

A Comprehensive Guide to Implement a Mobility Hub for Multifamily Households in Palo Alto, CA to Reduce Vehicles Miles Traveled and Greenhouse Gas Emissions

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Executive Summary

Background and Purpose

Transportation is the largest source of greenhouse gas emissions in Palo Alto. The city has committed to reduce its emissions by 80% from the 1990 level by 2030, while achieving full carbon neutrality in the same year. However, a critical barrier to achieving this goal is the unequal distribution of EV charging infrastructure. Roughly 25% of Palo Alto households own at least one electric vehicle, but 42% of them live in multifamily housing with outdated electrical infrastructure that makes home charging difficult. In this case, this project was commissioned by the city of Palo Alto, aiming to expand the accessibility of EV charging for multifamily households with a mobility hub. This project develops a planning framework and pilot site concept that prioritizes locations near multifamily neighborhoods. The hub would integrate EV charging with shared micromobility options, such as e-bikes and e-scooters, bicycle parking, real-time transit connections, and communal amenities. In addition to expanding charging infrastructure, the goal is to influence long-term behavioral change away from single-occupancy vehicle use by closing first and last-mile gaps and encouraging shared and low-cost transportation modes.

Methods and Key Findings

The research team conducted a three-layer literature review encompassing international mobility hub models, U.S. and European case studies, and Palo Alto-specific analysis. There is a combination of both quantitative data and qualitative analysis. Quantitative data from the City informed assessment of EV adoption, charging availability, zoning, and land use patterns, while qualitative analysis drew on best practices from cities including Boston, Minneapolis, Denver, Amsterdam, Vienna, and Manchester. Across all cases reviewed, the evidence consistently shows that hub performance depends less on the number of services offered and more on how well those services align with users' actual travel patterns. Besides, proximity to multifamily housing and reliable high-frequency transit is the strongest predictor of hub utilization and sustained mode shift. Low-friction and seamless transfers between modes further reinforce behavioral change, while fragmented or confusing transitions push users back toward private vehicles. For case studies, European programs demonstrate the additional value of clear branding, universal physical and digital design, and micro placemaking elements. For example, seating and greenery, and community co-design processes are embedded throughout the planning lifecycle. U.S. cases highlight the importance of equity provisions, including discounted access, non-digital payment options, and targeted siting in underserved areas. Both contexts affirm that mobility hubs are most effective when they complement robust transit rather than operate in isolation from it.

Design Guidelines and Components

Based on these findings, the report presents a comprehensive design framework organized around four component categories: transit and active transportation facilities, access facilities and services, technology and wayfinding, and placemaking. Several core infrastructure

recommendations include dedicated EV charging stations with accessible design and real-time availability monitoring, bikeshare docking with direct connections to transit stops, designated pick-up and drop-off zones, covered bus shelters, and secure bicycle parking. For technology components, real-time travel information displays, intuitive multilingual wayfinding signage, QR-code-based trip planning links, CCTV cameras, and public Wi-Fi with device charging ports are important. Lighting, drought-tolerant landscaping, community art, seating areas, and small retail amenities belong to placemaking elements. These components are framed not as decorative additions but as functional safety and utilization multipliers that increase dwell comfort and encourage repeat use. The report also identifies key implementation challenges including local grid capacity constraints, ongoing operations and maintenance costs, equity risks such as potential displacement from rising property values near the hub, and the risk of public resistance from residents accustomed to car-dependent travel.

Pilot Site Evaluation and Recommendations

Three candidate pilot locations were evaluated using a six-criterion scorecard covering proximity to multifamily housing, access to daily amenities, public transit connectivity, use of existing parking infrastructure, VMT reduction potential, implementation feasibility, scalability, and equity benefit. Location A, a surface parking lot at 3997 Fabian Way along San Antonio Road, ranked highest across criteria. It is surrounded by medium- to high-density multifamily residential buildings, sits within a mixed-use corridor containing schools, parks, restaurants, and community facilities, and is served by the ACE Orange line and multiple bus routes within 0.1 to 0.5 miles. Critically, the presence of an existing surface parking lot enables adaptive reuse without major land acquisition or demolition, supporting low-cost phased implementation. Location B, Herbert Hoover Park at 2901 Cowper Street, scored comparably on housing proximity and transit access but is constrained by limited existing parking infrastructure and higher costs for electrical grid connections. Location C, Juana Briones Park at 609 Maybelle Avenue, offers strong housing proximity, transit access, and VMT reduction potential but lacks existing parking infrastructure and faces scalability limitations due to surrounding physical barriers.

Metrics, Community Engagement, and Next Steps

The report proposes a performance evaluation framework organized around four outcome areas: Mobility and Travel Behavior, Accessibility, Equity and Housing, and Environmental and Community Outcomes. Given the difficulty of directly measuring VMT reduction at the hub scale, the framework relies on proxy indicators, intercept surveys, operator data, and disaggregated equity metrics to assess whether the hub is achieving its goals across different user groups. A community engagement roadmap outlines two groups of users as primary groups: “hub huggers” and transit-dependent residents. Secondary groups comprise commuters and occasional users. Furthermore, a competitive matrix is included to benchmark the proposed transportation hub against existing modes of travel (driving alone, ride-hailing services, and

private bicycle ownership). The roadmap recommends early stakeholder mapping, participatory design workshops, pilot testing with iterative feedback loops, and ongoing post-implementation monitoring through digital tools, QR-code kiosks, and qualitative user interviews. The report concludes that with strategic site selection centered on Fabian Way, strong community engagement, and a phased implementation approach, Palo Alto has a viable pathway to deploy a scalable mobility hub program that meaningfully advances its climate, transportation equity, and carbon neutrality commitments.

1. Introduction

1.1 Background

The City of Palo Alto is interested in designing and implementing a mobility hub to promote sustainable and accessible transportation options, including Electric Vehicle carshare, micromobility services (e-scooters/bikeshare), transit, EV charging.

The City would like to determine if a well-designed mobility hub is a scalable option to reduce both vehicle miles traveled and greenhouse gas emissions, if it contributes to a more equitable transportation system, and if it enhances overall accessibility for various users.

1.2 Goals & Objectives

Road transportation represents the largest percentage of Palo Alto's existing carbon footprint – and a congestion headache. Replacing a portion of vehicle trips with active transportation modes, such as walking, biking, and transit, is critical to reducing emissions in the transportation sector. Palo Alto has a strong biking community and multiple transit options, making it easy for residents to choose low- or zero-carbon transportation options.

The Sustainability and Climate Action Plan (S/CAP)¹ guides the City of Palo Alto's sustainability and emissions reduction strategy. Mobility is one of the three areas of the S/CAP with the largest potential for greenhouse gas emissions reductions, along with Energy and Electric Vehicles. Both mobility and Electric Vehicles tackle transportation emissions, the City's largest source of emissions. Mobility deals with reducing trips taken by car, measured in vehicle miles travelled (VMT), and increasing active transportation (walking, biking, and transit). VMT reduction can be influenced by local programs and policies, including roadway engineering, land use, and zoning, since these elements often determine travel mode choice.

The S/CAP outlines goals and strategies for reducing VMT and overall emissions from transportation, as well as the overall goal of reducing greenhouse gas (GHG) emissions 80 percent below 1990 levels by 2030 (the "80 x 30" goal). The 80 x 30 goal represents Palo Alto's fair share of the GHG emissions reductions needed to keep global warming below the 1.5°C goal of the Paris Agreement. Through this commitment to 80 x 30, Palo Alto will be doing its part in helping California achieve the statewide target of a 40 percent reduction below 1990 level² by 2030 and will place the City on the path to achieving the newly adopted Palo Alto goal³ of achieving carbon neutrality by 2030.

The client, the City of Palo Alto, is exploring the development of a pilot mobility hub program to advance its broader climate and transportation goals. Transportation accounts for a significant share of the city's emissions, with roughly one-third generated by residents, one-third by commuters, and one-third by visitors and commercial activity. In alignment with its

¹ "Sustainability and Climate Action Plan (S/CAP)," accessed March 3, 2026, <https://www.paloalto.gov/City-Hall/Sustainability/SCAP>.

² "Sustainability and Climate Action Plan (S/CAP)."

³ "Sustainability and Climate Action Plan (S/CAP)."

Sustainable Action Plan, the City aims to reduce vehicle miles traveled (VMT) by 12%⁴ while accelerating the transition from internal combustion engine (ICE) vehicles to electric vehicles (EVs). Although approximately one-quarter of households own an EV⁵, access to charging remains a major barrier, particularly for the 42% of residents living in multifamily housing⁶, where older infrastructure and transformer capacity constraints limit charger installation. Currently, Palo Alto is looking to expand its EV charger infrastructure by adding mobility hubs near multi-family housing in the South/South-East region of the city.

The City has tasked our team with developing a framework and pilot site concept for a publicly accessible mobility hub that prioritizes locations near lower-income and multifamily neighborhoods. The hub would combine expanded EV charging with shared micromobility options—such as e-bikes, scooters, and rideshare—while integrating secure parking, real-time transit connections, and community-serving amenities. The goal is not only to increase charging access, but also to solve first- and last-mile gaps, encourage shared and low-cost transportation modes, and drive long-term behavioral shifts toward sustainable travel. The City will provide data resources to support site selection and analysis. Deliverables include a written report, pilot site map, and presentation materials to help the City refine its approach and pursue future funding, including planning grants to expand mobility hubs citywide.

1.2.1 Research Question

This master project addresses the following overarching questions: How can the City of Palo Alto develop a sustainable and equitable mobility hub that increases multi-model transportation access for residents of multi-family housing?

With the following sub-questions:

- 1) What best practices and key components contribute to building a successful mobility hub?
- 2) Considering Palo Alto's local context and priorities, which factors should the city adopt?
- 3) What location would serve as an effective pilot site for the mobility hub?

1.3 What is a Mobility Hub?

A mobility hub is a place in a community that brings together public transit, bike share, car share and other ways for people to get where they want to go without a private vehicle.⁷ The purpose of a mobility hub is to offer a safe, comfortable, convenient and accessible space to

⁴ "Sustainability and Climate Action Plan (S/CAP)."

⁵ "Electric Vehicles," accessed March 16, 2026, <https://www.paloalto.gov/City-Hall/Sustainability/Electric-Vehicles>.

⁶ "EV FAQs," accessed March 16, 2026, <https://www.paloalto.gov/Departments/Utilities/Electrification/Electrify-My-Home/EV-Charging-at-Home/EV-FAQs>.

⁷ "Mobility Hubs | Metropolitan Transportation Commission," May 14, 2021, <https://mtc.ca.gov/planning/transportation/mobility-hubs>.

seamlessly transfer from one type of transportation to another.⁸ The main idea is to bring together shared transport with public transport and active travel in spaces designed to improve the public realm for all.

1.3.1 Purpose

While a mobility hub's main purpose is a meeting place to easily transition from one mode of transportation to another, it can serve other purposes as well. Other considerations can include a focus on improving user experience of different transportation options, ensuring safety and security for all travelers, and creating a sense of place through effective and meaningful placemaking strategies. Making public transportation a part of people's everyday lives is quite a challenge, but by providing access that is easily accessible and safe, it can encourage people in the right direction. It is imperative for a mobility hub to address equity by considering accessibility to and availability of transportation options in different neighborhoods. Lastly, it can allow for flexibility to embrace technological innovations and foster resiliency as well as create opportunities to form effective partnerships.

1.3.2 Characteristics

When thinking about designing a mobility hub, every jurisdiction is quite different, and to better serve its community it must be created with careful considerations of the physical landscape, community needs/wants, and budget. For high-density areas, a smaller mobility hub may be the best option as it could be located in the urban core or neighborhood with constrained street space. Some potential elements could include a convergence of public transit routes, shared micromobility, or pickup spots for carsharing services. For medium density locations such as city neighborhoods, suburban downtowns, or commercial districts, they could more elements than the small hub. It could be in a location of multiple high-capacity modes/routes such as a bus rapid transit (BRT), light rail transit (LRT), subway, or commuter rail, in addition to bus shelters, route/system information, and wayfinding for cross-mode transfers.⁹ There could be more carsharing spots, bikeshare docks, pick up zones, and microtransit stops. Other non-transit elements could include food trucks/carts, pedestrian plazas w/ seating, or a space for community gathering.¹⁰ Lower density locations prove to be the most difficult and less priority hubs. These are outlying city neighborhoods, suburban transit centers, suburban shopping/commercial areas, or even repurposed park-n-ride or transit parking locations with less single-occupancy vehicle travel places. While transit elements may be limited, there are several spacious opportunities for carsharing, bikesharing, and other nontransit elements.

⁸ "Mobility Hubs | Metropolitan Transportation Commission."

⁹ "Mobility-Hub-Principles.Pdf," n.d., accessed October 6, 2025, <https://sharedusemobilitycenter.org/wp-content/uploads/2018/08/Mobility-Hub-Principles.pdf>.

¹⁰ "Mobility-Hub-Principles.Pdf."

1.4 Benefits

1.4.1 Social Abundance

- Design and architecture matter: Attractive, well-integrated mobility hubs build community pride and encourage greater use of transport services.
- Greenspaces enhance user experience: Green areas make waiting more comfortable and enjoyable and provide public gathering spaces for relaxation and social interaction.
- Health and well-being benefits: Access to nature and comfortable public spaces can reduce stress and improve physical and mental health.
- Work and productivity opportunities: Co-working spaces enable teleworking, encourage collaboration, and may reduce commuting demand.
- Amenities attract diverse users: Features like cafes, shops, playgrounds, and rest areas make hubs appealing to residents, commuters, tourists, and cyclists.

1.4.2 Supporter of a Wider Economy

- First- and last-mile connectivity: Mobility hubs link neighborhoods to major public transport systems and key destinations (housing, jobs, schools, hospitals).
- Local economic support: By concentrating services and attracting visitors, hubs support nearby businesses and reduce travel time and costs.
- Energy and electrification infrastructure: Hubs can include EV charging, solar power, and vehicle-to-grid services.
- Economic and development benefits: Mobility hubs can increase property values, attract investment, and generate new revenue streams (e.g., parcel lockers).
- Sustainability and efficiency gains: Services like shared mobility and cargo logistics help reduce congestion, emissions, and energy use.

Read in more detail in Appendix G.

1.5 Challenges

- Environmental trade-offs: Shared mobility can reduce emissions, but emissions and traffic may increase if users shift from public transit or active transportation to shared cars or autonomous vehicles.
- Fleet and lifecycle impacts: Environmental benefits depend on vehicle type and lifecycle emissions, though shifting fleets to hybrid or electric vehicles can reduce impacts.
- Resource and pollution impacts: Building and operating hubs can lead to resource depletion, air pollution, and increased energy, water use, and waste generation.
- Community impacts: Nearby residents may experience increased noise, passenger traffic, and neighborhood disruptions.

- Adoption barriers: Communities with heavy car dependence may be reluctant to adopt shared mobility, requiring branding, outreach, and public engagement.
- Overcrowding and comfort issues: High usage can cause crowded vehicles, long waits, and uncomfortable transfers, which may push users back to private cars.
- Safety and design concerns: Poor layouts, overcrowding, and shared pedestrian–vehicle spaces can increase accident risks, requiring careful design and planning.
- Security and social challenges: As public spaces, hubs may face crime risks or serve as informal shelters, requiring safety measures like surveillance.
- Equity and housing impacts: Mobility hubs can raise nearby housing costs or contribute to neighborhood instability, while digital barriers may limit accessibility for some users.

2. Methods & Data

2.1 Methods

We addressed the research questions through a three-layer literature review that included international mobility hub models, case studies, and Palo Alto-specific analysis.

First, we conducted a general literature review that examined existing mobility hub models in the U.S. and globally. We identified common features and distinguishing characteristics of mobility hubs and focused on their impacts, including greenhouse gas (GHG) reductions, vehicle miles traveled (VMT), equity, and accessibility.

Building on this foundation, we examined case studies to identify good practices from existing mobility hubs and analyzed their landscape contexts, pilot locations, services, financing mechanisms, governance structures, community support, scale, and environmental justice considerations. We paid close attention to hubs with landscapes, transportation systems, and local conditions similar to those of Palo Alto.

By identifying essential elements that contributed to the success of mobility hubs, we were able to address the first sub-question by defining best practices and key components that supported the development of successful mobility hubs.

Finally, we carried out a Palo Alto-specific analysis to address the remaining sub-questions and the overarching research question. This analysis incorporated both quantitative and qualitative methods. Quantitatively, we leveraged city data to assess charging infrastructure availability, electric vehicle (EV) adoption, zoning factors influencing travel behavior, and cost considerations, supported by EV heat maps. Qualitatively, we adapted successful practices from the case studies to Palo Alto's local context and identified three potential pilot locations for a mobility hub. To ensure accuracy and feasibility, we engaged directly with the client team and city staff to refine and validate our analysis and held discussions with key stakeholders, including the Office of Transportation and utilities office.

2.2 Data

The literature review drew on data and resources from multiple sources. From the City of Palo Alto, we obtained electricity pricing, electricity consumption data, public transportation route info, school locations map, city district boundaries map, bike ped plan update, traffic operation safety and transportation datasheets, complete bicycle routes, walk and bike sheds for major transit stops, demand for walking/biking improvements, existing activity generators, complete vision bicycle network (2026), low-stress bicycle network, recommended pedestrian district location, high injury network (bicycle/pedestrian), bicycle level of citywide traffic stress map, parcel ownership, pedestrian and bicycle collisions, samTrans bus route map, land use, map of libraries, existing activity generators, and Google Environmental Insights Explorer VMT (2018-2023).

In addition, a virtual tour of the City on Google Maps that walked us through a few

potential pilot locations would serve as a valuable reference for us to locate the hub.

To supplement this analysis, we drew on studies examining how other mobility hubs were developed, with particular attention to their planning and implementation processes. We also relied on academic resources, including urban planning and transportation literature, peer-reviewed journals, and case studies of both domestic and international mobility hubs. Additional external resources included GIS-based city maps and zoning maps, which provided a clearer understanding of local land-use patterns.

Together, these data sources formed the foundation for rigorous analysis and well-informed recommendations. We accessed relevant data directly through our client, and the research did not require Duke University Institutional Review Board (IRB) approval or a nondisclosure agreement.

3. Mobility Hub Examples

3.1 US-Based Examples

3.1.1 Overall Takeaways from U.S. Mobility Hub Practices

Mobility hubs in the U.S. are primarily site-oriented rather than fully integrated regional networks and vary significantly from city to city. Most of the hubs are built as pilot projects or localized improvements under short-term funding and political feasibility, instead of a wide-ranging strategy across the country. There are several points that all the mobility hubs have in focus. First, reduction in VMT. It basically reduced through the substitution of short automobile trips, especially for the first and last mile travel. Improving access to transit and public transportation is one of the main ways of implementation, with less attention on reducing total trip frequency. One critical determinant of successfully achieving that goal is the proximity to major transit. Multiple U.S. cases suggest that hubs that are built near frequently used transit stops have higher utilization and better transportation pattern transitions than hubs located at other places. Besides, U.S. mobility hubs emphasize shared public options over restrictions on private vehicle use.¹¹ For example, the hubs typically rely on bike and scooter share and shared vehicles to encourage behavior change. Another important desired outcome is greenhouse gas (GHG) reduction. The measurement of impact is largely indirect and depends on behavioral change, highlighting the importance of long-term monitoring and community surveys. In addition, what's unique to the U.S. mobility hubs is the equity consideration. It strongly influences siting, design, and the decisions of the hubs. Many U.S. cases explicitly target underserved areas aimed at expanding the access to transportation.

3.1.2 Reducing VMT through First- and Last- Mile Travel

As discussed earlier, mobility hubs in the U.S. reduce vehicle miles traveled not by improving mobility itself, but by expanding accessibility. Confusion surrounding the distinction between mobility and accessibility is that while increasing mobility can reduce travel impedance and improve access, high mobility is neither a necessary nor a sufficient condition for good accessibility. This ultimately depends on the proximity, quality, and distribution of destinations.¹² Given that nearly half of all car trips in the United States are shorter than three miles,¹³ mobility hubs are particularly well positioned to target the segment of travel where mode substitution is

¹¹ "Regional Transportation Authority | Parking Strategies for Transit-Oriented Development," Regional Transportation Authority, accessed February 12, 2026, <https://www.rtachicago.org/communities/toolkits-and-education/what-are-mobility-hubs>.

¹² Susan L. Handy, *Accessibility- vs. Mobility-Enhancing Strategies for Addressing Automobile Dependence in the U.S.*, May 1, 2002, <https://escholarship.org/uc/item/5kn4s4pb>.

¹³ Equitable Cities, "Mobility Hubs and Displacement," Equitable Cities, May 7, 2025, <https://equitablecities.com/the-transit-trade-off-can-mobility-hubs-expand-equitable-access-to-transit-without-driving-displacement/>.

most feasible, especially through first- and last-mile connections to transit. This logic is reflected in practice: the core objective of the mobility hub pilot in Minneapolis, Minnesota, was explicitly to connect people to the transit system,¹⁴ while pre-installation community surveys for Boston's GoHubs! program suggested that improvements focused solely on reducing travel time or congestion were unlikely to substantially motivate individuals to drive less.¹⁵ The underline logic is easy: to make it easier not to drive by using public transportation, which helps the environment by cutting VMT and GHG emissions.¹⁶

3.1.3 Enabling Mode Shift through Shared and Micromobility Options

In the U.S. context, mobility hubs tend to encourage mode shift by adding convenient shared and micromobility options rather than by restricting private vehicle use. This choice-expansion approach makes co-location, visibility, seamless user experience weighty to whether travelers actually switch mode.¹⁷ Reader's Guide of Mobility hubs points out that hubs are designed to "add options rather than remove choices".¹⁸ With few actions on limiting personal vehicle usage, shared mobility services with transit are a primary mechanism enabling mode shift. In return, it can also improve first and last-mile connectivity and reinforce the relationship between shared mobility and public transit. Micromobility modes such as e-scooters and bikeshare can enhance access to rail transit by serving short-distance trips, especially in neighborhoods that are surrounded by stations.¹⁹ The example in Minneapolis proved that transit-centric mobility hubs are more effective than hubs located away from major transit services.²⁰ Micromobility options is an important component of mobility hubs, it can address short access trips while transit carries longer-distance travel. The complementarity is critical to achieving sustained mode shift rather than isolated changes in travel behavior. Visibility and ease of use are crucial to behavioral change in mode choice. Breaks between transits and micromobility can cause confusion and frustration to people, leading them to what they're used to instead of the new modes.²¹ Introduction of shared mobility solely is ineffective, and has limited influence on individual's willingness to drive less. Mode shift occurs primarily when these options are integrated with reliable transit access.

¹⁴ "Minneapolis-Mobility-Hub-FunctionFeatures-Deep-Dive.Pdf," n.d., accessed October 15, 2025, <https://carbonneutralcities.org/wp-content/uploads/2021/09/Minneapolis-Mobility-Hub-FunctionFeatures-Deep-Dive.pdf>

¹⁵ "Boston GoHubs! Micromobility Pilot," *Toole Design*, March 19, 2025, <https://tooledesign.com/project/boston-gohubs-micromobility-pilot/>.

¹⁶ "Mobility Hub Frequently Asked Questions | SFMTA," accessed February 12, 2026, <https://www.sfmta.com/mobility-hub-frequently-asked-questions>.

¹⁷ Mobility Hub Design and Implementation Guide, February 2025, 2025.

¹⁸ "Mobility-Hubs-Readers-Guide.Pdf," n.d., accessed October 19, 2025, <https://ladot.lacity.gov/sites/default/files/documents/mobility-hubs-readers-guide.pdf>.

¹⁹ Ilina Chipiliska, "Shared Mobility: How Can Local Efforts Have Global Impact?," *Modeshift*, October 12, 2023, <https://www.modeshift.com/shared-mobility-how-can-local-efforts-have-global-impact/>.

