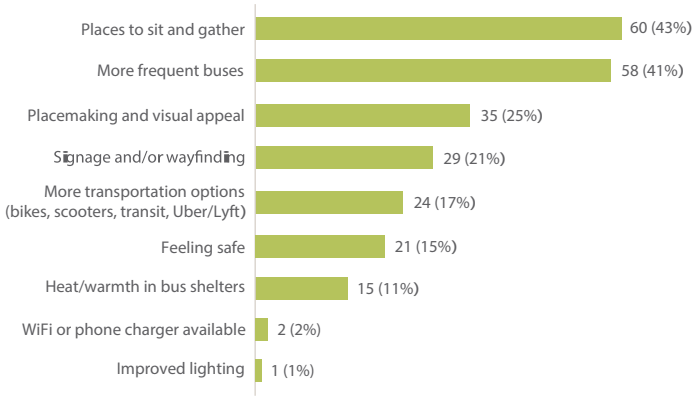
"[I'm] traveling less because less people are willing to help me get around - to keep [social] distance"

"We need more scooters in our neighborhood. Bikes are not just for leisure. People in lower income neighborhoods depend on them for transportation to work and school. We should always be fully stocked and drivers that deliver the bikes and scooters should be trained to be equitable."

What is most important to making your trip better?

When asked what was most important to making their trip better, or what would make their experience at the intersection of Spring and Central better (for SAENA respondents, there were consistent themes. There are similar desires among respondents for traditional trip improvements, like higher bus frequency, and nontraditional trip improvements, like the addition of places to sit and gather. Those considering improvements to transit service should expand their reach beyond traditional changes, while still promoting the basics. We heard as much from our respondents: improvements in placemaking and visual appeal are most effective when one is waiting for a bus they know will come in a timely manner.

Survey Results: *What is most important to making your trip better?*



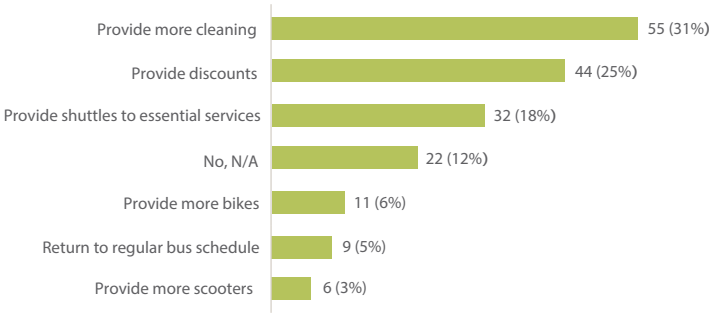
2020 Subject Focus: Safety and Responsive Programming

The following two questions were delivered in every survey method deployed in 2020. It was important to the project team to understand the specific challenges and barriers mobility hub users were facing this season and in other seasons also impacted by COVID-19. The 2019 survey had identified "feeling safe" as a key improvement to focus on, but we wanted to create an opportunity to dive deeper on what that means to people in the context of mobility hubs.

With COVID-19 and the unrest in our neighborhoods this year, is there anything about your transportation options that could be changed to make your trip easier during this time?

Respondents are reacting to the limitations of our current state. They're looking for cleaner, less expensive, and more efficient transportation to meet their needs. Many of those surveyed also expressed hope for more respectful behavior from their fellow passengers, but disagree on how best to enforce that goal: responses are evenly divided on whether increased or decreased policing is the solution. Others are hoping to decrease their bus travel through alternative modes, and see protected bike lanes as necessary support of that mode alternative. They want to get to their destination safely, comfortably, and efficiently.

Survey Results: *With COVID-19 and the unrest in our neighborhoods this year, is there anything about your transportation options that could be changed to make your trip easier during this time?*



"Since some of my bus trips have been replaced with biking, I've become super aware of the unsafe places to bike like Franklin Ave. It would be really nice if there were better separation between bicyclists and cars...so that I didn't have to be quite so afraid of being hit by a car now that I'm putting more miles on my bike."

"Much more frequent buses and assurance that all bus drivers are following rules about passenger limits. Also different options such as safe/low cost transport that cannot carry many people (like Uber/lyft) and ventilation on buses and physical distance/barriers (little plexiglass pod rooms, or barriers between each seat.)"

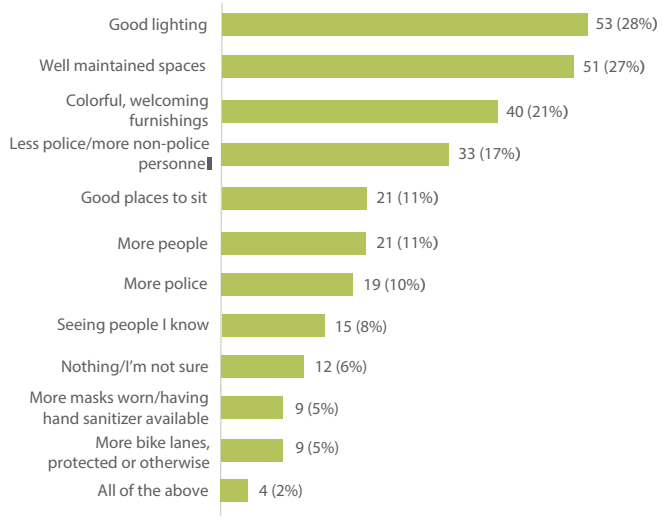
What makes you feel safe and comfortable while taking the bus, biking, walking or riding scooters now? What could be improved that would make you feel more safe and comfortable?

Respondents' top answers all came down to the built environment--not to policing or pandemic precautions, though less policing and more masks are preferred. Adequate lighting, consistent maintenance, and colorful furnishings are all tangible indicators of a service provider that cares about riders' daily experience. The mobility hub system can be a way to provide that level of care while adding convenient, desired features like additional transportation options and more places to sit. However, it must be implemented in conjunction with basics like reliable bus service.

"The only thing that makes me feel comfortable right now is walking and biking on the greenway. To improve the city, greatly reduce the number of people driving cars. Do this by pedestrianizing all local streets and dedicating larger corridors to transit with bus-only lanes, leaving less room for car culture to dominate."

"Lighting is also a big safety concern for me, in terms of walking, biking, scooters, and the bus. Sidewalks, trails, and bus stops are often not well illuminated and this makes me feel unsafe in those spaces. Also, it makes me uncomfortable when there are only a few people on the bus, especially at night. Poor lighting outside plus less people is not a great combination in terms of (feelings of) safety."

Survey Results: *What makes you feel safe and comfortable while taking the bus, walking, or riding scooters now? What could be improved that would make you feel more safe and comfortable?*



Contextual Notes

To contextualize trip data for this season, it is important to note the factors outside of the pilot that survey respondents reported affecting their trips. In the online survey, 80% of respondents reported a change in their employment status as a result of the pandemic, with 66% of total respondents now working remotely or unemployed, therefore reducing their work-related trips. In the SAENA survey, most Saint Anthony East residents reported a reduction in their typical trips. Therefore, while changes in sentiments tracked in the survey and improvements made at hubs can be adequately compared between both years of the mobility hub pilot, indicators like mode usage and ridership are too deeply affected by the pandemic to gauge the effectiveness of this year's hubs through raw numbers.

When combined with new partnerships, the engagement's reach broadened despite the limitations of the pandemic. In total, the 2020 survey engagement efforts documented feedback from 206 participants, many of which came through conversations that went deeper than multiple-choice questions. Conversational-style questioning had the potential to make data compilation more difficult, but in the end led to a better understanding of where the project team's questions were limited in scope and what attitudes the team may have failed to account for when creating surveys. A mix of interviews and simple surveys is the best path forward for future engagement.

"Today I start my new job in the Elliot Park Area and this [the plaza at 3rd and 12th] was the perfect place to wait for my day to begin. I think more seating areas like this would be great for making downtown more inviting of pedestrians and people on work breaks. It's nice to get out during breaks and not just eat lunch in our offices!

So thank you for inviting feedback. This little seating area has made my first day on the job a bit better!"

Scooter Share Data

The COVID-19 pandemic had significant impacts on scooter share ridership in the City of Minneapolis during the 2020 program year. The program launch was delayed to July, shortening the data collection period. Using 2018 as a baseline, the City saw a 361% increase in ridership from 2018 to 2019, but then an 86% reduction in ridership from 2019 to 2020. 2020 ridership was only 36% lower than 2018 ridership. Besides public health concerns from users, the stay at home orders and the shift to working from home resulted in a significant loss in daily daytime commuter users. Since Minneapolis usually sees a higher percentage of rides during the week than other cities due to more commute versus recreational trips, Minneapolis saw higher losses than other cities. As more trips became recreational, we saw the length of the trips increase (2019- 1.1 miles/ride and 13.13 minutes/ride, 2020- 2.24 miles/ride and 19.98 minutes/ride). Ridership increased throughout the season and also increased at many of our Mobility Hub locations once the placemaking and parking elements were installed (see below). Mobility Hubs with ambassador and community program also saw even higher increases in trips starting or ending near the hubs, such as Penn and Lowry and locations in the Cedar-Riverside neighborhood. The percentage of trips starting or ending in ACP50 areas also remained flat, despite the ridership loss, aided by equity distribution requirements and the placement of Hubs in those neighborhoods.

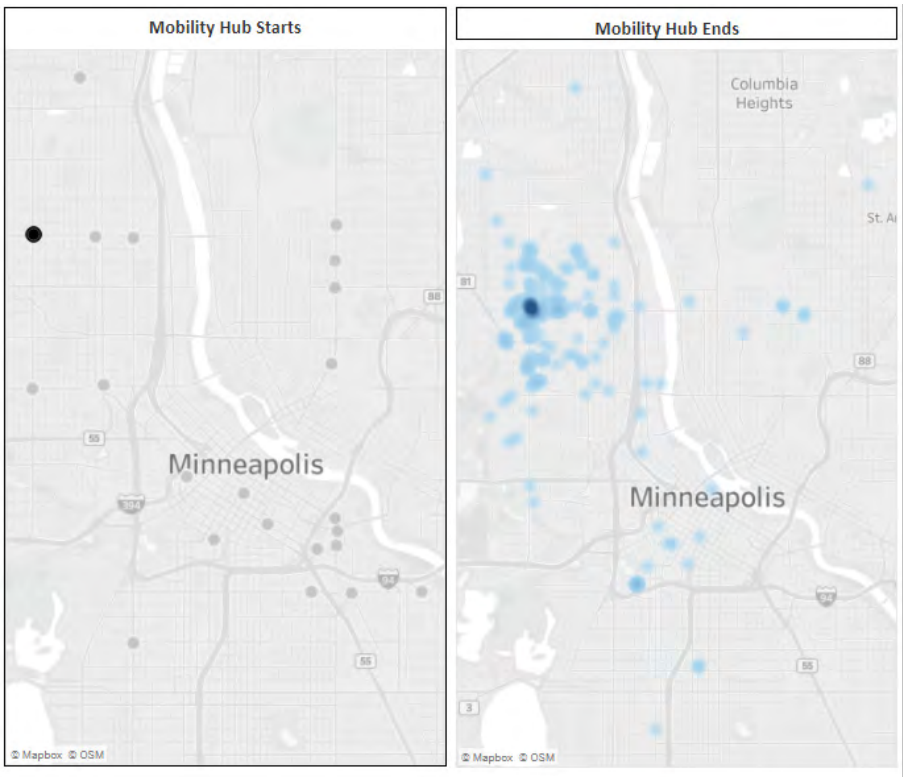
Table: Trip Counts Starting or Ending Near a Mobiltiy Hub

		before 2020	during 2020
Downtown	7th St N & 9th St N (Glenwood)		
	7th St S & Chicago Ave S		
	12th St S & 3rd Ave S		
	City Hall/Government Plaza Station		
North	44th Ave N & Humboldt Ave N		
	Lowry Ave N & Fremont Ave N		
	Lowry Ave N & Lyndale Ave N		
	Lowry Ave N & Penn Ave N		
	Plymouth Ave N & Emerson Ave N		
	Plymouth Ave N & Penn Ave N		
Northeast	18th Ave NE & Central Ave NE		
	22nd Ave NE & Central Ave NE		
	26th Ave NE & Central Ave NE		
	Spring St NE & Central Ave NE		
South	26th St W & Lyndale Ave S		
	Franklin Ave E & Bloomington Ave S		
West Bank/Cedar Riverside	3rd St S & Cedar Ave S		
	Cedar Ave S (Riverside Plaza)		
	Cedar Ave S & Washington Ave S (7 Corners)		
	Cedar-Riverside Station		
	Franklin Ave E & 29th Ave S (Riverside Ave)		
	Franklin Ave E & Minnehaha Ave		

Source: Data from scooter share providers for the 2020 pilot period from July through December 2020.

The City also analyzed the reach of trips starting or ending at Mobility Hubs. See below for where trips starting at the Penn and Lowry Mobility Hub ended, which shows both neighborhood and longer trips.

Map: Scooter Trips Starting or Ending at Mobility Hubs



Source: Data from scooter share providers for the 2020 pilot period from July through December 2020.
Link to open data portal

Scooter Share User Survey Data

Respondents to the scooter share user survey distributed by both Minneapolis operators - Lyft and Bird – reported that an average of 23% of scooter trips were used to connect to or from transit stops. Respondents reported that an average of 51% of scooter trips replaced use of a personal car, Uber/Lyft, or taxi. Questions related to COVID-19 verified some of our assumptions around ridership trends as well. 52% of respondents reported they were not commuting to work. Whereas 40% of respondents reported that COVID-19 had no impact on their scooter usage, 30% indicated they used scooters less often. When asked if they were using a scooter to avoid certain modes of transportation: 28% reported using scooters to avoid public transit, 28% reported avoiding Uber/Lyft rideshare, and 21% reported they would not have made a trip, had a scooter not been available.

Bike Share Data

Bike share ridership near Mobility Hubs was highest downtown (Government Plaza - 498 rides), in the Cedar-Riverside Neighborhood (Seven Corners - 799 rides), and in South Minneapolis (Lyndale and 26th - 614 rides). Traditional docking stations for classic bikes outperformed lightweight e-bike stations. Not having classic docking stations at all Mobility Hubs impacted the ridership, with users still preferring classic bikes. One surprise was the low ridership (16 rides) at the classic docking station added this season at North Market.

Source: Data from Nice Ride for the 2020 pilot period from July through December 2020.

Other Indicators and Feedback Opportunities

Beyond formal surveys, feedback can also be captured through other less formal means, such as media coverage, social media conversations, open comment emails, and reports from users on site.

On-Site Information and Email

Stickers were placed at many of this year's locations with an email address for feedback. Though a small sample size, these brief, in-the-moment pieces of feedback provided a more informal mechanism for connecting with users.

Business/Property Owner Feedback

Throughout the pilot there were several instances where the project team worked to connect with adjacent businesses and property owners. While the overall impact on the businesses from COVID made tracking the pilot's impact on the businesses' sales over the season unclear, their feedback was still a valuable tool to guide implementation.

- **North Market**
  The North Market grocery store also operated as a COVID test site this year and the managers there were supportive of the project and helped determine the right placement of mobility hub elements.
- **Lyndale Ave Businesses**
  Businesses adjacent to the Lyndale Ave & 22nd hub and the Lyndale & 26th hub were both eager to give input on those pilot locations. Both were supportive of the installation at their site. They also felt positively toward elements that complemented the existing streetscape and were well-integrated.
- **Central Lutheran Church and Minneapolis Convention Center (3rd Ave and 12th St)**
  The mobility hub at 3rd Ave & 12th St was placed in consultation with leadership at Central Lutheran Church and the Minneapolis Convention Center. Their position was primarily neutral with a concern raised around the limitations of the automobile free-right turning movement that is restricted by opening that space up for the mobility hub.
- **First Covenant Church of Minneapolis (Chicago and 7th)**
  The project team was able to meet with the church and other property owners nearby to share information about the project and how input was being collected. With the recent pilot-to-permanent improvements made to the sidewalk bump outs, participants were enthusiastic to see similar long-term improvements follow these mobility hub pilots.

"I just wanted to say I love the light-blue boxy installations set up around the city! They bring a pop of color where needed and are delightful! Please keep them up. Thank you for doing this!"

Earned Media and Online Forums

As the pilot sites grew in number, so did the awareness of the public regarding the mobility hub pilot. This season the mobility hub pilot was featured in several webinar presentations (Shared Use Mobility Center, MnDOT Shared Mobility Webinar) and one industry news article. The 2020 pilot enjoyed greater online exposure than 2019 both through traditional channels and social media like Twitter. One article describes the mission of the project:

> "In an open field near the major intersection of Penn and Lowry Avenues in North Minneapolis, across the street from a liquor store and near several churches and a school, resides one of the city's pilot "mobility hubs," one of 25 spaces designed to increase access to low- or no-carbon transportation options.
>
> The idea is that by concentrating various modes of transportation in strategically placed, centralized locations, people will be more likely to use public or shared transportation. City officials hope that the project ultimately reduces the reliance on personal vehicles for those that have them and increases mobility for those that don't."

The full article, "Mobility Hubs Become Community Anchors in Minneapolis" by Cinnamon Janzer can be read on NextCity.org.

I like these blue things that just started to appear out of nowhere

Tweet your reply

RESILIENCE AT MOBILITY HUBS

The events of 2020 provided an unplanned and unexpected window into what kind of role mobility hubs can play in producing more resilient, socially connected neighborhoods during crises.

