FEHR PEERS

Memorandum

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To: City of San Diego

From: Angelica Rocha, Katy Cole and Trevor Lien; Fehr & Peers

Subject: City of San Diego Bicycle Master Plan Update: Summary of Best Practices in Bike Facility Network Design

SD24-0523

Background

The following memo provides a summary of literature reviewed as part of the Existing Conditions Analysis for the City of San Diego (the City) Bicycle Master Plan Update (BMPU). The literature review summarizes the best practices relevant to the following topics:

- **Separated Bikeway Design**: Explores industry best practices for designing separated bicycle facilities, focusing on site selection, funding, materials, and maintenance.
- **Safety**: Summarizes the best practices on federal and state guidance for institutionalizing the Safe System Approach to enhance bicycle network safety.
- **Quick Build Implementation**: Examines the most effective strategies for quickly and efficiently implementing improvements.
- **Network Development and Amenities**: Provides recommendations on design practices that promote access, enhance comfort, and reduce conflicts.
- **Supportive Programs**: Details supportive programs and policies that have been the most effective at enhancing access and increasing cyclist comfort.

Each section begins with a presentation of available City best practices or case studies, termed below, "City Practices". Following the City Practices sub-section, industry best practices sourced from San Diego Association of Governments (SANDAG) and across the Country to guide, align, and evolve future City BMPU planning outcomes with current City best practices in mind as a starting point. Finally each section rounds out with suggestions for the City to further incorporate

best practices to enhance existing City practices. People on bikes and micromobility users will be referred to as "cyclists" for consistency throughout the document.

Separated Bikeway Design

A separated bikeway, also commonly referred to as a protected bikeway or cycle track, is an on-street dedicated lane for cyclists that includes a vertical separation between the bikeway and moving traffic. This physical separation creates a more comfortable riding experience for all ages and abilities, especially on roadways with higher speeds and volumes. Design recommendations detail how to determine viable roadways (determined based on speed, street and land use contexts) for planning, funding, and maintenance of separated facilities.

City Practices on Separated Bikeway Design

At the time of drafting this technical memorandum, the City was in the process of updating it's Street Design Manual. As a result, the application and accuracy of this section is subject to change.

The San Diego City Council approved the City's first-ever Complete Streets Policy (Policy No. 900-23) in December 2023. The Complete Streets Policy provides a guide for mobility governance and implementation in alignment with the City's General Plan and Climate Action Plan. It emphasizes designing roadways to accommodate all users and prioritizes convenient and accessible travel for people of all ages and abilities, regardless of their mode of transportation. The policy also involves incorporating street design elements that support Vision Zero's goal of eliminating severe traffic injuries and fatalities. Additionally, it establishes an interdepartmental mobility governance group tasked with implementation of multimodal facilities and inclusion of Complete Streets principles in City and private development projects.

The City has specific published design standards for separated bikeways for one-way and two-way configurations. The City's Street Design Manual (2024[1]) references several national sources that mention separated bikeways such as the NACTO Urban Bikeway Design Guide (which discusses cycle tracks as separated facilities), the FHWA Bikeway Selection Guide, and DIB 89-02 "Class IV Bikeway Guidance" (2022[2]) published by Caltrans; the latter represents the City's primary reference in use. Note that the City refers to separated bikeways as cycle tracks or protected bikeways within its website. In addition to the specification graphics founded in the Street Design Manual, the City's Downtown Mobility Plan provides graphics on the use of protected bikeways[3].

[1] https://www.sandiego.gov/sites/default/files/2024-12/sdmu-full-on-screen.pdf
[2] https://dot.ca.gov/-/media/dot-media/programs/design/documents/dib-89-02-final-a11y.pdf
[3] https://www.sandiego.gov/sites/default/files/san_diego_protected_bikeways_graphic.pdf

Additionally, recent on-street bicycle facility installations in the City have included flexible delineator posts, parking stalls, and berms that provide some separation between the bicycle lane and vehicular travel lane.

Best Practices on Separated Bikeway Design

MassDOT Separated Bike Lane Design (2015)

The *MassDOT Separated Bike Lane Planning & Design Guide* provides a detailed framework for planning, designing, and maintaining separated bike lanes. The guide aims to enhance safety and comfort by offering comprehensive strategies for integrating separated bike lanes into existing transportation infrastructure. The guide emphasizes the importance of creating low-stress bicycle networks that are well-connected, safe, and comfortable, thus encouraging more people to opt for cycling as a mode of transportation.

Suggested Best Practices

- **Separation Methods:** Implement various separation strategies such as raised medians, flexible delineator posts, parked vehicles, or elevation changes for horizontal or vertical separation from motor vehicles and pedestrians.
- **Bike Lane Configuration:** Assess the benefits of each configuration in terms of connectivity, access, and potential conflicts. Consider elevating bike lanes at sidewalk level, street level, or an intermediate level to optimize safety and functionality.
- **Intersection Design**: Use protected intersection designs to minimize conflicts and enhance visibility between cyclists and drivers. Employ design treatments like advanced stop lines, bike boxes, and dedicated signal phases.
- **Curbside Activity**: Address conflicts with curbside activities/conflicts by designing appropriate buffers for on-street parking, loading zones, and transit stops.
- **Signalization**: Bicycle-friendly signal phasing and bicycle detection loops at intersections enhance cyclist safety and comfort. A bicycle-friendly signal phasing includes:
    - Concurrent Bike Phase with Concurrent Permissive Vehicle Turns: Bikes run parallel with vehicles requiring vehicles to yield.
    - Concurrent Bike Phase with Leading Intervals: Provides three to seven more seconds of green time before vehicles.
    - Concurrent Protected Bike Phase: Provides full separation from turning vehicles
    - Protected Bike Phase: Maximum separation for bikes and vehicles but increases delay for both.
- **Maintenance**: Develop and implement detailed plans to address weather events or seasonal variations. Ensure regular inspections and timely repairs to maintain the functionality and safety of bikeways.

Other Takeaways

- Beveled or mountable curbs are recommended for sidewalk access. Standard six-inch vertical curbs adjacent to motor vehicle travel lanes and on-street parking can be used to discourage encroachment into the separated bike lane.
- Consider reducing the number of travel lanes, narrowing existing lanes, or adjusting on-street parking to allocate large buffer zones for separated bike lane zones.
- Use permeable asphalt or concrete for the bike lane zone to allow water to gradually soak into the ground, improving traction in the bike lane and providing a way for standing water to drain. The inclusion of green infrastructure can improve water quality, reduce flooding, and enhance corridor aesthetics.

FHWA Separated Bike Lane Design Guide (2015)

The *Separated Bike Lane Planning and Design Guide* by the Federal Highway Administration (FHWA) is a detailed resource for planning, designing, and maintaining separate bike lanes. It provides comprehensive guidelines to create safe, efficient, and comfortable bike lanes that cater to cyclists of all ages and abilities.

Suggested Best Practice

- **Directional and Width Characteristics**: When considering one-way or two-way separated bike lanes evaluate existing or planned traffic lane configurations, turning movement conflicts, parking requirements, and connection to existing facilities and destinations. To determine the appropriate width, consider expected bicycle volumes, required buffer width, and maintenance requirements. To identify bikeway placement, identify potential conflicts, like transit stops, intersections, driveways, and vehicle parking, along with key destinations.
- **Curbside Activity Management**: Design buffer zones to mitigate conflicts with parking, loading zones, and transit stops. Use treatments like floating bus stops, curb extensions, and raised cycle tracks for efficient curbside management and bikeway operation.
- **Signalization**: Integrate bicycle-specific signals, leading bicycle intervals, and detection systems to improve safety and reduce delays at intersections.
- **Intersection Design**: Enhance safety at intersection with setback crossings, advanced stop lines, bike boxes, and dedicated signal phases to minimize conflicts between cyclists and drivers.
- **Accessibility**: Ensure separated bike lane interface is accessible and compliant with the Americans with Disabilities Act (ADA) and other local design requirements.
- **All Ages and Abilities**: Separated bike lanes can improve access for less experience and confident cyclist.

NACTO Don't Give Up at the Intersection (2015)

Don't Give Up at the Intersection provides comprehensive guidance on designing safe and comfortable intersections for cyclists and pedestrians. This publication emphasizes the importance of dedicated bike infrastructure through the intersection that enhance safety by reducing conflicts.

Suggested Best Practices

- **Protected Intersections**: Provide a dedicated bike lane set back 10 to 20 feet from the intersection and through the intersection to provide shorter crossings and enhance visibility for all modes.
- **Dedicated Intersections**: Continue bike facilities through the intersection using dedicated signal phasing, striping, and other vertical treatments to reduce vehicle speed at the intersection and reinforce the bike lane. Markings and color markings can be used to highlight bike facilities, queuing areas, or crossings to enhance conflict zones.
- **Minor Street Crossings**: Design to minimize vehicle speed of the opposing travel lane before entering the intersection to enhance the crossing comfort for bikes and pedestrians.
- **Signal Phasing Strategy**: Implement bike-specific signal phases, like Leading Bike Intervals (LBIs) or protected bike signals, allowing cyclists to start crossing before vehicles turn. Configure signal timings to prioritize average speeds of cyclists and reduce delay for bikes with separate turn phases, which helps to enhance flow and minimize conflicts, supporting the safety of all modes.
- **Vertical Separation**: Use flexible delineator posts, low barriers, or other vertical elements to prevent cars from encroaching on the bikeway and to keep intersections clear of obstruction for cyclists. Vertical elements formalize bike lanes and can be implemented quickly and at a low cost.
- **Speed Management**: Implement mountable rubber speed humps which provide a simple way to reduce speed without the need for raised truck aprons or textured pavement and can be securely attached to asphalt or concrete road surfaces.
- **Pedestrian and Cyclist Islands**: Install modular islands and bulbs at bikeway intersections to create a level, accessible boarding platform or a protected waiting area between the bikeway and the street.

