SANDAG

Concept of Operations for Curb Access Management

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Expect More. Experience Better.

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LIST OF ACRONYMS

Acronym	Definition
ADA	Americans With Disabilities Act Of 1990
ALPR	Automated License Plate Reader
API	Application Programming Interface
ATCMTD	Advanced Transportation and Congestion Management Technologies Deployment
Caltrans	California Department of Transportation
CMCP	Comprehensive Multi-Modal Corridor Plan
CMM	Capability Maturity Model
ConOps	Concept of Operations
CVC	California Vehicle Code
FHWA	Federal Highway Administration
ICMS	Integrated Corridor Management System
ITS	Intelligent Transportation Systems
MPH	Miles per Hour
MPO	Metropolitan Planning Organization
MTS	Metropolitan Transit System
NACTO	National Association of City and Transportation Officials
NCRC	North County Regional Corridor
NEV	Neighborhood Electric Vehicle
OS	Operating System
RBMS	Regional Border Management System
RFID	Radio-Frequency Identification
SANDAG	San Diego Association of Governments
SE	Systems Engineering
SFMTA	San Francisco Municipal Transportation Authority
SIS	Smart Intersection System
TDM	Transportation Demand Management
TNC	Transportation Network Companies
TSMO	Transportation Systems Management & Operations
VRU	Vulnerable Road User

1 INTRODUCTION

The Regional Transportation Systems Management & Operations (TSMO) Plan for the San Diego Region provides a roadmap to implement integrated strategies that focus on operations and performance that use existing infrastructure and cost-effective solutions. TSMO strategies identify the institutional, organizational, and technical components that support the entire system. The Plan was developed for the San Diego region by San Diego Association of Governments (SANDAG), with critical input from California Department of Transportation (Caltrans), County of San Diego, regional transit providers, and local agencies.

Historically, transportation agencies across the United States have been organized to deliver capacity-based infrastructure improvements. Today, agencies are shifting their focus from solving congestion problems by expanding capacity to utilizing the existing transportation system more efficiently, managing the system to perform reliably, and utilizing technology to share real-time information with incident responders and the public. The Federal Highway Administration (FHWA) has developed research and guidance resources for transportation agencies, metropolitan planning organizations (MPOs), and other transportation organizations to plan for and use TSMO strategies within organizations.

TSMO offers integrated strategies to "improve system performance through multimodal, intermodal, and cross-jurisdictional systems, services, and projects that preserve capacity, enhance public safety and security, enhance seamless connections between modes, and improve reliability" (FHWA, 2017)[1]. The strategies are designed to improve safety and reliability by managing traffic congestion and minimizing any unpredictable delays to the transportation system. TSMO strategies are characterized into three buckets – institutional, operational, and technical. Some examples of TSMO strategies may include redefining agency roles and responsibilities to break down silos between planning and operations (institutional) or sharing data between agencies to track performance measures on a corridor-wide basis (operational). To implement a successful TSMO program, agencies often need to evaluate the institutional, operational, and technical aspects of its day-to-day processes for planning, programming, designing, constructing, and maintaining projects.

1.1 Overview of the 5 Big Moves

SANDAG is developing *San Diego Forward: The Regional Plan* (Regional Plan). This plan introduces a transformative vision for the San Diego region revolving around the 5 Big Moves, which are 5 key mobility strategies that reimagine how people and goods will move around San Diego County. The 5 Big Moves include:

► **Complete Corridors** – A variety of travel choices within a more dynamically managed road network with a shift in how space is allocated to different modes.

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[1] Federal Highway Administration (FHWA) Office of Operations, "Developing and Sustaining a Transportation Systems Management & Operations Mission for Your Organization: A Primer For Program Planning," April, 22, 2020, https://ops.fhwa.dot.gov/publications/fhwahop17017/ch1.htm

- **Transit Leap** – A network of high-speed and high-capacity transit services that connect major residential and employment centers and regional attractions, such that transit is convenient, fast, and an attractive alternative to driving.

- **Mobility Hubs** – Places of connectivity where different modes of travel converge near concentrations of employment, housing, shopping, and/or recreation.

- **Flexible Fleets –** Flexible options for making first- and last-mile connections to transit or to other destinations through shared vehicles, such as ride share, microtransit, ride hailing, e-bikes, drones, bots, or automated vehicles.

- **Next Operating System (OS)** – The system that will connect all devices, vehicles, and travel options through a proactively managed approach that includes integrated trip planning, payment and reservation choices.
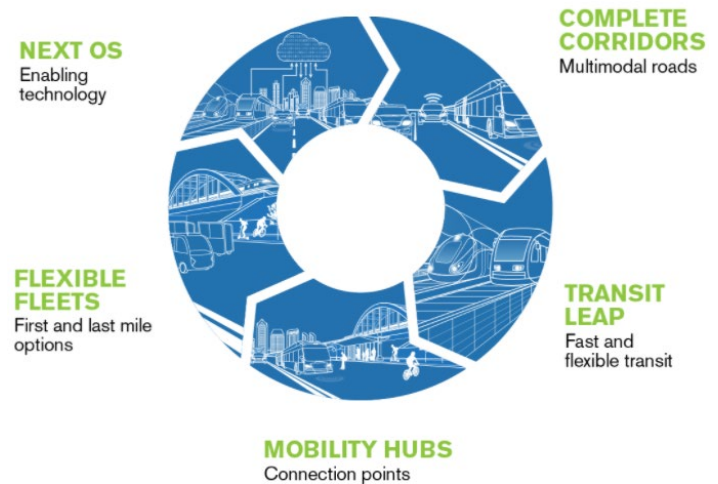

Figure 1. 5 Big Moves from San Diego Forward: 2021 Regional Plan
Source: SANDAG. (2021) *A Bold New Transportation Vision in 5 Big Moves*

The 5 Big Moves vision is to leverage innovative, new technologies to improve the region's connectivity, safety, and sustainability. These strategies are envisioned to work hand in hand, with all of the strategies complementing each other to fully enhance the transportation network, as shown in **Figure 1**. This balanced approach is directly linked to the practices of TSMO, wherein institutional, operational, and technical aspects of each project must be considered. Data is a driver to project success, maintenance, and regular assessment. Projects are focused on multiple modes to ensure that the system is not designed around the personal automobile. These practices align with the 5 Big Moves and allow for a comprehensive and coordinated approach for transportation planning and innovation.

The Regional Plan is under development at the time of writing of this document. The 5 Big Moves Vision of the Regional Plan can be accessed at the public facing website here:

- https://www.sdforward.com/mobility-planning/5-big-moves

Curb Access Management is an application of the 5 Big Moves, using principles from all strategies to reimagine the allocation and use of valuable curbside space.

Use Cases of Next OS

The Regional Plan effort produced the accompanying Next OS Concept White Paper, which provides a plan for implementing the Next OS digital platform. The report established six use cases for Next OS:

- Mobility-as-a-Service
- **Curb Access Management**
- Regional Border Management System (RBMS)
- Transit Optimization
- Next-Gen Integrated Corridor Management System (ICMS) and
- Smart Intersection System (SIS)

Each use case will interact with Next OS according to the respective needs of their stakeholders and users. This document is exploring the capabilities and concepts for the above bolded use case, Curb Access Management, also referred to as Curbside Management. Curbside management involves payments for curb use and data collection and data analysis to understand curb demands, all of which can potentially be served and managed by the Next OS.

Access to the full Next OS Concept White Paper is provided at this link:

- ► https://www.sdforward.com/docs/default-source/2021-regional-plan/san-diego-forward_next-os-concept-white-paper.pdf?sfvrsn=9499fe65_2

Following the development of the 5 Big Moves vision, SANDAG has been awarded a $9.3M grant through FHWA's Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) program to begin the deployment of the Next OS, Mobility Hub, Flexible Fleet, and Connected Corridors components of the 5 Big Moves. The ATCMTD project will include systems engineering and deploy concepts that will optimize multimodal system performance, offsetting worsening traffic congestion and travel inefficiencies that result in lost productivity and a reduction of the national gross domestic product. The ATCMTD planning documents and system deployments will help set up local stakeholder groups for additional funding opportunities.

1.2 Purpose of the Document

The purpose of this document is to provide a Concept of Operations (ConOps) for curbside management implementation in the San Diego region. The ConOps provides a non-technical description of the curbside management system from the point of view of the stakeholders, giving each stakeholder a conceptual look at how the system will function and their roles and responsibilities in operating and maintaining the system. The ConOps provides a high-level description of the system, how it will operate, who will operate what, and describes the anticipated scenarios under which the system will be operating. This document allows stakeholders to provide input on the high-level concept of the system and ultimately agree to the system to be designed.

Stakeholders can use this document as a framework for further development of projects, policies, and projects that reflect the goals, objectives, and needs presented here. While the ConOps provides a regional vision for deployments that are consistent with the San Diego Forward: 2021 Regional Plan, implementation will be performed by local stakeholder groups. The existing capabilities of each agency and each corridor vary significantly across the region, and the operational scenarios presented in this document have been chosen to represent a cross-section of possibilities for the diverse user groups across the region. Stakeholders should conduct a capability maturity assessment to determine strategies that will enable them to benefit from the full range of functionalities.

The ConOps is a critical step in the Systems Engineering (SE) process that assesses the planning and management throughout the major phases of the system's lifecycle. Because the document considers the positions of all the stakeholders, it fosters agreement for the approach, organizational structure, and processes for how the system will be run. **Figure 2** provides a general overview of the elements of the SE process needed for Intelligent Transportation Systems (ITS) projects, with the ConOps stage circled in red. The ConOps informs the steps that follow which eventually lead to project implementation. The ConOps helps build consensus among stakeholders regarding project components, roles and responsibilities, and operations. This helps minimize risks of conflict or change later in the project development process.
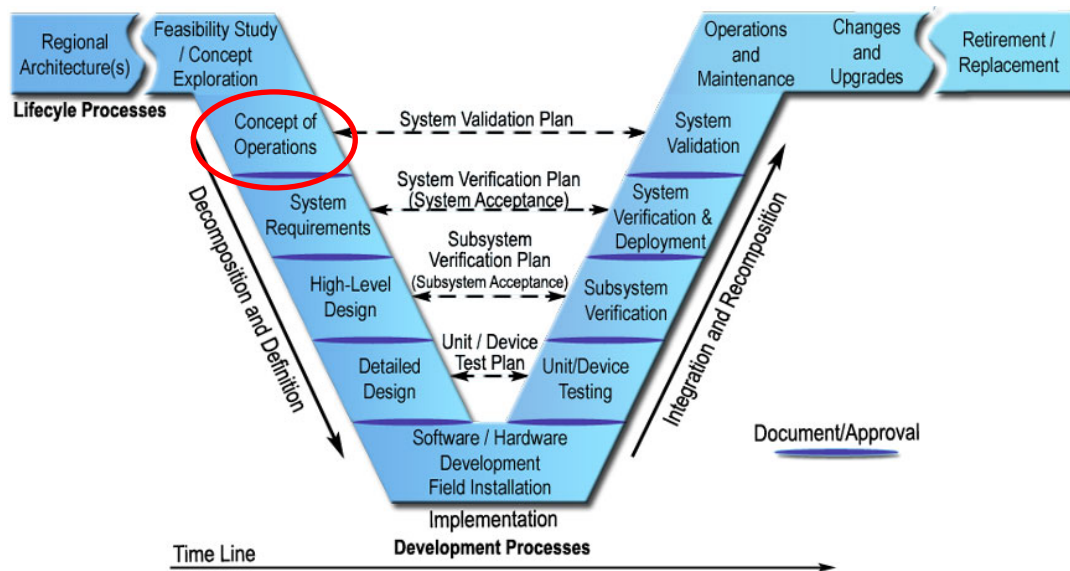

Figure 2. Systems Engineering Process

2 BACKGROUND

Existing curbside management within the San Diego region is mostly ad-hoc. In accordance with *San Diego Forward: The Regional Plan*, curbside management strategies will work in tandem with a network of other transportation management strategies to take a proactive approach to improving mobility and access.

This section provides the context of the current curb management system, existing constraints of the system, how curbs are used currently, and opportunities for improvement. In addition, the section describes the different community typologies that exist in the San Diego region. Curbside management strategies are extremely context-sensitive, meaning that different types of neighborhoods will have different spatial needs and curbside demands. These community typologies are presented to help agencies understand how to apply curb management strategies to different contexts in their jurisdictions.

2.1 Existing Curb Use Policies

Curb uses, policies, and designations are determined individually by cities. Today, most curbs are used for private vehicle storage. Community members in the region have become accustomed to this norm and generally expect public curbside parking in many areas. Because curbside parking is inherently limited and demand tends to exceed supply, many agencies have enacted paid, time-limited parking in commercial districts to encourage vehicle turnover, providing more people with access to businesses.

In urban areas and some business districts, curbside parking demand is high as motorists desire to park directly in front of their destination, which leads to cruising and increased congestion. These areas also experience high, competing demands throughout the day for curb space, which are difficult to manage with existing tools. Tools to manage the curb has become a focus of several agencies as innovations in mobility services are changing usage and demands at the curb.

SANDAG Region Parking Policy Inventory Study

SANDAG updated a regional parking policy inventory in 2019 to understand the current policies, needs, and challenges of each local agency within the SANDAG region. This was an update to the 2013 regional parking policy inventory and showed that not much has changed in the region's parking management between 2013 and 2019. SANDAG interviewed each agency to understand its current policies and plans for parking supply, pricing, and technology within its jurisdiction, and challenges and future outlook for the agencies. Seventeen local agencies participated in the interviews including:

▶ Coronado	▶ Oceanside	▶ Chula Vista
▶ Del Mar	▶ Escondido	▶ Santee
▶ La Mesa	▶ Solana Beach	▶ Imperial Beach
▶ Vista	▶ Carlsbad	▶ City of San Diego
▶ National City	▶ Lemon Grove	▶ County of San Diego
▶ El Cajon	▶ San Marcos	

The study found that there is a variance of parking policies and investments into parking management plans and parking supply studies across the region. Eight of the agencies interviewed have performed recent parking management plans and ten of the agencies interviewed have performed recent parking inventory or parking

utilization studies. However, most of these plans and studies were focused on specific areas such as new development, downtown commercial areas, and beach areas. Thus, it will be difficult for most agencies to holistically and quantitatively understand parking needs and management strategies applicable to their jurisdictions. All interviewed agencies have considered transportation demand management (TDM) strategies to manage parking, such as including shared parking allowances in their municipal code.

Six agencies have implemented paid, metered street parking, with the majority implemented in commercial areas. Most agencies with metered parking utilize smart meters that allow for credit card and coin-based payments, while some agencies are using traditional meters that only take coins. Agencies with metered parking generally utilize the funds towards improvements towards the areas where the fees are collected, including improving streetscapes, sidewalks, accessibility, and back into the parking program to update technologies.

Within all jurisdictions in the region, there are opportunities for improvement in the technologies and strategies in managing on- and off-street parking. Particularly, most agencies in the area do have ample parking supply, but the community tends to want to park directly in front of their destination. They may be unaware of off-street parking sites or parking available a short walk away from their desired destination, leading to a perception of parking shortage.

Larger agencies with more urban commercial districts find that there is more of a need to manage the curb due to competing demands. These agencies have more proactively evaluated specific strategies to monitor and manage the changing users of the streets, particularly with growing micromobility usage and pick-up and drop-off activity. However, all agencies are interested and open to looking into how innovative curb management strategies can be implemented in their jurisdiction.

Curb Striping Regulations

Typical curb striping in the region is as follows:

- ► **Red curb**: No parking/No stopping zone
  - Some no stopping zones are marked by signage instead of curb color
  - Prohibition of signed no stopping zones are in effect on the days and times specified on the sign
  - Transit vehicles are exempt from red curb regulations at marked or signed bus stops where buses must stop to load and unload passengers
- ► **White curb**: Passenger loading zone
  - Allows vehicles to stop for up to three minutes to load or unload passengers
- ► **Yellow curb**: Commercial loading zone
  - Permits trucks and other commercial vehicles to stop for up to 20 minutes to load or unload goods
  - Allows passenger vehicles to stop for up to three minutes to load or unload passengers
  - Some cities limit yellow curb restrictions between certain times of day and certain days of week. Outside of those hours, it acts as a generic vehicle parking zone.
- ► **Blue curb**: Disabled persons parking zone
  - Permits parking for only vehicles with valid disability placard or license plate.

► **Green curb**: Short-term time limit parking zone

- Allows parking for a marked time limit (e.g., 15 or 30 minutes) indicated on a sign or stenciled on the curb. Some time limits are in effect for certain times of day and certain days of week.

- Disabled persons with valid disability placard or license plate can park with no time restriction

► **Gray/Unstriped curb**: Parking allowed

- Allows vehicle parking

- Signage indicates time limits or other parking restrictions that are in effect for certain times of day and certain days of week.

- Some areas are designated a residential permit parking district, which restricts parking during certain hours, except for those displaying valid permits or valid disability placard or license plate. Residential permit parking districts are indicated by signage.

Each jurisdiction in the SANDAG region may differ slightly in its curb striping regulations as detailed in each agency's municipal code. Metropolitan Transit System (MTS) requires red curb at its bus stops such that no other vehicles occupy the area. Bus stops are designed for passenger safety and for access considerations for passengers with disabilities. Design standards for MTS bus stops are found in the *Designing for Transit* manual.