²⁰ "Minneapolis-Mobility-Hub-FunctionFeatures-Deep-Dive.Pdf"

²¹ "Minneapolis-Mobility-Hub-FunctionFeatures-Deep-Dive.Pdf"

3.1.4 Equity-Orientated Siting and Access

Many mobility hubs in the U.S. incorporate equity provisions into their design considerations, which helps ensure access for underserved populations. A recent analysis of 243 U.S. shared micromobility found that roughly 70% had at least one equity requirement, such as discount rides or equitable distribution of vehicles including e-scooters and bikes.²² This pattern shows that equity has become a requirement in many mobility programs, not just an informal goal, and provides practical precedents for designing. This approach applies not only to underserved communities but also to communities with a high number of residents who lack access to EV chargers. Shared micromobility can increase access for these communities. For people that cannot charge their car as needed in time, shared micromobility can replace car trips and connect them to transit and essential services. 37% of car trips were replaced by e-scooters and bikes, and 64% transitions were replaced, benefiting the underserved population with limited car or e-charger access.²³ Multifamily residents face challenges to accessing EV charging. Nearly one third of the U.S. people live in multi-family homes,²⁴ and these residents often lack convenient home charging options due to infrastructure constraints.²⁵ A policy brief on EV charging for multifamily housing highlights the need for off-site shared charging solutions as part of equitable electrification.²⁶ Los Angeles Metro implementation strategy mentions mobility hubs should be prioritized in areas with high residential density, lower vehicle ownership and high transit dependence. Denver, CO, also deployed mobility hubs with e-bikes near neighborhoods where residents lack access to private parking, which is a common condition associated with multi-family housing.²⁷

3.2 Europe-Based Examples

²² Anne Brown et al., “Equity Requirements in US Micromobility Programs Are on the Rise,” *Findings*, ahead of print, October 10, 2024, <https://doi.org/10.32866/001c.124480>.

²³ “Incorporating-Shared-Micromobility-in-Electric-Vehicle-Charging-Projects.Pdf,” n.d., accessed January 26, 2026, <https://betterbikeshare.org/wp-content/uploads/2023/08/Incorporating-Shared-Micromobility-in-Electric-Vehicle-Charging-Projects.pdf>.

²⁴ Alexander K. Epstein, *Community Charging: Emerging Multifamily, Curbside, and Multimodal Practices*, 2024.

²⁵ “Electric Vehicle Charging at Multifamily Homes in the United States: Barriers, Solutions, and Selected Equity Considerations,” International Council on Clean Transportation, n.d., <https://theicct.org/publication/promoting-equity-ev-transition-barriers-and-solutions-to-charging-at-multi-family-homes-us-apr24/>.

²⁶ “Policy Strategies to Promote Equitable EV Charging Access For Multi-Family Housing Residents,” n.d., accessed January 27, 2026, <https://www.law.berkeley.edu/wp-content/uploads/2024/08/EV-Charging-Access-for-Multifamily-Housing-Residents-CLEE-Report.pdf>.

²⁷ “Shared Micromobility & Micro Transit,” n.d., accessed January 27, 2026, <https://www.transportation.gov/sites/dot.gov/files/2025-01/Shared%20Micromobility%20%26%20Microtransit.pdf>.

3.2.1 Key Takeaways from European Mobility Hub Practices

European mobility hub best practices demonstrate that successful practices begin with clearly defined typologies matched to local context, ensuring that neighbourhood, transit-oriented, and regional hubs are right-sized to serve distinct travel needs.²⁸ Effective mobility hubs are strategically located near transit, multifamily housing, and key destinations to reduce car dependence.²⁹ Clear branding and wayfinding improve visibility and usability, while inclusive, universal design ensures low physical and cognitive barriers for diverse user groups.³⁰ Many European examples pair mobility services with placemaking elements, such as seating, greenery, lighting, and small amenities, to enhance safety, comfort, and community acceptance.³¹ Digital integration is also implemented, starting with real-time information and progressing toward integrated booking and payment systems.³² Community engagement is further embedded throughout planning and operations via co-design and ongoing feedback loops, strengthening trust and long-term adoption.³³ Moreover, equity is operationalized through targeted pricing models, eligibility rules, which support services that lower access barriers for vulnerable populations.³⁴ Together, these practices position mobility hubs not only as transportation infrastructure, but as inclusive, user-centered neighborhood assets that support mode shift, emission reduction, and improved urban livability.

3.2.2 Hub Typology and Design Context

European programs commonly distinguish between regional connectors (major transfer centers),³⁵ Transit-Oriented Development (TOD) hubs (mixed-used developments around a station), P+R hubs (park-and-ride facilities at the city edge), and neighborhood hubs (small

²⁸ Urban Mobility Observatory. *Shared Micromobility & Microtransit: SUMPs Guidelines, Second Edition*. European Commission, 2019. https://urban-mobility-observatory.transport.ec.europa.eu/system/files/2023-09/sump_guidelines_2019_second%20edition.pdf

²⁹ Stadnichuk, Vladimir, Laura Merten, Christian Larisch, and Grit Walther. “Optimisation of Mobility Hub Locations for a Sustainable Mobility System.” *Transportation Research Interdisciplinary Perspectives* 26 (2024): 101193. <https://doi.org/10.1016/j.trip.2024.101193>

³⁰ Roukouni, Anastasia, Inés Aquilué Junyent, Miquel Martí Casanovas, and Gonçalo Homem de Almeida Correia. “An Analysis of the Emerging ‘Shared Mobility Hub’ Concept in European Cities: Definition and a Proposed Typology.” *Sustainability* 15, no. 6 (2023): 5222. <https://doi.org/10.3390/su15065222>

³¹ HAL Open Science. “Document.” <https://hal.science/hal-04224810v1/document>

³² Garritsen, Kelt É., Anna B. Grigolon, and Karst T. Geurs. “The Role of Digital Mobility Skills in the Uptake of Shared Modes at Mobility Hubs.” *Journal of Urban Mobility* (2025). <https://doi.org/10.1016/j.urbmob.2025.100111>

³³ VHB. *Suburban Mobility Hubs: Regional Mobility Hubs White Paper*. <https://www.vhb.com/globalassets/viewpoints/whitepaper/regional-mobility-hubs/suburban-mobility-hubs-whitepaper.pdf>

³⁴ Equitable Cities. “The Transit Trade-Off: Can Mobility Hubs Expand Equitable Access to Transit Without Driving Displacement?” <https://equitablecities.com/the-transit-trade-off-can-mobility-hubs-expand-equitable-access-to-transit-without-driving-displacement/>

³⁵ Centralina Council of Governments, “All About Mobility Hubs,” *Centralina*, accessed January 17, 2026, <https://centralina.org/blog/all-about-mobility-hubs/>

footprint, shared modes, minimal parking), as illustrated in Figure 1.³⁶ The size, services, and management of these hubs are tailored to their specific type. For example, neighborhood hubs prioritize short trips, safe access, and high usability rather than massive parking capacity.³⁷ First, the city should define the hub's goal (first/last-mile, car-replacement, station feeder, rural transfer), then select the appropriate size, transportation mode mix, and supporting facilities. Location policy logic (e.g., “A/B/C” accessibility tiers) should be used to avoid placing hubs where they would induce car trips.³⁸

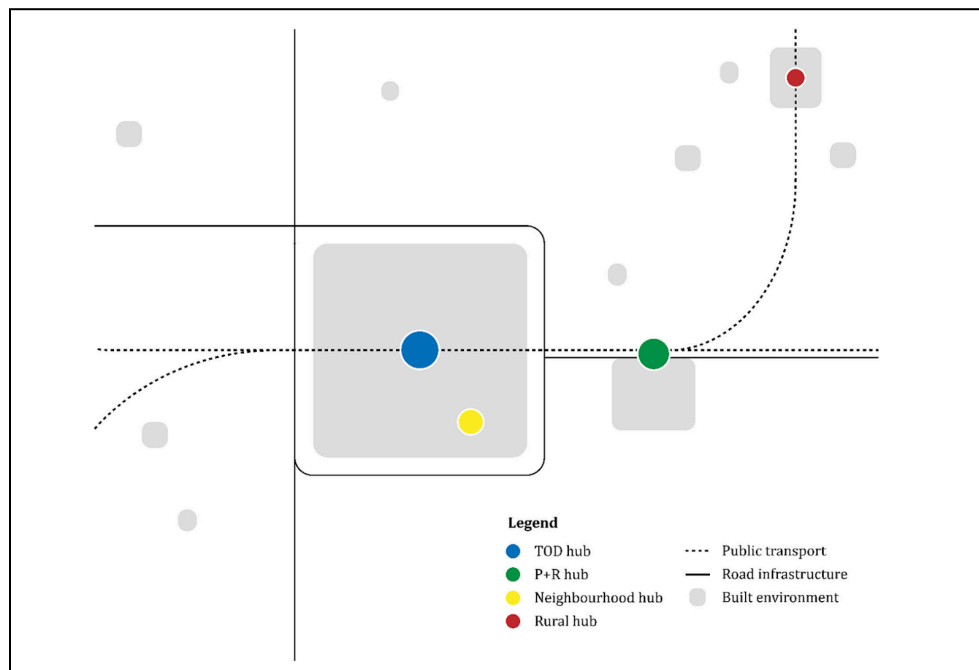


Figure 1: Conceptual visualisation of a preliminary hub typology based on a historical analysis of Dutch transport policies. Dot size signifies approximate user volumes (Rongen et al.).

The pilots emphasize connecting hubs with transit nodes and desired lines such as stations, bus corridors, employment clusters, multifamily districts. Manchester’s eHUB logic linking hubs to nodes and leveraging parking constraints is a classic example of shifting behavior through convenience and friction.³⁹ The city should prioritize sites with: multifamily density, transit proximity, safe walk/bike access, and trip generators such as schools, neighborhood retail, civic uses. Then, strategically leverage parking “pain points”: hubs work best when they are a better option than waiting or parking.

³⁶Tibor Rongen, Taede Tillema, Jos Arts, María J. Alonso-González, and Jan-Jelle Witte, “An Analysis of the Mobility Hub Concept in the Netherlands: Historical Lessons for Its Implementation,” *Journal of Transport Geography* 103 (2022), <https://doi.org/10.1016/j.jtrangeo.2022.103419>

³⁷Centralina Council of Governments, “All About Mobility Hubs,” *Centralina*, accessed January 17, 2026, <https://centralina.org/blog/all-about-mobility-hubs/>

³⁸Tibor Rongen, Taede Tillema, Jos Arts, María J. Alonso-González, and Jan-Jelle Witte, “An Analysis of the Mobility Hub Concept in the Netherlands: Historical Lessons for Its Implementation,” *Journal of Transport Geography* 103 (2022), <https://doi.org/10.1016/j.jtrangeo.2022.103419>

³⁹Interreg North-West Europe Programme, *DT141 Operational Plan: TFGM (Updated)*, PDF document, accessed January 17, 2026, <https://vb.nweurope.eu/media/17113/dt141-operational-plan-tfgm-updated.pdf>

3.2.3 Branding

Amsterdam uses clear brand/signage in its BuurtHub Program⁴⁰ while Manchester uses Bee Network branding.⁴¹ This shows that hubs are more easily accepted if users can recognize them instantly and understand “what is going on here” in seconds. Both cities create a unified set of components: signage, ground markings, hub map, and instructions, and they treat branding as behavior design: the hub should feel safe, orderly, and easy to use.

European guidelines increasingly embed universal physical and digital design into hub planning to ensure people are not excluded due to obstacles such as stairs, complicated interfaces, or smartphone-only access. For instance, the European SmartHubs “integration ladder” explicitly ties hub quality to physical, digital, and democratic integration, and incorporates universal design principles as the hub gets “smarter.” They provide accessible ramps and elevators where needed, a conflict-free layout, sheltered waiting areas, and clear visibility.⁴² In addition, SmartHubs in Vienna offer digital services allowing users to plan, book, and pay in one place, and low-tech alternatives: help desk, third-party booking, and training to reduce digital exclusion.⁴³

Most importantly, they view accessibility as a promotional strategy instead of “compliance only.” The Vienna-style approach highlights the value of physical and digital integration, including multiple modes of transportation and shared payment/info systems.⁴⁴ Furthermore, the SmartHubs model serves as a maturity ladder in Figure 2: it demonstrates integration at four different levels (0 to 4) and sets realistic targets.⁴⁵ To better integrate physical and digital planning into a mobility hub design, the city should start with modes of transportation, clear information signage, and safe access routes, then gradually add integrated booking or payment functions and real-time updates on vehicle or EV charging status. Finally, incentives should be implemented, such as policies and permanent feedback systems, to boost participation.

⁴⁰Jeltje van der Haer, *[Master's Thesis on Mobility Hubs / Sustainable Transport]*, SummaLAB, 2022, PDF document, accessed January 17, 2026, <https://summalab.nl/wp-content/uploads/2022/11/2122-EST4008-Thesis-JeltjevanderHaer-i6291946-1.pdf>

⁴¹ Interreg North-West Europe Programme, *DT141 Operational Plan: TFGM (Updated)*, PDF document, accessed January 17, 2026, <https://vb.nweurope.eu/media/17113/dt141-operational-plan-tfgm-updated.pdf>

⁴² Smart Mobility Hubs EU, *Smart Mobility Hubs: Integration Principles and Participation Framework*, PDF document, accessed January 17, 2026, https://www.smartmobilityhubs.eu/_files/ugd/c54b12_eec2ced132d04c158f16c04daa6b8c48.pdf

⁴³ SEStran, *Mobility Hubs Strategic Study: Final Report*, May 2020, PDF document, accessed January 17, 2026, <https://sestran.gov.uk/wp-content/uploads/2020/05/SEStran-Mobility-Hubs-Strategic-Study-Final-Report.pdf>

⁴⁴ SEStran, *Mobility Hubs Strategic Study: Final Report*, May 2020, PDF document, accessed January 17, 2026, <https://sestran.gov.uk/wp-content/uploads/2020/05/SEStran-Mobility-Hubs-Strategic-Study-Final-Report.pdf>

⁴⁵ Centralina Council of Governments, “All About Mobility Hubs,” *Centralina*, accessed January 17, 2026, <https://centralina.org/blog/all-about-mobility-hubs/>

		Physical integration	Digital integration	Democratic integration
Smart Mobility Hub	4	Conflict free and place making	Integration of societal goals and policies, and consideration of universal design principles	Social learning
	3	Visibility and branding	Integration of service offers and consideration of universal design principles	Integration of different knowledge
	2	Wayfinding and consideration of universal design principles	Integration of booking and payment and consideration of universal design principles	Deliberative engagement of stakeholders, including (vulnerable) user groups
Mobility hub	1	Walking distance to shared and public transport, minimum inclusive design standards	Digital integration of information	Appropriate representation of stakeholder interests, limited attention for vulnerable user groups
Single mobility services	0	No physical integration	No digital integration	No stakeholder involvement and consideration of (vulnerable) user needs

Figure 2: The SmartHubs Integration Ladder Summary (Geur et al.).

3.2.4 Microplace Making

European hubs often add small non-mobility services such as parcel lockers, seating, greenery, lighting, repair tools, kiosks/café edges. Munich’s parklet-style hub in southeastern Germany is a strong reference: it blends mobility functions with a seating area, cafe, and an urban garden.⁴⁶ Leuven’s socially inclusive mobility pilots provide bike repairs and parcel lockers, while the smart hubs in Bremen, Germany are located near multiple restaurant options, banks, and green spaces.⁴⁷ The mobility hub could add one or two “sticky” amenities that increase dwell comfort and perceived safety: seating and lighting, repair station, parcel lockers, small retail edge, or greenery.⁴⁸ Rather than being decorative, placemaking is a safety and utilization multiplier.

⁴⁶Smart Mobility Hubs EU, *Smart Mobility Hubs: Integration Principles and Participation Framework*, PDF document, accessed January 17, 2026,

https://www.smartmobilityhubs.eu/_files/ugd/c54b12_eec2ced132d04c158f16c04daa6b8c48.pdf

⁴⁷Smart Mobility Hubs EU Data Platform, “Hub 59,” accessed January 17, 2026,

<https://data.smartmobilityhubs.eu/wiki/Hubs/59>

⁴⁸Interreg North Sea Region, “New Mobility Hubs in Leuven and Rotterdam: Exploring Inclusive Approaches,” *SharedImobiHub*, accessed January 17, 2026,

<https://www.interregnorthsea.eu/sharedimobihub/news/new-mobility-hubs-in-leuven-and-rotterdam-exploring-inclusive-approaches-to>

3.2.5 Community Engagement

In Belgium, Brussels co-design⁴⁹ and Leuven’s “inclusive access for vulnerable residents” examples show that engagement is not merely an outreach.⁵⁰ It shapes pricing, access rules, training, and trust. The SmartHubs model frames this as a “democratic integration,” with increasing levels from basic consultation to permanent, independent participation. Therefore, the city should engage early on site selection, safety, and pricing. The hub design should include users intentionally through language access, offline options, and community partners, while building a feedback loop that persists beyond launch via advisory group, quarterly check-ins, and transparent changes.⁵¹ Furthermore, Leuven’s focus on providing free, low-cost shared mobility access for vulnerable residents highlights a practical European trend: equity is reflected in who can book, who can pay, and who can learn to use the system.⁵² This means equity measures need to be practical: for example, lowering fares, and offering cash payment options, training, offline booking support, and bundled essentials repair and lockers. The city should track equity indicators: uptake by target groups, barriers to access, and retention rates.⁵³

4. Best Practices

4.1 Clear Purpose and Target Users

It is important to have a clear definition about the primary function of the hub before determining the components. Both U.S. and European examples show that successful mobility hubs begin with a clearly core purpose such as first and last mile access to transit, shared electric mobility, or reducing private car ownership. For example, Amsterdam’s BuurtHub program mainly focuses on reducing the private car ownership in residential neighborhoods through shared electric modes, while U.S. pilots such as Boston’s Gohubs emphasize improving access and convenience instead of solely travel reduction. Identifying and prioritizing specific target users early in the planning process is the next process. European cases, such as

⁴⁹ Smart Mobility Hubs EU, *Smart Mobility Hubs: Integration Principles and Participation Framework*, PDF document, accessed January 17, 2026,

https://www.smartmobilityhubs.eu/_files/ugd/c54b12_eec2ced132d04c158f16c04daa6b8c48.pdf

⁵⁰ Interreg North Sea Region, “New Mobility Hubs in Leuven and Rotterdam: Exploring Inclusive Approaches,” *SharedImobiHub*, accessed January 17, 2026,

<https://www.interregnorthsea.eu/sharedimobihub/news/new-mobility-hubs-in-leuven-and-rotterdam-exploring-inclusive-approaches-to>

⁵¹ Smart Mobility Hubs EU, *Smart Mobility Hubs: Integration Principles and Participation Framework*, PDF document, accessed January 17, 2026,

https://www.smartmobilityhubs.eu/_files/ugd/c54b12_eec2ced132d04c158f16c04daa6b8c48.pdf

⁵² Interreg North Sea Region, “New Mobility Hubs in Leuven and Rotterdam: Exploring Inclusive Approaches,” *SharedImobiHub*, accessed January 17, 2026,

<https://www.interregnorthsea.eu/sharedimobihub/news/new-mobility-hubs-in-leuven-and-rotterdam-exploring-inclusive-approaches-to>

⁵³ Jeltje van der Haer, *[Master’s Thesis on Mobility Hubs / Sustainable Transport]*, SummaLAB, 2022, PDF document, accessed January 17, 2026,

<https://summalab.nl/wp-content/uploads/2022/11/2122-EST4008-Thesis-JeltjevanderHaer-i6291946-1.pdf>

neighborhood-based hubs in Amsterdam and Vienna, explicitly articulate their intended user groups and policy objectives, often focusing on residents of dense residential areas and households without private vehicles. Similarly, U.S. pilots in cities such as Boston and Minneapolis show that hubs framed around improving everyday convenience and access, rather than abstract goals like congestion or emissions reduction, are more likely to resonate with users. Community engagement findings from U.S. cases further suggest that users respond most strongly when hub functions align with observed travel behavior, particularly short local trips and access to transit. Taken together, these examples indicate that successful mobility hubs clearly identify who they are designed for, define a limited and legible core purpose, and use that purpose to guide decisions about infrastructure, services, and complementary features. For the city of Palo Alto, the main purpose is to reduce VMT and improve the accessibility of EV chargers for multi-family households, which leads to a clear and comprehensive direction to the next step.

4.2 Site Selection

Evidence from both U.S. and European mobility hub implementations consistently indicates that site selection is one of the most important determinants of hub adoption and long-term effectiveness. Across cases, successful hubs are located where people already move, rather than where space is merely available. European examples from cities such as Amsterdam, Vienna, and Bremen emphasize placement within a typical 300–500 meter walking distance of dense residential areas, transit stops, and daily destinations, ensuring that hubs fit naturally into existing travel routines. U.S. pilots, including those in Boston and Minneapolis, similarly demonstrate that hubs sited near high-frequency transit services and established multimodal corridors achieve higher utilization than those located in more isolated or low-visibility settings. In both contexts, safety, visibility, and active street frontage are repeatedly identified as critical factors, as users are more likely to engage with hubs that feel secure and are embedded in everyday urban life. These findings suggest that effective mobility hubs prioritize proximity to existing demand, multimodal flows, and residential density, particularly in areas where access gaps are most pronounced. Based on the siting criteria outlined above, three potential mobility hub locations were identified in Palo Alto, each presenting different contextual considerations, but all of them are chosen near multi-family communities and public transition points.

4.3 Multiple Sustainable Modes Integration

Best practices from U.S. and European mobility hub examples indicate that successful mobility hubs integrate multiple sustainable modes. It emphasizes functional complementarity rather than simply co-locating services. In both contexts, effective hubs prioritize a clearly defined core mode. Public transit access, shared micromobility, and secure bicycle infrastructure

are the most mentioned to create a seamless transition.⁵⁴ European mobility hubs often follow a “core modes plus optional extras” framework. They introduce additional amenities based on different site conditions and community needs. U.S. case studies similarly demonstrate that mobility hubs are most effective when each mode has a focus point. The main logic is micromobility serving short-distance access trips and transit accommodating longer journeys. Evidence mentioned before from U.S. pilots suggests that the presence of multiple shared modes alone is insufficient to induce meaningful mode shift. To achieve a successful shift, integration must be intuitive, physically cohesive, and easy for users to navigate. When transitions between modes are unclear or hard to follow, users tend to revert to familiar travel behaviors, particularly private vehicle use. As observed in cities such as Boston and Minneapolis, mode shift occurs primarily when shared mobility services are directly connected to reliable transit and designed to reduce friction. These findings highlight that effective integration is less about the number of modes offered but more about how well those modes reinforce one another in practice. Importantly, integration of multiple sustainable modes must be combined with observed user behaviors and system performance and cannot be assessed solely through design intent or infrastructure provision. U.S. guidance documents emphasize that the standards for evaluating a mobility hub should be assessed based on whether different modes function together as an integral system rather than as isolated services. For example, both the Metropolitan Transportation Commission’s Mobility Hub Playbook⁵⁵ and the Boston GoHubs! Guidebook⁵⁶ proposes evaluation frameworks that include the following metrics: ridership and service utilization rates, changes in public transit boardings and alighting, evidence of mode shifts, and long-term outcomes related to vehicle miles traveled and emissions. Short-term evaluation metrics serve to complement long-term assessment measures, including actual usage patterns, user feedback, and on-street efficiency. The latter aims to gauge whether new mobility models can foster lasting behavioral shifts and broader systemic impacts. These evaluation frameworks determine whether multimodal integration at transportation hubs translates into tangible transportation and environmental benefits.

4.4 Design for Safety, Lighting, and Comfort

Evidence from mobility hubs in Boston, Zurich, Brussels, Munich, and Manchester shows that perceived safety, comfort, and overall design quality are often more important to users than the technology itself. Mobility hubs that feel welcoming and intuitive are more likely to be used consistently, especially by families, seniors, and first-time users. Best practices emphasize clear sightlines, ample lighting, and the elimination of hidden corners to enhance both

⁵⁴ Hrvoje Prskalo et al., “An Overview of Mobility Hubs in Smart Cities,” *Transportation Research Procedia*, TRPRO_TRANSCODE 2025, vol. 91 (January 2025): 672–79, <https://doi.org/10.1016/j.trpro.2025.10.086>.