The mobility hub pilot sites are in neighborhoods where many residents are essential workers, experienced higher numbers of COVID cases, and/or experienced loss of income during necessary public health shutdowns[1]. These neighborhoods had to simultaneously respond to trauma within communities of color after the death of George Floyd and come together to respond to new dynamics disrupting neighborhood safety.

During the 2020 mobility hub pilot, several powerful examples of neighborhood resilience emerged, coming from existing neighborhood leadership and materializing at mobility hub spaces by nature of their central location, usage, and provision of public space. If future mobility hub programs maintain and amplify the qualities that made this possible, then greater social connections, better ways to reach people during crisis, and efficient public resource distribution can occur. This is an opportunity to build this program with the next challenges in mind - fortifying existing assets and investing in new ways for communities to emerge even stronger after COVID and better able to withstand future crises.

Defining Resilience

In the process of creating a resilience strategy, the City of Minneapolis has defined resilience in the following way:

> "City resilience is the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and ***thrive no matter what kinds of chronic stresses and acute shocks they experience.***
>
> What does this actually mean? We are working to make sure everyone in Minneapolis has what they need to thrive in good times and in bad – especially individuals and communities who may be more vulnerable due to things such as lower wealth, environmental threats, or structural racism."

1 For data on Minneapolis neighborhood COVID case data, view the latest on the City of Minneapolis dashboard.

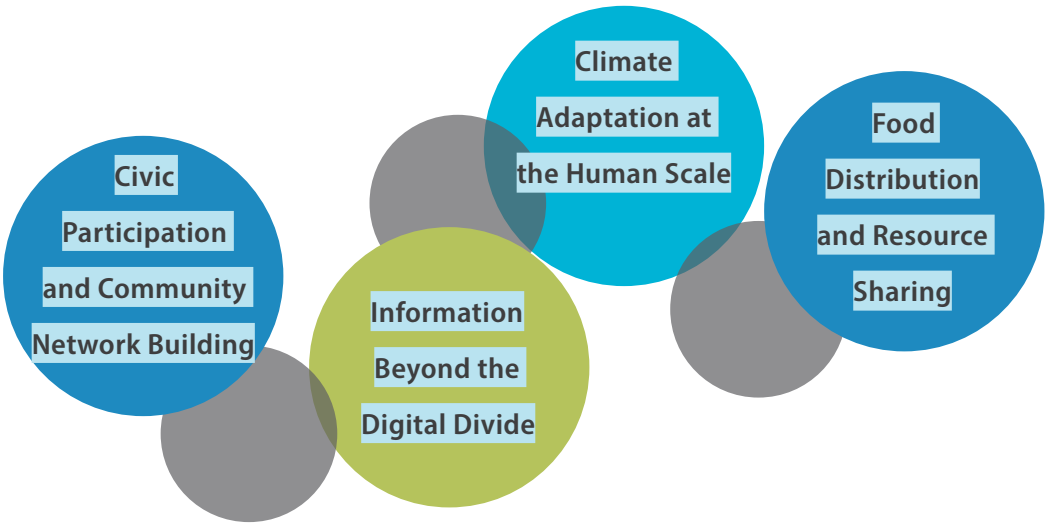
Transportation Resilience

A robust mobility hub network would contribute to resilience by increasing Minneapolis residents' accesss to destinations and contributing to redundancy in the transportation system. Redundancy means that during disruptions to one part of the system, users have the opportunity to easily fill their trip needs in another parallel way. For example, in 2020, many bus riders experienced localized service shutdowns during the unrest. With reliable, convenient additional modes that don't rely on car ownership, users are better able to navigate in times of uncertainty or sudden change.

For more on how mobility hubs functioned as substitute transportation options and could improve as a service during a pandemic, see the Engagement Deep Dive.

Examples of Resilience at Mobility Hubs

Mobility hubs, as key connection points in the public realm where people come to access transportation modes, have the potential to serve broader resilience goals as well. There are numerous ways this could unfold, but rather than list out potential solutions, the following section illustrates scenarios that are already occurring.



CIVIC PARTICIPATION AND COMMUNITY NETWORK BUILDING

Increased civic participation improves the ability of community members to shape the outcomes of issues that affect their lives and builds localized networks of information. In a similar respect, resilient communities have spaces where people can run into each other and keep up the kind of loose community connections that become critical when organizing a response to a crisis.

Neighborhood Resilience at Mobility Hubs Grant

Funded in part by a micro-grant within the Mobility Hub pilot, the Native American Community Development Institute (NACDI) hosted two of their Make Voting A Tradition (MVAT) events - socially distanced - at the Franklin and Bloomington mobility hub. NACDI has been using MVAT events in the neighborhood for seven years to build strong relationships with Indigenous residents and increase voter registration and turnout, making their voices heard in the democratic process. This year they also promoted the importance of completing the Census in their community to ensure equitable distribution of resources.

Informal Voter Information Distribution

Throughout the leadup to the 2020 election, voter information packets and educational signage on how to vote during the pandemic were seen at South Minneapolis Mobility hubs.

Parklet Painting at Penn and Lowry

Led by a Northside Mobility Hub Ambassador, this event served to build capacity among youth in executing community arts events and serve as a platform for their voice and vision to shape the design of the space there. Residents of the neighborhood also joined in the process painting the parklet.

FOOD DISTRIBUTION AND RESOURCE SHARING

Mobility hubs became natural destinations for food distribution to occur in the wake of several local grocery destinations closing down. In real time, residents were responding to emerging needs during crises. Because of the hubs' central location, visibility and availability of space, people took the opportunity to operate there.

This occured in spaces as small as the top of the mobility hub furniture and as large as a distribution event that filled a whole vacant lot at the hub. While food distribution can be logistically complex, shelf stable and hot meals were distributed at these sites.

FRANKLIN + CEDAR HUB MEALS

COMMUNITY FOOD SHARING

FRANKLIN + CEDAR HUB MEALS (II)

NORTHSIDE AMBASSADOR RESOURCE DISTRIBUTION

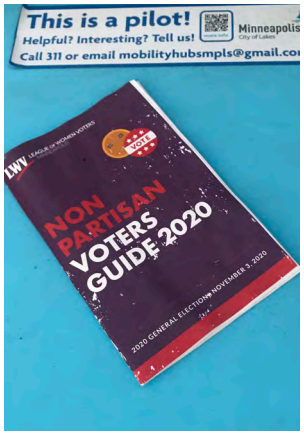
NORTHSIDE AMBASSADOR COAT DRIVE

INFORMATION BEYOND THE DIGITAL DIVIDE

In our increasingly digital age, a significant amount of information related to critical resources, service changes, and other elements of dynamic communication in crisis is transmitted online and via smart phones. However, according to the the most recent Census data, 15 percent of Black and Indegenous Minneapolis residents did not have home internet access along with 17 percent of Latino/a residents[1]. 21-26 percent of Northside residents did not have an internet subscription[2]. People without access to digital information are more vulnerable in times of crisis and less connected to resources for recovery. In this context, mobility hubs have the potential to become centralized, local, analog communication centers - able to distribute up to date information from the City to residents or from other neighborhood groups to residents as well.

Information already gets wrapped around poles and printed on lawn signs at these places. Examples included notices of rent relief resources, voter registration, census reminders, garage sales, and more. Neighborhood groups have shown interest displaying messages in any future message boards developed at mobility hubs. Messaging on COVID precautions occurred on a limited basis.

With more awareness of mobility hub messaging potential, hubs could serve as a more comprehensive analog communication solution. Advancment of information access at mobility hubs could include permanent kiosks/beacons, information on display in a permanent message board, or resources available in a locker system. Provision of Wifi at mobility hubs could also help boost access.



1 To access visit the US Census Bureau's online data portal.

2 To access visit the US Census Bureau's online data portal.

CLIMATE ADAPTATION AT THE HUMAN SCALE

Infrastructural climate adaptation is often envisioned on a large capital scale - updating aging infrastructure, building in redundancies to protect from future outages, etc. At mobility hubs, we have the opportunity to build in small-scale adaptation that people can use to control the comfort of their experience despite less predictable weather.

An example of small scale adaptation took place when person at the Franklin and Bloomington mobility hub was observed waiting for the bus. Due to the summer heat, they had moved the furniture into the shade of a nearby tree. This tiny action is, at a very human and immediate scale, the kind of adaptation that will help people stay comfortable as extreme weather conditions occur more frequently in the coming years. In the winter, seating can go in areas protected from wind, in the warmth of the sun. In the summer, it can be moved to areas best shaded for comfort.

OTHER RESILIENCE CONCEPTS FROM ENGAGEMENT

Residents have shared a broad range of ideas that connect to a resilience strategy during engagement on what features were most important to improving their trip. If tested and implemented, they could contribute to surrounding communities to thrive, be more connected and be more prepared to respond during crisis.

- Invest in access to organic produce through partnering with local farmers who have excess produce
- Produce carts like in Brooklyn, NYC - could be fresh food, food truck
- Place for celebrations of community successes, a center of community gathering
- Centering location decisions around increasing access to economic opportunity
- More activities - safe house to play cards, pool table, horse shoes
- More trees for shade

People-Centered Resilience Strategies at Mobility Hubs

Mobility hubs became sites of spontaneous acts of neighborhood resilience during the overlapping crises of 2020. Based on these innovative uses, next year the mobility hub program will explore the following approaches to foster access, programming, and community connection:

At the core of a resilient community is social capital. It's people knowing what the needs are and having the skills and access to resources to do something about it. To invest in resilience is to invest in social capital. Growing leadership and building capacity within communities is an asset that will translate to almost any type of challenge or crisis a community may face.

Build community partnerships and connections that build awareness of the opportunities to utilize the mobility hub for community based activities. As regular activations become more well known in the community, people will develop an awareness of the mobility hubs as a place to go to "plug in" with their neighborhood. At a mature mobility hub, there could even be emergency plans developed for how sites could operate for food distribution, shuttle locations or neighborhood response launch sites.

Establish space for programming to occur. Physical environments can be developed mobility hubs to serve as social infrastructure and provide space for the ongoing programming that can make mobility hubs the nexus of a thriving, resilient community. Programming spaces should be accessible to both project partners and welcoming toward other members of the community utilizing the spaces.

Keep programming spaces available and create simple systems to support use. It is important that as spaces grow and evolve, they still operate as fundamentally public spaces, able to be programmed in a dynamic and responsive fashion to evolving community needs. Through clearly communicating and simplifying the process of using public space.

Continue to center neighborhood identity and build in opportunities for localized control and capacity development through the mobility hub program. Opportunities to influence the design, operations and programming of mobility hubs will be an important component of scaling the program up from this pilot stage. Consistent avenues for participation in and control over the spaces will help ensure that residents feel well served by mobility hubs and feel ownership of spaces.

Coordination with staff advancing resilience work through Minneapolis Forward, the Resilience Hubs program, the Green Infrastructure program and Cultural Districts in the city is ongoing. As much as possible, mobility hub sites can become platforms for cooperative advancement of shared goals within the City enterprise.

Minneapolis
Public Works

This pilot was implemented by City of Minneapolis Public Works with the support of The Musicant Group.

THE MUSICANT GROUP

2020

APPENDIX G

SMART COLUMBUS

Smart Mobility Hubs Operations and Maintenance Plan

for the Smart Columbus Demonstration Program

FINAL REPORT | August 17, 2020

Produced by City of Columbus

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Disclaimer

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Acknowledgements

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IKE Smart City	Mobility Providers	Experience Columbus
St. Stephen's Community House	Columbus Metropolitan Library	Columbus State Community College
Central Ohio Transit Authority		

Abstract

The purpose of this Operations and Maintenance Plan is to explain operational and maintenance activities for the Smart Mobility Hubs project both during and after the pilot, funded as part of the Smart Columbus initiative. This document provides a comprehensive view of the Smart Mobility Hub environment, the roles and responsibilities that make it work, and the processes and procedures to maintain optimum functionality.

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Executive Summary

This Smart Mobility Hubs (SMH) Operations and Maintenance (O&M) Plan provides guidance of operations and maintenance of the SMH project. The Smart Columbus Smart Mobility Hub (SMH) project is one of eight projects in the Smart Columbus program and this project is committed to delivering solutions that help close the First Mile/Last Mile (FMLM) gap and is considered the future of consolidated transportation centers.

This O&M plan describes stakeholders involved (**Chapter 1**), materials and resources necessary (**Chapter 2**), training (**Chapter 3**), operational and maintenance activities (**Chapter 4** and **Chapter 5**) for the success of the project.

The intended audience is the Smart Columbus SMH project manager, City of Columbus, the USDOT, transportation and smart city researchers and those engaged in the deployment of Smart Columbus projects.

Chapter 1. Introduction

1.1. SCOPE AND PURPOSE

This document identifies the scope and purpose of the SMH Operations and Maintenance (O&M) Plan. It explains how operational and maintenance activities will be performed both during and after the pilot, funded as part of the Smart Columbus initiative. The following sections discuss the materials and resources, operational activities, maintenance tasks and routines taking place to operate and maintain the SMHs and other associated systems used to service its users. This document also specifies the stakeholders, such as agencies and departments within agencies, which rely on its successful operation. The purpose of this document is to provide a comprehensive view of the SMH project, the elements that make it work, and the processes and procedures for maintaining optimum functionality. **Table 1** provides a list of various SMH amenities and the organization that is responsible during and after the pilot period.

The goals of the SMH project are to:

- Provide physical access to comprehensive and multimodal trip planning
- Improving access to jobs, goods and services
- Improve customer satisfaction

The primary goals and expectations of SMH O&M plan are as follows:

- To keep the SMH system operational and to provide optimal service to users
- To provide access to troubleshooting tips and common user issues and how to resolve them
- To facilitate communications between the support teams and developers

Table 1: Smart Mobility Hubs System Stakeholder Responsibility Timeline

SMH Amenities	Organization	Responsibility period
Interactive Kiosks (IKs) O&M including ECB and Wi-Fi	IKE Smart City	During and after pilot period
IK-Central Management System (CMS) Administrator (Data collection and analysis)	IKE Smart City	During pilot period
	IKE Smart City	After pilot period
Smart Columbus Operating System (Operating System) Data Ingestion	City of Columbus	During pilot period
	TBD	After pilot period
Signage and Pavement Markings	City of Columbus	Pilot period and after pilot period*
	Site Stakeholders	After pilot period
Site Maintenance	Site Stakeholders	During and after pilot period
Mobility Infrastructure	Mobility Providers	During and after pilot period
Mobility Devices	Mobility Providers	During and after pilot period

**After pilot period, if in public right-of-way. TBD – To be determined.*

Source: City of Columbus

This O&M plan provides insight into the types of activities that are necessary to keep the SMH system operational and should serve as a guide for addressing and resolving issues that come up regarding the SMH suite of applications and their integration with the Operating System.

1.2. ORGANIZATION

The SMH O&M is organized into the following chapters:

- **Chapter 1.** Introduction
- **Chapter 2.** Materials and Resources
- **Chapter 3.** Training
- **Chapter 4.** Operations
- **Chapter 5.** Maintenance

1.3. PROJECT DESCRIPTION

The Smart Columbus SMH project is one of eight projects in the Smart Columbus program and is designed to foster a community of connections and accessibility with increased mobility options and free, easy to use trip planning tools – these were just some of the needs captured through public outreach surveys with area residents. The SMH is committed to delivering solutions that help close the FMLM gap and is considered the future of consolidated transportation centers.

The project is scoped to deploy a number of transportation amenities at six different facilities (the "smart mobility hub" – i.e., SMH). Listed below are the six facilities where the transportation amenities will be deployed.

1. Columbus State Community College (CSCC)
2. Central Ohio Transit Authority (COTA) Linden Transit Center
3. St. Stephen's Community House
4. Columbus Metropolitan Library – Linden Branch
5. COTA Northern Lights Park & Ride
6. COTA Easton Transit Center

These transportation amenities at the facilities listed above work together to deliver mobility as a service (MaaS). MaaS provides travelers with new and consolidated transportation options to move about the region using various modes, with a focus on empowering residents through information and technology, providing waiting areas with real-time transit information, microtransit connections for pedestrians, seamless transfer between modes, and local information on various points of interest to encourage city exploration. Individual SMH facilities vary in size, configuration, and available services since the goal of the sites is to incorporate amenities within existing physical constraints.

1.4. SMART MOBILITY HUB SYSTEM AND ITS COMPONENTS

Figure 1 shows the relationship between the SMH, Operating System, and new and existing systems. The SMH is the system of interest and establishes both a physical location for the traveler to access multimodal transportation options as well as Wi-Fi and an IK for travelers to access the Multi-modal Trip Planning Application (MMTPA) application referred to as Pivot 'app' for comprehensive trip planning tools. MMTPA is another Smart Columbus project. Trip data through the SMH facilities including preferred transportation mode and origin/destination will be collected through Pivot and, after proper de-identification, sent to the Operating System where the data will be available to users at the City of Columbus and third-parties for reports and analysis.