Agencies in the SANDAG region have enacted some policies and programs that use the curbside in other ways than the traditional parking and loading curb striping detailed above. These programs vary between jurisdictions, as urban and suburban environments have different challenges and priorities in curbside allocation. These curbside applications are examples of ways that agencies within the San Diego region are already implementing curbside management strategies.

► **Shared micromobility corrals** – City of San Diego converted over 500 parking spots to dedicated shared scooter parking corrals. Dockless scooter users are encouraged to park in these on-street corrals, with some micromobility companies providing a discount on a future ride if the user parks their scooter in the corral.

► **Car share vehicle parking zones** – City of San Diego provides dedicated curbside parking for car share vehicles. These spaces are painted black with "CAR SHARE VEHICLE ONLY" stenciled.

► **Bikeshare stations** – Cities with bikeshare programs have installed some bikeshare stations at the curb side, including payment kiosks and shared bike docks.

► **Passenger loading zones** – City of San Diego implemented 3-minute passenger loading zones on Fifth Avenue in the Gaslamp Quarter on Saturday and Sunday nights between 8 P.M. and 3 A.M. Outside of these hours, these spaces are metered parking spaces.

2.2 Motorized Device Restrictions

The California Vehicle Code (CVC) regulates the usage of motorized devices on the public right-of-way. CVC 21235 prohibits the operation of motorized scooters on sidewalks and on streets with speed limits over 25 miles per hour (MPH), unless in a striped bicycle lane. Bicycles and scooters also must be parked in a manner that does not block the pedestrian pathway.

Many local jurisdictions restrict usage of specific micromobility devices (e.g. bicycles, scooters, roller skates, skateboards) on public sidewalks and roadways. For example, the City of San Diego prohibits both roller skates and skateboards to be operated on both the sidewalk and roadways. Bicycles are allowed to be ridden on the

roadway and sidewalk, with some limitations in front of commercial businesses and boardwalk areas. Most agencies have micromobility permit programs that require operators to abide by certain rules and restrictions, such as geofenced zones that restrict speed and device parking.

Some agencies have outright banned shared micromobility companies from operating within city limits due to complaints of sidewalk clutter and safety concerns. However, these bans may be reevaluated as the agencies work with shared micromobility companies to develop a mutually beneficial permit program.

2.3 Planned Curbside Uses

As part of The Regional Plan, there are several aspects of the 5 Big Moves that may change the typical curb lane uses. These planned changes will affect the demand for curb lane usage throughout the region.

Next Gen Rapid

The planned Next Gen *Rapid* bus network will provide 10-minute headways for faster, more reliable bus service across the San Diego region. It is a component of the Transit Leap portion of the 5 Big Moves, which creates a network of high-speed and high-capacity transit services that are envisioned to connect the region's major residential and employment centers and regional attractions. Part of the Next Gen *Rapid* concept is to provide dedicated lanes for Rapid and other buses. In some applications, this dedicated bus lane may be at the curbside. If the Rapid service decreases during the off-peak, there may be opportunities to share the curbside lane for bicyclists and micromobility users.

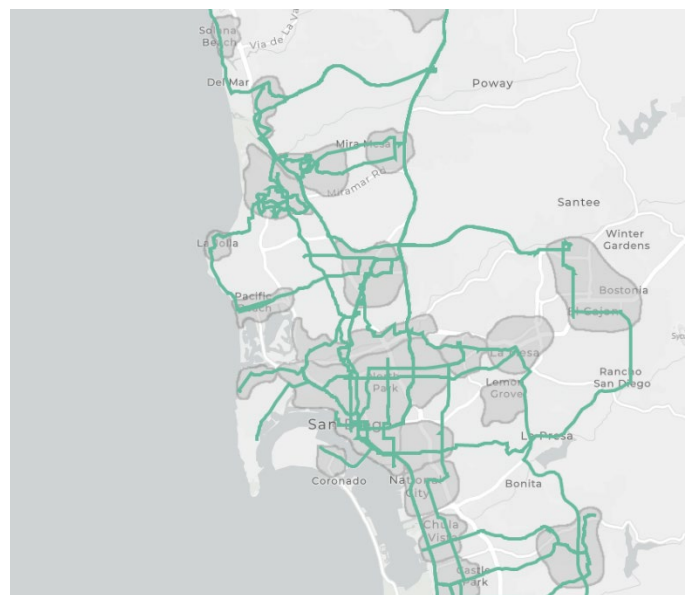**Figure 3** shows the planned Next Gen *Rapid* network in the Regional Plan.

Figure 3. Next Gen *Rapid* Network

Source: SANDAG. (2021) *San Diego Forward Interactive Map*

Flexible Fleets and Mobility Hubs

Mobility Hubs are communities that have a high concentration of people, destinations, and travel choices and can span one, two, or a few miles. SANDAG has identified a network of more than 30 Mobility Hubs across the San Diego region, which are shown in **Figure 4.** Flexible Fleets are envisioned to provide first- and last-mile connections to high-quality Transit Leap services within these Mobility Hubs.

Mobility vehicles from small to large will be contending for the curb space within these Mobility Hubs. These Flexible Fleets offer on-demand travel options using shared vehicles available 24/7 for a variety of trips that can provide users connections to high speed transit options from their doorstep. Flexible Fleets include the following:

Figure 4. Mobility Hub Locations

Source: SANDAG. (2021) *San Diego Forward Interactive Map*

► **Micromobility:** Micromobility consists of small, shared, low-speed vehicles like scooters, bikes, and neighborhood electric vehicles (NEVs) that support short trips. Micromobility could utilize the curb lane for vehicle storage or movement.

► **Rideshare and Ridehailing**: Ridesharing consists of carpool or vanpool vehicles that pick-up and drop-off multiple passengers with similar origins and destinations. Ridehailing provides individual on-demand trips (e.g. Uber/Lyft) for short or long distances. These vehicles may be a variety of sizes and configurations to meet the needs of the passengers and could utilize the curb lane for passenger loading and movement.

► **Carsharing**: Carsharing services like Zipcar provide a subscription-based service for individuals to have access to a car that they operate for a short or long-distance trip. These vehicles may be a variety of sizes and configurations and could utilize the curb lane for vehicle storage and movement.

► **Microtransit**: Microtransit vehicles are smaller than buses yet larger than passenger vehicles and are used typically to provide demand-responsive services to passengers in suburban areas. Microtransit could utilize the curb lane for passenger loading and movement.

► **Last Mile Delivery**: Vehicles, drones, e-bikes, and other automated vehicles (e.g., sidewalk bots) are envisioned to deliver a range of goods to homes and businesses. Vehicles may also make more efficient trips by delivering goods and passengers on the same trip. Last mile delivery could utilize the curb lane for goods loading.

2.4 Business Case for Curb Management

The curb has traditionally been an overlooked asset for agencies in the SANDAG region. Decades prior, competition for the curb was limited by vehicle parking, taxi stands, bus stops, and occasionally package and commercial delivery vehicles. Now, the demand for the curb has exploded. App-based services such as ridehailing, small package food and grocery delivery, and Amazon delivery services all have different curbside loading and dwell time patterns. Shared scooters and bikes are adding to the demand for sidewalk space, in addition to restaurants using sidewalks for table space.

As innovation continues, new mobility services, some with connected and smart vehicle technology, are expected to provide people with more mobility choices. Coupled with the current explosive growth in curb demand, the changing landscape of how people and goods move around the region will highlight the need for a different approach towards managing the curb.

Curbside management presents opportunities for equitable access, safety, and a more sustainable transportation network. Opportunities that can be leveraged with curbside management strategies include:

► **Reduced congestion –** Pricing parking and loading activities at the curb, in addition to other management techniques, can help reduce vehicles circling for parking or stopping traffic flow on streets and micromobility lanes.

► **Equitable access –** Prioritizing curbside access for those with mobility challenges provides them with freedom to access businesses and services.

► **Increased revenue –** Reallocating curbside space for short term users and pricing curbside access helps increase turnover and increase economic activity.

► **Improved transit speed and efficiency –** Prioritizing access for transit movement and designing for efficient curbside boarding/alighting makes transit faster and more convenient.

► **Improved safety for vulnerable road users –** Building curbside infrastructure that protects pedestrians, bicyclists, and other vulnerable road users can help remove barriers to active transportation.

Agencies in the SANDAG region should consider planning and implementing curbside management strategies detailed in this document to take advantage of these opportunities to assist with the healthy growth of the region. However, applying curbside management is context sensitive and agencies need to consider the differing needs and priorities within their jurisdiction.

2.5 Community Typologies

Operational evaluation of the curb use and the subsequent allocation needs of the curb are based upon the typologies of communities within the San Diego region. Curb demand and usage varies greatly from community to community. Existing community typologies and existing curb uses and challenges are described in this section.

Urban Core

Example: Downtown San Diego

Definition: The urban core is defined as the metropolitan downtown district of the region. Downtown San Diego is the primary example of the urban core in the region. It is the region's primary business, commercial, civic, and cultural destination with regional draw and an interconnected network of transit services. It provides a variety of residential uses and high levels of mixed uses. It experiences a large influx of residents, commuters, visitors, and delivery vehicles. It is densely populated, with varied demands at the curb for vehicle parking, bike parking, food trucks, delivery vehicles, active transportation, transit stops, shared mobility services, and expanded outdoor dining during the COVID-19 pandemic. Recently, curb space has been dedicated to scooter share, bike share, carshare, and short-term loading for passenger pick-ups and drop-offs.

The urban core is primarily characterized as an area where the curb demand is high throughout, without nearby lower-density streets that can relieve excess demand. In dense urban cores, on-street parking availability is extremely scarce in comparison with the demand. These parking spaces are typically time limited to incentivize

turnover throughout the day. Since there are few available on-street parking spots, drivers may cruise to find an available spot, contributing to the downtown congestion. Often, parking demands can be fulfilled with off-street parking, but some travelers choose to find on-street parking near their destination, especially if they are unfamiliar with off-street parking options. Other curb demands such as goods delivery, passenger loading and unloading, micromobility parking, food trucks, parklets, and other users are also competing for curb space.

Curb management solutions in the urban core will allocate more dynamically. Some streets in the urban core may prioritize mass movement of people along the curb lane, providing space for transit and active transportation. Providing access for people and access for goods throughout the urban core will also be prioritized. Public space and vehicle parking are allocated last.
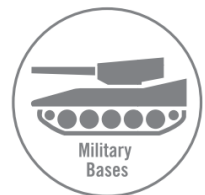
Community and Town Centers

Examples: Downtown Oceanside, Downtown Ramona, Downtown El Cajon, Santee Town Center, Lemon Grove, National City, Barrio Logan, North Park, College Area, Ocean Beach, Imperial Beach

Definition: Community and town centers are areas with a mix of office, commercial, and residential development that draw from their subregional areas. Examples are commercial districts such as Main Street in El Cajon or Third Avenue in Chula Vista, areas serving suburban environments that are less dense than the urban core, with fewer users competing for the curb space. These areas are served by regional transit lines, local bus services, or shuttle services. Due to suburban surroundings, many currently choose to access these areas by driving. Thus, the areas experience a high demand for vehicle parking, bike parking, food trucks, delivery vehicles, active transportation, shared mobility services, and expanded outdoor dining during the COVID-19 pandemic. Community and town centers are similar to the urban core in that the curb lane priorities within the commercial districts are movement, access for people, access for goods, public space and then vehicle parking. However, side streets adjacent to the town center do not experience the same high demands, and there is less need for these streets to have active curb management.

Universities/Military Bases

Examples: San Diego State University, University of California San Diego, local community colleges, Naval Base Coronado, Marine Corps Air Station Miramar

Definition: Curb usage at universities and military bases is similar to that in both the urban core and in the community and town centers environments. These are locations that have a large number of commuters that travel to and within the locations using all modes, and there is dense competition for curb space. Universities have needed to utilize TDM measures to make the usage of alternative modes more attractive and balance the users of the parking system. Military bases are similar to universities, but because of access limitations within the bases, they are an enclosed system.

A primary concern is spillover of curb space demands into adjacent residential or commercial areas. Parking is typically available off-street to accommodate demand in both environments, but parking lots are not always close by to the traveler's destination. Shuttle systems can reduce the demand for general on-street parking.

Major Transit Corridor

Example: Next Gen *Rapid* routes

Definition: Major transit corridors, such as along the planned Next Gen *Rapid* routes, may utilize the curb lane for frequent bus service with dedicated bus-only lanes. Outside of peak hours with peak frequency, the lane may be shared with other movement modes, such as micromobility, microtransit, and other flexible fleets. If a curb lane is allocated to movement, other curb demands such as access for people and access for goods will need to be balanced in the adjacent side streets or along the curb lane on the other side of the street.

Major Attractor

Examples: Sea World, SDCCU Stadium, Petco Park, Viejas Arena, Del Mar Fairgrounds, Pechanga Arena

Definition: Major attractors like stadiums, concert venues, theme parks, and other amusement parks are typically located in suburban environments. They are built with large paid parking lots and structures and internally serving shuttle systems to provide access to the venue. Curb space immediately around these attractors typically prohibit parking and are used for movement.
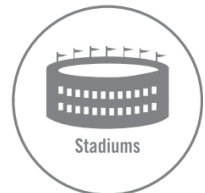
An example of a major attractor in the downtown area is the Petco Park stadium in Downtown San Diego. This venue has utilized TDM strategies to encourage attendees to use alternative modes to access the stadium during events. Curb space around the stadium is in especially high demand during events.

Another type of major attractor is parks and beaches, popular for outdoor activity and typically experience seasonal peak demands that can cause curbside parking conflicts with neighboring suburban housing and/or businesses. These locations can also host major events such as concerts and sporting events, which also drive up curbside demand.

Residential

Examples: Downtown, Little Italy, North Park (high density residential); Chula Vista, Carlsbad, Carmel Valley (low density residential)

Definition: Residential communities include high density, multi-family housing in urban areas and low density, single family housing in rural and suburban areas. Low density residential areas have lower user demands for the curb space, as houses typically are built with driveways and garages that can store vehicles. High density residential areas result in a greater demand for the curb from many users and will require more flexible space allocations for access for goods and access for people.

Flexible fleets are envisioned to provide residents with first and last mile transportation to mobility hubs and transit. These flexible fleets will need access to the curb for pick-ups and drop-offs. In addition, goods, package, and food delivery vehicles need short-term parking available.

Industrial

Examples: Port of San Diego, San Ysidro, Otay Mesa

Definition: Industrial areas serve a variety of uses, including goods distribution, production, and military needs. These areas experience issues with ingress and egress queuing related to shift work, freight schedules, and arrival and departure schedules. Primary concerns include spillover demand, freight accessibility, and security.
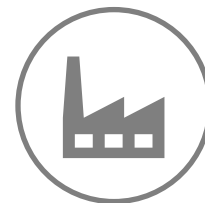
Access for goods is the main curbside use in industrial areas, after movement. There is also some demand from employees and visitors for vehicle storage, though many industrial buildings have off-street parking access.

3   CONCEPT OVERVIEW

To better manage the changing mobility uses in support of the Regional Plan, curbside management principles and strategies need to be explored and prioritized across the San Diego region. Though this document is addressing curbside management with a regional lens, most curb space is managed by local jurisdictions and transit agencies. Local agencies within the San Diego region have differing goals, level of need, and challenges related to their curbs and transportation network.

This section introduces and explores curbside management best practices at a high level. It intends to provide agencies with a description of possible approaches to managing curbs to better suit a more sustainable and inclusive transportation network. The section discusses the framework for prioritizing access at the curb and provides an updated hierarchy for prioritization of space.

3.1 Introduction to Curbside Management

The curb is an access point for people, goods, and services to and from the road network. As the transitional space between moving vehicles and the pedestrian environment, access to the curb is a key piece of the infrastructure that requires a careful eye toward safety. Throughout the 20th century, urban roadways on the west coast and their corresponding curb lanes were dominated by the private automobile. Even amongst privately owned vehicles, there was enough competition for the curb that cities implemented metered parking to regulate the duration of access to the curb as a means of managing supply and demand. In the 21st century, competition for the curb is greater than ever before. New curb lane users include:

- Bus rapid transit, microtransit and employer sponsored shuttles
- Transportation Network Companies (TNC) and other ridehailing vehicles
- Bikeshare, electric scooters, pedicabs, and other Flexible Fleets
- Parcel pick-ups and deliveries
- Active or 'pop-up' curb uses such as parklets, food trucks, and curb markets

Adding to traditional roadway users like bicycles, public transit, commercial delivery vehicles, taxis, and private automobiles, competition for the curb in the 21st century requires management strategies that do more than regulate parking for privately owned vehicles.

Curbside Management is the practice of providing equitable access to the curb for all roadway users. At its core, curbside management seeks to balance: Safety, Productivity, and Economic Activity.