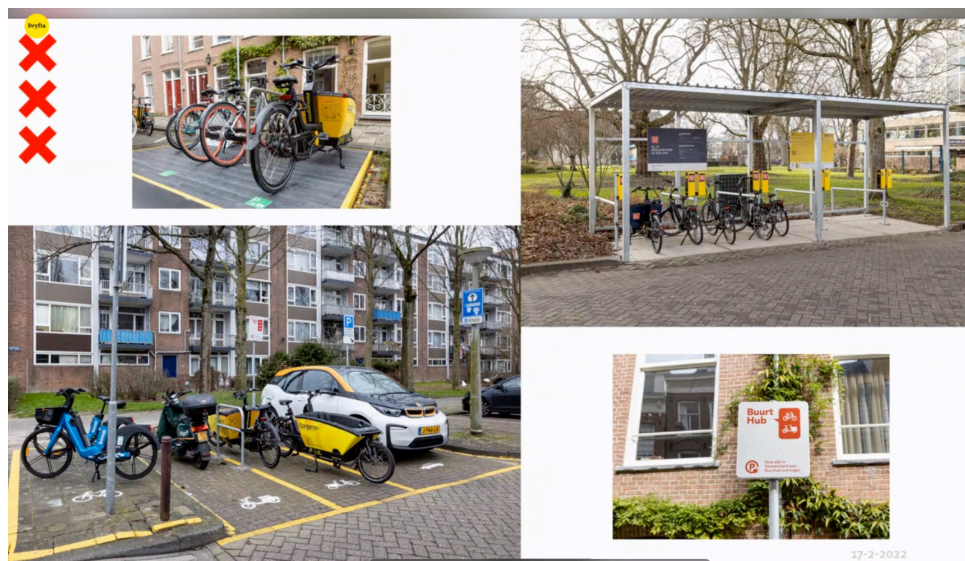
⁵⁵ “Play6 Mobility Hub Implementation Playbook.Pdf,” n.d., accessed February 10, 2026, https://mtc.ca.gov/sites/default/files/documents/2021-05/Play6_MTC%20Mobility%20Hub%20Implementation%20Playbook_4-30-21.pdf.

⁵⁶ “GoHubs! The City of Boston’s Mobility Hubs Program,” n.d., accessed October 8, 2025, https://cdn.prod.website-files.com/5d9f83b8b237fa6c07d5d69d/61b7ade6bc9dad16db578f09_Mobility%20Hubs_Lessons%20and%20Learnings%20from%20Boston_Matt%20Warfield%20Presentation.pdf.

real and perceived safety. In Palo Alto, hubs should be designed as small, active public spaces, similar to mini-plazas, with seating, shade, trees, and weather protection to support waiting, transfers, and short stays. Family-friendly features, safe cycling access, and well-designed crossings are particularly important given the city's high rates of walking and biking, as well as its proximity to schools, parks, and neighborhood commercial areas. Prioritizing comfort and safety in hub design will help ensure that these facilities are accessible and inviting to a broad range of users.

4.5 High-Visibility Branding and Wayfinding

Case studies from CoMoUK, Vienna, and Amsterdam demonstrate that strong branding and clear wayfinding are essential for mobility hub success, particularly in residential settings serving multi-family communities. High-performing hubs are easily recognizable in the urban environment and clearly communicate how residents can access different mobility options. For example, the logo of the Buurt Hubs in the Netherlands has three crosses, where users can clearly identify it as a mobility hub in Figure 3.⁵⁷ Best practices include consistent visual identity, real-time information displays, and intuitive signage directing users to nearby bus stops, bike lanes, Caltrain stations, and key destinations. In Palo Alto, mobility hubs should incorporate clear wayfinding and digital tools, such as QR codes linking to PA Link services, TMA routes, and trip-planning platforms, to support residents who may be new to shared mobility or EV charging. A recognizable hub identity across multiple sites will help multi-family residents quickly understand available services and encourage repeat use.



⁵⁷ J. E. van der Haer, *Shared Mobility Practices and Imaginaries: A Case Study Analysis of the Amsterdam BuurtHub Project* (Master's thesis, Maastricht University, June 30, 2022), accessed [1/25/2026], <https://summalab.nl/wp-content/uploads/2022/11/2122-EST4008-Thesis-JeltjevanderHaer-i6291946-1.pdf>

Figure 3: Two Pilot locations in Amsterdam (Dekkers et al.)⁵⁸.

4.6 Community Co-Design

Successful mobility hubs are shaped through early and ongoing community engagement, particularly when designed to serve multi-family households with diverse mobility needs. Best practices emphasize involving residents, property managers, schools, faith-based organizations, and senior centers early in the planning process. Engagement strategies such as community workshops in Figure 4, walk audits, and on-site discussions help ensure that hub locations, amenities, and design features reflect daily travel patterns, safety concerns, and accessibility needs.⁵⁹ In Palo Alto, where many multi-family residents face limited access to EV charging and safe alternatives to driving, co-design can help align hub features with lived experience while building trust and local support. Incorporating community input early such as surveys, walk and bike audits, local listening sessions, and partnerships with local schools, multi-family property managers, and community organizations will increase adoption and ensure hubs are responsive to neighborhood-specific conditions.

⁵⁸ Dekkers, Debbie, Jurre K, Amber Kahmann, Lisa Hobus, Lianne Nelemans, and Redactie AMS institute. “BuurtHubs: Shared Mobility in the Neighbourhood.” *OpenResearch Amsterdam*, February 17, 2022. Accessed January 27, 2026. <https://openresearch.amsterdam/en/page/82065/buurthubs-shared-mobility-in-the-neighbourhood>

⁵⁹ Metropolitan Washington Council of Governments, *Arlington County Micro-Mobility Transit Hub Prototype* (Transportation Land-Use Connections FY2021 Technical Assistance, 2021), accessed January 27, 2026, https://www.mwcog.org/assets/1/6/TLC_FY21_-_Arlington_County_Micro-Mobility_Transit_Hub_Prototype.pdf

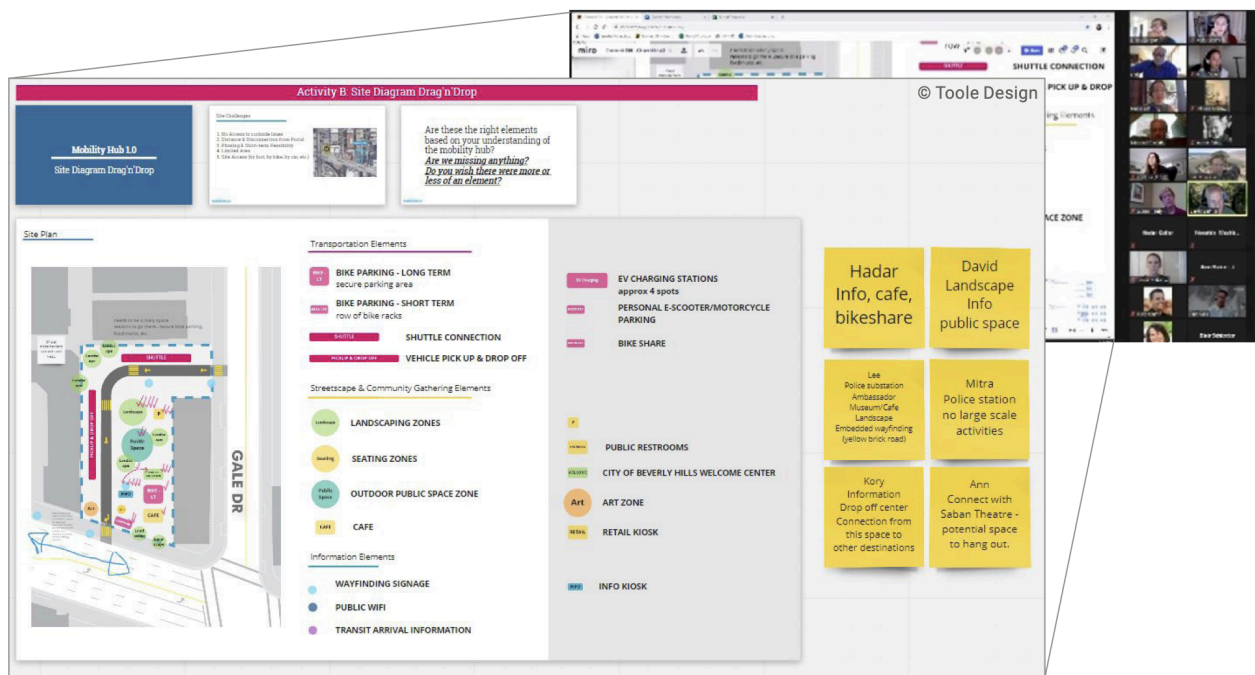


Figure 4: Virtual site design process for a mobility hub in Beverly Hills, CA.⁶⁰

4.7 Challenges

4.7.1 Minimal VMT Reduction Without Strong Transit

Both U.S. and European cases have evidence that the potential for vehicle miles traveled (VMT) reduction is limited if transitions are not strong enough. Shared micromobility often substitutes short trips and connects to transit, but evidence for broad VMT reduction is still context dependent and strongest where it complements robust transit service.⁶¹ Mobility hubs are most effective at enabling mode substitution for short trips and first and last mile connections, but they rarely induce significant changes in overall travel behavior without strong transition. How to quantify VMT is another tricky problem. Even if surveys are the main way of collecting data to estimate VMT reduction, there are still large measurement errors because of data accuracy.⁶²

⁶⁰ Metropolitan Washington Council of Governments, *Arlington County Micro-Mobility Transit Hub Prototype*, 2021.

⁶¹ “Shared Micromobility & Micro Transit.”

⁶² “Vehicle Miles Traveled (VMT) Measurement Methods and Pilot Test for Collecting Odometer Readings | National Center for Sustainable Transportation,” accessed February 5, 2026, <https://ncst.ucdavis.edu/project/vmt-measurement-methods-and-pilot-test-collecting-odometer-readings>.

4.7.2 Grid Capacity Constraints

Another challenge for implementing mobility hubs is the limitation of local electrical grid capacity. The problem is more significant for mobility hubs that contain EV charging infrastructure. Cases in both the United States and Europe demonstrate that integrating multiple charging points can put pressure on local distribution grids, particularly in older neighborhoods or areas where electricity demand is already high. In some pilot projects in the United States, increased project costs and project delays have resulted from grid upgrade requirements. These requirements have constrained the scale and pace of deployment. Examples in Europe also demonstrate that phased construction of charging infrastructure is necessary. Besides, load management strategies can be used to prevent local system overloads. These constraints indicate that transportation hubs are not merely transit projects but also energy infrastructure investments, requiring coordination with utility companies and careful consideration of the specific site's power supply.

4.7.3 Operational and Cost Challenges

While mobility hubs offer significant benefits, cities must plan for ongoing operational and cost challenges. One common issue is the high operations and maintenance (O&M) cost associated with EV charging infrastructure, including equipment upkeep, software management, and electricity demand charges. In addition, ensuring that shared bikes and scooters remain available, well-maintained, and appropriately distributed requires active fleet management and clear performance standards. Coordination among multiple vendors, such as charging providers, micromobility operators, and data platforms, can further complicate operations if roles and responsibilities are not clearly defined. Cities have also encountered challenges related to theft or vandalism, particularly in locations with limited oversight. For Palo Alto, addressing these operational risks early through clear contracts, vendor coordination frameworks, and thoughtful site design will be critical to maintaining reliable service and controlling long-term costs.

4.7.4 Equity Risks

Evidence from mobility hubs in metropolitan Europe and the United States highlights several equity risks that must be considered in hub planning and implementation. In some cases, improved mobility amenities have contributed to increased nearby property values, which can place additional pressure on lower-income renters and accelerate displacement.⁶³ Digital barriers also present a challenge, as many mobility-as-a-service (MaaS) tools and shared mobility platforms require smartphone access and a certain level of digital literacy. In Palo Alto, where housing affordability is already a significant concern, these risks are particularly relevant for multi-family households and residents with limited access to technology. To mitigate equity impacts, the City should pair mobility hub investments with inclusive design, non-digital access

⁶³ Aanya Marya, "Mobility Hubs and Their Impact on Business Growth: Evidence from Urban Centers," *The AI Journal*, May 13, 2025, accessed January 27, 2026, <https://aijournal.com/mobility-hubs-and-their-impact-on-business-growth-evidence-from-urban-centers/>

options, and targeted outreach to ensure that benefits are equitably distributed and accessible to all residents.

4.7.5 Public Resistance

Public resistance is a common challenge observed in mobility hub projects worldwide. Residents often express concerns about increased traffic, changes to parking availability, noise, or perceived neighborhood impacts associated with new infrastructure. There may also be low comfort or familiarity with shared mobility options, particularly among residents who are accustomed to private vehicle use. Additionally, limited public understanding of how EV charging works, especially in shared or public settings, can slow adoption. In Palo Alto, where many residents value existing neighborhood conditions, there may be a natural tendency to maintain the status quo and resist having a mobility hub. Addressing these concerns will require early and transparent communication, education about the benefits and operation of mobility hubs, and visible pilot projects that allow residents to experience the system before broader rollout.

5. Design Guidelines

In this section, we describe the comprehensive process of developing a mobility hub, from initial visioning and goal-setting⁶⁴ through design, implementation, and long-term operation. Effective mobility hub development requires coordination across planning, policy, funding, and space allocation, as well as attention to data sharing, technology, and public-private partnerships.⁶⁵ Central to this process is establishing a clear understanding of what a mobility hub means for the specific community it serves, including defining appropriate hub typologies⁶⁶ and aligning them with local transportation conditions⁶⁷ and policy frameworks. Early and continuous community engagement is essential to ensure that equity, safety, and accessibility are embedded throughout decision-making⁶⁸, rather than addressed after key choices have already been made.

The planning process begins by establishing clear program goals and conducting a suitability analysis⁶⁹ to identify areas of the city that best support those goals. This includes assessing existing transportation conditions, land use patterns, and network connectivity, as well as conducting preliminary outreach to understand community needs and preferences. Based on these findings, planners can identify potential mobility hub locations, plan a cohesive network of hubs⁷⁰, and prioritize sites according to community needs, safety considerations, and equity outcomes. Public engagement at this stage plays a critical role in shaping hub typologies, desired amenities, and service mixes, helping ensure that proposed hubs respond to actual travel behaviors and local priorities.

Implementation depends on sustained collaboration among public agencies, private partners, and utilities.⁷¹ City officials are responsible for aligning mobility hubs with local plans, policies, and programs⁷², securing necessary permits, and coordinating the allocation of curb and right-of-way space. At the same time, partnerships with third-party providers—such as ride-hailing companies, shared micromobility operators, carshare services, and electric vehicle charging vendors—help define the mobility mix and operational model of each hub. Given the growing emphasis on electrification, close coordination with utility providers is necessary to

⁶⁴https://www.mwcog.org/assets/1/6/TLC_FY21_-_Arlington_County_Micro-Mobility_Transit_Hub_Prototype.Pdf, n.d.

⁶⁵ “Mobility-Hub-Implementation-Memo-2017-12-13.Pdf,” n.d., accessed January 25, 2026, <https://www.sandag.org/-/media/SANDAG/Documents/PDF/projects-and-programs/innovative-mobility/mobility-hubs/mobility-hub-planning-resources/mobility-hub-implementation-memo-2017-12-13.pdf>.

⁶⁶ Mobility Hub Design and Implementation Guide, February 2025, 2025.

⁶⁷ Mobility Hub Design and Implementation Guide, February 2025, 2025.

⁶⁸https://www.mwcog.org/assets/1/6/TLC_FY21_-_Arlington_County_Micro-Mobility_Transit_Hub_Prototype.Pdf, “Mobility-Hub-Implementation-Memo-2017-12-13.Pdf.”

⁶⁹https://www.mwcog.org/assets/1/6/TLC_FY21_-_Arlington_County_Micro-Mobility_Transit_Hub_Prototype.Pdf.

⁷⁰https://www.mwcog.org/assets/1/6/TLC_FY21_-_Arlington_County_Micro-Mobility_Transit_Hub_Prototype.Pdf.

⁷¹https://www.mwcog.org/assets/1/6/TLC_FY21_-_Arlington_County_Micro-Mobility_Transit_Hub_Prototype.Pdf; Mobility Hub Design and Implementation Guide, February 2025, 2025; “Mobility-Hub-Implementation-Memo-2017-12-13.Pdf.”

⁷² “Mobility-Hub-Implementation-Memo-2017-12-13.Pdf.”

assess grid capacity, plan for future demand, and integrate resilient power and charging infrastructure that can support long-term growth.

Finally, designers and funding partners translate planning objectives and stakeholder input into feasible conceptual designs⁷³ and implementation strategies. Concept site designs help illustrate how selected amenities and services can be integrated within physical and financial constraints, while also serving as tools for communicating with stakeholders and refining cost estimates. Program recommendations and phased implementation strategies⁷⁴ allow mobility hubs to be piloted, adapted, and expanded over time as neighborhood conditions, funding opportunities, and mobility needs evolve. Together, these steps establish a flexible yet structured framework for delivering equitable, context-sensitive mobility hubs that can be sustained over the long term.

5.1 Identifying, Prioritizing, and Selecting Projects

The first step in mobility hub planning is the identification, prioritization, and selection of projects based on a comprehensive assessment of existing conditions. This process requires evaluating current land use patterns, transportation infrastructure, travel behavior, and gaps in access across the broader transportation network.⁷⁵ Strategic site selection should support overall mode shift goals by prioritizing locations where walking, bicycling, and transit can realistically replace single-occupancy vehicle trips. Equitable practices must be incorporated into this stage by identifying communities with unmet mobility needs and ensuring that proposed hubs improve access for historically underserved populations. Considering different mobility hub typologies during site selection allows planners to tailor hub scale, function, and amenities to neighborhood context rather than applying a one-size-fits-all approach.

Meaningful community engagement is central to both selecting and designing mobility hubs.⁷⁶ Engaging residents, workers, and transit users who will be served by the hub helps identify priorities related to safety, comfort, accessibility, and desired amenities, while also building local trust and long-term support. Community input can inform decisions about how the hub integrates with its surroundings and how it complements existing pedestrian, bicycle, and transit infrastructure beyond the hub itself. Attention to these external connections is critical, as the success of a mobility hub depends not only on on-site features but also on the quality, safety, and continuity of the networks that lead to and from it.

Partnerships

Effective partnerships are essential to translating planning concepts into successful projects. This requires identifying all relevant stakeholders, including public agencies, private mobility providers, utilities, community organizations, and funders⁷⁷, as well as determining

⁷³https://www.mwcog.org/assets/1/6/TLC_FY21_-_Arlington_County_Micro-Mobility_Transit_Hub_Prototype.Pdf.

⁷⁴ Mobility Hub Design and Implementation Guide, February 2025, 2025.

⁷⁵ “Hubguide.Pdf,” n.d., accessed January 25, 2026, <https://www.solent-transport.com/hubguide.pdf>.

⁷⁶ “Hubguide.Pdf.”

⁷⁷ Mobility Hub Design and Implementation Guide, February 2025, 2025.

which entities will champion the project and which will provide technical input, approvals, or operational support. Establishing a clear communication plan, defining approval processes, securing resource commitments, and proactively managing risks are critical to maintaining momentum and accountability. In addition, strong partnerships support the implementation of foundational demand management strategies, including coordinated parking and curb management, incentives and subsidies that encourage mode shift, and policy changes that enable flexible use of space and emerging mobility services.⁷⁸ Education and outreach programs further reinforce these efforts by helping users understand available options and benefits. Together, these actions support key mobility hub strategies, including creating a strong sense of place, ensuring user safety and comfort, incorporating technology and electrification, and providing seamless transfers and intuitive wayfinding that enhance the overall user experience.

5.2 Key Strategies

In parallel, planners must consider implementation and long-term use by addressing operations, maintenance, and institutional coordination early in the process. Developing a clear implementation strategy includes evaluating ongoing maintenance needs, accessibility and inclusivity requirements, safety features, environmental elements, and opportunities for community integration.⁷⁹ These considerations help ensure that mobility hubs remain functional, welcoming, and resilient over time rather than deteriorating after initial construction. Incorporating surrounding infrastructure improvements—such as sidewalks, bike facilities, transit amenities, and lighting—further reinforces the hub’s role as a reliable and safe node within the transportation system.

5.2.1 Elements, Access, & Design

The design should be from the perspective of the user, while considering equity, innovation, and the community needs. It should be connected to the already existing cohesive network design. Creating a priority-proximity matrix could be helpful when designing a mobility hub. See below for an example.

⁷⁸ Read Me, Metropolitan Council Mobility Hub Planning and Implementation Guidebook, n.d.

⁷⁹ Mobility Hub Design and Implementation Guide, February 2025, 2025.

Exhibit 6 Example of a priority-proximity matrix.

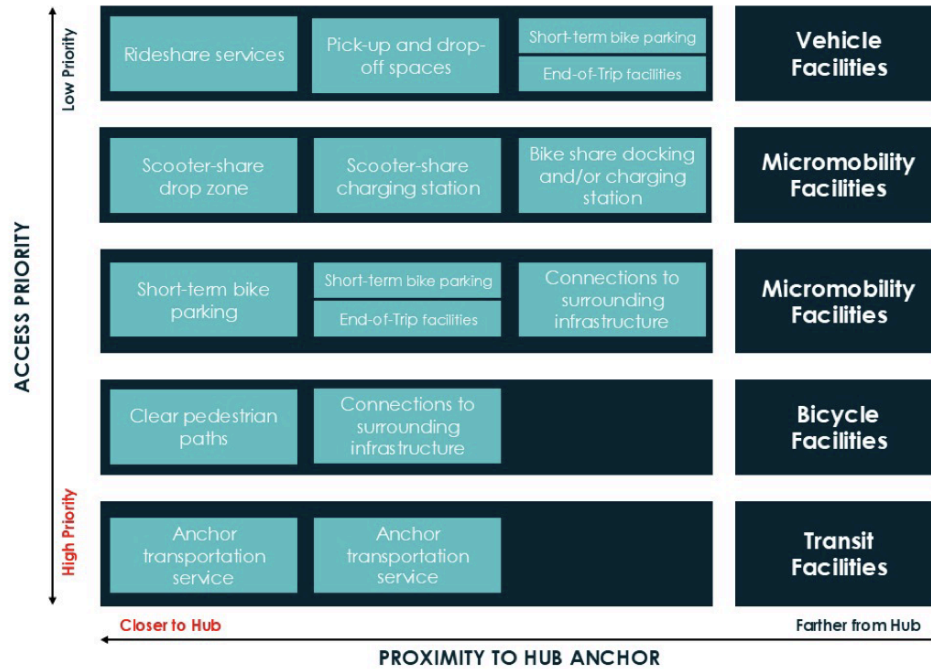


Figure 5: Example of a Priority Proximity Matrix

This matrix shows the importance of access and proximity to transit facilities (already existing transportation infrastructure such as LRT or subways), but every city will have different priorities as well as physical and regulatory barriers for more amenities. While cities might concentrate on integrating with the current transit infrastructure, it is equally important to consider safe access for pedestrians and bicyclists. Other design considerations include creating on-site safety considerations to minimize conflict and for crime prevention by design.⁸⁰ This will help riders feel safe and comfortable using the mobility hub at all times of day, ultimately supporting higher levels of use, trust, and long-term success of the facility. Lastly, ensuring the hub is reliable especially during all kinds of weather, it may be worth taking into account on-site renewable energy production and/or backup power systems.⁸¹ Incorporating these resiliency measures helps ensure uninterrupted service, enhances user confidence, and supports the long-term sustainability of the mobility hub.

5.3 Components

According to the Southern California Association of Governments (SCAG), components of a mobility hub can be consolidated into four categories: 1. transit and active transportation facilities, 2. access facilities and services, 3. technology, information, wayfinding, and 4.

⁸⁰ Mobility Hub Design and Implementation Guide, February 2025, 2025.

⁸¹ Mobility Hub Design and Implementation Guide, February 2025, 2025.

placemaking. This is relatively consistent with existing mobility hubs and current research. The following components are from the SCAG Mobility Hub Design and Implementation Guide.⁸²

5.3.1 Transit and Active Transportation Facilities

Transit Stops: Mobility Hubs are often designed and implemented around existing transportation infrastructure and existing transit stations.⁸³

Considerations for Application: For transit stops located on streets with curbside parking, the curb lane should be restricted to establish a bus zone, with stop geometry, bay design, taper lengths, and on-site transit exchange configurations designed to accommodate independent bus arrivals and departures and to conform to transit provider standards through direct consultation with the relevant agencies.⁸⁴

Carshare: They are short-term car rental typically provided by private companies and many programs use EVs that require charging stations.⁸⁵

Considerations for Application: Each dedicated carsharing parking space should be identified with regulatory signage and the minimum parking space size is twenty feet long by eight feet wide.⁸⁶

Electric Vehicle Parking and Charging Stations: Some plug-in hybrid cars, which use internal combustion and electric power, can also use charging stations. EV parking should be deployed within the onsite parking area of the mobility hub as opposed to on-street curbside parking to allow for the chargers.⁸⁷ Charging stations should be strategically located to encourage EV adoption and provide access to charging.