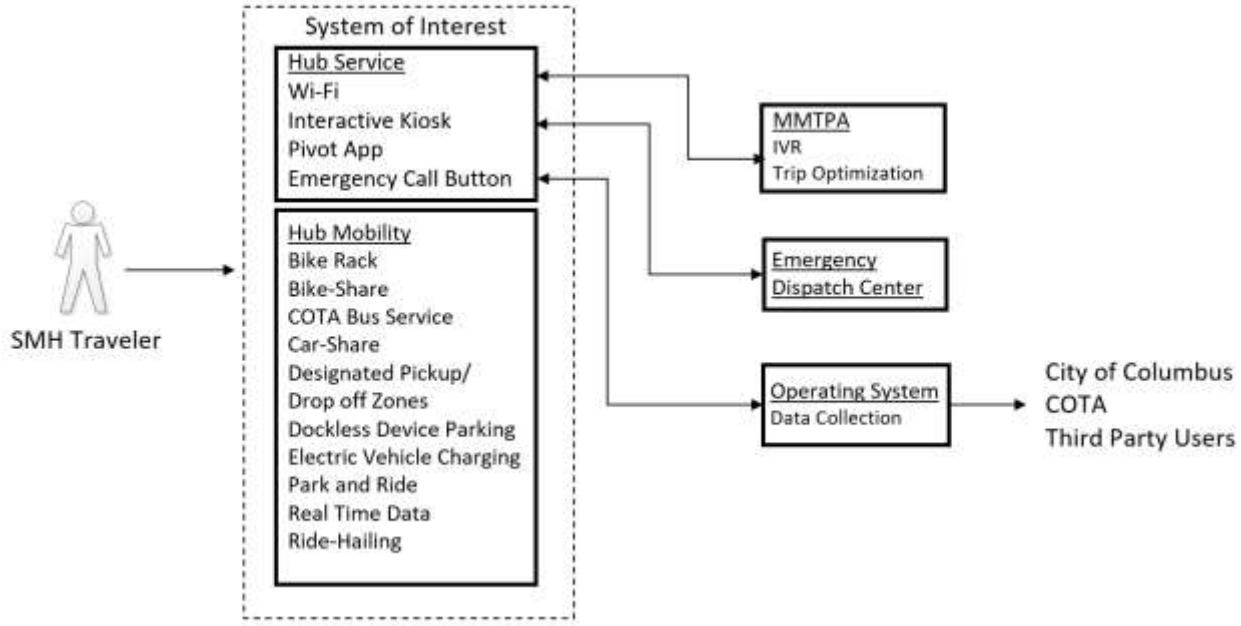


Figure 1: Smart Mobility Hubs High-Level Context Diagram

Source: City of Columbus

1.4.1. Smart Mobility Hubs Facility

The SMH Facility is the physical site that consolidates the amenities of the SMH system, which include the IK, real-time information displays, pick-up/drop-off areas and parking spaces for mobility providers and all other systems described in **Figure 1. Figure 2** shows an SMH sign installed at Metro Library – Linden Branch SMH site. Individual SMH facilities vary in size, configuration and available services.

Figure 2: Smart Mobilty Hub Sign Installed at Metro Library - Linden Branch

Source: City of Columbus

The following are descriptions of components available at an SMH facility.

1.4.1.1. INTERACTIVE KIOSK

Traveler IKs are installed on free standing pylons at all six SMH facilities. These IKs display real-time transit-related information and provide an embedded touch screen display to serve as a direct interface between travelers and the Pivot app, which gives the traveler the ability to plan trips using multimodal options available at the SMH facility or book available modes, along with additional information and instruction such as directing the traveler to a ride-hail pick-up location.

Figure 3 shows an IK currently in operation at Easton Transit Center.

Figure 3: Pedestal Mounted Interactive Kioks Deployed at Easton Transit Center

Source: City of Columbus

1.4.1.2. WI-FI

SMH facilities have access to public Wi-Fi through the IK. The Wi-Fi allows a traveler to access the Pivot app and other transportation information on his or her personal wireless device. A personal wireless device such as a cell phone or tablet may be used at SMH facilities to access the Pivot app via public Wi-Fi or through a personal data plan. Additionally, trip confirmation codes and other trip information may be sent to the personal wireless device upon traveler request and used to gain access to ride-hailing or to unlock bikes at bike-sharing docks.

1.4.1.3. PARK AND RIDE

Designated parking spaces are available at select SMH locations and provide a traveler the option to park a personal vehicle at an SMH facility and utilize the SMH amenities to continue his or her trip using alternate modes of transportation.

1.4.1.4. ELECTRIC VEHICLE CHARGING

Electric vehicle (EV) charging stations are available at some SMH locations based on the electrification study by the City of Columbus, as funded through the Vulcan or through other grant programs. Although charging infrastructure will be installed through a separate project, it was included within the SMH

Concept of Operations[1] to ensure proper provisions, such as designated parking areas, were set aside during deployment of the SMH facilities. At the time of this publication, COTA Northern Lights Park & Ride SMH facility has EV charging stations installed.

1.4.1.5. EMERGENCY CALL BUTTON

An Emergency Call Button (ECB) with speakers and a microphone is available at all SMH through the IK for interactive communications to 911 customer service and emergency facilities. When the ECB is activated, notification of the help request is directly sent to the 911 emergency call center (ECC) in the proper jurisdiction. The press of the button will initiate an audio connection between the distressed traveler and an operator at the ECC.

1.4.1.6. DESIGNATED PASSENGER PICK-UP/DROP-OFF ZONES

Loading zones are available at all SMH locations in the form of pull off lanes and/or parking spaces located away from travel lanes that will allow safe transfer of passengers between modes of transportation. These zones will primarily be used for ride-hailing and are clearly marked with signage and pavement markings. **Figure 4** shows the ride-hailing sign installed at Easton Transit Center.

Figure 4: Ride-hailing Sign at Easton Transit Center

Source: City of Columbus

[1] https://d2rfd3nxvhnf29.cloudfront.net/2020-03/SCC-B-SMH-ConOps-Update-Final-20191224.pdf

1.4.1.7. DOCKLESS DEVICE ZONES

Given the rapid rise in dockless mobility options such as scooters and bikes, it is important to enable mobility while balancing safety and site organization. Designated zones, including pavement markings and signage, are provided for dockless device parking so devices are not left in the way of walking paths or access ramps. **Figure 5** shows the dockless device zone installed at Linden Metro Library SMH site.

Figure 5: Dockless Device Zone at Metro Library - Linden Branch

Source: City of Columbus

1.5. SYSTEM USERS

The following are the main entities interacting with the SMH system:

- Users (SMH Traveler)
  - Have access to IK and transportation amenities installed at the SMH sites.
  - Have access to the Pivot app for comprehensive trip planning available on the IKs at the SMH sites.
- IKE Smart City
  - Has read-write-execute access to the IK, its components and all of its connected interfaces.
- Operating System
  - Has access to an Application Programming Interface (API) from IKE Smart City for the data collected from the IKs at SMH sites.
  - Has access to an API from the Pivot app for the data collected from the SMH sites.
- City of Columbus
  - Has access to SMH sites for maintenance of the signage and pavement markings.
- Experience Columbus

- Has access to an API from IKE Smart City for the data collected from the IKs at SMH sites.

- Mobility Providers
  - Have access to SMH sites to deploy, operate and maintain mobility options.

For more information on information flows, see the System Architecture and Standards Plan (SASP)[2], which contains the physical, enterprise and communications views for SMH, including a table of all information flows.

1.6. STAKEHOLDERS

1.6.1. The City of Columbus

The City of Columbus has collaborated with SMH partners to identify the SMH sites, IKs and signage and pavement markings to implement the SMH. The City has executed a maintenance agreement with the kiosk vendor and Memoranda of Understanding (MOU) with the site stakeholders. The City will oversee the collaboration of data and IK deployment between the SMH and Pivot app developers.

1.6.2. Emergency Dispatch Centers

The emergency dispatch centers handle incoming 911 emergency calls and communications with first responders through Computer Aided Dispatch (CAD) systems. Additionally, the ECB, which are installed on IKs at the SMH facilities, will be directly connected to these dispatch centers so proper emergency personnel may be dispatched directly to the appropriate SMH location if a traveler activates the ECB.

1.6.3. Experience Columbus

Experience Columbus has contracted with a kiosk vendor to supply IKs in downtown Columbus and the Short North area (area just north of downtown surrounding High Street). Experience Columbus partnered with Smart Columbus and extended its contract to the six SMH sites to ensure a seamless resident and visitor experience when utilizing IKs in Columbus.

1.6.4. Interactive Kiosk Vendor

Through the Experience Columbus contract, IKE Smart City will be responsible for the deployment, integration, and O&M of the IKs at the six SMH sites.

1.6.5. Smart Mobility Hub Site Stakeholders

SMH site stakeholders will be responsible for the maintenance of the site around the SMH amenities based on their MOU with the City of Columbus. Site stakeholders also have contracts with IKE Smart City and with individual mobility providers for O&M of their site(s), where applicable.

[2] https://d2rfd3nxvhnf29.cloudfront.net/2020-06/SCC-B-SASP-UPDATED_4_9_2020%20-%20final.pdf

1.6.5.1. CENTRAL OHIO TRANSIT AUTHORITY

COTA provides access to existing transportation facilities along the Cleveland Avenue corridor to facilitate development of the proposed SMH solution and access to COTA CMAX and other transit routes, Park and Ride facilities, bike racks, and space for mobility providers to operate. It will also provide the transit related data to the Operating System for Pivot functionality.

COTA will be responsible for maintaining the following SMH sites:

- **Linden Transit Center** - The Linden Transit Center is a COTA facility located at Cleveland Avenue and Eleventh Avenue. The facility offers public Wi-Fi, real-time transit information displays, and features an IK where users can access the Pivot app and an ECB. Bike-sharing docks, a dockless parking zone, and reserved space for ride-hailing are also available at this location. This location is also a station for the automated shuttle, which is part of the Smart Columbus Connected Electric Autonomous Vehicle (CEAV) project.
- **Northern Lights Park and Ride** - The Northern Lights Park and Ride is a new COTA facility at the Northern Lights shopping center located on Cleveland Avenue. A separate COTA-led initiative installed Charging stations at this SMH site. This location includes an IK at which users can access the Pivot app, Wi-Fi and an ECB. The Northern Lights Park and Ride site also provides space for bike parking, dockless device parking, car and bike sharing, and ride-hailing.
- **Easton Transit Center** - The Easton Transit Center is near the intersection of Stelzer Road and Transit Drive and serves transit and FMLM needs of travelers accessing the Easton office, shopping, and residential areas. It is currently equipped with many of the SMH-defined services. An IK is installed at the transit center where users can access the Pivot app, Wi-Fi and an ECB. A bike-share docking station, bike racks and ride-hailing amenities are also available at the transit center.

1.6.5.2. COLUMBUS METROPOLITAN LIBRARY – LINDEN BRANCH

An IK is installed at the Columbus Metro Library – Linden Branch, located on Cleveland Avenue between Kenmore Road and Kohr Place. The IK installed at this site provides users access to Pivot app, Wi-Fi and an ECB. This location also provides bike-sharing docks, dockless device parking, and reserved car-sharing and ride-hailing parking spaces, which will help bridge the gap for pedestrians between the adjacent Linden Transit Center and Northern Lights Park and Ride facilities.

1.6.5.3. ST. STEPHEN'S COMMUNITY HOUSE

St. Stephen's Community House is located near the intersection of 17th and Joyce Avenues. An IK is installed in the lobby of St. Stephen's Community House, which provides users access to features such as the Pivot app, Wi-Fi and an ECB. This SMH site provides zones for dockless parking, bike-sharing, ride hailing pick-up/drop-off and car-sharing parking spaces. This location also is a station for the automated shuttle as part of the Smart Columbus CEAV project. The community house serves the Linden area residents in numerous ways, including programs to promote employment, social development, education, health care and child care.

1.6.5.4. COLUMBUS STATE COMMUNITY COLLEGE

CSCC attracts largely local commuter students and is a major employment center. COTA serves this site, which contains CMAX Bus Rapid Transit (BRT) stations. A considerable number of transit-users access this site, which offers public Wi-Fi and real-time transit information displays. An IK, bike-share infrastructure and other mobility infrastructure are installed in the right-of-way on Cleveland Avenue between Mt. Vernon Avenue and East Naghten Street. At the IK, users can access features such as the Pivot app, Wi-Fi, and an ECB. The site offers access to a dockless parking zone and car-share amenities at the southwest corner of Cleveland Avenue and Mt. Vernon Avenue.

CSCC is the only SMH site where all the SMH amenities are installed in the right-of-way. Therefore, CSCC is not responsible for the site maintenance around the SMH amenities.

1.6.6. Mobility Providers

There are several types of mobility providers that provide FMLM services to the SMH that will support COTA's fixed route service.

All amenities at CSCC are located within the right-of-way and mobility providers have executed contracts with the City of Columbus or the State of Ohio for operations, maintenance and use of premises. O&M of these amenities at this SMH site are discussed below. For the five other SMH locations, each mobility provider has executed a contract with the appropriate site stakeholder for the O&M of the area to be used or mobility infrastructure deployed at each SMH site where the amenity resides on the stakeholder property. The City of Columbus is not party to the contracts between mobility providers and site stakeholders. Therefore, the related O&M activities of the mobility providers at these five SMH sites are not discussed in this O&M plan.

1.7. REFERENCES

Table 2 provides the lists the documents that are related to the O&M of the SMH system.

Table 2: Documents Related to Operations and Maintenance of the Smart Mobility Hub System

Title	Revision	Publication Date
IKE Smart City Contract with Experience Columbus	Final	May 11, 2018
IKE Smart City Operation and Maintenance Agreement with City of Columbus	Final	December 14, 2018
Spin, 904 Lease with the City of Columbus	N/A	2019
Smart Columbus Demonstration Program Smart Mobility Hubs Construction and Installation Plans	Final	March 18, 2019
Motivate International (CoGo) Contract with the City of Columbus	Final	July 1, 2019
Smart Columbus Demonstration Program Data Management Plan	Final	August 22, 2019
IKE Smart City Agreement with various SMH Site Stakeholders	Final	September, 2019
Bird, 904 Lease with the City of Columbus	N/A	September, 2019
Lime, 904 Lease with the City of Columbus	N/A	September, 2019
Smart Columbus Demonstration Program Data Privacy Plan	Final	September 6, 2019
SMH Site Stakeholders Memorandum of Understanding (MOU) with the City of Columbus	Final	September 11, 2019
Smart Columbus Demonstration Program De-Identification Plan	Final	September 17, 2019
Smart Columbus Demonstration Program Smart Mobility Hubs Test Plan	Final	October 11, 2019

Title	Revision	Publication Date
Smart Columbus Demonstration Program Smart Mobility Hubs System Requirements	Final	November 15, 2018
Smart Columbus Demonstration Program Smart Mobility Hubs Concept of Operations	Final	December 27, 2019
Site Stakeholders Agreement with various Mobility Providers	Final	2020
Smart Columbus Demonstration Program System Architecture and Standards Plan	Final	February 25, 2020
Smart Columbus Demonstration Program Smart Mobility Hubs Test Report	Final	August 5, 2020

Source: City of Columbus

Chapter 2. Materials and Resources

This section identifies the equipment/materials used and personnel responsible for O&M of the SMH system. Several SMH elements are not managed by the City of Columbus, including IKs and mobility provider infrastructure elements. Therefore, only a high-level description is provided in this section. Materials and resources directly managed by the City of Columbus are covered in detail.

2.1. PERSONNEL

Table 3 lists personnel, their positions, key functions, and the percentage of time dedicated to SMH O&M, if not full time, as defined during the grant period. **Table 4** lists the same information but is focused on personnel who will be involved post-grant. At the end of the pilot period, each hub will continue to operate per the kiosk and mobility provider contracts that have been executed with each site stakeholder. These tables will be reviewed for any needed revisions based on a known change in a named individual and at the end of the pilot period.