Denver Bikeway Design Manual (2024)

The Bikeway Design Manual from Denver's Department of Transportation and Infrastructure outlines comprehensive guidelines for designing and implementing bikeways, emphasizing safety, comfort, and connectivity for all users. It prioritizes protected and separated bikeways to enhance safety and details various bikeway types, including bike lanes, buffered bike lanes, and cycle tracks, with criteria for selecting the appropriate type based on traffic volume and speed. The manual also discusses design strategies for intersections to improve safety, such as bike boxes

and protected intersections, and highlights the importance of clear signage and markings. Additionally, it stresses the need for regular maintenance to ensure bikeway safety and usability.

Suggested Best Practices

- **Safety as a Priority**: Prioritize designs that physically separate cyclists from motor vehicle traffic, using barriers such as curbs, bollards, or planters. This separation significantly reduces the risk of collisions and enhances the sense of security for cyclists.
- **Signage and Markings**: Consistent and clear signage helps guide cyclists along the bikeway and informs motorists of the presence of cyclists. Markings such as bike lane symbols, directional arrows, and colored pavement can improve visibility and reduce confusion at intersections and crossings.
- **Key Destinations**: Bikeways should connect important community destinations like schools, parks, transit stations, and commercial areas. This encourages more people to use bicycles for their daily commutes and errands, reducing reliance on cars.
- **Seamless Transitions**: Ensuring smooth transitions between different types of bikeways (e.g., from a bike lane to a cycle track) helps maintain a continuous and comfortable riding experience. This can be achieved through consistent design standards and clear wayfinding.
- **Prompt Issue Resolution**: Quickly addressing problems such as debris and surface damage ensures that bikeways remain safe and usable. This can involve dedicated maintenance crews and clear reporting mechanisms for the public to report issues.

Suggestions for Incorporating Separated Bikeways National Best Practices

The following section summarizes how the City can further integrate national best practices into current practices:

- Ensure the forthcoming City Streets Design Manual includes best practices (described above) for separated bikeway design that provides desirable and acceptable separated bikeway design standards to allow for flexibility to work within right-of-way constraints and prioritize safety.
- Perform before and after studies for City implemented separated bikeways to evaluate design effectiveness in increasing mode share and safety.

Quick Build Implementation

As demand for better bike facilities increases, jurisdictions across the state and the country are installing bike facilities using "quick-build" methods, which are beneficial for their cost-effectiveness and ease of implementation. This method uses low-cost, often temporary, materials

to respond quickly to address community and safety needs. These types of projects can be used to evaluate a new design concept or as a phased implementation strategy to secure funding for a higher-cost permanent design. The section below summarizes state and federal resources on material selection, maintenance, and strategies to support increased implementation.

City Practices on Quick Build Implementation

The City's Pavement Management Plan (PMP) details the City's current street network conditions, financial needs for ongoing maintenance, and efficient maintenance strategies. The City aims to raise their citywide pavement condition score (referred to as the Pavement Condition Index) over the next ten years, which will be supported by an average annual investment of $188 million, totaling approximately $1.9 billion.

The Pavement Management functions are coordinated between Divisions within the Transportation Department and other City departments involved in planning, designing, or operating transportation related projects. This coordinated effort aims to bundle repair efforts with other City projects, prioritize projects, and maximize cost efficiency. This approach allows bike facilities to be implemented as part project striping modifications.

Best Practices on Quick Build Implementation

Fehr & Peers Bike Lane Buffer Materials (2023)

The *Bike Lane Buffer Materials* guide outlines various bike lane buffer treatments and separation materials, including their specifications, costs, and implementation considerations. The guide emphasizes spacing, durability, ADA considerations, and maintenance requirements to ensure effective and sustainable bike lane infrastructure.

Suggested Best Practices

- **Buffer Treatment Spacing**: Start with 10-to-20-foot raised buffer element spacing for urban arterials, adjust spacing closer to an intersection or driveway.
- **Combining Treatments**: Use durable low-profile curbs (e.g. Tuff Curb) in combination with high-visibility flexible posts to create effective buffers.
- **Buffer Treatments**: Utilize raised buffers at intersections to deter turning vehicles conflicts with cyclists and use flexible post buffers for emergency vehicle access midblock.
- **Maintenance**: Select reinforced treatments in high-impact areas and order extra inventory for maintenance purposes, typically 20%-50% more.
- **ADA Considerations**: Maintain a 5-foot ADA access aisle buffer in parking-protected bike lanes; avoid continuing low-profile treatments through crosswalks and bus boarding islands to allow full access of crosswalks to mobility device users and reduce tripping hazards for those who are visually impaired.

- **Durability**: Use products like Tuff Curb and cast-in-place curbs, which are noted for their durability in high-conflict areas, reducing long-term maintenance needs.

Other Takeaways

- Low profile barrier solutions include: CycleLane, Zebra, Zipper, Tuff Curb, Precast Curb, Cast in Place Curb Extruded Concrete Curb. These solutions all have designated guidance and pros/cons, which are outlined in the report. They are generally more effective at minimizing vehicle encroachment when combined with vertical elements.
- Flexible plastic bollards provide visual separation and are design to allow vehicles to run over with no damage; these include K-71 Flexible, Post K-72 Post, and MP Flex Post-Short Squeeze.
- Vertical elements with curbs include: RailRibbon, Narrow Cycle Lane Defenders, RailScreen, Bike Rail, Tuff Curb XLP (with delineators), and OmegaPost. Curbs help minimize vehicle encroachment, while bollards provide visual queues to drivers.
- K-Rail and Planters serves a physical protection from vehicles. These types of materials include K-Rail, SteelGreen Planters, and Self-Watering Planters.

FHWA Incorporating On-Road Bicycle Network (2016)

The *Incorporating On-Road Bicycle Networks into Resurfacing Projects* guide by the Federal Highway Administration (FHWA) provides recommendations for integrating bicycle facilities into roadway resurfacing projects, creating opportunities to improve bike infrastructure during routine maintenance. The document presents a clear process for integrating bike facilities, including considerations for project planning, design flexibility, cost, and public engagement.

Suggested Best Practices

- **Project Planning**: Consider bicycle facilities opportunities at the beginning of the resurfacing project planning process by comparing planned resurfacing project locations to local, regional, and state bicycle plans. Include bicycle facilities in the preliminary project scope to allow sufficient time for design and public engagement.
- **Design and Implementation**: Use narrower travel lanes (10 to 11 feet) to create space for bike routes without reducing traffic capacity or safety. Road diets can support the adding of bicycle facilities and narrowing pedestrian crossing distances.
- **Intersection Safety**: To enhance cyclists' safety at intersection, incorporate design features such as corner islands, separate bicycle signal phases, and bike boxes.
- **Cost and Materials**: Resurfacing budgets optimize the use of public funds, allowing agencies to implement bicycle facilities at a lower cost as compared to standalone projects.

Other Takeaways

- Madison, WI, adopted a resurfacing policy to incorporate bike facilities on arterial and collector streets during resurfacing projects when they are feasible. All projects included in the resurfacing improvement program are evaluated to determine the potential expansion of the bike network or improvement of bicycle facilities based on the City's Bicycle Plan.
- Oakland, CA has a five-year resurfacing outlook and multi-departmental coordination between paving and bicycle program staff to integrate bikeways into resurfacing projects effectively.

Best Practices on SRTS Quick-Build Implementation

Safe Routes to School (SRTS) is a program aimed at making it safer and easier for children to walk, bike, or roll to school. A key component of a SRTS program is identifying critical safety needs on routes commonly used by students and implementing infrastructure improvements to enhance safety and accessibility on those routes.

Quick-Build projects, such as curb extensions, protected bike facilities or cycle tracks, and various crosswalk enhancements, are seen as a useful strategy to quickly immediately improve safety, engage the community, and gather data to guide future long-term investments. Several SRTS case studies highlight how Quick-Build projects promote cycling by making it safer and more appealing, leading to reduced traffic congestion around schools.

Case Study of Quick-Build Implementation: Cincinnati Quick-Build Project (2023)

The City of Cincinnati initiated a quick-build project to address an urgent safety concern at the intersection of Linn Street and Chestnut Street in the West End neighborhood. This intersection served as a crucial route for elementary school students traveling between the school and the local recreation center. To enhance safety, the project involved the installation of preformed thermoplastic curb extensions and the removal of a parking space, which aimed to reduce crossing distances and improve visibility for pedestrians and cyclists.

The quick-build project was considered a cost-effective solution to address safety issues while waiting for a larger, more permanent project. The pilot project incurred an approximate cost of $25.50 per square foot for materials and installation.

Case Study of Quick-Build Implementation: Atlanta Quick-Build Project (2023)

The City of Atlanta was awarded $10,000 of grant funds to create a pilot walk/bike lane adjacent to a middle school in an underserved community with many students living within a reasonable walking distance from the school. The City worked with community members throughout the planning and design process, including a single day demonstration event during initial design

development and additional in-person and virtual engagement following the demonstration. The successful pilot project eventually led to the installation of a permanent walk/bike lane and garnered increased support for future Safe Routes to School initiatives.

Suggestions for Incorporating Quick Build National Best Practices

The following section summarizes how the City can further integrate national best practices into current practices:

- Create a general and SRTS specific library or "toolbox" of approved quick build treatments and materials, including considerations, specifications, and approved vendors.
- Create a community plan area grant program to allow residents to suggest projects for quick build improvements across the community and pertaining to SRTS.
- Consider bicycle facility needs and identified priority corridors in maintenance project schedule development process, rather than exclusively pavement condition.
- Secure grant funding and/or allocate investment into the implementation of short term (i.e. spot treatments like painted or raised curb extensions and new high visibility crosswalks) and long term (i.e. implementation of system and corridor-wide walk and bike pathways) SRTS improvements.