Considerations for Application: EV charging infrastructure should be designed to support efficiency, accessibility, and ease of use. Standard EV charging spaces are typically 20 feet by 9 feet, with charging equipment placed 12 to 18 inches from the curb and preferably located at the edge of parking areas to accommodate equipment placement, with 90-degree parking angles recommended.⁸⁸ Third-party vendors can install and should offer multiple charging ports, accessible design features, and user-friendly authentication and payment options, such as mobile apps or card readers. Real-time monitoring capabilities further enhance usability by allowing users to check availability and charging status.

⁸² SCAG, “Mobility Hub Design and Implementation Guide”, February, 2025.

⁸³ SCAG, “Mobility Hub Design and Implementation Guide,” 19.

⁸⁴ SCAG, “Mobility Hub Design and Implementation Guide,” 19.

⁸⁵ SCAG, “Mobility Hub Design and Implementation Guide,” 20.

⁸⁶ SCAG, “Mobility Hub Design and Implementation Guide,” 20.

⁸⁷ SCAG, “Mobility Hub Design and Implementation Guide,” 21.

⁸⁸ SCAG, “Mobility Hub Design and Implementation Guide,” 21-22.

Shared Micromobility: Bikeshare and scootershare are commonly provided by transit agencies, municipalities, or private sector companies to make (electric) bicycles or e-scooters. These micromobility devices can serve as the first/last mile solution and can be used one way (dock at another station) or returned back to the same station. There should be a physical corral or designated parking space for the devices staying clear of the pedestrian pathways and vehicle traffic.

Considerations for Application: Bikeshare facilities at mobility hubs typically include docking stations, some of which provide electric bike charging, and should be located near supportive bicycle infrastructure and amenities. Designated bikeshare zones should be placed within 25 to 50 feet of the transit stop or exchange, separated from motor vehicles, and connected by a direct and safe route from the street.⁸⁹ To prevent vehicle encroachment, flexible posts should be installed at intervals of no more than 10 feet, and minimum zone dimensions of approximately 4 by 5 feet should be provided, with the ability to expand as demand and space allow.⁹⁰

Pick-up and Drop-off Zone (PU/DO): They are dedicated areas for vehicles to temporarily stop to pick up or drop off users - can be used by ride-hailing companies, microtransit, taxis, campus and student shuttles, and other passenger vehicles.⁹¹

Considerations for Application: Designated PU/DO zones should be located as close as possible to the mobility hub access point, ideally as curbside zones adjacent to a pedestrian waiting area near the transit focal point. The PU/DO zone should be sized to accommodate two to three single-unit trucks, depending on the hub's scale, with nearby short-term parking stalls for waiting vehicles connected via maneuvering aisles.⁹² A dedicated queuing aisle may be provided along the right side of the access lane for taxis, operating on a single-file, first-come, first-served basis, while other ride-hail services should wait in designated short-term parking stalls until hired by a customer.

Bicycle Facilities: Safe and convenient bicycle parking is essential for helping people switch smoothly between cycling and other transportation modes. Parking options range from racks to lockers to dedicated storage rooms, each varying in terms of adaptability, security, space needs, and cost. Racks are the most adaptable and simple to install or maintain, though they provide relatively limited protection against theft or weather. In contrast, lockers and enclosed bike rooms offer greater security and shelter, making them better suited for longer-term storage. Bike rooms are typically secured, access-controlled

⁸⁹ SCAG, "Mobility Hub Design and Implementation Guide," 23.

⁹⁰ SCAG, "Mobility Hub Design and Implementation Guide," 23.

⁹¹ SCAG, "Mobility Hub Design and Implementation Guide," 24.

⁹² SCAG, "Mobility Hub Design and Implementation Guide," 24.

spaces reserved for registered users and can accommodate a large number of bicycles, which makes them especially useful at high-traffic commuter transit stations. Beyond parking, mobility hubs may also include repair stations equipped with tools for basic maintenance, such as tire inflation and minor adjustments.

Considerations for Application: Bike racks should be upright in design, straightforward, and easy for users to understand. They need to be placed in locations that are convenient to reach, while lockers should be built so cyclists can roll their bikes directly inside without difficulty. Planning should also account for the ongoing costs associated with bike rooms and repair facilities, including equipment, replacement parts, and any staffing required for upkeep.

5.3.2 Access Facilities and Services

Covered Bus Shelters: They are a safe place to wait for transit providing protection from the rain, sun exposure, and heat.⁹³

Considerations for Application: They should provide a space to rest, lighting, and wayfinding signage with enough space to maintain at least four-foot wide path of travel around the shelter amenities.⁹⁴ The shelter should be built with sturdy materials that can endure frequent use and constant exposure to weather conditions. It should also allow riders to easily see incoming buses, which can be achieved by positioning seating toward the travel lane and incorporating clear, tempered glass panels. In addition, the city should determine responsibility for both construction and ongoing upkeep, and may explore advertising options as a way to help offset related expenses.

Street Furniture: By adding benches, seating areas, and trash/recycling options, it greatly improves the traveler experience. Benches support comfort for passengers especially the elderly or disabled. If a hub is located where there could be longer intervals between buses or trains or very crowded, installing benches might be appreciated.

Considerations for Application: Benches should be 40x30 inches and where stops have high boarding numbers, lean bars and shallow benches could also be provided.⁹⁵ Consider if the majority of passengers have a high volume of users, high wait times, or a significant number of older adults or children.

Restrooms: Publicly available restrooms may provide an ease of mind for passengers traveling a long distance or for a large part of their day.

⁹³ SCAG, “Mobility Hub Design and Implementation Guide,” 26.

⁹⁴ SCAG, “Mobility Hub Design and Implementation Guide,” 26.

⁹⁵ SCAG, “Mobility Hub Design and Implementation Guide,” 27.

Considerations for Application: These will need ongoing operations and daily maintenance, but could be contracted to a third-party vendor. Other amenities in the restroom could include a changing table or even a nursing room.

Package Delivery Lockers: These provide secure lockers for storing and picking up online orders, which can save travelers from an extra car trip to pick up a package, creating an incentive to use the mobility hub.⁹⁶

Considerations for Application: It is important to incorporate security features—such as adequate lighting and surveillance cameras—at package delivery areas within a mobility hub. Municipalities may also consider establishing rules to oversee private-sector activity and forming agreements or partnerships with delivery providers to clarify expectations and operations.

Water Refilling Stations: These are places where people can fill their reusable water bottles with purified water. Users can benefit from the convenience of easy access to fresh water without the hassle of transporting heavy containers around. These stations can support people during periods of extreme heat and reduce the amount of plastic wasted from using disposable bottles.

Considerations for Application: Place the water refilling station to ensure convenient and safe locations that would also discourage vandalism.

5.3.3 Technology, Information, Wayfinding

Real-time Travel Information: Lighting-equipped signage should be placed throughout the mobility hub to support navigation and provide key information. These displays can offer real-time updates on nearby transportation options to help users make informed travel choices. In addition, they may include directions, transit timetables, parking availability, safety messages, traffic updates, and promotional materials.

Considerations for Application: Electrical availability should be assessed early; where power is not available, solar-powered e-ink signs and illuminated wayfinding should be considered to improve nighttime visibility. Information display boards, including digital maps and real-time schedules, should be placed in highly visible locations such as entrances, waiting areas, and platforms, with electrical and communication needs coordinated through site planners and relevant stakeholders. LED monitors should be mounted under canopies, oriented north when possible, and installed at ADA-compliant heights that also minimize vandalism risk. Sign type, size, and purpose should be

⁹⁶ SCAG, “Mobility Hub Design and Implementation Guide,” 30.

carefully matched to each location, with opportunities explored for coordination with transit agencies on consistent design and maintenance, and public address systems considered for automated announcements and emergency notifications.

Wayfinding Signage Purpose: Including wayfinding signage helps customers easily navigate to and from platform entrances and exits, bicycle parking areas, bus stops, and other nearby mobility services and facilities.

Considerations for Application: Signage should be easy to read and understand, providing key details such as route and system maps, schedules, estimated travel times, real-time arrivals, and instructions for using transit services.⁹⁷ It may also incorporate multilingual information, accessibility features, guidance on connections and transfers, interactive wayfinding kiosks, and live service updates.⁹⁸ In some cases, signs can be placed beyond the hub itself, particularly along major active transportation corridors. Formats may include static displays, electronic message boards, or real-time digital screens.⁹⁹ To promote durability and reduce vandalism, signage materials, finishes, and placement should be standardized across the transit system and throughout the mobility hub network.¹⁰⁰

Hub Area Maps and Facility Information: Static or digital displayers that show real-time information such as announcements or train/bus schedules can orient users and direct them to hub facilities

Considerations for Application: Maps of the hub and information about its facilities should be easy to read and designed to clearly direct users into and around the mobility hub. They should accommodate a wide range of users, including those unfamiliar with the system, individuals with disabilities, and people who speak different languages. These materials should also remain visible and effective in both indoor and outdoor settings, during both day and night.

Closed-Circuit Television (CCTV) Cameras: Video surveillance of the mobility hub provides safety and security for users as well as support security personnel and law enforcement agencies identify security breaches, incidents, and suspicious behavior.¹⁰¹

Considerations for Application: CCTV cameras should be strategically positioned throughout the mobility hub in places such as platforms, waiting areas, entrances, exists,

⁹⁷ SCAG, “Mobility Hub Design and Implementation Guide,” 34.

⁹⁸ SCAG, “Mobility Hub Design and Implementation Guide,” 34.

⁹⁹ SCAG, “Mobility Hub Design and Implementation Guide,” 34.

¹⁰⁰ SCAG, “Mobility Hub Design and Implementation Guide,” 34.

¹⁰¹ SCAG, “Mobility Hub Design and Implementation Guide,” 36.

and parking facilities with features (pan, tilt, zoom, built-in-radars, protective physical elements, day/night image qualities, and fields of view)¹⁰² to capture the maximum area and minimize coverage gaps. Since the cameras will require electricity, it's important to ensure sufficient capacity. Cities should also consider ongoing operations and maintain surveillance videos.

Emergency Telephone: These are a communication device specifically designed for situations where individuals require immediate assistance or emergency services. These phones include an emergency call button that, when pressed, connects directly to the local 911 emergency call center to provide a quick and reliable means of audio communication during emergencies. They should comply with accessibility guidelines and have an alternate power source such as solar or battery power.

Considerations for Application: There should be coordination with local law enforcement and consider establishing them in parking areas, station platforms, and waiting areas.

Public Wi-Fi and Charging Ports for Mobile Phones: Providing wifi and charging ports can improve accessibility of information by accessing transit information, getting directions, paying fares or fees, or using transportation and other apps, without a data plan.

Considerations for Application: There should be consideration that personal devices have multiple charging types (USB, wireless, USB-c, etc.) and evaluate if there is sufficient broadband infrastructure available at the hub and if not, create a partnership so it can be made available.

Solar Panels (not a part of SCAG guide): These can turn mobility hubs into sustainable, self-sufficient energy producers by powering EV charging, micromobility, lighting/CCTV, and personal device charging ports. Solar panels can reduce grid strain and provide clean energy for EV and public transit infrastructure.

Considerations for Application: These panels can be placed on covered parking lot structures or covered shelters providing shade while generating electricity directly to EV charging stations. They can also provide battery storage that can function independently, providing essential and reliable energy to the community during outages or disasters.

5.3.4 Placemaking

Lighting: Well-lit areas give a sense of safety and security for mobility hub users and the general public. It can enhance a waiting passenger's sense of comfort and poor light can

¹⁰² SCAG, "Mobility Hub Design and Implementation Guide," 34.

encourage unintended use of the facilities by non-riders, especially after hours. Lighting provides guidance and creates a welcoming atmosphere for travelers and pedestrians.

Considerations for Application: There should be early coordination with the utility provider to ensure sufficient electrical capacity as well as who will maintain and operate the system. Cities should consider installing lighting in key areas, such as intersections, under and over passes, crossings, paths or trails, tunnels, or near signage using sustainable lighting and futures to minimize light pollution - ideally a “Dark Sky” certification. Striking a balance between safety, security, visibility and enjoyment, while not negatively impacting the neighboring communities will be essential for the support from residents.

Landscaping: These are areas that are partly or completely covered with grass, trees, or shrubs to improve visual aesthetics, reduce soil erosion and carbon dioxide emissions, and provide shade while minimizing the heat island effect that results from asphalt, large building surfaces, and parking lots.

Considerations for Application: Consider installing drought tolerant (preferably native plants) landscaping, efficient irrigation systems, and climate-adapted plant material with low water and maintenance requirements. Positioning greenery in parking lots and walk ways can reduce the heat island effect. Planting high canopy trees, low shrubs, or ground cover to avoid obstructing driver views and signage. Avoiding trees that drip sap or drop large quantities of fruit, flowers, seed pods, or leaves in parking lots can help with ongoing maintenance.

Community/Local Art & Murals: Community-centered art is a popular method to integrate and connect with the local community by creating opportunities for community members to provide input, partnering with local artists or organizations, showcasing the community’s identity and establishing a sense of place.¹⁰³

Considerations for Application: Engage residents, community groups, nonprofits, local businesses, schools, and artists in shaping a cohesive artistic identity for the mobility hub.

Plazas: Incorporating an open, community-focused plaza within the hub can create a versatile space for pedestrian use, public events, and gatherings. The design should reflect the specific needs and character of the surrounding area.

Considerations for Application: Because plazas often integrate many hub features, ongoing maintenance is essential. If events are anticipated, plan for vehicle access and event setup needs. The space should also include appropriate amenities and

¹⁰³ SCAG, “Mobility Hub Design and Implementation Guide,” 40.

utilities—such as restrooms, waste and recycling bins, lighting, and power sources—to support a range of activities.

Parklets: Parklets are small public spaces created by repurposing one or two parking spots, typically outfitted with seating, greenery, and sometimes public art.¹⁰⁴

Considerations for Application: Design parklets with safe and accessible entry and exit points. Elevating them slightly above street level can improve drainage and create separation from traffic, while physical elements like planters or railings can provide additional protection.

Event and Meeting Spaces: Similar to plazas, having flexible spaces at the hub can encourage social interaction and community participation. Local agencies, organizations, and individuals can utilize these spaces whether that includes a small or large room that can act as a convenient location for community meetings and outreach opportunities.

Considerations for Application: This space could be located indoors or outdoors and will require maintenance and operations including potentially needing to utilize a system to manage reservations.

5.4 Conceptual Design

This design will be a visual, realistic model of the hub taking into consideration the physical space, desired components, and the interactions between the modes. The following steps will be useful when creating this design. 1. determine where different shared mobility services make sense by using mapping tools to indicate where shared micromobility or vehicle-based shared passenger mobility are most viable at the mobility hub locations across the region.¹⁰⁵ 2. Select the modes and services in the mobility mix.¹⁰⁶ 3. Prioritize mobility mix according to the access hierarchy, which describes the directness of route and proximity to platforms. 4. Negotiate to secure space and install hub amenities.¹⁰⁷ Once the list of facilities, features, elements, and design parameters are identified for the selected site, the next step should be to develop a conceptual design for the mobility hub. This would include the design, layout, and availability of transportation options at a hub and will depend on the local context, nearby transit options, and existing and future land use patterns.¹⁰⁸ A well-developed conceptual design is a crucial foundation for a successful project and is used to communicate with stakeholders. It incorporates feedback from stakeholders and communities, including facilities and spaces ideal for the mobility hub typology within the constraints of the location and illustrating how the desired amenities can fit together cohesively as well as help to refine the scope and cost estimates.

¹⁰⁴ SCAG, “Mobility Hub Design and Implementation Guide,” 41.

¹⁰⁵ Me, Metropolitan Council Mobility Hub Planning and Implementation Guidebook.

¹⁰⁶ Me, Metropolitan Council Mobility Hub Planning and Implementation Guidebook.

¹⁰⁷ Me, Metropolitan Council Mobility Hub Planning and Implementation Guidebook.

¹⁰⁸ Mobility Hub Design and Implementation Guide, February 2025, 2025.

5.5 Implementation

After building a conceptual design and creating a team, there are a few paths to implementation. The most common is as follows: retrofit an existing location, pilot and demonstrate new features, or integrate into current projects and developments.¹⁰⁹ Any of these will require establishing management and operations teams and plans to ensure resiliency. The core elements no matter how a mobility hub is built relies on visibility and accessibility, choice of sustainable modes, safety, waste of switching modes, practical facilities, and social and community appeal.¹¹⁰ The Intergovernmental Panel on Climate Change advocates reductions using the “avoid-shift-improve” framework.¹¹¹ Cities should avoid and reduce the need for motorized travel by implementing transport demand management and being mindful of spatial planning (considering 15-20 min neighborhoods). The hub should encourage residents to shift to more environmentally friendly modes such as shared or public transport and active travel. Overall, the mobility hub should improve energy efficiency of the transport modes through improved fuel economy, increased usage of electric vehicles, and inject opportunities for renewable energy use.

¹⁰⁹ Me, Metropolitan Council Mobility Hub Planning and Implementation Guidebook.

¹¹⁰“Rail and Shared Transportation Integration,” n.d., accessed January 26, 2026, https://cdn.prod.website-files.com/6102564995f71c83fba14d54/6442615f135abd9c35c5f54b_CoMoUK%20Rail%20and%20shared%20transport%20integration%202023.pdf.

¹¹¹“Rail and Shared Transportation Integration,” n.d., accessed January 26, 2026, https://cdn.prod.website-files.com/6102564995f71c83fba14d54/6442615f135abd9c35c5f54b_CoMoUK%20Rail%20and%20shared%20transport%20integration%202023.pdf.

5.6 Operations & Maintenance

Operations Controls	Description
Access Controls	Determine who can enter the facility and when. Access controls include ticketing or access card systems, barriers, or gates that regulate vehicle and passenger flow.
Parking Management	Organize and monitor the allocation of parking spaces. Parking management controls include signage, designated areas for vehicle types, and monitoring systems to enforce parking and use regulations. Potentially include emergency management, such as facility closures or evacuations.
Traffic Management	Ensure smooth traffic flow within the mobility hub. Traffic management controls include clear signage, road markings, traffic signals, and designated routes for entering, exiting, and navigating the facility.
Security and Safety	Ensure a safe and secure environment for consumers. Security and safety controls involve active security and safety operations, including technology devices, in-person patrols, and on-site personnel or enforcement patrols.
Maintenance and Cleanliness	Ensure the facility is well-maintained and welcoming. Maintenance and cleanliness controls include scheduled cleaning routines, regular inspections, and maintenance checks.
Customer Service and Information	Provide users with a positive experience and relevant information. Controls include the presence of staff or automated systems to help, provide guidance, and address consumer queries or concerns.

Operations controls play a critical role in ensuring that mobility hubs function safely, efficiently, and reliably by coordinating access, parking, traffic, security, maintenance, and user support across the facility.¹¹²

Figure 6: Operations Controls & Descriptions¹¹³

¹¹² Mobility Hub Design and Implementation Guide, February 2025, 2025.

¹¹³ Mobility Hub Design and Implementation Guide, February 2025, 2025.

5.7 Funding Resources

A diverse and layered funding strategy is essential to the successful planning, construction, and long-term operation of mobility hubs. Funding sources can include local government capital projects and competitive grant programs, sales tax revenues generated by self-help county transportation agencies, parking revenues, transportation impact fees, and developer requirements tied to new development or transportation demand management obligations. Additional tools such as tax increment financing and community benefit districts can help capture value created by improved accessibility and reinvest it into mobility hub infrastructure. At the regional and state level, agencies such as the California Transportation Commission, California Department of Transportation, California Air Resources Board, California Department of Housing and Community Development, California Strategic Growth Council, and California Office of Traffic Safety offer grant programs that support mobility, safety, climate, and equity goals. Federal funding opportunities—administered through the Federal Transit Administration, Federal Highway Administration, and the U.S. Department of Transportation—can further support planning, pilot projects, and capital investments. These funding mechanisms provide the financial flexibility needed to deliver mobility hubs that are resilient, equitable, and scalable over time.

6. Metrics of Success

It is crucial to evaluate the efficiency of mobility hubs after implementation especially for the pilots which affect the next steps expansion. To ensure a comprehensive evaluation, this framework distinguishes between Key Performance Indicators (KPIs), which track progress toward our primary strategic goals, and Metrics, which provide the granular data necessary to understand operational trends. Setting KPIs can quantify the performance of the existing hubs and also identify potential room for future improvement. In other words, it disregards the diverse local environments and critical values, imposing uniform construction standards on all transportation hubs within a city or state.¹¹⁴ To capture this full picture, the evaluation framework is organized into four categories: Mobility & Travel Behavior Outcomes, Accessibility Outcomes, Equity and Housing-related Outcomes and Environmental and Community Outcomes.¹¹⁵

Mobility & Travel Behavior Outcomes

- Percentage of trips utilizing the mobility hub (overall and by mode)
- Percentage change in mode usage (drive alone vs. transit, bike, micromobility)
- Number of transit boardings, alightings, and transfers at or near the hub
- Number of shared mobility trips (bike share, scooter share, car share) starting or ending at the hub
- First- and last-mile connections supported by the hub

The main target of mobility hubs is facilitating mode choice and transfers instead of simply increasing the frequency of use. In this context, behavioral changes and shifts in mode share serve as the most direct evidence of whether a hub is functioning effectively. Percentage of trips utilizing a mobility hub should be considered a foundational metric. If the utilization rate remains low, the subsequent outcomes such as mode shift, VMT and equity perspectives are meaningless.

Measuring hub utilization can be relatively straightforward and cost-effective. Surveys are the most practical and efficient way to collect data. For instance, distributing questionnaires to nearby neighborhoods, conducting intercept surveys at the hub site, or assigning on-site observers to record user patterns are all easy to adopt. These approaches allow planners to understand not only how often the hub is used, but also who is using it and for what types of trips.

Accessibility Outcomes

- Percentage change in access to work within 30 minutes by transit or active transportation
- Changes in access to daily destinations (schools, services, retail)
- Reduction in average access distance or travel time for hub users

¹¹⁴ “Play6 Mobility Hub Implementation Playbook.Pdf.”

¹¹⁵ “Play6 Mobility Hub Implementation Playbook.Pdf.”

Accessibility outcomes measure whether the mobility hub improves people's ability to reach key destinations within a reasonable amount of time. Unlike mobility indicators that focus on movement itself, accessibility indicators evaluate whether users can more conveniently access jobs, schools, services, and daily activities. Therefore, one important metric is the percentage change in access to job centers within 30 minutes by transit or active transportation. This can be evaluated using basic travel-time analysis or existing transit accessibility data, comparing conditions before and after implementation. Changes in access to daily destinations are also important. This can be measured through travel time comparisons or short surveys distributed to nearby residents asking whether the hub has made it easier to reach specific places. In addition, accessibility includes the overall travel experience. For example, Southern California Association of Governments (SCAG)'s Mobility Hubs' accessibility also include accessible parking spaces and tactile information.¹¹⁶ A smooth and continuous travel process could significantly influence whether people choose to use the hub.

Equity and Housing-related Outcomes

- Percentage change in mode usage in multi-family communities
- Percentage change in access to jobs for multi-family communities within 30 minutes
- Number of multi-family complexes within a half-mile of the hub
- Percentage of household income spent on transportation
- EV charging access for multi-family housing resident

Many mobility hub initiatives in the U.S. place strong emphasis on equity considerations. A central question is who benefits from the hub and whether it effectively serves populations that face transportation constraints. Both Metropolitan Transportation Commission (MTC)¹¹⁷ and SCAG¹¹⁸ takes equitable mobility as the core target of mobility hubs. In the context of Palo Alto, this focus can be adapted to prioritize multi-family households, as these residents are more likely to experience limited parking availability and restricted access to private EV charging. For this point, we need disaggregated metrics, using average solely cannot show the distribution effect.