Table 3: Smart Mobility Hubs Personnel Involved During Grant Period

Name	Role	Key Functions	Full time Equivalent (%)	Organization
Andy Wolpert	Project Owner	Product owner	5%	City of Columbus
Jeff Kupko	Project Manager, Safety Manager	Responsible to identify and report any safety incidents at the SMH sites and for overall project management.	10%	Michael Baker International
Andrew Volenik	Traffic Operations Manager	Maintenance of pavement markings and signage.	5%	City of Columbus
Anthoni Goble	Operating System Data Analyst	Responsible for creating the data structure/schema to import IK and Pivot data into the Operating System.	10%	Battelle
Jarred Olson	Operating System Technical Lead	Responsible for storing IK and Pivot data into the Operating System.	10%	Accenture
Scott Walker	Project Manager and IK-CMS Administrator	Product owner, project management.	20%	IKE Smart City

Name	Role	Key Functions	Full time Equivalent (%)	Organization
Brian McGurer	IK Operations and Maintenance Engineer	Responsible for operations and maintenance of the IKs at the SMH site and perform daily checks.	15%	IKE Smart City
Jaclyn Toopes	IK Customer Care Support Personnel	Responsible for addressing customer issues received through the customer care support.	30%	IKE Smart City
Chet Ridenour	CoGo O&M	Responsible for the maintenance of CoGo bikes and infrastructure at the SMH sites.	15%	CoGo (Lyft)
Katie Drown	O&M of Spin scooters	Responsible for the maintenance of Spin scooters bikes at the SMH sites.	15%	Spin
Sam Cooper*	O&M of Bird scooters	Responsible for the maintenance of Bird scooters bikes at the SMH sites.	15%	Bird
Crew Cypher	O&M of Lime scooters	Responsible for the maintenance of Lime scooters bikes at the SMH sites.	15%	Lime
Morgan Kauffman	O&M of Yellow Cab Fleet	Responsible for the maintenance of Yellow Cab taxis that access the SMH sites.	5%	Columbus Yellow Cab
Daniel Jamerson	O&M of EasyMile AV Shuttles	Responsible for the maintenance EasyMile shuttles that access the SMH sites.	10%	EasyMile
Timothy Smith	Site Maintenance	Responsible for maintenance of the site around SMH amenities.	10%	COTA
Tommy Ferguson	Site Maintenance	Responsible for maintenance of the site around SMH amenities.	10%	St. Stephen's Community House
Andrew Kistler	Site Maintenance	Responsible for maintenance of the site around SMH amenities.	10%	Columbus Metropolitan Library
Doug Wright	Site Maintenance	Member of SMH Project team.	5%	CSCC

**Contract with Bird is expected to be signed by September 2020*

Source: City of Columbus

Table 4: Smart Mobility Hubs Personnel Post-Grant

Name	Role	Key Functions	Full time Equivalent (%)	Organization
Andy Wolpert	Project Owner	Product owner	5%	City of Columbus
Andrew Volenik	Traffic Operations Manager	Maintenance of pavement markings and signage located within the right-of-way.	5%	City of Columbus
TBD	Operating System Data Analyst	Responsible for updating the data structure/schema to import IK and Pivot data into the Operating System.	10%	TBD
TBD	Operating System Technical Lead	Responsible for storing IK and Pivot data into the Operating System.	10%	TBD
Scott Walker	IK Product Owner and IK-CMS Administrator	Product owner	20%	IKE Smart City
Brian McGurer	IK Operations and Maintenance Engineer	Responsible for maintenance of the IKs at the SMH site and perform daily checks.	15%	IKE Smart City
Jaclyn Toopes	IK Customer Care Support Personnel	Responsible for addressing customer issues received through the customer care support.	30%	IKE Smart City
Chet Ridenour	CoGo O&M	Responsible for the maintenance of CoGo bikes and infrastructure at the SMH sites.	15%	CoGo (Lyft)
Katie Drown	O&M of Spin scooters	Responsible for the maintenance of Spin scooters bikes at the SMH sites.	15%	Spin
Sam Cooper*	O&M of Bird scooters	Responsible for the maintenance of Bird scooters bikes at the SMH sites.	15%	Bird

Name	Role	Key Functions	Full time Equivalent (%)	Organization
Crew Cypher	O&M of Lime scooters	Responsible for the maintenance of Lime scooters bikes at the SMH sites.	15%	Lime
Morgan Kauffman	O&M of Yellow Cab Fleet	Responsible for the maintenance of Yellow Cab taxis that access the SMH sites.	5%	Columbus Yellow Cab
Timothy Smith	Site Maintenance	Responsible for maintenance of the site around SMH amenities, pavement markings and signage.	10%	COTA
Tommy Ferguson	Site Maintenance	Responsible for maintenance of the site around SMH amenities, pavement markings and signage.	10%	St. Stephen's Community House
Andrew Kistler	Site Maintenance	Responsible for maintenance of the site around SMH amenities, pavement markings and signage.	10%	Columbus Metropolitan Library
Doug Wright	Site Maintenance	Member of SMH Project team.	As needed	CSCC

TBD – To be determined

Source: City of Columbus

2.2. EQUIPMENT, SOFTWARE AND MATERIALS

This section discusses the operating equipment, software and other computing facilities used for operating the SMH system, sites and amenities.

2.2.1. Equipment

As part of the Smart Columbus SMH project, six IKs were installed at the SMH sites. The IKs provide users access to various apps including Smart Columbus' Pivot app. The other amenities installed as part of the IK includes an ECB, public Wi-Fi, bike- and car-share spaces, dockless devices parking spaces. Pavement markings and signage were also installed at all SMH sites to provide users dedicated areas and wayfinding to mobility options deployed at the SMH sites.

Table 5 and **Table 6** provide recurring costs and the party responsible for the cost related to the O&M of the project during and after the pilot period.

Table 5: Monthly/Yearly Recurring and Support Costs During Pilot Period

Maintenance of SMH Amenity	Cost to the City of Columbus	Responsible Party	Comments
IK including ECB and Wi-Fi	$0*	IKE Smart City	
Pavement markings and signage maintenance costs at SMH sites			No O&M costs unless reinstalled due to damage.
• CSCC	$0	City of Columbus	
• Linden Transit Center	$0	City of Columbus	
• St. Stephens Community House	$0	City of Columbus	
• Metro Library – Linden Branch	$0	City of Columbus	
• Northern Lights Park and Ride	$0	City of Columbus	
• Easton Transit Center	$0	City of Columbus	
Bike-Share			
• CoGo Infrastructure	$0	CoGo	

**IKE Smart City indicated a $15,000 per year per kiosk O&M cost that is provided as part of the turn-key built in solution. Due to this reason, there are no O&M costs to the City of Columbus.*

Source: City of Columbus, IKE Smart City

Table 6: Monthly/Yearly Recurring and Support Costs After Pilot Period

Maintenance of SMH Amenity	Cost to the responsible party	Responsible Party	Comments
IK including ECB and Wi-Fi	Not available	IKE Smart City	Per vendor, cost information is considered confidential. End of life replacement is expected to be 10 years. Multiple components of IK will be replaced as needed over the years. Additional components of IK include: • Monitors replaced at 5 years • Computers replaced at 5 years • Modem replaced at 5 years • Air Conditioners at 4 and 8 years, or twice in the 10 yr. lifespan • Security NVR (Network Video Recorder) at 5 years or once in the 10 yr. lifespan • Emergency call assembly at 5 years or once in the 10 yr. lifespan
Pavement markings and signage maintenance costs at SMH sites. Cost below includes replacement of all signage and pavement markings at the SMH site.			Signage and pavement markings installed will be inspected and replaced as necessary or when damaged.
• CSCC	$2,700	City of Columbus	Estimated cost every seven years.
• Linden Transit Center	$3,200	COTA	Estimated cost every seven years.
• St. Stephens Community House	$3,900	St. Stephen's Community House	Estimated cost every seven years.
• Metro Library – Linden Branch	$3,550	Columbus Metropolitan Library	Estimated cost every seven years.
• Northern Lights Park and Ride	$3,450	COTA	Estimated cost every seven years.
• Easton Transit Center	$1,700	COTA	Estimated cost every seven years.
Bike-Share			

Maintenance of SMH Amenity	Cost to the responsible party	Responsible Party	Comments
• CoGo Infrastructure	Not available	CoGo	Per vendor, cost information is considered confidential.

Source: City of Columbus, IKE Smart City

2.2.2. Software

No software licensing and support costs are required for the IK maintenance during or after the pilot period.

2.2.3. Materials

IKs and other supporting infrastructure installed at the sites are off-the-shelf products. Signage and pavement markings were designed and installed at the sites for easy navigation to the transportation mobility options provided at each site. **Table 5** and **Table 6** provide recurring and support cost information related to the project for these items. Beyond these items, no other materials are required for the SMH sites.

2.3. DATA COLLECTION AND PRIVACY

While the Data Privacy Plan[3] (DPP) provides overarching guidance for every project on privacy and security controls for data, detailed information on privacy and security controls for SMH will be maintained in the Institutional Review Board (IRB) protocol and contracts with participating organizations, such as the kiosk provider, as needed. Data Security refers to the tools, policies, practices, and procedures used to protect data from being accessed, manipulated, destroyed or being leveraged by those with a malicious intent or are unauthorized to do so. Data privacy is the reasonable expectation that data of a sensitive nature will be kept confidential, sanitized and/or encrypted, and respectfully and responsibly maintained by all users, managers, and collectors of the data, while adhering to applicable laws and regulations, policies, and procedures.

2.3.1. Data Collection

2.3.1.1. INTERACTIVE KIOSKS AUTOMATICALLY COLLECTED INFORMATION

IKE Smart City makes its privacy policy available for the users on both the IKs installed at the SMH sites and on their website.[4] Various features like public Wi-Fi, photo booth and ECB are available at the IK that are interactive features and will need information from the user. When connected to the IK Wi-Fi on a smart device, location information (SMH site) and time stamp of when the user is connected to the Wi-Fi is automatically collected at the IK. The ECB is equipped with its own video camera which records

[3] https://d2rfd3nxvhnf29.cloudfront.net/2019-09/SCC-D-Data%20Privacy%20Plan-FINAL-20190906%5B1%5D_0.pdf

[4] https://www.ikesmartcity.com/documents/en/privacy-policy.html

continuously. When the ECB is activated, location (SMH site), timestamp and length of the call is automatically collected. The IKE Smart City privacy policy describes in detail the types of information collected when using an IK and practices that are followed when collecting, using, maintaining, protecting, and disclosing that information.

2.3.1.2. SMART COLUMBUS OPERATING SYSTEM

The Smart Columbus DPP[5] provides program-level oversight and guidance for the privacy and security controls for any data collected as part of the Smart Columbus Program and stored on the Operating System.

For the SMH project, IKE Smart City has created an API for Operating System to access IK usage information. Though other data is collected as mentioned above when using interactive features, only data that is needed for performance measurement of this project is collected through the API. The Operating System data includes dwell times, IK popularity (returning sessions), IK usage frequencies, and venue information. Data collected by the Operating System has a five year rolling retention period per the Smart Columbus record retention schedule.

2.3.2. Access to Interactive Kiosk Data by Third Parties

With respect to any interactive feature provided on the IK and operated by a third-party, the IK will only store the information that the user provided to perform the service requested. After that, the information will no longer be retained by IKE Smart City, but it may continue to be retained by the respective third-party who is the owner of that interactive feature, i.e. Smart Columbus Pivot. IKE Smart City will only share this information with that third-party, and will not share, sell or otherwise disclose this information to any other third parties. However, IKE Smart City does not exercise control over third parties, and users will be subjected to their policies and terms and conditions when engaging with any feature operated by a third-party. The IKE Smart City privacy policy, available on its website and on the IK at the SMH sites, describes what data collected through the IK is available for third parties. [6]

2.3.3. Interactive Kiosk Data Retention Policy

As per the IKE Smart City privacy policy, IK and Wi-Fi usage information that is automatically collected through the IK as described in section 2.3.1 will not be stored for more than 12 months. Video that is collected at the IK when accessing the ECB has a 14 day rolling window storage period. Any information collected from the user to access third-party interactive features at the IK will not be retained by IKE Smart City after the service requested is complete. This information may be stored by the third-party, i.e. Smart Columbus Pivot.

2.3.4. Interactive Kiosk Data Security

IKE Smart City provides physical, electronic, and procedural safeguards to protect information they process and maintain. IKE Smart City follow industry standard security measures like Transport Layer Security (TLS) encryption, and monitoring tools such as Open Source HIDS (host-based intrusion detection system)

[5] https://d2rfd3nxvhnf29.cloudfront.net/2019-09/SCC-D-Data%20Privacy%20Plan-FINAL-20190906%5B1%5D_0.pdf

[6] https://www.ikesmartcity.com/documents/en/privacy-policy.html

security system to prevent cyber-attacks. The IK system platform undergoes a third-party cyber security audit on an annual basis to detect and remediate any potential attack vectors.

Chapter 3. Training

As part of the SMH project, there will be no training provided to the users of the system. Therefore, this section only provides an overview of the assessment and training needed for O&M personnel, including off-site courses, on-site courses, and hands-on training on the system itself.

3.1. INTERACTIVE KIOSK CENTRAL MANAGEMENT SYSTEM ADMINISTRATOR TRAINING

The IK-CMS administrator (admin) is responsible for the data collected from the SMH sites. The IKE admin performs routine checks on the data collected to ensure there are no system and data receiving errors. The IK-CMS admin along with other IKE Smart City team go through the data collected through IK-CMS when any anomalies are reported within the system.

3.2. INTERACTIVE KIOSK OPERATIONS AND MAINTENANCE TRAINING

IK O&M personnel are provided a daily and weekly checklist to perform at each of the SMH sites. Training is provided to the personnel performing the checks to make sure all equipment is working accordingly. **Appendix A** provides the daily checklist that will be used to perform routine checks at the IK.

Chapter 4. Operations

This section provides insight into the types of operational activities that are necessary to keep the SMH system operational and should serve as a guide for addressing and resolving issues that may arise regarding the SMH applications and integration with the Operating System.

4.1. HOURS OF OPERATION

The IKs and amenities installed at the SMH sites are always available except for the St. Stephen's Community House site where the IK will be available only during the St. Stephen's Community House operating hours (Monday through Friday 7am to 9pm). All other transportation mobility amenities installed at St. Stephen's Community House are available throughout the year.

4.2. SMART MOBILITY HUBS TECHNICAL SUPPORT

IKE Smart City technical support can be contacted using the toll-free number. This tech support is available 24/7 for kiosk issues, including emergencies. This support number is intended for City of Columbus and stakeholders, not the general public who may have general inquiries.

The phone number is: 1-833-624-0494. Once dialed, the caller is prompted with three options.

- **Option 1** – When Option 1 is selected, the call will be transferred to on-call staff. This option is intended for emergency responders or utility representatives to speak with somebody immediately.
- **Option 2** – When Option 2 is selected, the call will be transferred to on-call staff. This option is intended for the City of Columbus partners to speak with somebody immediately to report significant kiosk damage (broken glass, kiosk struck by a car, etc.).
- **Option 3** – When Option 3 is selected, the caller will be prompted to leave a voicemail. This voicemail will then show up as a ticket to be addressed during normal business hours. This option is intended for non-emergency messages that can be handled during normal business hours.

4.3. OPERATING SYSTEM TECHNICAL SUPPORT

Operating System technical support can be reached through the following URL:
https://www.smartcolumbusos.com/contact-us

The following information is required in the correspondence:

- Contact name and organization
- Email
- Subject (Tech Help/Request)
- Message
- Verification (reCAPTCHA)

4.4. INTERACTION AND COORDINATION

See Section 2.1 Personnel for SMH system responsibilities. Smart Columbus hosts a monthly meeting to review project updates, kiosk usage and system performance and other upcoming activities. This meeting includes Smart Columbus, site stakeholders and COTA.

4.5. OPERATIONAL ACTIVITIES

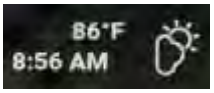
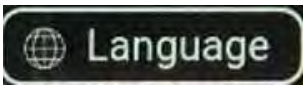
4.5.1. Smart Mobility Hubs Application Builder

This section provides a description of common operational activities and troubleshooting activities related to the IK.

4.5.1.1. INTERACTIVE KIOSK USER OPTIONS

Various options are available on the IK interface for users to access including American with Disability Act (ADA) accessible options. **Table 7** describes those user options available.

Table 7: Interactive Kiosk User Options

Option	Description
	User, upon arrival at the IK, will need to touch the screen to exit the stand-by screen and view the home screen.
	This icon is used to increase the font size on the IK for visibility purposes.
	This icon is used to lower the content on the IK screen for ADA users for easy accessibility of the IK options.
	ECB button is used to call and alert ECC officials in an emergency situation.
	This icon gives information on how to connect to the IK provided public Wi-Fi on a smartphone or smart device.
	Various apps including Pivot are provided on the kiosk to explore various activities, including food, events, and multimodal transportation options around the City.
	Provides current weather information.
	Clicking this icon will modify the display language on the IK.
	Clicking this icon will change the background of the IK home screen.

Source: City of Columbus

4.5.1.2. INTERACTIVE KIOSK TROUBLESHOOTING

IK troubleshooting provides recommendations to solve issues that may be encountered while using the IK. This table is expected to be updated periodically as new issues are identified and appropriate

recommendations for how to resolve are learned. **Table 8** provides the list of issues that maybe encountered with the IK. The IK troubleshooting will be handled by the IK-CMS admin.

Table 8: Interactive Kiosk Troubleshooting

Issue	Description
IK not responding	This issue is when the kiosk itself is out of service. This may be due to a power outage or when there is a crash where the kiosk is damaged. The IK-CMS admin will be notified when there is an error in the data transfer from the kiosk to the backend SMH system.
Call center customer care not reachable	This issue is when all of the customer care representatives are not available at the moment due to the call being made outside business hours or when the call center is experiencing a high call volume.
ECB not working	This issue is when the user is not able to connect to the ECC. This may be due to a power outage or when there is a crash where the kiosk is damaged. The IK-CMS admin will be notified when there is an error in the data transfer from the kiosk to the backend SMH system which will occur when there is a power issue.
Wi-Fi service is not available	This issue is when the user is not able to connect to the Wi-Fi provided at the kiosk due to a power outage or when the router has stopped working. The IK-CMS admin will be notified with an error message when there is a disconnection with the IK.
Apps not working	This issue is when the user is unable to open one or all apps provided on the kiosk. The IK-CMS admin is notified with an error message when there is a software or hardware glitch and cannot download and upload data from the kiosk to the backend system.

Source: IKE Smart City

4.5.2. Smart Columbus Operating System

4.5.2.1. ACCESS TO DATA

For the SMH project, IKE Smart City has created an API for the Operating System to ingest certain IK usage information for performance measurement purposes. Once retrieved, data will be made available for public access and will be used to assess performance measures.

4.5.2.2. INGESTING DATA

The Operating System team checks the validity of the data and generates statistics relative to the completeness of the dataset as it is ingested. This will provide a score that will be appended to the data page. The data provider will be contacted and asked to remediate any anomalies detected.

Chapter 5. Maintenance

The SMHs and deployed amenities are expected to be operational nearly 24 hours a day, seven days a week. Both during and after the demonstration period, maintenance activities are necessary to keep the system running. This section outlines various maintenance tasks, including preventative and corrective maintenance activities and other adjustments as needed. Depending on the activity and the SMH component, responsible parties maintaining the activity maybe change depending if it is during or after the demonstration period.

5.1. PREVENTATIVE MAINTENANCE ACTIVITIES

Preventative maintenance is maintenance activity routinely performed to lessen the likelihood of failure and to discover issues in a proactive manner to lessen their impact. IKE Smart City is responsible for performing preventative maintenance on the IKs and the City of Columbus is responsible for maintaining the signage and pavement markings installed at the SMH sites. Preventative maintenance activities for IKs and infrastructure are documented here. **Table 9** lists the preventive maintenance activities related to SMH.