Agencies seeking to manage their curbs will be balancing usages promoting safety, productivity, and economic activity as shown in **Figure 5**. Curb space is a finite public resource that can accommodate many demands. Today, it mostly accommodates for vehicle storage, but reallocating the curb can open up accessibility and mobility for many other users. In this reallocation, agencies will need to identify trade-offs to prioritize safety of vulnerable road users, access for people spurring economic activity, and the total number of people served for any usage in the finite curb space.
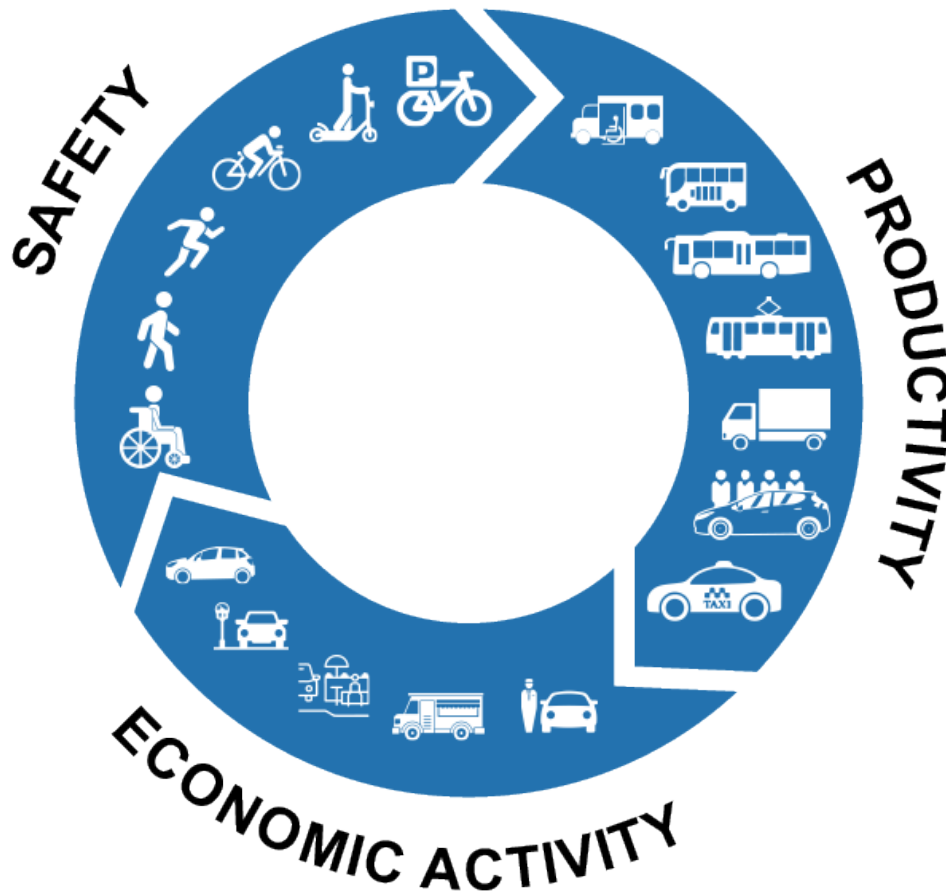
Figure 5. Three Foundational Principles of Curb Lane Management

3.2 Mobility Hierarchy

Because curb space is finite, the allocation and management of curb uses are critical to providing equitable access to the curb for all users. The process of curb space allocation begins with evaluating the needs of all roadway users and determining a prioritization system that reflects the safety, productivity, and economic activity needs of that space.

The Mobility Hierarchy as depicted in **Figure 6** is a travel mode prioritization guideline used to create a multimodal transportation landscape that ensures a safe and efficient experience for all users. The tool provides an overall structure for how curb lanes should be managed to benefit the users and surrounding urban space.

Figure 6. Mobility Hierarchy

VARYING MOBILITY   **WALK**   **RUN**

The hierarchy prioritizes roadway users that are most vulnerable such as pedestrians with varying mobility and those who are walking or running.

BICYCLE   **MICROMOBILITY DEVICES**   **BIKE PARKING**

Bicyclists and users of micromobility fleets are given priority before other vehicle modes, because they are also vulnerable roadway users and their safety is valued over other uses of the curb lane.

PARATRANSIT   **MICROTRANSIT**   **PUBLIC TRANPORTATION**   **STREETCAR**   **DELIVERY VEHICLES**
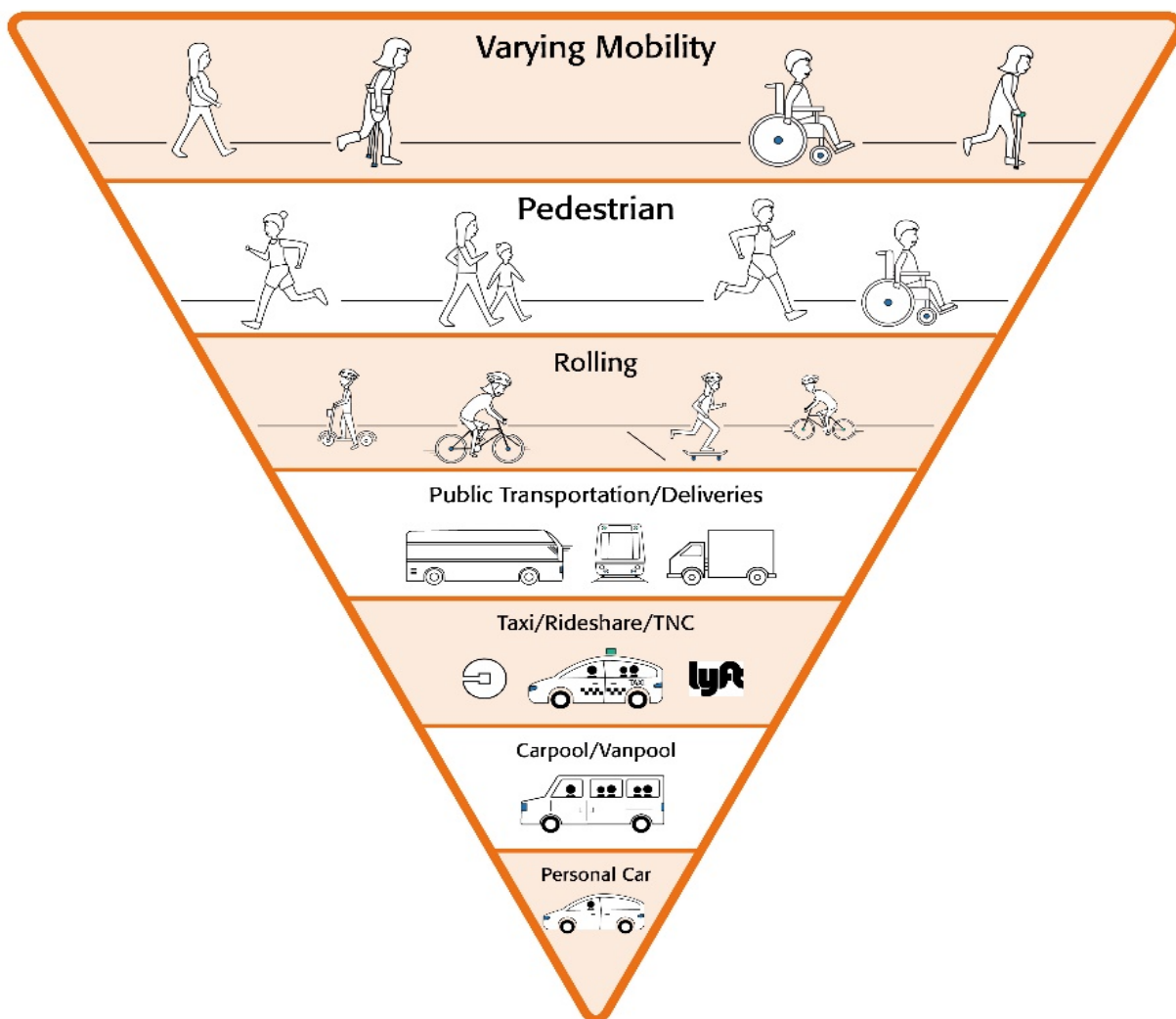
After the active transportation travel modes, the hierarchy prioritizes motorized modes by their efficient use of space. It places a higher priority on public transport than other vehicular modes because of transit's high-capacity capabilities, allowing more patrons to interact with the curb than a personal vehicle can. Delivery vehicles are included in the prioritization of public transport. Because delivery vehicles can serve multiple businesses while accessing a single commercial delivery loading zone, they are prioritized over other modes.

CARPOOL   **VANPOOL**   **RIDE HAILING**   **TAXI**   **VALET**

Carpool, vanpool, and ridehailing vehicles are given priority over person vehicles. Vanpool and ridehailing vehicles typically have limited time at the curb and serve multiple users, resulting in higher curb space productivity than personal cars. Similarly, carpools serve multiple passengers, resulting in a higher curb space productivity.

METERED PARKING   **PERSONAL CAR**

Finally, personal vehicles are given the least priority in the mobility hierarchy. Curb space allocated to personal vehicles typically takes up more space while serving fewer people. Additionally, managed and metered parking would be prioritized over free parking.

3.3 Industry Best Practices Overview

In addition to prioritizing users through the principles of safety, productivity, and economic activity, curbside management plans should consider industry best practices and regional trends in mobility. Curbside management can take many forms depending on the lens used to view the curb. In the National Association of City and Transportation Officials (NACTO) whitepaper, "Curb Appeal: Curbside Management Strategies for Improving Transit Reliability"[2], NACTO views curbside management in terms of prioritizing transit reliability in areas of urban growth. This prioritization is shown in **Figure 7**. In NACTO's whitepaper, four curb management strategies to improve transit operations were identified:

► Shifting from parking lane to flex zone;

► Clearing the way for transit;

► Moving loading and access nearby; and

► Looking beyond the corridor

Shift from parking lane to flex zones means programming the curb lane by the time-of-day demand. Because demand for the curb changes throughout the day, the management practices of the curb lane should be adjusted to reflect the demand from different users.

Clear the way for transit prioritizes the curb lane by the number of people that can be served in a given area. Transit stops support business districts by connecting the district with employees and patrons. The typical length needed for a bus stop ranges from 90 feet to 150 feet. This space can be used to park three to seven vehicles or provide access to larger amounts of patrons and employees. As seen in **Figure 7**, NACTO details the number of users that can be served by different curb lane uses. A typical bus stop can support 1,000 riders per day while a metered parking spot serves 15 vehicles per day on average.

Move loading and access nearby to discourage vehicles from double parking on roadways that could block the flow of traffic. Additionally, placing loading and access areas near the businesses they intend to serve helps to increase the likelihood that delivery drivers use the spaces allocated to meet their needs. Reducing the walking distance between loading areas and businesses will also help to decrease the time needed to make deliveries and increase the efficiency of the loading zone.

Look beyond the corridor uses a network of streets to support the needs of businesses and residents. Rather than relying on one street to meet the demand for curb space by various user groups, using a network of streets will leverage the combined capacity of curb lanes to meet the needs of an area. This network approach allows curb space directly in front of businesses to be reassigned from parking to access points that serve larger user groups. Looking beyond the corridor also includes the practice of using both on-street and off-street parking to meet the needs of vehicle storage. This increases the total parking supply while creating additional flexibility for curb space.

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[2] Matthew Roe, Craig Toocheck, "Curb Appeal: Curbside Management Strategies for Improving Transit Reliability," NACTO, November 20, 2017, https://nacto.org/wp-content/uploads/2017/11/NACTO-Curb-Appeal-Curbside-Management.pdf
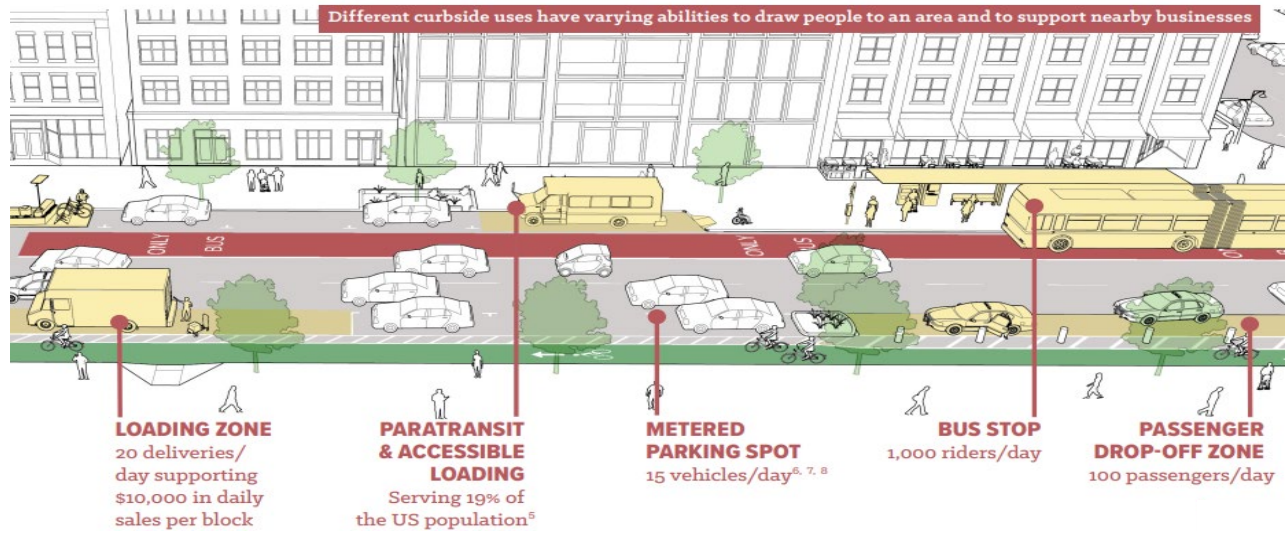
Figure 7. NACTO Curb Lane Management Prioritization by User

Source: NACTO. (2017) *Curb Appeal: Curbside Management Strategies for Improving Transit Reliability*

Curbside management strategies can vary by city, neighborhood, and roadway typology. In the Curb Management Strategy report by the San Francisco Municipal Transportation Authority (SFMTA)[3], curb lane functions are prioritized according to the associated lane uses. **Figure 8** displays curb functions prioritized by land use according to SFMTA. The curb lane functions are movement, access for people, access for goods, public space and services, and storage for vehicles. Definitions and examples of these curb lane functions are as follows:

Movement Active space for movement of people utilizing both motorized and unmotorized means

- People walking, biking, or using other personal mobility devices
- Emergency vehicles
- Public transportation vehicles (including buses, microtransit, paratransit, NEVs, etc.)
- Carpool, vanpool, or ridehail vehicles
- Personal vehicles

Access for People Active space for people on transit or micromobility to access adjacent land use

- Transit boarding and alighting
- Passenger pick-ups and drop-offs
- ADA accessible parking and loading
- Shared micromobility corrals/parking
- Personal micromobility corrals/parking

Access for Goods Active space for goods deliveries of different types and sizes utilized for short periods of time

- Commercial loading and unloading
- Small package and food delivery loading and unloading

Public Space Space dedicated to the public for use by people and public services

- Parklets
- Outdoor dining and seating
- Food trucks
- Pedestrian plazas

Vehicle Storage Space for longer term storage of vehicles, such that the space cannot be accessed by others

- Metered parking
- Residential permit parking zones
- Long-term parking

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[3] "Curb Management Strategy," SFMTA, February, 2020, https://www.sfmta.com/sites/default/files/reports-and-documents/2020/02/curb_management_strategy_report.pdf

LEGEND

| ACCESS FOR PEOPLE | ACCESS FOR GOODS | PUBLIC SPACE AND SERVICES | STORAGE FOR VEHICLES | MOVEMENT |
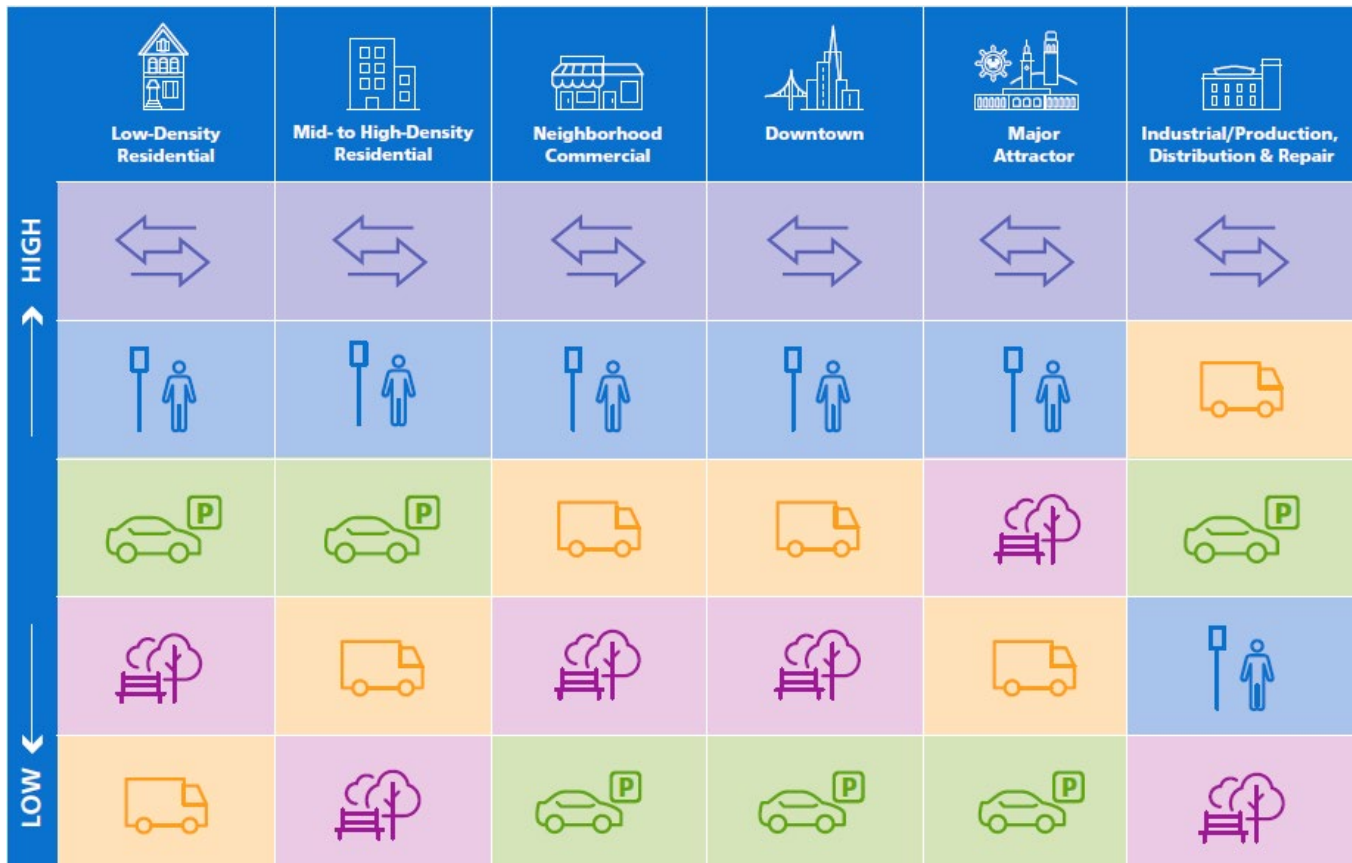
Figure 8. Curb Functions Prioritized by Land Use according to SFMTA

Source: SFMTA. (2020) *Curb Management Strategy*

Based on the prioritization matrix developed by SFMTA, movement at the curb lane is the highest priority across all land use typologies. The tier 2 priority is typically providing access for people, with the exception of the movement of goods in areas that are designated as industrial/production distribution and repair. All other tiers vary by land use, highlighting the importance of understanding the area that the curb lane is serving. SFMTA's Curb Management Strategy report drives home the importance of developing context sensitive curbside management plans. There is not a one-size-fits-all approach to curb lane management and the strategies detailed in this report should be compared against the area-specific needs of the curb.