Safety

City Practices on Safety

The City committed to Vision Zero in 2015, and further affirmed their commitment to the Safe System Approach in the Systemic Safety Plan (adopted in 2024). This plan outlines the data driven approach to achieving Vision Zero and the initiative aimed at eliminating all traffic fatalities and sever injuries, with an added focus on those occurring in the intersections. This specifically identifies short- and long-term strategies to achieve Vision Zero and as it related to the BMPU, reduce cyclists related injuries and fatalities. The City practices outlined in the Systemic Safety Plan are similar to the guidance provided by FHWA and Caltrans. Additionally, the City has adopted Revision 8 of the Caltrans 2014 CA MUTCD, which was available as of March of 2023.

The City is focused on safer intersection design, recognizing that a higher percentage of severe and fatal crashes occur at or near intersections. The Systemic Safety Plan evaluates citywide patterns to identify characteristics of intersections and roadways that increase crash risk and then systemically address mitigations. To maximize impact with limited funds, the City prioritizes cost-effective solutions (e.g. leading intervals and countdown timers and high-visibility crosswalks). In addition, the City continuously monitors crash data to assess effectiveness of implemented

countermeasures, and adjusts the strategy as needed. Lastly, with a long-term vision, the City integrates safe systems principals into infrastructure planning (e.g. when traffic signals are replaced, the City considers installing roundabouts to eliminate the possibility of severe broadside or left-turn crashes).

The City also recently participated in the SANDAG Vision Zero Action Plan as a Local Agency Project Development Team member. SANDAG has made several resources available to the City to help further safety planning.

Best Practices on Safe Systems Approach

The Safe System Approach aims to eliminate fatal and serious injuries for all road users by prioritizing the reduction of crash severity, accommodating human errors through road and vehicle design, promoting shared responsibility among all stakeholders, and implementing proactive measures, such as data-driven risk identification and safety improvements.

Federal and state agencies, including Federal Highway Administration (FHWA) and California Department of Transportation (Caltrans), have committed to the Safe Systems Approach, emphasizing safety of vulnerable road users as a top priority. The section below details how larger agencies prioritize and commit to safety, as well as recommendations and guidance that can support implementation of bike facilities at the local level.

FHWA Federal Guidance

FHWA's Safe System Approach framework includes the following principles:

- **Deaths and Serious Injury are Unacceptable**: Prioritize the reduction of crashes that result in fatalities and severe injuries.
- **Humans Make Mistakes**: Recognize that human error is inevitable and design systems that accommodate these mistakes.
- **Humans are Vulnerable**: Understand human limits to tolerate crash forces and design to protect these vulnerabilities. Examples include separating people traveling at different speeds, providing dedicated times for different users to move through an area, and alerting users to hazards and other road users.
- **Responsibility is Shared**: Ensure that all stakeholders, including roadway users, vehicle manufacturers, and policymakers, share the responsibility for roadway safety.
- **Safety is Proactive**: Use proactive tools to identify and mitigate risks before crashes occur.
- **Redundancy is Crucial**: Strengthen all transportation system parts to protect users if one part fails.

In 2024, the FHWA further bolstered its guidance to include the *Safe System Roadway Design Hierarchy*. The approach recommends prioritizing designs using the following four-tiered system:

- **Tier 1 Remove Severe Conflicts**: To eliminate severe conflicts on the road, it is essential to address high-risk conditions by separating road users traveling at different speeds or in different directions. This can include removing intersection crossing conflicts, fixed roadside objects, or railway-highway crossings. Additionally, providing physical separation between motorized and non-motorized users, along with varying degrees of buffered separation, helps reduce collision risks.
- **Tier 2 Reduce Vehicle Speeds**: Implementing design features and speed management strategies helps reduce vehicle speeds and danger involved in crashes. Local jurisdictions should establish appropriate speed limits to protect vulnerable road users and drivers. In addition to speed limits, agencies can use strategies like self-enforcing roadways, traffic calming measures, and speed safety cameras to achieve lower speeds. Self-enforcing roads incorporate design elements such as lane narrowing and traffic deflection to encourage slower driving, while also providing enhancements for pedestrians and cyclists, such as median islands and raised crosswalks.
- **Tier 3 Manage Conflicts in Time**: Managing conflicts on roadways involves coordinating users' access to the same space over time through yellow change intervals, leading pedestrian intervals, and beacons to enhance safety and reduce vehicle conflicts. This approach improves safety and enhances user comfort and convenience, particularly for cyclists, by offering clear and alternating opportunities to navigate the roadway.
- **Tier 4 Increase Attentiveness and Awareness**: Enhancing attentiveness and awareness among roadway users can help them recognize potential conflicts, allowing for appropriate responses in line with the SSA. This includes measures like improving crossing visibility, using backplates with retroreflective borders, rectangular flashing beacons (RRFB) and implementing rumble strips or stripes.

Caltrans Statewide Guidance

Caltrans' Strategic Highway Safety Plan (SHSP) aligns with the Safe System Approach by setting a vision of zero fatalities and serious injuries. California's SHSP focuses on eliminating serious crashes first, addressing disparities in road safety outcomes, and involving comprehensive strategies, such as education, enforcement, engineering, emergency response, and emerging technologies.

Legislation that Supports Safe Speed Limits

Excessive speeding remains a top cause of fatal and serious injury crashes. Enhancing safety of all modes, but especially those most vulnerable, includes encouraging safer travel speeds to lower the likelihood of crash severity by allowing more response time and better visibility. The following

section summarizes legislation updates that allow agencies additional considerations for lowering speed limits.

CA MUTCD, 2014

Revision 8 of 2014 CA MUTCD (effective March 10, 2023) introduces updates that improve traffic control and safety. Guidance was added on setting speed limits, especially along safety corridors and in areas with high pedestrian traffic. The new standards also emphasize engineering and traffic surveys to justify speed limits and provide detailed guidelines for pavement markings and temporary traffic control devices.

Legislative Best Practices Application

- **Speed Limit Setting**: Updated criteria for setting speed limits, including consideration for safety corridors and high pedestrian areas. Designation of safety corridors with high crash rates allows for lower speed limits.
- **Engineering Surveys**: Engineering and traffic surveys are required to establish speed limits and include analysis of speed distribution, collision records, and roadway conditions. "Conditions Not Readily Apparent" to drivers is the mechanism used to lower the posted speed limit per CVC 627.
- **Pavement Markings**: New longitudinal pavement marking standards, including width and pattern specifications.
- **Pedestrian and Cyclist Safety**: Increased focus on safety for vulnerable groups, including children, seniors, and people with disabilities.
- **Business Activity Districts**: Provide lower speed limits in business activity districts with specific conditions to accommodate pedestrian traffic.
- **Advisory Speeds**: Guidelines for using advisory speed plaques and their placement to warn drivers of changes in road conditions.
- **Speed Trap Regulations**: Clarifications on speed trap regulations, including the conditions under which they apply, to ensure fair and just enforcement of speed limits.

Suggestions for Incorporating Safety National Best Practices

The following section summarizes how the City can further integrate national best practices into current practices:

- Utilize resources from SANDAG's Vision Zero Action Plan, including leveraging regionally significant safety projects for grant funding programs or using the Local Agency Resource Hub to develop projects.
- Integrate FHWA's Safe System Roadway Design Hierarchy into project development.

Network Development

A complete and connected network leads to enhanced comfort and safety of cyclists. In addition to the principals laid out in the "Separated Bikeway Design" section, this section outlines best practices for facility type selections that considers all ages and abilities, and are inclusive of all facility type considerations, including bike superhighways, which provide continuous, low-stress travel across urban and suburban areas, physically separated from vehicular traffic to minimize risk and enhance the cycling experience. A complete and well-integrated network encourages widespread bicycle use by reducing barriers and making cycling a viable, enjoyable option for commuting, recreation, and daily errands.

City Practices on Network Development

San Diego's network includes the following bicycle facility types:

1. Class I Bike Paths (Off-street paths for non-motorized users, enhancing safety and providing scenic route),
2. Class II Bike Lanes (On-street bike lanes adjacent to traffic for streamlined travel)
3. Class III Bike Routes (Shared roadways with vehicle traffic, marked by sharrows and signage)
4. Class III Enhanced Bike Routes (similar to Class III Bike Routes with additional traffic calming treatments)
5. Class IV Cycle Tracks (Protected lanes separated from vehicle lanes by barriers).

The City develops the bicycle network using congruent facilities found in the Caltrans Highway Design Manual (HDM), and seeks to support cyclists of all ages and abilities with safe options. The previous City of San Diego Bicycle Master Plan (2013) presented a proposed bicycle network with facility types based best practices at the time the plan was developed. The forthcoming tasks as part of this BMPU will detail revised strategies for network selection based on the best practices described in the section below, and will specifically include Class IV bikeways which were not included in the previous plan.

Best Practices on Network Development

All Ages and Abilities (2017)

The *Designing for All Ages & Abilities* guide by National Association of City Transportation Officials (NACTO) outlines strategies for implementing high-comfort bicycle facilities for all users by considering vehicle speeds, vehicle volumes, and operational uses.