Table 9: Preventative Maintenance Activities

Activity	Description	Frequency	Effort

Kiosks
• Software
  ○ Apps
• Hardware
  ○ ECB
  ○ Camera
  ○ Wi-Fi
  ○ IK surface
	IK field inspection and maintenance will be performed daily to make sure kiosks are working properly at all SMH locations. The SMH Test Plan and SMH Test Report capture the daily inspection and maintenance checklist used by IKE Smart City for inspection.	Daily	3 hours

Pavement markings and signage	The City of Columbus, during the pilot period, and site stakeholders, after the pilot period, will maintain pavement markings and signage installed on private property at the SMH sites. The City will maintain items installed in public right-of-way before and after the pilot period.	As needed	6 hours
EV Charging Stations	EV charging stations installed at the Northern Lights Park and Ride SMH site will be maintained by COTA who is the site owner for that site.	As needed	6-8 hours
CoGo Infrastructure	CoGo docking stations and bikes are deployed at multiple SMH sites. The O&M of the infrastructure will be conducted by CoGo.	As needed	5 hours

Source: City of Columbus, IKE Smart City

5.2. CORRECTIVE MAINTENANCE ACTIVITIES

Table 10 lists the corrective maintenance activities associated with addressing issues related to the SMH system or Operating System.

Table 10: Corrective Maintenance Activities

Activity	Description	Frequency	Effort
Apps on the IK not working	Some or all apps not working on the IK. Error is displayed when accessed. IKE Smart City is notified and will be responsible to respond accordingly.	Infrequent	1-8 hours
IK out of service	IK is out of service due to power outage or maintenance issues. IKE Smart City is notified and will be responsible to respond.	Infrequent	1-72 hours
ECB not working	Not able to activate and connect to the ECC when ECB is pushed. No audio response is received from ECC. IKE Smart City is notified and will be responsible to respond.	Infrequent	24-72 hours
Wi-Fi not available	Wi-Fi service is not available at SMH site due to power issues or equipment related issue. IKE Smart City is notified and will be responsible to respond.	Infrequent	8-72 hours
Operating System not available to receive data	An API is setup to access data from IKE Smart City to Operating System and an error is presented when trying to access the API. Any Operating System data ingestion error will be handled by IKE Smart City and Operating System team.	Infrequent	1-8 hours
Pavements markings or signage needs replacement	Pavement markings or signage installed at SMH sites need replacement. The City of Columbus will replace the signs and pavement markings as needed during the pilot period. SMH Site Stakeholders will be responsible for signs and pavements markings.	Infrequent	1-2 hours

Source: City of Columbus, IKE Smart City

5.3. DATA INGESTION TO OPERATING SYSTEM

5.3.1. Background on Data Template and Format

An API is setup for the Operating System team to access SMH data from IKE Smart City. Data is available in CSV and JSON formats for download and query. The query supports the full ANSI SQL syntax and only selects from the tables specified in the query. Various datasets are setup for different information including counters, dwell times, frequencies at the SMH sites.

5.3.2. Maintenance of Data Ingestion to Operating System

The IKE Smart City data transfer is through a RESTful API which is an HTTPs/TLS server. Data is uploaded with a POST method and received with a GET method. Data is posted on the server where the data in transit is encrypted via TSL. Data feed schema is defined by the Operating System team based on inputs from IKE. The Operating System team schedules ingestion jobs for various data feeds based on their update frequency. In case of any changes or updates to the data feed schema or endpoint, the Operating System team updates the data pipeline to reflect the changes. These data pipeline updates can take a level of effort of up to 6 hours. **Table 11** provides activities associated with updating data that is collected in the Operating System.

Table 11: Maintenance of Data Ingestion to Operating System

Activity	Description	Frequency	Effort
Update data structure/schema in Operating System	Data ingested into the Operating System has changed and requires updates to the existing data structure/schema.	As needed	6 hours

Source: City of Columbus

Appendix A. Interactive Kiosk Daily Maintenance Checklist

IKE Field Maintenance Checklist

Once a unit is set up and powered on, perform the following checks on both sides of the unit:

- Ad-loop is cycling through ads
- When tapped, unit transitions from the ad-loop to the dashboard correctly
- Time and weather are displaying correctly based on current location and time zone
- City specific application designs are displaying
- Unit returns to the ad-loop after 60 seconds of inactivity

Directory Listing Applications (Choose one of Eat and Drink, Shop, Stay, Activities, Parks & Outdoor, Museums & Culture, Social Services, Civic Resources)

- Listings appear correctly - Name, address, category, directions with time, images (if present otherwise category icon)
- Can filter results by category
- Can search by name / category
- Tapping the card flips to the detail view and the map zooms to show directions
- Detail view has appropriate content
- Tapping 'Get Directions / info' displays the texting keyboard and allows you to text the listing info to your phone
- Can pan the map and pinch to zoom in & out
- Clicking a pin on the map displays the detail card

Arcade

- Game starts and you can play

Get Around Application

- City specific transit map loads properly
- Bus stops load properly
- When a stop is tapped, screen zooms to focus on that stop, available modes load
- with route information.
- Tapping 'Get Directions / info' displays the texting keyboard and allows you to send the listing info to your phone
- Can pan the map and pinch to zoom in & out

Survey Says

- Question loads properly
- After selecting an answer, you can vote
- Tapping vote take me to the results screen

Photobooth

- Interface loads correctly
- Frames, filters, and stickers load and can be applied to photo
- Photos are taken

- Verify photo can be sent via text and correct photo is received

Hardware

- Wash glass face. Wash body of kiosk top to bottom.
- Remove Graffiti or other marks. If applicable, describe what graffiti was removed and where on kiosk it was located (example: spray paint on side, sticker on front base, etc.).
- Check for scratches or other damage (*how to repair?)*
- Pick up and dispose of debris or garbage
- Connect to IKE Free Wi-Fi and verify it is operational

Appendix B. Acronyms and Definitions

Table 12 provides project specific acronyms used throughout this document.

Table 12: Acronym List

Abbreviation/Acronym	Definition
Admin	Administrator
API	Application Programming Interface
App	Application
CMS	Central Management System
COTA	Central Ohio Transit Authority
CEAV	Connected Electric Autonomous Vehicle
CSCC	Columbus State Community College
ECB	Emergency Call Button
ECC	Emergency Call Center
EV	Electric Vehicle
FMLM	First Mile/Last Mile
HIDS	Host-based Intrusion Detection System
IK	Interactive Kiosk
IKE	Interactive Kiosk Environment
IP	Internet Protocol
MaaS	Mobility as a Service
MMTPA	Multimodal Trip Planning Application
NVR	Network Video Recorder
O&M	Operations and Maintenance
Operating System	Smart Columbus Operating System
OSU	The Ohio State University
PaaS	Platform as a Service
PII	Personally Identifiable Information
SASP	Systems Architecture and Standards Plan
SMH	Smart Mobility Hub
TLS	Transport Layer Security

Source: City of Columbus

Appendix C. Glossary

Table 13 provides project specific terms used throughout this document.

Table 13: Glossary

Term	Definition
App	A software application
Data Privacy	The reasonable expectation that data of a sensitive nature will be kept confidential, sanitized and/or encrypted, and respectfully and responsibly maintained by all Users, managers and collectors of the data.
Data Retention	The continued storage of data for compliance or business reasons.
Data Security	The tools, policies, practices, and procedures used to protect data from being accessed, manipulated, or destroyed or being leveraged by those with a malicious intent or without authorization, as well as the corrective actions taken when data breaches are suspected or have been identified.
MaaS	Mobility as a Service refers to the shift in society from the use of mass-produced personal vehicles, which decentralizes human activities to a human-centric approach. Through the sharing of information, multiple modes of transportation are integrated and offered through a digital platform that provides FMLM mobility bookings across all modes, private and public.
reCAPTCHA	A free service from Google that helps protect websites from spam and abuse
Travelers	Travelers are users of the SMH who access amenities and utilize the features at SMH facilities to plan, begin, pass through, or complete their trips.
Third-Party	Organizations not affiliated with the Smart Columbus Program.

Source: City of Columbus

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

APPENDIX H

SMRT COLUMBUS

Final Report

for the Smart Columbus Demonstration Program

June 15, 2021

Chapter 11. Smart Mobility Hubs

11.1. PROJECT OVERVIEW

The Smart Mobility Hubs (SMH) project was designed to improve the availability of transportation options for people living in areas with limited connectivity. The Linden neighborhood was identified as the location for the project, as its residents face numerous socio-economic challenges, including low household income, lack of major employers, and high infant mortality rates.

These problems are compounded by the lack of access to transportation options, as there are numerous job centers throughout the Columbus region, including some a short drive from this neighborhood. Easton is a high-traffic retail destination and office center in the northeast part of Columbus, just a few miles from Linden. Although Easton is a major employment center, the jobs in this area have a high turnover rate. Research has shown that a major contributor to this type of job instability is the lack of reliable transportation, including first mile/last mile (FMLM) challenges related to safety and mobility.

Six SMHs shown in **Figure 11-1** were deployed to provide travelers with consolidated transportation amenities such as Interactive Kiosks (IKs) with Wi-Fi and Emergency Call Buttons (ECBs), enabling modal transfers between a variety of transportation options that exist in the City, and providing access to comprehensive trip-planning tools such as Pivot – the Multimodal Trip Planning Application (MMTPA). Taken together, these services were intended to facilitate multimodal trips, including coordinating FMLM connections.

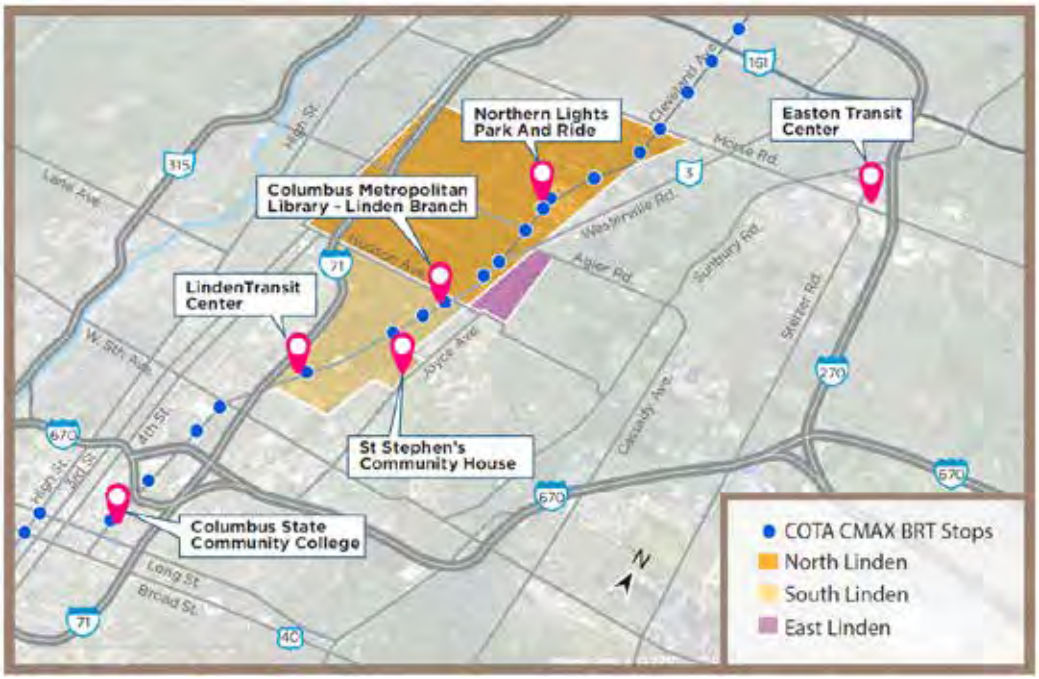


Figure 11-1: Smart Mobility Hub Locations

Source: Google Earth Pro, City of Columbus

11.2. DEPLOYMENT SUMMARY

11.2.1. Systems Engineering Approach

The City used a traditional systems engineering process for the development of the project to ensure that the original vision developed in the Smart City Challenge was vetted, refined, and modified as appropriate according to site stakeholder and community input. Systems engineering is described in more detail in **Chapter 2**.

As part of this process, the project team had to fully document and vet user needs and system requirements, and each aspect of the systems engineering "V-Model" (see **Figure 2-3** in **Chapter 2**) was addressed, with deliverables developed for each stage and posted to the Smart Columbus website.[112] The challenge to using the systems engineering process for the SMH project was that not only was the project team designing a system, but it was also designing physical, non-connected amenities. The development of the System Requirements and Specifications (SyRS) prior to the evaluation of available kiosk technologies ensured the system desired was delivered, and the project team was able to determine that the IKE Smart City product met the requirements prior to engaging in discussions with the vendor and partners to leverage an existing city deployment agreement.

The specific service gaps in the system that the SMH project intended to address include:

- Lack of physical facilities offering trip-planning, multimodal transit options, and other amenities at centralized locations
- Limited FMLM transportation options; these limitations make it difficult for transit-dependent residents to access basic services such as health care, grocery stores, and banking
- Inadequate optimization of ride-sharing trips
- Exclusion of unbanked users and users without smartphones from travel options
- Lack of adequate safety features like ECBs at transit facilities

Any changes recommended through this development process had to be vetted and managed appropriately. One example of this process change was the solicitation of bids to complete the physical installation of amenities. The City of Columbus received no bids on the construction contract due to the small amount of work and multiple sites involved, so City forces were tasked with completing the work for the concrete pads, signage, and pavement markings. This was a deviation from the original plan but did not impact project goals. The costs to install each site were minor and were easily completed by the skilled labor that the City employs. Also, by utilizing in-house forces, the hubs can be more easily scaled across the City.

Prior to launch, the system had to be tested and verified that it was delivered as designed. The test plan was developed based on the project system requirements that ensure traceability with the system delivered.

The verification process also included the assurance that agreements have been completed. While not part of the construction, the execution of agreements enabled the installation of the amenities, defined the roles and responsibilities for deployment, and enabled the mobility providers to enter onto private property to deploy assets. The phases and tests conducted were as follows:

- Preliminary testing – Individual, basic tests of each function that the system was required to perform
  - IK functionality
  - Trip planning with Pivot, the Smart Columbus MMTPA installed on each IK

[112] https://smart.columbus.gov/projects/smart-mobility-hubs

- ECBs
- Wi-Fi access

- Acceptance testing – covered the functional use of the entire system
  - Validated the Application Programming Interface (API) was active and providing the Smart Columbus Operating System (SCOS) with data

11.2.2. Project Launch

The initial launch for the SMH project was anticipated to occur in early April 2020. As some of the last remaining testing items were occurring, the COVID-19 pandemic hit Columbus and delayed the launch date. While all testing and installations were complete for the project, travel in the region was greatly reduced through Ohio's stay-at-home order.

As the project team monitored travel patterns in the region as well as pandemic conditions, a revised launch date was set for July 28, 2020. While travel in the region had not returned to pre-pandemic levels, there were indications that some travel had returned – especially for workers deemed essential or those that could not work from home – and the SMH project could provide some mobility benefits. Central Ohio Transportation Authority (COTA) was operating fare-free and with some reduced service until January 11, 2021, providing some financial relief for those hit economically by the pandemic.

The launch press conference was combined with two other Smart Columbus initiatives: the re-launch of the Linden Empowers All People (LEAP) automated shuttle as a food pantry service, and the start of the public recruitment for the Connected Vehicle Environment (CVE). Because all three projects had a large footprint in the Linden community, it made sense to combine the announcements into one. Given the recommendations to limit unnecessary gathering, the press conference was held virtually. Speakers included Mayor Andrew J. Ginther, Mandy K. Bishop (the City's Program Manager), and Sophia Mohr (COTA's Chief Innovation Officer) to speak about the SMH project. While the original launch plan included demonstration rides, helmet giveaways, kiosk training, and other mobility-focused activities, this plan needed to be scaled back and the information disseminated through a press release to local, national and trade media, and posted to the Smart Columbus website.

The launch was covered in local publications including the Columbus Dispatch and Columbus Underground. Additionally, the project launch was shared with local stakeholders through area commission meetings and community partners like St. Stephen's Community House, Community of Caring Development Foundation, and Active Linden. Ads were also placed on the six SMH kiosks through IKE Smart City, the IK vendor.

11.2.3. Demonstration

Once the SMH project launched, the project data were monitored. The project team had access to IKE Smart City kiosk data, ChargePoint electric vehicle charging data, and CoGo bike-share data in addition to trips booked using Pivot that originated, ended, or traveled through each SMH. While most of the data are summarized in the Performance Measures Results Report, a few key observations are included below.