4 USER-ORIENTED OPERATIONAL DESCRIPTION

This section provides an overview of the proposed regional curbside management system, including a high-level description of possible regional curb management strategies, regional partnership strategies, and stakeholder relationships. Each agency will have differing capabilities and goals for their jurisdiction. This list of strategies is a menu of potential strategies that may be used to manage curbs within a variety of community typologies.

4.1 Curbside Management Strategies

Possible curbside management strategies are described in this section. Each agency will have differing capabilities and goals for their jurisdiction. This list of strategies is a menu of potential strategies that may be used to manage curbs within a variety of community typologies. Strategies should be prioritized with a focus on the area's specific needs and with the input and buy-in of the adjacent business, residential, and recreational communities.

Within all community typologies, accommodating for mobility for vulnerable road users within the street network is the highest priority. This may not only be accommodated at the curb with sidewalks and the curb-adjacent lane, but also can be accommodated within the rest of the street's right-of-way. Making decisions on curbside space allocation should be looked at in accordance to the needs of the communities and with a holistic view of the available space on-street and off-street in the area.

Sidewalks

Pedestrianized spaces for walkers, runners, and disabled persons' mobility devices should be prioritized and protected at the curbside, such that these users have a comfortable and safe space to exercise and access adjacent buildings. Strategies to enhance the safety, comfort, and user experience on sidewalks include the following:

- ► **Curb extensions** extend the pedestrian zone into the curb lane at crosswalks, making the pedestrian crossing distance shorter and reducing pedestrians' exposure to traffic. In addition, they can help reduce drivers' speeds and help improve drivers' line-of-sight to pedestrians, improving pedestrian safety.
- ► **Widening the sidewalk** increases the pedestrian accessible area, which allows for increased foot traffic and reducing pedestrian exposure to on-street traffic.

Micromobility Lanes

At the street network, safe and comfortable movement of vulnerable road users on faster moving devices, such as bicyclists, micromobility devices, and other flexible fleets should be allocated such that they have protected space to travel across the network of streets in the region. This typically takes form in a network of micromobility lanes and protected micromobility/bikeways. The location of the micromobility lanes within the right-of-way will depend on the street context. For example, micromobility lanes along the curb protected by parking and/or bollards can be beneficial for user safety, but design of these lanes should consider conflicts with people with mobility challenges (e.g. people in wheelchairs, seniors) who need to access the curb from the parking/loading lane.

Transit-Only Lanes

In addition, the street network should also accommodate for a network of transit-only lanes, which provides buses, light rail, and street cars with space to efficiently move people, enhance reliability of service, and reduce

conflicts with other forms of traffic. Transit-only lanes are ideally designed to be median-running, with transit stations in the median, which reduces conflicts with right-turning traffic, driveways, bicyclists, tree branches, drainage inlets, and other debris. Transit-only lanes at the median should be accompanied with curb treatments such as curb extensions to help pedestrians safely cross the street from the sidewalk to the transit-only lane.

In some situations, transit-only lanes may be accommodated at the curbside, which can still provide priority for transit and can enhance safety for passenger pick-up and drop-offs. Making the space for transit-only lanes across the network should be prioritized on key transit corridors, such as those planned for the Next Gen *Rapid* initiative.

Shared Bus-Bike Lanes

Shared usage of curbside or parking-adjacent transit-only lanes between buses and active transportation can provide benefits on streets that cannot accommodate separate bike lanes. During peak hours when transit is moving quickly through traffic, the transit-only lane may not accommodate for cyclists or other slower moving flexible fleets (e.g. NEVs, micromobility), as buses do not have enough space in the lane to safely maneuver around slower moving cyclists. However, during off-peak hours when there are fewer buses and cars on the street, the transit-only lane may be flexible and designated as a shared bus-bike lane. These times-of-day and days-of-week designations for these flexible uses should be indicated on overhead signage. An example from NACTO's *Transit Street Design Guide* is shown in **Figure 9**.

Another option to accommodate cyclists and flexible fleets at all hours would be to design the transit-only lane adjacent to a curbside parking lane. Curbside parking could be restricted during peak hours to accommodate cyclists and flexible fleets, while the transit-only lane remains dedicated to fast-moving transit service only.
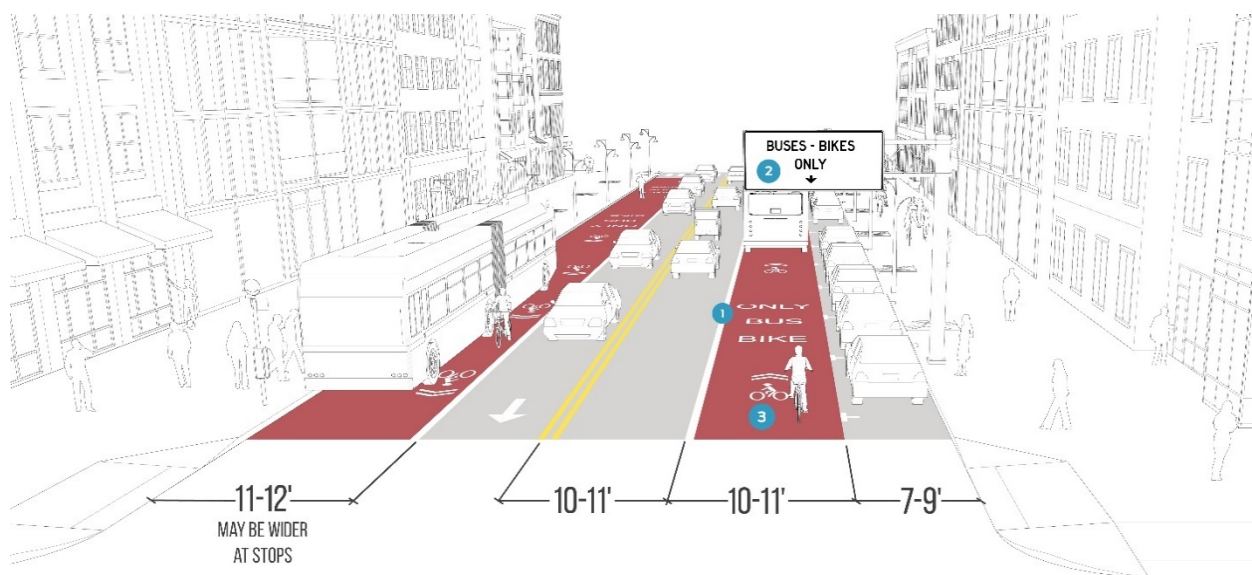

Figure 9. Example of a Shared Bus-Bike Lane

Source: NACTO. (2016), *Transit Street Design Guide*

Kimley»Horn

Transit Enhancements

In addition to transit-only lanes, other design concepts to enhance transit service can be considered. Queue jumps give transit a head start at signalized intersections in mixed-flow lanes. Bus bulb-outs that extend the sidewalk into the parking lane allows transit vehicles to load and unload passengers without leaving the travel lane.

Prioritizing Access for People with Disabilities

Though vehicle storage should be limited on-street when possible, conveniently located Americans with Disabilities Act of 1990 (ADA) compliant accessible parking spaces for people with mobility challenges should be prioritized such that these travelers can have easier access to buildings. However, accessible parking at the curbside without time limits may prevent other travelers with disabilities who also need easy access to their destination. A regional working group involving planners, policy makers, and community advocates for seniors and people with disabilities should be established to determine curbside parking and loading policies to address accessible parking and paratransit needs.

Pricing Commercial Loading Zones

Currently, commercial curb loading zones are not priced to encourage turnover. This can cause vehicles to double park if there is no appropriate curbside or off-street loading space for goods loading and unloading. This conflict impedes mobility of all modes on the travel lane and causes safety issues. This scenario should be avoided along key transit corridors and strategies to make loading spaces available for those who need them, and are willing to pay for them, should be considered.

In commercial districts, the main street tends to have the greatest demand for all uses. Having variable, demand-based pricing on commercial loading zones will allow users to choose a loading zone location based on their need. Loading zones on the side streets may be cheaper and have a longer time limit, thereby allowing commercial loading to occur further away from the storefronts. Loading zones on the main street can be priced higher to encourage turnover and reduce double parking.

Some areas like Washington, D.C. have implemented a permit reservation in addition to pricing their commercial curb space with success, as shown in **Figure 10**. Commercial curb users and ridehail drivers could use an app to reserve curbside space for pick-ups and drop-offs of packages and passengers. Implementation of this type of reservation system involved utilizing a 3rd party app that helped manage reservations at the designated curbside loading zones. Though users had to pay to use a curb previously free to them, commercial

Figure 10. Washington, D.C. commercial curb reservation system

Source: CurbFlow. (2019), *via Medium article "The Curb Would Like to Reintroduce Itself"*

users derived value from being able to reserve curb spaces ahead of time, creating more efficient delivery routes, and receiving fewer parking tickets due to improper parking.

TNC Geofencing

TNC passenger pick-up and drop-off activity has spurred the conversation on curbside management within the San Diego region. As the popularity of using Uber/Lyft and other ridehailing apps has grown, the question of how to reallocate the curb to accommodate these activities and how to price TNCs for dwell time at the curb has gained attention. This has become an issue for cities as passenger pick-ups and drop-offs sometimes occur illegally in red curb zones, micromobility lanes, and in travel lanes, causing unsafe conditions.

Success has been shown in dedicating curbside locations as TNC pick-up and drop-off locations, prohibiting parking where it was previously allowed. Geofencing these pick-up and drop-off zones within the ridehailing apps allows both drivers and customers to find a meeting location, and drivers can safely access a curbside away from the travel lane to pick-up and drop-off passengers.

Geofencing locations can provide policymakers with data on pick-up and drop-off activity in certain locations. Additionally, some agencies have charged passenger loading zone fees through TNC activity within a geofence.

Flex Zones

Shifting from a traditional parking lane to a flex zone reflects the national best practice of programming the curb lane by the time of day demand. Because demand for the curb changes throughout the day, the management practices of the curb lane should be adjusted to reflect the demand from different users. An example of a flex zone implementation in the San Diego region is provided in **Figure 11** and **Figure 12**, which show signage and passenger loading zones that prioritize TNCs, pedicabs, taxis, and other short term pick-up and drop-off activities on Fifth Street in the Gaslamp Quarter.

Figure 11. Short-term Passenger Loading Signage

Figure 12. Short-term Passenger Loading

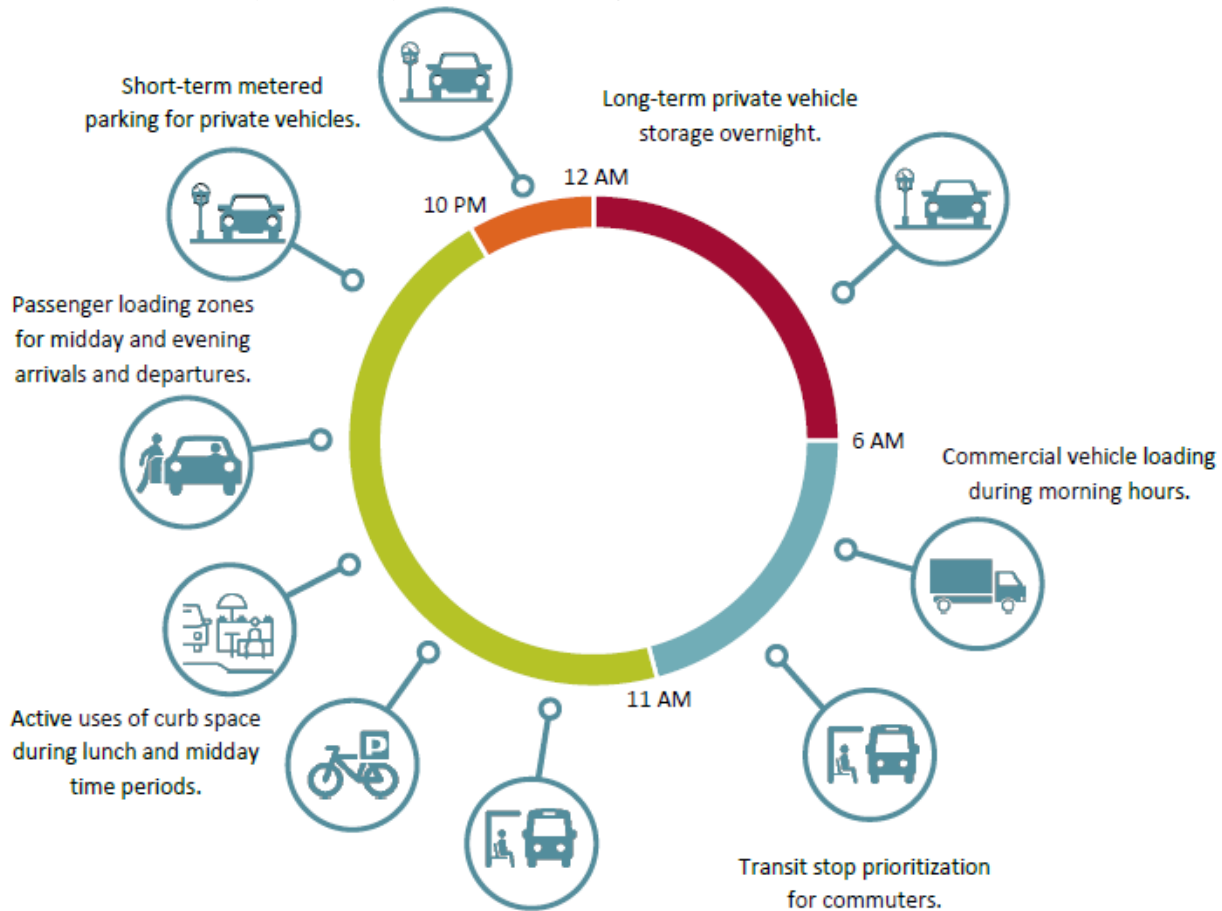Typical curb demands by time of day are detailed in **Figure 13**.

Figure 13. Curb Lane Users by Time of Day

Conversion of parking lanes to flex zones will need routine monitoring of the changing demand for the curb to understand the needs of users during different hours of the day. In urban core areas, demand is likely more variable than in other community typologies. Some locations with active nightlife may need pick-up/drop-off zones throughout the evening to the late evening. Some locations with office buildings may need passenger loading zones in the morning and evening rush hours and parklets/dining areas for outdoor seating during the lunch hours. Depending on demand, flex zones along a lane might mean that some spaces along the curb are fixed use for one use throughout the day because of high demand or operational challenges (e.g. furniture at parklets may be difficult to remove). But some spaces along the parking lane may flex by time-of-day to accommodate changing demand, reduce conflicts, and improve access to the curb for a greater number of people.