Suggested Best Practices

- **Speed and Volume Management**: Aim for motor vehicle speeds of 20 to 25 mph to improve cyclist comfort on select street typologies that prioritize cycling. Consider traffic calming elements like speed humps, pinch points, and raised crossings to reduce vehicle speeds. Aim for motor vehicle volumes below 1,000 and 1,500 vehicles per day to create a low-stress environment, and implement traffic diverters to reduce through traffic.
- **Bike Design and Operation**: Use physical barriers like curbs, flex posts, or parked cars to separate bike lanes from motor vehicle traffic on streets where speeds exceed 25 mph or where daily vehicle volume is higher than 6,000 vehicles.
- **Intersection Safety**: Design intersections to reduce conflicts between cyclists and motor vehicles by using corner islands, bend-out bike facilities, and dedicated bicycle signals. Install two-stage turn boxes at intersections to help cyclists make left turns in high traffic areas.
- **Signal Timing**: Use bicycle-friendly and/or prioritized signal timing, including leading bicycle intervals and low-speed signal progression, to enhance safety, reduce waiting times, and improve flow for cyclists.
- **Curbside Management**: Designate specific loading zones to prevent freight and passenger loading activities from blocking bike facilities. Restrict loading activities to off-peak periods. Implement transit boarding islands to reduce conflicts between buses and cyclists.
- **Accessibility**: Use separated bike facilities built to design preferential maximums. Design for clear sightlines and daylighting, a low-speed environment, and accommodate adaptive cycling devices.
- **Network Connectivity**: Ensure that bike facilities form a continuous network that connect key destinations, such as schools, recreational amenities, and commercial and residential areas. Consider off-street shared-use paths for cyclists and pedestrians where space allows.

FHWA Facility Selection Guide (2019)

The *Bikeway Selection Guide* provides a selection framework for various bike facility types. It emphasizes safety and comfort, with a direct link to roadway user speeds and volumes. The document encourages a comprehensive process-oriented approach to making informed decisions, including the incorporation of public feedback and engineering best practices.

Suggested Best Practices

- **Context Considerations**: Depending on the geographical context, there is a unique selection process for urban and suburban, and then for rural areas that can be used. Each process links roadway speeds and volumes to a preferential bike facility.

- **Design**: Encourages the use of engineering judgment and design flexibility to adapt bike facility designs to specific project constraints, promoting innovative solutions. Differentiates between interim and final design solutions, allowing for phased implementation of bikeway projects as conditions and funding allow.
- **Public Engagement**: Actively involve the public and stakeholders in the planning and design process. Ensure that decisions are made transparently and reflect community needs and preferences.

Caltrans DIB 94: Complete Streets: Contextual Design Guidance

The *Caltrans Design Information Bulletin 94* (DIB-94) outlines the guidance for planning and designing Complete Streets projects across California's State Highway System. This document promotes an inclusive, context-sensitive approach to the development of transportation facilities that accommodate all users—whether they are pedestrians, cyclists, or transit riders. It prioritizes equitable and sustainable mobility options while emphasizing the importance of safety, livability, and community input. DIB-94 aligns with broader policy objectives, such as Caltrans' commitment to a Safe System approach and the goal of eliminating fatal and severe traffic injuries.

Suggested Best Practices

- **Speed Management**: Implement speed management strategies, such as speed limit signs and traffic calming measures like speed bumps, to encourage slower driving. Design road features with narrower lanes, tighter curves, and proper shoulder widths to promote lower speeds. Assess current vehicle speeds and traffic patterns to identify necessary adjustments. Recognize unique characteristics of differing place types such as Rural Main Street areas have a higher need for a smooth transition from high speed to low speed.
- **Prioritizing Modes**: Narrow traffic lanes when the width is available, including median, turning lanes, or street parking to maximize the existing right of way where it is limited. Understand what type of roadways will have modal priority for cyclists, personal vehicles, freight, transit, and/or pedestrians. Such as, urban areas and rural main streets will have cyclists at a higher priority.
- **Roadway Cross Section**: Consider curbs and roadway reallocations to enhance cross section design. On-Street parking can operate as a vertical separation for a Class IV separated bikeway when parking is allowed all times of the day. For right shoulders, the minimum usable paved shoulder wide should be four feet. For Class I or Class IV less than four feet is allowable except at an interchange crossroad.

Bike Superhighways

Bicycle superhighways represent a visionary approach to transforming mobility by creating dedicated, high-quality, uninterrupted bike facilities that support long-distance bicycle travel. Inspired by successful models from cities like Copenhagen and London, these superhighways are

designed to serve as the backbone, connecting residential areas with key destinations such as employment hubs, transit centers, and recreational spaces.

The *Central Bikeway Feasibility Study* and *Bike Superhighway Implementation Plan for Santa Clara County* is a case study on the development of bicycle superhighways in the United States. The Santa Clara Valley Transportation Authority (VTA) is proposing a network of bicycle superhighways designed to connect various parts of Santa Clara County, providing low-stress, separated pathways for people of all ages and abilities. The Central Bikeway also aims to support disadvantaged communities by offering east-west access to Santa Clara and San Jose. This bike facility will traverse several highways, linking popular local bicycle facilities and connecting to regional transit hubs. The plan articulates the vision and goals for the Central Bikeway and also provides a toolbox of design features that other cities can utilize to support effective implementation.

Suggested Best Practices

- **Design Features for Safety and Accessibility**: Ensure that Class I bike paths do not exceed 15 mph and should be 12 to 15 feet wide so that they are accessible to a diverse range of users, including children, seniors, and people with disabilities. Class IV cycle tracks can support users who travel 25 mph or more with a recommendation of six to seven feet with a three-foot buffer at street level, or a five-foot bike lane with a one and a half-foot buffer at sidewalk level. Class III bike routes can be part of a superhighway network if the volumes are low and the roadway has low vehicular speeds.
- **Route Integration**: Strategically integrate bike facilities with existing public transportation systems to enhance connectivity and make multi-modal travel convenient. Develop routes that link key destinations like business districts, residential areas, and recreational spaces. Implement measures to improve safety on bike paths by enforcing speed limits, providing educational resources for path users, and upgrading infrastructure to create wider paths or designated lanes for high-speed cyclists.
  Clear Communication and Wayfinding: Implement a bicycle wayfinding system featuring clear signage, pavement markings, kiosks, maps, and apps in local languages to direct cyclists along preferred routes. Establish a strong brand for the bicycle superhighway network to underscore its significance across the county. Place signs at decision points and key destinations to enhance navigation.

Suggestions for Incorporating Bikeway Selection National Best Practices

The following section summarizes how the City can further integrate national best practices into current practices:

- Utilize the best practices to inform bikeway selection for the updated BMPU.
- Develop a facility selection guide that begins with the NACTO and FHWA's framework, then allows for flexibility as needed for constrained roadways.
- Identify bikeways that are low stress and provide access to all ages and abilities. If a low stress facility is not possible along a desirable route, consider a parallel route, or changes to the roadway that would reduce vehicular speeds.

Network Amenities

Supportive network amenities play an integral role in the accessibility of a bicycle network, the interconnectedness with transit, and the ability for users to orient efficiently between origins and destinations. The following section summarizes best practices for network amenities to support bike facilities, such as bus and bicycle interface design, bus stop design, wayfinding signs and markings, and bicycle parking.

City Practices on Network Amenities

The City provides network amenities that support cyclists as they travel along bike facilities, which include bus and bicycle interface design considerations, bicycle wayfinding, and end of trip facilities like bicycle parking. Business Owners can request a bike rack through an existing City bike rack request program[4]. Guidance documents exist at the regional level that inform the design, placement, and provision of network amenities within San Diego. The existing regional documents may act as City practices documents in place of existing City network amenities documents. For example, the Wayfinding Design Guidelines: San Diego Regional Bike Network (2015) can serve as the City's basis in addition to others listed herein.

The SANDAG *Wayfinding Design Guidelines (2015)* is a comprehensive guide on how to design a wayfinding system and ways to design the signage through appearance and messaging. The goal is to promote consistent signage look and feel, placement, and size specifications to enhance the bike network to the destinations cyclists want to go. The guide informs the following:

- **Destination Wayfinding**: Identify the user's location in relation to popular destinations. Position the bike network in the context of the city, region, and its destinations to guide people to their destination and as a way to visualize themselves in the network even if their destination is not on a specific sign.

[4] https://www.sandiego.gov/bicycling/racks-and-lockers

- **Signage**: Pavement markings can work with signs to provide guidance and visual queues. If possible, signs should be placed in both directions of a street. One mile of a bike facility should have two to four wayfinding signs in each direction.
- **Design Principles**: When creating signs, it's important to make them visually prominent and eye-catching. The information on the signs should be organized in a logical hierarchy and flow from top to bottom and left to right. The key elements to include on a sign are designation, destination, direction, and distance. Repeating the position, shape, color, and font of signs provides consistency and makes the signage easier to understand.
- **Messaging**: Have consistency in abbreviations for street suffixes but try to spell out all other words space permitting. Place arrows left aligned if also having destination on sign. Place a max of three destinations on one sign. Show distance in mileage or measured in blocks.
- **Installation**: Ensure that signs are consistently mounted in locations with clear sight lines. Keep a minimum seven-foot clearance between the ground and the bottom edge of each sign. It is best to mount signs on their own poles and avoid mounting signs on utility, lighting, or transit stop poles to maintain visibility.

Best Practices for Bus and Bicycle Interface Design

SamTrans Bus Stop Design Guidelines (2024)

The SamTrans Bus Stop Design Guidelines provides design considerations for bus and bike interfaces to enhance the safety for both transit riders and cyclists. The document presents strategies for integrating transit stop designs into multimodal corridor projects, focusing on creating a safe and comfortable environment for buses and bicycles to interact while being efficient for both.

Suggested Best Practices

- **Mitigating "Leapfrogging"**: Leapfrogging occurs when buses and bikes frequently pass each other as buses stop to pick up or drop off passengers. Separate the movements of buses and bicycles as much as possible using infrastructure solutions like bus bulbs, boarding islands, and protected bike lanes.
- **Intersection and Signal Design**: Transit Signal Priority (TSP) can improve bus travel times when combined with stop optimization strategies and can be combined with Leading Pedestrian Intervals (LPIs) to enhance safety. At intersections, design considerations are needed for areas where bike lanes are next to the curb to avoid conflicts between cyclists and turning vehicles. Solutions include separate bike facilities with physical barriers or curb extensions, along with clear signage and road markings for guidance.
- **Bus Stop Optimization**: Reducing or relocating the number of bus stops can significantly decrease the interactions between buses and bicycles, thus enhancing safety and efficiency.