One important metric is the percentage change in mode usage among residents of multi-family communities. This indicates whether transit or micromobility use is increasing within the target group. Similarly, changes in access to jobs within 30 minutes for these residents can reflect improvements in equitable accessibility. These outcomes can be assessed through disaggregated surveys or location-based usage data. Housing-related indicators provide additional context. The number of multi-family complexes within a half-mile of the hub can measure whether the site aligns with potential demand. Transportation affordability is measured by the share of household income spent on transportation. This can help evaluate whether the hub reduces financial burdens. Finally, EV charging access for multi-family residents is especially relevant in Palo Alto and can be assessed through charging station utilization and user

¹¹⁶ Mobility Hub Design and Implementation Guide, February 2025, 2025.

¹¹⁷ "Play6 Mobility Hub Implementation Playbook.Pdf."

¹¹⁸ "SCAG Mobility Hub Design and Implementation Guide," n.d., accessed January 21, 2026, <https://scag.ca.gov/sites/default/files/2025-03/25-416-MMI-0150-MobilityHubsGuidance-Feb-25-Final.pdf>.

feedback. Importantly, equity metrics should be disaggregated, as citywide averages may mask distributional differences.

Environmental and Community Outcomes

- Reduction in VMT (estimated or proxy-based)
- Reduction in fossil fuel use or GHG emissions
- Changes in parking demand or curb utilization
- Safety outcomes (collisions, conflicts involving pedestrians and cyclists)
- Perceived safety, comfort, and usability of the hub

In the city of Palo Alto, increasing EV charging access for multi-family households and reducing VMT are two primary objectives, the VMT reduction is for environmental outcomes. Quantifying VMT reduction is a central metric. However, VMT and GHG emissions are long-term and system-level outcomes, and they are rarely measured directly at the site level. As noted in federal guidance, reductions in VMT are often estimated using proxy-based methods. For example, changes in mode share, trip substitution, or self-reported reductions in driving can be helpful in quantifying. Therefore, survey data and behavioral indicators should be combined to estimate potential VMT impacts instead of a single direct measurement.¹¹⁹

Community-level outcomes reflect the place-based nature of mobility hubs. Changes in parking demand can indicate whether the hub is reshaping local travel patterns. Observations of parking occupancy or pick-up and drop-off activity can provide practical evidence of operational impact. Public transportation means increased walking and micromobility activity, therefore, safety is also a critical indicator. In other words, people may not choose mobility hubs if safety cannot be promised. Boston's GoHub! had a pre-installation survey, "More and Safer sidewalks and bike paths" are on the top 3 reasons for people would like to reduce driving a personal car.¹²⁰ In this case, Palo Alto could also use field observation or user surveys to monitor collisions, near-conflicts, and perceived safety to help ensure that mode shift does not come at the expense of safety. Finally, perceived comfort and usability should not be overlooked. Even if environmental targets are met, poor user experience may limit long-term adoption. Intercept surveys and on-site observation can help evaluate whether the hub feels safe, legible, and easy to navigate. Together, these environmental and community indicators provide a more complete assessment of both system-level and site-level impacts.

Limitations

While the indicators listed above provide a comprehensive framework for evaluating mobility hub performance, some of these metrics may be difficult to measure at the individual hub scale due to limited staff capacity, budget constraints, or lack of detailed data. In practice, cities often rely on existing administrative data sources such as shared mobility operator data, transit boarding data, and EV charging utilization records. When direct measurement is not feasible, proxy indicators or periodic surveys may be used to approximate outcomes such as mode shift or travel behavior changes. Therefore, this framework

¹¹⁹ "Shared Micromobility & Micro Transit."

¹²⁰ "GoHubs! The City of Boston's Mobility Hubs Program."."

should be understood as a flexible set of indicators, where municipalities can prioritize metrics based on available data and institutional capacity.

7. Discussion

7.1 Community Engagement

While comprehensive community engagement is critical to the successful planning and implementation of mobility hubs, this study does not have the scope or time to conduct the full engagement process described in the following sections. However, meaningful community input remains essential for ensuring that mobility hubs reflect local needs, address equity considerations, and achieve long-term adoption. The community engagement components outlined below are therefore presented as a framework to inform future mobility hub design and implementation efforts.¹²¹ These elements are intended to provide the City of Palo Alto with actionable insights and guidance for structuring community engagement in subsequent phases, when additional time and resources are available.¹²²

7.1.1 Define User Segments and Characteristics

The primary goal of the proposed mobility hub is to increase access to multimodal transportation for residents of multifamily housing in Palo Alto by providing shared e-bikes, e-scooters, and electric vehicle charging infrastructure. To achieve this goal, the project should first make assumptions about the user segments and identify two primary user groups. For example, “hub huggers” and low-income or transit-dependent residents are the target user segments in most cases.¹²³ Hub huggers are typically younger, highly educated individuals who already use shared transportation options and are likely to become frequent users of the hub, including residents who may own or drive electric vehicles but lack access to home charging.¹²⁴ Low-income and transit-dependent residents,¹²⁵ by contrast, rely more heavily on public and shared transportation for essential daily trips and require solutions that are affordable, accessible, and reliable.¹²⁶

¹²¹Metropolitan Transportation Commission. *Mobility Hub Implementation Playbook*. April 30, 2021. https://mtc.ca.gov/sites/default/files/Play3_MTC%20Mobility%20Hub%20Implementation%20Playbook_4-30-21.pdf

¹²²Govocal. “How to Use Community Engagement to Create an Inclusive Mobility Plan.” <https://www.govocal.com/blog/how-to-use-community-engagement-to-create-an-inclusive-mobility-plan>

¹²³Equitable Cities. “The Transit Trade-Off: Can Mobility Hubs Expand Equitable Access to Transit Without Driving Displacement?” Accessed January 28, 2026. <https://equitablecities.com/the-transit-trade-off-can-mobility-hubs-expand-equitable-access-to-transit-without-driving-displacement/>

¹²⁴<https://www.sciencedirect.com/science/article/pii/S2590198225003616>

¹²⁵Equitable Cities. “The Transit Trade-Off: Can Mobility Hubs Expand Equitable Access to Transit Without Driving Displacement?” Accessed January 28, 2026. <https://equitablecities.com/the-transit-trade-off-can-mobility-hubs-expand-equitable-access-to-transit-without-driving-displacement/>

¹²⁶Institute for Transportation and Development Policy (ITDP). “Can Shared Mobility Help Low-Income People Access Opportunity?” <https://itdp.org/publication/can-shared-mobility-help-low-income-people-access-opportunity/>

In addition to these primary groups, the project should also recognize and make assumptions on two secondary user segments, such as commuters and occasional users.¹²⁷ Commuters include individuals traveling to work, school, or other regular destinations who need dependable first- and last-mile connections to regional transit networks such as Caltrain.¹²⁸ Occasional users are residents who primarily rely on personal vehicles but may choose shared mobility for specific trip types, such as short errands, social trips, or when parking is constrained.¹²⁹ Defining these segments early enables the City to design engagement and infrastructure that reflect the varied mobility needs present in multifamily neighborhoods.

7.1.2 Assess User Needs

Following the identification of user segments, the engagement process focuses on assessing the specific needs and gaps experienced by each group. Different segments prioritize different aspects of transportation access:¹³⁰ some users place greater emphasis on safety and comfort, while others focus on affordability, accessibility, or travel efficiency.¹³¹ For instance, hub huggers often seek convenience, reliability, fast transfers, and seamless digital integration,¹³² while low-income residents emphasize affordability, physical accessibility, and personal safety, particularly during evening hours.¹³³ Commuters prioritize predictable travel times and high-quality transfers, whereas occasional users value ease of use, clear information, and low barriers to entry.¹³⁴ Understanding these differing priorities allows the City to identify where the current transportation system falls short and where targeted interventions through the mobility hub can have the greatest impact.

¹²⁷ Firmansyah, Dedy, Muhammad Zudhy Irawan, Mukhammad Rizka Fahmi Amrozi, and Imam Muthohar. “Uncovering Motivations for Innovation in Urban Commuting: A Segmentation of Jakarta’s Motorcyclists.” *Journal of Open Innovation: Technology, Market, and Complexity* 11, no. 3 (2025): Article 100614.

<https://www.sciencedirect.com/science/article/pii/S2199853125001490>

¹²⁸ Stadnichuk, Vladimir, Laura Merten, Christian Larisch, and Grit Walther. “Optimisation of Mobility Hub Locations for a Sustainable Mobility System.” *Transportation Research Interdisciplinary Perspectives* 26 (2024): 101193. <https://www.sciencedirect.com/science/article/pii/S2590198221001743>

¹²⁹ Pangbourne, Kate, Marcus Enoch, and Glenn Lyons. “Transport Policy and Shared Mobility Integration.” *Transport Policy* 136 (2025). <https://www.sciencedirect.com/science/article/pii/S1361920925006169>

¹³⁰ Roukouni, Anastasia, Inés Aquilué Junyent, Miquel Martí Casanovas, and Gonçalo Homem de Almeida Correia. “An Analysis of the Emerging ‘Shared Mobility Hub’ Concept in European Cities.” *Transportation Research Interdisciplinary Perspectives* 19 (2023). <https://www.sciencedirect.com/science/article/pii/S2590198219300776>

¹³¹ Docherty, Iain, Jon Shaw, and Marcus Enoch. “Transport Governance and Mobility Transitions.” *Transport Policy* 96 (2022). <https://www.sciencedirect.com/science/article/pii/S096669232200237X>

¹³² Curtis, Carey, and David Scheurer. “Mobility Hubs and Integrated Transport Planning.” *Transport Policy* 125 (2025). <https://www.sciencedirect.com/science/article/pii/S0966692325001875>

¹³³ Metropolitan Transportation Commission (MTC). “Mobility Hubs and Affordable Housing.” Accessed January 28, 2026. <https://mtc.ca.gov/planning/transportation/access-equity-mobility/mobility-hubs-affordable-housing>

¹³⁴ Union Internationale des Transports Publics (UITP). *CEMP2 Final Report*. December 15, 2024. https://uic.org/IMG/pdf/20241215_cemp2-report-final_maj.pdf

Most importantly, insights from user segmentation and needs assessment directly inform the design of the mobility hub’s amenities and services.¹³⁵ As a neighborhood-scale facility primarily serving multifamily residents, the hub should prioritize core accessibility features over extensive or destination-oriented programming.¹³⁶ Key elements may include shared bike and scooter services, secure bike parking, EV charging, and real-time transit information displays.¹³⁷ Rather than emphasizing long-distance connectivity, the hub should focus on enabling short, reliable first- and last-mile trips and supporting daily travel needs.¹³⁸ Designing services around the needs of primary user segments ensures that the hub remains relevant, intuitive, and well-utilized.

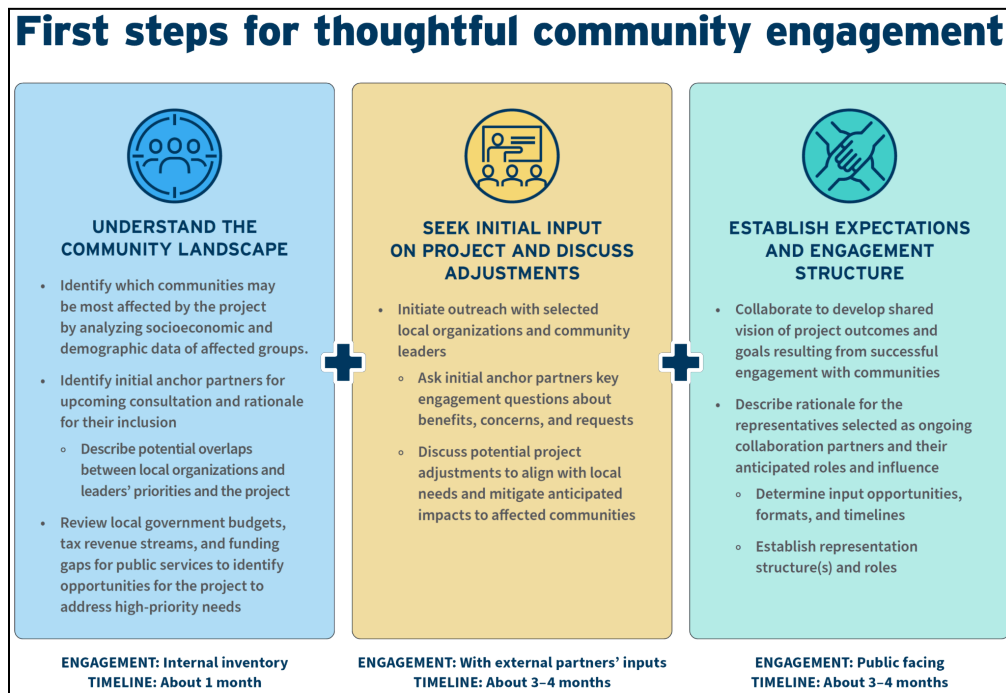


Figure 7: RMI’s toolkit for initial engagement and collaboration with communities.¹³⁹

To ground design decisions in lived experience, the project should use more surveys and advisory input to identify community needs and concerns. Figure 6 shows steps for engaging communities, which is a framework that Palo Alto can use when incorporating residents’ input into the hub design process. Survey questions collect demographic and housing information, travel behaviors, and mobility constraints, including vehicle ownership, trip purposes, transit

¹³⁵ Witte, M. A., *Title of the Thesis* (Master’s thesis, University of Twente, 2025), accessed January 28, 2026, https://essay.utwente.nl/fileshare/file/106320/Witte_MA_ET.pdf

¹³⁶ Urban Design Studio, City of Los Angeles. *Mobility Hubs Reader’s Guide*.

<http://www.urbandesignla.com/resources/docs/MobilityHubsReadersGuide/hi/MobilityHubsReadersGuide.pdf>

¹³⁷ City of Durham. “Shared Active Transportation.” Accessed January 28, 2026.

<https://www.durhamnc.gov/3219/Shared-Active-Transportation>

¹³⁸ Union Internationale des Transports Publics (UITP). *Policy Brief: Mobility Hubs*. 2025.

<https://www UITP.org/wp-content/uploads/sites/7/2025/04/Policy-Brief-Mobility-hubs-web.pdf>

¹³⁹ Rocky Mountain Institute (RMI), *Community Engagement Toolkit*, accessed January 28, 2026,

<https://rmi.org/insight/community-engagement-toolkit/>

usage frequency, and perceived transportation challenges (Appendix 1).¹⁴⁰ Additional questions assess desired hub services, amenities, and willingness to shift toward more sustainable modes if convenient options are available nearby.¹⁴¹ Location-specific questions evaluate walking distance to proposed hub sites, perceived safety during the day and at night, and last-mile infrastructure gaps.¹⁴²

Beyond data collection, survey responses should be further segmented to reflect differences across housing type, income level, travel mode, trip frequency, distance to the hub, and vehicle ownership.¹⁴³ This approach avoids treating community input as a single aggregated perspective and instead recognizes that residents face distinct mobility barriers and compare different alternatives, such as private vehicles, ride-hail, or transit-only travel. Translating survey findings into design priorities allows the City to align hub features with the needs most likely to drive behavioral change toward shared and sustainable transportation.¹⁴⁴

7.1.3 Competitive Landscape: Existing Mobility Behavior Substitutes

The engagement process also includes a comparative analysis of existing mobility behaviors that function as substitutes for the proposed hub. These include driving alone, ride-hail services, bus-only travel, personal bike or e-bike ownership, carpooling, and remote work or delivery options.¹⁴⁵ Each alternative is evaluated based on convenience, cost to users, equity access, reliability, safety perception, and VMT. This provides a transparent, user-centered comparison of existing travel behaviors, enabling targeted outreach, informed dialogue, and co-design of hub features that directly respond to community priorities (Score 1-5: 1-weak, 5-strong).¹⁴⁶

¹⁴⁰National Aging and Disability Transportation Center (NADTC). *Transportation Survey Questions*.

<https://www.nadtc.org/wp-content/uploads/TransportationSurveyQuestions.pdf>

¹⁴¹Transform. *Community Transportation Needs Assessment*. June 2024.

https://www.transformca.org/wp-content/uploads/2024/06/community-transportation_needs_assessment.pdf

¹⁴²Southern California Association of Governments (SCAG). *Mobility Hub Design and Implementation Guide*. February 1, 2025.

<https://scag.ca.gov/sites/default/files/2025-03/25-416-MMI-0150-MobilityHubsGuidance-Feb-25-Final.pdf>

¹⁴³<https://www.sciencedirect.com/science/article/pii/S2590198225001046#:~:text=A%20scalable%20approach%20that%20can%20generate%20travel,as%20well%20as%20the%20household's%20demographic%20profile>.

¹⁴⁴“Article S2590061725000110.” ScienceDirect. <https://www.sciencedirect.com/science/article/pii/S2590061725000110>.

¹⁴⁵“Article S1361920924002311.” ScienceDirect. <https://www.sciencedirect.com/science/article/pii/S1361920924002311>.

¹⁴⁶Bureau of Transportation Statistics. “Transportation Statistics Annual Report 2022.” <https://www.bts.gov/newsroom/transportation-statistics-annual-report-2022>.

Competitor behavior	Convenience	Cost to user	Equity access	Reliability	Safety perception	VMT	Notes / why people choose it
Drive alone + park	5	2	2	5	4	1	Fast door-to-door travel; high cost & emissions
Ride-hail (Uber/Lyft)	4	2	2	4	4	2	Convenient, no parking; expensive and increases VMT
Bus only	2	5	4	3	3	4	Affordable & accessible but slower, weak last-mile
Bike / e-bike (owned)	4	4	3	3	2	5	Low cost & emissions; safety & storage barriers
Carpool / private rideshare	3	4	3	3	4	3	Cost sharing helps; coordination reduces convenience
Remote work / delivery	5	4	3	5	5	5	Eliminates trips; not feasible for all jobs
Mobility Hub (proposed)	4	4	5	4	4	5	Integrates modes, improves first/last mile, lowers cost & emissions while increasing access

Table 1: Competitive Matrix: Existing Mobility Behavior Substitutes.

Relative to existing options, the proposed mobility hub in the City of Lake Forest Park performs strongly across equity access, VMT reduction, and integration of multiple modes.¹⁴⁷ Table 1 presents a comparative matrix evaluating existing mobility behavior substitutes against

¹⁴⁷City of Fort Pierce. VMT Study Final Report. Fort Pierce, FL.
https://www.cityoflfp.gov/DocumentCenter/View/12486/8_LFPVMT_Study_Final.

the proposed mobility hub across six key performance criteria: convenience, cost to users, equity access, reliability, safety perception, and VMT. The analysis illustrates that driving alone remains dominant in convenience and reliability, explaining its continued prevalence despite low equity performance and high VMT impacts.¹⁴⁸ Ride-hail services offer similar convenience advantages but at higher user costs and with limited environmental benefits due to increased deadheading and induced travel.¹⁴⁹ Bus-only travel performs strongly in affordability and equity access but scores lower in convenience and reliability, largely due to first- and last-mile challenges.¹⁵⁰ Privately owned bicycles and e-bikes demonstrate strong VMT reduction and cost efficiency, yet safety perception and storage constraints limit broader adoption. Carpooling offers moderate cost and environmental benefits but depends heavily on coordination, reducing flexibility. Remote work and delivery options eliminate trips entirely and perform strongly across most criteria, although their applicability is limited to certain job types.

In contrast, the proposed mobility hub achieves balanced, high performance across all categories by integrating multiple modes in a single, accessible location. By improving first- and last-mile connectivity, enhancing safety and reliability through infrastructure design, and expanding equitable access to multimodal options, the hub reduces dependence on single-occupancy vehicles while preserving convenience. The matrix therefore demonstrates that the mobility hub does not aim to replace a single competitor mode, but rather to combine the strengths of multiple alternatives while minimizing their weaknesses, positioning it as a comprehensive, user-centered solution within the local transportation ecosystem.

By improving first- and last-mile connectivity while lowering costs and emissions, the hub addresses gaps that single-mode or car-dependent behaviors cannot. Presenting this comparison transparently supports informed dialogue with the community and helps co-design hub features that directly respond to residents' priorities. This could be further presented when the city is doing direct community outreach.

7.1.4 Positioning and Community Outreach

Based on the engagement findings, the mobility hub is positioned as a neighborhood-scale transportation solution for residents of multifamily housing and transit-dependent communities in Palo Alto. The hub provides affordable, reliable last-mile connectivity by integrating shared micromobility and EV charging, offering an alternative to

¹⁴⁸ Washington State Department of Transportation. Report 806.1: Research Report. Olympia, WA: WSDOT. <https://www.wsdot.wa.gov/research/reports/fullreports/806.1.pdf>.

¹⁴⁹ National Center for Biotechnology Information. "Article PMC8890988." PubMed Central. <https://pmc.ncbi.nlm.nih.gov/articles/PMC8890988/>.

¹⁵⁰ Accuardi, Zak. "New Toolkit Supports Bus Priority Implementation." Natural Resources Defense Council (NRDC). <https://www.nrdc.org/bio/zak-accuardi/new-toolkit-supports-bus-priority-implementation>.

car-dependent travel or single-mode transit. This positioning statement clearly communicates who the hub is for, what problem it solves, and how it improves daily mobility.

For funders, this positioning demonstrates alignment with common priorities such as reduced VMT, lower emissions, and improved access for underserved populations, strengthening the case for public or philanthropic investment. For target users, the positioning helps residents quickly understand how the hub supports their needs, increasing trust and willingness to participate in surveys, workshops, and pilot programs. When community members see their experiences reflected in the project's framing, engagement becomes more meaningful and adoption more likely.

7.1.5 Collaborations with Stakeholders

Effective stakeholder collaboration is essential for successful mobility hub planning, as the literature on collaborative urban planning highlights the need to actively involve both public and private actors throughout the decision-making process. Collaborative planning in urban freight and transport settings requires structured engagement mechanisms that give stakeholders not just opportunities to provide input, but meaningful influence over outcomes, aligning with higher levels of participation on citizen involvement. The “Stakeholder Identification and Engagement in Problem Structuring Interventions” research demonstrates that when stakeholders, including local authorities, private service providers, community representatives, and end users, are engaged through consensus-building processes and anchored in political and planning frameworks, the resulting plans tend to be more legitimate, contextually informed, and better able to reconcile competing interests.¹⁵¹ For a mobility hub in Palo Alto, this implies establishing collaborative forums, iterative consultation loops, and multi-sector partnerships early in the planning stage to ensure that diverse priorities, such as accessibility, sustainability, equity, and operational feasibility, can be integrated into the hub's design. Overall, collaborations with stakeholders reduce conflict and enhance long-term buy-in.¹⁵²

This process should begin with early identification and mapping of all relevant stakeholders, including local government agencies, public transit operators, private mobility providers, developers, community organizations, and user groups.¹⁵³ Establishing a shared vision among these groups, centered on goals such as sustainability and accessibility, helps build trust

¹⁵¹Gregory, Amanda J., Jonathan P. Atkins, Gerald Midgley, and Anthony M. Hodgson.

“Stakeholder Identification and Engagement in Problem Structuring Interventions.” *European Journal of Operational Research* 283, no. 1 (2020): 321–340. <https://doi.org/10.1016/j.ejor.2019.10.044>.

¹⁵²Bjørgen, Aud Tennøy, and Marianne Røiseland, “Governing Urban Freight Transport: The Role of Collaboration in Policy and Planning,” *Cities* 108 (2021): 103047,

<https://www.sciencedirect.com/science/article/pii/S0264275121000470>

¹⁵³Movability, “Mobility Hubs: The Complete Guide to Multimodal Transportation Properties—and Why Some Succeed and Others Fail,” *Movability*, n.d.,

<https://www.movability.io/blog/mobility-hub-the-complete-guide-to-multimodal-transportation-properties-and-why-some-succeed-and-others-fail>

and reduces conflicts throughout the planning process. Then, co-creation approaches, such as participatory workshops and design charrettes, could be implemented to enable stakeholders to contribute local knowledge and user perspectives, ensuring that the hub responds to real mobility needs.¹⁵⁴ Pilot projects can further support collaboration by allowing partners to test services such as micromobility or EV charging on a small scale, gather feedback,¹⁵⁵ and iteratively refine solutions before full deployment. Public–private partnerships such as utilizing site-specific parking lots also play a key role in leveraging private-sector expertise, technology, and financing capacity alongside public oversight and policy alignment.¹⁵⁶

The partnerships model in Figure 8 highlights the broad array of collaborators needed, including public transport agencies, shared mobility and private operator firms, support service providers, and technology platforms, reinforcing that hubs are co-designed and co-delivered through negotiated relationships rather than unilateral planning. The *SEStran* study further emphasizes that stakeholder engagement and communication are essential components of the planning and implementation framework, with local authority engagement of transport operators and regional partners helping align mobility hub objectives with regional travel strategy and public policy goals. Together, the model underscores that successful mobility hubs emerge from structured multi-stakeholder collaboration that blends public oversight, private service delivery, and shared planning processes to meet local mobility needs while advancing sustainability and accessibility goals.¹⁵⁷

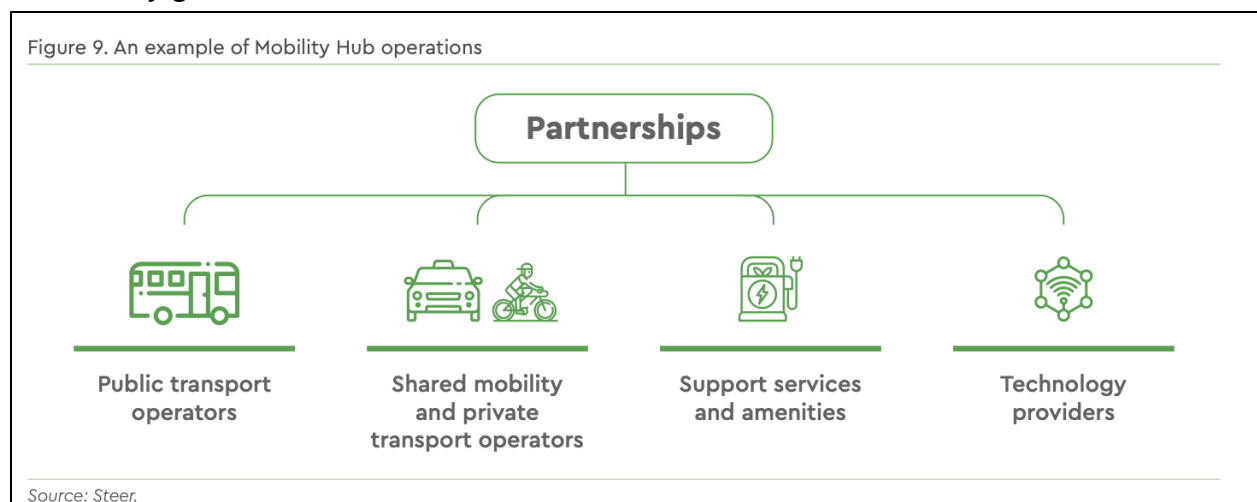


Figure 8. An example of mobility hub operations on partnerships.

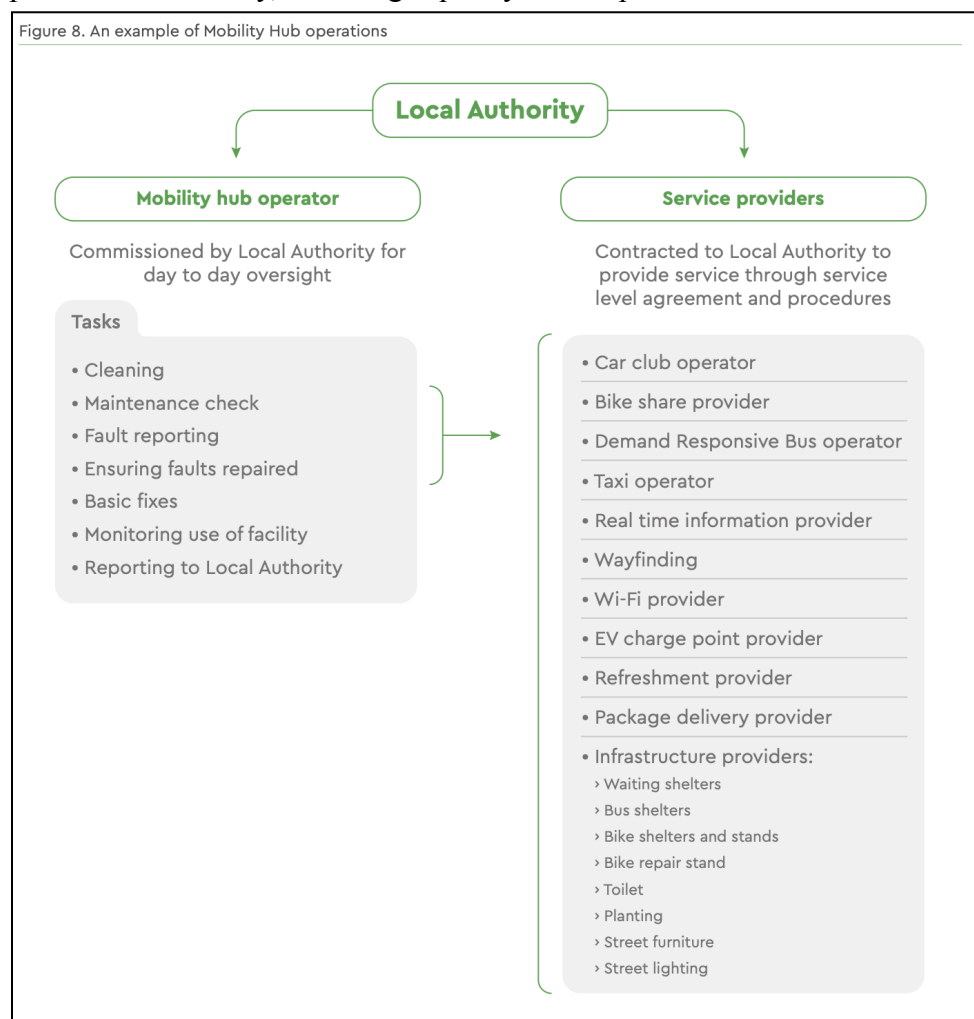
¹⁵⁴POLIS Network / Urban Europe, “10 Recommendations for Mobility Hubs,” *JPI Urban Europe*, n.d., <https://jpi-urbaneurope.eu/news/10-recommendations-mobility-hubs/>

¹⁵⁵The Institution of Highway Engineers (IHE), “My Journey in Collaborative Stakeholder Management,” *IHE*, n.d., <https://www.theihe.org/my-journey-in-collaborative-stakeholder-management/>

¹⁵⁶ Bhadragoudar Shivanagouda, Lata, *Stakeholder Perspectives on Mobility Hub Planning for Sustainable Cities*, master’s thesis, 2024, DiVA Portal, <https://www.diva-portal.org/smash/get/diva2:1894907/FULLTEXT02.pdf>.

¹⁵⁷SEStran, *Mobility Hubs Strategic Study: Final Report* (Edinburgh, UK: South East Scotland Transport Partnership [SEStran], May 2020), <https://sestran.gov.uk/wp-content/uploads/2020/05/SEStran-Mobility-Hubs-Strategic-Study-Final-Report.pdf>

In addition, mobility hubs should be understood not merely as physical infrastructure, but as integrated multimodal systems whose operation depends on collaboration among a defined set of stakeholders. These stakeholders include local authorities, mobility hub operators, public transport agencies, shared mobility and private transport providers, technology partners, and service and amenity providers.¹⁵⁸ As illustrated in Figure 9, the local authority typically assumes a commissioning and oversight role, appointing a mobility hub operator to manage day-to-day operations while contracting service providers, such as car- and bike-share companies, EV charging operators, and real-time information system providers, to deliver mobility services at the hub.¹⁵⁹ This multi-stakeholder operating model relies on clear role definition, coordinated contractual arrangements, and ongoing partnership governance to ensure reliable service delivery, operational efficiency, and a high-quality user experience.¹⁶⁰



¹⁵⁸ Alam, Md Ashraful, and Anders Wretstrand. *Stakeholder Perspectives on Mobility Hub Planning for Sustainable Urban Mobility*. Malmö University, 2024. <https://www.diva-portal.org/smash/get/diva2:1894907/FULLTEXT02.pdf>.

¹⁵⁹ South East Scotland Transport Partnership (SEStran). *Mobility Hubs Strategic Study: Final Report*. Edinburgh, 2020. <https://sestran.gov.uk/wp-content/uploads/2020/05/SEStran-Mobility-Hubs-Strategic-Study-Final-Report.pdf>.

¹⁶⁰ SEStran, *Mobility Hubs Strategic Study*, 24.

Figure 9. An example of mobility hub operations on local authority.

7.1.6 Feedback Mechanisms

Feedback mechanisms are critical to ensure that a mobility hub responds to local needs, supports sustainable travel behavior, and remains adaptable over time.¹⁶¹ As highlighted in mobility hub best-practice literature, including Movability’s analysis of why some hubs succeed while others fail, successful hubs integrate community engagement, data-driven evaluation, and iterative design throughout the project lifecycle rather than relying on one-time consultation.¹⁶² Early feedback mechanisms during the pre-implementation phase, such as community needs assessments, stakeholder advisory groups, and public workshops, allow planners to understand travel patterns, safety concerns, and service gaps before design decisions are finalized in Figure 10. These engagement tools help align the hub’s configuration with user expectations and build early trust among residents, transit agencies, and adjacent landowners.¹⁶³

During implementation, feedback is most effective when paired with pilot programs and real-world testing, a strategy emphasized by Movability as essential for reducing risk and improving adoption.¹⁶⁴ Quick-build or pop-up pilots enable planners to test amenities such as micromobility parking, seating, wayfinding, or curb management at low cost while collecting immediate user input through on-site surveys and observations.¹⁶⁵ Iterative design adjustments based on pilot feedback, such as relocating facilities, modifying layouts, or adjusting service levels, ensure that the hub evolves in response to actual usage rather than assumptions.¹⁶⁶ This approach allows mobility hubs to function as learning environments, where feedback directly informs operational and spatial refinements.

Post-implementation and continuous engagement mechanisms further support long-term success by combining quantitative performance metrics with qualitative user insights.¹⁶⁷ Digital tools, including app-based usage data, QR-code feedback kiosks, and geofencing analytics,

¹⁶¹ Sacramento Area Council of Governments (SACOG). “Mobility Hub Design Guidance.” Accessed March 16, 2026. <https://www.sacog.org/planning/transportation/sustainable-mobility-program/mobility-hubs>.

¹⁶² Powell, Brian J., Byron J. Powell, and Enola K. Proctor, “Implementation Strategies for Health Interventions: A Scoping Review,” *Implementation Science* 7, no. 1 (2012): Article 91, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11191329/>

¹⁶³ Lyons, Glenn, and Kiron Chatterjee, “A Radical Rethinking of Transport and Mobility?” *Transport Policy* 133 (2024): 1–12, <https://www.sciencedirect.com/science/article/pii/S0967070X25000320>

¹⁶⁴ Larson, Elaine L., Sameer J. Patel, David Evans, and Lisa Saiman. “Feedback as a Strategy to Change Behavior: The Devil Is in the Details.” *Journal of Evaluation in Clinical Practice* 19, no. 2 (2013): 230–234. <https://pmc.ncbi.nlm.nih.gov/articles/PMC3303967/>.

¹⁶⁵ Metropolitan Transportation Commission (MTC), *Playbook 2: Mobility Hub Implementation—Modular Mobility Hub Pilots* (Oakland, CA: Metropolitan Transportation Commission, April 30, 2021), https://mtc.ca.gov/sites/default/files/Play2_MTC_Mobility_Hub_Implementation_Playbook_4-30-21.pdf.

¹⁶⁶ Metropolitan Transportation Commission (MTC), *Playbook 3: Mobility Hub Implementation—Hubs and Community Needs Assessment* (Oakland, CA: Metropolitan Transportation Commission, April 30, 2021), https://mtc.ca.gov/sites/default/files/Play3_MTC_Mobility_Hub_Implementation_Playbook_4-30-21.pdf.

¹⁶⁷ Visible Network Labs. “Community Engagement 101: Ultimate Beginner’s Guide.” Last modified November 21, 2023. <https://visiblenetworklabs.com/guides/community-engagement-101/>.

provide ongoing information on service utilization, transfer behavior, and system performance.¹⁶⁸ These data are complemented by qualitative methods such as interviews and maintenance audits, which capture user perceptions of safety, comfort, and accessibility—factors that strongly influence repeat use but are difficult to measure through metrics alone. Together, these layered feedback mechanisms in Figure 10 ensure that the mobility hub is not a static piece of infrastructure, but a user-centered, adaptive system capable of improving over time as travel behavior, technology, and community needs evolve.¹⁶⁹

¹⁶⁸Movability, “Mobility Hubs: The Complete Guide to Multimodal Transportation Properties—and Why Some Succeed and Others Fail,” *Movability*, n.d., <https://www.movability.io/blog/mobility-hub-the-complete-guide-to-multimodal-transportation-properties-and-why-some-succeed-and-others-fail>.

¹⁶⁹FeedbackNow, “How Real-Time Feedback Can Improve Passenger Experience in Airports,” *FeedbackNow*, n.d., <https://www.feedbacknow.com/blog/how-real-time-feedback-can-improve-passenger-experience-in-airports>.

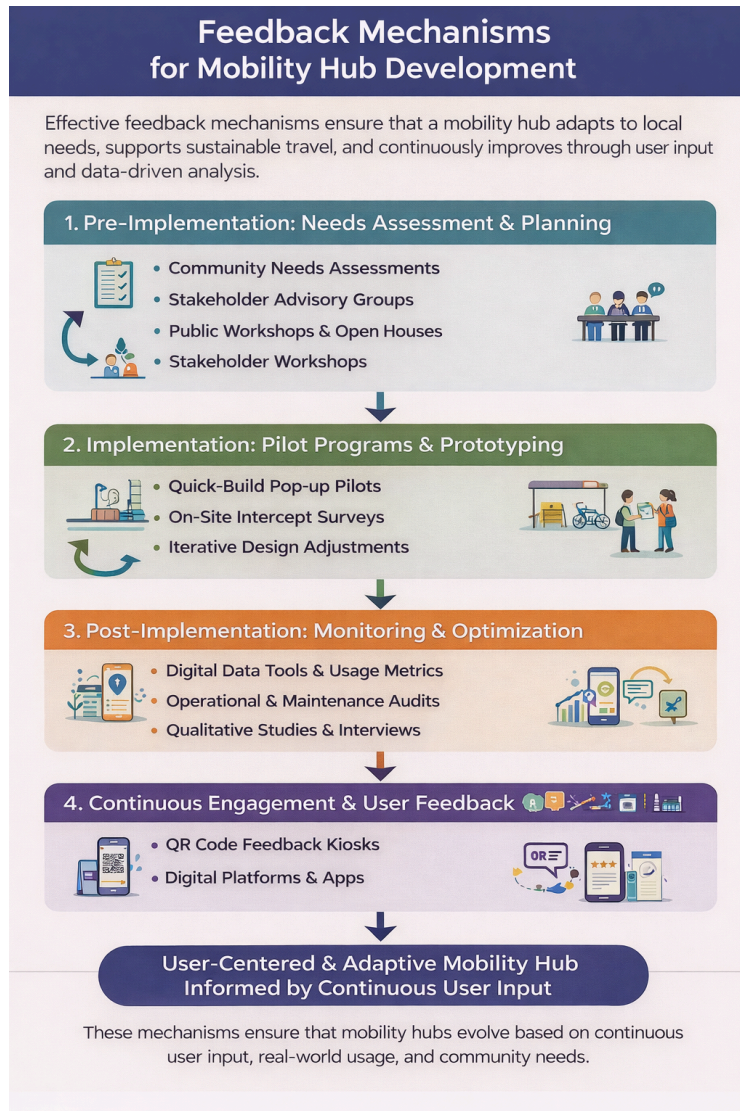


Figure 10. Feedback mechanisms for mobility hub development.

7.2 Limitations

7.2.1 Data Insufficiency

Although this study offers important contributions, its conclusions are constrained by several limitations including lack of community input, the team's ability and knowledge of helpful software (e.g. GIS), and challenges obtaining data. During our literature review, one of the best practices was to include community needs and support through surveys. Because this is only a two semester project, we were unable to narrow down a location, create a survey, collect

data, and analyze in time. This was one of the biggest challenges for the project from the clients. We pivoted the scope of the original idea for the project and created an alternative where we would present our research about how to design a mobility hub from the idea to implementation and give our suggestions for a few potential sites based on our limited research.

One of the main objectives for this mobility hub was to include EV charging for multi-family homes in the city. While we had data about landuse/parcel ownership, the clients were unable to share information about EV ownership due to privacy concerns and they did not have the permission to give it out. In addition, we were given many GIS files including, bike and pedestrian routes, transportation routes, and locations of schools/libraries/community buildings, none of our team members had the skills to effectively utilize the data. Because of this, we were unable to confidently choose the “best” area to place our proposed mobility hub site. Similarly, the team has never been to Palo Alto nor could we fly out due to lack of budget.

It was also very difficult to calculate some of the components such as infrastructure cost, operations cost, and energy usage because the proposed site was hypothetical. Without knowing exactly what components and how many, it proved challenging to estimate for a potential site.

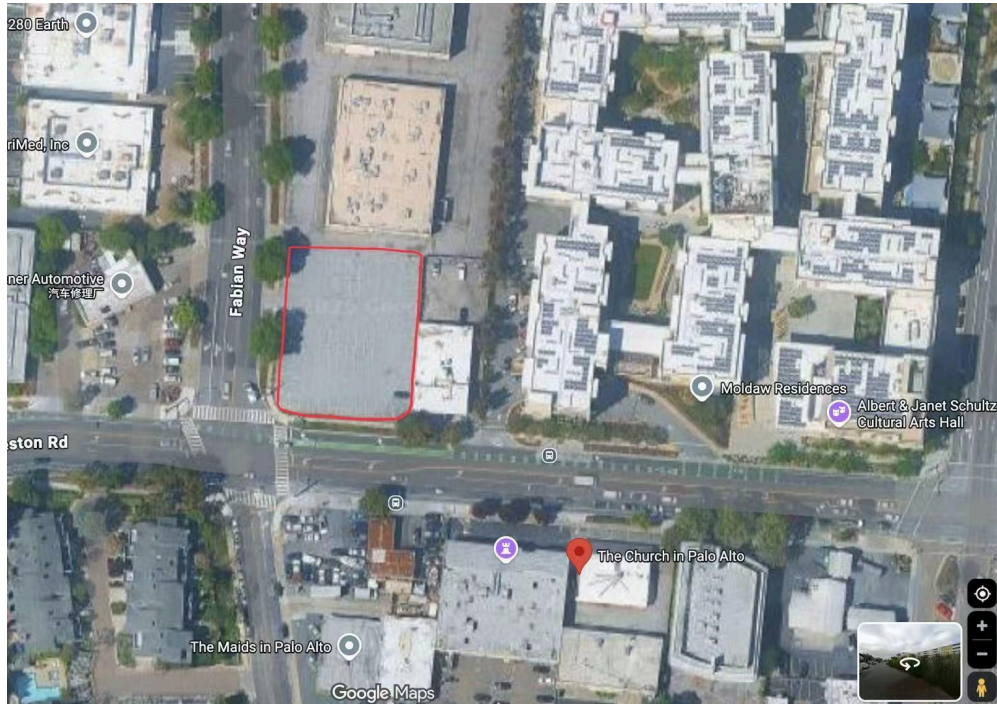
8. Potential Sites

Building on the design guidelines, metrics of success, community engagement framework, and limitations outlined above, the following section applies these principles to identify and evaluate three potential pilot locations for a mobility hub in Palo Alto. Each site was selected based on the key siting criteria established through our literature review and best practices analysis, including proximity to multifamily housing, access to public transit, connectivity to daily destinations, and feasibility of implementation. While the engagement framework described in Section 7 is intended to guide future community input, the site evaluations below draw on available city data, spatial analysis, and the best practices identified from U.S. and European case studies to assess each location's strengths, constraints, and potential to advance the City's VMT reduction and equity goals. For each site, we provide a qualitative assessment organized around six criteria: proximity to multifamily housing, access to amenities, public transit connectivity, utilization of existing infrastructure, VMT reduction potential, and implementation readiness, along with a summary scorecard to support comparison across locations.

8.1 Location A

Proposed Site: 3997 Fabian Way, Palo Alto, CA 94303.

Surface parking lot along San Antonio Road (Approx. 4200–4300 San Antonio Rd, Palo Alto, CA)



1. Proximity to Multi-Family Housing (Equity & Demand)

The proposed site is surrounded by medium- to high-density multi-family residential buildings within a short walking radius, creating a strong and consistent base of potential users. Residents in multi-family housing are more likely to rely on shared mobility, public transit, and first- and last-mile solutions due to constraints related to parking availability and private vehicle ownership. As a result, the location aligns closely with equity-focused siting criteria by prioritizing populations with higher potential benefit from non-automobile transportation options.

2. Access to Local Amenities and Daily Destinations

The site is embedded within a mixed-use corridor that includes a wide range of nearby destinations, such as Kehillah Jewish High School, neighborhood restaurants (including Taco Bell and Ramen and Tapas), Freidenrich Community Park, Greenmeadow Pool and Community Center, Magical Bridge Playground, Mitchell Park, Monta Loma–Mardell Little Free Library, Hotel Citrine, Cubberley Community Center Field #3, and Align Health. This concentration of educational, recreational, commercial, and community amenities supports trip chaining, enabling users to combine commuting, errands, and services within a single trip. The proximity to diverse daily destinations increases the utility of the mobility hub beyond peak commuting periods and strengthens its function as a daily-use node rather than a single-purpose facility.

3. Public Transportation Connectivity

San Antonio Road functions as a major north–south arterial with existing bus service and regional connectivity. The site is served by the ACE Orange line (Mountain View–Palo Alto) and School Route 288 within approximately 0.1 miles, with the Santa Clara Transit Center Route 21 (Middlefield & Montrose) located within 0.5 miles. The site’s frontage along a high-visibility corridor supports efficient transfers between buses, micromobility, and walking, improving first- and last-mile access. These characteristics make the location well suited as an intermediate transfer point, even without immediate proximity to a major rail station.

4. Utilization of Existing Parking Infrastructure (Feasibility & Cost)

The presence of an existing surface parking lot provides a significant feasibility advantage by enabling adaptive reuse without the need for substantial land acquisition or demolition. This condition supports low-cost, near-term implementation of key mobility hub elements, including micromobility parking, EV charging infrastructure, designated pick-up and drop-off zones, wayfinding, and seating. Repurposing existing parking minimizes disruption to surrounding uses and allows the City to pursue a phased or pilot-based rollout strategy, reducing both financial and political risk.

5. Support for VMT Reduction and Mode Shift

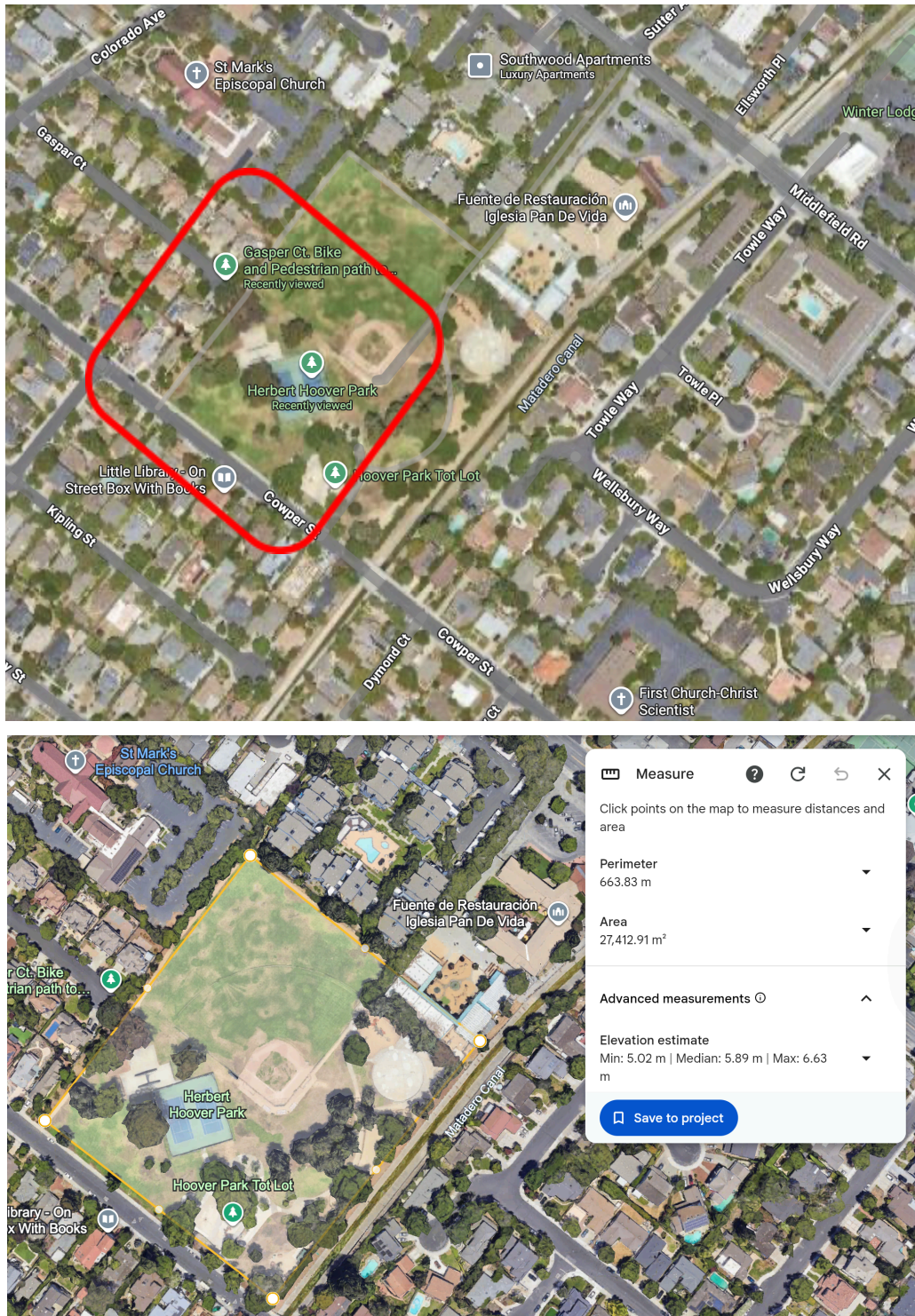
By concentrating shared mobility services and transit access within a dense residential and activity-rich area, the proposed site encourages mode shift away from single-occupancy vehicle travel. The mobility hub can reduce short car trips by enabling walking, biking, and shared modes for local travel, particularly for first- and last-mile connections. These characteristics directly support VMT reduction and climate objectives, especially for frequent, repeat trips that account for a significant share of local travel demand.

6. Implementation Readiness and Scalability

The site’s physical characteristics, including flat terrain, direct street access, and existing utility connections, support incremental deployment and long-term scalability. Initial pilot installations can be implemented quickly and adjusted based on observed usage patterns and user feedback. This flexibility makes the location well suited for an iterative, data-driven mobility hub strategy, allowing the City to refine services over time while responding to evolving community needs and travel behavior.

8.2 Location B

Proposed Site: 2901 Cowper St, Palo Alto, CA 94306 (Hoover Park Baseball Field)



1. Proximity to Multi-Family Housing (Equity & Demand)

It can be seen that the park is surrounded by churches, schools and mostly, apartment buildings and houses. Within a 1-block-walking-distance, there are 6 apartment communities,

which are also the multi-family residential areas. Residents have limited parking and may prefer public transportation for commuting instead of private vehicles due to budget or EV chargers constraints. A mobility hub could help them improve the accessibility to transportation no matter for private or public demands. These conditions increase reliance on public and shared transportation options. Locating a mobility hub near these multi-family communities can improve access to both public transit and shared mobility, addressing everyday transportation needs for residents with limited private vehicle infrastructure.

2. Access to Local Amenities and Daily Destinations

The site is surrounded by a high concentration of daily destinations, including approximately six schools and ten churches. Nearer amenities include Keys School and Palo Alto First Christian Church just across the park, the other can be reached by e-scooters or e-bikes sharing within 5 to 6 minutes. Restaurants and cafés in this area are primarily located to the northwest, further contributing to short and discretionary trips. These generate frequent short-distance trips throughout the day and week. The combination of nearby amenities supports walking and micromobility and makes the site a good location for a mobility hub that facilitates short trips without relying on private vehicles.

3. Public Transportation Connectivity

The site benefits from strong proximity to public transportation, with eight bus stops located along Middlefield Road within a one- to six-minute walk. The main route is bus 21, operating from San Jose to Stanford University. Besides, a school bus route 288 also has stops here. It connects Palo Alto Veterans Hospital through Henry M Gunn High School to Loma Verde/Waverley. Implementing a mobility hub enhances first- and last- mile transition and the access to public transportation.

4. Utilization of Existing Parking Infrastructure (Feasibility & Cost)

One of the main constraints of this site is the limited space of existing parking infrastructure. Although they already have a small parking lot, its capacity may not be enough if a mobility hub requires a larger area or additional facilities. Meanwhile, additional cost for expansion and adding new facilities is another factor that challenges this site choice. For instance, expanding parking or adding electric infrastructure could involve substantial costs, particularly due to the need for electrical grid connections. In addition, if the hub requires larger space to support parking or charging infrastructure, it is likely to require demolition and additional financial investment, which present challenges in terms of feasibility and funding.

5. Support for VMT Reduction and Mode Shift

This site has potential to support VMT reduction by enabling short trips and encouraging EV transition. The proximity provides more EV charger options to multi-family households,

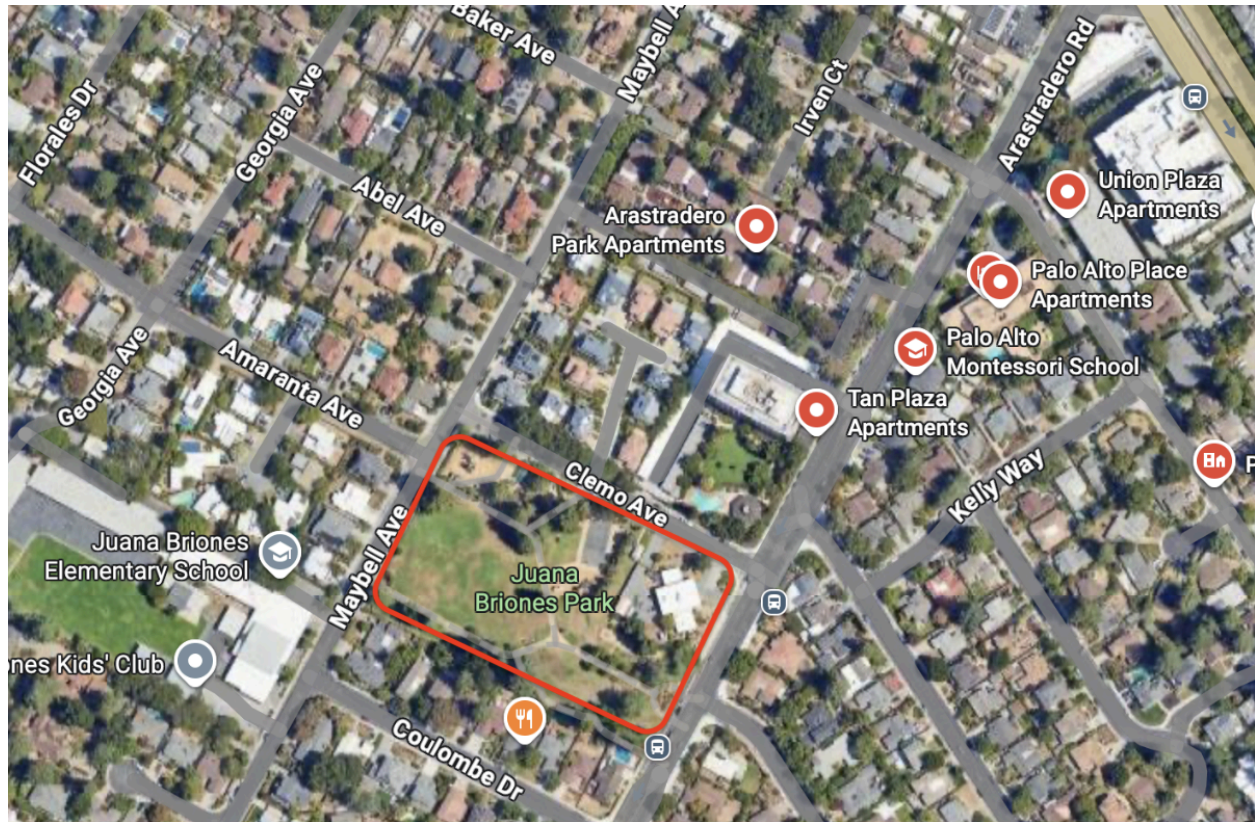
which encourage transition from fossil fuel vehicles to EVs. Also, the site is close to daily destinations and frequent bus services, creating more opportunity for residents and visitors to choose cleaner commutes such as walking, biking, and shared micromobility instead of driving for short trips. However, because the impact on VMT is dependent on user adoption, the magnitude of VMT reduction is likely to be incremental through behavioral change rather than large-scale trip elimination.

6. Implementation Readiness and Scalability

From an implementation perspective, the site shows moderate readiness and may require phased development. Located within residential areas with bus stops suggest that a mobility hub could be introduced at a small scale without major changes to the local network. However, limitations such as space requirement, parking capacity, and electrical infrastructure may determine the potential for a pilot hub. Starting with a smaller, concentrated hub could allow the city to test demand and operational feasibility before city-wide expansion.

8.3 Location C

Proposed Site: Juana Briones Park, 609 Maybelle Ave. (Arastradero at Clemo Ave.)



1. Proximity to Multi-Family Housing (Equity & Demand)

As shown on the map, this park is located walking distance to several multi-family homes. This has the ability to create a high volume of daily users for their commute. Residents of these homes are more likely to use public transit or active modes (walking/biking) due to limited space and budget for car ownership. The nearest apartments are the Tan Plaza Apartments, Palo Alto Place Apartments, Union Plaza Apartments, and Arastradero Park Apartments.

2. Access to Local Amenities and Daily Destinations

While this mobility hub is not near many commercial locations such as restaurants, stores, libraries, or community centers, there are a few. However, there is an elementary school, fire department, and of course, the park. There is access to bus lines and a train station, which can easily transport someone to another location.

3. Public Transportation Connectivity

The park already has infrastructure for bikes and pedestrians such as paved routes, rest stops, and bike racks. It is located .3 miles from El Camino & Arastradero (bus stop for routes: 22 and Rapid 522). Additionally, it is 1.5-2 miles from San Antonio Station and other businesses.

4. Utilization of Existing Parking Infrastructure (Feasibility & Cost)

This space already contains many service and recreational amenities thus the largest cost would be developing a surface suitable for parking and EV charging. It currently sits on 4.1 Acres with different play areas including basketball courts, picnic tables, benches, and a large unprogrammed E-class field. In addition, it has public bathrooms and a fire station on the same block. The south east section of the park would be a potential area to create a surface lot with EV chargers.

5. Support for VMT Reduction and Mode Shift

Having a space for shared mobility and transit connections surrounded by multiple multi-family homes can support VMT reduction by promoting active and sustainable travel if the first and last mile were easy to access. This mobility hub can easily facilitate the change from single occupancy vehicles to different transit modes especially for those traveling the first and last mile. This mode shift will contribute to VMT reduction, which will lead to lower total GHG emissions, and allow residents to live a sustainable life.

6. Implementation Readiness and Scalability

With limited knowledge of this park about the ability for existing utility connection, allowable permits, and community support, it's difficult to determine if this site is ready for implementation. It does contain many services such as recreational spaces as well as active travel infrastructure such as bike and pedestrian trails so that would reduce the initial upfront costs. Because this park makes up the entire block, it would be difficult to scale since there are physical barriers.

9. Conclusion

This project explored how the City of Palo Alto can design and implement a mobility hub that supports sustainable transportation while improving accessibility for residents living in multi-family housing. Through a review of international mobility hub practices, case studies from U.S. and European cities, and analysis of Palo Alto's local context, this report identified key design principles and planning strategies for developing an effective mobility hub program.

Successful mobility hubs are strategically located near transit, residential density, and daily destinations, while integrating multiple sustainable transportation options such as shared micromobility, transit access, and EV charging. Equally important are clear branding, safe and comfortable design, and early community engagement to ensure long-term adoption. These best practices informed the identification of several potential pilot locations in Palo Alto that could improve first- and last-mile connections and expand mobility options for residents.

Overall, this report demonstrates that mobility hubs represent a promising strategy for Palo Alto to advance its climate, mobility, and equity goals. By integrating EV charging, shared micromobility, and transit access into accessible community-centered spaces, mobility hubs can reduce reliance on private vehicles while improving transportation options for residents who currently face mobility constraints. With thoughtful design, strong community engagement, and strategic site selection, Palo Alto has the opportunity to implement a scalable mobility hub program that supports sustainable urban mobility and contributes to the city's long-term climate commitments.

Appendix

Appendix A.Example Community Needs Survey

Mobility Hub Planning – City of Palo Alto

Purpose:

This survey aims to understand community transportation needs, mobility behaviors, and perceptions related to the proposed neighborhood mobility hub. Responses will inform hub design, location, services, and equity considerations, particularly for residents of multifamily housing.

Section A. Community and Demographic Information

1. Which neighborhood do you currently live in?
☐ Open-ended response
2. What is your age range?
☐ Under 18
☐ 18–24
☐ 25–34
☐ 35–44
☐ 45–54
☐ 55–64
☐ 65+
3. What is your approximate household income level?
☐ Prefer not to say
☐ <\$50,000
☐ \$50,000–\$99,999
☐ \$100,000–\$149,999
☐ \$150,000+
4. What is your gender?
☐ Female
☐ Male
☐ Non-binary / gender diverse
☐ Prefer to self-describe: _____
☐ Prefer not to say
5. How long have you lived in Santa Clara County?
☐ 0–5 years
☐ 5–10 years
☐ 10–15 years
☐ 15+ years
6. Do you currently own or have regular access to a personal vehicle?
☐ No personal vehicle
☐ Internal combustion engine (ICE) vehicle

- ☐ Electric vehicle (EV)
- ☐ Hybrid vehicle
- 7. What is one change to local transportation that would most improve your quality of life?
 - ☐ Open-ended response

Section B. General Transportation Habits and Needs

- 8. What is your primary mode of transportation for daily activities (work, school, errands)?
 - ☐ Personal vehicle
 - ☐ Public transit
 - ☐ Walking
 - ☐ Bicycle or e-bike
 - ☐ Ride-hail (e.g., Uber/Lyft)
 - ☐ Other: _____
- 9. What are your most frequent trip purposes? (Select up to three.)
 - ☐ Work
 - ☐ School
 - ☐ Grocery / errands
 - ☐ Medical appointments
 - ☐ Social / recreation
 - ☐ Childcare
 - ☐ Other: _____
- 10. How often do you make trips that require public transit?
 - ☐ Never
 - ☐ A few times a year
 - ☐ Once every few months
 - ☐ Monthly
 - ☐ Weekly
 - ☐ Daily
- 11. In a typical week, how often do you use public transit or non-car modes?
 - ☐ Never
 - ☐ 1–2 times
 - ☐ 3–4 times
 - ☐ 5+ times
- 12. What factors most influence your transportation choices?

Please rank the following from **1 (least important)** to **6 (most important)**:

 - ☐ Convenience
 - ☐ Cost
 - ☐ Travel time
 - ☐ Safety
 - ☐ Weather
 - ☐ Accessibility

13. In your opinion, what are the biggest transportation challenges in your area? (Select all that apply.)

- ☐ Traffic congestion
- ☐ Limited access to e-bikes or e-scooters
- ☐ Lack of EV charging
- ☐ Infrequent bus service
- ☐ Safety concerns
- ☐ Other: _____

14. Are there trips you currently cannot make due to a lack of transportation options?

- ☐ No
- ☐ Yes — please describe: _____

Section C. Mobility Hub Services and Features

15. Which transportation modes would you like to see available at a local mobility hub? (Select all that apply.)

- ☐ Bike sharing
- ☐ Electric scooter sharing
- ☐ EV charging stations

16. Which amenities or features would encourage you to use the mobility hub? (Select all that apply.)

- ☐ Real-time transit information displays
- ☐ Secure bike parking or storage
- ☐ Good lighting and security cameras
- ☐ Restrooms
- ☐ Small retail or food options
- ☐ Green space
- ☐ Seating

17. How likely are you to switch to a more sustainable mode of transportation if convenient options were available at a nearby hub?

- ☐ 1 – Very unlikely
- ☐ 2 – Unlikely
- ☐ 3 – Neutral
- ☐ 4 – Likely
- ☐ 5 – Very likely

Section D. Location, Safety, and Accessibility

18. How far is your home from the proposed mobility hub location?

- ☐ Less than 0.25 miles ($\approx$ 5-minute walk)
- ☐ 0.25–0.5 miles ($\approx$ 5–10-minute walk)
- ☐ 0.5–1 mile ($\approx$ 10–20-minute walk or short bike ride)
- ☐ 1–2 miles

- ☐ More than 2 miles
 - ☐ I do not live nearby
19. How safe do you feel walking or biking near the proposed hub location?
- During the day:**
- ☐ Very unsafe
 - ☐ Somewhat unsafe
 - ☐ Neutral
 - ☐ Somewhat safe
 - ☐ Very safe
- At night:**
- ☐ Very unsafe
 - ☐ Somewhat unsafe
 - ☐ Neutral
 - ☐ Somewhat safe
 - ☐ Very safe
20. What infrastructure improvements would make your “last-mile” journey safer or more convenient?
- ☐ Open-ended response
21. What concerns do you have about the proposed mobility hub? (Select all that apply.)
- ☐ Safety
 - ☐ Traffic
 - ☐ Noise
 - ☐ Equity
 - ☐ Parking loss
 - ☐ Affordability
 - ☐ Other: _____
22. Please rank the severity of your concerns from **1 (low)** to **5 (high)**:
- ☐ 1
 - ☐ 2
 - ☐ 3
 - ☐ 4
 - ☐ 5

Survey Considerations and Quantitative Assessments:

1. Public-facing survey version

For public-facing outreach, the survey can be streamlined to focus on essential questions related to travel behavior, safety, proximity to the proposed hub, and desired mobility services. Demographic questions should be limited to those necessary for equity analysis, with clear “prefer not to say” options to reduce survey fatigue. Using plain language and a shorter completion time (5–7 minutes) will encourage broader

participation while still capturing actionable insights to inform hub design and siting decisions.

2. Intercept surveys and QR-based engagement

To reach residents who may not participate in traditional surveys, the City can deploy intercept surveys and QR-code-based engagement at key locations such as Caltrain stations, shopping centers, libraries, and multifamily housing complexes. QR codes can link to a mobile-friendly survey and be displayed on signage, flyers, or temporary kiosks near proposed hub sites. This approach allows residents to provide feedback in real time, lowers participation barriers, and helps capture input from people already traveling through the area.

3. Survey analysis methods

Survey responses would be analyzed using a mixed-methods approach combining descriptive statistics and qualitative thematic analysis. Quantitative responses would be segmented by user characteristics such as housing type, income level, travel mode, distance to the hub, and vehicle ownership to identify patterns across user groups. Open-ended responses would be coded to identify recurring themes related to safety, affordability, accessibility, and last-mile challenges. Findings would then be translated into design and service priorities to guide future mobility hub planning and community engagement efforts.

Appendix B. Feedback Survey

Mobility Hub User Feedback Survey

(Post-Implementation & Continuous Engagement)

Introduction (shown to users)

Thank you for using this mobility hub. Your feedback helps us improve safety, accessibility, and overall experience. This survey takes 3–5 minutes, and responses are anonymous.

Section 1: About Your Trip (Usage Context)

1. **Which best describes you?**

- ☐ Student
- ☐ Employed full-time
- ☐ Employed part-time
- ☐ Self-employed / remote worker
- ☐ Retired
- ☐ Other

2. **Do you face any mobility or accessibility challenges?**

- ☐ Yes
- ☐ No
- ☐ Prefer not to say

3. **How often do you use this mobility hub?**

- ☐ Daily
- ☐ Several times a week
- ☐ Weekly
- ☐ Monthly
- ☐ First time

4. **What modes did you use today? (Select all that apply)**

- ☐ Public transit (bus/train)
- ☐ Bike share
- ☐ Scooter share
- ☐ Car share
- ☐ Personal bike or scooter
- ☐ Walking
- ☐ EV charging
- ☐ Other: _____

5. **What was the main purpose of your trip?**

- ☐ Commuting to work/school
- ☐ Errands
- ☐ Social/recreation
- ☐ Connecting between transit modes
- ☐ Other: _____

Section 2: User Experience & Satisfaction

4. **Overall, how satisfied are you with this mobility hub?**

- 1 ☐ Very dissatisfied
- 2 ☐ Dissatisfied
- 3 ☐ Neutral
- 4 ☐ Satisfied
- 5 ☐ Very satisfied

5. Please rate the following aspects of the hub:

Aspect	Very Poor	Poor	Fair	Good	Excellent
Safety (day & night)	☐	☐	☐	☐	☐
Ease of transfers	☐	☐	☐	☐	☐

Wayfinding/signage	☐	☐	☐	☐	☐
Cleanliness	☐	☐	☐	☐	☐
Seating & comfort	☐	☐	☐	☐	☐
Lighting	☐	☐	☐	☐	☐
Availability of services	☐	☐	☐	☐	☐

Section 3: Safety, Comfort & Accessibility

6. Do you feel safe using this hub?

- ☐ Yes, at all times
- ☐ Mostly during the day
- ☐ Sometimes
- ☐ No

7. What factors affect your sense of safety? (Select all that apply)

- ☐ Lighting
- ☐ Visibility
- ☐ Presence of others
- ☐ Traffic conflicts
- ☐ Cleanliness
- ☐ Security presence
- ☐ Other: _____

8. Is the hub accessible for your needs?

- ☐ Yes
- ☐ Somewhat
- ☐ No
- ☐ Not applicable

If no or somewhat, please explain: _____

Section 4: Information & Technology

9. How easy is it to access real-time information (arrival times, availability, maps)?

- 1 ☐ Very difficult
- 2 ☐ Difficult
- 3 ☐ Neutral
- 4 ☐ Easy
- 5 ☐ Very easy

10. **How do you usually get information at the hub?** *(Select all that apply)*

- ☐ Mobile app
- ☐ Digital screens
- ☐ Signs/maps
- ☐ Staff assistance
- ☐ I don't use information tools

Section 5: Improvements & Priorities (User Input)

11. **What improvements would most enhance your experience?** *(Select up to 3)*

- ☐ More seating
- ☐ Better lighting
- ☐ Improved safety measures
- ☐ Clearer signage
- ☐ More micromobility options
- ☐ EV charging
- ☐ Weather protection
- ☐ Restrooms
- ☐ Other: _____

12. **What is the ONE change you would prioritize first?**

(Open text) _____

Section 6: Continuous Engagement

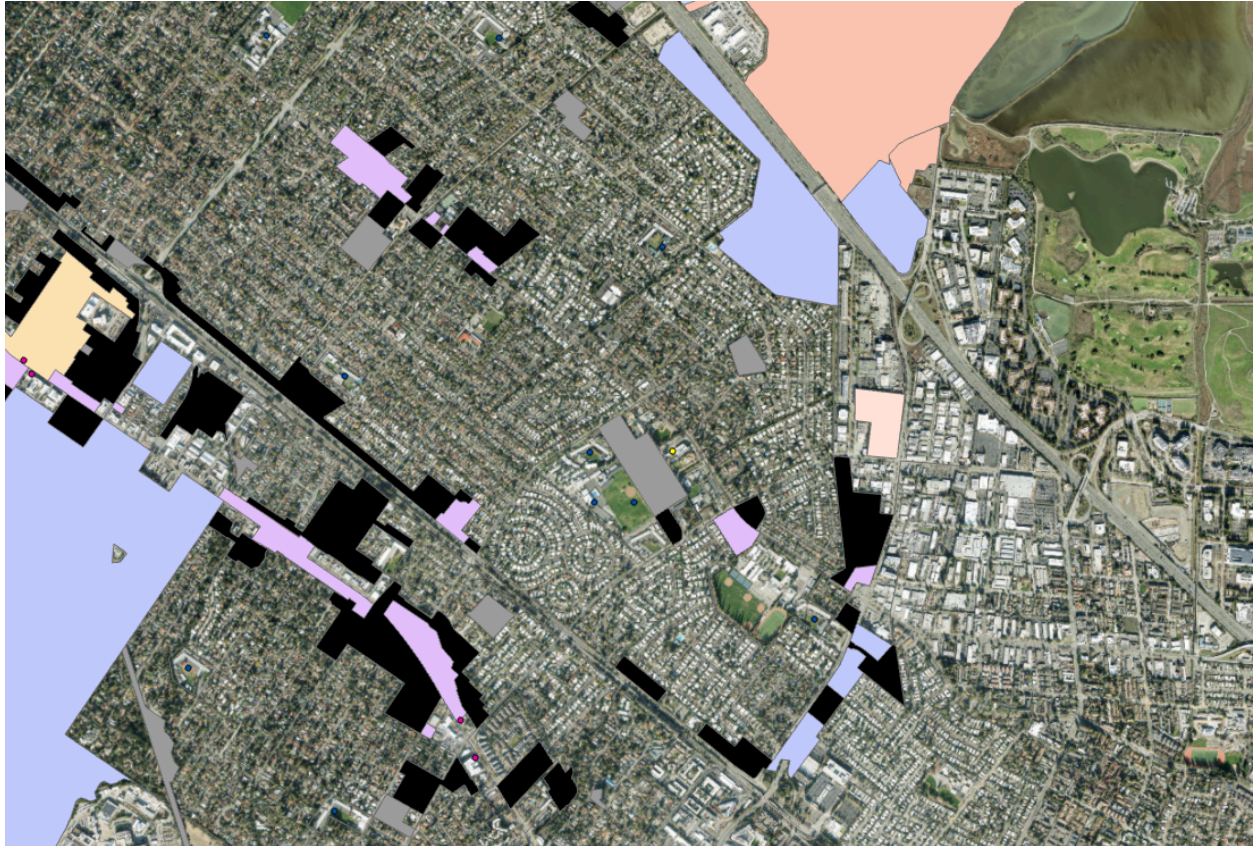
13. **Would you like to provide ongoing feedback in the future?**

- ☐ Yes
- ☐ No

14. **How would you prefer to share feedback?** *(Select all that apply)*

- ☐ QR codes at the hub
- ☐ Interviews
- ☐ Mobile app notifications
- ☐ Short email surveys
- ☐ Community meetings
- ☐ Pop-up events

Appendix C: Map from GIS with Landuse Pancel Data



Black: multifamily properties, Grey: public parks

Appendix D: Other potential sites near Location C

Site	Address	Size	Existing Amenities	Additional Amenities	Surrounding Area	Distance to Bus Stop	Distance to Caltrain
Robles Park	4116 Park Boulevard	4.7 Acres	Two children's playgrounds (wheelchair accessible toddler swings), two picnic areas (one shaded by wisteria-covered arbors), barbecues, benches, multipurpose bowl with colorful tile art, basketball court, softball backstop, footpat	EV Chargers	James Apartments, Barclay House Apartments	<.5 mile from El Camino & El Camino Way & El Camino & Vista & El Camino & El Camino Way	1.2-1.7 miles from San Antonio Station or 1.5-2 miles from California Ave Station
Block: East of Wilton Ave, North of Rt. 82, West of Ventura Ave, South of Park Blvd (middle of block: 37.419436, -122.130110)			businesses	EV Chargers	Boardwalk Apartments, Curtner Apartments, Park Terrace, Alto Riviera Apartments, Merrilllee Terrace, Curtner Square Apartments	.3 miles from El Camino & Curtner	1-1.5 miles from California Ave, 2 miles from San Antonio Station
Buena Vista Mobile Home Park	3980 El Camino Real, Palo Alto, CA 94306		few businesses	EV Chargers	Oak Manor Townhouses Alta Housing & Palo Alto Apartments, Montage	<.1 miles from El Camino & Los Robles	<2 miles to San Antonio Station 1.5-2 miles to California Ave Station

Appendix E: Metrics for Mobility Hubs in the City of Palo Alto

Metrics for Mobility hubs in the City of Palo Alto				
Category	Measure	KPI or Metric	Data Collection Method	Goal
Mobility & Travel Behavior	% of trips utilizing the mobility hub (overall and by mode)	KPI	Intercept surveys, on-site observers	Increase
	% change in mode usage (drive alone vs. transit, bike, micromobility)	KPI	Resident questionnaires, travel diaries	Increase non-auto share
	# of transit boardings, alightings, and transfers at/near hub	Metric	APC (Automated Passenger Counter) data	Increase
	# of shared mobility trips (bike, scooter, car share) starting/ending at hub	Metric	MDS (Mobility Data Specification) / Provider APIs	Increase
	First- and last-mile connections supported	Metric	User surveys / Trip origin-destination data	Increase
Accessibility Outcomes	% change in access to work within 30 mins (transit/active air)	KPI	GIS Travel-time analysis	Increase
	Changes in access to daily destinations (schools, services, retail)	Metric	Travel time comparison / Resident surveys	Increase
	Reduction in average access distance or travel time for hub users	Metric	User intercept surveys	Decrease
	Presence of accessible parking and tactile information	Metric	Site audit / ADA compliance checklist	Maintain/Improve
Equity & Housing	% change in mode usage in multi-family communities	KPI	Disaggregated surveys (by housing type)	Increase
	% change in job access for multi-family residents within 30 mins	KPI	Location-based usage data / GIS	Increase
	Number of multi-family complexes within 0.5 miles of the hub	Metric	GIS / Planning department records	Monitor (Site Selection)
	% of household income spent on transportation	Metric	Census data / Intercept surveys	Decrease
	EV charger utilization for multi-family residents	Metric	Charging network API / User feedback	Increase
Environmental & Community	Estimated reduction in Vehicle Miles Traveled (VMT)	KPI	Proxy-based modeling (via mode shift data)	Decrease
	Reduction in fossil fuel use / GHG emissions	Metric	Estimated via VMT & Mode Shift proxies	Decrease
	Changes in parking demand or curb utilization	Metric	Field observations / Sensor data	Monitor/Decrease
	Safety outcomes (collisions/conflicts involving peds and cyclists)	KPI	Police reports / Conflict point video analysis	Decrease
	Perceived safety, comfort, and usability score	Metric	Intercept surveys / User experience rating	Increase

Appendix F: Success Factors

1.3.4. Success Factors

Packing a site with as many elements as possible does not create a successful mobility hub. While mode mix is important, with public transit, shared mobility, and walking often serving as the first benchmark, it is only one part of the equation. A successful hub also depends on its visibility and recognizability within the broader network, its accessibility for diverse users, the ease of transfers between modes, and the extent to which the space feels safe, comfortable, and socially welcoming.¹⁷⁰ In practice, this requires clear wayfinding, thoughtful integration of non-transport amenities, design strategies that reduce conflict points, and both physical and digital coordination so that moving between modes feels like one seamless journey rather than a series of disconnected trips.

¹⁷⁰ “Mobility Hubs > Starting and Running Successful Hubs,” accessed October 6, 2025, <https://www.como.org.uk/mobility-hubs/starting-and-running-successful-hubs>.

Appendix G: Benefits

1.4.1 Social Abundance

Recent research highlights the importance of architectural identity in the design of mobility hubs. A study conducted in Zurich, Switzerland, found that users often weigh a hub's look and architectural character more heavily than the specific car-sharing or micromobility services it happens to offer.¹⁷¹ By integrating seamlessly into their urban surroundings, mobility hubs not only enhance visual appeal but also foster a sense of community and local attachment.¹⁷² This sense of pride and ownership can, in turn, motivate travelers to utilize the available transport facilities more frequently.¹⁷³

Incorporating greenspaces within mobility hubs elevates their attractiveness and utility. “Green spaces at mobility hubs can be transformed into more inviting waiting areas.”¹⁷⁴ and provide greater aesthetic appeal and improve the user experience during transfers.¹⁷⁵ Travelers might be more open to longer wait times if there are other distractions (people watching) or comfort (places to sit such as benches or tables and chairs).

Beyond transit users, these green areas are accessible to the wider community, offering opportunities for relaxation, leisure, and recreational activities. As an alternative gathering space, the hub can improve social interactions. Consistent engagement with natural environments yields significant health benefits, fostering psychological well-being and stress relief.¹⁷⁶ while also contributing to improved physical outcomes such as decreased rates of cardiovascular disease and lower overall mortality.¹⁷⁷ Taken together, these mental- and physical-health gains reframe hubs that knit in greenery as something more than transit nodes — they double as neighborhood amenities that quietly support everyday wellness and strengthen community health at the population level.

Co-working spaces integrated within mobility hubs can contribute to professional and social outcomes. Workers gravitate toward such spaces when reaching them is simple from

¹⁷¹ “Beyond a Transport Node? What Residents Want from Transforming Railway Stations,” accessed January 20, 2026, <https://www.tandfonline.com/doi/epdf/10.1080/09654313.2023.2236145?needAccess=true>.

¹⁷² David Lois et al., “Analysis of Satisfaction Factors at Urban Transport Interchanges: Measuring Travellers’ Attitudes to Information, Security and Waiting,” *Transport Policy* 67 (September 2018): 49–56, <https://doi.org/10.1016/j.tranpol.2017.04.004>.

¹⁷³ Thomas Arnold et al., “An Exploratory Study of Mobility Hub Implementation,” *Research in Transportation Economics* 101 (November 2023): 101338, <https://doi.org/10.1016/j.retrec.2023.101338>.

¹⁷⁴ Sofia Taborda et al., “People-Centred Design Methods in a Local Decision-Making Process: Masterplan for Lisbon’s Multimodal Mobility Hubs,” *Transportation Research Procedia* 72 (2023): 900–907, <https://doi.org/10.1016/j.trpro.2023.11.500>.

¹⁷⁵ Maria Ana Benoliel et al., “‘Greening’ and Comfort Conditions in Transport Infrastructure Systems: Understanding Users’ Preferences,” *Building and Environment* 195 (May 2021): 107759, <https://doi.org/10.1016/j.buildenv.2021.107759>.

¹⁷⁶ Yasser Jezzini et al., “Models and Methods for Quantifying the Environmental, Economic, and Social Benefits and Challenges of Green Infrastructure: A Critical Review,” *Sustainability* 15, no. 9 (2023): 7544, <https://doi.org/10.3390/su15097544>.

¹⁷⁷ Mark J. Nieuwenhuijsen, “Influence of Urban and Transport Planning and the City Environment on Cardiovascular Disease,” *Nature Reviews Cardiology* 15, no. 7 (2018): 432–38, <https://doi.org/10.1038/s41569-018-0003-2>.

several travel modes, and when on-site extras like cafés or grab-and-go food are part of the offering.¹⁷⁸ and when they provide amenities such as food and beverage services.¹⁷⁹ Beyond convenience, co-working facilities foster social interactions¹⁸⁰ and enhance creative output, as well as the diversity of knowledge exchanged among users.¹⁸¹ Where hubs also host remote-work setups, some daily commute trips disappear altogether and the remaining ones tend to be shorter, a pattern that pushes cities closer to their broader sustainability targets.¹⁸²

Finally, mobility hubs designed with rest, leisure, and tourism in mind can attract a wide range of users. Cafes, restaurants, shopping areas, playgrounds, and designated rest spaces provide convenient amenities for tourists, particularly cyclists, who may require a comfortable layover. By combining functional transport infrastructure with spaces for socializing, relaxation, and recreation, mobility hubs can become integral within urban life, supporting both mobility and community well-being.

1.4.2 Supporter of a Wider Economy

Mobility hubs serve as seamless first- and last-mile connectors to major public transportation networks. Depending on the population the city would like to focus on and serve the most, implemented hubs have been sited next to neighborhoods and emerging housing areas, employment districts and industrial zones, schools and campuses, medical centers, cultural and recreational venues, and other destination anchors.¹⁸³ The location of a mobility hub is influenced by its intended function and the priorities of the surrounding community. Mobility hubs can support neighborhood-based businesses and facilitate decentralized urban services,¹⁸⁴ thereby avoiding unnecessary trips and, when travel is needed, reducing travel time, distance, and cost.¹⁸⁵ These economic benefits can strengthen local support by attracting visitors and associated commercial activity while reinforcing the hub's role within the community. In addition, mobility hubs can advance transport electrification through the provision of charging infrastructure for

¹⁷⁸ Minou Weijss-Perrée et al., "Analysing User Preferences for Co-Working Space Characteristics," *Building Research & Information* 47, no. 5 (2019): 534–48, <https://doi.org/10.1080/09613218.2018.1463750>.

¹⁷⁹ Mina Di Marino et al., "New Working Spaces in the Helsinki Metropolitan Area: Understanding Location Factors and Implications for Planning," *European Planning Studies* 31, no. 3 (2023): 508–27, <https://doi.org/10.1080/09654313.2021.1945541>.

¹⁸⁰ Cornelia Gerdenitsch et al., "Coworking Spaces: A Source of Social Support for Independent Professionals," *Frontiers in Psychology* 7 (April 2016), <https://doi.org/10.3389/fpsyg.2016.00581>.

¹⁸¹ Alexandra Rese et al., "Social Networks in Coworking Spaces and Individual Coworker's Creativity," *Review of Managerial Science* 16, no. 2 (2022): 391–428, <https://doi.org/10.1007/s11846-021-00445-0>.

¹⁸² Nadezda Krasilnikova, "Re-Thinking the Role of Municipalities in Mobility Transitions: Co-Working Spaces in Suburban and Rural Areas as a 'New Normal,'" *Cities* 145 (February 2024): 104672, <https://doi.org/10.1016/j.cities.2023.104672>.

¹⁸³ Alexandros Nikitas et al., "Decoding Mobility Hubs: Opportunities and Risks Underpinning Their Introduction for the Contexts of Transport and the Wider Society," *Journal of Transport Geography* 127 (July 2025): 104296, <https://doi.org/10.1016/j.jtrangeo.2025.104296>.

¹⁸⁴ Georgia Pozoukidou and Zoi Chatziyiannaki, "15-Minute City: Decomposing the New Urban Planning Eutopia," *Sustainability* 13, no. 2 (2021): 928, <https://doi.org/10.3390/su13020928>.

¹⁸⁵ Amir Reza Khavarian-Garmsir et al., "The 15-Minute City: Urban Planning and Design Efforts toward Creating Sustainable Neighborhoods," *Cities* 132 (January 2023): 104101, <https://doi.org/10.1016/j.cities.2022.104101>.

electric buses, private vehicles, e-bikes, and e-scooters¹⁸⁶. When equipped with appropriate battery systems, hubs may also function as distributed energy resources—acting as a “battery for the neighborhood” by integrating solar panels, enabling vehicle-to-grid services such as peak shaving, and reducing public energy costs¹⁸⁷. Mobility hubs further present value-capture opportunities by increasing shared transportation use, expanding the customer base, and supporting the utilization rates necessary to recover infrastructure costs¹⁸⁸. Their presence can increase the investment attractiveness and property values of surrounding developments, while ancillary features such as parcel lockers and cargo-hitching can create additional revenue streams and help reduce energy use, tailpipe emissions, and congestion.¹⁸⁹

¹⁸⁶ Tibor Rongen et al., “An Analysis of the Mobility Hub Concept in the Netherlands: Historical Lessons for Its Implementation,” *Journal of Transport Geography* 104 (October 2022): 103419, <https://doi.org/10.1016/j.jtrangeo.2022.103419>.

¹⁸⁷ Yan Heng et al., “The Heterogeneous Preferences for Solar Energy Policies among US Households,” *Energy Policy* 137 (February 2020): 111187, <https://doi.org/10.1016/j.enpol.2019.111187>.

¹⁸⁸ Carlos Madina et al., “Methodology for Assessing Electric Vehicle Charging Infrastructure Business Models,” *Energy Policy* 89 (February 2016): 284–93, <https://doi.org/10.1016/j.enpol.2015.12.007>.

¹⁸⁹ Francesco Bruzzone et al., “Environmental and Energy Performance of Integrated Passenger–Freight Transport,” *Transportation Research Interdisciplinary Perspectives* 22 (November 2023): 100958, <https://doi.org/10.1016/j.trip.2023.100958>.

Appendix H: Challenges

1.5 Challenges

Poorly designed mobility hubs may generate environmental burdens, foster public disengagement, create user discomfort, encourage misuse of space, and exacerbate existing equity challenges. In contrast, car-sharing systems have the potential to reduce emissions from passenger transportation. Across shared-mobility LCAs, operating the vehicles dominates cumulative impact, building them runs a distant second, and the disposal stage plus auxiliary infrastructure together add only a thin sliver on top.¹⁹⁰ When users substitute public or active modes of transport with shared car use, overall emissions may increase and potentially discourage use of already low-carbon modes; by contrast, people who give up a personal car and lean on a shared fleet typically end up with a smaller emissions footprint than they started with.¹⁹¹ If riders treat shared or self-driving fleets as a substitute for transit, walking, or biking, the result can be the opposite of what planners hope for — more miles driven, thicker congestion, and a higher emissions tally overall.¹⁹² When fares and convenience line up roughly evenly, many riders still default to solo trips rather than shared ones. Any tailpipe savings, however, can be partly or wholly eaten up once upstream manufacturing, electricity generation, and disposal impacts are accounted for. At the neighborhood scale, the cleanest levers are a higher transit mode share, fewer total vehicle miles, and more passengers per trip. In addition, the types of vehicles used in shared fleets are another important determinant of overall climate impacts, and electrifying the shared fleet magnifies these gains: swapping a conventional fleet for hybrids trims impact by about a third, and going fully battery-electric pushes those savings to roughly two-thirds.¹⁹³

In addition to climate impacts, building a mobility hub can lead to resource depletion as well as an increase in air pollution. When impacts are measured in terms of fuel and material use, pressure on fuel resources likewise arises primarily from the use phase, and it generally declines over time as shared fleets become newer and more efficient, private car trips are displaced, and total travel distances decrease.¹⁹⁴ Energy use from carpooling can be reduced even further when the vehicles used are hybrid or electric, allowing riders to achieve additional energy savings through shared travel. Local air quality can move in either direction: the net effect hinges on what powertrains the shared fleet runs, and on how meaningfully travelers swap private-car trips for shared, walking, or cycling alternatives.¹⁹⁵

¹⁹⁰ Ana María Arbeláez Vélez, “Environmental Impacts of Shared Mobility: A Systematic Literature Review of Life-Cycle Assessments Focusing on Car Sharing, Carpooling, Bikes sharing, Scooters and Moped Sharing,” *Transport Reviews* 44, no. 3 (n.d.): 634–58, <https://doi.org/10.1080/01441647.2023.2259104>.

¹⁹¹ Arbeláez Vélez, “Environmental Impacts of Shared Mobility.”

¹⁹² Nikitas et al., “Decoding Mobility Hubs,” July 2025.

¹⁹³ C. Lausset et al., “LCA and Scenario Analysis of a Norwegian Net-Zero GHG Emission Neighbourhood: The Importance of Mobility and Surplus Energy from PV Technologies,” *Building and Environment* 189 (February 2021): 107528, <https://doi.org/10.1016/j.buildenv.2020.107528>.

¹⁹⁴ Arbeláez Vélez, “Environmental Impacts of Shared Mobility.”

¹⁹⁵ Arbeláez Vélez, “Environmental Impacts of Shared Mobility.”

Finally, both building and running a hub can create friction for the neighbors who live closest to it. At hubs already in service, residents have pushed back on louder street noise and heavier foot traffic, along with upticks in electricity draw, water demand, and waste volumes.¹⁹⁶ Cities that are planning to build a mobility hub should be aware of these changes and ensure they can accommodate.

People who already dabble in shared modes, or who routinely mix several transport options across their week, are markedly more willing to keep using shared mobility going forward.¹⁹⁷ Uptake is not a given; some residents push back on the idea altogether. Driving meaningful adoption takes deliberate outreach, a branded identity, sustained marketing, and clear communication about why the service matters to the community.¹⁹⁸ The community needs to understand how this will positively affect them and their neighbors. The plan needs to be strategic otherwise tension will arise with traditional car users because mobility hubs are seen as a threat to the “status quo”.

Once a hub becomes the default for daily commuting, ride quality itself can suffer — platforms, vehicles, and waiting areas simply start to feel crowded. There is a risk of overcrowding,¹⁹⁹ which could de-incentivize users for continuing to use the mobility hub and revert back to their personal vehicle. This could be combatted by modeling usage especially during peak hours and compensating for the overcrowdedness with more vehicles more frequently. Beyond issues of overcrowding, rider-satisfaction scores hold up well so long as transfers clock in under roughly six minutes and ten seconds.²⁰⁰ While it is important to maintain a comfortable number of people on a bus or train, it is equally important to have enough space for a reasonable number of people waiting for their ride. Otherwise, overcrowding leads to the increased risk of unsafe or inappropriate pedestrian behavior in spaces shared with moving vehicles, potentially resulting in crashes that cause injuries or fatalities.^{201 202} Thoughtful spacing between each mode within a hub footprint is one of the simplest levers a city has for reducing collision risk. In addition to physical considerations to reduce frustration, cities may want to

¹⁹⁶ Anna Kapustkina, “Main Measures to Reduce the Environmental Burden in the Operation of Transport Hubs of Large Urban Agglomerations,” *E3S Web of Conferences* 403 (2023): 07007, <https://doi.org/10.1051/e3sconf/202340307007>.

¹⁹⁷ Alexandros Nikitas et al., “Decoding Mobility Hubs: Opportunities and Risks Underpinning Their Introduction for the Contexts of Transport and the Wider Society,” *Journal of Transport Geography* 127 (July 2025): 104296, <https://doi.org/10.1016/j.jtrangeo.2025.104296>.

¹⁹⁸ Karst Geurs et al., “The Smarthubs Integration Ladder: A Conceptual Model for the Categorisation of Shared Mobility Hubs,” *Transport Reviews* 44, no. 1 (2024): 112–39, <https://doi.org/10.1080/01441647.2023.2239499>.

¹⁹⁹ Alexis Pibrac and Bilal Farooq, “Integrated Microsimulation Framework for Dynamic Pedestrian Movement Estimation in Mobility Hub,” arXiv:1702.02624, preprint, arXiv, February 8, 2017, <https://doi.org/10.48550/arXiv.1702.02624>.

²⁰⁰ Tatiana Kopylova et al., “A Level-of-Service Concept Regarding Intermodal Hubs of Urban Public Passenger Transport,” *Transportation Research Procedia* 36 (2018): 303–7, <https://doi.org/10.1016/j.trpro.2018.12.087>.

²⁰¹ Lesley Strawderman et al., “Improving Safety of Vulnerable Road Users: Effectiveness of Environment and in-Vehicle Warning Systems at Intermodal Interchanges,” *Journal of Transportation Safety & Security* 10, no. 3 (2018): 177–92, <https://doi.org/10.1080/19439962.2016.1237598>.

²⁰² Patrick Miner et al., “Car Harm: A Global Review of Automobility’s Harm to People and the Environment,” *Journal of Transport Geography* 115 (February 2024): 103817, <https://doi.org/10.1016/j.jtrangeo.2024.103817>.

evaluate how weather could affect people's moods or if there's any uneven topography.²⁰³ The mobility hub's purpose is to create an easy and comfortable experience for riders.

As public spaces, mobility hubs can be vulnerable to criminal activity and may function as informal shelters for unhoused populations. Cities should contemplate putting in safety features such as Closed Circuit Television (CCTV) or safety poles. Lastly, while the wider public tends to view hubs as a net benefit, their arrival is also associated with upward pressure on nearby rents and home prices.²⁰⁴ This is a delicate balance between stable prices for current residents and adding this amenity. Alternatively, if crime rates increase this may reduce housing prices leading to instability in the community. The hub should prioritize accessibility for all users. However, this objective may be hindered by varying levels of digital literacy; therefore, providing multiple modes of system navigation and information access is imperative.

²⁰³ Nikitas et al., "Decoding Mobility Hubs," July 2025.

²⁰⁴ Sefa Awaworyi Churchill et al., "Transport Infrastructure and House Prices in the Long Run," *Transport Policy* 112 (October 2021): 1–12, <https://doi.org/10.1016/j.tranpol.2021.08.006>.

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