The major challenge of implementing flex zone parking is communication to customers at the curb in a manner that is clear, accessible to all, and enforceable. Dynamic signage is likely not cost-efficient, given capital and maintenance costs. However, existing signage regulation in municipal codes likely do not have the flexibility to provide enforceable and clear information on flex zones to travelers. Thus, enforceable signage standards to designate flex zone times of operation will need further study within the region.

In addition, an inventory of curbside regulations, including flex zone regulations, should be kept up-to-date within jurisdictions. This information may also be useful to provide to commercial curb users, such that they can plan for more efficient routes and schedules.

Dynamic Parking Pricing

Pricing parking by demand is an influential tool to disincentivize travelers from cruising around city blocks to find a metered spot on the street. Often, street parking may be less expensive than parking at off-street sites. In locations with variable demand, such as those in the "Major Attractor" community typology, variable metered parking pricing can improve event travel demand management. During events, the high demand for parking will drive up meter prices at the curb, which disincentivizes those attending the event to pay the high rate for the event duration. It frees up those spaces for those who may need the curbside space for short trips. Off-peak, with lower demand, these spaces are more affordable to use for parking or loading access to the storefronts.

To price dynamically, there needs to be a system that can detect usage data from the parking spots, and then utilize algorithms to determine the optimal pricing for each spot based upon parking demand and proximity.

Micromobility Parking Corrals

Shared dockless micromobility is an efficient, convenient, and affordable solution for users to complete short trips or provide first-/last-mile access to transit stations. Designated parking "corrals" or stations at the curbside can be helpful in managing dockless device blockages on the sidewalks, particularly at mobility hubs. The City of San Diego has implemented both bike parking corrals and micromobility corrals, as seen in **Figure 14.**

Figure 14. City of San Diego scooter and bike corrals

Source: City of San Diego. (Accessed 2020), *via* https://www.sandiego.gov/bicycling/racks-and-lockers

Parklets/Street Activation

Parklets and other street activation methods provide temporary or permanent space for pedestrians to utilize as public space. This may include dining furniture, benches, landscaping, art, play spaces, and other amenities that create a more dynamic and inviting environment for pedestrians. Some parklets may provide free public Wi-Fi. Usage of the Wi-Fi may be tracked to estimate the number of users of the parklet throughout the day.

During the COVID-19 pandemic, many agencies have provided free permits for restaurants to utilize the curb space for outdoor dining. Past the pandemic, agencies may consider charging restaurants and other businesses for usage of the curb space, generating revenue and creating an inviting environment for pedestrians.

Residential Parking Permits

To manage spillover curbside parking demand near commercial areas, many agencies have established a residential parking permit program. This prioritizes curbside parking for residents of a street that may experience vehicle parking demand due to their proximity to a commercial district or due to impacts from undersupplied

parking from developments. These parking permits are typically paid permits such that residents are incentivized to utilize off-street parking options when available.

Enforcement

Effective enforcement is key to achieving curbside management goals and reducing unsafe parking or loading behavior. In addition to staffing traditional parking enforcement officers, a customer-service oriented approach may involve staffing parking ambassadors who can help guide curb users to use the curb appropriately and help those who have issues with payment, particularly when rolling out a new program.

Technology can also assist in the effectiveness of enforcement. Transit-only lanes can speed up buses and other transit vehicles, but sometimes experience operational challenges with passenger vehicles driving in or stopping in these lanes. Enforcement cameras mounted on buses can more effectively enforce transit-only lanes and disincentivize drivers from double parking in these lanes. Other formats of automated enforcement may involve automated license plate readers (ALPRs) or other sensors that can detect vehicles parked or stopped at the curb and automatically charge users or notify parking enforcement officers to ticket violators.

4.2 Regional Collaboration and Coordination

The foundation of effective implementation of TSMO is to plan for effective regional collaboration and coordination among and within agencies. This means that collaboration and coordination between transportation operators, those who are managing the day-to-day needs of transportation systems, and transportation planners responsible for all transportation modes should be involved in planning for a safe, seamless, and reliable system across jurisdictions.

The San Diego region's curbside management planning and deployment can greatly benefit from coordination within an organized framework. The framework for building effective, sustained collaboration within a region to facilitate providing better transportation outcomes is illustrated in **Figure 15**.

Structure

The starting point is to establish a *structure*, or a means to coordinate amongst jurisdictions to identify needs, establish priorities, make commitments, allocate resources, and evaluate performance. The structure can be a regional subcommittee hosted by any agency, but typically would be hosted by a regional MPO like SANDAG.

This subcommittee or working group would be inclusive of all decision-making stakeholders of curbside management, including local jurisdictions' planners and policymakers, transit and paratransit operators, maintenance personnel, and other relevant stakeholders.

Figure 15. Framework for collaboration and coordination

Source: Federal Highway Administration. *Regional Transportation Operations Collaboration and Coordination: A Primer for Working Together to Improve Transportation Safety, Reliability, and Security*

Process

The *process* defines the course of action through which options are created and decisions are made. It defines for the group how ideas are generated, decisions are made, and programs and projects are implemented. The process can be formal activities, such as regularly scheduled meetings, or informal activities, such as regular conversations through open communication between stakeholders.

Agencies in the San Diego region should establish its own desired processes within the organizing structure. The frequency, formality, and members of the subcommittee should be discussed and established at the outset to achieve the desired regional results.

Products

The *products* are the agreements and commitments that move forward an agreed upon set of strategies and priorities. Products are the results of the processes set up by the organization. These products may be concepts of operations, operating plans and procedures, identified list of priorities, or other documents and initiatives.

Products that potentially may be discussed and delivered from this working group are as follows:

- ► Capability maturity model priorities and self-assessment
- ► Data collection standards
- ► Data sharing agreements
- ► MOUs and other agreements among agencies jointly conducting curbside management programs
- ► Coordination on new curbside regulations and policies
- ► Coordination on interoperability of customer-facing applications
- ► Coordination to promote costs savings for procurement of new systems, devices, or technologies

Resources

Resources reflect the commitments of funding, people, equipment, facilities, support, and other assets needed to implement the strategies agreed upon by the organization or subgroups. Commitments of resources can be formal or informal. Formal commitments are recommended, particularly if agencies are planning to perform joint procurements.

Performance

Performance measurement provides participants with feedback to determine how well the agreed-upon strategies were implemented and executed, and the effect these strategies had on outcomes relative to the agreed-upon goals and objectives. Performance measures are to be determined within the organization as it establishes its priorities and regional goals.

Some examples of performance measurements relevant to curbside management are:

- ► Productivity of curb space, or how many people are served within a defined distance of the curb within a defined area
- ► Cost-benefit of metered parking and dynamic pricing
- ► Increased high-occupancy shared TNC rides in comparison to individual ride-hailing

- ► Fewer blocked bike and transit only lanes
- ► Improved transit reliability
- ► Reduced pedestrian/bike involved crashes
- ► More disabled loading and parking zones

Additional performance measures can be found in the Institute of Transportation Engineers *Curbside Management Practitioners Guide.*
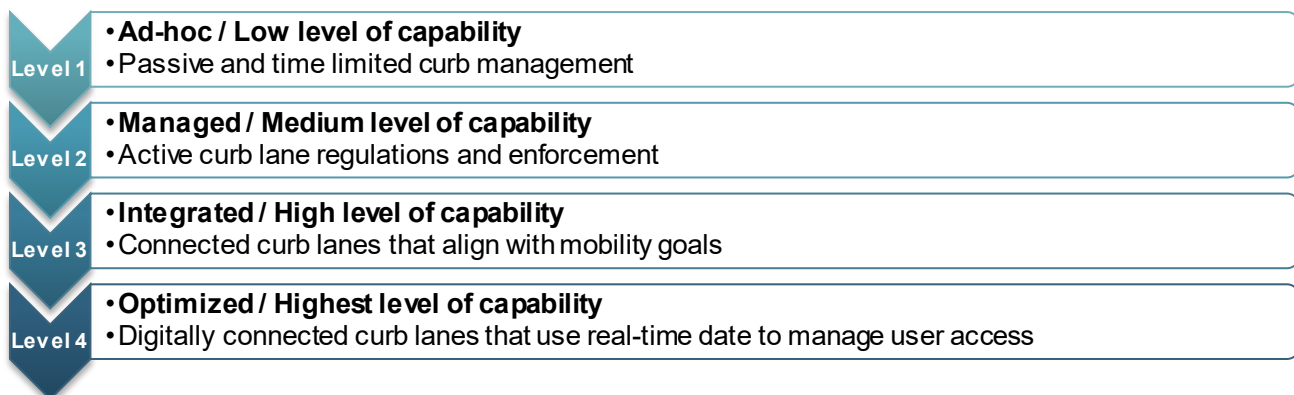
4.3 Agency Capability Maturity Focuses

To effectively manage the curb lane, agencies should understand their current institutional capabilities and develop a plan for reaching their desired level of capacity. Using the Capability Maturity Model (CMM) for TSMO as a foundation for self-evaluation, agencies can assess their capacity to conduct curb lane management across dimensions or process areas that apply to curb management. This document does not prescribe specific measures for the region but provides an example of how to apply CMMs to the curb management context.

Within the information technology world, CMMs are often utilized to review barriers to adoption and promote success of new technologies or concepts. The CMM provides a common understanding of the focus areas for improvement within an organization. By performing the CMM exercise, agencies can develop consensus around needed improvements, identify priorities, and initiate actions to continuously improve its capabilities. Establishing CMM benchmarks regionally can help agencies understand other agencies' capabilities. Those agencies with similar capabilities can work together towards the next level of capability. Those agencies with higher capabilities can provide knowledge and lessons learned for agencies with lower capabilities.

Dimensions or process areas for curbside management may include:

1. Policies and Mobility Planning
2. Systems and Technology
3. Performance Measurement
4. Organization and Workforce
5. Culture of Compliance, and
6. Collaboration Across Agencies

These dimensions or process areas are measures against strategic benchmarks that develop the agency's capacity to reach an operational goal. These benchmark levels are:

Level 1
- **Ad-hoc / Low level of capability**
- Passive and time limited curb management

Level 2
- **Managed / Medium level of capability**
- Active curb lane regulations and enforcement

Level 3
- **Integrated / High level of capability**
- Connected curb lanes that align with mobility goals

Level 4
- **Optimized / Highest level of capability**
- Digitally connected curb lanes that use real-time date to manage user access

A regional curbside management working group should determine the specific measures to utilize as benchmarks in the context of a CMM analysis, such that agencies can perform self-assessments of their jurisdiction's capabilities.

To demonstrate the self-evaluation process and highlight real-world benchmarks for the CMM for curbside management, an example of an agency evaluation is provided in **Table 1**. This evaluation assesses the agency's ability to address the curbside management goal of prioritizing equity and accessibility across all land uses with respect to the dimension of Policies and Mobility Planning.

<div align="center">

Table 1. Example Capability Maturity Model Evaluation

</div>

Capability Assessment Question: What is my agency's capacity to prioritize equity and accessibility across all land uses?	
Dimensions or Process Areas	**Policies and Mobility Planning**
What is it?	Enabling legislation, standardize curb lane policies, short- and long-term mobility plans.
Level 1 Ad-Hoc, Low Level of Capability	My agency has written policies that require/provide guidance of the placement of accessible parking spaces in the public right-of-way.
Level 2 Managed, Medium Level of Capability	My agency has an inventory of the existing accessible parking network and routinely monitors changes to this system.
Level 3 Integrated, High Level of Capability	My agency has developed and implemented a plan to support/expand the accessible parking network and ensure persons with varying mobility have access to the system.
Level 4 Optimized, Highest Level of Capability	My agency monitors the accessible parking network through real-time occupancy technology and develops system enhancement plans based on observed user behavior.

This example details levels of an agency's capabilities to prioritize equity and accessibility across all land uses through curbside management. The example illustrates a possible CMM that the region should define to evaluate each agency in the region to compare capabilities. Each agency should document their existing policies and processes and provide a self-evaluation on the CMM scale. With that, each agency can develop strategic action items that will enable the agency to reach higher levels of capability and maturity.

In this example, if an agency determines that there are written policies that require the placement of accessible spaces in the public right-of-way but doesn't maintain an active inventory of the accessible parking system, the agency can identify an action item to conduct an annual inventory of accessible parking spaces throughout a designated area. This action helps to address the identified capability gaps. This self-evaluation process helps set a baseline for agency-specific capabilities and helps develop context-sensitive actions that improve an agency's effectiveness in accomplishing targeted goals.

There is no one-size-fits-all approach to developing a curbside management plan and actively advancing an agency's capability and maturity. Agencies should conduct a true self-evaluation to determine their specific

capabilities, establish strategic goals for their respective jurisdictions, develop action items that will expand their capability and maturity as an agency, and re-evaluate their capacity as action items are completed.

4.4 Stakeholder Roles and Responsibilities

Curbside management strategies are largely deployed individually, within one agency's jurisdiction. In this section, general roles and responsibilities are presented in **Table 2** for agencies, companies, and other stakeholder groups with interest in the curbside.

Table 2. Stakeholder Roles and Responsibilities

Stakeholder	Roles and Responsibilities
SANDAG	▶ Metropolitan Planning Organization for the San Diego region ▶ Leading the San Diego Forward: The 2021 Regional Plan ▶ Manages regional planning activities, including providing regional guidance and leadership on implementing transportation initiatives ▶ Creates regional forums for operations coordination and meetings ▶ Develops training programs for SANDAG and partner agencies to share knowledge and develop standards ▶ Provides a forum to establish regional standards for data and technology for curbside management and offers high-level guidance for a regionally coordinated deployment of curbside management strategies ▶ Planning and implementing Next OS ▶ Potentially acts as a mobility data clearinghouse for curb, transit, mobility service, and traffic data, such that data is collected and shared through Next OS
Infrastructure Owner-Operators (Cities, Counties, Caltrans)	▶ Owns, manages, and maintains the public right-of-way, including the curbside ▶ Determines individual regulations and policies for curb usage ▶ Coordinates with partner local agencies, transit agencies, and partner mobility providers to implement curb management strategies ▶ Distributes permits for business operations at the curbside, including private micromobility operators and restaurants ▶ Procures, designs, operates, and maintains curb management technologies ▶ Collects and shares curbside usage data
Transit Agencies	▶ Operates public transit and paratransit services ▶ Loads and unloads passengers at the curb ▶ Loads and unloads passengers with disabilities at the curb ▶ Operate moving vehicles that may utilize the curb lane for movement ▶ Coordinates with enforcement agencies to perform automated transit lane enforcement ▶ Collects and shares boarding and alighting data
Public Works	▶ Responsible for regular street sweeping of the curbside ▶ Clears curbside debris and blockages upon request ▶ Provides schedule of street sweeping
Parking Enforcement	▶ Enforces parking and loading violations

	▶ Issues tickets to vehicles and people violating parking and loading rules ▶ Collects and shares enforcement data
TNC Operators	▶ Provides ridehailing and ridesharing services ▶ Coordinates with jurisdictions for permitting ▶ Coordinates with jurisdictions for geofencing requests ▶ Collects and shares data with agencies through partnerships
Car-Sharing Operators	▶ Provides shared cars ▶ Coordinates with jurisdictions to designate curb spaces for parking and charging (if electric) shared cars
Micromobility Operators	▶ Owns, manages, and maintains shared scooters and bikes ▶ Provides platform for users to find and ride shared micromobility devices ▶ Provides electric device charging and rebalancing services ▶ Coordinates with jurisdictions for permitting ▶ Coordinates with jurisdictions for geofencing micromobility operations and device parking locations ▶ Collects and shares data with agencies through partnerships
Vanpool Operators	▶ Provides vanpooling services for commuters ▶ Uses curb space for loading
Microtransit Operators	▶ Provides demand-responsive, flexible-route transportation services ▶ Uses curb space for loading
Commercial Delivery	▶ Loads and unloads goods from delivery vehicles ▶ Plans for efficient delivery routing
Local Businesses	▶ Utilize commercial delivery, app-based drivers, or in-house delivery vehicles to load and unload goods ▶ Requests permits from local jurisdiction to utilize curbside for outdoor dining and commerce

5 OPERATIONAL NEEDS

This section describes the vision, goals, objectives, and needs of implementing a regional curb management system. These drive the concept of the system and provides stakeholders with an understanding of what are the vision, goals, and objectives of the proposed system and what the designed system needs to do in order to fulfill them.

5.1 Vision

The vision, goals, and objectives serve as the backbone for the project. The vision statement provides high-level guidance on what the project strives to be long-term.

Curb access management is a use case of the Next OS and will therefore support the core values of The Regional Plan. The Regional Plan vision statement is: *"To use the 5 Big Moves strategies to envision a balanced transportation network that gets you where you need to go quicker and easier, increases access to opportunity, and meets state greenhouse gas emissions mandates. A system that leverages technology to create a safe, adaptable, and socially equitable transportation ecosystem that responds to the unique needs of the wonderfully diverse communities throughout our region."*

Consistent with the Regional Plan, the vision for curbside management in San Diego is:

> To create a safe, adaptable, and socially equitable curb access management strategy that uses technology to help manage valuable curbside space across the San Diego Region in alignment with state and regional greenhouse gas emissions mandates.