- **Multimodal Integration**: Integrating bus stop design into multimodal corridors provides improved bus and bike interactions and allows for pedestrians to be well-connected to the bus stop. In space-constrained areas, shared bike and bus platforms can be used, though they should be carefully designed to minimize conflicts.

Other Takeaways:

- Bus bulbs extend the sidewalk into the parking lane, allowing buses to stop without disrupting traffic flow. This design helps reduce travel time for buses and improve safety at intersections. However, it can obstruct cyclists, so using bus boarding islands with bike bypass zones can help maintain separation and safety.
- Boarding islands provide a separate lane for cyclists to bypass bus stops, improving safety and comfort for both cyclists and bus passengers. This design minimizes conflicts, particularly in high-traffic areas, and should be clearly marked with considerations for pedestrian right of way. The design should also accommodate both raised bike facilities and street-level bike facilities depending on the context.

AC Transit Multimodal Corridor Guidelines (2018)

The *AC Transit Multimodal Corridor Guidelines* provides design standards for efficient transit operations, safe access to bus stops, and accommodations for cyclists along multimodal corridors. The guideline presents five typologies (detailed in full in the document) for bus stops, each designed to coexist with different types of bicycle infrastructure, ensuring that transit services can operate smoothly without compromising cyclist safety, stressing the importance of strategic bus stop placement, clear sight distances, and the provision of ADA-compliant access to ensure safety and efficiency.

Suggested Best Practices

- **Bike Facility Integration**: Design bike facilities to route behind bus stops, minimizing conflicts and enhancing safety for cyclists. Provide sufficient width for the bike lanes, with a minimum of 5 feet, to ensure comfortable and safe cycling conditions. Floating bus stops eliminate direct conflicts between buses and cyclists, making these the most supportive. Far-side stops are preferred over near-side stops as they reduce conflicts with right-turning vehicles and allow for smoother bus operations, particularly in areas with transit signal priority.
- **Intersection Safety**: Implement design features such as corner islands and separate bicycle signal phases to enhance cyclist safety at intersections. Use bicycle boxes at intersections to provide cyclists with a safe and visible way to position themselves ahead of traffic during red lights.

- **Multimodal Integration**: Integrate bus stops with pedestrian and bicycle facilities to create a seamless multimodal transportation network. Use transit signal priority at intersections to improve bus travel times and reliability.

Best Practices for Bicycle Wayfinding

NACTO Bike Route Wayfinding Signage and Markings System (2014)

The *Bike Route Wayfinding Signage and Markings System* by the National Association of City Transportation Officials (NACTO) offers a comprehensive guide for implementing wayfinding signage and pavement markings to enhance navigation for cyclists. The system is designed to improve safety, accessibility, and connectivity within urban bicycle networks.

Suggested Best Practices

- **Standards**: Follow standards for mounting height, lateral placement, and sign content as outlined in the Manual on Uniform Traffic Control Devices (MUTCD). Decision signs should be placed near intersections and turns; confirmation signs every ¼ to ½ mile on off-street routes or every two to three blocks on-street.
- **Design Features**: Make sure that signs are positioned for maximum visibility and usefulness. For example, turn signs should be placed on the near side of intersections. Consider implementing numbering systems for routes, but keep in mind that users may need maps or directories to understand them. Decision signs should include destinations, directional arrows, and travel times. It's recommended to use the Clearview Hwy Font for consistency and readability.
- **Wayfinding Signs**: Wayfinding signs can direct users to the best routes for various destinations, including Primary Destinations up to five miles away (e.g., downtown areas), Secondary Destinations up to two miles away (e.g., transit stations), or Tertiary Destinations up to one mile away (e.g., parks). Wayfinding signage is typically applied along all streets and bicycle facilities within the network and on circuitous routes to guide cyclists to their destinations.
- **Pavement markings**: Pavement markings reinforce routes and directional signage, which are particularly useful in urban areas where signs might be obscured. These include stencils indicating bicycle boulevards and directional chevrons to guide cyclists.

Other Takeaways

- **Types of Signs**: Decision Signs: Located at junctions of two or more bike facilities, providing directions to key destinations with optional distance and travel time information.
- **Confirmation Signs**: Indicate that cyclists are on a designated bike lane, placed every ¼ to ½ mile on off-street facilities or every 2-3 blocks on-street. Turn Signs: Positioned near

intersections where a bike facility changes direction, featuring arrows and destinations to guide cyclists. Include map signs and pavement markings to enhance wayfinding.

- **Maintenance**: Maintaining wayfinding signage involves periodic replacement due to wear. Cities should keep comprehensive inventories of signage locations and ages to integrate maintenance into broader asset management activities. Pavement markings require regular upkeep, especially in high-traffic areas.

Best Practices for Bicycle Parking

Bicycle Parking Guidelines, 2nd Edition by the Association of Pedestrian and Bicycle Professionals (APBP)

The *Bicycle Parking Guidelines, 2nd Edition* by APBP provides comprehensive recommendations for bicycle parking facilities, covering both short-term and long-term facilities. They provide specific performance criteria for racks and lockers, site planning requirements, and sample layouts.

Suggested Best Practices

- **Short-Term Parking**: Place short-term parking in visible, high-traffic areas to improve security and convenience; ensure easy access to building entrances. Provide temporary, attended, or unattended bicycle parking for events to accommodate large numbers of cyclists.
- **Long-Term Parking**: Offer various long-term parking solutions such as bike lockers, cages, and indoor bicycle rooms. Make sure that long-term parking areas are secure and only accessible to authorized users. Establish bicycle transit centers near major transit hubs to provide secure and weather-protected parking options for commuters.
- **Security**: Use bicycle racks that support the bicycle in at least two places, allowing the frame and one or both wheels to be locked with a U-lock. When planning parking sites, prioritize safety and visibility, especially in low-traffic areas. Choose materials that resist theft and deterioration.
- **Sheltered Parking**: Install sheltered parking to protect bikes from weather, including considerations for roof span, setbacks, and clearances.
- **In-Street Parking**: Use bicycle corrals to consolidate bicycle parking in the street, freeing up sidewalk space and improving the streetscape.
- **Policy and Requirements**: Establish clear requirements for both short-term and long-term bicycle parking by land use type. Incorporate bicycle parking standards into local zoning and development codes to ensure consistent implementation.

Essentials of Bike Parking by the Association of Pedestrian and Bicycle Professionals (APBP, 2015)

The Essentials of Bike Parking guide by the Association of Pedestrian and Bicycle Professionals (APBP) provides comprehensive recommendations for selecting and installing bicycle parking facilities. This guide is intended to promote cycling by ensuring that bike parking is convenient, secure, and accessible.

Suggested Best Practices

- **Integration**: Include bicycle parking in the initial stages of project planning to ensure adequate space and proper placement. Involve local businesses, community groups, and transportation agencies to gather input and support for bicycle parking projects.
- **Facilities**: Ensure short-term bike parking is visible and close to destinations, ideally within 50 feet of the entrance. This convenience encourages usage and increases the likelihood that visitors will use bike transportation.
- **Street Parking**: Use bicycle corrals to consolidate bicycle parking in the street, freeing up sidewalk space and improving the streetscape. Choose bike racks that support bikes without stressing the wheels, accommodate a variety of bike types, and allow locking of the frame and at least one wheel with a U-lock. Ensure the racks are intuitive for first-time users.
- **Security**: All bike racks must be sturdy and well-anchored. Place short-term parking in visible areas to deter theft and ensure the racks can be seen from within nearby buildings. Implement adequate lighting for locations that will see use outside of daylight hours.
- **Limited Space**: In areas with limited space, use high-density rack systems. However, ensure these racks are complemented with ground-level options to accommodate users who cannot lift their bikes or operate two-tier systems.
- **Sheltered Parking**: Implementing secure enclosures, bike rooms, or lockers with access control systems like keys, smart cards, or user-supplied locks can also provide more safety and protection from weather conditions.

Bicycle Parking Guidelines by San Francisco Municipal Transportation Agency (SFMTA, 2015)

The *SFMTA Bicycle Parking Guidelines* provide detailed standards and recommendations for bicycle parking in San Francisco. The guide examines different types of bicycle parking, guidelines for placement and installation, and policies for ensuring the security and usability of the facilities to provide secure and accessible bicycle parking to support the city's transportation system.

Suggested Best Practices

- **Bike Parking Classification**: Clearly differentiate between short-term and long-term bicycle parking needs. Short-term parking should prioritize convenience and accessibility, while long-term parking should focus on security and protection from the elements.
- **Assessments**: Conduct regular assessments of bicycle parking demand across different areas. Prioritize installation in high-demand areas such as commercial districts, schools, libraries, transit stops, and other service destinations. A general guideline is where the existing demand is for five or more bikes.
- **Installation**: Maintain adequate clearances from curbs, walls, and other street furniture. Select materials that are durable and resistant to environmental factors such as rust and corrosion.
- **Suitability**: Offer a variety of bicycle parking solutions, such as sidewalk racks, on-street corrals, bicycle lockers, and cages/rooms. This ensures that different user needs and space constraints are met.
- **Integration**: Incorporate bicycle parking into the broader streetscape design, ensuring it complements other street elements like trees, lighting, and pedestrian pathways. Avoid placing bicycle racks in isolated or hidden locations.
- **Usability**: Make bike racks easy to use for all cyclists. Avoid confusing designs. Use clear, standardized signage to direct cyclists to parking facilities, especially in busy areas.