With CoGo bike-share, there were not many trips between two different SMHs (inter-hub trips). A majority of the CoGo bike users who began their rental at an SMH returned the bicycle to that same SMH, potentially using it as a FMLM connection. Many trips also ended at a non-SMH location. The introduction of the electric pedal-assist bicycles was successful, and the option became a very popular choice, accounting for 26% of bike-share trips at the SMH since the launch. The CoGo bike trips by SMH location are presented in **Figure 11-2.**

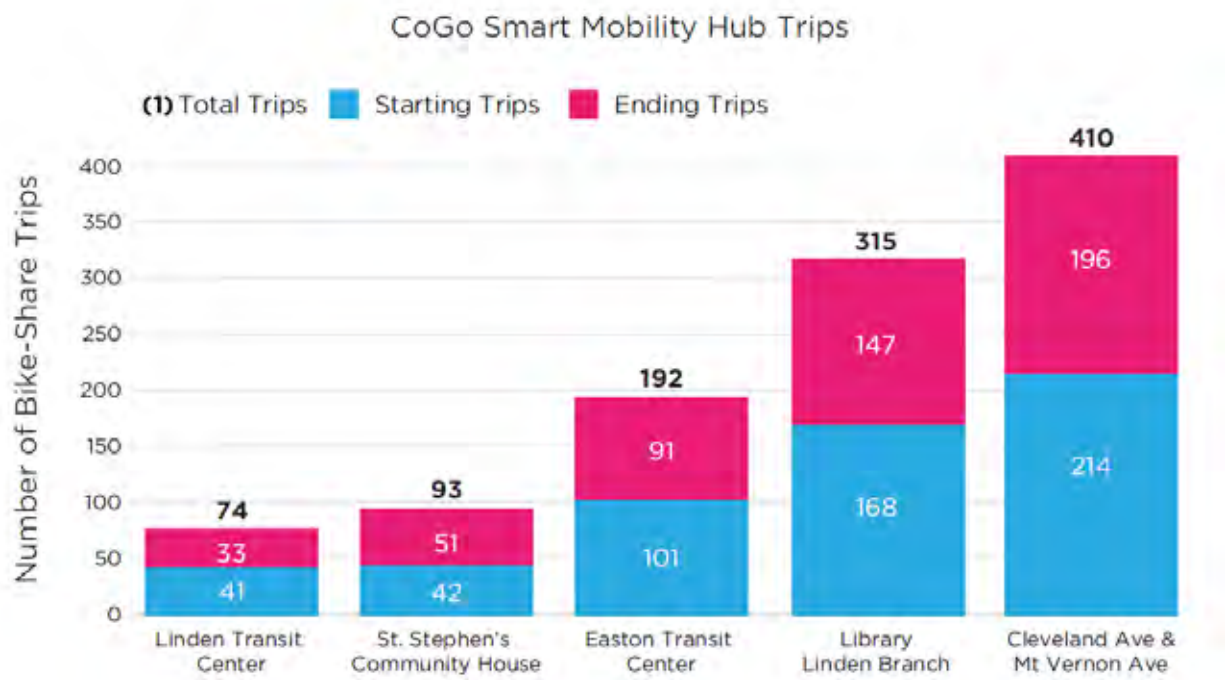


Figure 11-2: CoGo Bike-share Trips by SMH

Source: City of Columbus, https://discovery.smartcolumbusos.com/visualization/veeu0omf

Figure 11-3: A Traveler Interacts with the IKE

Source: City of Columbus

Figure 11-4 displays the IK interactions with visitors at each SMH site through March 31, 2021. An interaction with the IK is recorded when a new device carried by a traveler passes by the screen. Based on this data, the Linden Transit Center had the most foot traffic and St. Stephen's Community House had the least amount of traffic. Due to COVID-19, St. Stephen's had reduced programming, limited guests in the building, and was closed to visitors for some time. Additionally, with the kiosk being located inside the building, interactions with the IKs were drastically limited.

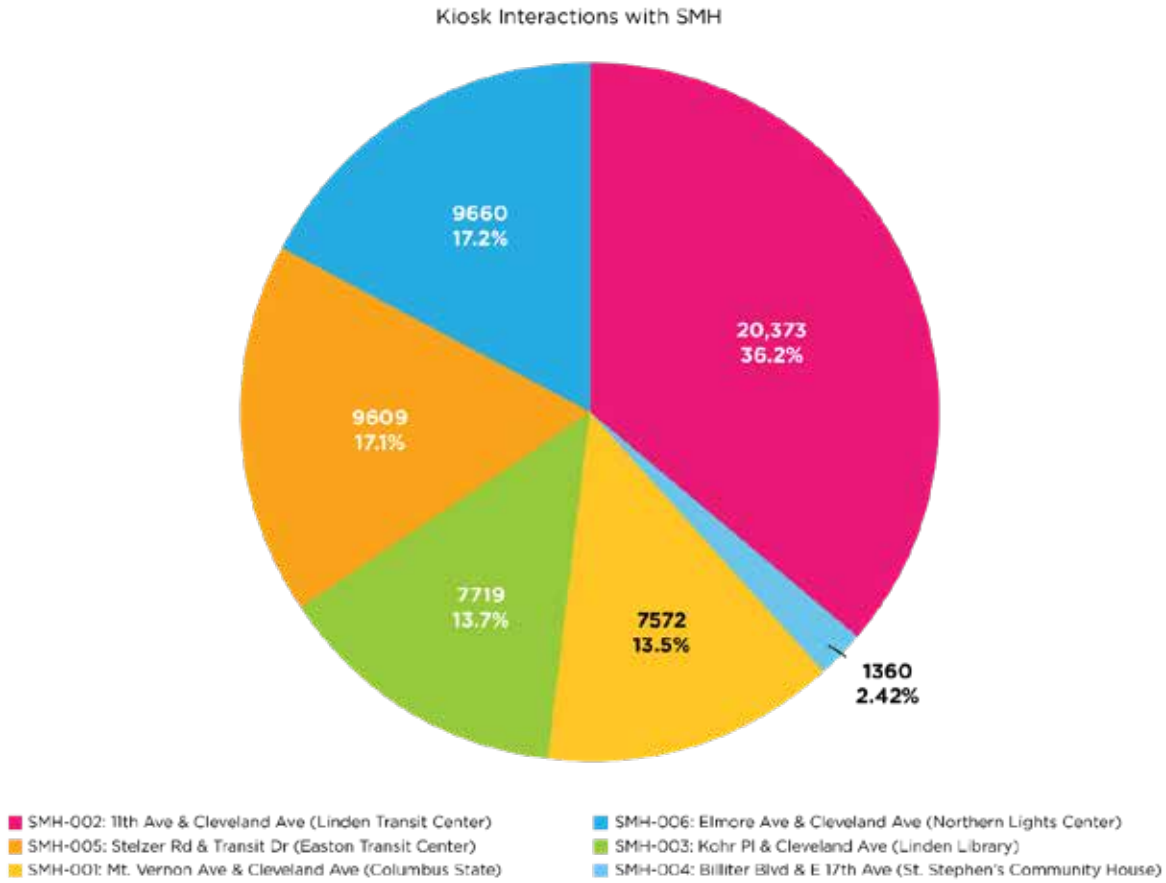


Figure 11-4: Kiosk Interactions with SMH Visitors

Source: City of Columbus, https://discovery.smartcolumbusos.com/visualization/rctetf54

Figure 11-5: Easton Transit Center SMH

Source: City of Columbus

Upon conclusion of the Smart Columbus Program, management of the SMH sites will be turned over to the private property owners, where applicable. The agreements with the site owners were developed with the sustainability of the sites in mind to ensure they outlived the demonstration project. The mobility provider agreements were also signed to continue beyond the program. It will be the responsibility of the mobility providers and site stakeholders to renew the agreements when they expire. The maintenance of the sites will transition from the City to the stakeholders, and the management of the signage and pavement markings will transition to those stakeholders.

11.2.4. Communications and Recruitment

The project publicly launched at the end of July after several months of delay due to the pandemic. Looking at multiple sources of data – traffic counts, bus ridership, kiosk interactions – it is evident that the travel volumes were significantly down compared with the time before the stay-at-home order.

In addition to reducing travel demand and use of SMH services, the reduced travel also lessened the project team's ability to build awareness. Factors that impacted the communications and outreach related to SMH included reduced bus ridership; statewide and city stay-at-home orders; public concerns about using shared mobility options; and the number of temperate weather months remaining during the demonstration period.

The key audiences were residents living or traveling within two miles of an SMH location.

Key messages included:

- SMHs bring the City's many transit options together at a single, convenient location so that you can get where you need to go, efficiently and affordably.
- SMHs are located largely along the CMAX line in the Linden area, making it easy to connect with transit and other modes of transportation to get to work, school and other destinations.
- Each SMH is equipped with an interactive kiosk known as "IKE" that provides access to Wi-Fi, Pivot, and listings of restaurants, shops, activities and social services.

- The City of Columbus has partnered with property owners throughout Linden to ensure that the SMH sites are maintained and will remain long-term community assets.
- The City of Columbus and its partners are taking significant measures to promote the health and safety of SMH users during these unprecedented times.
- Linden is leading the way in bringing smart technology and mobility into the City's neighborhoods, creating ladders of opportunity for residents, and serving as a model for neighborhoods in Central Ohio and beyond.

The key tactics to reach these audiences occurring July 30, 2020, through March 31, 2021, are listed below. These are divided into the types of media used – paid, earned, owned or shared, as **Chapter 3, Section 3.2.4** describes in detail.

11.2.4.1. PAID MEDIA

- Paid digital ads on Google, Facebook, Instagram, and Twitter
- Ads on six SMH IKE kiosks

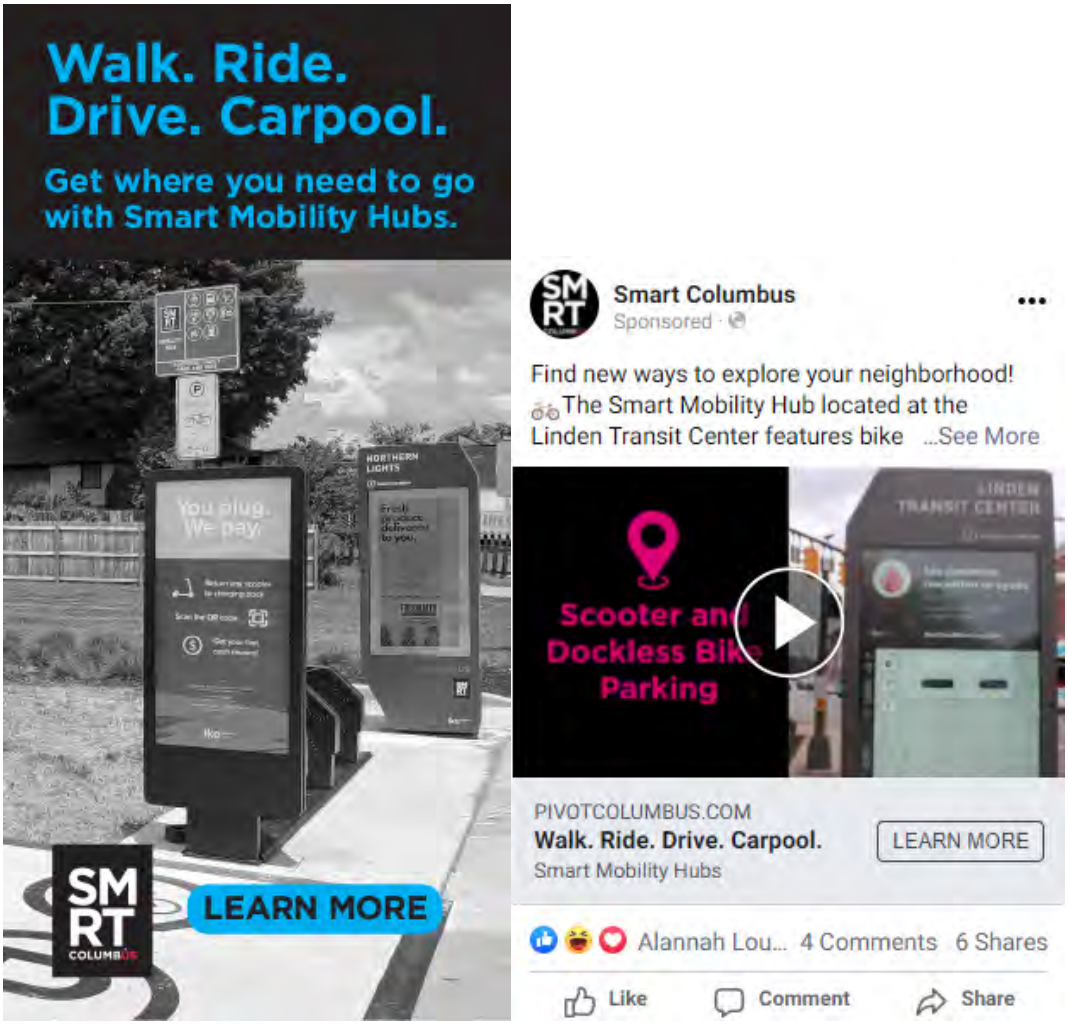


Figure 11-6: Examples of Paid Media

Source: City of Columbus

11.2.4.2. EARNED MEDIA

- Launch press conference and press release
  - Picked up by The Columbus Dispatch, Columbus Underground, and local television station

11.2.4.3. OWNED MEDIA

- Organic social media posts on Smart Columbus accounts
- Updates in Smart Columbus newsletter

11.2.4.4. SHARED MEDIA

- Stakeholder updates at area commission meetings or through community partners like St. Stephen's Community House, Columbus Metropolitan Library, Columbus State Community College, the Community of Caring Foundation, and neighborhood resident consultants known as "Linden Liaisons" utilizing a toolkit with one-page flyers, FAQ sheets, sample newsletters, social media copy and graphics, etc.
- Shared social media posts from location partners like the Columbus Metropolitan Library, St. Stephen's Community House, and Columbus State Community College
- Select community events like working with a local bike ride group to plan a ride with a stop at one of the SMH locations for short demonstration, and providing printed informational materials for inclusion in food pantry boxes at St. Stephen's Community House
- Website[113]
- Google Business Listings

[113] http://pivotcolumbus.com/smart-mobility-hubs

Figure 11-7: Active Linden Bike Ride

Source: City of Columbus

The paid digital campaign had two phases; one with a graphic and copy focus aimed at raising awareness about the new concept of SMH, and the second using videos to raise awareness about the locations and features available at each hub and to drive use of the services at the hubs.

Google Display was the best platform to help spread awareness, accruing over 2M impressions throughout both campaigns. Given the nature of the Google Display Network, click-through rate was relatively low, yet the frequency of ads and high reach contributed to keeping the SMHs in recent memory of the target audiences. In terms of engagement, Facebook performed the best not just in terms of driving website traffic, but also social interactions around the Smart Mobility Hubs. Together the campaigns drove over 16,000 post engagements, 2,000 clicks, 170 reactions, and 45 shares.

In terms of both awareness and engagement, Twitter performed at much lower rates compared to Facebook and Google and had higher costs per engaged user. Another downside of Twitter is the higher price elasticity to social events (Thanksgiving holiday, presidential election), which increased costs considerably. However, the addition of Twitter brought in the benefit of reaching a significantly different audience (predominantly male-identifying, under 39 years old) which balanced Facebook's over 35 years old, female-identifying audience and broadened the possibility for social interactions to everyone.

The communications team recommends featuring imagery of the services in photos or videos from the beginning of the campaign to increase engagement and communicate ideas faster than just through ad text. The team also recommends setting up Google Business Listings for each hub location before the project goes live, as the verification process can be lengthy. Creating Google Business Listings provides added exposure, credibility, and increased ease of use for the target audience, who is likely already familiar with using Google to find things. The ease of navigation through the listing and richness of information (e.g., service explanations, images, videos, updates) makes it an important tool. A challenge of setting up the Google Business Listing was that the City did not "own" the business being added, and sites do not have a traditional store front, so several forms of verification were needed to publish the listing including a video conference at each location.

Ultimately, reliance on paid and shared tactics was more than originally planned due to the lack of grassroots engagement activities because of COVID-19 restrictions. Providing content to partners to share on their owned communication channels was the best-performing grassroots engagement tactic. The

communication team recommends meeting with each organization to understand its unique communication needs and developing content unique for each entity, rather than developing a universal toolkit that can be shared broadly. The more customized approach helps with buy-in and aids in the content being shared more than once and in multiple ways.

When the MMTPA (Pivot) was launched in December 2020, SMH messaging was incorporated and cross promoted in the neighborhood-focused digital campaign through March 31, 2021.

11.2.5. Project Costs

Table 11-1 and the pie charts below show the cost of deploying and operating the SMH project along with the specific vendors of the project. Deployment covers the project beginning until launch on July 28, 2020. Operations covers the launch until the end of the demonstration. Of the shown deployment costs, $271,178 was expended on construction and installation.

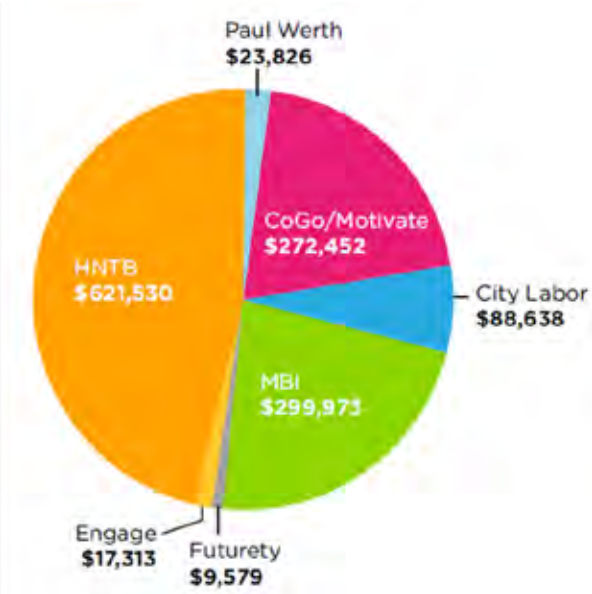


Table 55: Deployment and Operations Costs for the Smart Mobility Hubs Project

SMH Vendor Actuals	Deployment	Operations	Total
CoGo/Motivate	$197,452	$75,000	$272,452
City Labor	$73,726	$14,910	$88,638
MBI	$217,598	$82,375	$299,973
Engage	$9,885	$7,428	$17,313
Futurety	-	$9,579	$9,579
HNTB	$499,009	$122,521	$621,530
Paul Werth	$10,469	$13,357	$23,827
Total	**$1,008,140**	**$325,171**	**$1,333,311**

Source: City of Columbus

Table 11-2 provides the contributions of key leveraged partners that are not included in the project costs listed in **Table 11-1**.