Allocation of public space is a reflection of the priorities in the region. The vision for the San Diego region promotes the allocation of curbside street space that encourages and prioritizes travel on modes that create less greenhouse gas emissions, while also accommodating safe, easy access to buildings and storefronts for people and goods. This would be achieved with the help of a coordinated, regional approach that strategically utilizes technology to more equitably allocate street space, provide access to all, and responds to competing demands for the curbside.

5.2 Goals, Objectives, and Needs

The goals detailed below can be applied to curbside management in the SANDAG region. As curbside management is integrated with the 5 Big Moves and the Next OS, these goals and their corresponding strategies can be used to establish an operations plan that modernizes curb lanes throughout the region.

Prioritize equity and accessibility across all land uses.
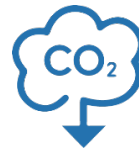
Support sustainability goals by elevating transit and low emission modes at the curb lane.

Connect users with real-time information about curb lane utilization.

Provide clear and easy to understand rules and regulations.

Advance access for commercial and passenger loading.

Develop time-of-day/day-of-week curb management plans that address varied user needs.

Promote economic activity and revenue generation opportunities.

Ensure compliance to curb management regulations.

1.0 Prioritize equity and accessibility across all land uses.

Transportation equity is providing accessible and affordable transportation for everyone, accounting for the innate and socially imposed differences that exist among communities. The San Diego region is extremely diverse, and the curbside management system should take into consideration the diversity of needs from minority or disadvantaged populations. Some populations in the region are unbanked, do not regularly use smart phones, or may not have access to the internet. There should not be an undue burden on these people to utilize the public curbside space.

To prioritize equity and accessibility in curb management, the following focused objectives and needs are defined:

► **Prioritize accessibility along the curb.**

- Need for passenger loading zones to be designed with ADA accessible standards.
- Need for specific paratransit-only loading locations.
- Need to prioritize accessible spaces for handicapped parking spots when reallocating curbside uses.

- ▶ **Implementation of curb management projects should be considered across the San Diego region, focusing on specific needs of each community.**
  - Need to identify and involve local community stakeholders in the planning and design of curb management concepts.
  - Need to use curb management strategies to add value and access to the community while prioritizing disadvantaged groups.
- ▶ **Promote equitable access for all modes and people.**
  - Need to consider curb space allocation and access for all street users
  - Need to prioritize safety of vulnerable road users
  - Need to prioritize access of curb functions and payment platforms for all people, including those with disabilities, those who are unbanked or underbanked, and those who speak languages other than English.
  - Need to consider distribution of curb usage fees towards benefits for vulnerable populations.

2.0   *Connect users with real-time information about curb lane utilization.*

Travelers in the region can make informed travel decisions before and during their trip if they have access to traveler information. In addition to real-time traveler information, implementing curbside management will require an extensive outreach and engagement campaign to educate people on flex zones, loading zone rules and restrictions, and how to use the apps and kiosks. Customer service and seamless travel experience is prioritized in the Regional Plan through the Next OS. Thus, integration of data from multimodal sources and dissemination of that data will be crucial.

Establishing standard technologies and an interoperable system among all jurisdictions are important aspects for customer experience. Customers typically do not only travel within one agency or jurisdiction. To provide a seamless travel experience across the region, agencies should establish a goal of interoperability, scalability, and a common customer user interface for all curbside management activities.

- ▶ **Provide customers with seamless travel information.**
  - Need to provide location-based, real-time parking and loading zone availability data, including occupancy, pricing, and reservation status.
  - Need to provide transit schedules and real-time transit arrivals at the curb.
  - Need to provide a way to book, schedule, and pay for flexible fleets options at mobility hubs.
  - Need to provide locations of ADA accessible curbside parking and loading zones.
  - Need to allow customers to apply for or reserve special parking and loading permits.
- ▶ **Promote a curbside management system that is implementable across jurisdictions.**
  - Need to establish standards that can be adopted throughout the region.
  - Need to identify technology that can be scalable and adaptable to all jurisdictions.

- Need to identify opportunities to use economies of scale for purchasing and maintaining curbside technologies.
- Need to plan for consistent operating experiences for both agency- and customer-facing technologies.

3.0   Advance access for commercial and passenger loading.

Unsafe stopping and double parking occur when commercial and passenger vehicles completing short deliveries or loading actions cannot find a curb space to stop near their destination. With the growing use of app-driven food and goods delivery, ridehailing, and microtransit, there will be a growing demand for curbside spaces dedicated to short term loading. Geofencing is a powerful tool for local agencies to control the areas in which privately operated vehicles can perform loading actions in exchange for utilizing the publicly owned right-of-way. Commercial vehicles can better plan for compliance with better curbside availability data and ability to make and pay for advanced curb space reservations.

► **Provide data exchange to commercial curb users.**
- Need to standardize geofencing requests for privately operated TNCs and micromobility companies across the region.
- Need to provide data on loading zone availability, pricing, and reservations for commercial delivery vehicles.

► **Provide dedicated curb space for commercial and passenger loading.**
- Need to consider time-of-day flexible curb space to accommodate commercial deliveries.
- Need to consider time-of-day flexible curb space to accommodate passenger loading.
- Need to analyze data on demand and productivity of curb space to determine allocation of curb space for dedicated loading.

4.0   Promote economic activity and revenue generation opportunities.

Allocating the valuable curbside space for free parking in business districts can be detrimental to economic activity and parking turnover, as the convenience of using the curbside as a location to start and end a trip is only allocated to the occupants of the vehicle for as long as they are parked. Pricing for parking incentivizes turnover at the curb space and the revenue generated can be invested towards providing a safer and more comfortable pedestrian, transit user, and ADA accessible experience in the area.

Looking beyond parking, utilizing the curb space for other modes to begin and end trips also has potential to improve economic vitality by expanding the number of people passing by storefronts to access bikeshare stations, micromobility storage, microtransit stop, and transit stops.

► **Prioritize parking turnover and alternative modes access at the curb.**
- Need to consider pricing parking and loading and establishing time limits for parking and loading at urban and suburban commercial centers.

- • Need to consider allocating spaces for shared micromobility stations and flexible fleets passenger loading zones.
- ► **Identify revenue generation opportunities for curbside usage.**
  - • Need to work with business community to determine beneficial curbside uses, including access for people and goods, parklets, and curbside dining.
  - • Need to identify locations with highly variable curbside demand and consider dynamic parking and loading pricing based on demand.
- ► **Invest revenues from curbside usage towards improvements in the areas where the fees are collected.**
  - • Need to identify equitable mobility and accessibility improvements to be funded with curbside usage revenues.
  - • Need to reinvest revenues towards initiatives enhancing community placemaking and community identity.

5.0 Support sustainability goals by elevating transit and low emission modes at the curb lane.

Traveling by single-occupant car trips is safe and convenient for those who can afford it, but historical dedication of public right-of-way space towards efficient car travel has made sustainable travel by transit and low emission modes less desirable. Bus transit users typically sit in the same congestion as car modes, making it inconvenient and slow. People who bike, use micromobility, or walk are considered vulnerable road users (VRUs) when sharing lanes or crosswalks with fast moving cars, making their experience unsafe and uncomfortable. Using the curb lane as a tool in elevating transit and low emission modes prioritizes the needs of those who travel more sustainably, making these trips convenient and safe.

- ► **Prioritize movement of people.**
  - • Need to identify cross-jurisdictional transit corridors to dedicate lanes for mass transit.
  - • Need to identify and implement a regional network of safe bicycle lanes that can be used by all modes of micromobility.
- ► **Prioritize curbside usage based on the priority structures of the adjacent land use.**
  - • Need to plan for movement of motorized and non-motorized means of transportation within the street network prior to lower priority curbside functions.
  - • Need to align curb uses with improving the street network connectivity of pedestrians, micromobility users, and transit users, and ensuring that sidewalks, paths, micromobility lanes, and transit lanes are connected to destinations.

6.0 Provide clear and easy to understand rules and regulations.

Taking a regional approach towards curbside management provides an opportunity for agencies to standardize curbside signage and markings to clearly and efficiently communicate any new or changed

rules and regulations. Curbside signage with multiple panels showing layered restrictions based on times of day, days of week, permit parking, school zones, and others can be difficult to understand. However, easier to understand signage may not be legally enforceable in accordance to the municipal code, and thus should be provided in addition to enforceable signage.

Some flexible curb spaces may benefit from dynamic signage that clearly communicates the rules for usage of the curb lane. Design of the dynamic signage should be enforceable. Other flexible curb spaces that are based upon time-of-day and day-of-week may not need dynamic signage, which can be expensive to connect to communications and power and maintain.

► **Take a regional approach in planning for new curbside management strategies.**
  - Need to develop a regional steering committee to explore new curb signage and markings with the goal to standardize policies across the region.
  - Need to evaluate existing colored curb rules and regulations for operational utility.
► **Identify alternative methods for communicating curbside rules.**
  - Need to evaluate operational effectiveness and reliability of dynamic signage.
  - Need to simplify loading zone hours and signage to make them easier to communicate and enforce.
  - Need to evaluate ways to communicate curbside rules, reservation status, and usage pricing, including signage, meters, and through mobile applications and websites.

7.0   Develop time-of-day/day-of-week curb management plans that address varied user needs.

Flexible curb zones prioritize curb usage based upon priorities of the surrounding land use. Setting curb rules based upon time-of-day and day-of-week curb management plans gives curb users a regular expectation of the type of curb usage allowed in an area that they frequent. Time-of-day and day-of-week based flexible curbsides also provides the benefit of allocating curb space based on variable curbside demands.

► **Proactively allocate curb space based on demand and regional sustainability goals.**
  - Need to develop a data-driven approach to allocate short-term parking, loading zones, bike corrals, and shared micromobility zones along the curb.
  - Need to develop a demand monitoring process and to understand how the curb functions are satisfying users' needs.
  - Need to align curb management plan with the city's and the region's goals.
► **Collect curbside usage data to inform planning and policy.**
  - Need to identify data standards for curbside data collection.
  - Need to identify available data that can provide curb usage insights, including transit alighting, shared bike/micromobility usage, TNC usage, parking meter payments, parking enforcement, permit requests, and others.

- Need to identify potential partner public agencies and private mobility service providers and establish partnerships for information sharing opportunities.

- Need to develop a comprehensive, location-based inventory of curb spaces, connect existing curb usage data sources, and develop a process to keep this inventory up-to-date.

- Need to identify locations with frequent freight deliveries for businesses and work with business owners to encourage off-street loading or designating storefront curb space as flex zones for deliveries during appropriate times of day.

8.0 Ensure compliance to curb management regulations

Effective enforcement of curb rules is key for the success of curbside management. Efficiently enforcing curb rules can improve safety and accessibility, encouraging people to perform parking and loading in legal locations such that loading zones are available for use and accessible loading zones are available for people with disabilities to be safely picked up or dropped off. Many dangerous loading-related violations are inherently difficult to enforce with the existing system of manual ticketing by enforcement officers. Violations such as double-parking, stopping at a red curb/travel lane, or stopping in the bus lane occur for less than a minute, but can be unsafe and cause congestion and crashes. Pursuing legislation to allow automated, camera-based enforcement can be effective to prevent unsafe loading and parking.

► **Pursue safety and accessibility through parking enforcement.**

- Need to communicate rules and regulations clearly.

- Need to utilize technology to improve the accuracy and speed of parking enforcement.

- Need to approach parking enforcement fairly and encourage compliance through positive customer-service techniques, such as utilizing a parking ambassador program at new curbside management sites.

- Need to prioritize enforcement of unsafe parking and stopping that prevent others' accessibility of the street and/or cause others to stop and change lanes to proceed.

- Need to evaluate methods to prevent and/or quickly remove blockages (e.g., trash bins, vehicles, devices, debris) in the curb lane that present safety and operational challenges.

► **Study automated enforcement applications.**

- Need to evaluate and prioritize low-hanging fruit technologies for automated enforcement, such as bus only lane enforcement cameras onboard buses, mounted cameras at intersections, etc.

- Need to pursue state legislation to expand automated and camera-based enforcement.

- Need to identify technology that assists with enforcement for use across the region.

5.3 Summary of Goals & Objectives

Table 3 summarizes the above goals and corresponding objectives of the curbside management system.

Table 3. Summary of Curbside Management Goals and Objectives

Goals	Objectives
Prioritize equity and accessibility across all land uses. (G1)	► Prioritize accessibility along the curb. ► Implementation of curb management projects should be considered across the San Diego region, focusing on specific needs of each community. ► Promote equitable access for all modes and people.
Connect users with real-time information about curb lane utilization. (G2)	► Provide customers with seamless travel information. ► Promote a curbside management system that is implementable across jurisdictions.
Advance access for commercial and passenger loading. (G3)	► Provide data exchange to commercial curb users. ► Provide dedicated curb space for commercial and passenger loading.
Promote economic activity and revenue generation opportunities. (G4)	► Prioritize parking turnover and alternative modes access at the curb. ► Identify revenue generation opportunities for curbside usage. ► Invest revenues from curbside usage towards improvements in the areas where the fees are collected.
Support sustainability goals by elevating transit and low emission modes at the curb lane. (G5)	► Prioritize movement of people. ► Prioritize curbside usage based on the priority structures of the adjacent land use.
Provide clear and easy to understand rules and regulations. (G6)	► Take a regional approach in planning for new curbside management strategies. ► Identify alternative methods for communicating curbside rules.
Develop time-of-day/day-of-week curb management plans that address varied user needs. (G7)	► Proactively allocate curb space based on demand and regional sustainability goals. ► Collect curbside usage data to inform planning and policy.
Ensure compliance to curb management regulations. (G8)	► Pursue safety and accessibility through parking enforcement. ► Study automated enforcement applications.

5.4 Needs Assessment

System needs are used to communicate the expectations of the proposed system – the 'what do the stakeholders want the system to do'. They are used to help define the components of the system; those that would be required to implement for enhancing safety and optimizing efficiency within the smart intersection system.

System needs were developed through a series of stakeholder workshops and surveys with staff from state, regional, and local agencies. The results of the North County Regional Corridor (NCRC) Capability Maturity Model were combined with surveys completed by stakeholders of other corridor Comprehensive Multi-modal Corridor Plan (CMCP) groups and local stakeholder groups across the region to develop the needs assessment.

The needs are grouped within the following categories: Institutional, Curb Space Allocation, Data-Driven Decision Making, Multi-Modal/Active Transportation, Technology and Innovations, and Traveler Information. For traceability purposes, each need is associated with a corresponding goal, as shown in **Table 4**.

Table 4. Summary of Curbside Management Needs

Curbside Management Needs	Goal
Institutional	
Need to identify and involve local community stakeholders in the planning and design of curb management concepts.	G1
Need to use curb management strategies to add value and access to the community while prioritizing disadvantaged groups.	G1
Need to consider curb space allocation and access for all street users.	G1
Need to prioritize safety of vulnerable road users.	G1
Need to consider distribution of curb usage fees towards benefits for vulnerable populations.	G1
Need to establish standards that can be adopted throughout the region.	G2
Need to identify opportunities to use economies of scale for purchasing and maintaining curbside technologies.	G2
Need to standardize geofencing requests for privately operated TNCs and micromobility companies across the region.	G3
Need to work with business community to determine beneficial curbside uses, including access for people and goods, parklets, and curbside dining.	G4
Need to identify equitable mobility and accessibility improvements to be funded with curbside usage revenues.	G4
Need to reinvest revenues towards initiatives enhancing community placemaking and community identity.	G4
Need to develop a regional steering committee to explore new curb signage and markings with the goal to standardize policies across the region.	G6
Need to evaluate existing colored curb rules and regulations for operational utility.	G6
Need to align curb management plan with the city's and the region's goals.	G7

Curbside Management Needs	Goal
Need to identify potential partner public agencies and private mobility service providers and establish partnerships for information sharing opportunities.	G7
Need to develop a comprehensive, location-based inventory of curb spaces, connect existing curb usage data sources, and develop a process to keep this inventory up-to-date.	G7
Need to approach parking enforcement fairly and encourage compliance through positive customer-service techniques, such as utilizing a parking ambassador program at new curbside management sites.	G8
Need to prioritize enforcement of unsafe parking and stopping that prevent others' accessibility of the street and/or cause others to stop and change lanes to proceed.	G8
Need to pursue state legislation to expand automated and camera-based enforcement.	G8
Need to evaluate methods to prevent and/or quickly remove blockages (e.g., trash bins, vehicles, devices, debris) in the curb lane that present safety and operational challenges.	G8
Curb Space Allocation	
Need for passenger loading zones to be designed with ADA accessible standards.	G1
Need for specific paratransit-only loading locations.	G1
Need to prioritize accessible spaces for handicapped parking spots when reallocating curbside uses.	G1
Need to prioritize access of curb functions and payment platforms for all people, including those with disabilities, those who are unbanked or underbanked, and those who speak languages other than English.	G1
Need to consider time-of-day flexible curb space to accommodate commercial deliveries.	G3
Need to consider time-of-day flexible curb space to accommodate passenger loading.	G3
Need to consider pricing parking and loading and establishing time limits for parking and loading at urban and suburban commercial centers.	G4
Need to consider allocating spaces for shared micromobility stations and flexible fleets passenger loading zones.	G4
Need to plan for movement of motorized and non-motorized means of transportation within the street network prior to lower priority curbside functions.	G5
Need to align curb uses with improving the street network connectivity of pedestrians, micromobility users, and transit users, and ensuring that sidewalks, paths, micromobility lanes, and transit lanes are connected to destinations.	G5
Need to identify locations with frequent freight deliveries for businesses and work with business owners to encourage off-street loading or designating storefront curb space as flex zones for deliveries during appropriate times of day.	G7
Data-Driven Decision Making	
Need to provide data on loading zone availability, pricing, and reservations for commercial delivery vehicles.	G3
Need to analyze data on demand and productivity of curb space to determine allocation of curb space for dedicated loading.	G3