Emerging Trends in E-Bike Parking and Charging (2024)

New York City has launched a pilot program to test public e-bike charging hubs in Manhattan and Brooklyn. The program aims to reduce the risk of lithium-ion battery fires, which have caused fatalities and injuries. The first hub was unveiled at Cooper Square, and four more locations are planned. The city has partnered with micro-mobility companies to provide battery-swapping stations and secure charging racks. These hubs will include fire safety measures and will be regularly inspected by fire officials. The program, costing about $950,000, will allow up to 100 delivery workers to use the hubs for free and provide feedback. This initiative is part of broader efforts to enhance e-bike safety, which includes stricter regulations and public awareness campaigns. As more cities and communities explore similar initiatives, cities need to ensure that e-bike users stay informed about emerging trends and advancements in e-bike technology and infrastructure.

Suggested Best Practices

- **Battery Storage:** Store lithium batteries outdoors because they can explode. They should never be stored near doors or windows or where a fire would block exits.

Suggestions for Incorporating Supportive Amenities National Best Practices

The following section summarizes how the City can further integrate national best practices into current practices:

- Coordinate with MTS on transit stop design features that safely integrate with bicycle facilities.
- Develop a bikeways branding program/wayfinding program.
- Continue to support the bicycle parking program that allows businesses to request bicycle parking racks. In urban areas, consider a bicycle locker program that can accommodate e-bikes as well.

Supportive Programs

The following section provides an overview of other bicycle supportive programs. There are many examples of supportive programs, and while the items provided are not exhaustive, they offer ideas for the City to consider, including:

- Bicycle facility evaluation programs, for example, before/after studies, collect data on vehicle speed and traffic/ bicycle volumes pre- and post-implementation, and helping to measure changes in usage and safety.
- Transportation Demand Management (TDM) focuses on reducing car dependency by encouraging alternative transportation modes like cycling as well supported means of travel.
- Community safety can be improved through the enforcement of existing safe cycling laws and the promotion of community solutions.
- Outreach and encouragement involves community engagement to increase cycling awareness and support for infrastructure development.
- E-mobility initiatives and policies address needs for infrastructure and education that can promote improved safety and access.
- Bike and scooter share programs increase access to shared mobility devices for short trips, and adaptive programs enable people with disabilities to cycle with tailored equipment, fostering inclusivity and independence.

City Practices on Supportive Programs

When a City practice relating to a supportive program is not in place, regional practices for supportive programs are deferred to as they are available to the City to learn on and adopt as their own. Below represents a list of these programs.

San Diego Association of Governments (SANDAG)

SANDAG provides a wide range of bike services to promote active transportation in the San Diego region. These services include an extensive network of bike facilities, secure bike parking facilities with lockers at transit stations, and free bike education classes for schools and employers. SANDAG's goal is to encourage biking as a way to save money, reduce stress, and contribute to environmental sustainability. The Regional Active Transportation Plan outlines regionally significant facilities, which SANDAG partners with local jurisdictions to implement. Additionally, SANDAG's transportation demand management plan involves regularly updating the regional bike map, identifying and fixing gaps in the bike facility network. SANDAG also manages before/after active transportation studies for SANDAG funded projects and has been performing this data collection for over a decade.

Circulate San Diego (SD)

Circulate SD collaborates with various entities to create planning and community engagement programs, promote transportation choices, and advocate for sustainable land use policies. They have also implemented outreach events using demonstration projects. Demonstration projects test infrastructure improvements before making them permanent (i.e. protected bike lanes, high-visibility crosswalks, and curb extensions) using non-permanent materials. Circulate SD has implemented several types of demonstration projects such as parklets, bicycle and pedestrian facilities, and wayfinding signage.

SANDAG Active Transportation Project Data Evaluation (2017)

The *Active Transportation Project Data Evaluation* guide from SANDAG outlines the methodology for before/after evaluation of bicycle facilities and pedestrian improvements. The methodology ensures that active transportation projects meet the community's needs and SANDAG's goals for enhancing mobility, access, safety, user experience, placemaking, and economic activity.

The evaluation process begins with defined goals with contextually representative data. These data can be collected with manual or automated methods. For example, SANDAG currently maintains an automated counter for the San Diego region for pedestrians and bikes on specific bikeways and trails. It is important the data are collected in a way that ensures the data are directly comparable year of year, across locations, and land use contexts. Include control locations that are similar in land use and demographics but not affected by the project to differentiate between project impacts and broader trends. External factors such as seasonal variations, economic conditions, and other local projects might influence the study results. A summary of findings should be compiled and used to support iterative improvements to the project and future studies.

Best Practices on Evaluation Programs (Before and After Studies)

A before/after study or evaluation program assesses a project by comparing data and outcomes before and after implementation. This type of program typically involves collecting data on relevant metrics, such as vehicle speed, crash data, and modal volumes before the project begins, then collecting the same metrics once the project is implemented. This type of evaluation can be beneficial for assessing how project implementation changes vehicle flow, bicycle activity, and pedestrian safety.

ITE Evaluating Success: Complete Streets Before and After (2019)

This paper provides a framework for evaluating the effectiveness of Complete Streets projects and discusses the importance of evaluation, appropriate comparison metrics, and data collection methods to assess the impacts of projects on vehicle flow, bicycle activity, and pedestrian safety.

Suggested Best Practices

- **Planning**: Establish standardized data collection protocols to ensure reliable and comparable results across different projects. Use near-term safety metrics like near-collision video analytics and user perception surveys to evaluate project impacts before collision data is available.
- **Data Collection**: Measure 24-hour vehicle volumes and average corridor speeds to understand changes in traffic patterns and vehicle flow. Assess vehicle turning movements during peak hours to establish context for appropriate improvements.
- **Bike Assessment**: Measure mid-block bicycle volumes to establish volume context. Observe bicycle behavior, such as riding on sidewalks or wrong-way riding, to determine the effectiveness of new bicycle facilities.
- **Quick-Build**: Implement quick-build projects using low-cost materials to test new treatments and gather data before making permanent changes.
- **Long-term**: Measure user volumes, intercept surveys, and sales receipts to document and monitor the economic impacts of projects. Use tools like Reliability+ to evaluate transit travel times, dwell times, and passenger demand, providing context to reliability statistics.
- **Metrics**: Use metrics to assess the full impact of projects, including vehicle volumes and speeds, bicycle activity, crash and safety data, and queueing.

Case Study on Evaluation Program: SFMTA Safe Streets Evaluation Handbook (2017)

The *Safe Streets Evaluation Handbook* by the San Francisco Municipal Transportation Agency (SFMTA) provides a detailed framework for evaluating transportation project impacts. It offers a

step-by-step guide to help assess the impact of these projects on neighborhoods, aiming to achieve city and agency goals through consistent evaluations.

A case study was conducted on Polk Street, which included streetscape improvements such as bicycle facilities, pedestrian safety upgrades, signal improvements, transit stop changes, and public realm enhancements. Metrics used in the evaluation included bicycle volumes, vehicle speeds, right-hook bike conflicts, and user surveys, which aimed to assess the project's impact on mobility, safety, and perceived safety.

The project resulted in increased bicycle volumes, reduced vehicle speeds, and improved pedestrian safety. User surveys indicated an enhancement to perceived safety and comfort.

Best Practices on Transportation Demand Management (TDM)

Transportation Demand Management (TDM) reduces car dependency by promoting alternative transportation options like cycling, walking, transit, and carpooling. TDM strategies include incentives such as subsidized transit passes, bike-to-work programs, flexible work hours, and improved facilities for cyclists and pedestrians. Through these measures, TDM aims to shift commuter behavior, decrease traffic congestion, and create a more sustainable, accessible transportation network – with cycling as a viable and safe option.

Case Study on TDM: Carlsbad TDM Handbook (2019)

The *Carlsbad TDM Handbook* outlines strategies for reducing single-occupancy vehicle (SOV) trips by promoting alternative travel options, aligning with the city's sustainability and mobility goals. It addresses the requirements for both residential and non-residential developments and provides a structured approach to reducing SOV trips, promoting alternative transportation modes, and improving overall mobility within the city.

Suggested Best Practices

- **TDM Ordinance**: The ordinance requires TDM plans for significant non-residential developments generating 110 or more average daily employee trips (ADET) to reduce single-occupancy vehicle trips and provide adequate amenities and services to support walking, biking, ridesharing, and transit use among Carlsbad workers.
- **TDM Plan Elements**: Designate a Transportation Coordinator to ensure compliance with TDM requirements. Distribute transportation options information to new employees. Participate in the citywide TDM program, i.e. the Carlsbad Commuter. For shell and multi-tenant buildings, include TDM requirements in lease agreements.
- **Strategies**: Secure bike parking, public bike racks, bicycle repair stations, micromobility parking, car share parking, end-of-trip facilities, and on-site amenities. Provide security for micromobility transit options parking near building entrances.

- **General Plan Mobility Element**: Requires TDM plans for developments adding traffic to exempt street facilities, focusing on reducing reliance on single-occupant vehicles. Developments must select from a menu of infrastructure strategies to achieve the required points based on their tier.
- **Resources**: The handbook includes templates, forms, and detailed guidance to facilitate TDM plan preparation and implementation. The Carlsbad Commuter program is part of the city's TDM initiative, supporting businesses in implementing strategies such as ride-matching tools, commute benefits, and trip-tracking apps.
- **Enforcement**: The city employs stringent enforcement mechanisms to ensure that TDM strategies are properly implemented and maintained. Physical inspections, compliance assessments, and periodic reviews are conducted to verify adherence to the approved TDM plans and to address any issues promptly.

Best Practices on Community Safety

Community safety/enforcement refers to the strategies and actions to regulate and promote safe cycling practices while ensuring equitable treatment of all cyclists. Typically, bike safety/enforcement involves revising existing laws, training police officers, implementing community-based solutions, and investing in better infrastructure. These practices collectively aim to achieve a safer, more inclusive, and supportive biking culture, encouraging more people to choose cycling as a viable mode of transportation.

Breaking the Cycle: Reevaluating Bike Laws that Prevent Safe & Inclusive Biking by NACTO (2022)

Breaking the Cycle paper, released by NACTO, examines the adverse social, political, economic, environmental, and health impacts resulting from biased enforcement of bicycling laws. The enforcement of these laws leads to various negative outcomes, including increased fatalities, unjust policing, and social, economic, and health disadvantages. Recommendations include eliminating prejudicial bike laws, improving data collection on bike stops, and investing in better infrastructure to create safer and more equitable biking environments.

Suggested Best Practices

- **Bike Laws**: Cities should consider removing biking laws such as mandatory helmet laws, bike registration requirements, and specific bike equipment mandates. Research shows that these laws do not significantly improve safety and unfairly target marginalized cyclists. Instead, cities should focus on providing free or subsidized equipment through community programs.
- **Police Training**: To reduce biased enforcement, interim measures such as police training and community engagement can be employed. It's important to conduct regular training sessions for police officers, focusing on understanding why cyclists might choose to ride

on the sidewalk, go through red lights, or make other safety-driven decisions. Additionally, involving community members, especially those from marginalized groups, in the training sessions can offer firsthand perspectives on biking safety and enforcement issues.

- **Community-Based Solutions**: Organize events to distribute free bike lights, helmets, and other safety equipment, particularly in low-income neighborhoods. Launch educational campaigns on biking safety and rights, targeting both cyclists and drivers. Foster community policing models prioritize engagement and trust-building over punitive measures.
- **Infrastructure**: Cities need to invest in high-quality, well-connected bike facilities that separate cyclists from motor vehicle traffic rather than just increasing enforcement. This includes implementing measures such as reduced speed limits and traffic calming designs to ensure safer streets for cyclists and pedestrians. In addition, cities should invest in appropriate infrastructure to adapt to new mobility devices such as electric scooters.

Best Practices on Outreach and Encouragement

Bike outreach and encouragement involves activities designed to engage communities, promote cycling, and gather feedback on infrastructure improvements. Making the process for collecting input on bicycle infrastructure more accessible and inclusive, helps to promote biking and contributes to the development of vibrant communities.

Case Study on Outreach and Encouragement: Demonstration Projects or "Living Previews" – SCAG Toolkit

The SCAG Toolkit explores how to implement temporary street design demonstrations to promote safety and create more welcoming public spaces. The Go Human initiative's Kit of Parts Lending Library offers pop-up materials to showcase potential street design treatments and safety infrastructure, such as parklets, curb extensions, median refuge islands, artistic crosswalks, and separated bike lanes.

These demonstrations provide residents with the opportunity to experience re-designed streets in live traffic settings, allowing for valuable feedback, refinement of designs, and identification of community support for safety improvements. The portable and easy-to-transport materials make hosting an event efficient and easy.

Furthermore, the Resilient Streets Toolkit, within the Go Human initiative, serves as a comprehensive resource for engaging in a community-driven process to implement strategies for promoting bike and pedestrian safety. The kit's installation guide and video further support the successful deployment of these temporary street design demonstrations.

The SCAG Toolkit highlights how temporary safety demonstrations can effectively engage communities, gather feedback, and drive tangible improvements in street design and safety infrastructure.

Best Practices on E-Mobility Devices (E-Bikes and E-Scooters)

E-mobility devices are becoming increasingly popular, providing a versatile and eco-friendly transportation option for urban and recreational use. However, with their growing presence in communities, effective guidelines are needed to address safety, accessibility, and infrastructure needs for a diverse range of users. Recent studies, including the *Electric Bicycle Trends, Impacts, and Opportunities* by FHWA and reports from communities like Orange County and the City of Irvine, emphasize the importance of structured e-bike policies. These documents outline the best practices for regulation, infrastructure, education, and community engagement, aiming to balance the benefits of e-bike mobility with the necessary safety measures to protect cyclists, pedestrians, and other road users.

Electric Bicycle (E-bike) Trends, Impacts, and Opportunities: Literature Review Summary by FHWA (2023)

This summary is a comprehensive literature review of electric bicycles (e-bikes), examining their trends, impacts, and opportunities. The review covers North America, Europe, and Asia, and focuses on safety, health, equity, infrastructure, energy, and freight use. The regulatory landscape is evolving, with varied state and international approaches to e-bike classification and usage.

Suggested Best Practices

- **E-Bike Regulation**: Adopt the three-tier classification system (Class 1, 2, and 3) to standardize e-bike regulations. This helps in creating clear guidelines for manufacturers, cyclists, and law enforcement. Consider whether e-bikes should be registered and if cyclists need a specific license, especially for higher-speed models (Class 3).
- **Safety Measures**: Invest in dedicated bike lanes and shared-use paths to ensure e-bike cyclists have designated and separated spaces to ride. Implement signage that clearly indicates where e-bikes are allowed. Enforce speed limits on bike facilities. Consider separate speed regulations for different classes of e-bikes. Mandate helmet use, particularly for higher-speed e-bikes (Class 3), and for younger cyclists.
- **Accessibility and Equity**: Implement purchase incentive programs, including subsidies, rebates, or low-interest loans, to make e-bikes more affordable. Target these programs to low-income individuals and underserved communities. Encourage the availability of adaptive e-bikes for people with disabilities. Expand shared e-bike programs, ensuring they are accessible to people without smartphones or bank accounts through features like “text-to-unlock” options.

- **Infrastructure**: Develop infrastructure that supports recreational use of e-bikes, such as parks and trails designed for leisurely rides. Invest in charging infrastructure that uses renewable energy sources. Provide ample charging stations to support e-bike cyclists.
- **Education**: Offer safety training programs for new e-bike users. These could include online courses, community workshops, and partnerships with e-bike retailers. Run campaigns to educate the public about e-bike laws, safe riding practices, and the benefits of e-bikes.

Case Study on E-Mobility Devices: Ladera Ranch E-Bike Program in the County of Orange (2023)

The Ladera Ranch E-Bike Program Report offers comprehensive analysis and recommendations to enhance e-bike safety and usage. Key findings include high usage among teenagers, significant helmet non-compliance, and prevalent unsafe behaviors. Recommendations emphasize the need for comprehensive regulations, improved infrastructure, targeted education, and stringent enforcement to enhance e-bike safety in the community.

Suggested Best Practices

- **Public Education**: Develop multilingual flyers with e-bike rules, tips, and maps. Distribute at community centers, parks, schools, and online via social media and local radio. Cover basic riding rules, signage, legal rights, maintenance tips, and emergency maneuvers for all age groups. Teach children and teenagers the rules, rights, and safe operation of e-bikes with practical sessions on school playgrounds.
- **Enforcement**: Focus enforcement near schools to ensure compliance with helmet laws for cyclists under 18. Provide specific training on e-bike laws and enforcement parameters to local law enforcement officers.
- **Infrastructure**: Install additional bicycle lane markings, especially at intersections. Use green retro-reflective paint for better visibility. Improve e-bike collision data collection and analysis to prioritize safety measures and enforcement.
- **Signage**: Implement two-stage turn queue boxes at signalized intersections with significant bicycle left turns. These allow cyclists to wait for a green signal on the cross street, ensuring safer turns. Install speed limit signs for bicycles on sidewalks and trails and enforce a 5-mph speed limit on sidewalks and a 10 mph limit on trails. Use Bicycle Wrong Way and Ride With Traffic signs to discourage wrong-way riding and reinforce proper traffic flow.
- **Policies**: Engage the community in developing and implementing e-bike policies through public meetings, surveys, and feedback sessions. Adapt state laws to local conditions and harmonize e-bike regulations across different jurisdictions to ensure consistency and safety.

Case Study on E-Mobility Devices: E-Bike Safety Guide in the County of Orange

This guide by the Orange County Public Works (OCPW) covers essential safety information and regulations for e-bike cyclists in Orange County. It provides details on the types of bike facilities, helmet requirements, speed limits, and various safety tips to ensure a secure riding experience.

Suggested Best Practices

- **E-Bikes on Bike Facility**: Orange County has assigned each of the bike facilities with specific rules for e-bike usage:
    - Share Use Paths: Exclusive right of way for cyclists and pedestrians, separate from the roadway. E-bikes are allowed with a speed limit of 10 MPH.
    - Bike Lanes: Designated right of way on a street with pavement striping and signage. E-bikes must follow the road's posted speed limit or the bike's design speed, whichever is lower.
    - Bike Route: Shared road with motor vehicle traffic. Similar speed regulations as Class II.
    - Sidewalks: Shared paths for cyclists and pedestrians, with a 5 MPH speed limit for e-bikes.
- **E-Bike Labeling**: To ensure compliance with regulations, all e-bikes must have a label indicating their classification, top assisted speed, and motor wattage.
- **E-Bike Safety**: Helmets are required for all cyclists under 18 and recommended for everyone. Carrying passengers is only allowed if the e-bike has a permanent seat or a child safety seat, ensuring safety for all cyclists.

Case Study on E-Mobility Devices: E-Bike Ordinance in the City of Irvine

The City of Irvine's ordinance Sec. 4-7-210 outlines the rules for riding bicycles and electric bicycles on sidewalks, playgrounds, and other areas to ensure the safety of both cyclists and pedestrians in various public spaces.

Suggested Best Practices

- **Permitted Areas**: Riding bicycles and electric bicycles on sidewalks, in bicycle facilities, or roadways is allowed unless prohibited by signs.
- **Yielding to Pedestrians**: Cyclists must yield to pedestrians and give an audible signal before overtaking them on sidewalks, paths, or trails.
- **Restricted Areas**: Riding on playgrounds, parks, or school grounds where children are playing is prohibited unless permission is obtained from the supervising authority.
- **Speed Limits**: The speed limit on bicycle paths or trails is 20 mph, and cyclists must not exceed a speed that is reasonable and safe under current conditions.

- **Direction of Travel**: Cyclists of electric bikes, scooters, and skateboards must travel in the same direction as vehicle traffic on roadways and bike facilities, and this also applies to sidewalks less than eight feet wide unless otherwise posted.
- **Passenger Restrictions**: Passengers are not allowed on bicycles or electric bicycles unless the bike is designed to accommodate them with a separate seat. For passengers under four years old or weighing 40 pounds or less, the seat must have safety provisions.

Best Practices on Education

Bike education is designed to inform and empower cyclists and the broader community about safe biking practices, regulations, and the benefits of cycling. This typically involves safety campaigns, training programs, workshops, and community engagement efforts. By equipping individuals with the knowledge and tools needed for safe cycling, bike education programs aim to reduce accidents, foster a culture of safety, and encourage more people to choose biking as a sustainable and enjoyable mode of transportation.

Case Study on Education: Safety and Education Campaign – *Go Human* (SCAG)

The SCAG Go Human program (previewed above in the outreach example), aims to reduce traffic collisions and promote walking and biking. By providing engagement resources, education, information sharing, and hosting events, Go Human strives to create safer and more connected communities. The campaign emphasizes driver awareness, especially regarding people walking and biking, who experience a disproportionate share of serious injuries and fatalities in traffic crashes.

Suggested Best Practices

- **Community Ambassador Program**: Developed for Imperial, San Bernardino, and Ventura counties, this program trains safety ambassadors to promote pedestrian and cyclist safety. It's operated by California Walks (CalWalks) with funding from SCAG and the California Office of Traffic Safety (OTS).
- **Regional Traffic Safety Workshops**: In 2019, SCAG conducted workshops across the region, providing presentations on traffic safety in Imperial, Los Angeles/Ventura, Orange, and San Bernardino/Riverside counties.
- **Planning For Safer Streets**: Go Human offers tools for planning and building safer streets, including funding information, traffic safety work planning, and sample resolutions.

Case Study on Education: E-Bike Education in the City of Irvine

The Irvine Unified School District (IUSD) has launched a Mandatory E-Vehicle Safety and Registration Program aimed at promoting the safe and responsible use of e-vehicles, such as e-bikes, e-scooters, and e-skateboards, among middle and high school students. This initiative is

designed to educate students on the rules, safety practices, and legal requirements associated with e-vehicle use.

A key component of the program is the safety presentations conducted by the Irvine Police Department (IPD). These presentations cover various topics, including the types of e-vehicles, road rules, helmet safety, passenger rules, and the importance of avoiding distractions. Attendance is mandatory for students who use e-vehicles to commute to school, with middle school students required to attend with a parent or guardian.

Following the safety presentations, students and their parents or guardians must complete a digital verification of attendance and fill out a Student e-Vehicle Registration Form to obtain a parking permit sticker for campus parking. The presentations are scheduled at various high schools emphasizing community involvement and the crucial role of parents in reinforcing safety practices. The program aims to reduce accidents and ensure that students are well-informed about the safe operation of e-vehicles.

Case Study on Education: OCTA E-Bike Education

The Orange County Transportation Authority (OCTA) has introduced a comprehensive E-Bike Education Program to promote the safe and responsible use of electric bicycles. This initiative aims to educate the public on e-bike regulations, safety practices, and legal requirements to support a safer riding environment.

The educational resources created by OCTA include informative videos, brochures, and online guides covering topics such as the different classes of e-bikes, helmet safety, speed limits, and traffic laws. OCTA also organizes interactive workshops and training sessions where participants can learn and practice safe riding techniques.

In collaboration with local communities, OCTA partners with schools, community centers, and bike shops to distribute educational materials and raise awareness. Community events, such as e-bike safety days and group rides, are organized to engage residents and promote safe riding practices.

To further support the program, OCTA leverages technology by promoting mobile apps and online platforms that provide real-time information on safe routes and e-bike regulations. Feedback mechanisms are established to allow residents to share their experiences and suggestions, ensuring the program remains effective and responsive to community needs. This initiative not only enhances safety but also encourages the adoption of e-bikes as a sustainable mode of transportation.

Case Study on Education: E-Bike Education in the City of Carlsbad

The Carlsbad Unified School District (CUSD) has initiated a comprehensive E-Bike Safety and Registration Program with the aim of promoting safe and responsible e-bike use among students. The program is designed to educate students about rules, safe and legal operation.

A mandatory safety presentation is organized in collaboration with the Carlsbad Police Department. These presentations cover a range of topics, including different types of e-bikes, road rules, helmet safety, and Carlsbad-specific e-bike laws. Attendance at these presentations is mandatory for students intending to ride e-bikes to school. This ensures that they are well-informed about safe riding practices.

After the safety presentations, students must digitally verify their attendance and complete a Bike/E-Bike Permit Form to receive a parking permit sticker. This process highlights the involvement of the community and emphasizes the important role of parents in reinforcing safety practices.

Best Practices on Bike and Scooter Share

Bike and scooter share programs offer micromobility options that expand access to regular bikes and scooters, and e-mobility devices such as e-bikes and e-scooters. The best practices for these devices include equitable pricing to increase accessibility, dedicated bike lanes for safety, data analytics to improve service, and sustainable infrastructure, such as solar-powered stations.

FHWA Micromobility (2021)

This paper discusses the rapid growth of micromobility options like bike-sharing and e-scooters in the U.S., focusing on their management, trends, and design needs. The paper also explores various city initiatives and programs aimed at integrating micromobility into their transportation networks, ultimately enhancing urban mobility and reducing congestion.

Suggested Best Practices

- **Equity**: Implement tiered pricing structures and subsidies for low-income users to make bikeshare programs accessible to all socio-economic groups. Ensure bikeshare stations are evenly distributed, especially in underserved neighborhoods, to promote equity in transportation access.
- **Safety**: Develop and maintain dedicated bike lanes to enhance cyclist safety and encourage usage. Establish a robust maintenance program to keep bikes in good working condition, ensuring reliability for users.
- **Data**: Utilize data analytics to monitor usage patterns and optimize station locations and bike availability. Integrate smart technologies such as GPS and mobile apps to provide real-time information on bike availability, navigation, and safety to reduce collisions.

- **Sustainability**: Incorporate environmentally friendly practices, such as solar-powered stations and promoting the use of bikes over cars to reduce carbon footprints. Run campaigns to raise awareness about the environmental benefits of using bikeshare programs.
- **Public-Private Partnership**: Form partnerships between city governments and private companies to leverage resources and expertise, ensuring the long-term sustainability of bikeshare programs.

NACTO Bikeshare Initiative

The Bike Share and Shared Micromobility Initiative by NACTO supports cities in enhancing urban mobility through bike share and micromobility services. This initiative focuses on increasing cycling, integrating micromobility with public transit, and promoting sustainability. NACTO offers guidelines and research on managing and regulating these systems.

Suggested Best Practices

- **Equity**: Ensuring that bike share and micromobility services are well-connected with public transportation systems, and examining how different bike share pricing structures, particularly monthly passes, impact sign-up rates in low-income communities.
- **Public Engagement**: Involving local communities in planning and decision-making processes to address their needs.
- **Regulations**: Develop adaptable regulations that can evolve with the growing and changing landscape of micromobility. Implement and enforce safety measures, including helmet use and safe riding practices.
- **Safety**: Research ways to make bike infrastructure safer, such as low-speed zones for vehicle traffic.
- **Walkable Station Spacing**: High station density, about every 1,000 feet, enhances service quality and makes bike share systems more accessible to all populations. In areas with less pedestrian activity and population density, consider reducing station size while maintaining same station spacing.

Best Practices on Adaptive Bicycling Program

Adaptive bicycling programs are designed to make cycling accessible for individuals with disabilities or mobility challenges. These programs typically involve different types of adaptive bicycles such as handcycles, tandem bikes, recumbent bikes, and tricycles, tailored to meet different needs and abilities. Activities may include community rides, one-day experiential events, multi-day clinics, and challenging rides to engage participants of all levels. Participants receive guidance from trained staff and volunteers to ensure they can safely and confidently use the adaptive bikes. The primary goals of adaptive bicycling programs are to provide a means of transportation and exercise for individuals with disabilities and create opportunities for social

interaction and community engagement, helping participants feel more connected and independent.

Case Study on Adaptive Bicycling Program: Adaptive POGOH - Pittsburgh's Bike-Share System

Adaptive POGOH is a bike rental program in Pittsburgh designed to accommodate people of all abilities. The program offers seven types of adaptive cycles, including hand tricycles, tandem bicycles, and recumbent bikes. POGOH operates Pittsburgh's bikeshare system and offers various membership options, including annual, mobility justice, flex pass, and pay-as-you-go plans, and includes both pedal and e-assist bikes.

POGOH also organizes events to promote adaptive cycling by hosting Community Rides and other events that cater to cyclists of all abilities, providing opportunities to use adaptive cycles in a supportive environment. Events often feature free bike rentals, including adaptive options, and are designed to foster inclusivity and community engagement.

Suggestions for Incorporating Supportive Programs National Best Practices

The following summarizes how the City can further integrate national best practices into current practices:

- The City should identify key programs and/or needs to support cycling in the City of San Diego. Ideas should come from feedback received from residents or critical gaps found within existing City or regional programs. As an example, E-bike/E-scooter use has come up as an issue area. The City could consider offering education in partnership with schools, policy making, and other strategies to address issues associated with E-mobility devices.

Conclusion and Next Steps

This technical memorandum is meant to document the state of the practice for bicycle facility design, safety, quick build implementation, network development and amenities, and supportive programs. The insights gained from this best practices review will inform the next stages of the City of San Diego Bicycle Master Plan Update, ensuring the recommended bicycle facility network, policies, and supportive programs identified in the plan integrate the latest and greatest best practices. Moving forward, the City should evaluate how these recommendations align local conditions and community needs, as well as change innovations in the state of the practice.