Table 56: SMH Key Leveraged Partners Contributions (in Dollars)

Partner	Amount	Item
IKE Smart City	Not disclosed	Six IKs
AEP (through COTA)	Not disclosed	Three ChargePoint Level 2 Charging Stations

Source: City of Columbus

Table 11-3 provides recurring O&M costs by project, and the party responsible for the cost after the demonstration period.

Table 57: Operations and Maintenance Costs and Funding Sources

Maintenance of SMH Amenity	Responsible Party	Cost to Responsible Party	Comments
IK including ECB and Wi-Fi	IKE Smart City	Not available	Ÿ Per vendor, cost information is considered confidential Ÿ End-of-life replacement expected at ten years. Multiple components of IK will be replaced as needed over the years. Additional IK components include: Monitors replaced at five years Computers replaced at five years Modem replaced at five years Air conditioners at four and eight years, or twice in the ten-year lifespan Security network video recorder at five years or once in the ten-year lifespan Emergency call assembly at five years or once in the ten-year lifespan
CoGo Infrastructure	CoGo	Not available	Per vendor, cost information is considered confidential
Pavement markings and signage maintenance costs at SMH sites (costs below include replacement of all signage and pavement markings)			Signage and pavement markings installed will be inspected and replaced as necessary or when damaged
Columbus State Community College	City of Columbus	$2,700	Estimated cost every seven years
Linden Transit Center	COTA	$3,200	Estimated cost every seven years
St. Stephen's Community House	St. Stephen's Community House	$3,900	Estimated cost every seven years

Metro Library – Linden Branch	Columbus Metropolitan Library	$3,550	Estimated cost every seven years
Northern Lights Park and Ride	COTA	$3,450	Estimated cost every seven years
Easton Transit Center	COTA	$1,700	Estimated cost every seven years

Source: City of Columbus

11.2.6. Project Stakeholders

Each project was led by the City, with vendor support playing a critical role in implementation. Vendors were primarily responsible for planning, documentation, testing and integration, and delivery of system functionality. For SMH, these vendors and their roles are summarized in **Table 9-6**.

Table 58. Smart Mobility Hubs Project Vendor Responsibilities

Vendor	Role/Responsibility
IKE Smart City*	Kiosk supplier
City of Columbus Department of Public Service*	Infrastructure installation/construction
MTECH / Etch	Pivot developer
Michael Baker International	Project Manager
HNTB	Systems engineering documentation, Cooperative Agreement deliverables, development of installation/construction plans, testing
CoGo/Motivate/Lyft	Bike-share stations
Engage *(Community of Caring Foundation, Linden Liaisons)*	Outreach and community engagement
Futurety	Recruiting and adoption (Strategy/Planning, Digital Analysis and Audience Segmentation, Paid Digital Management/Optimization, Website Development, Tool Integration/Automation, Database Development & Visualization, Analytics)
Paul Werth	Recruiting and adoption (Strategy/Planning, Messaging, Copywriting, Graphic Design, Video Capture and Editing, Grassroots Engagement, Crisis Communications)
Fahlgren Mortine	Recruiting and adoption (Website and survey development)

**Services/responsibilities were not procured but provided through key leveraged partners or the City forces.*

Source: City of Columbus

While the project team worked throughout the Cooperative Agreement to develop, deliver, operate, and maintain the SMH project, stakeholders played a critical role in the process. **Table 7-11** summarizes the specific stakeholders that were engaged, as there were many diverse groups that came together to make the project successful. This table serves to highlight their contributions by categorizing them into three areas to indicate when their participation was used:

- **Systems Engineering –** These organizations/groups contributed to defining end-user needs, ConOps or SyRS documentation.
- **Development –** These organizations/groups contributed to the build out of the project. This includes installation, integration, testing, and recruitment/outreach planning.
- **Demonstration –** These organizations/groups contributed to the operations and maintenance of a project from go-live to end of the demonstration.

Table 59: Project Stakeholders

Stakeholder	Systems Engineering	Development	Demonstration
Government			
City of Columbus Department of Public Service	X	X	X
City of Columbus Department of Public Safety		X	
USDOT	X	X	X
Columbus Metropolitan Library	X		X
Clinton Township		X	
Community-Based Organization			
St. Stephen's Community House	X		X
Active Linden			X
Mobility Provider			
COTA (property owner and mobility provider)	X		X
Mobility Providers (CoGo, Columbus Yellow Cab, Lime, Spin, Link)			X
Private Entity			
IKE Smart City	X	X	X
Educational			
Columbus State Community College	X		X
Tourism			
Experience Columbus	X		

Source: City of Columbus

11.3. PROJECT EVOLUTION

This section details how the SMH project evolved from its original conception during the development phase through the systems engineering process and to deployment. **Figure 11-8** summarizes the general timeframe for the project as it relates to SMH's major activities.

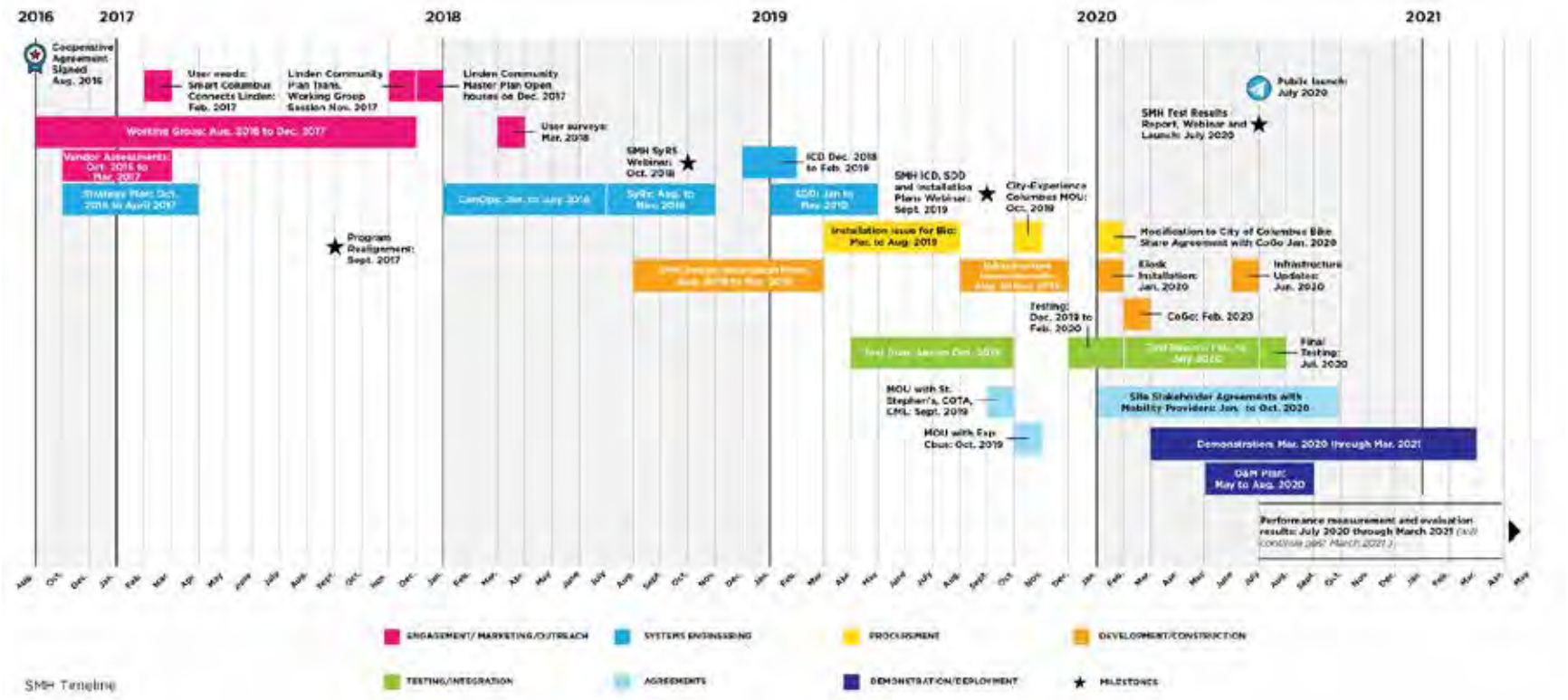


Figure 11-8: Smart Mobility Hubs Project Timeline

Source: City of Columbus

11.3.1. Scope – The Proposal

Volume 1 Technical Application for the Smart Columbus Program identified "Neighborhood Hubs" to support the COTA CMAX corridor and provide a variety of transportation options to facilitate FMLM connections, as well as access to the jobs and amenities that were cut off by the construction of Interstate 71. These multimodal service hubs were envisioned at the start to include the following components:

- Dedicated Short Range Communication (DSRC) radios
- Security features (CCTV and emergency call boxes)
- Multi-function kiosks providing transit service information, FMLM and vehicle sharing request and information, bike sharing information, and parking availability information
- Automated by-request shuttle service at Easton hub
- Wi-Fi hot spots
- Pedestrian detection
- Traveler information
- Payment kiosks

The City's original Technical Application identified how the City intended to partner with COTA and one or more kiosk vendors to monetize its downtown kiosk installations to support a more robust kiosk installation in the Linden neighborhood and in support of the new COTA CMAX Bus Rapid Transit (BRT) project. The City would work with its procured vendor or vendors to install numerous kiosks downtown, and approximately ten kiosks at key locations in Linden and along the CMAX corridor to facilitate access to public transit, as well as transitions to other modes. These locations were envisioned as "Neighborhood Hubs" and would be located at key locations outside Linden to provide information access and trip planning to Easton Town Center, Columbus State Community College, and Downtown Columbus.

The Neighborhood Hubs would be used to facilitate FMLM travel by supporting a range of modal options. The City would expand the CoGo bike share service in Linden. It was proposed that a car-share partner would be engaged to provide access to this service. Finally, Neighborhood Hubs with parking facilities, like the Northern Lights Shopping Center, would enable car owners to transfer to the CMAX line, and avoid downtown parking and congestion. These parking facilities were to include electric charging stations to encourage electric vehicle use.

11.3.2. System Delivered

Through several workshops in the Linden Community, the project team determined that there were six preferred Smart Mobility Hub locations based on the input received and where the community saw FMLM gaps. To identify the mobility services to be provided at each site, the project team then transitioned to coordinating with the site stakeholders to deploy what was preferred by the property owners, and what fit within existing geometric constraints. The amenities at each of the six SMHs are outlined in **Table 11-6**. Continual stakeholder engagement was critical in transforming the high-level vision of SMHs into a product that would meet the real needs of the community.

Table 60: Amenities at Smart Mobility Hubs

	Amenities												
Location	IK	Wi-Fi	Park and Ride	Pickup/Drop-Off Zones	Car-Share	Bike-Share	Bike Racks	Dockless Parking	Real-Time Display	Comprehensive Trip-Planning	ECB	Electric Vehicle Charging*	Automated vehicle (AV) Shuttle**
Columbus State Community College													
Linden Transit Center													
Metro Library – Linden Branch													
Northern Lights Park and Ride													
St. Stephen's Community House													
Easton Transit Center													

= installed, = existing

**While defined in the SMH project documents, this was pursued outside of the scope of this project by COTA.*
***This is part of the CEAV project, another project in the Smart Columbus portfolio.*

Source: City of Columbus

Figure 11-9: Traveler Undocks CoGo Bike-share at CML-Linden Branch

Source: City of Columbus

Table 11-7 describes the amenities deployed at the SMHs.

Table 61: Amenity Descriptions

	**Interactive Kiosk** The IK is a standalone touchscreen information device used to deliver a variety of services for travelers including: Ÿ **Traveler Information Service –** This service provides travelers transportation-related and community centric information services, including access to Pivot to plan multimodal trips. Ÿ **ECB –** This service provides a physical button affixed to the exterior of the IK that initiates a direct audio connection to the 911 emergency call center operated by the City of Columbus upon activation by the traveler. Ÿ **Wi-Fi –** This service provides complementary, publicly-accessible Wi-Fi at SMH locations for travelers using a personal wireless device to access the internet services.
	**Ride-Hail Pickup/Drop-Off Zone** Pickup and drop-off zones are available at select SMH facilities in the form of pull-off lanes and/or parking spaces located away from travel lanes that allow for the safe transfer of passengers for ride-hailing opportunities.
	**Car-Share** Car-share parking spaces are available at select SMH facilities for staging or parking car-sharing vehicles.
	**Dockless Device Parking** Designated zones are available for parking dockless devices, such as scooters and e-bikes, located at the SMH sites within the deployment boundaries of the devices.
	**Park and Ride** Designated locations are available at select sites that allow a traveler the option to complete a segment of his or her trip using a personal vehicle where he or she can use the SMH amenities to continue his or her trip using alternate modes of transportation like transit.
	**Bike-Share Docking Station** Physical locations were identified at most SMH facilities for docking stations for privately operated bike rentals using a back-end software system.
	**Bicycle Parking** Outdoor bicycle racks are a common short-term bike parking option offered at the SMH facilities for personal bicycles.
	**Bus Service** COTA provides bus facilities and vehicles along the Cleveland Avenue corridor. Most of the facilities were located at or near CMAX stations.

	**Electric Vehicle Charging Station** Free charging at the Northern Lights Park and Ride was provided through three electric vehicle stations and six J1772 Level 2 outlets through a deployment by COTA and supported by an installation grant through American Electric Power (AEP).
	**AV Shuttle Service** A shuttle service between the Linden Transit Center and St. Stephen's Community House SMHs providing a FMLM option for travelers, and demonstrating automated technology deployed by the City of Columbus through the Connected Electric Autonomous Vehicles (CEAV) project. The service operated for two weeks before a minor on-board incident paused passenger service, which was not restarted due to the pandemic. The shuttle service returned as a food pantry delivery service into the Rosewind Community, Central Ohio's largest public housing development.

Source: City of Columbus

11.3.2.1. CHANGES BETWEEN CONCEPT AND DEPLOYMENT

From the original application vision, the final delivered product did not include DSRC radios, pedestrian detection, or payment kiosks. DSRC and pedestrian detection did not surface through the public engagement process, so they were not viewed as user needs, and ultimately they were removed from the project. Payment kiosks, as originally described, would have been accommodated through COTA's Ticket Vending Machines (TVMs) that are located at limited COTA facilities. COTA indicated a hesitance to deploy more TVMs across the City and the TVMs did not surface as a user need through the public engagement, as the TVMs cited limited use. The TVMs were also removed from the project.

Some key takeaways from the SMH deployment are as follows:

- **Kiosks –** As the development of the Concept of Operations (ConOps) and SyRS progressed, the project team became aware of a kiosk deployment already underway within the City of Columbus. The original vision encompassed working with one or multiple vendors, and this was anticipated to be a procurement. However, with the planned deployment of kiosks around downtown and the Short North, the project team engaged kiosk contract holder Experience Columbus and kiosk vendor IKE Smart City to determine how to add the SMH locations to the deployment. The goal of the project team was to provide a consistent experience for all in Columbus, as any procured kiosks for the SMH that differed from the rest in the City could provide a negative perception. The kiosk system offered by IKE Smart City was vetted to verify that it met the requirements specified in the systems engineering documentation prior to installation.
- **Bike-Sharing –** Per the original scope, the project team worked with the site stakeholders and the existing bike-share provider (CoGo) team to determine the best locations for deploying new bike-share infrastructure. Looking at historical ride data, it was determined that the average trip on CoGo was one mile; therefore, the project team used that distance to locate which SMHs were the best candidates for a docking station based on the SMH's distance from another docking station. Columbus State Community College already had a bike-share dock, and based on the analysis, the project team identified three other locations: Linden Transit Center, St. Stephen's Community House, and Columbus Metropolitan Library – Linden Branch. The distance to Northern Lights Park and Ride was too great to recommend docking infrastructure, and Easton was significantly outside of the service area. However, during the project, the private developer of the Easton Town Center procured six CoGo bike-share docking stations and bikes for visitors to use around the area. The Easton Transit Center was situated less than one mile from the nearest new bike docking station, so the project team also included the Easton Transit Center SMH location in the bike-share deployment,

enabling visitors to Easton to ride transit and use bike-share rather than driving to Easton to then use bike-share.

- **Electric Vehicle (EV) Charging –** EV charging was envisioned in the original scope, particularly at the Northern Lights Park and Ride. The project team decided not to deploy this infrastructure on COTA's property but rather coordinated with COTA to have it secure a grant for the EV charging equipment through AEP. Therefore, this scope item was satisfied by other Smart Columbus leveraged partners.
- **Scooters –** A new addition to the mobility landscape that was not anticipated during the application and scoping process was the emergence of electric scooter sharing. These devices exploded onto the scene nationwide, and Columbus was no different. While some cities banned the scooters until regulations were developed, Columbus' leadership decided to allow the scooter operation to continue while working together with the mobility providers to develop the regulations. During discussions with the property stakeholders, the project team recognized the need to deploy designated dockless device parking areas to enable better site organization at the SMHs, expecting that this affordable transportation option would be attractive to many in the community. Therefore, the scope of the project was widened to accommodate this mode.