Curbside Management Needs	Goal
Need to develop a data-driven approach to allocate short-term parking, loading zones, bike corrals, and shared micromobility zones along the curb.	G7
Need to develop a demand monitoring process and to understand how the curb functions are satisfying users' needs.	G7
Need to identify data standards for curbside data collection.	G7
Need to identify available data that can provide curb usage insights, including transit alighting, shared bike/micromobility usage, TNC usage, parking meter payments, parking enforcement, permit requests, and others.	G7
Multi-Modal/Active Transportation	
Need to identify cross-jurisdictional transit corridors to dedicate lanes for mass transit.	G5
Need to identify and implement a regional network of safe bicycle lanes that can be used by all modes of micromobility.	G5
Technology and Innovations	
Need to provide location-based, real-time parking and loading zone availability data, including occupancy, pricing, and reservation status.	G2
Need to provide transit schedules and real-time transit arrivals at the curb.	G2
Need to provide a way to book, schedule, and pay for flexible fleets options at mobility hubs.	G2
Need to provide locations of ADA accessible curbside parking and loading zones.	G2
Need to allow customers to apply for or reserve special parking and loading permits.	G2
Need to identify technology that can be scalable and adaptable to all jurisdictions.	G2
Need to plan for consistent operating experiences for both agency- and customer-facing technologies.	G2
Need to identify locations with highly variable curbside demand and consider dynamic parking and loading pricing based on demand.	G4
Need to evaluate operational effectiveness and reliability of dynamic signage.	G6
Need to utilize technology to improve the accuracy and speed of parking enforcement.	G8
Need to evaluate and prioritize low-hanging fruit technologies for automated enforcement, such as bus only lane enforcement cameras onboard buses, mounted cameras at intersections, etc.	G8
Need to identify technology that assists with enforcement for use across the region.	G8
Traveler Information	
Need to simplify loading zone hours and signage to make them easier to communicate and enforce.	G6
Need to evaluate ways to communicate curbside rules, reservation status, and usage pricing, including signage, meters, and through mobile applications and websites.	G6
Need to communicate rules and regulations clearly.	G8

6 SYSTEM OVERVIEW

The system overview provides the high-level context of the potential architecture of a curbside management system, focusing on system and subsystem connections. Each agency may have its own goals, level of capability, and priority, and may not require all of the components and data connections presented in this section. Agencies should view these system descriptions as what could be included within their own system, rather than as a guide to what needs to be included in all systems.

6.1 Collect the Curbside Inventory

Collecting and maintaining curbside striping and use data provides planners and policymakers with a clear view of the current curbside space allocations. Collecting the initial data for the inventory will require Cities and the County to conduct a field curb inventory data collection of the curbs within their jurisdiction. It is also essential that the curbside inventory is regularly updated when rules and assets are changed along the curb. Updates to the curbside inventory should be part of the process whenever curbside assets are changed or maintained, and there should be clear guidance within the jurisdictional agency regarding who is responsible for updates, how the inventory is updated, and when it should be updated.

The curbside inventory should be map-based and include both the physical assets along the curb and the legal regulations that govern these curbs. Physical assets include curb paint, signage, parking meters, fire hydrants, and other curbside infrastructure used to communicate curb rules. Regulations are associated with these physical assets, such as usage restrictions, times of enforcement, and the jurisdiction that governs the curb at each segment.

A regional working group should be established to establish standards for the type and format of data to be collected and explore potential ways the region can work together to most cost-effectively complete the initial data collection. There are private companies that provide high-tech image processing technology to collect and process street imagery to extract curb regulations into the desired data format. There are also low-tech options to utilize field data collection tools to help with manual curb surveying, which can be time consuming but more accurate than the high-tech solution.

Some cities may also choose to expand curbside inventory data collection to include an inventory of the street network, including sidewalks, vehicle lanes, bus lanes, and micromobility lanes, allowing analysis of the street network connectivity for all modes.

6.2 Integrate Data and Payments into Next OS

Disparate data sources, including curb data, are envisioned to be integrated and shared through Next OS. Next OS is defined as a *digital platform* that will help transform the San Diego region's current transportation system into a world-class network. A digital platform is a set of technologies that are connected such that data can flow between separate systems, data analysis is performed, and actions can be taken based upon the data generated by each system. Businesses utilize technology in a digital platform to help create new products and services that benefit their customers.

The Next OS digital platform can assist San Diego region's curbside management operations by providing a data connectivity and integration point for various data sources to form connections. Then, the digital platform is a data

warehouse that can disseminate the data to those who need it. Data that can be helpful to collect and distribute to the public or commercial curb users include:

► Real-time inventory of curb striping and curb regulations, including flex zones (as described in 6.1 Curbside Inventory)

► Real-time commercial loading zone availability

► Real-time parking meter pricing

► Schedule of commercial loading zone reservation availability

► Transit stop locations and schedule

► Microtransit stop locations

► Micromobility corral locations

In addition, Next OS is envisioned to have payment platform capabilities, such that users can use the Next OS application to pay for mobility services. These payments at the curb may include:

► Payment or pre-payment of shared micromobility usage

► Payment or pre-payment of transit/microtransit

► Curbside parking meters

► Curbside loading meters and reservations

Other data connections can be used for planners and policymakers to examine curbside usage and curbside demand, such that they can perform regular reallocations of the curb space. Some of this data may be collected through data exchange connections with Next OS. Other data may be collected manually or sampled periodically. These data connections may include:

► Inventory of curb striping and curb regulations, including flex zones

► Commercial loading zone usage, dwell times, and pricing

► Parking meter pricing and payments, including dynamic pricing

► ADA accessible parking and loading zone usage

► Parking and loading zone usage

► Transit/microtransit boardings and alightings

► Micromobility travel and docking locations and times

► Number of improperly parked micromobility complaints or relocation by agency staff

► Enforcement data from parking enforcement staff

► Incidences of violations from automated transit lane enforcement cameras

► Number of people utilizing public space (proxy data from public parklet Wi-Fi connections)

► Number of applications for curbside dining and shopping permits from businesses

The data connections listed are not a comprehensive list of performance measures to be collected but is a sampling of potential methods to determine the productivity of the curb, the enhancement of safety for vulnerable road users, and the economic activity generated. Planners and policymakers should be looking towards the balance of the three foundational principles of curb management (as presented in **Figure 5**) in determining the

data to be measured and analyzed such that the curbside management strategies are furthering the agency's goals.

6.3 Process Payments and Reservations

Curbside payment meters that can accept cash, card, and digital transactions should be maintained for convenience and availability for those who are unbanked or do not regularly use smartphones. Digital payments for usage of the curb can be an additional method of payment, particularly for short-term curb users. Commercial curb users may participate in a program to add radio-frequency identification (RFID) tags to their vehicles such that the curbside payment meter can sense, scan, and automate payments for short-term loading scenarios. These users will need to connect a payment method to the platform such that deductions can occur automatically.

Additionally, for commercial curb users, there may be an online reservation platform to reserve and prepay for usage at commercial loading zones. This benefits commercial curb users, as they can preplan an efficient route for their delivery vehicles. In addition, commercial delivery vehicles typically budget for parking tickets due to lack of available loading curb space and perform dangerous double parking and parking in transit and micromobility lanes. Allowing for adequate curb space for commercial loading reduces delivery costs even while levying loading zone pricing and improves safety for all road users. An example of a type of commercial loading

Mobility hub trip planning kiosks may provide payment and reservation services to book or reserve flexible fleets, including ridesharing, ridehailing, shared micromobility, microtransit, and other public services. These kiosks should provide a method for cash transactions for fixed cost services.

6.4 Monitor System

The curb management system helps operators, planners, and policymakers monitor system performance. Data connections described in *6.2 Integrate Data and Payments into Next OS* provide regional and local staff with an understanding of the performance of the curb against the agencies' goals. Data collection and monitoring provides information on current curb usage and potential curb demand. This then determines necessary curb space reallocation projects along corridors or zones or changes in curb management strategies that are implemented in the area.

In addition, the curb management system should monitor for failures such as power and communications outages throughout the system, equipment failures, and debris or improperly stopped vehicles along the curbs. There should be a communications protocol, whether it be within the curb management system or some other aspect of Next OS, such that automatically detected failures and failures reported by the public or operations staff are addressed efficiently by maintenance, public works, and enforcement personnel. Individual curbside assets including kiosks, parking and loading zone payment meters, sensors, and any dynamic signage may require maintenance personnel to be on-call.

6.5 Communicate Rules

Travelers approaching or wishing to access the curb can receive information on its current allowable usage through various means. Traditional parking/loading signs and curb paint will continue to be in use, but agencies may need to designate new signing and curb striping regulations in the municipal code to accommodate for curb management strategies like flex zones, car share parking, electric vehicle charging, and new short-term loading zones. In addition, QR codes or other digital markings may be added to curbside signage such that users can scan and clearly understand the allowable usage in real-time. Future automated and connected vehicles may also rely on these digital markings.

Agencies may choose to invest in a mobile application tied to Next OS that can provide travelers with curb inventory, curb occupancy, and open curb space information. This may be connected to routing applications for commercial delivery companies, paratransit operators, and TNCs such that they can find open curb spaces relevant to their needs. Available applications should be designed such that they are multilingual.

At transit and mobility hubs, users will be able to pick the best mode of transportation for their needs. Transit stops may have kiosks or information signs that tell travelers the next bus schedule and available transit lines and routes. These signs may also provide special alerts in real-time to inform travelers of delays, route changes, incidents, and other alerts. An example of an implementation of this signage in Oregon by TriMet is shown in **Figure 16**. Kiosks in the San Diego region should be designed to be able to "speak" and give information to those who have visual impairments. Kiosks should also provide information in common languages used in the area.

Figure 16. Digital Bus Stop Signage

Source: Mass Transit Magazine. *TriMet awards Connectpoint five-year digital signage contract*

6.6 Enforce Rules

After determining the curb management strategies appropriate for communities within a jurisdiction and communicating the rules, Cities should determine effective enforcement and public education strategies to encourage the public to follow these rules.

Newly introduced concepts to an area such as paid parking/loading where parking/loading was previously free, flex zones where curb use was previously static, or transit-only lanes where there were only mixed flow lanes will require agencies to communicate to the public with an extensive public outreach campaign. New rules and systems (e.g., a new app-based commercial loading reservation system) can be difficult for people to adopt, and as such, ambassadors who help users navigate the rules can encourage more compliance than enforcement officers. Cities should plan to partner with traffic and parking enforcement personnel to prioritize enforcement of actions that harm safety and accessibility, such as double-parked vehicles, vehicles improperly stopped in transit-only or micromobility lanes, misuse of ADA accessible parking zones, and misuse of all types of loading zones.

Partnering with technology solution providers to provide curbside services can also assist with enforcement challenges. For example, curbside reservation platforms can be procured commercial-off-the-shelf and through public-private partnerships. These platforms can provide real-time curb space availability and allow commercial vehicle operators or the general public to reserve on-street curbside loading and parking spaces. In addition to this, these platforms may offer automated enforcement technology based on ALPR or other sensors at managed curb locations. If integrated into Next OS, customers who use Next OS may be notified when their paid parking meter time is almost up and can be encouraged to pay remotely through Next OS or move their vehicle. These platforms can be integrated with existing parking enforcement systems and notify officers of locations where vehicles are inappropriately parked or exceeds their reserved time.

Figure 17. Automated bus lane enforcement signage in New York City

Source: Traffic Technology Today. *New York City to install Siemens camera system for bus lane enforcement*

Automated enforcement technologies such as camera and ALPR based automatic ticketing may be explored by the regional working group to enforce transit-only lanes and curbside parking/loading. Automated bus lane enforcement has been implemented in New York City, with signage shown in **Figure 17**. Usage of these technologies may require state legislation.

6.7 Report and Analyze

Finally, reporting and analysis of the curb management program should be regularly performed at both the regional and local levels to measure performance against goals. Reporting of the following data sample can assist agencies with measuring the effectiveness of curb regulations and treatments in satisfying modal demands and improvement of community livability and economic vitality.

► Reduction in blocked bike lanes, transit-only lanes, and misuse of ADA accessible and general loading zones

► Improved loading zone utilization and turnover levels

► Improved transit reliability and transit ridership

► Improved average transit speeds

► Reduced incidences of drivers cruising for curbside parking

► Reduced congestion and pollution

► Reduced parking demand

► Improved access to destinations for people with disabilities

► Improved agency efficiency through streamlining data collection, analysis, and inventory updates

► Improved enforcement efficiency through implementation of technology

► Improved funding for streetscape, placemaking, and VRU safety infrastructure

► More greenery, bicycle parking, seating, and general "third spaces" available for communities to gather

► Fewer curb access related incidents or near-misses

► More sales at restaurants and retail stores

► More café and restaurant seating permits issued

Regular and transparent reporting of these measures within both regional and local agencies will assist in continuous improvement in refining the curb for equitable access and long-term responsiveness to new mobility patterns, travel preferences, and vehicle technologies.

6.8 High-Level Context Diagram

The diagram in **Figure 18** provides a graphical view of the context for the proposed curbside management system. Curb users can access the curb through many potential curb uses and mobility services described in this document. This diagram presents Next OS as a possible central clearinghouse for data collection and dissemination and for curb use payments and reservations. Next OS also powers the processes that agency administrators perform to manage the curb, maintain the curb, and reallocate space on the curb.
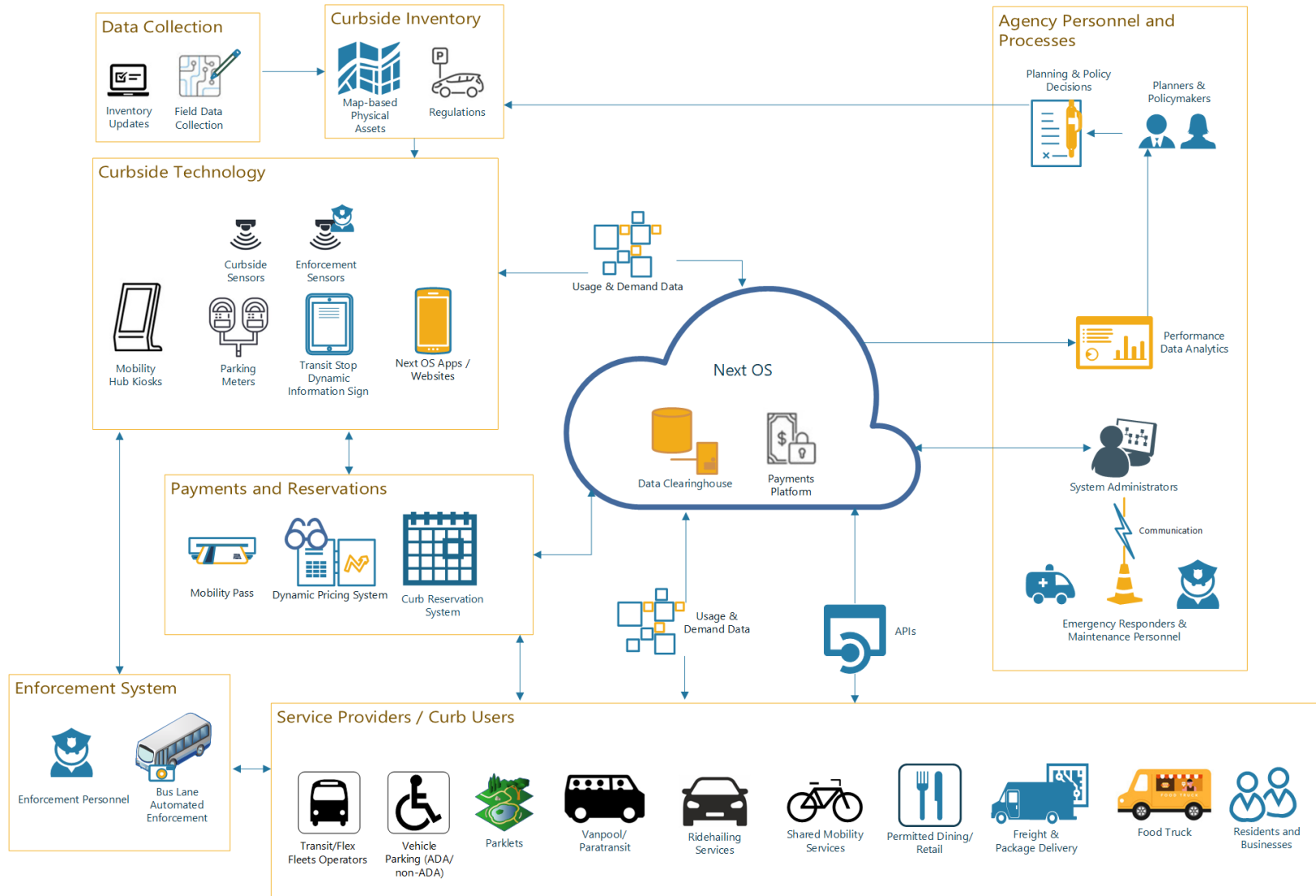
Figure 18. Curb management high-level context diagram

7 OPERATIONAL SCENARIOS

Operational scenarios are used to describe a variety of activities and events for the system from different users' perspectives. These stories help to describe the steps taken in the process, information exchanges, and user roles in order to inform the system definition in terms of functionality.

Each scenario is told in the format of a user story, showing how a potential user of the system moves in a complete trip. This is accompanied with a graphic to show the user's trip. In addition, the user stories correspond to system stories, which provide context for stakeholders to understand the "behind-the-scenes" actions that allow the user story to occur.

7.1 Commuter from Southeast San Diego to Sorrento Valley

Carla

Commutes from Southeast San Diego Mobility Hub to various Sorrento Valley tech companies

Occupation: Office cleaning services

Speaks Spanish, does not have a bank account/bank cards

User Story:

Carla lives with her family in southeast San Diego and works for a cleaning service, providing janitorial services in tech company office buildings in Sorrento Valley. A typical weekday for her consists of a bus trip to work after dropping her two children off at school in the morning.

 As an unbanked, Spanish speaking resident, she pays for her monthly bus pass using cash at a multi-lingual kiosk at the mobility hub near her home.

 Midday during the week, there is a dedicated bus pick-up/drop-off space at the Sorrento Valley Mobility Hub where she disembarks to get to work.

Three days a week her husband, Juan, who also works in Sorrento Valley (but a different shift) stays late to drive her home. Juan drives his own car as his wheelchair makes commuting by bus challenging. Dedicated accessible parking spaces at the curb in front of his office building help a lot. There are a lot of amenities that support travelers with disabilities like screen readers on the kiosks and pay stations, app-based mapping software that includes geolocated wheelchair ramps and accessible parking spaces.

On the other days, since her shift ends late at night, she prefers to take a rideshare home. At this time of day, some of the curb space that was dedicated to buses earlier in the day has now changed to a TNC pick-up/drop-off zone. Maria can tell when the curb has changed to a TNC zone by the dynamic message sign on the sidewalk (in English and Spanish) and by the color of the in pavement lighting. She could also tell through an app on her smart phone, but she doesn't really like to use the apps – for her, the phone is just for making phone calls and texting on occasion. She also picked up a flier that explained the curb space uses and what times of day and days of week she can expect to find different uses/services – it is consistent every week.

She really enjoys her Saturday commute as it is markedly different – much of the curb space near her home and in Sorrento Valley has transformed into recreational space. There is still dedicated space for buses and accessible spaces for drivers who are reliant on their cars, but now there are food trucks, outdoor dining, and a lot more flexible fleet micromobility options like scooters and bikes.
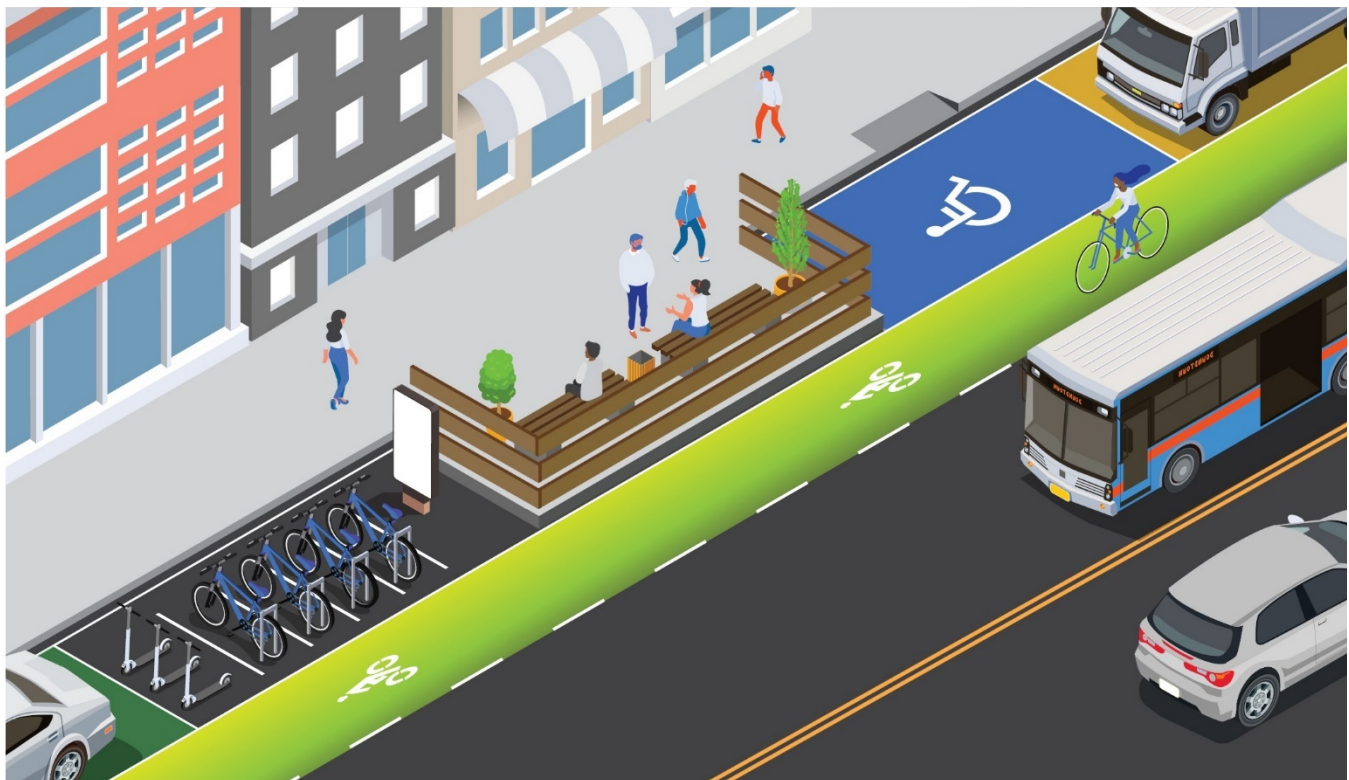
System Story:

Private flexible fleets services companies have an agreement with transit agencies and other government entities in the region to allow their vehicles and services to be rentable with a Next OS account. This allows unbanked people to utilize the services by paying with cash at the kiosks.

The curbside bus stop has seating, shade, and a real-time information display. The display is connected to the transit agency's real-time data application programming interface (API). Users can also find real-time and scheduled transit information through their Next OS application.

City of San Diego finds that there are many people commuting to the mobility hub and provides dedicated curb space nearby for flexible fleets services like shared micromobility, neighborhood electric vehicles, and ridehailing. Usage data is shared between service providers and the City to monitor demand for curb space and vehicles/services.

Planners and policymakers in the region partnered to identify locations to initiate flex zone operations. At the Sorrento Valley mobility hub, they recognized that transit services at night is used infrequently, so after 10 P.M., the bus zone transitions to a TNC pick-up/drop-off area.

The City of San Diego monitors the curb spaces that change automatically by time-of-day and day-of-week. City staff manages the curb spaces through a combination of curbside sensors, cameras, communication with curb users through Next OS, and communication with in-field enforcement and maintenance staff. This assists with smooth and safe transitions between curb uses.

If there are technology or other problems that would impact the ability of the system to transition to a new use, the personnel in the field would identify the problem (e.g., a stalled vehicle in the space that is meant to transition to a delivery vehicle drop-off zone) and communicate with other parties like the City TMC operators and third parties like towing companies to clear the hazard and maintain accurate communications on signs and the app/website.

The City of San Diego partners with business owners and the surrounding community of a commercial area in Southeast San Diego to reimagine the curbside street space. They come up with a plan to remove curbside parking spots on the weekend, implement a slow streets program, and provide outdoor dining, food trucks, open-air shopping, parklets, playspace, and seating instead of vehicle parking. Vendors and businesses agree to pay San Diego permit fees towards the use of the curb space. accessible spaces are maintained for ADA compliant access, including parking and loading areas. Transit stops are also maintained.

People are encouraged to walk, take micromobility and transit, or ridehail to the area, but parking is also available off-street. Micromobility and flexible fleets partners are notified of the recurring event and know to rebalance devices accordingly.

Public works and enforcement are reachable via Next OS or the Get It Done apps if there are vehicles illegally parked at the curb prior to the events. In addition, they can be reached at the conclusion of the event should there be any remaining furniture or debris.

7.2 University Setting

Marni

Lives in La Mesa and walks to the bus stop near her apartment to commute to San Diego State University.

Occupation: Student

User Story:

Many of the universities in the San Diego region are commuter colleges, meaning that the majority of students do not live on campus, but rather commute from locations around the region. The high cost and lack of availability of parking on campus naturally encourages the use of alternate modes like transit and rideshare. On campus, curb space prioritizes active modes like walking and micromobility by providing dedicated micromobility lanes and clearly marked pedestrian crossings. Where curbs are dedicated for pick-up and drop-off, buses and shuttles have the most desirable spaces followed by rideshare/general drop-off areas. In some places, parking is offered for drivers with disabilities and for very short term uses.

Marni is a college student at San Diego State University and gets around without a car. She lives in La Mesa and walks to the bus stop near her apartment to commute to campus.

On-campus, she usually walks or rents micromobility to get around. She is running late, so she opens Next OS on her phone to check if there are scooters available at the transit stop. As she approaches, she sees that there is only one available scooter left at the stop, so she reserves a scooter from the app, which gives her 5 minutes to start her ride. She takes the scooter in the micromobility lanes and as she approaches the building, the scooter enters a geofenced zone and slows down to 8 MPH. She parks the scooter at a dockless micromobility parking space at the curb, which gives her a small discount on her next ride.

On occasion, she uses the docked bikeshare system to go into downtown for lunch with her friends. The Next OS app lets her find available bikes and stations, map her route, and find an available docking station near her destination. It is helpful because the curb lanes downtown change uses throughout the day, and since she doesn't go often, she is less familiar with how it works.

A curb management subsystem outage in the region occurs, meaning that the subsystem that manages the curb space in the downtown area is no longer connected to Next OS. When Marni checks her app to plan her trip downtown, she receives an alert in Next OS that the application is undergoing maintenance. The app still provides her a map to get to her destination, but it does not have real-time docking station availability or other real-time curb use information. It provided a link to the bikeshare system's direct app and website to find a docking station and gave her general instructions to be aware of curb space uses to stay safe.

Marni uses the bikeshare kiosk instead of Next OS to check out a bike. Since she forgot to bring her mobility pass, which she could have tapped to check out a bike, she enters her Next OS passcode to use her account and check out a bike. She takes micromobility lanes to downtown and checks the bike into a station that she found through the bikeshare app.

System Story:

Next OS is integrated with real-time bus arrival information and with a trip planner.

Next OS is integrated with the scootershare providers in the area, which shows available scooters on the map and allows users to reserve and rent scooters. Micromobility companies operating within the region are required to allow agencies to geofence certain areas where scooter speeds are limited to 8 MPH for pedestrian safety. They must also provide incentives to users to encourage scooter parking in designated areas.

Docked bikeshare providers provide Next OS with real-time bike availability and bike docking space availability at each of their curbside stations. These stations typically do not move and are not placed in locations with flexible curb lane usage.

Cities monitor their own curb management platforms, which are integrated with Next OS. Curb management platforms store map-based curb inventory data that can be both updated automatically with curb sensors or updated manually by staff. This real-time data provides users with information on curb lane uses, including time-of-day changes for bus lanes, general purpose lanes, and micromobility lanes and other curb flex zone updates. Systems have a built-in outage monitor which sends designated operations and maintenance personnel alerts when outages occur.

The outage Marni experienced occurred in the communication between the curb management platform and Next OS. The operators worked with IT and maintenance staff through Next OS alerts management system, text, email, and phone communication to understand the source of the outage and get the system back up and running. The system also sent out alerts to transit, enforcement, and emergency response such that they are aware that they will need to monitor flex curb changeovers in case curb space is occupied by another use.

7.3 Next Gen Rapid through Urban Core to Pacific Beach

Jennifer

Lives in La Mesa. While she owns a car, she is on a tight budget and the cost of parking in Pacific Beach is prohibitive, she travels to the beach via Next Gen Rapid.

John

John is also a low income resident of the region, but he relies on his car due to a disability. John used Next OS to pre-register and reserve his parking space online in advance.

User Story:

Pacific Beach draws crowds of local residents and tourists to the beach, bay, and many recreational businesses in the area. The traditional drive and pay for parking model, has historically flooded neighborhoods with circulating cars, limited parking availability, and inequitably favored high income travelers due to the high cost of parking and limited/undesirable transit options. Next Gen *Rapid* will be serving Pacific Beach through two routes with connections to local bus lines and shared micromobility stations. New parking policies and curb management strategies promise to positively impact traffic, equity, and access for all visitors and residents.

Jennifer lives in La Mesa. While she owns a car, she is on a tight budget and the cost of parking in Pacific Beach is prohibitive.

The new Next Gen *Rapid* has a great solution that she and her family take advantage of when she has a day off from work. For a considerably lower cost, they take *Rapid* straight to the beach. For a portion of the ride, the bus travels on a lane reserved for transit only, which makes the ride much faster than it used to be.

On arrival, there is space dedicated to bus drop-off immediately adjacent to places to rent scooters and bikes. It makes it fun and easy to get to the beach quickly and then use the bikes to move around to restaurants or to just cruise around the Bay.

John is also a low-income resident of the region, but he relies on his car due to a disability. Luckily there is parking close to the beach that allows him priority due to his disabled placard. He notices upon arrival that these particular parking spaces are for short term use only (less than two hours) and that they convert to loading zones for deliveries to local businesses and restaurants.

In order to use the parking space, John used Next OS to pre-register and reserve his space online in advance. He could also have driven there and found a space without using the technology, but he knew this would be faster and more convenient.

System Story:

Due to the high parking demand on sunny weekends, the commercial area of Pacific Beach implemented dynamic priced parking. Users can check the prices of on-street parking meters in the area in real-time on the Next OS app. The City of San Diego partnered with a vendor to implement their dynamic pricing algorithm on smart meters in the area. As a part of the technology, priced parking spaces are equipped with sensors that can tell when a vehicle is parked in the spot. This also helps with enforcement. The system is connected to parking enforcement officers' handheld devices, which notify officers when there are vehicles parked improperly or unpaid meters.

Next Gen *Rapid* provides all day service in dedicated bus lanes 7 days a week. Next Gen *Rapid* buses are equipped with camera enforcement, which is a new system that was implemented with extensive public outreach and marketing. Drivers were notified that driving in bus lanes and blocking buses will earn them an automated ticket in the mail.

The bus stops at the beach are equipped with several amenities paid for by the nearby Pacific Beach dynamic pricing program. The parking meter payments pay for the parking program itself and also reinvested into the community's transit, walking, and micromobility infrastructure. Investments were made into bus shelters with shade, seating, and dynamic signage that shows the next bus arrival times. There are also shared micromobility options near these bus stops to help tourists and beach goers get around the area.

The City provides curbside ADA-only spaces to access the beaches and shops in Pacific Beach. These spaces are priced, just like regular spaces, but are typically available for people with disabilities to access parking close to where they need to go.

Next OS allows people to reserve curbside parking spaces in advance. The parking vendor provides sensors and cameras that match the license plate in the Next OS account of the user and the license plate of the vehicle actually parked in the reserved space. The parking meter is connected to the reservation system and notifies potential parkers of the reservation status of the space. However, if the vehicle does not show up within 5 minutes of its reservation start, the reservation is canceled, and the space is made available.

8 NEXT STEPS

The Curb Access Management ConOps provides a regional perspective on a locally implemented concept. The next steps for implementation of the ConOps includes activities at both the regional and the local level. A curbside management working group should be established to coordinate amongst jurisdictions to identify needs, establish priorities, make commitments, allocate resources, and evaluate performance. The structure can be a regional subcommittee hosted by any agency, but typically would be hosted by a regional MPO like SANDAG. This subcommittee or working group would be inclusive of all decision-making stakeholders of curbside management, including local jurisdictions' planners and policymakers, transit and paratransit operators, maintenance personnel, and other relevant stakeholders.

An action item for this working group should be to establish the relevant measures in the region that need to be assessed in a CMM, and then have each agency perform and share their CMM self-assessment as related to curb management. This action can produce opportunities for partnerships, learning, and priority-setting for all agencies in the region.

In addition, a data collection process should be established to provide data to the Next OS for location-based curbside management policies and infrastructure assets. This effort may focus on commercial areas that are more in need of active curbside management. This data collection process will build off the already established baseline from the Regional Parking Policy Inventory Study.

Local agencies will then utilize the working group and findings from the data collection efforts to establish their own curbside management policies with input from the working group. Agencies will use this ConOps as a guide for identification of appropriate strategies and needs for their specific communities. The regional working group will utilize this ConOps as a guide to build requirements for regional curbside management technology systems.