11.3.3. Site Stakeholders

Working with SMH site stakeholders was key to the success of the Smart Columbus Program. Each of the site stakeholders was responsible for the ownership and maintenance of their sites, and any improvements or access that the project was granted had to have minimal impact to the business operation of the site. Input and agreement were also required to finalize the physical design of the SMH, particularly where parking facilities, drop-off lanes, or other space-intensive uses needed to be dedicated to particular mobility services. Even in the instance of Columbus State Community College, where no improvements were on private property, the coordination between the project team and the stakeholder allowed the SMH to be installed in a fashion that did not impact the campus master plan and future improvements to the adjacent property. The site stakeholders also provided critical input on the modes available at each site. There were geometric constraints that prohibited some improvements, such as a park and ride where few parking spaces were available, or other considerations such as traditional bike racks leading to site clutter or other challenges.

11.3.4. Leveraged Partners

While the project team was finalizing the SyRS and preparing to develop procurement documents for the SMH, the team became aware of an existing agreement to deploy IKs throughout the City. Experience Columbus, the regional tourism agency, was the holder of the contract with IKE Smart City for kiosk deployment in Columbus. An evaluation was performed of the capabilities of the IKE Smart City product to determine if it met the needs identified in the ConOps and the SyRS. When it was determined that the product was appropriate for the SMH deployment, the project team entered into discussions with Experience Columbus to leverage its existing contract. Experience Columbus saw the potential of the SMH anchored with a kiosk and allowed a contract modification to include the six selected hub locations.

Since the IKE Smart City product is entirely advertising revenue supported, there was no cost to the City of Columbus for the installation of the six kiosks at the SMHs.

IKE Smart City played an important role in the development of the Interface Control Document, the System Design Document, and the testing procedures development. The project team needed to make the specifics of those documents, and the testing procedures, more granular and applicable to the system being deployed within the context of the SMHs. The project team regularly held meetings to discuss key

developments and make decisions. Further, after IKE Smart City was on-boarded as the contractor, additional discussions finalized the location of the IKs, developed site access and power-sharing agreements, and determined where the power for the kiosks would come from – either from new connections to the public utility, or from the stakeholder buildings.

11.3.5. Challenges

11.3.5.1. PANDEMIC

The most significant challenge that impacted this project was the COVID-19 pandemic, as it was completely unexpected and unprecedented. The launch date for the project was targeted for early April 2020, shortly after the pandemic began to impact the United States, and around the time that Ohio began implementing restrictions. COTA also requested that all trips on its buses be limited to essential travel and reduced the routes, frequencies, and operating hours. Therefore, mobility in the Central Ohio region sharply declined. Even as businesses began to re-open and the travel restrictions eased, most of the travel in the region did not recover to pre-pandemic levels during the demonstration. The project team decided it was appropriate to launch the Smart Mobility Hubs in July so that those that did rely on public transportation for work could benefit from the services, recognizing that this would have a significant impact on data collection and performance evaluation. The full extent to which the project could have helped the community may not be known until travel and the economy begin to recover, and schools start to re-open.

11.3.5.2. PAYMENT AND BOOKING

The original scope and vision included payment kiosks, largely for purchases of COTA transit passes/fares. When developing the ConOps and SyRS, the project team identified that users should be able to book other modes of transportation from the kiosks to help bridge the technology gap. Through the SyRS phase, it was identified that the MMTPA would be installed on the kiosks and would provide access to a Common Payment System (CPS) to book trips. While the original plan envisioned all modes, technical challenges arose that led to limiting the modes available on the CPS. For instance, scooter companies need to know the location of the device and the user needs to lock the device at the end of the journey to complete the trip and end the billing. This relies on a traveler's cell phone and was not feasible to complete using a stationary kiosk. The project team continued to explore modes that would work under this model and was pursuing CoGo bike-share, COTA transit, and Yellow Cab ride-hail. However, the CPS was removed from the Smart Columbus portfolio in the summer of 2020, resulting in payment options being removed from the SMH project. In addition, due to low usage, COTA expressed a lack of interest in deploying ticket kiosks at additional locations throughout the City beyond the few that existed when the program started. Therefore, standalone payment kiosks were not part of the final product delivered.

11.3.5.3. USB CHARGING

From the user needs sourced in the ConOps, it was proposed to provide USB charging at the Smart Mobility Hubs for travelers to add power to their mobile devices. During development of the Data Privacy Plan, a security audit flagged this item as a concern. With the USB charging located in the public space and unmonitored, it opened the door for nefarious activity utilizing USB skimmers. Skimmers collect the private information from a personal device and can provide it to someone with malicious intent. Therefore, the project team made a decision with project stakeholders to remove these from the project. Most sites provide building access where travelers could use a wall outlet to charge their devices.

11.3.5.4. CAR-SHARE

When the scope was developed, car2go was operating a car-share in the City. As the project progressed, car2go ended its operations in Columbus, and Zipcar came into the City; however, the operations and deployment areas of Zipcar did not align with the SMH locations, so the project team and the mobility provider could not reach an agreement. The project team still dedicated space for car-share parking at some of the SMHs in anticipation of future car-share providers coming into the City and to provide dedicated parking locations for the Zipcar fleet for the users, understanding that car-share vehicles would not be staged at those locations.

11.3.5.5. AGREEMENTS

A challenge that was expected was the difficulty of executing all of the mobility provider agreements between the site stakeholders and the mobility providers. Each mobility provider needed to enter into an agreement with each site stakeholder where the amenity was to be placed on private property.

The project team recognized that since agreements would be necessary it would be best to have them as similar as possible across all stakeholders.

COTA was in the process of developing agreements for the agency's own mobility hub initiative, so the City worked with COTA to use its agreement as a model for St. Stephen's and the Columbus Metropolitan Library. By doing so, the level of effort to review the agreements from the City and mobility providers' perspectives was minimized. Even though there were minor differences in the agreements, at the core they were largely the same. With varying business models and different legal departments, it was originally expected that the agreements could take some time to be signed. The agreements were provided to the mobility providers for review, edits, and execution beginning in November 2019. Some of the agreements were signed as early as May and June of 2020. However, some took almost an entire year for execution, with COVID-19 having some impact on this timeline due to mobility providers reducing workforce. The length of time for executing the agreements was longer than anticipated. Not all of the agreements were signed by the launch, but at least one agreement for each type of mode was available when the project went live. Ultimately, the City of Columbus was not able to coordinate agreements between the site stakeholders and the Transportation Network Companies (TNCs) – Uber and Lyft – because they had their own vision on a national scale and did not want disparate agreements, terms, and layouts from city to city. Because the state regulates TNCs, the City had little leverage to encourage an agreement but was able to accommodate ride-hailing through Columbus Yellow Cab.

11.4. CONCLUSIONS, LESSONS LEARNED AND RECOMMENDATIONS

The service gaps that the SMH intended to address were as follows:

- Lack of physical facilities offering trip-planning, multimodal transit options, and other amenities at centralized locations
- Limited FMLM transportation options; these limitations make it difficult for transit-dependent residents to access basic services such as health care, grocery stores, and banking
- Inadequate optimization of ride-sharing
- Exclusion of unbanked users and users without smartphones from travel options
- Lack of adequate safety features like ECBs at transit facilities

Through the visioning, design and deployment phases, the project team was able to address all of the gaps to some degree except for the exclusion of unbanked users and users without smartphones from travel options. The gap was largely intended to be addressed through the inclusion of the MMTPA/CPS on the

kiosks. As the MMTPA/CPS project developed, challenges arose with enlisting mobility providers in the CPS and that part of the project was removed from the Smart Columbus Program. In addition, it became evident that it was not feasible to facilitate the unlocking of some mobility options, such as dockless scooters or ride-hailing service, away from the IK without a smartphone. These modes have been developed with the smartphone at the core of the system architecture, and few mitigations exist to accommodate the lack of a smartphone, especially ones that would align with the design of the MMTPA.

The SMHs continue to provide modal choices and mobility information for travelers to reach their destination. SMHs may require ongoing coordination with stakeholders, such as private businesses, COTA, and the Department of Recreation and Parks. The Department of Public Service will take ownership of the SMH project and coordinate further implementation. Additional neighborhoods and mobility corridors are being studied as part of the City's mobility plan, LinkUS. Opportunities to include SMHs in LinkUS will be identified and implemented using the framework developed by the Smart Columbus Program and COTA's mobility hub program. The existing sites have agreements with the private property owners to ensure they continue beyond the demonstration.

The SMH project addressed the City challenges and met the original expectations defined in the City's Smart City vision. The project addressed transportation challenges by deploying applications and strategies in the following USDOT's vision elements in **Table 11-8**.

Table 62: Smart Mobility Hubs Project Relationship to USDOT Vision Elements

VISION ELEMENT #3 Intelligent, Sensor-based Infrastructure 	Deployed IKs that integrate Pivot and bike-share docks that report the number of available bikes.
VISION ELEMENT #4 User-focused Mobility Services and Choices 	SMH deployed ten different mobility enhancements across six sites to give travelers options.
VISION ELEMENT #7 Strategic Business Models and Partnering 	Partnership with Experience Columbus enabled kiosks to be deployed at no cost to the City, in addition to partnering with site stakeholders at the six hub locations. Overall a low-cost project that through a private-public partnership deployed informational kiosks to enhance mobility.

	Through coordination with COTA, the project deployed EV charging at the Northern Lights Park and Ride.
	With the installation of the kiosks at the SMH, the project was able to provide technology access to help bridge the digital divide, as well as Wi-Fi access points to address those with limited access to data plans or internet.
	Developed ITS architecture using Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) / Systems Engineering Tool for Information Technology (SET-IT) for the repeatable deployment of mobility hubs.
	Brought together technology, transit sites, privately owned land, and existing right-of-way in support of transit-oriented development by maximizing mobility options to support of CMAX BRT with FMLM connections.

Source: City of Columbus

11.4.1. Conclusions

- Public and stakeholder input is critical to identify the transportation challenges and needs of the residents and business community.
  - Engaged with stakeholder groups and residents to identify locations where better transportation and technology access would benefit the community to address issues in safety, mobility, and access to opportunity.

- The deployment of the SMHs was inexpensive considering significant construction was not required, with expenses of approximately $250,000 on infrastructure (concrete, signage, pavement markings) and bike-share stations and bikes to deploy six SMHs.
  - Coordinated with COTA as it applied for an AEP grant for EV charging at Northern Lights Park and Ride
  - The City of Columbus was able to leverage the existing kiosk contract that is advertisement-supported to install the six kiosks at no cost to the City.
- Once a vision for the project concept, user needs, and participating mobility providers are identified, the construction of the sites can be accomplished quickly: in the case of the SMH, site survey, design, permitting, and construction can be accomplished in months if using in-house forces to construct.
- There are opportunities to seek efficiencies in contracting and delivery:
  - Creating one similar site access contract that was used by all site stakeholders worked for all parties and reduced the need for each mobility provider to review up to three different site access contracts.
  - Even with unified contracts, the SMH project team spent several months negotiating and executing the first mobility provider agreement, with remaining agreements taking up to a full year to execute. Reaching agreement between stakeholders and mobility providers requires careful schedule budgeting and continuous communication and coordination between the parties.
  - Leveraging partners and existing agreements and contracts, such as the existing city-wide IKE Smart City kiosk agreement with Experience Columbus, to avoid a lengthy procurement process.
- The project installations extended mobility accessibility into Linden, provided access, allowed residents to live their best lives. The CoGo for All program connected affordability of bike-share with the access provided through the Smart Columbus Program. CoGo for All provides eligible participants with a $5 annual membership and unlimited 45-minute classic bike trips ($.05 per minute for rides longer than 45 minutes). The program is available to all Central Ohio residents, aged 18 and older that receive Medicaid, SNAP (WIC, EBT, and EBT), or a discounted utility bill.

Bike-Share Provides First Mile/Last Mile Connections from Smart Mobility Hubs

"By placing CoGo Bike Share stations at Smart Columbus Mobility Hubs, we are able to integrate an important first mile/last mile solution for the Linden community that helps residents complete connections to the greater transportation network and links them to essential resources like healthcare, libraries, groceries and jobs."

Chet Ridenour, CoGo Bike Share Operations Manager

11.4.2. Lessons Learned

- Schedule delays should be accounted for in project planning, with contingency included if possible. In the case of the SMH project, specific examples of delays that include:
  - Specific requirements for IKs – such as specifying an indoor unit with the ECB – delayed delivery and installation. The indoor units are slimmer due to the absence of heating and cooling elements.
  - Even with an existing bike-share contract, delivery of the bike-share docking stations took more time than anticipated due to the ordering process of the vendor amongst its various cities.
- Emerging technologies demand adaptability in deployment. Many of the emerging modes, such as scooters, e-bikes, and car-shares are new businesses that can quickly enter and exit the market. Accommodating these modes requires:
  - Flexibility during the project development and design process. In the case of the SMH project, there were several examples:
    - The project had to accommodate scooters after they arrived in Columbus.
    - CoGo bike-share expanded its deployment area into Easton and enabled the City to increase the mobility options at the Easton Transit Center SMH.
    - One car-share company left the Columbus market. Another entered; however, it did not express interest in the project sites. A third car-share provider is currently entering the market and does have interest in deploying vehicles at the SMH sites.
  - Accounting for plan adjustments, since some final locations can change during the final permitting phase due to access to power, specifically with the kiosks.
- Solidifying mobility providers' participation requires clear definition of terms and the projection of potential benefits though the project may not tie into their larger business models. For example:
  - Not all mobility providers wanted to participate in the program and the City had little control over the situation, particularly the providers that are not regulated at the City level like TNCs (Uber and Lyft), though ride-hailing was satisfied through Columbus Yellow Cab.
  - Some mobility providers did not want to enter into agreements with private entities nor did they want a lack of consistency from city to city of how they approach mobility hubs nationally.
  - While some leg work can be done up front to educate providers on what an agreement may look like, most were unwilling to consider/finalize participation until exact terms are determined.
- It is especially important when advancing technology and mobility projects, especially those that are integrating multiple modes, to use a unified technology approach so that the efforts and projects taking place elsewhere in the agency and through other funding sources can be leveraged and brought together for the benefit of all stakeholders and projects. For example:
  - Kiosks were being deployed across the City by the City's travel and tourism agency. Using the same kiosks that met a majority of the requirements presented a consistent approach to technology deployment in opportunity neighborhoods.
  - It made sense for property owners to leverage other available grants for EV charging so the City supported and encouraged COTA to take the evolutionary and revolutionary steps to integrate charging into the management and operations of locations with parking including Northern Lights Park and Ride.

Interactive Digital Kiosks are a Smart Solution to Mobility Challenges in Columbus

When planning the launch of an IKE network in a new city, one of IKE Smart City's goals is to equitably distribute the kiosks in locations that are easily accessible to the public. Installing digital wayfinding kiosks in the Linden neighborhood of Columbus, OH, where Smart Mobility Hubs were located, was a critical component in solving the complex transportation and mobility challenges found in growing urban populations. Amongst its many features, IKE offers comprehensive wayfinding tools, including maps, step-by-step directions, and real-time transit information such as bus schedules, scooter and bike-share availability, and multi-modal travel times.

Consistency is important to community adoption of interactive digital kiosks. Deploying a cohesive network of wayfinding kiosks as Columbus has done provides users with the same experience at each kiosk location. This approach builds familiarity with and affinity for the platform so that the public can easily find and use the kiosks as they navigate from place to place throughout the city.

Randall Sistrunk, Director of Development, Orange Barrel Media and IKE Smart City

- Even in a pandemic, the importance of communications throughout the process should be stressed. For the SMH project, while it was difficult to measure the impact of communications due to lack of interest in shared rides during the pandemic, the communications efforts of the project team throughout the process not only were critical to gaining and sustaining partner involvement, they are also setting the project up for sustained success by educating the community on awareness and understanding new options and tools.

11.4.3. Recommendations

For agencies considering the deployment of mobility hubs, the SMH project team recommends:

- Align goals and locations early in the process with stakeholders, as user needs may grow and may change from what is first gathered. To the extent feasible, stakeholders should remain engaged as the project continues development so that changing needs can potentially be incorporated. Be adaptable to changes during design, construction, and deployment as well as the systems engineering process to accommodate the pace of emerging technologies.
- Develop standardized stakeholder agreements between public and private entities, where applicable, for quicker legal review time. These agreements will facilitate construction on the site and should address the sustainability of the site.
- Coordinate with mobility providers regarding the project vision and the business case: mobility hubs are the building blocks for Mobility as a Service (MaaS). This can help align mobility providers to participate in the program, though not all mobility providers will align and instead pursue their own path.
- Identify the data desired and have discussions with partners to assure they can be collected to measure the performance of the mobility hubs as well as build the business case for future scaling of the project and engagement with mobility providers.

- Identify a champion and long-term owner to develop a public-private partnership; this will make agreements and outreach easier and promote the scaling hubs around the city for the mutual benefit of both businesses and residents.

11.5. SUMMARY

The SMH project combined traditional systems engineering methods (V-Model) while leveraging innovative partnerships (Experience Columbus and Orange Barrel Media and its IKs) to complete the project on schedule and within budget. Unanticipated challenges centered on the planning and coordination required to solidify agreements with site stakeholders and participating mobility providers, and, of course, the impact of COVID-19 which delayed the launch and altered the communications strategy around user adoption.

Despite these challenges, however, the six SMHs launched with minimal delay, and will be sustained after the Cooperative Agreement ends and become part of the mobility ecosystem in Columbus. The SMHs are a support service to enable MaaS deployment, and as travel returns to the region, it is anticipated that mobility hub use will increase. These continued lessons learned will support growth and further deployment of SMHs across the City to enable transit-dependent residents to better access basic services such as health care, grocery stores, and banking.

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR