

Carlsbad Coastal Mobility Readiness Plan

DRAFT

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FOREWORD

It's easy to comprehend how important mobility is to the future of Carlsbad when you first understand how important our transportation history has been in shaping our city's past and present.

Since our beginning as a town in the 1880's, transportation has been constantly evolving, from walking and the horse and carriage, to the steam engine and rail, to the car, and to the Interstate Hwy system. Each evolution involved great changes in our land use and to how we connect and move around.

Most of our transportation infrastructure is concentrated along our coastline, including Interstate 5, Hwy 101 (Carlsbad Blvd.), the coastal rail trail, and the two NCTD Coaster Stations at Poinsettia and Carlsbad Village, thereby determining the focus of the Carlsbad Coastal Mobility Readiness Plan.

Changes in our transportation system are advancing rapidly with many new ways to move around such as car share, bike share, Uber, and the beginning phases of autonomous transportation technology, all appearing in the last few years. We can predictably envision a near future where computational power and the internet are entwined with the smart energy grid and transportation options that will result in new modes and less expensive choices in mobility as well as advances and improvements in our current mobility choices.

Are we ready for that future?

How we plan, how we implement and how we connect our transportation hubs with where people work, live and recreate, will have great importance to the future of our city and the quality of life enjoyed by our residents and visitors.

The Carlsbad Coastal Mobility Readiness Plan was developed to help our stakeholders and constituents envision a coastal transportation system that connects people, creates a sense of belonging, and closely links quality of life issues to economic growth. The report was designed as a blueprint for building the infrastructure to meet the mobility needs of our community, encourage healthy lifestyles, and support a vibrant downtown setting. Collaborative partnerships with our community will bring the following vision to life and is intended to guide Carlsbad's mobility and access decisions along the coast:

To create an innovative transportation future in which advanced information, new technologies and sustainable fuels support a vibrant community with seamless mobility options.

To attain this goal, it is important to improve existing transportation options while increasing viable mobility choices that provide many of the same advantages as personal vehicles. We will encourage people to share the ride and share the road by using an integrated transportation system that builds upon the "Park Once" strategies developed in the Village and Barrio Master Plan.

The transportation system along the coast is intended to become a vital part of the experience and allow residents and visitors to access more services and activities than would otherwise be available. It is intended to help solve last mile solutions connecting our two coastal Coaster Stations with work places and with our residents both along the coast and inland. Traveling along the coastline should link people of all ages, abilities, and backgrounds. The coastal corridor will showcase this innovative transportation future as envisioned in the following image.



The following three vignettes illustrate how the Carlsbad Coastal Mobility Readiness Plan builds upon the notion that people will have greater options to get to work, get to their homes, and how they will have a greater connection throughout coastal Carlsbad and the Village of Carlsbad for recreation and leisure. Two other descriptions showing the future possibilities of Carlsbad can be found at the end of the document in an Appendix.



“Ticket to Ride”

Say “hi” to **John**, a recent MBA graduate from USD, who lives in a condo in Little Italy with his wife Rita. They own one car and like to bike downtown to meet their friends for dinner before a Padres game.

John recently received a job offer from Revolution, an upstart internet company located in the new Carlsbad MAKE project site.

The idea of buying a second car and wasting unproductive hours commuting each day troubles John, and Rita is concerned they will have less time together.

John looks at the City of Carlsbad website and learns about the Travel Demand Management program that highlights a COASTER subsidy and new on-demand transit system linking the Poinsettia station to the MAKE campus.

John talks to his classmate that works at the new company and finds out employees use a fleet of bikes to go downtown for lunch each day.

John accepts the job offer after his new boss encourages John to productively work during his commute on the train so he can leave early each day.

A man and a woman are jogging on a beach. The man is on the left, wearing a light blue t-shirt and white shorts, smiling. The woman is on the right, wearing a grey tank top and white pants, also smiling. They are running towards the right side of the frame. The background shows the ocean and a clear blue sky.

“When I’m 64”

Meet **Bill and Lucy**. High school sweethearts, they have been married for over 40 years.

They bought their house on Oak Street in 1975, where they raised their daughter Michelle. They miss their three grandchildren and are considering selling their home to move into a retirement village close to Michelle’s family in Orange County.

Lucy decides to become more active and convinces Bill to start walking to dinner almost every night. As they begin walking more, they realize they no longer need two cars now that the neighborhood has a NEV loaner. They take the train to San Juan Capistrano every few weeks to visit the kids.

Their daughter Michelle can hardly believe her parents’ commitment to an active lifestyle, and begins taking the train down to the Village Station, which helps her to get over her reluctance to deal with the weekend traffic on I-5.

Once there, Bill and Lucy pick the troops up with bikes from the City’s bikeshare system, and they ride east, where three generations enjoy a day at LEGOLAND and end the day with dessert across the street at Strawberry Fields Forever.

As they take the Coastal Trolley back home to Oak Street, the youngest grandson asks Grampa to promise to never move.



“Here Comes the Sun”

These are **The Judes**. The family lives in Los Angeles. He has great memories of family trips to Carlsbad, circa 1974, where he and his brother would get dropped off by the beach and sit on their heavy wooden surfboard with a pile of beach stuff while their parents parked the car.

Dad likes to tell his kids the story about their last family trip when his father got really mad about the ticket he got for blocking someone’s driveway.

As the Jude family now approaches Carlsbad, Dad asks Mom to open the Park Once software on their iPhone to figure out the best way to enjoy their weekend trip. Mom reserves a space at the free parking lot and sends a message to their hotel to send the free shuttle to pick them up.

They unload luggage and get dropped off at the beach. The kids rent bikes and go for a trip down the coast after a day of surf, while Mom and Dad decide to take the Coastal Trolley to the Premium Outlets.

They all meet in the Village for dinner and enjoy a late movie before taking the shuttle back to the hotel.

As Dad makes reservations to come back next year, he laughs about the time his father got so upset looking for another place to park for dinner and seeing all that sand in the back seat of the car.



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EXECUTIVE SUMMARY

Transportation issues are at the forefront of many growing cities. As trends and technology change, so must transportation policies. The City of Carlsbad is working on a multi-modal corridor plan and technology assessment for Carlsbad Boulevard, also known as the Coastal Corridor.

To implement this project, attractive travel choices based on new technologies must provide residents and visitors with many of the same advantages as personal vehicles, while also reducing their *disadvantages*. The identification of multimodal transportation options will improve mobility along the coastal corridor by coordinating a wide range of attractive travel choices for residents and visitors. The coastal corridor will showcase this innovative transportation future based on the findings within this plan.

The Carlsbad Coastal Mobility Readiness Plan will help to guide and inform the development of a diverse transportation system. Its goal is to reimagine transportation investments and infrastructure in a way that better serves the city as it changes today and into the future. To do so, the plan needs to overcome the barriers to coastal access and surrounding neighborhoods, while striving to provide mobility choices in a more comprehensive fashion. In order for the plan to be successful, collaboration with partner agencies and private market innovation will be necessary. By developing realistic implementation strategies, Carlsbad can be confident in the achievement of their regional vision. Specific actions the City would need to undertake are identified at the end of the document in an Implementation Matrix. These actions include a variety of policy and infrastructure efforts over a 10-year period that would help to guide decision makers into the successful implementation of the Carlsbad Coastal Mobility Readiness Plan.

The City of Carlsbad wants to be a top-rated city in terms of innovative, yet realistic, transportation choices. This plan will convey these transportation choices in a way that is easily understood by decisions makers, city staff, stakeholders, and the general public. Transportation industry experts will continue to serve as a resource to the City and stakeholders, to aid in the development of the big elements and operational components of an innovative transportation future. The use of infographics in this report paints a clear picture of the opportunities and benefits the various modes of transportation evaluated in the study can provide.

The last decade has seen exponential growth in the variety of transportation technologies and strategies that are used daily by travelers. With this recent growth in transportation options, travelers will expect diversity in their travel modes. Understanding that the Coastal Corridor is primarily accessed by automobile, the City initiated an expansive survey of potential technologies and strategies – ranging from autonomous vehicles to smart-phone based valet parking - to enhance existing options and provide new transportation choices.



The opportunities listed below will work collectively to create a more resilient, robust, and connected community.

Mobility Hub & the “Park Once” Approach

- Mobility Hub – Mobility Hubs are more than a transit station. They co-locate several transportation options intended to connect the rail station to the greater community. These hubs can serve local residents commuting outbound to work, visitors enjoying the coastline, or employees traveling into Carlsbad for work. Two such potential mobility hubs have been identified at the Carlsbad Village Station and the Poinsettia Station.
 - Commuter Rail – The Amtrak Surfliner and NCTD Coaster connect Carlsbad by rail to communities outside the City. Focusing these stations to function as mobility hubs will address many of the first-mile/ last-mile limitations, which currently occur as transit riders are often unable to get to their final destination from the station. The Carlsbad Village Transit Station is the northern-most transit station in the city. It is located in the heart of the village and within walking distance of the coast. The Poinsettia Station is the southernmost transit station in the city located on Avenida Encinas,
 - Electric Vehicle (Charging Stations) – An electric vehicle (EV) is powered by an electric motor instead of a gasoline engine. Electric vehicles reduce air pollution and greenhouse gas emissions. Electric vehicles can also be cheaper to operate as they can be recharged instead of refueled with gasoline. Providing charging stations at key activity centers will encourage patrons to spend time in the community while charging their vehicle.
- “Park Once” – By placing buildings close to the center of a district, close to the street, and supplementing with other forms of transportation, people can walk/ride between different buildings, to or from transit stops, and around the village without having to move their cars.
 - Parking Management – Smart Parking refers to a suite of strategies that maximize parking utilization. Smart Parking focuses on sharing information regarding parking to limit needless vehicular circulation as people look for parking spaces. Smart Parking also includes strategies to maximize the use of available on-street and off-street spaces for public and private users. Previous studies have estimated that as much as 30 percent of all congestion in an urban environment is related to vehicle circulation and looking for parking spaces.

Mobility Connections

- Car Share – Carsharing is an alternative to personal vehicle ownership that grants drivers convenient and affordable access to a range of vehicles on an hourly or daily basis. The principle of carsharing is that individuals gain the benefits of private cars without the costs and responsibilities of ownership. Car sharing potentially allows persons to either add or reduce the number of vehicles they own or provide another mobility option for visitors who may only need a car for a limited period of time.



- Bike Share – Bike sharing programs are an innovative and relatively new concept designed to allow users free or relatively cheap alternatives to the automobile for short trips. Bike sharing involves the short-term rental of a bicycle to get between two points, typically in an urban area. The goal of bike share programs is to reduce traffic congestion, vehicular parking demands, noise pollution, air pollution, and the use of the automobile.
- Comfort Station – Comfort Stations along the coastal corridor provide opportunities for pedestrians and bicyclists to rest, get a drink of water or fill up a water bottle, and fix a flat tire. Ideally, these rest stops are shaded with seating, and provide a water fountain at minimum. Quarter- to a half-mile spacing along the corridor is recommended to accommodate both bicycles and pedestrians. At longer distance intervals, some stops may include a bathroom or other amenities.
- Trolley – A trolley refers to either fixed guideway or rubber tire vehicles that primarily service visitors within a localized area. Visitor-serving trolleys often travel at low speeds, making frequent stops to facilitate tourist travel. These vehicles are often traditional transit vehicles that have been rebranded to look like trolleys, though they retain the same operating components as regular transit buses. Trolleys can also be a significant amenity in a visitor oriented area and become an attraction by itself. The trolley should stop at the Mobility Hubs as well as key parking areas, hotels and other activity centers such as shopping. Regular stops along the coastline will also improve access to the beach.
- Various Technologies – Other transportation options that have proliferated in recent years that may have promise in the Coastal Corridor are Electric Bicycles (already being sold by corridor bike shops), Next Generation Valet, Next Generation Delivery Vehicles, Ridesharing Applications, Autonomous Cars, and Personal Mobility Devices. The plan looks into these technologies to determine their applicability for the Carlsbad region and its transportation network.

Table 1 below indicates the lead agency for each of the proposed mobility enhancing opportunities. The opportunities and the corresponding strategies needed to implement them are summarized on Figures 1 and 2.



TABLE 1: MOBILITY LEADERS

| Mobility Opportunity | Responsible Jurisdiction | Lead Agency and Key Stakeholder(s) |
|--------------------------------------|---------------------------------|---|
| Comfort Stations | City | State Parks Department |
| Mobility Hubs | City | SANDAG, NCTD |
| Parking Management | City | Merchants & Business Owners |
| Autonomous Vehicles | City | SANDAG |
| Electric Vehicle (Charging Stations) | City | SANDAG, CEC |
| Bike Sharing | SANDAG | City, Neighboring Cities |
| Trolley | City or Private Entity | SANDAG, NCTD |
| Car Share | Zipcar, other providers | City |
| Various Technologies | SANDAG | City, Service Providers |

Figure 1:

Coastal Mobility Readiness Plan



MOBILITY HUB

Mobility Hubs are "one stop shops" for transportation services. They co-locate several transportation options for a variety of users including local residents commuting outbound to work, visitors enjoying the coastline or employees traveling into Carlsbad for work. Mobility Hubs are places of connectivity that provide a wide range of mobility options including bicycling, transit connections (both public and private), car share and pedestrian connectors.



COMMUTER RAIL

The Amtrak Surfliner and NCTD Coaster connect Carlsbad by rail to communities outside the City. The Amtrak Surfliner provides limited stops at the Carlsbad Village Station and does not stop at Poinsettia Station. The NCTD Coaster stops at both Carlsbad stations. Converting these stations to mobility hubs will address many of the first-mile/last-mile limitations, which currently occur as transit riders are often unable to get to their final destination from the station.



VISITOR TROLLEY

A Visitor Trolley would travel along Carlsbad Boulevard connecting parking areas to key activity centers such as Carlsbad Village, the beach, activity points along the coastline, and even inland retail. The trolley should stop at the Mobility Hubs as well as key parking areas. Regular stops along the coastline will also improve access to the beach. To encourage ridership along the coastline and reduce boarding and alighting time, it is recommended that the trolley be provided free of charge.



BIKE SHARE

Bike sharing allows for short-term bicycle rentals to provide transportation from the Mobility Hubs and activity centers. Bike share is restricted to travelers 18 years of age and older, making it an infeasible form of transportation for families or younger riders. Therefore, placement of bike share stations should focus on connecting the Mobility Hubs to employment centers and activity centers. Bike share stations should be placed within a 30 minute bike ride of the nearest station.



CAR SHARE

Car share programs can take many forms, from traditional programs, to one-way pick up/drop off programs, to peer-to-peer programs. Each of these programs connect transit riders, visitors, and other persons needing a car for a limited time period to the community without the reliance of a personally owned automobile. Public parking areas, street parking spaces and car charging stations are key design elements that will need to be considered along the Coast to accommodate car share programs.



ELECTRIC VEHICLE

Vehicles with alternative fuel sources such as plug-in hybrids and electric vehicles are becoming increasingly common. Providing charging stations at key activity centers will encourage patrons to spend time in the community while charging their vehicle. Electric vehicles are also used by several car sharing operators, meaning that users of these vehicles will be able to charge them during their daily travels.

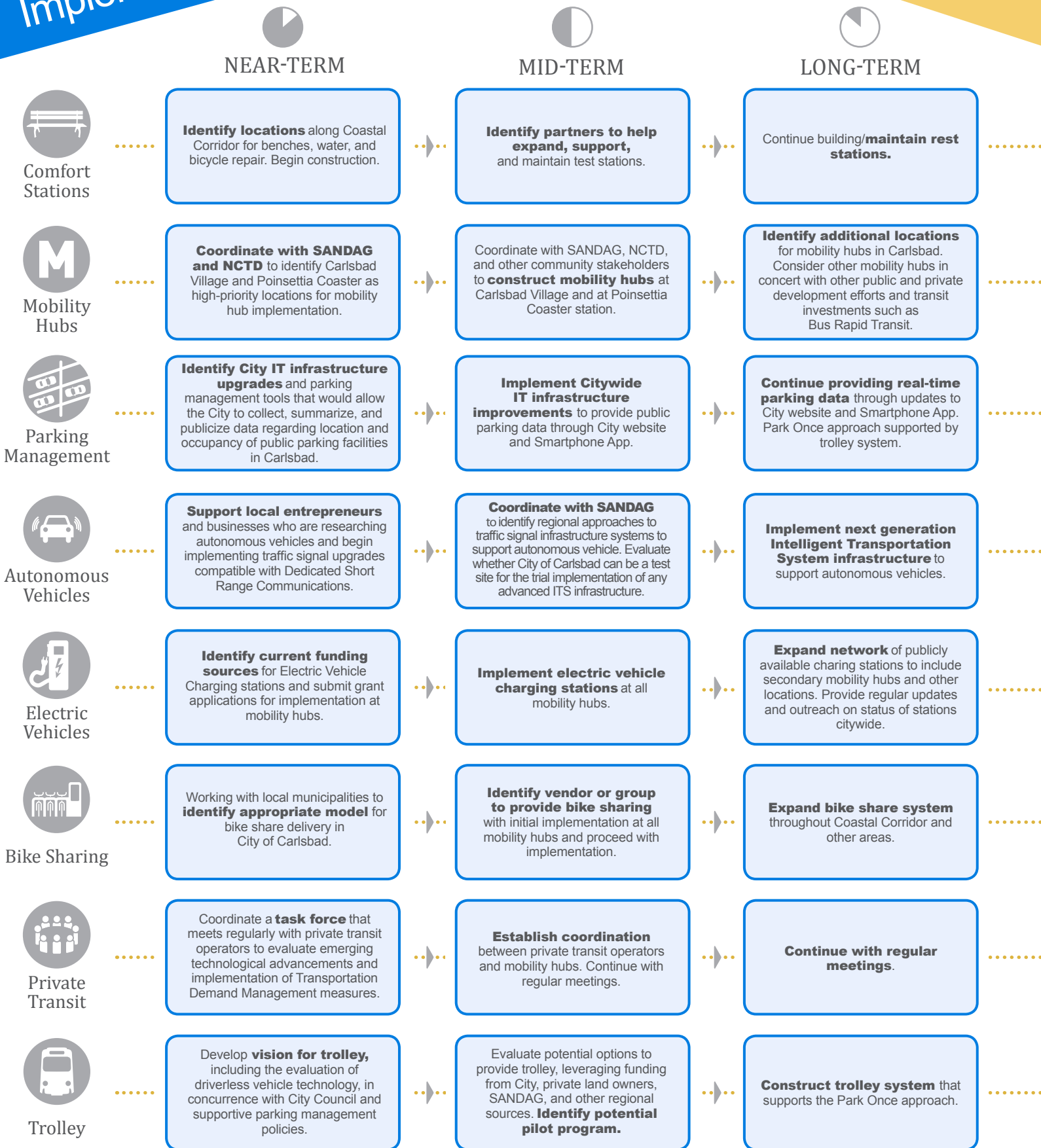


COMFORT STATION

Comfort Stations along the coastal corridor provide opportunities for pedestrians and bicyclists to rest, get a drink of water or fill up a water bottle, and fix a flat tire. Ideally, these rest stops will be shaded with a bench and water fountain at minimum. Quarter mile to 1/2 mile spacing along the corridor is recommended to accommodate both bicycles and pedestrians.

Carlsbad Implementation Matrix

Figure 2





INTRODUCTION

The Carlsbad Coastal Mobility Readiness Plan represents a blueprint for building the infrastructure to meet the growing mobility needs of our coastal community. It builds strategies that help define the city's proactive role in emerging technology, encourage healthy lifestyles, and support a vibrant downtown setting. This plan realizes the importance of sound resource allocation that ensures new mobility options are implemented in a way that maximizes chances for success. The City of Carlsbad will lead coastal transportation planning using a proactive approach that creates an environment where innovation is strategically implemented by intent. In some cases, this means the city will finance transportation infrastructure, while at other times it will simply support market driven ideas that serve our community's mobility needs.

The Foreword and Executive Summary have painted a high-level picture of what the Carlsbad of the future could look like if it embraces these new ideas and emerging trends in transportation. After the Introduction section, there is a chapter explaining how this plan is consistent with established policies found within other plans approved through Carlsbad's local government. The Carlsbad Coastal Mobility Readiness Plan builds upon the concepts identified in the established plans and introduces infrastructure strategies and action plans.

The Technology Review section identifies the thirteen different transportation technologies that each have the ability to improve access for all types of users of the Coastal Corridor. These overviews provide key takeaways about each transportation technology, indicate the various impacts of their benefits, and outline how each could fit within the existing and future context of the city.

The following chapter, Outreach Review, provides a summary of the outreach that was conducted to solicit input and educate the general community and stakeholders on the transportation options evaluated in the study. Several outreach activities were held over the course of year, each of which is summarized in the chapter.

The Implementation Recommendations identifies the specific actions the city can take to implement the recommended technologies of the Carlsbad Coastal Mobility Readiness Plan. In order to ensure the implementation of the Coastal Mobility Readiness Plan projects, there must be formalized processes in place and the chapter outlines the necessary tasks and responsible parties needed to help ensure implementation of the plan.



Lastly, the highest priority implementation actions are highlighted in the final chapter. These actions have been flagged as most important for the City of Carlsbad to consider in the near future. Such improvements could be supplemented through a variety of citywide initiatives.

An appendix containing the outreach materials from the public meetings has also been included at the end of the document.



CONSISTENCY WITH ESTABLISHED PLANS

The City of Carlsbad has already adopted several transportation plans that will help to support the programs and policies identified in the Coastal Mobility Readiness Plan. The City is organized in a way that almost a dozen divisions have some responsibility and input in street design and/or operations. The following paragraphs are a review of the transportation plans and policies that the city has adopted that affect transportation in the City of Carlsbad and an explanation of how the Coastal Mobility Readiness Plan relates to each of them.

- Carlsbad Active Transportation Strategy (2015) – As the community’s expectations, values, needs, and wants shift towards livable streets, an increase in Active Transportation facilities becomes necessary. This plan outlines core values shared by the Carlsbad community, which express a healthy lifestyle as being one of the most important things for current residents. To support this, **the City is enhancing trail connectivity and focusing on mobility for all modes of travel in the city.** This document assesses what the City is doing well related to the active transportation process and supporting infrastructure, but also identifies the gaps that exist in delivering successful projects. With the Coastal Mobility Readiness Plan including several active transportation modes as part of its overall network, this document will allow practitioners to build on strengths, identify common challenges, and avoid failure.
- City of Carlsbad General Plan Update (2015) – The former General Plan and associated Circulation Element was based on an auto-oriented approach to provide for our community’s transportation needs. The General Plan approved in 2015 includes a new Mobility Element approach based on Complete and Livable Streets concepts. This plan moves the city towards a more comprehensive approach to address the community’s mobility needs by providing safer access for all users, including pedestrians, cyclists, motorists and transit riders of all ages and abilities. It also **sets the stage for a park once approach that focuses on the first and last mile of travel as addressed in the Village/Barrio Master Plan.** A major change includes the use of new street typologies that evaluate different types of streets based on the users being served along the facility. This new version of the General Plan will provide great support to the Coastal Mobility Readiness Plan, as it encourages multimodal policies and the appropriate design elements that can best serve different modes based on the surroundings and context. The General Plan and Mobility Element are closely tied to the Climate Action Plan, with the inclusion of greater encouragement and dependence on alternative travel modes being a key element to achieving Climate Action Plan goals for Greenhouse Gas reductions.
- Bicycle Master Plan (2007) – The Carlsbad Bicycle Master Plan provides a blueprint for bicycle transportation and recreation in the City of Carlsbad, building on the 2004 Circulation Element. The plan enhances and expands the existing bikeway network, connects gaps, and encourages more residents to bicycle. It also has been designed to meet the requirements for funding from the California Bicycle Transportation Account (BTA) and other state and federal funding programs.



Because the Bicycle Master Plan serves to improve an alternative mode of transportation, it is consistent with Livable Streets implementation. It **provides support to the Coastal Mobility Plan by already laying out the groundwork for a bicycle network and providing recommendations for getting new infrastructure approved and funded.**

- Pedestrian Master Plan (2008) – This plan was created to guide the future development and enhancement of pedestrian facilities in the city to make walking a more prominent mode of transportation. As with the Bike Plan, this expands on the 2004 Circulation Element. The Plan identified priority projects based on a needs analysis. Projects included sidewalk infill, enhanced signage, signals and striping, and better linkages to trails. The plan also proposed education, implementation, enforcement, and funding programs. This Pedestrian Plan also provides a foundation for the Coastal Mobility Readiness Plan, as many of the target pedestrian improvement projects were for Carlsbad Boulevard, and **will help in creating the necessary linkages to the mobility hubs and beyond.**
- Climate Action Plan (2015) – The Climate Action Plan identifies a roadmap through which the City can reach greenhouse gas reduction goals identified in AB 32 and other documents. **One GHG mitigation strategy is the use of electric vehicles, which is a key component of this document.**
- Village and Barrio Master Plan – The City is preparing a Master Plan for the Village and Barrio neighborhoods. This plan **identifies specific initiatives the city can undertake related to parking management, increased pedestrian and bicycle mobility, opportunities for emerging and future technologies, accommodation of alternatives to private cars,** which were prepared in coordination with the CMRP.

The Carlsbad Coastal Mobility Readiness Plan will utilize these existing reports and policies to help guide and inform the development of a diverse transportation system. It will also explore how new transportation technologies will work in tandem with the network that already exists, in hopes of strengthening it for the future.



TECHNOLOGY REVIEW

The following are state of the art and emerging technologies that will change transportation and will improve access for all users of the Coastal Corridor.

TECHNOLOGY T-1: AUTONOMOUS VEHICLES

Key Takeaways

1. *Autonomous vehicles are no longer a futuristic idea.* Today, there are already vehicles equipped with automated features and driver assistance technologies on the road (e.g., collision avoidance systems, automated parallel parking, and adaptive cruise control). Connected vehicle research is a multimodal initiative that aims to enable safe, interoperable networked wireless communications among vehicles, the infrastructure, and passengers' personal communications devices. A connected vehicle environment requires a robust, underlying technological platform that can provide consistent, interoperable, and safe operations for all users. The US Department of Transportation manages connected vehicle technology under their Intelligent Transportation Systems Joint Program Office. Within the next five to ten years, "self-driving automation," where the driver can cede control of the vehicle in selected environments, will become more readily available. Autonomous vehicles can include both passenger cars with autonomous control systems or automated people movers. Cities should begin addressing potential infrastructure needs for autonomous and connected vehicles which could include additional equipment within existing traffic signal systems.
2. *Significant benefits to automation.* User productivity, safety, and time and cost savings are just a few of the compelling benefits to autonomous vehicles. Additionally, their deployment into the transportation system could foster the development of new social norms, behaviors, and business models.
3. *Barriers to automated vehicles remain significant.* Integration of self-driving automation into the transportation system is happening now and there are still many regulatory and liability related questions left unanswered. Currently, there are minimal policies, laws, or codes of practice to guide the regulation of autonomous vehicles. Thus, we are at a crucial timeframe to seriously work with the State and Federal government to integrate autonomous vehicles into both policymaking and planning efforts for due diligence purposes and to develop good policies, mitigate downsides, and maximize benefits.

| T-1: Autonomous Vehicles Measures of Effectiveness | Low | Medium | High |
|--|-----|--------|------|
| Vehicle Miles Traveled (VMT) reduction | X | | |
| Vehicle trip reduction | X | | |
| Benefit to mobility challenged persons | | | X |
| Reduction in traffic congestion | | X | |
| Reduction in collisions | | X | |
| Improvement in visitor mobility | | X | |
| Improvement in resident/employee mobility | | X | |
| Air quality improvement | X | | |



| | |
|--|--|
| IMPORTANCE | The deployment of “driverless” or fully autonomous vehicles will transform the transportation landscape. This innovation presents new opportunities, such as improving the mobility of unlicensed individuals (i.e., the young, the underprivileged, and the disabled). Although there are compelling benefits, autonomous vehicles will also present challenges, which includes job displacement and privacy issues. As autonomous vehicles become less of a farfetched idea and more of a reality, cities and public agencies need to lay the groundwork to accommodate this technology. |
| NEAR-TERM FORECASTS (0-5 YEARS) | <ul style="list-style-type: none"> • 2018: Google cars with limited self-driving automation are set to be available • Industry standards related to autonomous vehicles will be clarified and developed • Car companies (e.g., BMW, Mercedes, Tesla, and Ford) have already released or are soon to release vehicles with many self-driving features |
| MID-TERM FORECASTS (5-10 YEARS) | <ul style="list-style-type: none"> • 2020: Most Level 3 autonomous vehicles (where the driver can fully relinquish control of all safety-critical functions in certain conditions) commercially available will be high-end luxury models in which a consumer is paying a substantial premium • 2020: Autonomous vehicles may be 1-2% of all vehicle sales, representing a fraction of the total vehicle fleet |



| | |
|--|--|
| | <ul style="list-style-type: none"> • 2025: Mercedes Benz to release the autonomous truck, which could revolutionize freight logistics and goods movement • Increase in mobile retailers and services that come to the consumer |
| <p>LONG-TERM FORECASTS (10+ YEARS)</p> | <ul style="list-style-type: none"> • 2026/2027: Autonomous vehicle/commercial vehicle “tipping point” will be reached • 2026/2027: Autonomous vehicles make-up 10-20% of cars on the road • 2035: Autonomous vehicles might represent 25% of all new vehicle sales and 15-20% of the overall vehicle fleet • Transition period could be a very problematic time for driving as drivers will be interacting with driverless cars • Private vehicle ownership moves towards transportation as a shared service via new transportation models (i.e., shared automated taxis) • Increased on-demand services and mobility for non-licensed individuals could cause more congestion unless the average vehicle occupancy also increases • Even in the most optimistic long-term scenario, 80-90% of the vehicle fleet will lack any significant level of autonomy, as such, we would expect autonomous vehicles to have a limited effect on transportation • There may be some noticeable improvements in overall traffic flow within very congested corridors should autonomous vehicles reach critical mass • Overall, long-term commercial success of these vehicles will be dependent on the experience of first generation owners • If ever the auto fleet becomes 100% autonomous and predominately self-driving, cities may be able to reconsider many of their car-oriented land uses |
| <p>CARLSBAD CONTEXT</p> | <p>Government</p> <ul style="list-style-type: none"> • Should include autonomous vehicle technology into goals and objectives outlined in the City’s long range and transportation planning documents • Should look for grant funding opportunities related to the testing and integration of autonomous vehicles into the local transportation system • Regardless of what actions the City makes to encourage adoption, it is hard to predict at this time whether these vehicles will become commonplace or be a niche transportation option <p>Infrastructure</p> <ul style="list-style-type: none"> • Mode shift, safer roadways, and decreased congestion with autonomous vehicles could change the needs for future road construction projects • As autonomous vehicles become more widely available in the context of shared rides, some infrastructure (e.g., an autonomous taxi station) may be needed |



- Since autonomous vehicles spatially orient themselves by identifying lane lines, the City may need to increase the frequency they paint/maintain their road striping
- Vehicle safety applications that use vehicle to vehicle (V2V) and vehicle to infrastructure (V2I) communications need secure, wireless interface dependability in extreme weather conditions with short time delays
- Anonymous information from electronic sensors in vehicles and devices can be transmitted to provide better traffic and travel condition information to travelers and transportation managers

Locals

- Carlsbad residents are relatively affluent and may choose to purchase these cars at higher levels than other areas
- As current residents age, they likely will prioritize the benefits of autonomous vehicles which can extend the time during which they are able safely to drive themselves

Commuters

- Autonomous vehicles have the potential to increase the commute-shed for employment centers
- Commuters who want to live in Carlsbad but maintain their jobs in other areas (e.g., LA, OC, and San Diego) could choose to purchase an autonomous car
- Commuters can start their work and/or multi-task during their drive to work
- A subscription based, on-demand autonomous car service would complement transit by offering transit users a great last-mile solution

Visitors & Non-drivers

- Shared autonomous vehicle services would allow both non-drivers and visitors in Carlsbad to effectively travel around the City

TECHNOLOGY T-2: ELECTRIC VEHICLES

Key Takeaways

1. *A growing market.* Electric vehicle ownership has continued to grow with the help of technology improvements and a variety of more affordable vehicle models being offered. Additionally, vehicle electrification has gone multi-modal with the deployment of electric buses and electric two- and three-wheelers.
2. *Significant eco-benefits to electric vehicles.* Electric vehicles produce no tailpipe emissions, reduce our dependency on oil, and tap into an energy source that is both domestic and relatively inexpensive. Such benefits have become even more desirable through increasing and volatile oil prices, deteriorating urban air quality, and growing climate change concerns.
3. *A mix of Incentives.* There is a mix of financial (e.g., energy rebates and State and county tax-credits) and non-financial incentives (e.g., access to restricted highway lanes and reserved, preferential parking) available to consumers who invest in electric vehicles.

| T-2: Electric Vehicles Measures of Effectiveness | Low | Medium | High |
|---|-----|--------|------|
| VMT reduction | X | | |
| Vehicle trip reduction | X | | |
| Benefit to mobility challenged persons | X | | |
| Reduction in traffic congestion | X | | |
| Reduction in collisions | X | | |
| Improvement in visitor mobility | | X | |
| Improvement in resident/employee mobility | | X | |
| Air quality improvement | | | X |





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| <p>IMPORTANCE</p> | <p>An electric vehicle is powered exclusively by electricity via an electric motor instead of a gasoline engine. Thus, this type of sustainable transportation represents one of the most promising solutions to increasing energy security and to reducing emission of greenhouse gases and other pollutants. Over the recent years there has been strong government support coupled with increased R&D for electric vehicle and charging infrastructure deployment, further contributing to rising market penetration of this form of clean transport.</p> |
| <p>NEAR-TERM FORECASTS (0-5 YEARS)</p> | <ul style="list-style-type: none"> • 2014: U.S holds the largest fleet of plug-in electric vehicles with 43% of global sales • 2014: CA accounts for about 40% of electric cars (100,000 units) sold in the U.S. • 2014: 23 highway legal plug-in cars available in the U.S. from 12 car companies • Increased infrastructure, fiscal, and research, development and demonstration spending to help electric vehicles reach full market potential and deployment targets • Increased electric vehicle car sharing services in cities (e.g., car2go) |
| <p>MID-TERM FORECASTS (5-10 YEARS)</p> | <ul style="list-style-type: none"> • 2020: At least 25% of CA's state vehicle fleet purchases of light-duty vehicles will be zero emission vehicles (ZEVs) • 2023: Global market share to grow from 2.7 million electric vehicles to 6.4 electric million vehicles • 2023: Charge Ahead California campaign set a goal to have at least 1 million ZEVs or near-ZEVs in CA • 2025: 35% of all cars sold will be electric, 25% will be plug-in hybrids, and 10% pure electric vehicles • Technology improvements (e.g., battery technology) will allow electric vehicles to become more affordable and mainstream |
| <p>LONG-TERM FORECASTS (10+ YEARS)</p> | <ul style="list-style-type: none"> • 2035: At least 5 million cars and light trucks will be powered by electricity • 2050: Greenhouse gas emissions from the transportation sector will be 80% less than 1990 levels • Electric vehicles will increasingly go beyond cars (e.g., military applications, two-wheelers, buses heavy forklifts, and hybrid-electric power trains) • Electric vehicles will reduce environmental impacts of congestion, but will have minimal effect on reducing congestion |



**CARLSBAD
CONTEXT**

Government

- City of Carlsbad's "Environmental Guiding Principles" incorporates electric vehicles to enable the community to design energy saving features into projects
- Can help facilitate electric vehicle supply equipment (EVSE) deployment in multi-family dwellings by amending building codes and laws to mandate EVSE capability in all new construction
- Develop parking and ADA policies as applied to electric vehicle charging stations
- Develop agreements with power companies/public utilities for EV charging stations
- Regardless of what actions the City makes to encourage usage, these vehicles will either become commonplace or be a niche transportation option

Infrastructure

- Energy needs to be readily available to power electric vehicles, which could mean modifications to create a smart grid system
- Increase access to electric charging stations with supporting wayfinding signage
- Employers should consider providing access to EVSE or workplace charging stations
- Preferential parking spaces for electric vehicles in public areas

Commuters

- An electric vehicle owner has a variety of monetary incentives they can cash in on
- Mean travel time for Carlsbad residents is about 45 minutes
- Commuters who want to cut down their commute time might invest in an electric vehicle so that they can drive in the HOV lane even with single vehicle occupancy

Locals, Visitors, & Non-drivers

- Electric vehicles would have minimal direct effects to non-electric vehicle owners, with the exception that increased zero tailpipe emissions would provide cleaner air

TECHNOLOGY T-3: BIKE SHARING

Key Takeaways

1. *Effective mode for short trips.* Bike sharing programs are designed to allow users free or relatively cheap alternatives to the automobile for short trips.
2. *Improves connectivity.* A shared bike service makes spontaneous and planned urban trips possible by bike and can be an ideal counterpart to transit trips as it provides first mile and last mile connections.
3. *Significant benefits to bike share.* Bike Sharing programs can contribute to reduced traffic congestion, reduced use of fossil fuels, reduced pressures on motor vehicle parking supply, and an increased use of transit and other single occupant vehicle alternatives. Bike sharing also offers environmental, social, economic and public health benefits.

| T-3: Bike Sharing Measures of Effectiveness | Low | Medium | High |
|--|-----|--------|------|
| VMT reduction | X | | |
| Vehicle trip reduction | X | | |
| Benefit to mobility challenged persons | X | | |
| Reduction in traffic congestion | X | | |
| Reduction in collisions | X | | |
| Improvement in visitor mobility | | | X |
| Improvement in resident/employee mobility | | X | |
| Air quality improvement | X | | |





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| <p>IMPORTANCE</p> | <p>Bike sharing involves the short-term rental of a bicycle to get between two points, typically in an urban area. The programs are designed to provide fast and easy access for commute-type trips and differ from leisure-oriented rental services generally found in popular tourist areas.</p> |
| <p>NEAR-TERM FORECASTS (0-5 YEARS)</p> | <ul style="list-style-type: none"> • 2014: U.S. hosts 41 modern bike-sharing programs • 2015: With a number of upcoming, new programs and planned expansions of existing programs, the U.S. fleet is set to total over 39,000 bicycles • The current & upcoming systems being deployed in the U.S. are the information technology (IT)-based, automated kiosk bike share systems |
| <p>MID-TERM & LONG-TERM FORECASTS (5+ YEARS)</p> | <ul style="list-style-type: none"> • Future “Fourth Generation” bike sharing programs will be a demand-responsive, station-less system; these systems place all the security and checkout infrastructure on the bike, so there is no formal location from which the bikes are dispatched or returned • More cities, universities, and employers will adopt a bike share program especially as other transportation technologies (e.g., car sharing) continue to emerge that will complement bike share trips • Improved bicycle-related infrastructure to complement the increased bike usage • The viability of bike share programs are dependent on the financial success of current programs, as well as corporate sponsorship and government funding |
| <p>CARLSBAD CONTEXT</p> | <p>Government</p> <ul style="list-style-type: none"> • Implementation of a citywide bike share system with an appropriate business model that would fall in line with the City’s comprehensive active transportation strategy and complete streets objectives • Host or sponsor bicycle education programs and safety awareness campaigns targeting unsafe motorist and bicyclist behavior • Since Carlsbad currently forbids bicycle riding on sidewalks the Municipal Code could be modified to allow riding bicycles on sidewalks, or could encourage the construction of more-bike friendly street networks |



Infrastructure

- Strategically located bike stations or storage/locking locations near Mobility Hubs, key origins/destinations, and near existing and planned bicycle facilities
- Stations may include the following elements: automatic docks that lock the bikes in place, an electronic payment kiosk, and signage for maps
- To better suit the cycling influx, investment in a comprehensive bike network and increased road maintenance is needed

Commuters

- Good regional transit connections, including buses, Amtrak, and the NCTD Coaster, provide opportunities for travelers to leave their cars behind and use a combination of bike share and other transit for in-town travel

Locals, Visitors, & Non-drivers

- Will expand the mobility of locals, visitors, & non-drivers
- Bike share users may need to participate in a form of bike education class
- Increase economic activity in central business districts

TECHNOLOGY T-4: CAR SHARING

Key Takeaways

1. *Reduces personal vehicle ownership.* Car sharing grants drivers convenient and affordable access to a range of vehicles on an hourly or daily basis. The principle of car sharing is that individuals gain the benefits of private cars without the costs and responsibilities of ownership.
2. *Context matters.* Car sharing is most successful in an area with high density, a mix of land uses, good transit access, and already-low vehicle ownership levels. In suburban areas, the situation gets less effective, since a car-share user might park the car somewhere without a new user nearby to pick it up.
3. *Significant benefits to Car share.* Car sharing brings social, environmental and economic benefits, by helping to reduce dependence on the private automobile. These include reduced conflict over parking, reduced air and water pollution, and an increase in transit and other alternative modes of travel.

| T-4: Car Sharing Measures of Effectiveness | Low | Medium | High |
|---|-----|--------|------|
| VMT reduction | X | | |
| Vehicle trip reduction | X | | |
| Benefit to mobility challenged persons | X | | |
| Reduction in traffic congestion | X | | |
| Reduction in collisions | X | | |
| Improvement in visitor mobility | | X | |
| Improvement in resident/employee mobility | | X | |
| Air quality improvement | X | | |





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| <p>IMPORTANCE</p> | <p>Car sharing reduces car ownership and changes driving habits. Each car-share vehicle is used by numerous people rather than the traditional model of one car serving one person or household. Because one car-share vehicle is accessed by many people, there are participant cost savings as car sharing spreads the attached costs of monthly payments, gasoline, maintenance, parking, and insurance among several people.</p> |
| <p>NEAR-TERM FORECASTS (0-5 YEARS)</p> | <ul style="list-style-type: none"> • Currently, the worldwide car sharing market encompasses several million customers with fleets that consists of tens of thousands of vehicles • 2014: 23 U.S. operators' claimed 1,337,803 members shared 19,115 vehicles • 2020: Worldwide membership in car sharing programs are expected to grow to more than 12 million with a projected revenue of \$6.2 billion • 2020: City CarShare in San Francisco hopes to reduce traffic by removing 20,000 cars from Bay Area roads • A half million vehicle purchases in the U.S have been avoided due to the growing popularity of car sharing programs like Zipcar |
| <p>MID-TERM & LONG-TERM FORECASTS (5+ YEARS)</p> | <ul style="list-style-type: none"> • 2025: Forecasted that increased growth in car sharing worldwide could replace an additional 1.2 million purchases of new vehicles • About 25 years from now it is predicted that only half of the U.S. households will own more than one vehicle, down from current rates |
| <p>CARLSBAD CONTEXT</p> | <p>Government</p> <ul style="list-style-type: none"> • Implementation of a citywide car share system with an appropriate business model (e.g., peer to peer, business to consumer, and/or not-for-profit or co-op) • To help car sharing break into the suburban commuter market, the City and/or local and regional transit agencies can form a partnership with a suburban car sharing service <p>Infrastructure</p> <ul style="list-style-type: none"> • Cars of various sizes are kept in small parking lots or designated street parking spots • If the car-sharing program uses electric vehicles, charging stations are required at the vehicle parking stall |



- Car sharing barriers for Carlsbad is finding visible and affordable well-located parking, and the existing land-use patterns that favor the private automobile
- A successful car sharing program will tip the scales so less parking infrastructure and road expansions will be needed

Commuters

- Good regional transit connections, including buses, Amtrak, and the NCTD Coaster, provide opportunities for travelers to leave their cars behind and use a combination of car share and other transit for in-town travel

Locals, Visitors, & Non-drivers

- They are attractive to customers who make occasional use of a vehicle, as well as others who would like occasional access to a vehicle of a different type than they use day-to-day
- It should be noted that car sharing is still likely to have limited effect on overall mobility for residents of Carlsbad as it is not a highly dense city and has high private vehicle ownership

TECHNOLOGY T-5: ELECTRIC BIKES

Key Takeaways

1. *Need to change the U.S. perception.* In the U.S., electric bikes are far less utilized compared to other parts of the world due to Americans being very car-centric for transportation. Being one of the smallest, lightest vehicles on the road has led to a perception of the electric bike as unacceptably unsafe. Additionally, most Americans see cycling as a form of recreation and only as an effective form of transport in places where parking and traffic congestion are problems.
2. *To gain greater mode share, promotion is crucial.* The most important steps to achieving more electric bike mode share are probably to lower the initial cost, continue promoting and providing infrastructure for conventional bicycling, and possibly increasing awareness of e-bikes existence and potential benefits.
3. *Significant benefits of electric bikes.* Electric bikes are intended to make cycling commutes more inviting by easing worries about hills, headwinds, and fatigue. E-bikes goals are to reduce greenhouse gas emissions, air pollution, and traffic congestion.

| T-5: Electric Bikes Measures of Effectiveness | Low | Medium | High |
|--|-----|--------|------|
| VMT reduction | X | | |
| Vehicle trip reduction | | X | |
| Benefit to mobility challenged persons | X | | |
| Reduction in traffic congestion | X | | |
| Reduction in collisions | X | | |
| Improvement in visitor mobility | X | | |
| Improvement in resident/employee mobility | X | | |
| Air quality improvement | X | | |





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| <p>IMPORTANCE</p> | <p>An electric bicycle is a bicycle with an integrated electric motor which can be used for propulsion. Electric bikes use rechargeable batteries and the lighter varieties can travel up to 16 to 28 mph. Thus, electric bikes make cycling based commutes easier.</p> |
| <p>NEAR-TERM FORECASTS (0-5 YEARS)</p> | <ul style="list-style-type: none"> Worldwide, electric bikes outsell electric cars by a wide margin and sales are high in China and Europe 2013: U.S. sales reached 185,000 bikes Smart, Ford, and General Motors are already or will be selling pedal-assist electric bikes in their U.S. car dealerships 2018: projected U.S. bicycle sales of 350,000 Increased sale numbers in the U.S. Some of the world's biggest electric bike manufactures will break into the U.S. market |
| <p>MID-TERM & LONG-TERM FORECASTS (5+ YEARS)</p> | <ul style="list-style-type: none"> Electric bikes are expected to continue with an upward trend as business with car dealers increase As cost for electric bicycles falls, demand increases, especially in aging populations Within the next 20 years, the number of electric bike sales could be as high as 2 million in the U.S. |
| <p>CARLSBAD CONTEXT</p> | <p>Infrastructure</p> <ul style="list-style-type: none"> Electric bicycles can use the existing/planned bicycle infrastructure, but if they travel faster than 20 mph, they are not allowed on Class I bike paths <p>Commuters</p> <ul style="list-style-type: none"> The majority of residents own one or more cars and few are willing to trade in the luxury of owning a vehicle for an electric bike <p>Locals & Visitors</p> <ul style="list-style-type: none"> Electric bikes are anticipated to have little impact to mobility as biking is predominately perceived as a recreational activity Among the sport cyclists, a major purpose of cycling is to get a good workout, and e-bikes destroy the workout |



Non-drivers

- Users of electric bicycles can travel up to 16 to 28 mph through the propulsion of an electric motor and can increase their commuting distance and the difficulty of the terrain they travel



TECHNOLOGY T-6: NEIGHBORHOOD ELECTRIC VEHICLES (NEVS)

Key Takeaways

1. *Not your typical electric vehicle.* Neighborhood electric vehicles (NEVs) are a form of alternative travel, but differ from electric cars in that they lack typical automobile amenities and are considerably cheaper. In particular, NEVs are intended for low speed operation and are therefore limited to either lower speed roadways (35 MPH or less) or dedicated pathways.
2. *Selected market.* NEVs have been heavily promoted for the past 10 years and have not been purchased in significant numbers. Given the current market for NEVs and the likely evolution of the market based on existing trends, NEVs will continue to be a niche vehicle for the foreseeable future. NEV's will have a limited effect on personal mobility outside of select users (e.g., institutions, master planned communities, business parks, downtown, retail centers).

| T-6: Neighborhood Electric Vehicles (NEVs) Measures of Effectiveness | Low | Medium | High |
|---|-----|--------|------|
| VMT reduction | X | | |
| Vehicle trip reduction | X | | |
| Benefit to mobility challenged persons | | X | |
| Reduction in traffic congestion | X | | |
| Reduction in collisions | X | | |
| Improvement in visitor mobility | | X | |
| Improvement in resident/employee mobility | | X | |
| Air quality improvement | X | | |





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| <p>IMPORTANCE</p> | <p>NEVs are low speed electric vehicles designed for localized circulation. NEVs typically are limited to speeds of 35 miles per hour or less. NEVs are commonly used within Master Planned Communities, universities, campuses, and other areas to serve short distance trips. Many of these users also employ NEVs for delivery and service purposes.</p> |
| <p>NEAR-TERM FORECASTS (0-5 YEARS)</p> | <ul style="list-style-type: none"> • 2012: About 500,000 NEVs in operation worldwide • 2012: Approximately 15,000 to 20,000 NEVs were in operation in the U.S. • One of the primary manufacturers of NEVs is GEM, which is owned by Polaris • Traditional car companies, such as Mitsubishi and Chrysler, offer NEV type vehicles • There are a limited number of Master Planned Communities, such as Rancho Mission Viejo, where NEV's may be widely deployed to facilitate internal travel within the community in the next 5 years |
| <p>MID-TERM & LONG-TERM FORECASTS (5+ YEARS)</p> | <ul style="list-style-type: none"> • The U.S. Army is going to lease a significant number of NEV's for security and delivery purposes within the next several years • The likely market for NEV's in the next 10 years may show some improvement, but there is not likely to be a significant increase in their sales and usage • Some manufactures will provide NEVs with more amenities • Absent a significant event outside current market trends, NEVs will struggle for market share against other electric vehicles and ride sharing |
| <p>CARLSBAD CONTEXT</p> | <p>Government</p> <ul style="list-style-type: none"> • Carlsbad could adopt a NEV Master Plan, which would allow more roadways to be accessible to NEVs • Look for opportunities for future Master Planned Communities to integrate NEVs <p>Infrastructure</p> <ul style="list-style-type: none"> • NEVs require charging stations, which may be unique to NEVs and unsuitable for other types of electric vehicles • NEVs can use public streets if the posted speed limit is 35 mph or less • Providing connectivity for NEVs could require the construction of dedicated trails and lanes on existing roadways to maximize their usage |



Commuters, Locals, Visitors, & Non-drivers

- NEV's are likely to have little effect on mobility in Carlsbad unless there is a significant public sector or private sector effort to incentivize their ownership and use

TECHNOLOGY T-7: TRANSIT VEHICLES

Key Takeaways

- 1) *Multiple transit vehicle forms.* Transit vehicles are designed to transport people between two points and come in the following forms:
 - a. A bus is a road vehicle designed to carry many passengers that travel on designated routes around the jurisdiction.
 - b. A shuttle train is a train that travels back and forth between two points and offers frequent stops over a short route.
 - c. A Bus Rapid Transit (BRT) system is an innovative, high-capacity, lower-cost public transit solution that can achieve the performance and benefits of a light rail.
- 2) *Significant benefits with transit vehicles.* Transit vehicles improve the mobility of users and support regional economic development by improving transit access to key employment sites and activity centers.

| T-7: Transit Vehicles Measures of Effectiveness | Low | Medium | High |
|--|-----|--------|------|
| VMT reduction | X | | |
| Vehicle trip reduction | X | | |
| Benefit to mobility challenged persons | | X | |
| Reduction in traffic congestion | | X | |
| Reduction in collisions | X | | |
| Improvement in visitor mobility | | X | |
| Improvement in resident/employee mobility | X | | |
| Air quality improvement | | X | |



IMPORTANCE

Transit vehicles are designed to transport people between two points. A public transportation system operating at frequent short intervals, mostly on non-stop routes between two places, includes buses and shuttle trains. For transit vehicles to



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| | <p>gain ridership, this form of public transportation must demonstrate time-saving over other modes, as well as cost-effectiveness.</p> |
| <p>NEAR-TERM FORECASTS (0-5 YEARS)</p> | <ul style="list-style-type: none"> • 2009: Bus service in CA accounted for the largest part of transit service • 2012: 10.5 billion trips on public transportation in the U.S. • 2014: North County Transit District (NCTD) recorded nearly 12.6 million train and bus trips • Amtrak ridership has grown more than 40% in the last 10 years • Increased BRT lines in U.S. cities |
| <p>MID-TERM & LONG-TERM FORECASTS (5+ YEARS)</p> | <ul style="list-style-type: none"> • As more people move away from using vehicles, transit will be a popular mode of transportation, especially BRT • Jurisdictions will need to expand transit options to unlock new opportunities for growth while achieving key environmental, health, and equity goals • In the next 25 years, America's highway system will be replaced in large part by a crisscrossing network of passenger rail lines and transit vehicle services |
| <p>CARLSBAD CONTEXT</p> | <p>Government</p> <ul style="list-style-type: none"> • BRT could possibly address many problems in congested corridors and help create Complete Streets in Carlsbad by implementing strong transit and pedestrian elements in connection with existing roads • BRT in Carlsbad could be planned to connect with the San Diego MTS BRT, which could improve connection from North County to the City of San Diego and benefit mobility for Carlsbad residents • The City and public transit agencies will need to work towards securing a high level of awareness and understanding of BRT among stakeholders to encourage implementation and ridership • Working with communities to identify their transit needs and keeping them involved at every step of the process are the keys to community acceptance <p>Infrastructure</p> <ul style="list-style-type: none"> • Buses can use existing roadways or general traffic lanes can be converted into a busway • ITS system to provide traffic signal priority for buses at selected intersections • Improved bus fleet, passenger stations, and shelters equipped with appropriate amenities <p>Commuters, Locals, Visitors, & Non-drivers</p> <ul style="list-style-type: none"> • Though BRT will take street space from cars and give it to buses, it can possibly change the commuting habits of patrons in Carlsbad |



- BRT can significantly improve transit service and will make taking the bus a lot more convenient and thus increase ridership
- Use of transit vehicles also promote non-motorized trips (i.e., people walking or biking down the street to get to transit stations)

TECHNOLOGY T-8: TROLLEYS

Key Takeaways

- 1) *Visitor-serving transportation.* For the purpose of this study, a trolley refers to either fixed guideway or rubber tire vehicle that primarily serves visitors within a localized area. These vehicles travel at lower speeds and make frequent stops to facilitate tourist travel.
- 2) *Viability is challenging.* Some cities have deployed systems and then discontinued service when ridership did not meet expectations or economic challenges arose. In order to create a sustainable trolley system, a thorough planning and feasibility study will need to be prepared to verify optimal routes and stops, to project ridership, and to identify financial issues. Once a system is implemented it will need to be operated and maintained appropriately.

| T-8: Trolleys Measures of Effectiveness | Low | Medium | High |
|--|-----|--------|------|
| VMT reduction | | X | |
| Vehicle trip reduction | | X | |
| Benefit to mobility challenged persons | X | | |
| Reduction in traffic congestion | | X | |
| Reduction in collisions | X | | |
| Improvement in visitor mobility | | X | |
| Improvement in resident/employee mobility | X | | |
| Air quality improvement | X | | |



IMPORTANCE

Trolleys are an important part of mobility services for select cities which have the resources to operate these types of systems. They are essentially community amenities which are highly valued when successful.



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| <p>NEAR-TERM FORECASTS (0-5 YEARS)</p> | <ul style="list-style-type: none"> • A number of Southern California communities offer a visitor serving trolley system with one of the primary examples being Laguna Beach’s expansive system • 2015: Dana Point proposing to add trolley service • Due to limited funding opportunities, it is expected that there would be a small number of upcoming implementation in communities • Majority of future trolley systems would likely be rubber tired as opposed to fixed guideway given the cost differential between the types of systems |
| <p>MID-TERM & LONG-TERM FORECASTS (5+ YEARS)</p> | <ul style="list-style-type: none"> • Future trolley systems deployed would be either powered by electric, CNG, or other non-gasoline engines • 2025-2035: Trolley systems could use autonomous vehicles, which would decrease annual O&M costs and further incentivize additional implementation |
| <p>CARLSBAD CONTEXT</p> | <p>Government</p> <ul style="list-style-type: none"> • Implementation of a visitor-serving trolley system where the City partners with the private sector and contracts for vehicles, operations, and maintenance to a vendor who collects revenues from riders and also supplemental operation funds from the City • Carlsbad would need to hire a consulting firm to conduct a thorough feasibility study to verify routes for the trolley, the potential ridership, and the likely financial issues and appropriate mitigation to identified issues <p>Infrastructure</p> <ul style="list-style-type: none"> • Trolleys can operate using rubber tire vehicles or a fixed guideway • Trolley stations or stops would need signs, shelters, and/or benches • Space to store and maintain the trolley vehicles, which could take place at an existing City facility or a new dedicated facility • A fixed-guideway trolley would require significant additional investment in the form of tracks, power sources, etc. <p>Visitors</p> <ul style="list-style-type: none"> • A visitor oriented trolley represents a significant opportunity for Carlsbad to improve mobility for the high-level of visitors during the summer and peak holiday seasons • A successful trolley would also require frequent service with an eye towards connecting key destinations and other transit modes (e.g., a trolley system could run through Carlsbad Village and the beach areas) |



- A successful trolley can also become a key attraction in Carlsbad

Commuters, Locals, & Non-drivers

- Trolleys would have minimal direct effects to commuters, locals, and non-drivers

TECHNOLOGY T-9: NEXT GENERATION DELIVERY VEHICLES

Key Takeaways

1. *A local delivery option.* Next generation vehicles offer another delivery option for smaller businesses and is effective in dense urban areas where there are a lot of physical constraints.
2. *Limited market demand.* Absent outside influences, the market for these vehicles is likely to remain limited except in areas with significant physical constraints. A primary limiting factor is the use of large personal vehicles (i.e., SUVs, mini-vans, etc.) that fulfill the same need.

| T-9: Next Generation Delivery Vehicles Measures of Effectiveness | Low | Medium | High |
|---|-----|--------|------|
| VMT reduction | X | | |
| Vehicle trip reduction | X | | |
| Benefit to mobility challenged persons | X | | |
| Reduction in traffic congestion | X | | |
| Reduction in collisions | X | | |
| Improvement in visitor mobility | X | | |
| Improvement in resident/employee mobility | X | | |
| Air quality improvement | X | | |



IMPORTANCE

Most delivery vehicles are larger trucks such as those used by UPS or Fed Ex. In more dense urban areas, smaller van sized vehicles are becoming increasingly common given their lower cost, smaller size, and greater suitability for smaller businesses. These next generation delivery vehicles are typically used for local deliveries, such as floral and food deliveries.



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| <p>NEAR-TERM FORECASTS (0-5 YEARS)</p> | <ul style="list-style-type: none"> • 2010: Ford started selling the Transit Connect in the U.S. • Nissan NV 200 has been more recently introduced to the U.S. market • Limited market demand unless a major current delivery company, such as Fed Ex, UPS, or the Post Office, will transition their current fleet to these type of vehicles • Viable in areas with significant physical constraints |
| <p>MID-TERM & LONG-TERM FORECASTS (5+ YEARS)</p> | <ul style="list-style-type: none"> • Most likely the current model of delivery will dominate and there will be continued limited market demand • There may be a greater use of these vehicles in the near-future as their size, convenience, and cost become apparent to potential users • Small businesses might use next generation delivery vehicles over mini-vans and SUVs • Deployment and success of these vehicles will need significant private and public sector intervention |
| <p>CARLSBAD CONTEXT</p> | <p>Government</p> <ul style="list-style-type: none"> • The City could alter the allowable designs for loading areas and loading docks, which would in turn encourage adoption of these types of vehicles <p>Infrastructure</p> <ul style="list-style-type: none"> • Carlsbad Village is one potential location where these smaller vehicles could be broadly deployed, given the physical limitations of the existing roadways <p>Visitors, Commuters, Locals, & Non-drivers</p> <ul style="list-style-type: none"> • Next generation delivery vehicles have minimal to no direct effects to visitors, commuters, locals, and non-drivers |

TECHNOLOGY T-10: PERSONAL MOBILITY DEVICES (I.E., SEGWAYS)

Key Takeaways

1. *Segways top the list.* The most commonly used personal mobile device is a Segway.
2. *Three primary user types.* There are three primary users of Segways: persons who use them for personal travel, agencies who use Segways for police and other emergency services, and visitors who are on a Segway tour or want to use an alternative mode instead of a bicycle to tour an area.
3. *Cost and gaining mode share is a challenge.* A new Segway may cost upwards of \$5,000 to \$8,000, depending on the version purchased. That price point greatly exceeds that of a bicycle and approaches the cost of an NEV. Given their current cost, Segways are less desirable than bicycles since they provide similar levels of mobility on short distance trips. Segways also compete poorly with cars and NEVs on medium distance trips due to a lack of amenities.

| T-10: Personal Mobility Devices Measures of Effectiveness | Low | Medium | High |
|--|-----|--------|------|
| VMT reduction | X | | |
| Vehicle trip reduction | X | | |
| Benefit to mobility challenged persons | X | | |
| Reduction in traffic congestion | X | | |
| Reduction in collisions | X | | |
| Improvement in visitor mobility | | X | |
| Improvement in resident/employee mobility | X | | |
| Air quality improvement | X | | |



IMPORTANCE

The Segway is a two-wheeled, self-balancing, battery-powered mobility device that relies on a driver shifting their weight to go forward or backward. It is a good eco-friendly alternative for short distance travel. Additionally, this small, portable mobile



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| | <p>device can be parked and stored anywhere and would not require a garage or standard parking space to park it.</p> |
| <p>NEAR-TERM FORECASTS (0-5 YEARS)</p> | <ul style="list-style-type: none"> • Segways were first sold in 2001 and had sold less than 30,000 units worldwide in the first 10 years of sales, thus a significant increase in the number of persons using Segways or other similar vehicles within the next 5 years is highly unlikely • Institutional users are likely to continue to purchase Segways, though there is likely to be significant competition from electric bicycles and small NEVs |
| <p>MID-TERM & LONG-TERM FORECASTS (5+ YEARS)</p> | <ul style="list-style-type: none"> • Based on current trends and behavior patterns, a significant increase in the number of persons buying and using Segways within the next 10, or even 20 years is unlikely • Segways may be supplemented or displaced by a similar technology • For many people Segways will be a novelty rather than a preferred mode of transportation, outside of agency and institutional users who need a vehicle like a Segway |
| <p>CARLSBAD CONTEXT</p> | <p>Government</p> <ul style="list-style-type: none"> • The City could evaluate whether a private vendor (similar to bike share) could come in to provide short-term Segway rental <p>Infrastructure</p> <ul style="list-style-type: none"> • Segways do not require dedicated infrastructure and can use sidewalks and bicycle lanes in lower speed environments • Segways also perform best in areas with curb cuts at intersections and ramps <p>Locals, Commuters, Visitors, & Non-drivers</p> <ul style="list-style-type: none"> • The use of Segways are unlikely to have any noticeable effect on the overall transportation system • While Segways are not likely to be widely used by residents of Carlsbad, they could be used for visitor serving enterprises (e.g., hotels could provide Segways to their guests while other companies could organize Segway tours) |

TECHNOLOGY T-11: SMART PARKING

Key Takeaways

1. *Parking management > parking supply.* Parking management is in many ways more important than parking supply. For example, available spaces are of little use if they are “invisible” to motorists. Thus, smart parking coupled with management strategies can be implemented to mitigate parking impacts and to improve perceptions of parking availability.
2. *A suite of strategies.* Smart parking refers to a variety of strategies that maximize parking utilization. Specific measures included in smart parking include informational signage, parking space optimization, real-time occupancy data, apps, and pricing strategies. For many cities, there is a significant benefit by optimizing the use of existing on-street and off-street spaces. This approach could include allowing leasing of private spaces for public parking, closing unused driveways, restriping red curbs to create additional on-street parking, and other similar efforts.
3. *It needs to be a layered strategy.* The success of effectively managing parking relies on a layered strategy of smart parking technologies, travel options, and wayfinding programs that geographically and temporally distribute demand to facilities that can adequately provide the supply.

| T-11: Smart Parking Measures of Effectiveness | Low | Medium | High |
|--|-----|--------|------|
| VMT reduction | | | X |
| Vehicle trip reduction | | X | |
| Benefit to mobility challenged persons | X | | |
| Reduction in traffic congestion | | | X |
| Reduction in collisions | X | | |
| Improvement in visitor mobility | | X | |
| Improvement in resident/employee mobility | | X | |
| Air quality improvement | | X | |





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| <p>IMPORTANCE</p> | <p>Smart Parking better manages parking demand and has the potential to reduce overall demand by ensuring that all available parking is fully utilized.</p> |
| <p>NEAR-TERM FORECASTS (0-5 YEARS)</p> | <ul style="list-style-type: none"> • Real-time informational signage will be more widely deployed, as the cost of smart parking technologies such as sensors decrease over time • Continued use, improvement, and development of Smart Phone parking apps • More cities will transition to providing the information in real-time as is the case in San Francisco and Santa Monica |
| <p>MID-TERM FORECASTS (5-10 YEARS)</p> | <ul style="list-style-type: none"> • Informational parking strategies may become ubiquitous • Drivers will expect that smart parking is readily available and may object if they are unable to access the information easily • Sufficient parking for businesses • Drivers will continue to dislike paying for parking • More leased parking facilities |
| <p>LONG-TERM FORECASTS (10+ YEARS)</p> | <ul style="list-style-type: none"> • Increased privatization of parking infrastructure where cities choose to sub-contract out the construction, maintenance, and operation of parking facilities • Rise of mechanical parking systems (MPS) or automated parking systems (APS) which utilize machines, lifts, elevators, or other mechanical devices to transport vehicles to and from parking spaces and eliminates much of the space wasted in a multi-story parking garage • If full-scale privatization were to occur, then we would expect the use of aggressive pricing and implementation strategies to maximize investment |
| <p>CARLSBAD CONTEXT</p> | <p>Government</p> <ul style="list-style-type: none"> • Commission a detailed Parking Management Study that provides roadmap towards the level of smart parking needed in specific areas, more detailed timelines, and implementation actions • Smart parking will help the City limit the need to add parking associated with development and redevelopment • Partnership with an intelligent parking system service provider, which will provide the City access to a parking supply/demand database, a management portal that provides real-time information of parking conditions and offers a variety of applications to help manage assets and optimize enforcement activities, and the ability for the City to publish real- |



time parking information and easily reach motorists online, via mobile devices, and/or external message signs

- Implementation of dynamic pricing at public parking facilities and meters, which would require the City to add some mechanism to collect funds (e.g., pay stations or centralized locations where everyone pays for their parking space)
- Formation of a traffic and parking management team composed of property managers, tenants, parking managers, parking enforcement, event organizers, City staff, and other local entities (as applicable)
- Coordination and collaboration among these key stakeholders is essential in ensuring that parking facilities are operating in an efficient manner, especially during peak periods and major events

Infrastructure

- Install parking sensors at public facilities that link to signage and/or a mobile application to provide real-time parking availability updates
- Changeable messages signs outside of any public parking facilities that would be linked to some sensors in the parking areas
- Deployment of smart meters and/or electronic pay stations to help with dynamic pricing
- Public parking awareness program which includes public advisory messages and media alerts, along with use of social media (Twitter, Facebook, etc.), the City website, parking websites or mobile apps (e.g., ParkMe, Parkopedia) and the 511 transportation information program

Commuters & Non-drivers

- Smart Parking would have minimal direct effects to commuters and non-drivers

Locals & Visitors

- Through smart parking technology in combination with better wayfinding and a supplemental Smart Phone app, finding a parking space will become more of a positive experience for drivers as all these technologies will help efficiently navigate patrons to parking facilities with available supply
- In areas with high parking demand (i.e., Carlsbad Village and the beach areas), finding a parking space will become more streamlined with the implementation of such technology

TECHNOLOGY T-12: NEXT GENERATION VALET SERVICES

Key Takeaways

1. *Non-traditional valet.* Next generation valet services combine elements of Uber and other similar Smart Phone Apps with traditional valet service. Under this new strategy, a person arrives at their destination and uses their smart phone to request a valet, who travels to the customer's vehicle and then takes the car to park. Thus, unlike traditional valet service, they are not tied to a particular use or geographic location.
2. *Limited benefits & unintended consequences.* From a macro-perspective, the benefits of this strategy may be limited in that there is no reduction in vehicle trips and limited reduction in VMT, which mostly occurs through limiting cars circulating looking for parking spaces. Wide-scale deployment of this technology could result in a reduction in transit trips, since parking limits can be used to promote transit usage.

| T-12: Next Generation Valet Services Measures of Effectiveness | Low | Medium | High |
|---|-----|--------|------|
| VMT reduction | X | | |
| Vehicle trip reduction | X | | |
| Benefit to mobility challenged persons | X | | |
| Reduction in traffic congestion | X | | |
| Reduction in collisions | X | | |
| Improvement in visitor mobility | | X | |
| Improvement in resident/employee mobility | | X | |
| Air quality improvement | X | | |





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| <p>IMPORTANCE</p> | <p>Under this new strategy, a person arrives at their destination and uses their smart phone to request a valet, who travels to the customer's vehicle using a scooter, bicycle, or other similar form of conveyance. The valet then takes the car and parks it at an off-site location. When the customer has concluded their activity (dining, shopping, etc.), they notify the valet service via the same Smart Phone application. The valet then returns the car to the original owner. Overall, such a service can be very effective towards improving the user experience for persons wishing to park (assuming that the cost of this service is comparable to the cost of parking pricing).</p> |
| <p>NEAR-TERM FORECASTS (0-5 YEARS)</p> | <ul style="list-style-type: none"> • Current vendors (e.g., Luxe Valet, Zirx) operate in Seattle, San Francisco, and Los Angeles and have high ratings from users • Demand for these services to be robust, especially within dense urbanized areas • Expansion to more suburbanized areas is unlikely • Existing vendors to expand their services geographically |
| <p>MID-TERM & LONG-TERM FORECASTS (5+ YEARS)</p> | <ul style="list-style-type: none"> • Service expansion is dependent on the demand side (customers) and the supply side (valets) • Success outside of large dense cities is unknown since it is unclear if there will be a sufficient pool of both customers and persons willing to work as valets • Expansion into other urban cities, particularly in the mid-west and east-coast • Within the next 20 years, it is possible that service could expand to mid-size cities |
| <p>CARLSBAD CONTEXT</p> | <p>Government</p> <ul style="list-style-type: none"> • One significant limiting factor will be the availability of free parking. The success of this service relies on providing a high level of convenience at prices similar to market rate parking charges • If cities continue to provide low cost or free parking which is readily accessible, then the application of this service will be limited outside of current markets • Without parking charges and other restrictions, then it is likely that vendors providing this service will find little incentive to operate within Carlsbad • Implement strategies to price parking at market rates, reduce the availability of free parking, and then also limit additional parking provided either in public or private lots |



Visitors, Commuters, Locals, & Non-drivers

- It is doubtful that we would see widespread deployment of this strategy in Carlsbad within the foreseeable future absent widespread implementation of parking charges
- Thus, next generation valet will have minimal to no direct effects to visitors, commuters, locals, and non-drivers

TECHNOLOGY T-13: RIDESHARING APP

Key Takeaways

1. *AKA Transportation Network Companies.* Transportation Network Companies (TNCs) provide decentralized ridesharing through applications on a Smart Phone.
2. *Barriers to Overcome.* One significant issue is the competition with traditional taxi companies. Another challenge is how best to regulate these services with several agencies banning their use either in limited circumstances (airports) or on a citywide basis.
3. *Unintended Consequences.* Ridesharing services have the potential to transform the transportation system, though the end result is likely to be a zero-sum game in terms of transportation metrics. Any VMT and congestion benefits accruing with the use of these services could be offset by the additional VMT associated with drivers circulating around looking for passengers. These services also have the potential to affect other shared ride travel modes and could reduce transit ridership in selected areas.

| T-13: Ridesharing App Measures of Effectiveness | Low | Medium | High |
|---|-----|--------|------|
| VMT reduction | X | | |
| Vehicle trip reduction | X | | |
| Benefit to mobility challenged persons | | X | |
| Reduction in traffic congestion | X | | |
| Reduction in collisions | X | | |
| Improvement in visitor mobility | | X | |
| Improvement in resident/employee mobility | X | | |
| Air quality improvement | X | | |





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| <p>IMPORTANCE</p> | <p>Ridesharing has always occurred either through formal or informal means. The recent innovations applies Smart Phone based applications, which have elevated ridesharing's use and acceptance by the general population. Uber, Lyft and others report heavy use within urbanized areas, though exact numbers of patrons and customers are closely held.</p> |
| <p>NEAR-TERM FORECASTS (0-5 YEARS)</p> | <ul style="list-style-type: none"> • Ridesharing services will continue to grow in usage and acceptance, assuming that existing legal and regulatory barriers are overcome |
| <p>MID-TERM FORECASTS (5-10 YEARS)</p> | <ul style="list-style-type: none"> • Continued service expansion within larger urban areas • Increased use outside of urban areas, assuming drivers are available • Services may be viable alternatives to other types of transportation such as transit, para-transit, and vanpools |
| <p>LONG-TERM FORECASTS (10+ YEARS)</p> | <ul style="list-style-type: none"> • Within the 20-year horizon, we expect that ride sharing services will be widespread and one of the main travel modes within select areas • Taxis are likely to disappear or significantly change their operating procedures to deal with the competition • These ride sharing services may be transformative in that they could impact transit use and also change vehicle ownership patterns by reducing the need for additional vehicles within a household |
| <p>CARLSBAD CONTEXT</p> | <p>Visitors, Commuters, Locals, & Non-drivers</p> <ul style="list-style-type: none"> • These ridesharing services could benefit Carlsbad, assuming that there are sufficient drivers available for persons who want to use these services • One potential market would be for visitors to the City, which would reduce the need for a person to bring a car to the City, however, there are few disincentives towards driving and parking, which could limit the use of these services |



OUTREACH REVIEW

The City of Carlsbad and the Mobility Readiness team conducted a range of outreach activities to solicit input and educate staff and key stakeholders about transportation options evaluated in the study. The outreach events included:

- Informational meetings with the Public Information Team
- Two-Day Charrette (March 2015)
- Small Group Meeting with NCTD and SANDAG (May 2015)
- Presentations to Coast Corridor Team
- Coordination with Technical Advisory Committee

The purpose of the outreach efforts on this project was to inform both stakeholders and the technical advisory committee about the project, solicit input regarding the technologies evaluated in the report, and provide regular updates on the project progress. The stakeholder group was comprised of a select group of local business owners, City staff, and contract staff. The technical advisory group was comprised solely of City staff, who served as an advisory body to the project team.

INFORMATIONAL MEETING WITH PUBLIC INFORMATION TEAM

In December 2014, the Mobility Readiness team kicked off the outreach process with a meeting with the Public Information team. The intent of the meeting was to provide a broad overview of the Mobility Readiness Project and to brainstorm ways and timeframe to implement the project. The Public Information team provided valuable insight into the process including format for City materials, website site ideas, and methods by which to present the information to Council, and recommendations in working with the Stakeholder meetings.

Technical Advisory Group

- Gary Barbario
- Doug Bilse
- David de Cordova
- Scott Donnell
- Jason Geldert
- Jon Maashoff
- Don Neu
- Marshall Plantz
- Peder Norby
- Lolly Sangster
- Pat Thomas
- Glen Van Peski
- Craig Williams

Stakeholder Group

All members of the Technical Advisory Group PLUS representatives from the following local businesses and agencies:

- Grand Pacific Hotel
- Legoland
- County of San Diego / Airport Liason
- Urban Place Consulting
- SANDAG
- NCTD
- Dover Kohl



TWO-DAY CHARRETTE (March 2015)

Over a two-day period, the Mobility Readiness team worked together to facilitate interactive sessions with the Stakeholder Group. A team of experts were assembled to make presentations and lead discussions regarding four key technologies under consideration in the Mobility Readiness Plan:

- Parking Management
- Electric Vehicles and Trends in San Diego County
- Trolley Programs
- Bike Share Programs & Implementation

The charrette was broken into a morning session and an afternoon session each day. The morning session was conducted at the City's Faraday Building and allowed city staff to meet with presenters in advance of the larger group meeting. On the first day, the morning charrette focused on Parking Management programs and included a presentation by Jay Primus. Mr. Primus was the project manager responsible for extensive parking research, data collection, and implementation of a complex parking management plan for the City of San Francisco. The morning meeting on the second day focused on existing trolley programs. A representative from the City of Laguna Beach met with City staff to discuss the process of implementing a visitor-serving trolley in the heart of Laguna Beach to address peak summer month parking demand and traffic issues.

Whereas the morning sessions focused on presentations and detailed discussions on technical topics and implementation, the afternoon sessions explored the interest, need, and reaction of key businesses in the community to the four transportation focus areas. Each session opened with a brief introduction of the day's activities, an overview or summary of the activities completed to date, and introductions. Participants were encouraged to ask questions, share thoughts or experiences with the different transportation technologies, and identify concerns as the presentations were made and during the follow-on discussions.

The first day of the two-day charrette included presentations on Parking Management and Electric Vehicles. Presentations were made by Jay Primus and Allison Wood (SANDAG) on the two topics, respectively. The second day of the two-day charrette included presentations on Trolley Programs and Bike Share. Presentations were made by the City of Laguna Beach and Alta Planning & Design on these two topics, respectively. Detailed notes regarding the workshops are provided in the technical appendix attached to this report.

Following the two-day charrette, these key takeaways emerged:

- The focus of this study is along the Coastal Corridor. The concepts explored in the Coastal Corridor could easily be expanded to other areas of the city.

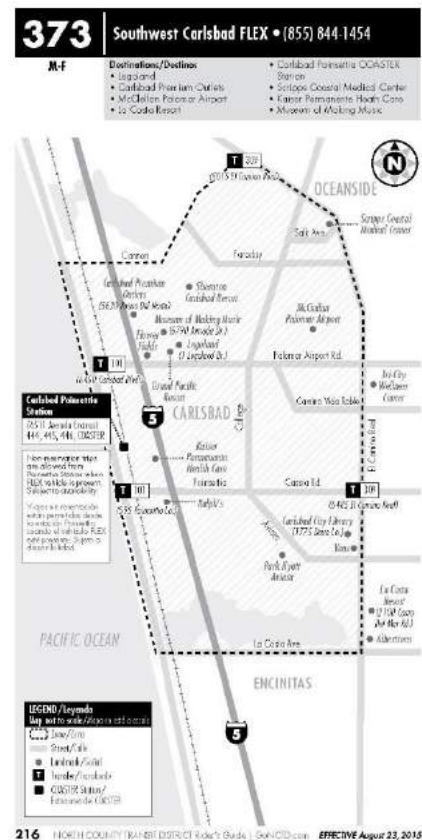


- Ensure that the recommendations from this plan are coordinated with other plans prepared or in preparation within the City (i.e., Village/Barrio Master Plans).
- Before we jump into parking management, let's identify a parking issue. Consider methods to implement new parking policies that provide flexibility in meeting parking requirements. Can you incentivize businesses to use other modes for employees or others?
- Focus on creating mobility hubs throughout the study area. Consider focusing transportation options near the transit centers and develop a strategy from there to move people.
- Think about the deliverable of this project. What are the near, mid and long-term solutions or suggestions? How do we reach implementation of these concepts?
- This should be a guiding document and lead decisions for future development and other planning policies.
- Make sure the document prepared provides tangible steps and objectives that can be used to measure success or clearly outline next steps in the project.

SMALL GROUP MEETING (May 2015)

As a follow up to the Stakeholder Charrette, the City and Mobility Readiness Team conducted a small group meeting with representatives from SANDAG and NCTD. During this meeting, the Mobility Team presented the transportation technologies under consideration to SANDAG and NCTD. SANDAG provided insight into SANDAG's Mobility Hub project and discussed how the City may integrate the City effort into the region wide effort. SANDAG is basing the selection on the Los Angeles example, but is interested in new technology and a more forward-thinking approach than Los Angeles.

NCTD provided insight into local transit circulation and service from the existing Coaster Station into the business park in the City. NCTD found that circulator service did not meet necessary ridership requirements, so they have transitioned from circulator to on-demand service called FLEX. The Southwest Carlsbad FLEX service extends from the Poinsettia Coaster Station to El Camino Real to the east, Cannon Road to the north, and La Costa Avenue to the south. NCTD suggested that Uber may be a more affordable option when compared to FLEX service and would be open to discussing or partnering with Uber to meet this current on-demand point to point service.



Consultants to SANDAG representing the Transportation Demand Management Program (TDM Program) described the Uber pilot program. This program provides employers the opportunity to establish business accounts with Uber for guaranteed ride home programs and access to transit links. Another program



SANDAG has initiated is the “Try Transit” program, NCTD/MTS/SANDAG are working with participating employers to help provide “1st month free programs.” However, carpool/vanpool programs have been and continue to be the most successful TDM measure implemented in San Diego County. SANDAG indicated that there are a number of TDM programs the City and businesses in Carlsbad can participate in to help reduce auto-oriented trips. Antoinette Meyers of SANDAG emphasized the importance of education and explained that SANDAG can be an active partner for businesses and the City.

Overall, this meeting resulted in an excellent exchange of ideas on how to work with the local transit providers and regional planning agency in developing measures to reduce reliance on auto and help shift trips to transit. The City agreed to continue to work with SANDAG and NCTD on the Mobility Hub concept and TDM programs.

COASTAL CORRIDOR COMMITTEE PRESENTATIONS

Carlsbad Traffic Engineer Doug Bilse and Program Manager Lolly Sangster regularly attended Coastal Corridor Committee meetings and provided updates on the project process. A formal presentation of the transportation technology recommendations was provided by the Mobility Readiness team on September 28, 2015.

COORDINATION WITH TECHNICAL ADVISORY GROUP

The Mobility Readiness team conducted regular meetings with the project management team as well as the Technical Advisory Group. Meetings were scheduled to coincide with specific project deliverables. The meetings were conducted in person at the Faraday building and included formal PowerPoint presentations of the findings and recommendations as the transportation technologies were selected and prioritized.

Beginning in September 2015, the project team conducted bi-weekly conference calls to monitor progress as the draft Mobility Readiness report was prepared. As necessary, key members of the Technical Advisory Group were invited to participate in the project team coordination meetings and were asked to provide input on draft report outlines and technical working papers.



IMPLEMENTATION RECOMMENDATIONS

Identifying the specific actions the city can take to implement the recommended technologies of the Carlsbad Coastal Mobility Readiness Plan is an important step in assuring that these policies and strategies come to fruition. By clearly highlighting the infrastructure requirements, regulatory barriers, staff responsibilities, implications for the City, and actions that will encourage adoption, these suggestions for improvement can become tangible mobility options for residents and visitors of Carlsbad.

POTENTIAL IMPLEMENTATION ACTIONS

AUTONOMOUS VEHICLES

One major benefit of autonomous vehicles is that they do not require major new investments in roadway infrastructure, only minimal modifications need to be made on roadway surfaces or the implementation of traffic signal equipment, as opposed to the development of new roadways. Traditional parking spaces are also sufficient for autonomous vehicles. Since autonomous vehicles spatially orient themselves by identifying lane lines, the City may need to increase the frequency with which they paint and maintain their road striping. In the event that the entire auto fleet becomes autonomous (instead of just a niche-market), there would be no need for any traffic lights because each car would know where the other cars are in a system. The City has no regulatory barriers that would prevent implementation, though State and Federal legislation may present issues.

To better prepare for the possibility of widespread autonomous vehicle use, Carlsbad should begin to include autonomous vehicle technology into the goals and objectives outlined in the City's long range and transportation planning documents. It should also look for grant funding opportunities related to the testing and integration of autonomous vehicles into the local transportation system.

Should it choose to, the City could take a much more active role in facilitating the implementation of autonomous vehicles. For example, City could identify unused land owned by the City that autonomous vehicle developers could use to test out their vehicles.

ELECTRIC VEHICLES

To support Electric Vehicles, there are several critical pieces of infrastructure that need to be put in place in Carlsbad. The first is finding and leasing the land for electric charging stations around the city while also working on agreements with the power companies and public utility services that will charge the cars. The



latter may require modifications leading to a smart grid system and could be done in tandem with the creation of Mobility Hubs. Another is providing electric charging stations at strategic rest areas and DOT maintenance facilities throughout the region. There also needs to be consistent way-finding signage on highways and other streets. Parking and ADA policies will need to be adapted to include EV charging stations. No current regulatory barriers exist within the city for electric vehicles in Carlsbad or California.

The City of Carlsbad's "Environmental Guiding Principles" already incorporates electric vehicles to enable the community to design energy saving features into projects. The state of California also provides rebates/incentives to residents purchasing an electric vehicle. A progressive action Carlsbad can take to facilitate electric vehicle supply equipment (EVSE) deployment in multi-family dwellings is by amending building codes and laws to mandate EVSE capability in all new construction. Regardless of what actions the City makes to encourage usage, these vehicles will either become commonplace or be a niche transportation option.

BIKE SHARING

A 3rd generation bike share system (one that uses high tech solutions including electronically locking racks, or bike locks, chip cards, mobile phones, and internet) makes the most sense for the City of Carlsbad but requires some new infrastructure. A third generation bike share system has two main components: automatic bike docks that lock each bike into place and electronic payment kiosks. Docks are typically six to eight feet wide and require an additional four to six feet of adjacent clearance for docking and bike removal. Electronic payment kiosks may be wired or solar powered. The goal would be to have quality bike infrastructure in place to support safe riding. Small systems can be successful even in low-density cities. Carlsbad currently forbids bicycle riding on sidewalks, so future bike share stations need to be strategically located near existing or planned bicycle facilities. Carlsbad could consider working to change the Carlsbad Municipal Code to allow riding bicycles on sidewalks when accessing a bike share station or other parking facilities on the same block.

The local government would need to implement a bike share system with an appropriate business model that falls in line with the City's comprehensive Active Transportation strategy and Complete Streets objectives. It could also host or sponsor bicycle education programs and safety awareness campaigns targeting unsafe motorist and bicyclist behavior. Bike share programs can work together with programs that teach bicycle safety skills, advertising helmet protection, safety awareness campaigns targeting unsafe motorist and bicyclist behaviors, and similar efforts. With the potential influx of cyclists, there may also need to be additional investment towards a comprehensive bike system and road maintenance.



CAR SHARING

Carsharing infrastructure is fairly minimal, but requires locations for the cars to be stored when not in use. This is usually either a marked parking lot or designated street parking. If the car-sharing program uses electric vehicles, charging stations will be required at the vehicle parking stall as well. A regulatory barrier for carsharing in Carlsbad is finding visible and affordable parking that is well-located and convenient to users, unless the local government allows some spaces in public lots to be made available for hosting these services.

The city can work on developing a citywide car share system with an appropriate business model (e.g., peer to peer, business to consumer, and/or not-for-profit or co-op). In order to break into the suburban commuter market, the City and/or local and regional transit agencies can form a partnership with a suburban car sharing service. Using the Transit Cooperative Research Program Report 101 "Car-Sharing" Where and How it Succeeds" Carlsbad can follow the subsequent five key factors for successful carsharing:

1. Identifying a representative for car-sharing, such as an elected official or high-placed staff member who recognizes the benefits of car-sharing and works to promote it
2. Adopting supportive policies and regulations, such as zoning incentives and inclusion of car-sharing in environmental, transportation, and corporate sustainability plans
3. Providing funds to help car-sharing programs become established
4. Implementing supportive actions such as providing marketing, parking, and integration with transit
5. Selecting the right neighborhoods that have the density, walkability, and transit service to help car-sharing survive

ELECTRIC BIKES

Electric bikes require no special infrastructure, they can utilize existing and planned bicycle infrastructure. If the e-bike is capable of traveling at speeds faster than 20 mph, they are not allowed on Class I bike paths. This is the only city regulatory barrier that exists for electric bikes, and will likely not be changed, as those speeds are proven dangerous for that type of bicycle facility. The most important steps to achieving a greater e-bike mode share is to lower the initial cost of ownership, continue promoting and providing infrastructure for conventional bicycling, and having the city increase awareness of e-bikes existence and their potential benefits.

NEIGHBORHOOD ELECTRIC VEHICLES (NEVS)

Neighborhood Electric Vehicles do not require any additional roadway infrastructure; most communities that allow their use have them operate on existing roads (with lower speed limits) and/or on particular pathways (such as bike lanes). NEVs do require charging stations, which may be unique to NEVs and



unsuitable for other types of electric vehicles. The City of Carlsbad could make charging be the responsibility of the owner and not supply these facilities or they could choose to supply charging stations around the city. To better provide connectivity through the community, the construction of dedicated trails and lanes on existing roadways may be necessary. The local government could adopt a NEV Master Plan, which would allow more roadways to be accessible to NEVs. It could also look for opportunities for future Master Planned Communities to better integrate NEVs.

TRANSIT VEHICLES

Additional transit service could be provided through either public or private sources. Public transit service would generally include larger buses operating on fixed routes. Private transit service would include point to point service, traveling from areas such as hotels to locations such as LEGOLAND, shops and restaurants, the beach, and other similar types of amenities.

TROLLEYS

The type of trolley implemented by the City of Carlsbad would determine the overall infrastructure investment needed. Certain trolleys using rubber tire vehicles can operate like buses, others run on a fixed guideway. A fixed-guideway trolley would require significant additional investment in the form of tracks, power sources, and other infrastructural components. Trolley routes need stations and stops, as well as signs, shelters, and seating. There must also be space for the storage and maintenance of the vehicles. Carlsbad would need to hire a consulting firm to conduct a thorough feasibility study to verify routes for the trolley, the potential ridership, and the likely financial issues and appropriate mitigation to identified issues.

NEXT GENERATION DELIVERY VEHICLES

No significant infrastructure is needed to support these smaller delivery vehicles. As part of pedestrian improvements to provide shorter crossing distances at intersections, reducing curb radii has been suggested. This could have the added benefit of potentially slowing speeds of vehicles within the community. Carlsbad Village is one potential location where these smaller vehicles could be broadly deployed. In order to encourage the implementation and adoption of these vehicles, the city could alter the allowable designs for loading areas and loading docks in commercial areas. Overall, next generation delivery vehicles would have minimal to no direct effects to visitors, commuters, locals, and non-drivers.



PERSONAL MOBILITY DEVICES

These mobility devices do not require dedicated infrastructure and can use sidewalks and bicycle lanes in lower speed environments. Performance is best in areas with curb cuts at intersections, crossings, and ramps. The city could evaluate whether a private vendor (similar to bike share) could come in to provide short-term personal mobility device rental. There are no barriers to the implementation of these devices, though they would most likely be focused on tourist mobility rather than use by residents.

SMART PARKING

There are several infrastructural additions needed to implement smart parking. These include installing changeable message signs outside of any public parking facilities that are linked to sensors in the parking areas. A second level of implementation related to smart parking would include physical and programmatic changes to public and private parking facilities. Specific actions the City could undertake include:

- Closing unneeded curb cuts to facilitate more on-street parking
- Restriping existing red-curb areas to create more on-street parking
- Leasing private parking lots for public parking
- Facilitating the usage of private parking lots by differing businesses through the creation of a liability policy template for use in these transactions

The City could commission a detailed Parking Management Study to provide a roadmap towards the appropriate level of smart parking needed in specific areas, including more detailed timelines, and implementable actions. The city could also partner with an intelligent parking system service provider, which would provide the City access to a parking supply/demand database, a management portal that provides real-time information of parking conditions and offers a variety of applications to help manage assets and optimize enforcement activities, and the ability for the City to publish real-time parking information and easily reach motorists online, via mobile devices, and/or external message signs. The formation of a traffic and parking management team composed of property managers, tenants, parking managers, parking enforcement, event organizers, City staff, and other local entities (as applicable) may also ensure the success of a smart parking program. Coordination and collaboration among these key stakeholders is essential in ensuring that parking facilities are operating in an efficient manner, especially during peak periods and major events. Smart meters and/or electronic pay stations could also be necessary to help with dynamic pricing (especially in the beach areas).

NEXT GENERATION VALET SERVICES

No new physical infrastructure is needed to provide this service. The provision of mobility is done entirely through a digital platform. The limiting factor of this service will be the current availability of free parking.



The success of this service is determined by providing a high level of convenience at prices similar to market rate parking costs. If cities continue to provide low cost or free parking that is readily accessible, then the application of this service will be limited outside of current markets. If the City wants to encourage adoption, it would need to implement strategies to price parking at market rates, reduce the availability of free parking, and then also limit additional parking provided either in public or private lots. The City should also reconsider how it allocates existing curb areas to provide more loading areas, which could also facilitate car sharing and other shared mobility services.

RIDESHARING APPLICATION

No new physical infrastructure is needed to provide this service, although the identification of passenger loading/unloading zones in the Village may be beneficial to improving service visibility. The provision of ridesharing is done entirely through a digital platform. No current barriers exist from hindering the implementation of this service.



HIGH PRIORITY IMPLEMENTATION ACTIONS

The overall vision for the Corridor provided in the Executive Summary includes the following elements within the Corridor:

- A primary mobility hub at the Carlsbad Village Station with a secondary mobility Hub at the Poinsettia Station
- The mobility hubs would be placed at the Carlsbad Village Drive and Poinsettia Stations along the existing commuter rail line, providing seamless connectivity between these stations and other locations in Carlsbad
- The mobility hubs would be tied together through a visitor-serving trolley
- Bike sharing stations would be located throughout the Coastal Corridor, allowing residents and visitors to rent bicycles on a short-term basis
- Car sharing would be co-located at the mobility hubs
- Electric vehicles charging stations would be placed at the mobility hubs and other strategic locations throughout the Coastal Corridor
- A final element would be comfort stations, which would provide water, shade, and rest areas for persons walking and biking in the area

These specific improvements would be supplemented through a variety of citywide initiatives, which would address other emerging technologies including:

- Developing the IT infrastructure to support a real-time parking management system, which would include the placement of various types of sensors (such as loop detectors) in public parking areas
- Implementing strategic upgrades to the traffic signal system to facilitate communication between traffic signals and vehicles with increasing levels of automation and interconnections
- Implementing an innovation fund to support research on topics like autonomous vehicles by local firms

The continuous evaluation of new innovative transportation projects could be achieved through a Task Force:

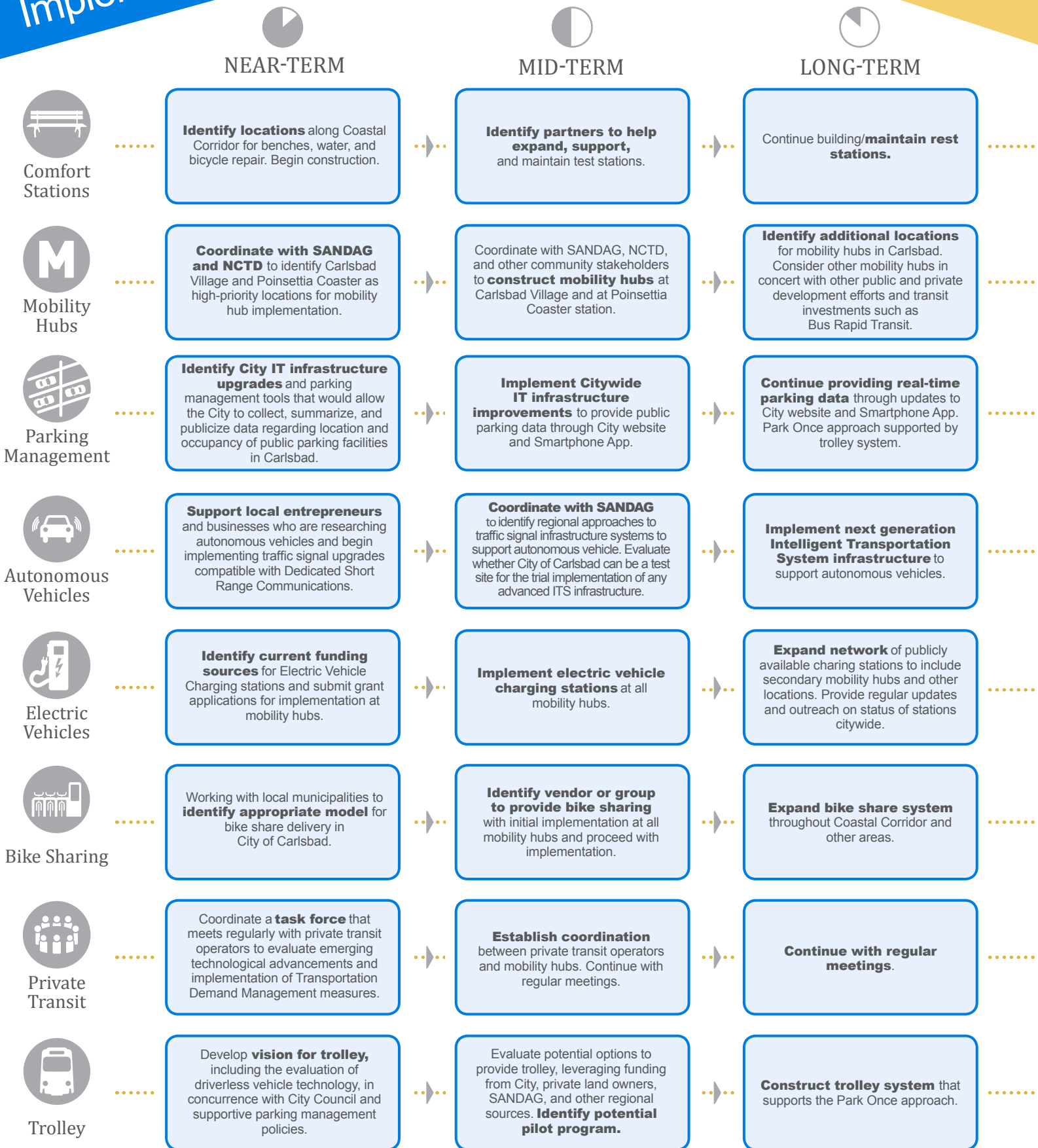
- Task force to meet regularly with local business and regional experts in the field of intelligent transportation systems to coordinate private and public transportation efforts such as local shuttles and other multimodal mobility options
- The creation of a task force gives stakeholders a venue or mechanism to evaluate future emerging technologies from a user-focused mobility services and choices approach, addressing the needs of urban delivery and logistics, and smart land use planning
- Consider pilot programs to test innovative ideas and incorporate continuous improvement feedback loops into the system that can be shared with other local municipalities



The actions the City of Carlsbad would need to undertake to achieve implementation of the high-priority transportation improvements are identified in Figure 3. These actions include a variety of policy and infrastructure efforts over a 10-year period that also align with the timing of the Climate Action Plan. The benchmarks are split between near-term (1-2 years from now), mid-term (3-6 years), and long-term (8-10+).

Carlsbad Implementation Matrix

Figure 3



APPENDIX A: VIGNETTES





“Day Tripper”

This is **Loretta Pepper**.

Loretta grew up in Pennsylvania and moved to Carlsbad when her husband Paul, a sergeant in the army, transferred to Camp Pendleton.

As the mother of three toddlers, Loretta enjoys what little time she gets for herself. So when the opportunity to get a day off comes up, she quickly takes it. Dad drops Loretta off before taking the kids to Alga Norte Park.

Loretta’s girlfriends live in North County and they decide to meet at the new Poinsettia Mobility Hub because Julia takes the train from Vista while Michelle needs to recharge her electric vehicle.

The three moms walk over to the new sandwich shop called Yellow Submarine where they share stories over wine and tapas.

They decide to take a walk to see the new art work along the coastal trail and find themselves enjoying happy hour at Penny Lane, the new bar at the Ponto development.

Time flies when you’re with good friends and they soon realize it’s too dark to walk back. They decide to take the coastal trolley back to the Mobility Hub where they say goodbye and promise to do it all again soon.



“I Want to Hold Your Hand”

Perhaps you know **The Harrisons.**

We’ve all heard about someone like the Harrisons. They’re the couple who wait in line to be the first ones to own the latest tech gadget. The couple that registered at the Apple Store and flew first-class on their honeymoon. The couple that just got funding to start their new biotech company. The type of couple that Carlsbad would do well to attract over the new few decades.

The Harrisons decided to vacation in Carlsbad and instantly fell in love with the area as they took the automated shuttle from Palomar Airport to Octopus Garden- their boutique bed and breakfast.

They were impressed with the small town feel of the beach community integrated with the high-tech, business-friendly culture. The young newlyweds want to live on the coast while working close to home and welcomed the way they could travel anywhere in Carlsbad without owning a car.

They noted the proximity to Palomar Airport and the value of working close to several high-tech employment centers.

“What a great place to relocate” they say to each other as they take a driverless taxi to the Apple Store in the Forum.

APPENDIX B: PUBLIC OUTREACH MEETING MATERIALS



Carlsbad Multimodal Charrette: Bike Share



How Does Bike Share Work?

- Short trips – 0.5 to 2 miles -- either from station A to station B, or parked/locked within designated zone
- Accessible to MEMBERS via the web site or SHORT-TERM USERS (24-hour, weekly etc.) via the kiosk
- All members accounts are connected to a credit card account
- Most systems: Bikes available for a free period—usually 30 minutes—before additional fees
- Numerous pricing schemes being utilized and tested



Madison WI B-cycle

What Are the Benefits?

- Provides additional mobility choice for residents and visitors
- Economic development (green jobs, improved access to businesses and helping to “brand” the city)
- Supports and extends the public transit system
- Improved individual and community health through active transportation
- Contributes to the “safety in numbers” effect for all bicyclists



***New Balance Hubway,
Boston***

Who will use bike share?

Typical bike share user profiles:

- ❖ **Local residents:** trips too long to walk and not convenient to drive
- ❖ **Visitors and tourists:** trips to Village, beach, other destinations
- ❖ **Transit commuters:** going to/from rail stations
- ❖ **People without access to a car or a bike:** looking for a supplement to transit



Bike Share and Transit

Bike share helps transit

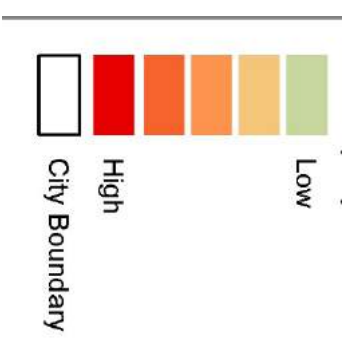
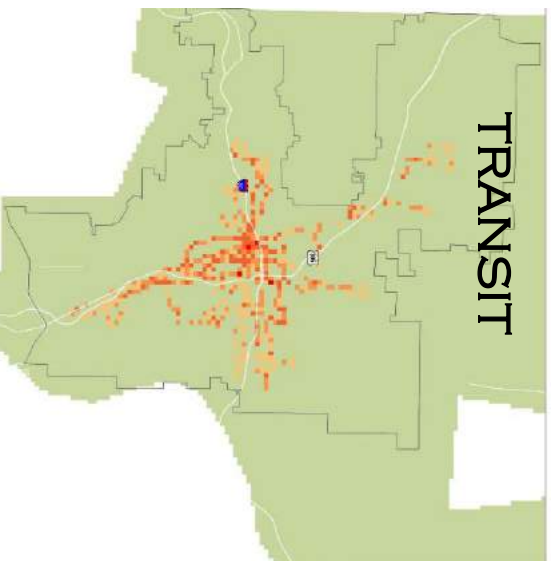
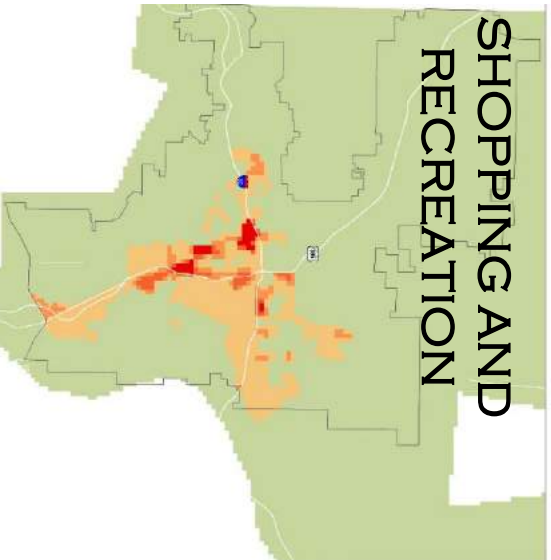
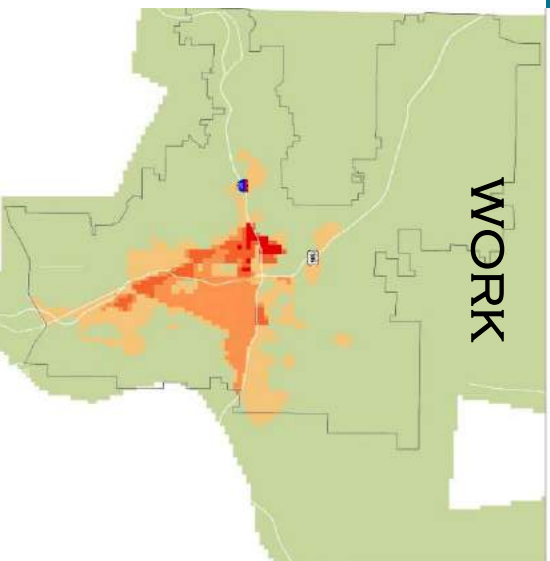
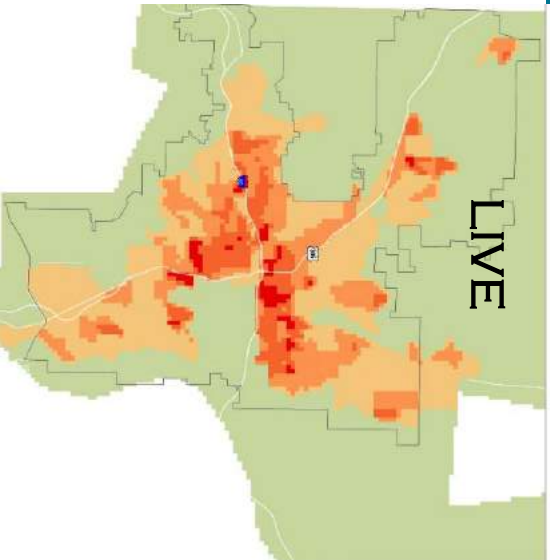
- Bike share can extend the reach of current transit service, filling in the “last mile” between train/bus and work/home
- Potential combination pass is in development phase

Transit helps bike share

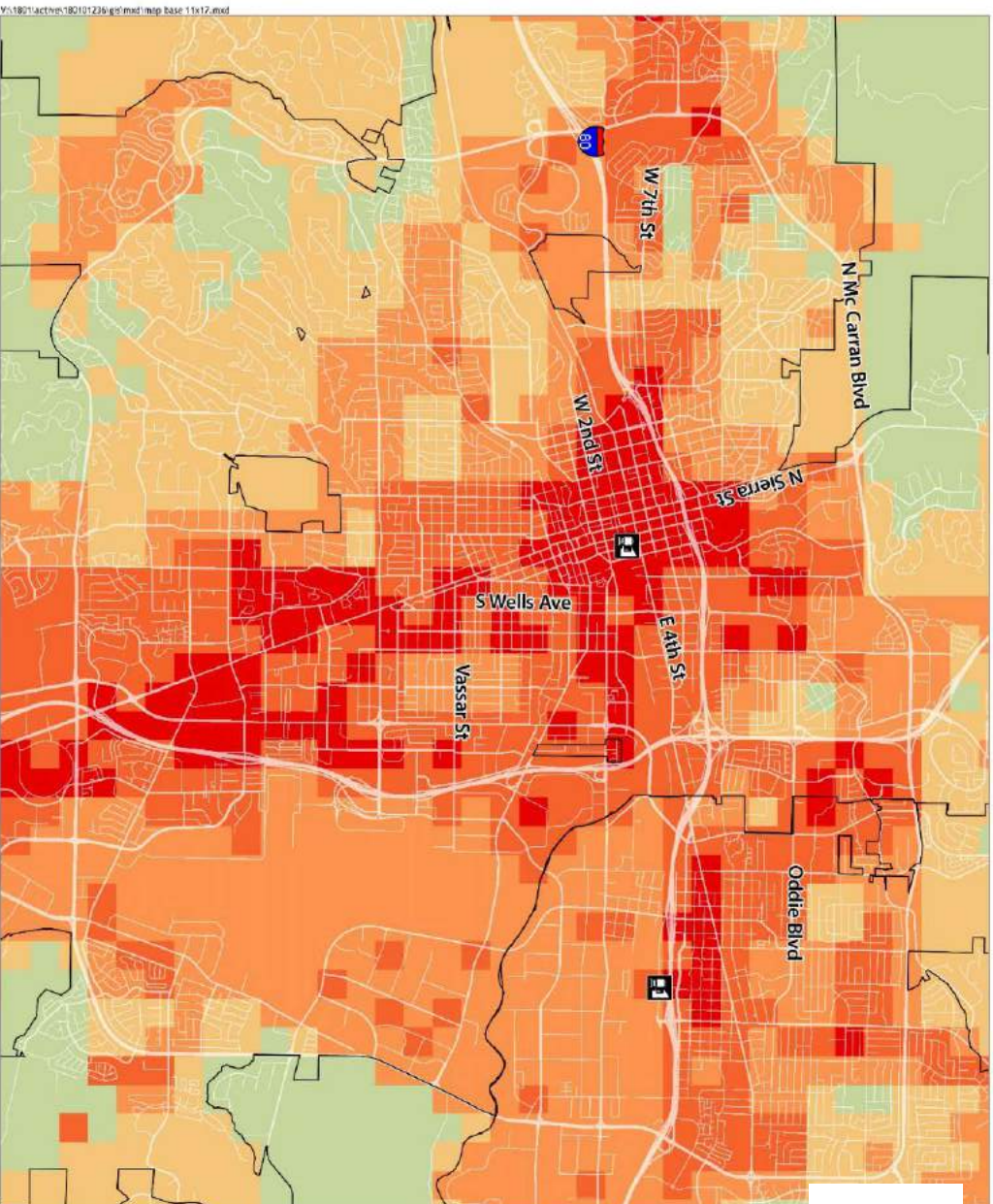
- Bike racks on buses can help riders overcome hills and travel longer distances
- Together, they help to form a transportation hub



Demand Mapping



Demand Map: A Closer Look



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Will it Be Safe?

HUBWAY (BOSTON)

- 1.8 million trips with 0 fatalities and <20 significant injuries

CAPITAL BIKESHARE (WASHINGTON DC)

- 6.7 million trips with 0 fatalities and <40 significant injuries

DIVVY (CHICAGO)

- 1.1 million trips with 0 fatalities and <10 significant injuries

CITIBIKE (NEW YORK CITY)

- 8.2 million trips with 0 fatalities and <40 significant injuries

NORTH AMERICA (ALL CITIES COMBINED)

- >30 million trips with only 1 fatality

Bicycles Designed for Safety

*Only 3-5 speeds,
geared low*

*Heavy bike (40-45 lbs)
= slower speeds*

*Upright
position w/
good visibility*

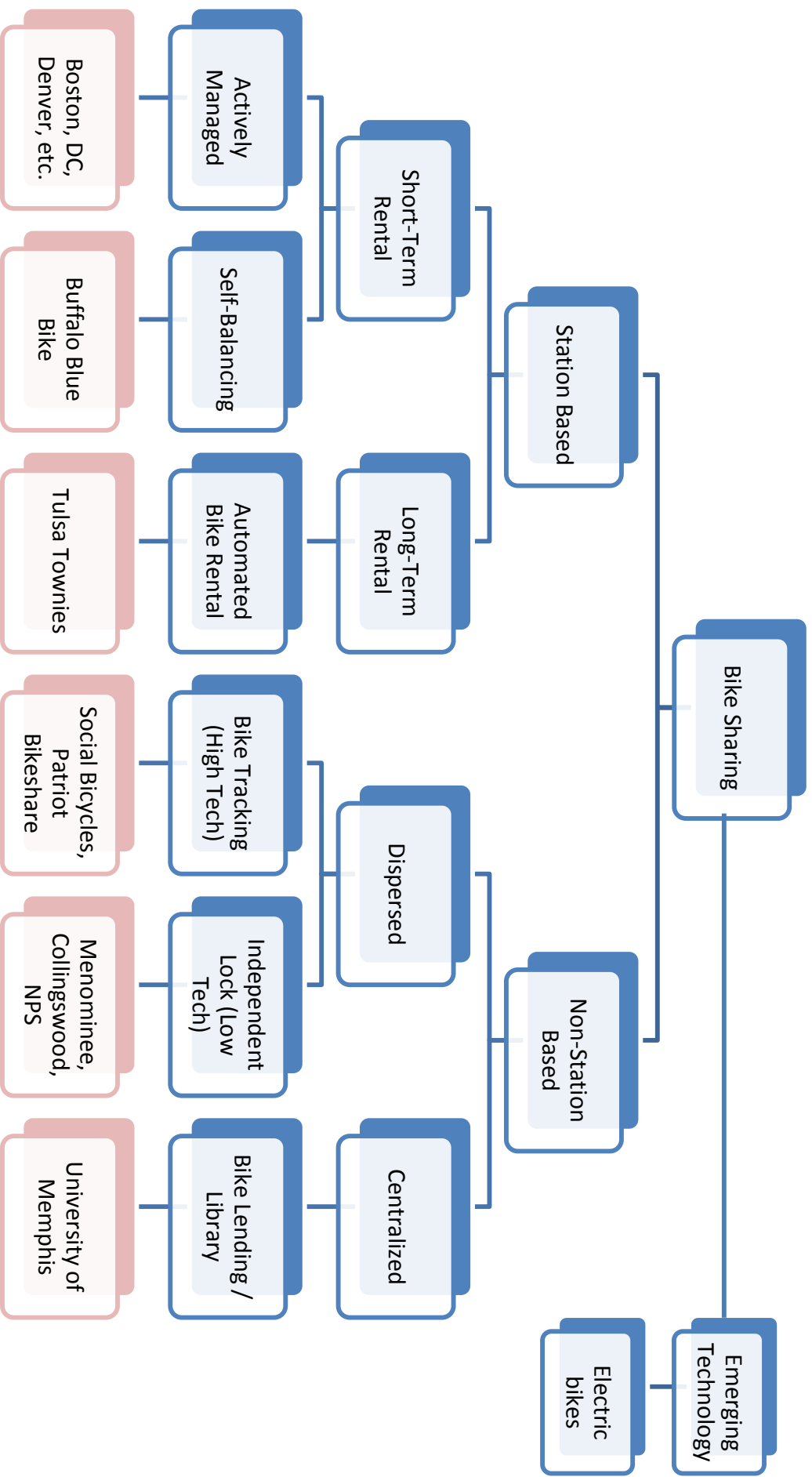


*Wide and
puncture-proof
tires*

*Hub roller brakes
for all-weather
stopping*

*Built-in lights
and
generator*

Bike Share Family Tree



Existing US Systems



*** Coming Soon?**

Some of the 30 existing bike share systems in North America

Snapshot of Available Technologies

Smart Lock Bikes



Providence's Social Bicycles

Movable/modular



Minneapolis Nice Ride

Permanently mounted



Miami's DecoBike

Common System Elements

Map Frame

Solar Panel

Bikes

Kiosk

Docks



Business Models

Who will own, administer, and operate the system?



Zotwheels, U.C. at Irvine

What are the pros & cons of different ownership options?



Denver B-Cycle

Four Main Business Models

- Publicly Owned / Privately Operated
 - Cabi, Bay Area, Divvy
- Non-Profit Owned and Operated
 - B-Cycle systems
- Non-Profit Owned / Privately Operated
 - Seattle Pronto
- Privately Owned and Operated
 - Citibike, DecoBike, Phoenix



Model 1. Boston Hubway



Model 3. Seattle Pronto! bike share



Model 2. Denver B-cycle



Model 4. Miami Beach DecoBike

Comparative Examples

| Name | Stations / Bikes | Ownership of Capital Infrastructure | Operations |
|------------------------------------|------------------|---|--|
| Des Moines B-cycle | 6 / 35 | Non-profit: Des Moines B-cycle | Non-profit Operator (Des Moines Bike Collective) |
| Chattanooga Bicycle Transit System | 33 / 300 | Public: City of Chattanooga | Private Operator (Alta Bicycle Share) |
| CoGo, Columbus OH | 30 / 300 | Public: City of Columbus | Private Operator (Alta Bicycle Share) |
| Madison B-Cycle | 35 / 350 | Public: City of Madison | Non-profit Operator (Madison Bike Share) |
| Hamilton ON Sobi | 105 / 750 | Public: MetroLinx (public transit agency) | Non-profit Operator (Hamilton Sobi) |

Costs and Funding Options

Bike Share Funding: Capital - Equipment, Launch Costs



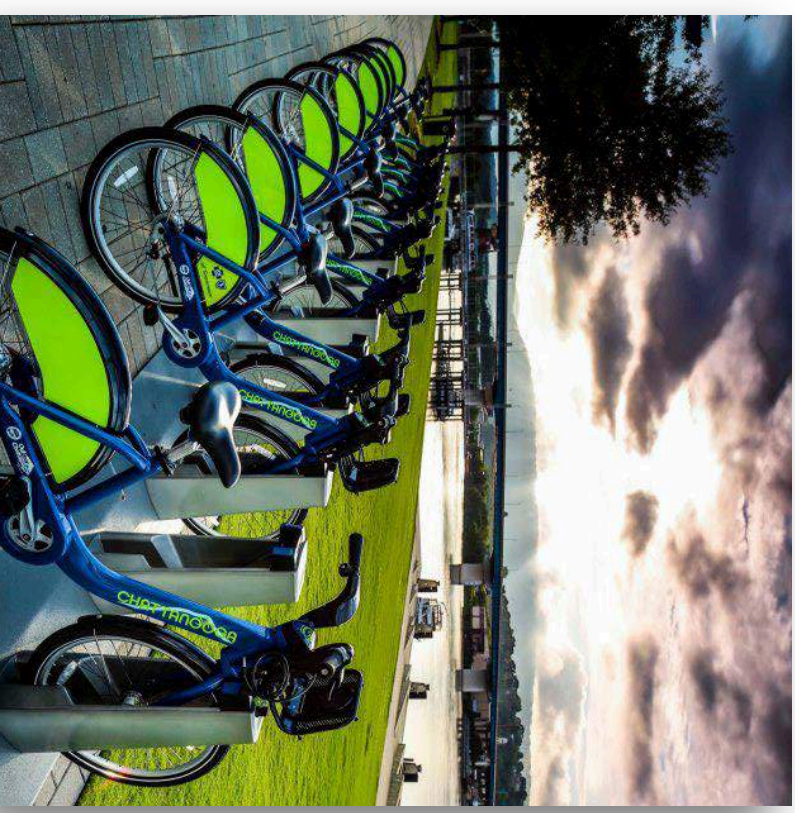
Costs and Funding Options

Operations

| Source | Cabi | Hubway | Citibike | Divvy | Denver | NiceRide |
|------------------------------|------|--------|----------|-------|--------|----------|
| User Revenue | ● | ● | ● | ● | ● | ● |
| Sponsorship \$\$ | | ● | | | ● | ● |
| Government \$ (incl. grants) | ● | ● | | ● | ● | ● |
| Advertising | | ● | | ● | ● | ● |

Membership Pricing and Strategy

- \$50-150 for annual membership (some cities provide discounts for low-income residents)
- \$5-15 for one-day pass
- 0-30 minutes free
- 30-90 minutes: \$2-5; >90 minutes: \$6 and up
- Percent of Casual vs Annual users



Typical System Costs

- \$4,500-5,500 per bike (includes docks, kiosks, stations, etc)
- \$2,000-2,500 per bike/year maintenance
- Smart-bike up-front costs can be 1/3 less, but operation costs are still unclear



Performance Measure: Cost Per Trip

| | Per Bike | Per Operating Month | Per Trip |
|-------------------|----------|---------------------|----------|
| Nice Ride | \$2,378 | \$264 | \$13.12 |
| Denver B-Cycle | \$2,838 | \$237 | \$5.40 |
| Hubway | \$2,144 | \$238 | \$2.48 |
| Capital Bikeshare | \$2,225 | \$185 | \$2.41 |
| Citi Bike | \$1,636 | \$136 | \$1.81 |

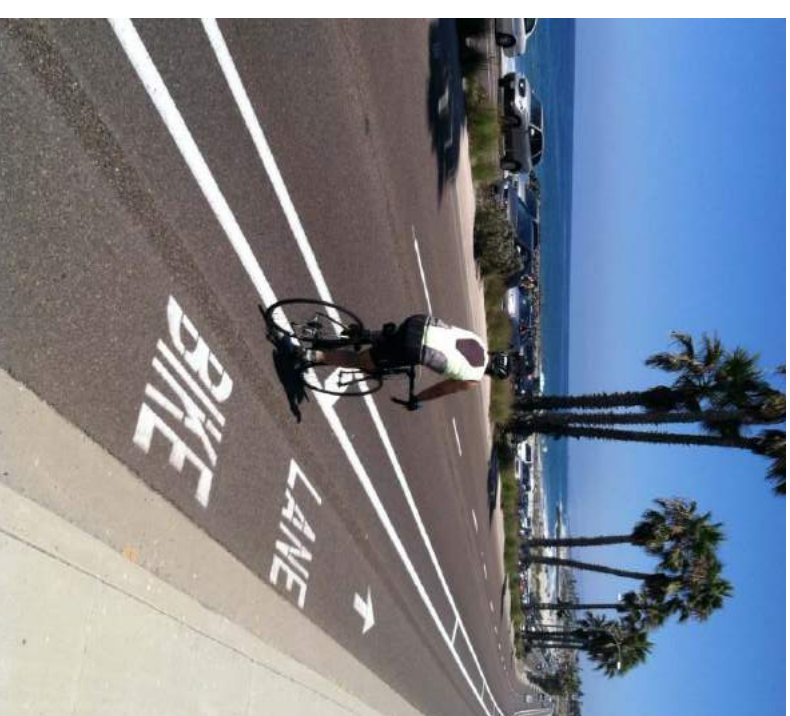
Potential Sponsors for Bike Share

- Would there be interest in bike share sponsorship among local/regional businesses?
- Would the City and local leadership support that effort?



Carlsbad has great opportunities

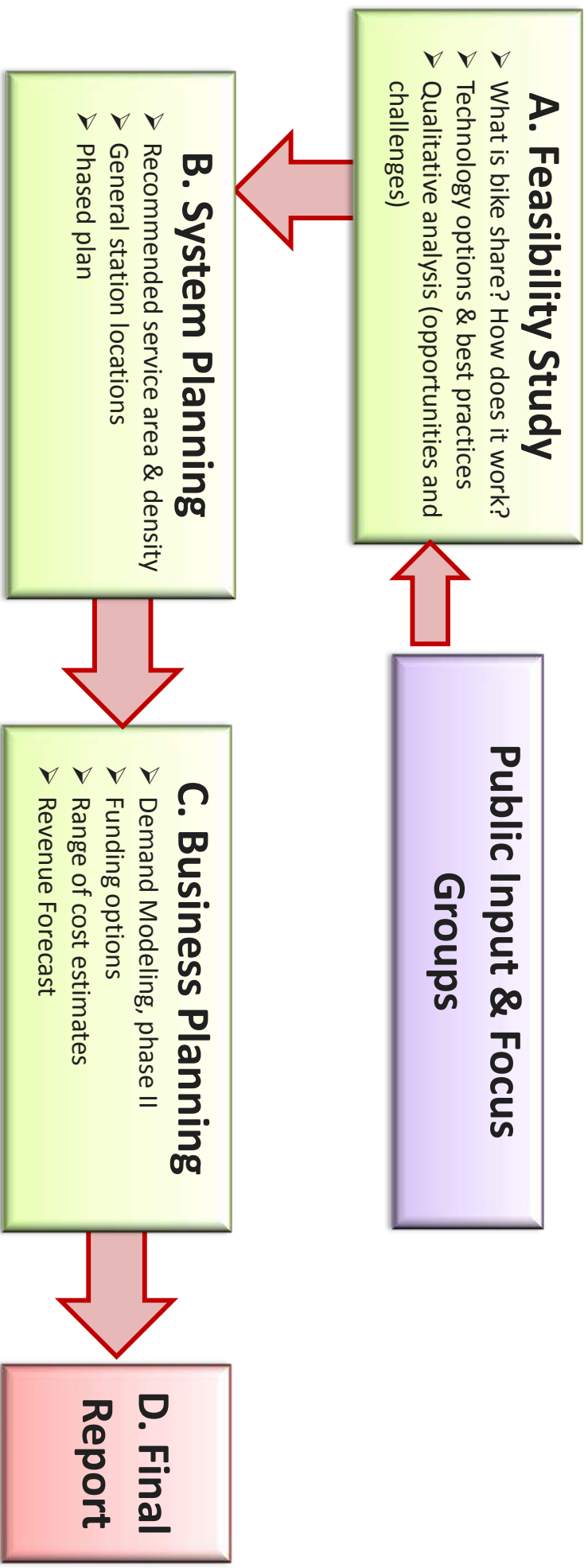
- ✓ 7 miles of world class beaches and a vibrant historic Village downtown area
- ✓ Numerous art, cultural and sporting festivals and events that attract visitors
- ✓ 25% of population aged 25-45, high median household income
- ✓ Large concentration of employers including those in sports and recreation industries
- ✓ Year round mild weather
- ✓ Amtrak / Coaster stations
- ✓ A good basic bikeway network, both trails and on-street facilities



...but not without its challenges

- Low density land uses, with major employers dispersed in business park / campus areas
- Significant topography
- Network of high speed arterial roads
- City bisected by I-5 with limited non-interchange crossings
- Major visitor destinations and attractions dispersed away from downtown
- The relative ease of driving and free/inexpensive parking throughout the entire city

Next Steps: Bike Share Study Process



SF park

CIRCLE LESS, LIVE MORE

What to expect over the next 30 minutes

- Background & overview
- Preparations
- Implementation
- Evaluation
- Lessons learned

Part 1: Background & overview



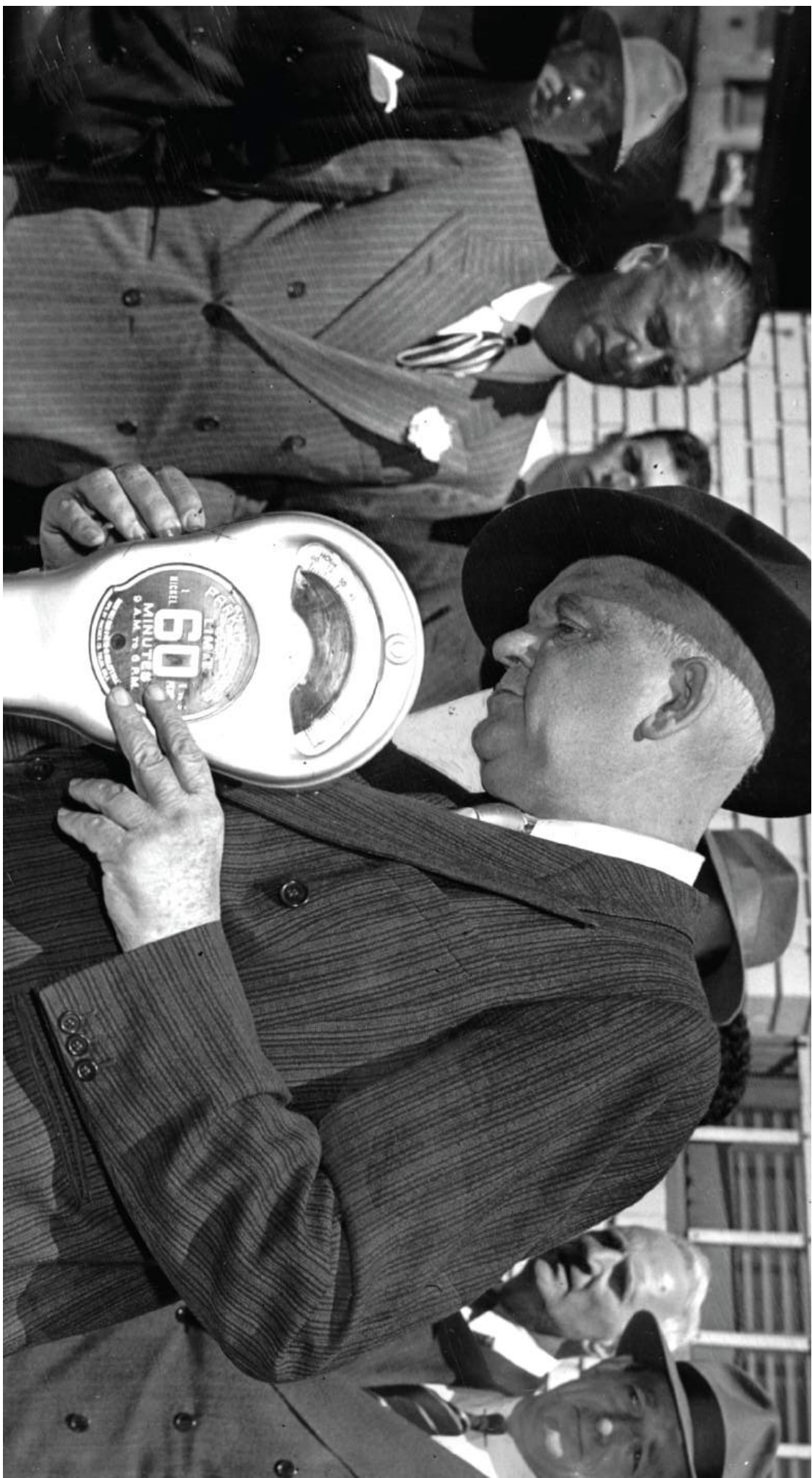
The SFMTA



What is parking like in San Francisco?



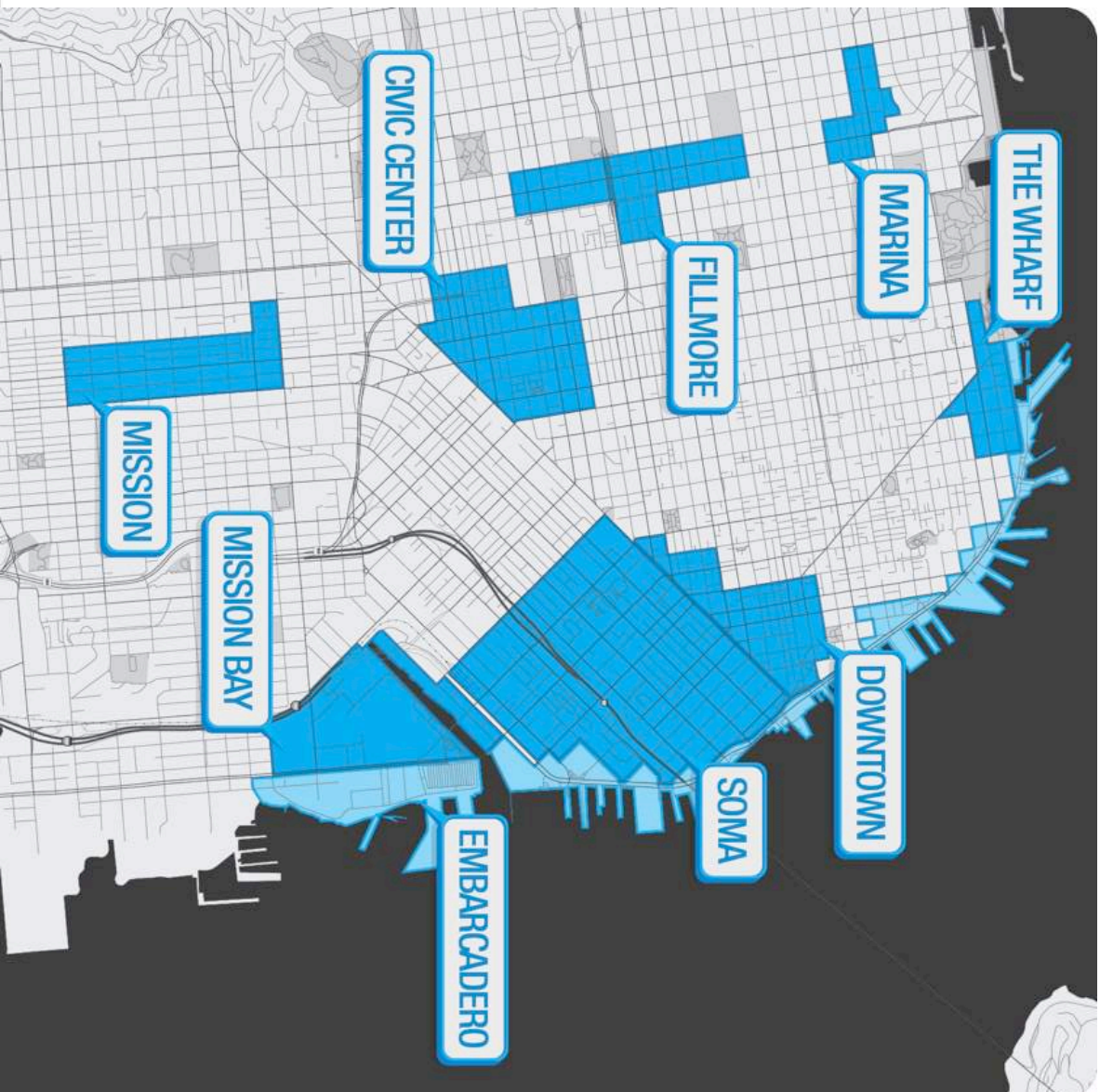
How did we get here?



What is the SFMTA doing about it?



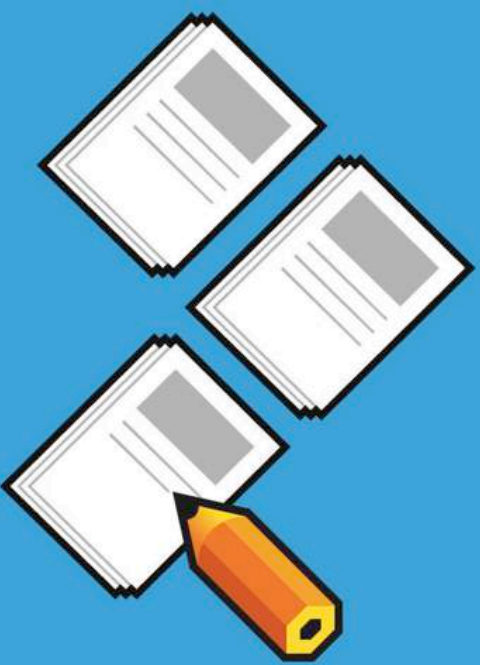
Demonstrating a new approach to parking



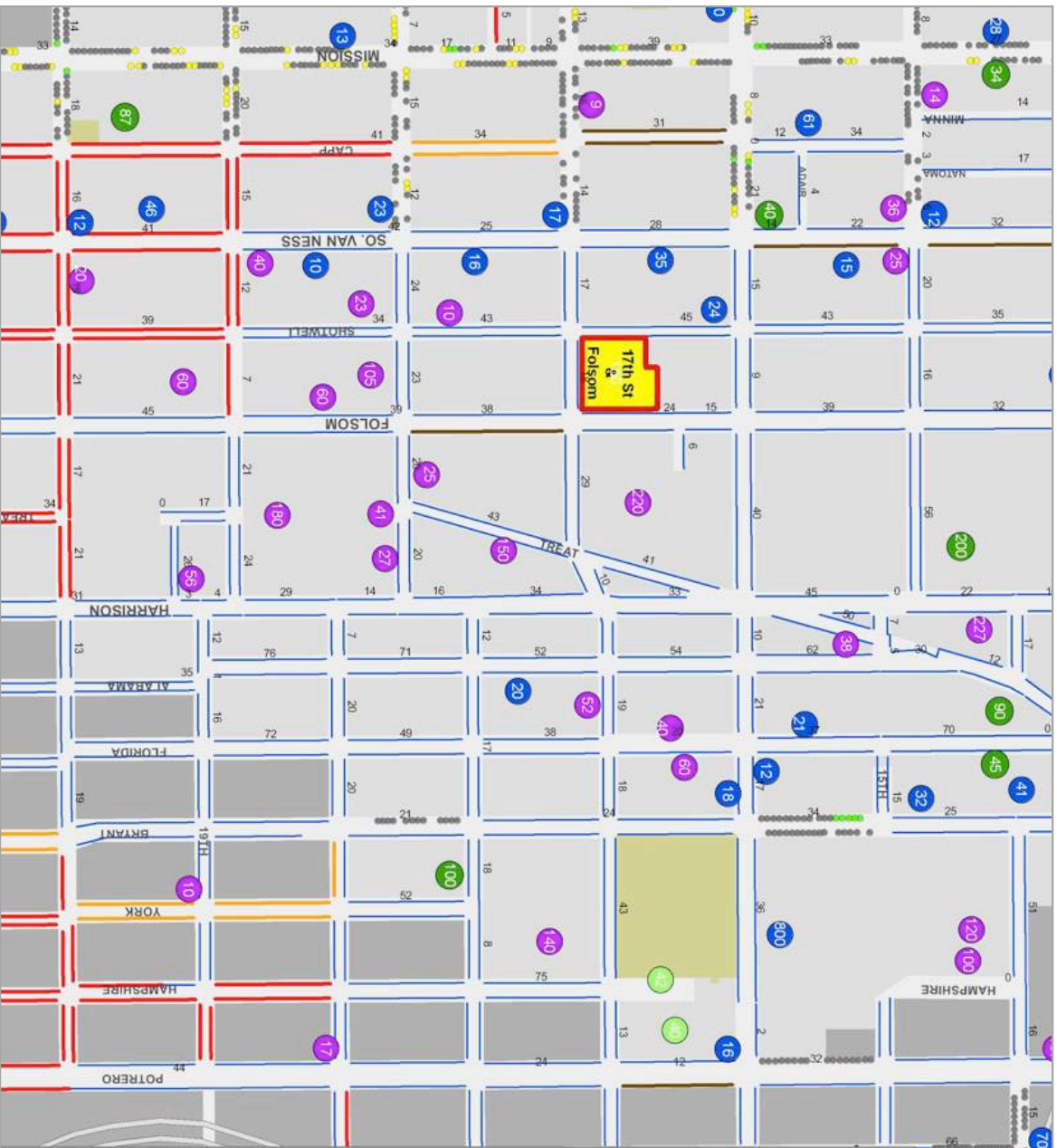
Timeline

- June 2009 – Funding in hand
- April 2011 – Project launch
- April 3, 2013 – 10th demand-responsive rate change
- April/May 2013 – Gather “after” data
- Fall 2013 through Summer 2014 – Project evaluation

Part 2: Preparations

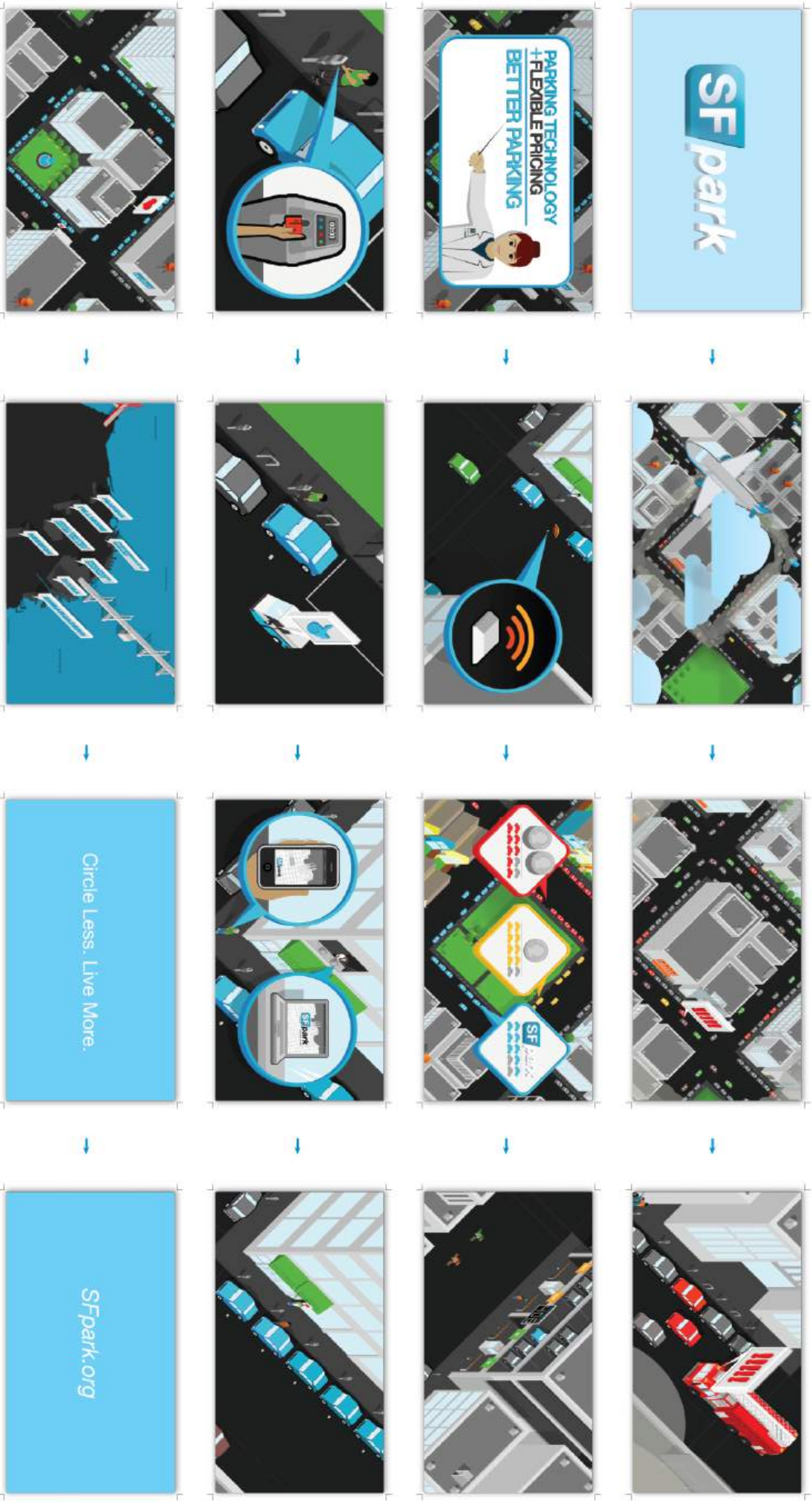


Parking census



| Inner Mission Parking Supply | | Plan Area Totals |
|--|--|------------------|
| Publicly Available Off-Street Parking | | |
| 67 Paid Publicly Available | | 1,054 |
| 87 Free Publicly Available | | 82 |
| 67 Permit Holder Only | | 2,018 |
| 67 Customer Parking Only | | 1,931 |
| On-Street Parking | | |
| Metered Area Parking | | |
| • < 30 mins | | 34 |
| • 1 - 2 hrs | | 735 |
| • Commercial Loading | | 133 |
| • Motorcycle | | 75 |
| Non-Permit Parking | | |
| 16 2 hr time limit | | 101 |
| 16 No time limits | | 3431 |
| Permit Parking -- Areas S, I, or W | | |
| <i>Non-permitted parking restrictions:</i> | | |
| 21 1 hr time limit | | 645 |
| 21 | | 454 |

Framing and messaging



Outreach



Japan Center Garage

New rates effective August 17

| Hourly | Daily |
|---|---|
| Midnight - 9am 9am - Noon Noon - 3pm 3pm - 6pm 6pm - Midnight | Early Bird (Mon-Fri) Enter before 7:30am and exit after 7:00pm Must enter and exit on same calendar day |
| \$1.50/hr \$2.00/hr \$2.50/hr \$2.00/hr \$1.50/hr | \$12 |
| Maximum/lost ticket (Mon-Sun) Motorcycle | |
| \$18 \$6 | |
| Charged in 30-minute increments | |

| Monthly | Off-Peak Discounts |
|---|---|
| Regular Regular M-F Reserved Carpool/carpshare Motorcycle | Enter before 7:30am (Mon-Fri) Exit after 7:00pm (Mon-Fri) Valid only for hourly parkers Must enter and exit on same calendar day Must park for at least 3 hours |
| \$170 \$130 \$255 \$85 \$60 | \$2,000 off \$2,000 off \$255 \$85 \$60 |

Garage upgrades

- Facility upgrades: New signage, paint and lighting will make garages more welcoming and easier to use.
- Demand-responsive prices: To attract drivers and make sure spaces are almost always available, rates at garages will be adjusted quarterly in response to demand. They may also vary by the time of day and day of week.



Find SFpark rates

Meters

SFpark meters display the current hourly rate as well as rate information for the full day. When you add funds, the meter automatically adds the appropriate amount of time.

Apps

Download the SFpark app at SFPark.org/apps to check real-time parking availability and rates on your iPhone. An SFpark Android app is coming soon.

SFPark.org

Visit the homepage for an interactive map of current availability and rates. SFPark.org/rates features complete rate adjustment information including maps showing pilot areas and affected streets. All new rates will be posted at least seven days in advance.

The SFpark Pilot Project

SFpark is a federally funded pilot project that aims to make it easier to park in San Francisco, reducing traffic and other problems caused by circling and double-parking. This is done using smarter demand-responsive pricing and providing drivers better information about where to find parking. At SFpark meters, drivers will have longer time limits and new meters that make it easy to pay. SFpark garages will undergo facility upgrades that make them more convenient to use.



Lombard Street Garage

| Hourly | Daily |
|---|---|
| Midnight - 9am 9am - Noon Noon - 3pm 3pm - 6pm 6pm - Midnight | Early Bird Enter before 7:30am and exit after 7:00pm M-F |
| \$2,000/hr \$2,500/hr \$2,500/hr \$2,000/hr \$2,000/hr | \$22 \$15 |
| Charged in 30-minute increments | |

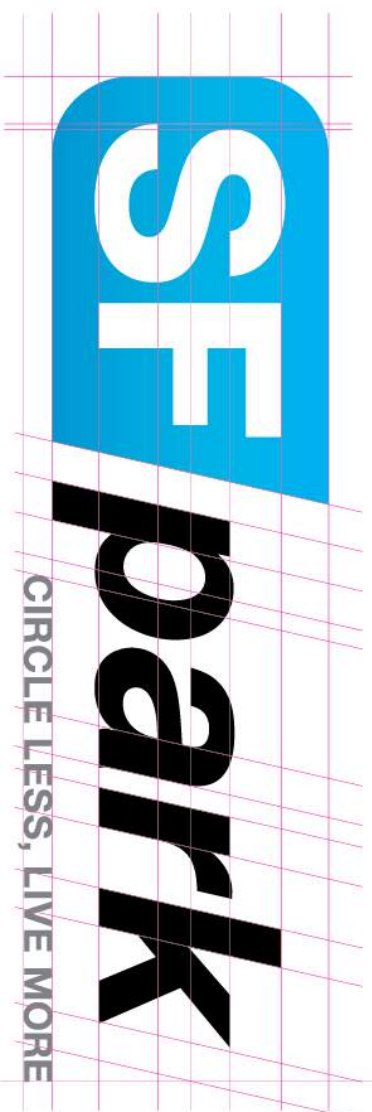
| Monthly | Off-peak discounts |
|---|--|
| Monthly (reserved parking) Monthly (carpool/carpshare) Motorcycle | Enter before 7:30am M-F Exit after 7:00pm M-F Applies to hourly rates only Must park for at least 3 hours |
| \$220 \$330 \$110 | \$2,000 off \$2,000 off |

New upgrades for the City's 14 SFpark garages

- Facility upgrades: New signage, paint and lighting will make garages more welcoming and easier to use.
- Demand-responsive prices: To attract drivers and make sure spaces are almost always available, rates at garages will be adjusted quarterly in response to demand. They may also vary by the time of day and day of week.



Identity and brand management



Creating a cohesive identity

New Coin & Card Meters

Coming to the Financial District
August – September

Pay by coin, credit & debit card, and SFMTA parking card.

Meter Upgrade Locations
From August to September, the San Francisco Municipal Transportation Agency (SFMTA) will replace around 415 existing parking meters with the new SFpark coin & card meters throughout the neighborhood. The state-of-the-art meters are easy to use and allow drivers to pay in multiple ways.

Learn more at SFpark.org

SFpark MTA San Francisco Municipal Transportation Agency

New Coin & Card Meters

Coming to the Financial District
August – September

SFPark Circle Less, Live More
The new coin & card meters are part of the SFMTA's SFPark project, which will help drivers find open spaces quickly, use time parking availability data to be accurate via SFPark's 911, text messaging, smartphone and web applications. The goal is to make parking meter use and pay for, and to reduce double-parking and circling. Better management of parking will open our streets and result in cleaner air, improved safety, lower travel times and improved access for commercial and emergency vehicles.

Find Parking More Easily
To help drivers find open space quickly, real-time parking availability data will be accessible via SFPark's 911, text messaging, smartphone and web applications. The data will be available from City-owned parking garages and parking sensors at metered spaces in eight pilot neighborhoods.

Smarter Parking Pricing
The new coin & card meters are designed to be used at least one space available per block. SFPark will adjust meter prices periodically to encourage drivers to park on underused blocks and to generate. While high-demand spaces will gradually go up in price, underused spaces will cost less. The SFMTA will change the way it sets parking rates to encourage drivers to use the spaces. Demand-responsive pricing will start early 2011.

Get Faster Parking Tickets
When a driver receives a parking ticket, they will have the option of making parking at meters more convenient. With longer time limits and many ways to pay, it will be easy for drivers to avoid parking tickets.

Learn more at SFpark.org

Upgraded Meters for the Financial District
From August to September, the San Francisco Municipal Transportation Agency (SFMTA) will replace around 415 existing parking meters with the new SFpark coin & card meters throughout the neighborhood. The state-of-the-art meters are easy to use and allow drivers to pay with coins, credit/debit cards and SFMTA parking card.

Single-Space Meters
Illustrated Display
New parking rates, hours, time limits and other important information.
Coin Payment
Insert and remove coin(s) from slot. Use credits, dimes, quarters or dollar coins.
Card Payment
Insert and remove credit/debit card. Adjust payment amount with **+** buttons. Press **0** button. Press **OK** button.
Multi-Space Meters
Illustrated Display
New parking rates, hours, time limits and other important information.
Keypad
Keypad shows number that your space number is based on the each next to your car.
Coin Payment
Enter space number. Insert coins for selected time. Use nickels, dimes, quarters or dollar coins. The meter does not dispense change.
Card Payment
Insert and remove credit/debit card. Adjust payment amount with **+** buttons. Press **0** button. Press **OK** button. Press **+**, **-** and **0** to change time. Press **OK** to confirm. Insert and remove card to complete transaction. Bring an SFpark parking card to the meter to complete transaction. Press **OK** to activate card up and remove your card when the desired time is reached. No receipt is necessary.

SFpark MTA San Francisco Municipal Transportation Agency



Product design

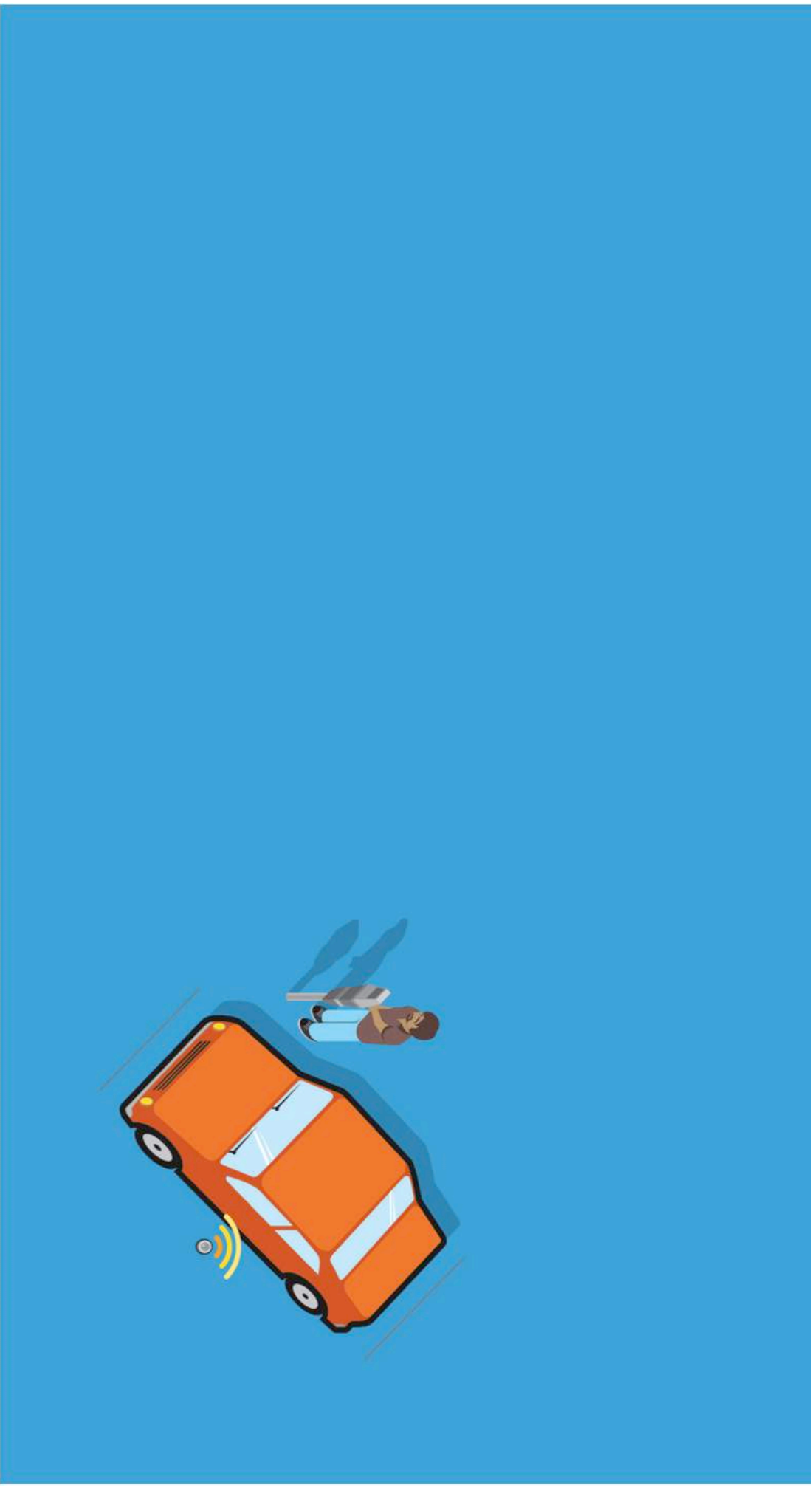


| | |
|---|--|
| <p>Pay By Credit or Debit Card</p> <ol style="list-style-type: none"> 1. Insert and remove card as shown. 2. Use to change time and payment. 3. Press to approve payment amount. <p>Transaction will appear on statement.</p> | |
| <p>Pay By SFMTA Parking Card</p> <ol style="list-style-type: none"> 1. Insert parking card, chip side up. 2. Use to change time and payment. 3. Press and remove card. | |
| <p>Pay By Coin</p> <ol style="list-style-type: none"> 1. Insert coins to pay for desired time. <p>Press to cancel at any time.</p> | |

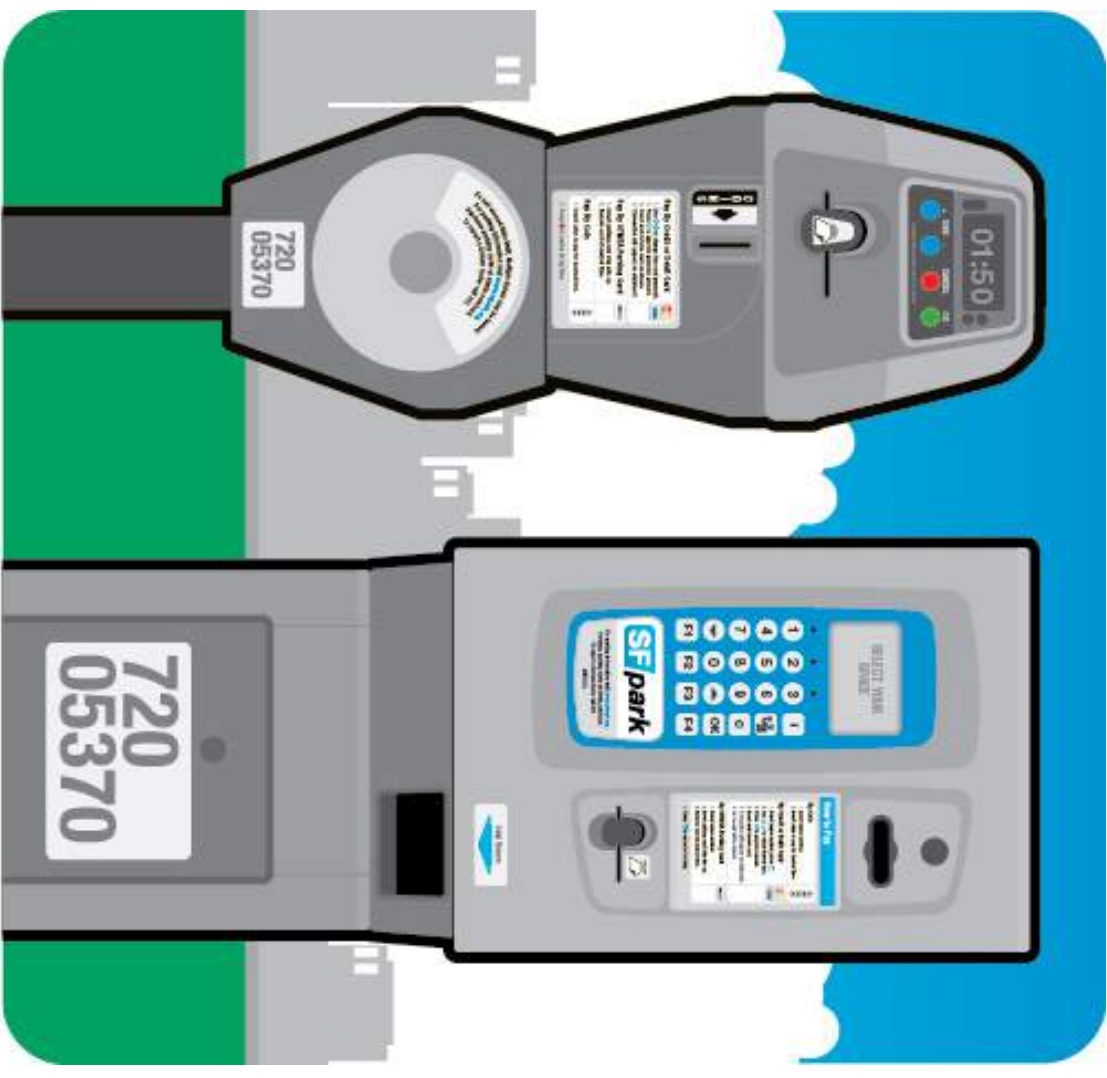
Advertising



Part 3: Implementation



Coin and card meters



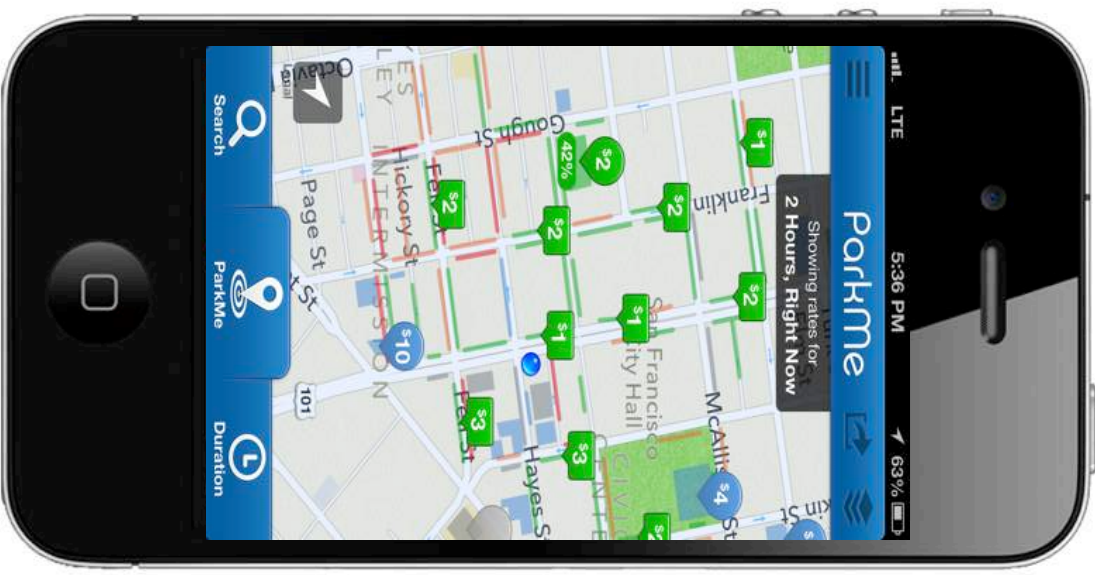
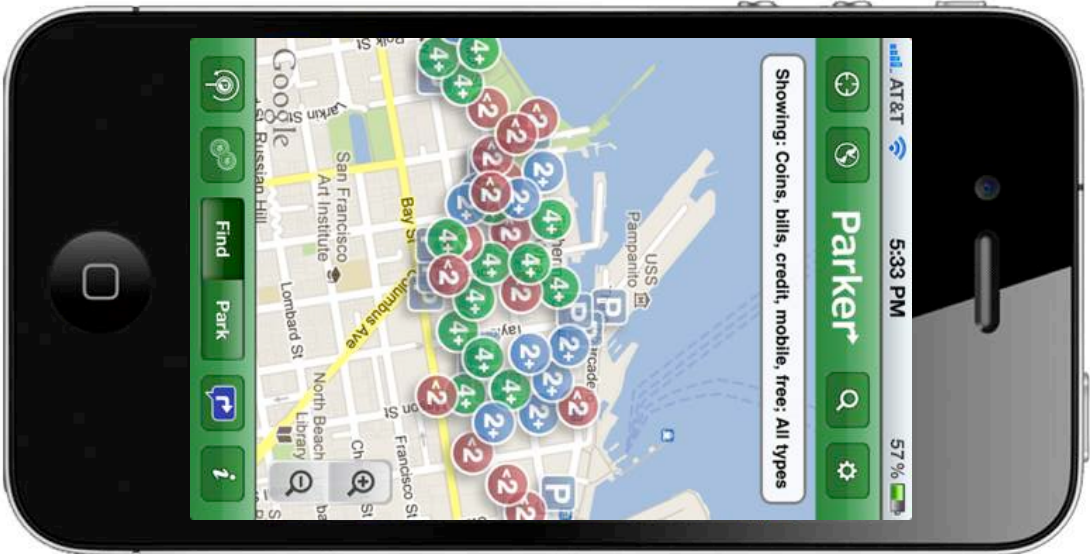
Parking sensors



Real-time information



Enable app development



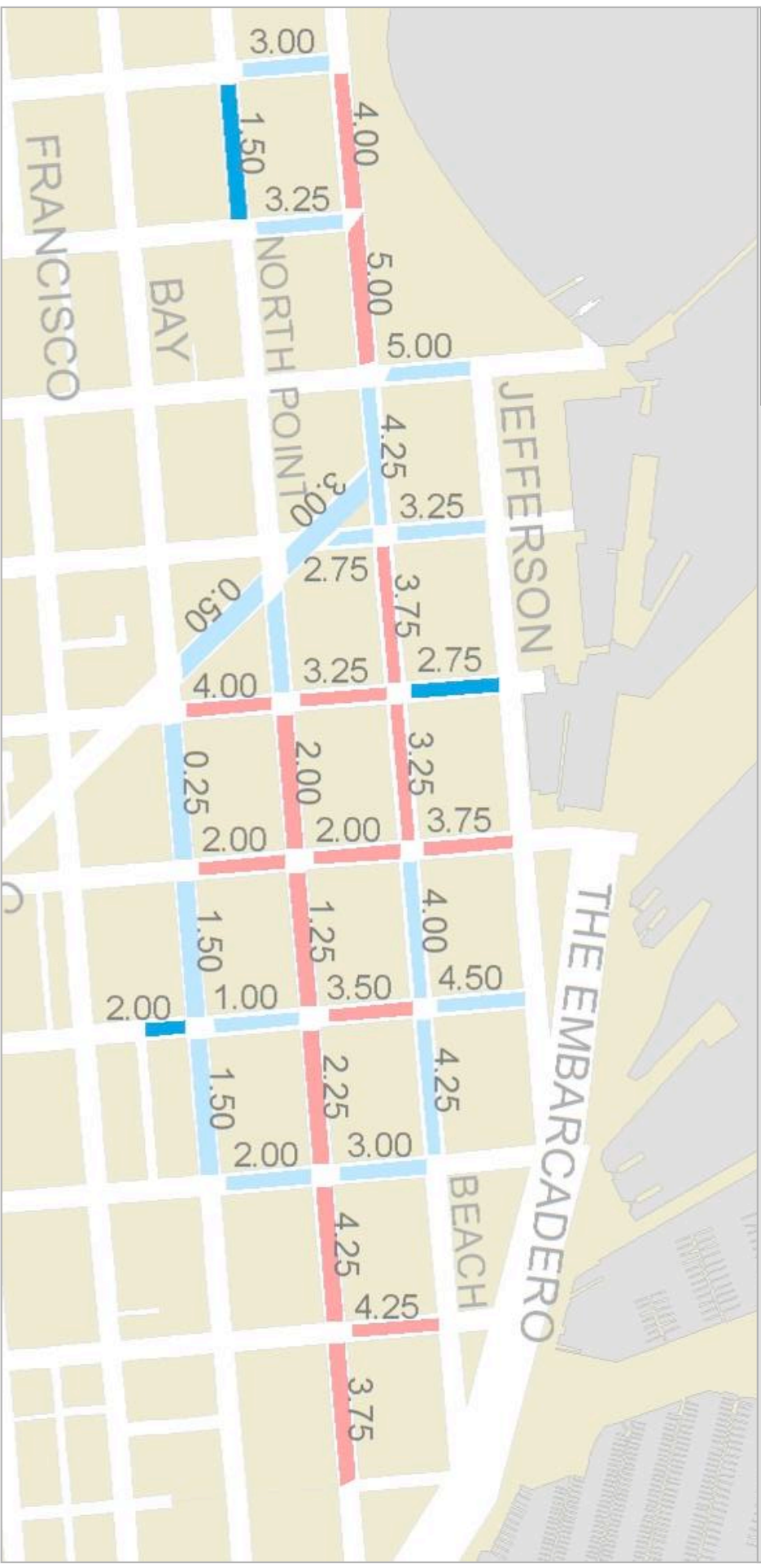
Pricing at parking meters and lots

- Demand responsive to find lowest possible prices
- Gradual and periodic changes: \$0.25 up or down every 4-6 weeks
- Time of day pricing (vary by block + weekday/end)



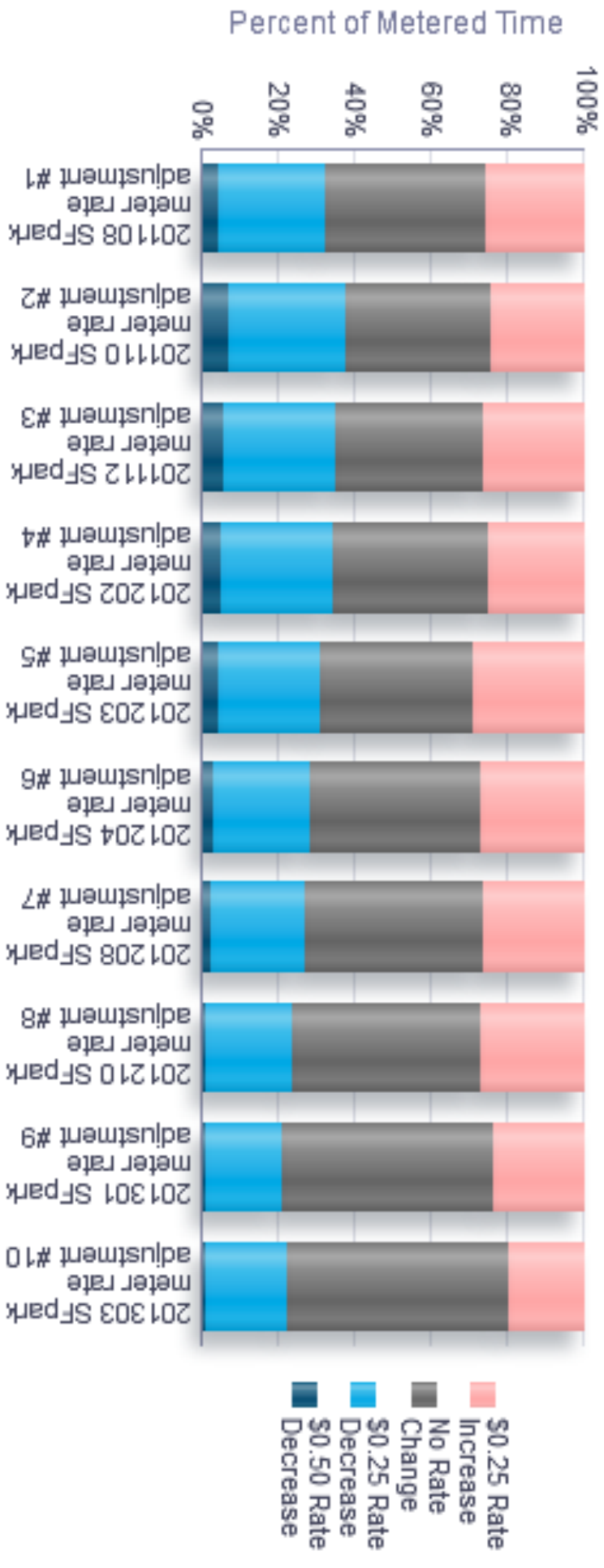
Demand responsive rate adjustments

Monday-Friday
Noon to 3pm

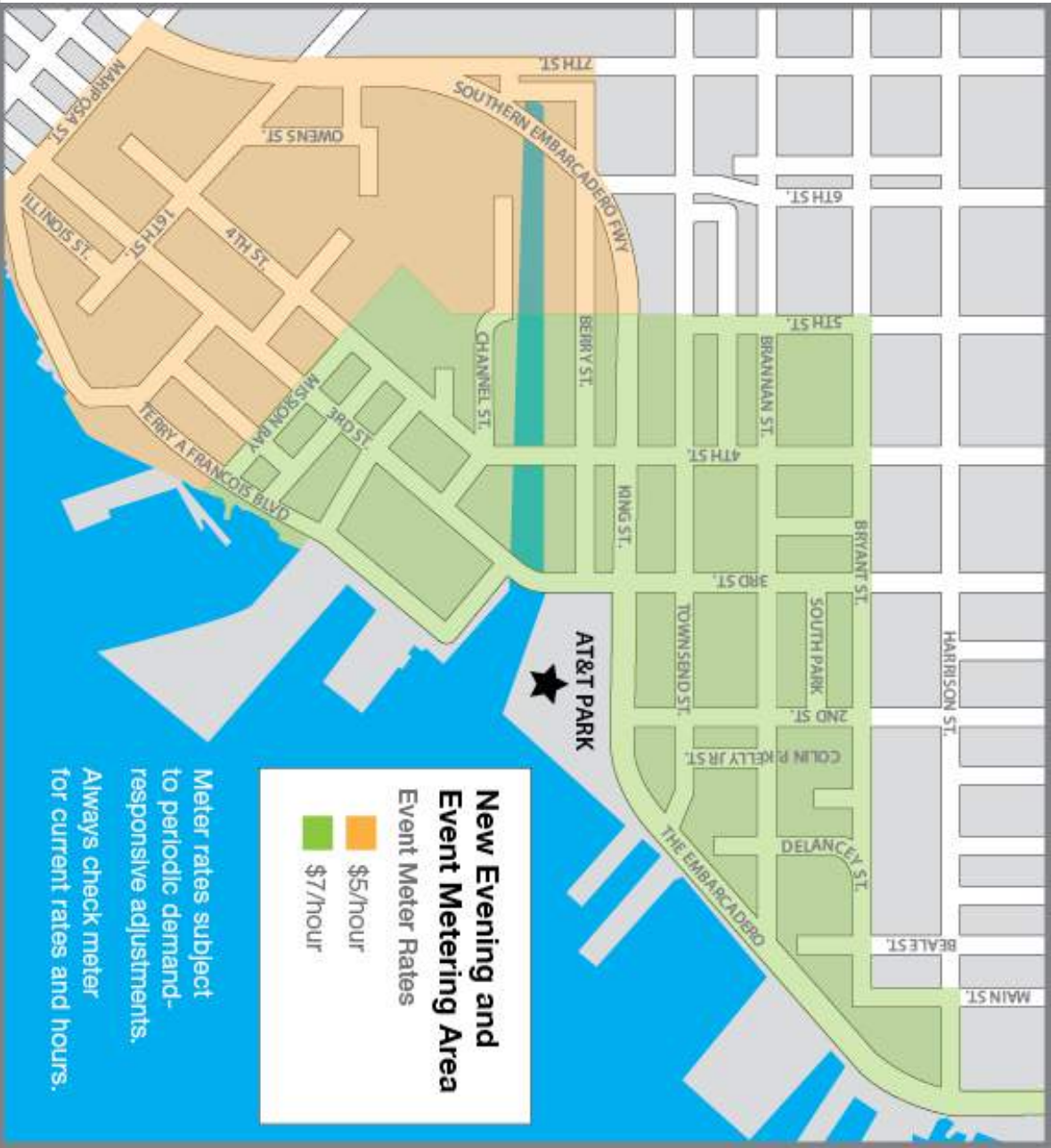


Demand responsive rate adjustments

Rate Change Distribution by Metered Hours



Special event pricing + evening hours



Pricing at SFpark parking garages

Performing Arts Garage

Hourly

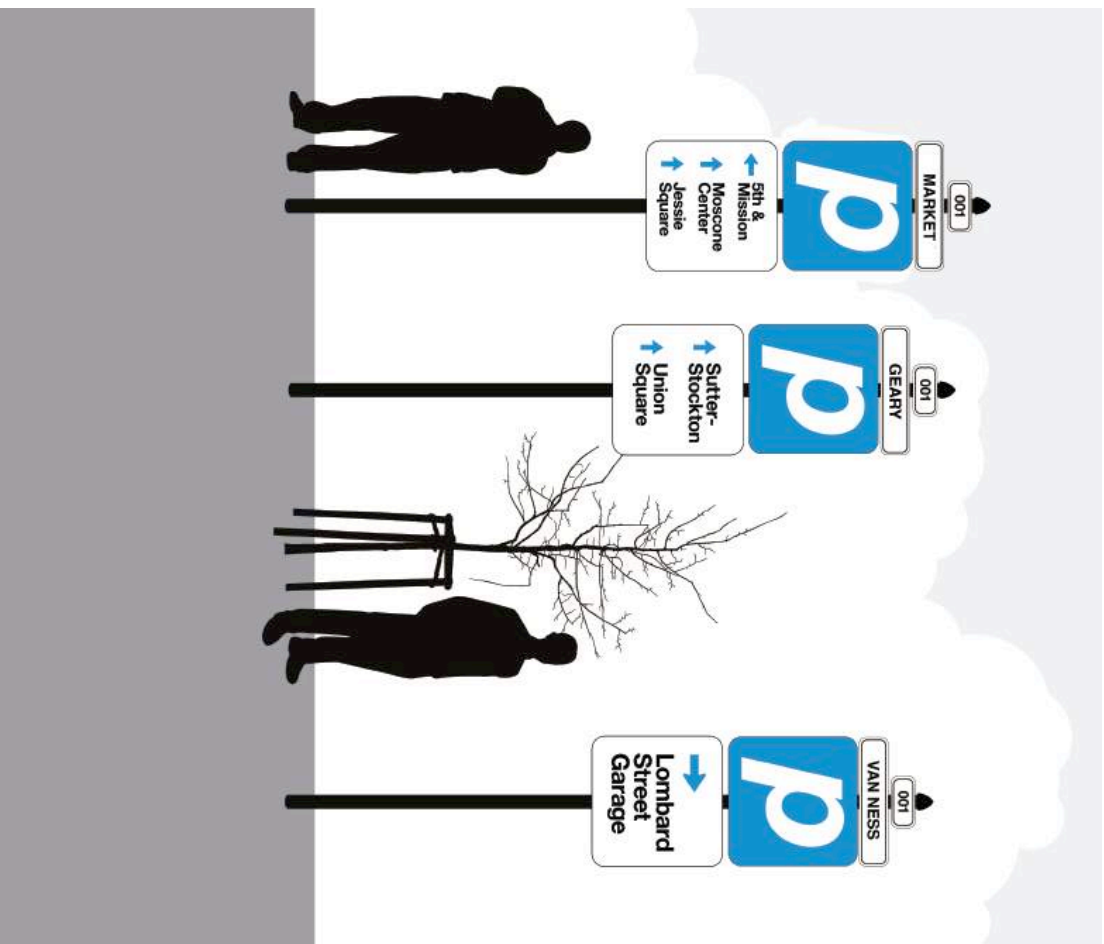
| | |
|----------------|-----------|
| Midnight – 9am | \$1.00/hr |
| 9am – Noon | \$2.00/hr |
| Noon – 3pm | \$4.00/hr |
| 3pm – 6pm | \$1.00/hr |
| 6pm – Midnight | \$1.00/hr |

Off-Peak Discounts *Mon-Fri*

| | |
|---------------------|---------|
| Enter before 8:30am | \$2 off |
| Exit after 6:30pm | \$2 off |

*Must enter and exit on same calendar day
Must park for at least 3 hours*

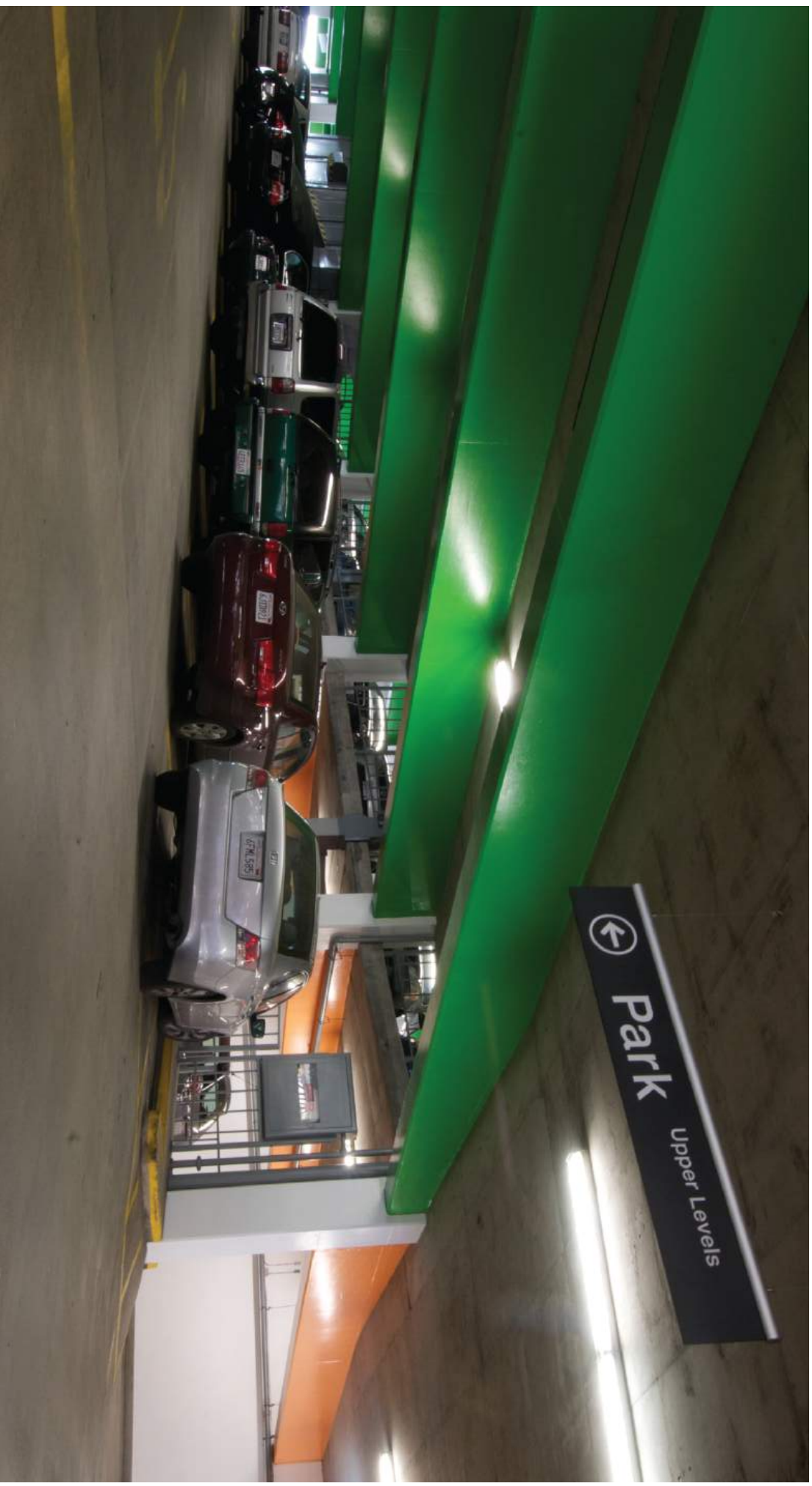
Wayfinding signs



Making garages more appealing



Making garages more appealing



Part 4: Evaluation



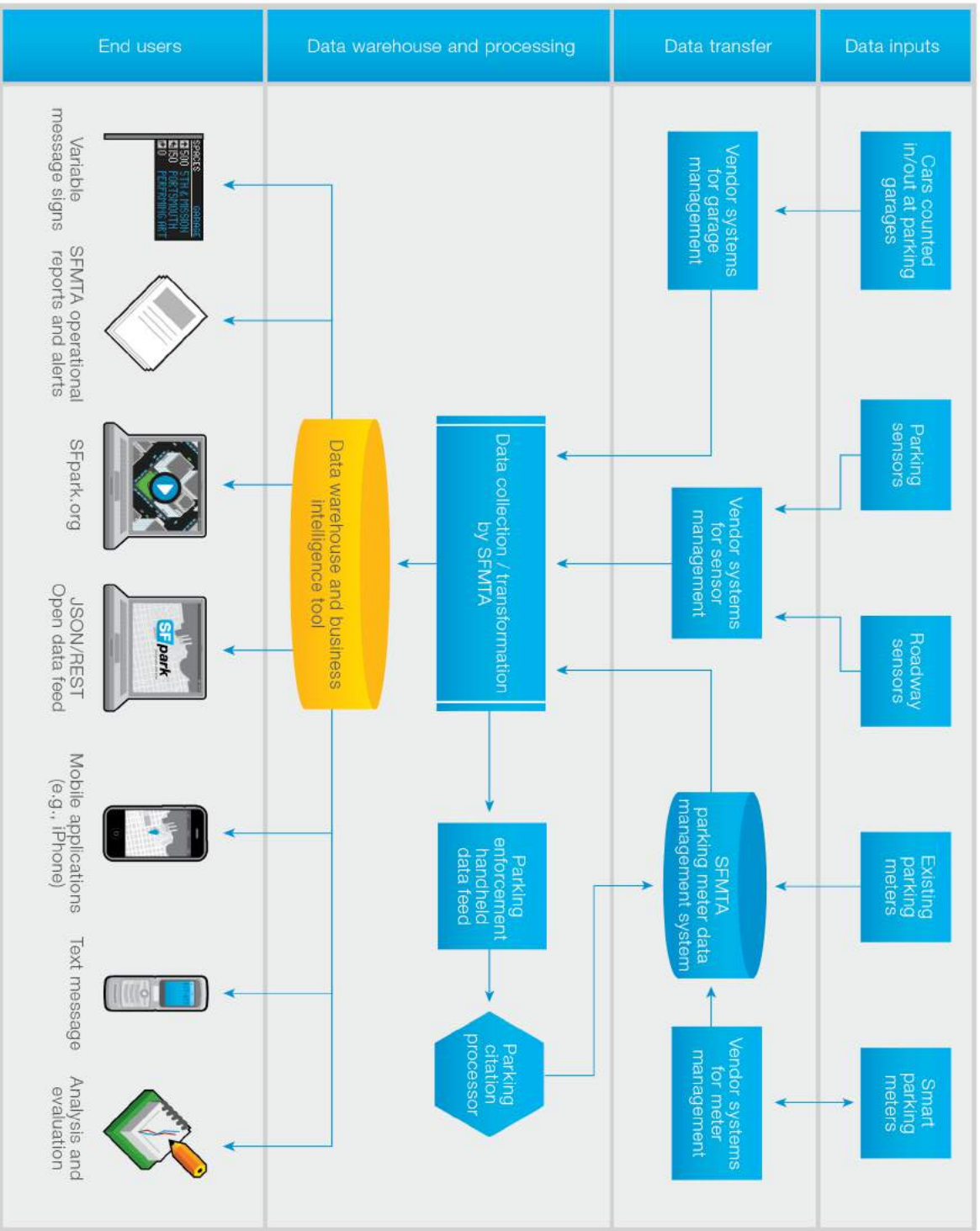
Automatic data

- Supply data (census, asset management, street closures)
- Parking data (from sensors, meters, and citations)
- Garage data (usage by hour)
- Travel demand data (roadway sensors, highways PEMS, BART, Muni)
- Muni data (travel time data from APCs)
- Parking tax
- Sales tax
- Safety (SWITIRS collision data)
- Exogenous (fuel price, CPI, unemployment, precipitation)

Manual data

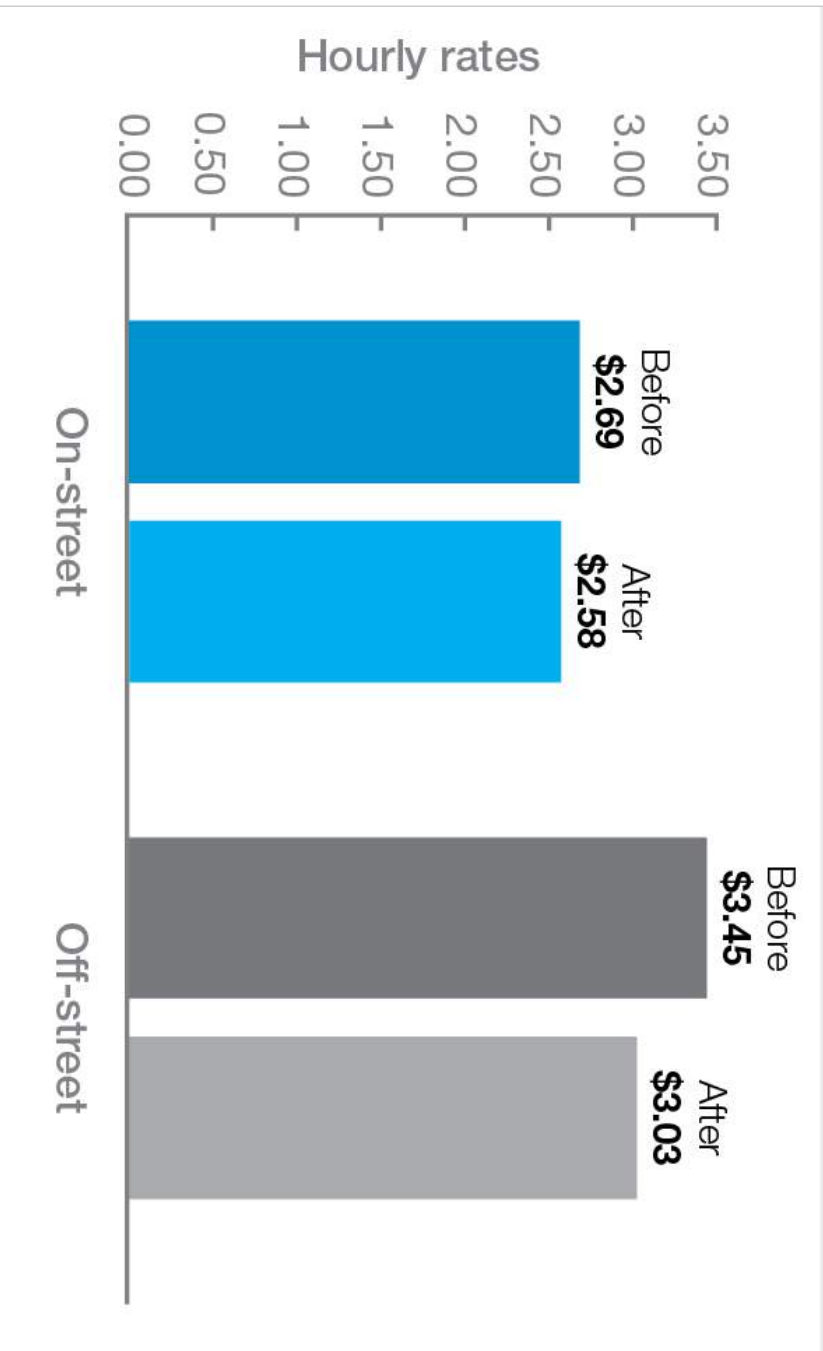
- Parking search time
- Double parking and disabled placard
- Intercept surveys (professional survey firm)

Investment in data management/analytical tools



How did rates change?

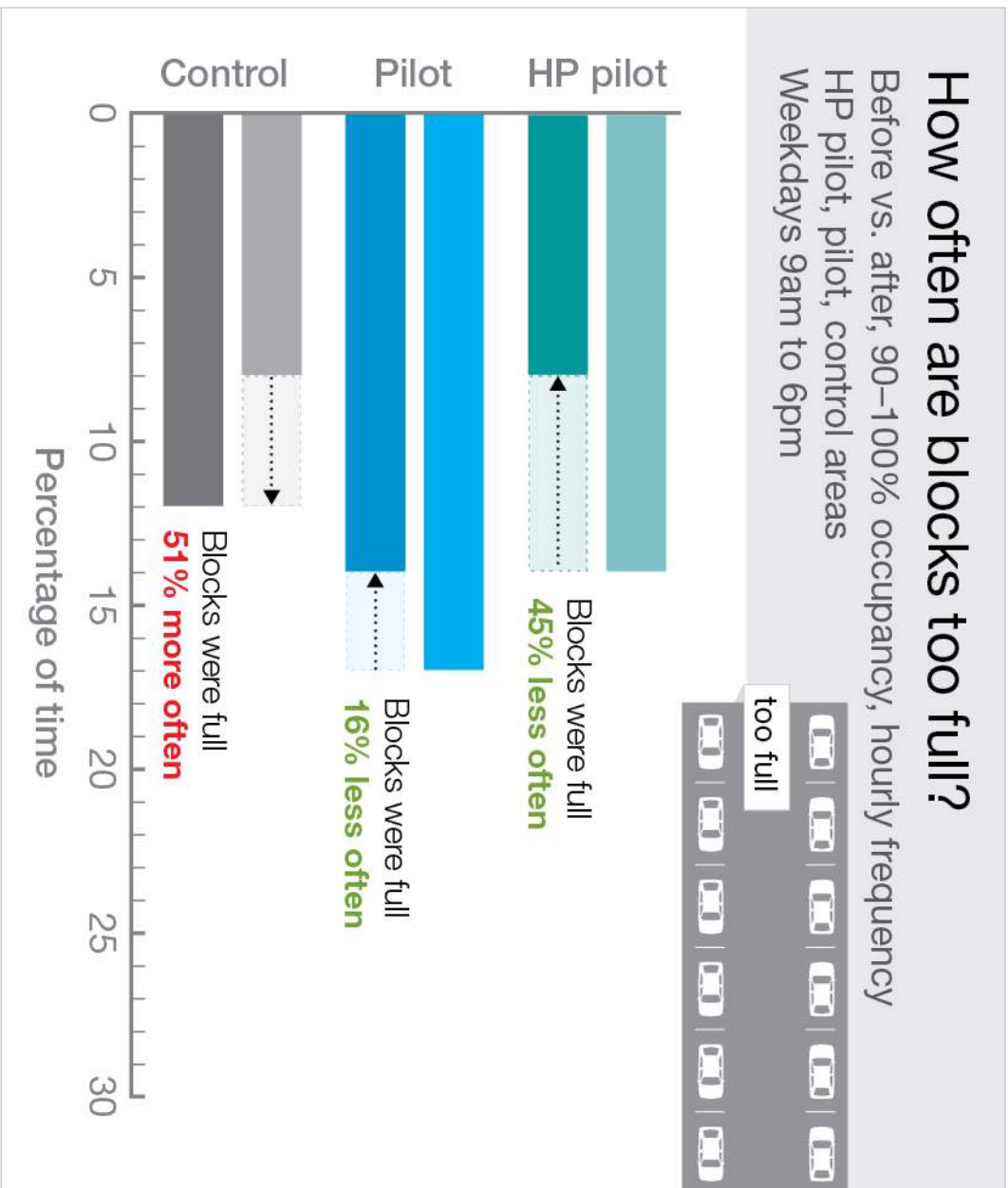
Hourly parking rates in SFpark areas
Before vs. after (10 rate changes)
On- and off-street rates



Was it easier to park?

How often are blocks too full?

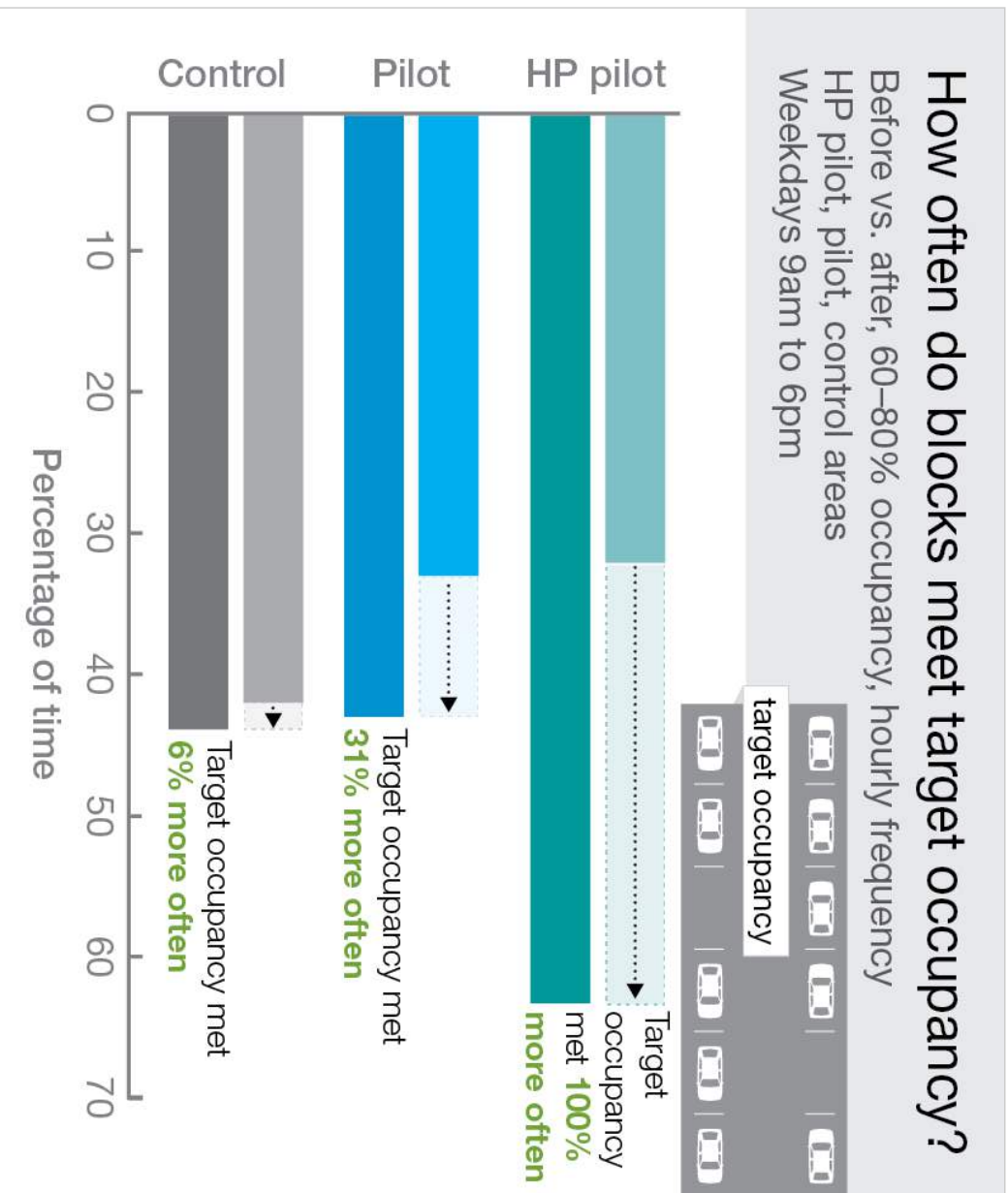
Before vs. after, 90–100% occupancy, hourly frequency
 HP pilot, pilot, control areas
 Weekdays 9am to 6pm



Was it easier to park?

How often do blocks meet target occupancy?

Before vs. after, 60–80% occupancy, hourly frequency
 HP pilot, pilot, control areas
 Weekdays 9am to 6pm

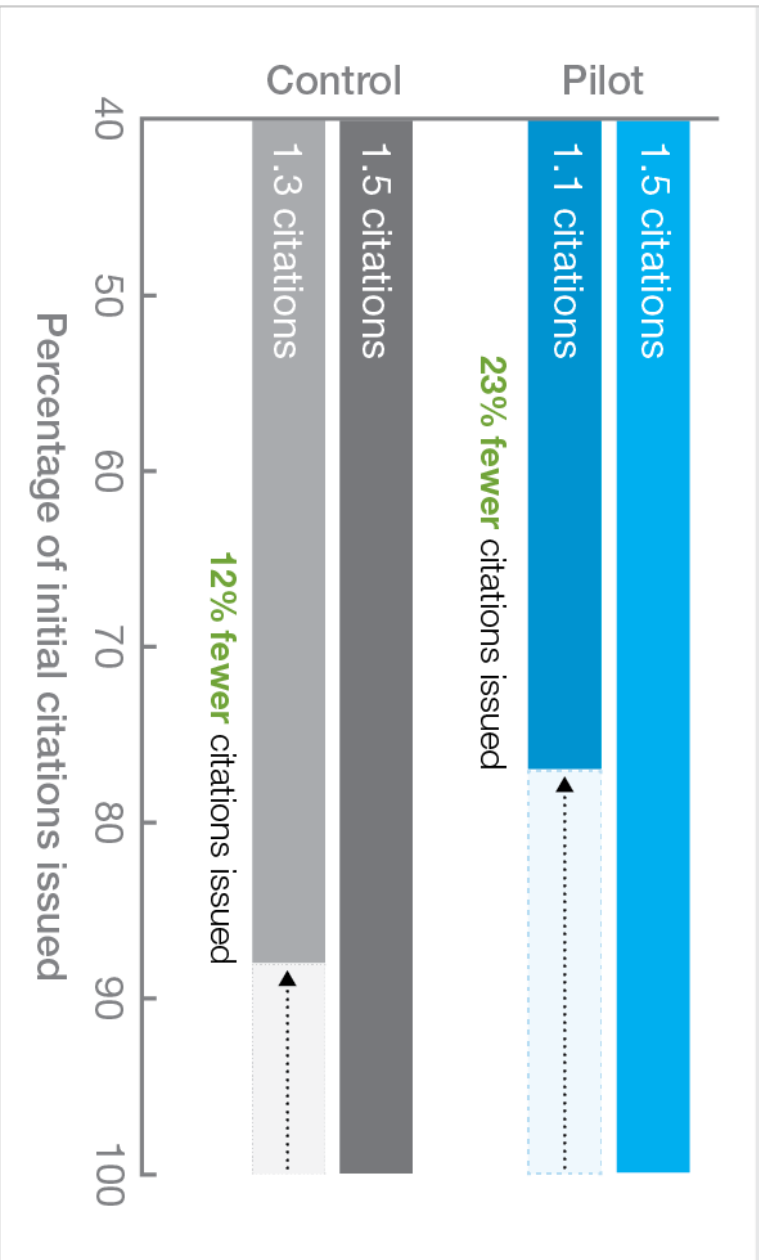


Secondary benefits we expected

- Easier to pay and avoid citations
- Easier to find a parking space
- Parking spaces better utilized
- Less circling
- Less vehicle miles travelled
- Decreased greenhouse gas emissions
- Decreased double parking
- Improve Muni speed
- Supported economic vitality and safety

Easier to pay and avoid citations

Average monthly parking citations per meter
 Before vs. after
 Pilot vs. control areas | Weekdays 9am to 6pm

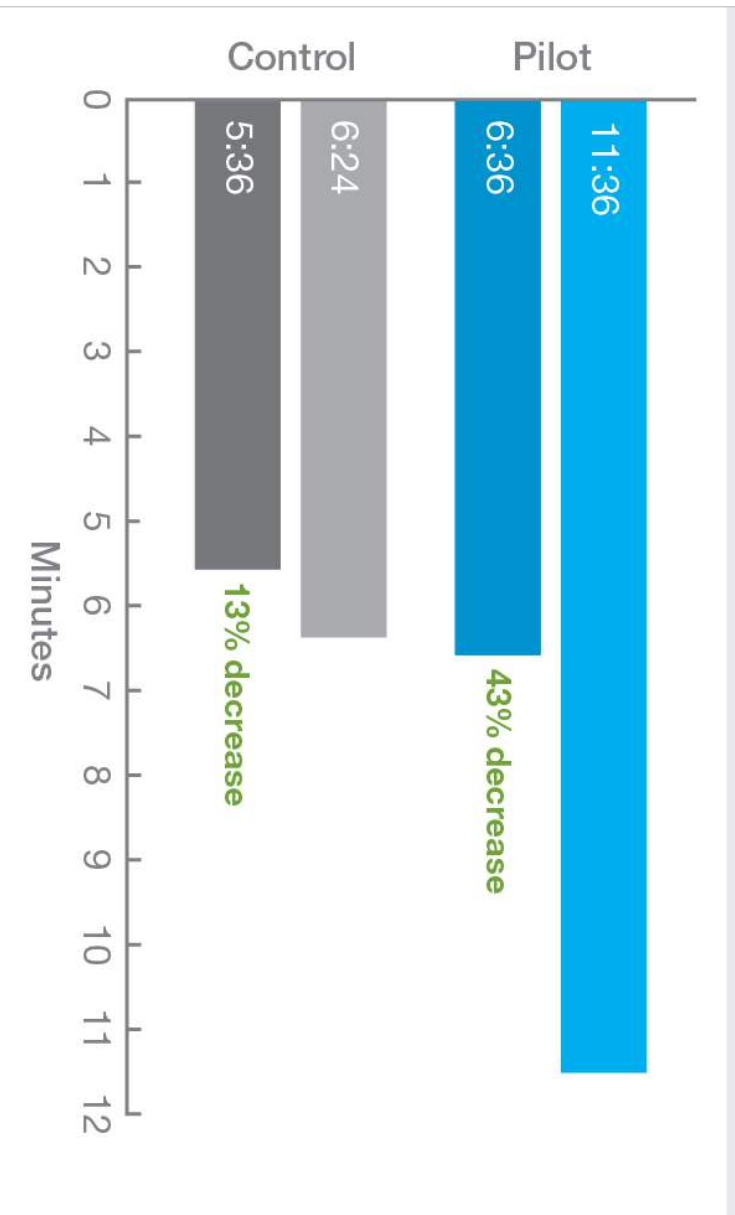


Easier to find a parking space

Parking search time (minutes)

Reported search times, before vs. after

Pilot vs. control areas | Weekdays 9am to 6pm

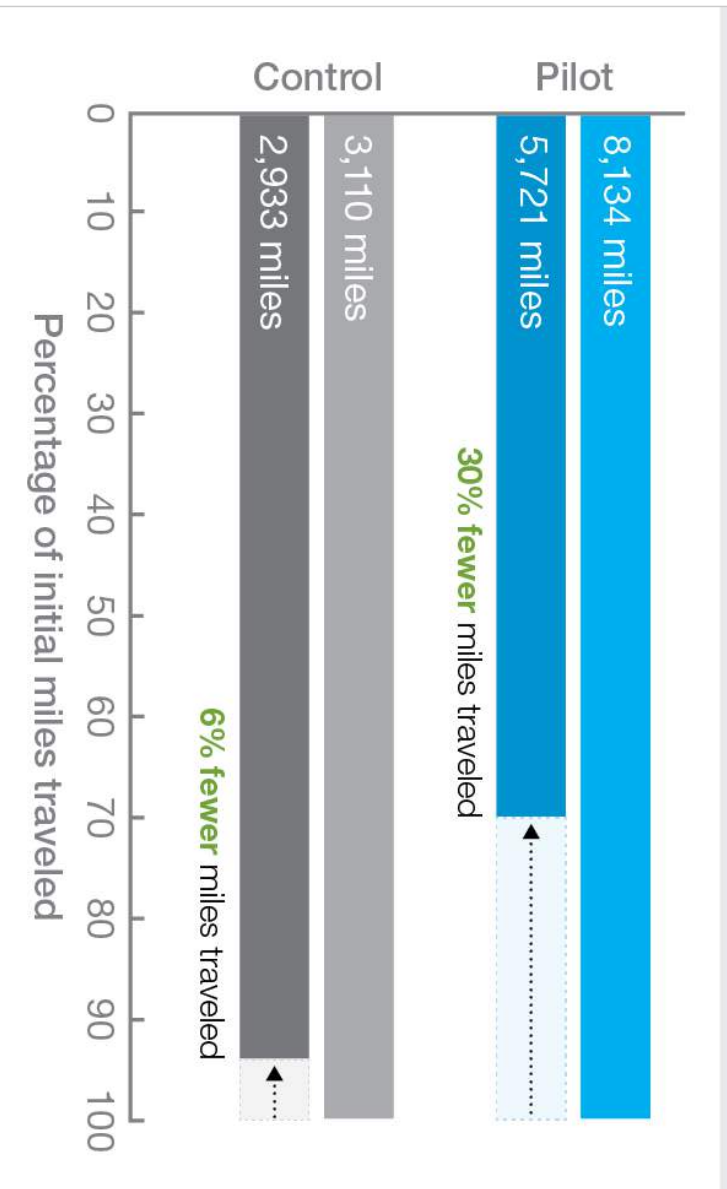


Decreased vehicle miles travelled

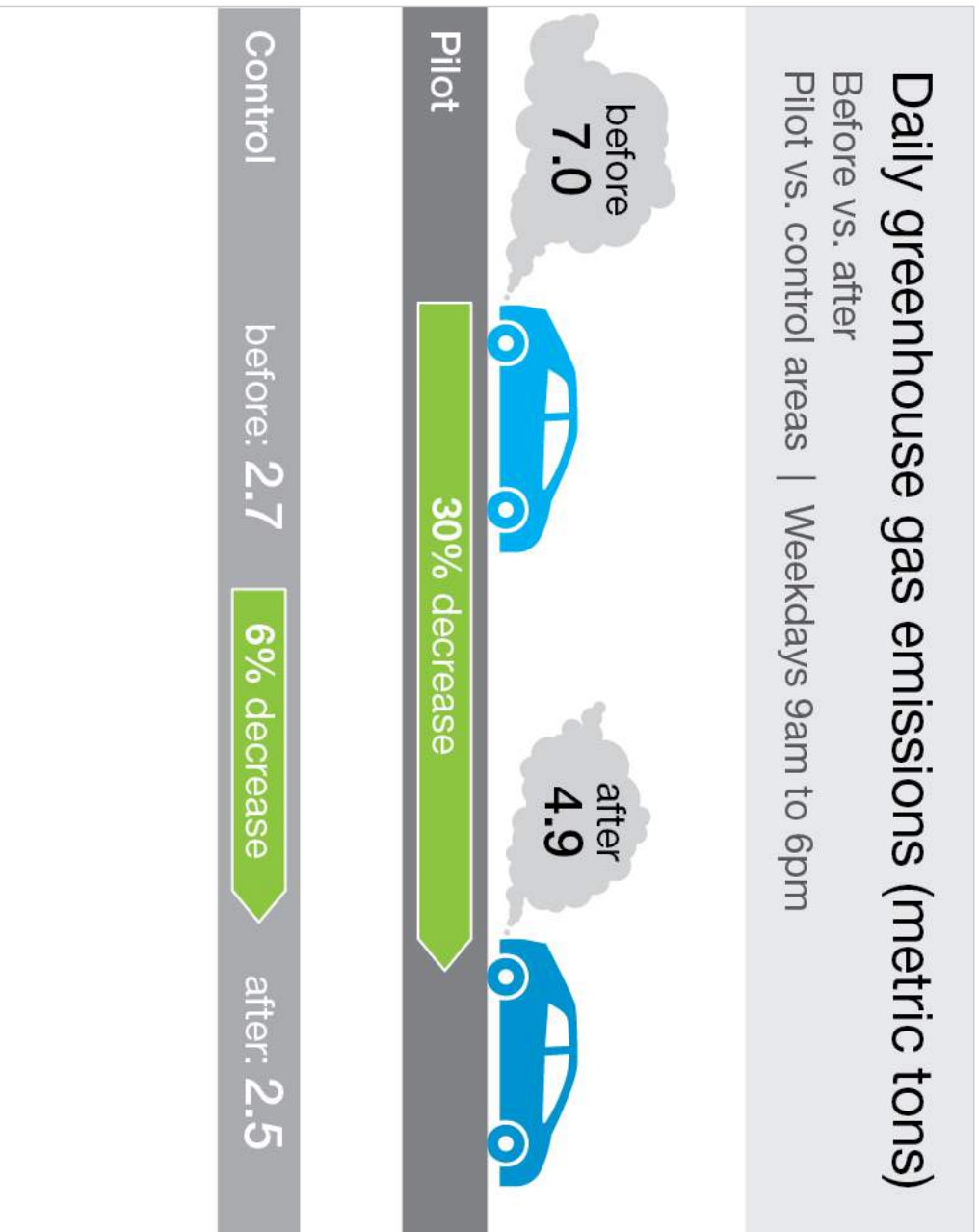
Daily vehicle miles traveled

Before vs. after

Pilot vs. control areas | Weekdays 9am to 6pm



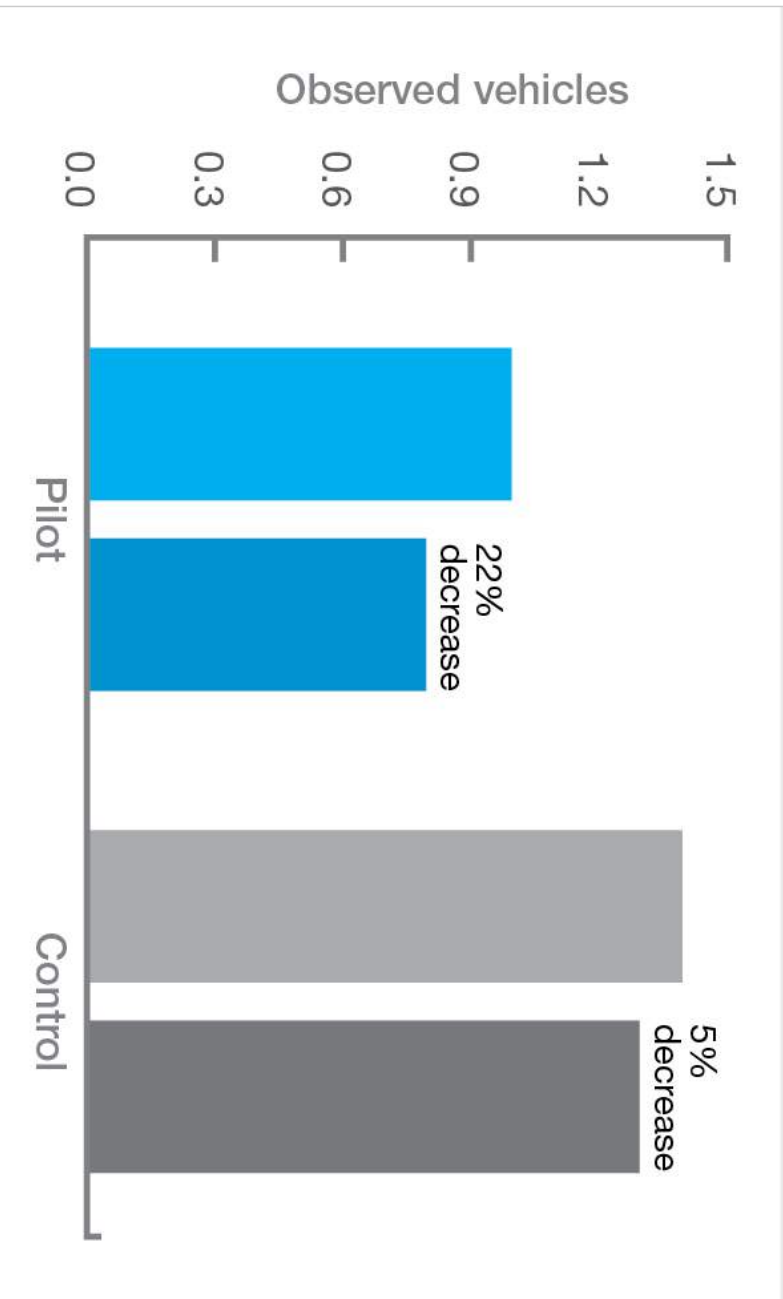
Decreased greenhouse gas emissions



Decreased double parking

Double parked vehicles per block per day

All pilot and control areas, weekdays 9am to 6pm, 2011–2013
Includes blockfaces with 5+ parkable spaces



Improved transit speed

Transit speed and double parking

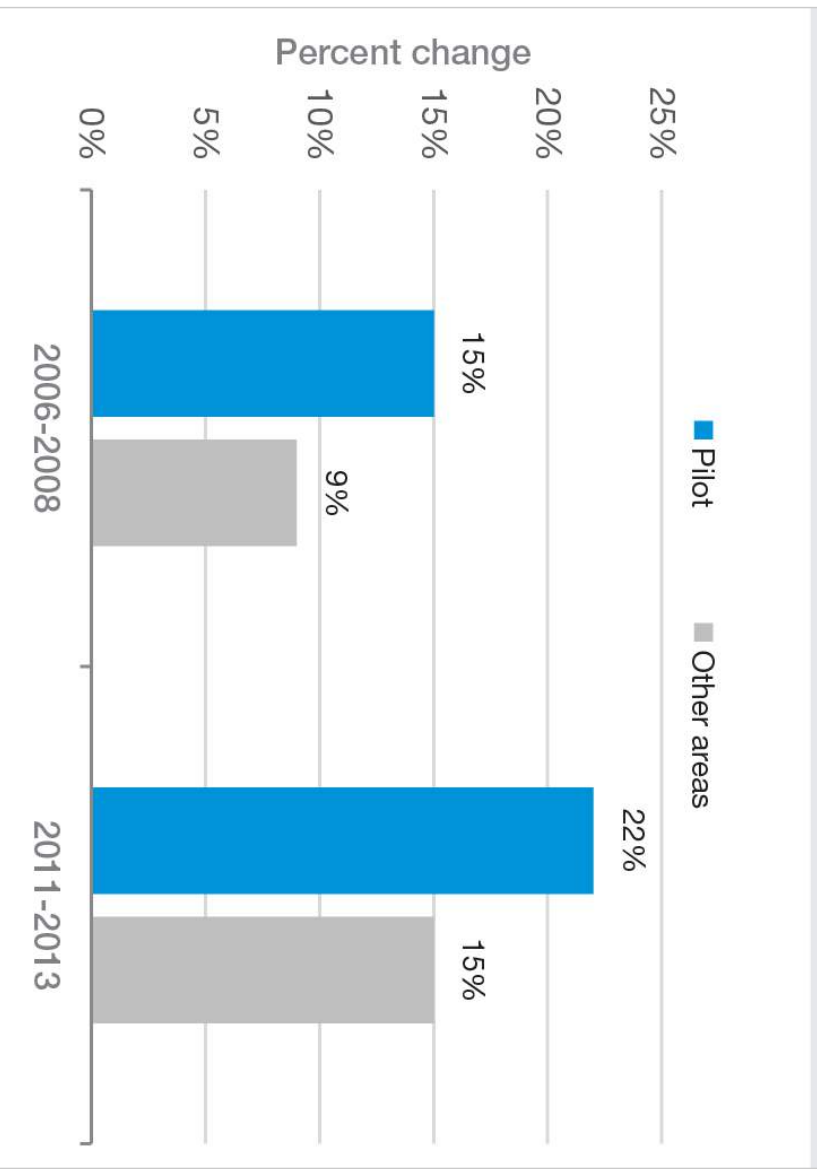
Transit speed on corridors with increased vs. decreased double parking (DP)
Weekdays, 9am to 6pm
Before vs. After

| | Before | After | Net change | % change |
|----------------------------|--------|-------|------------|----------|
| Corridors w/decrease in DP | 6.4 | 6.6 | 0.2 | 2.3% |
| Corridors w/increase in DP | 7.1 | 6.7 | (0.4) | -5.4% |

Supported economic vitality and safety

Sales tax revenue, percent change

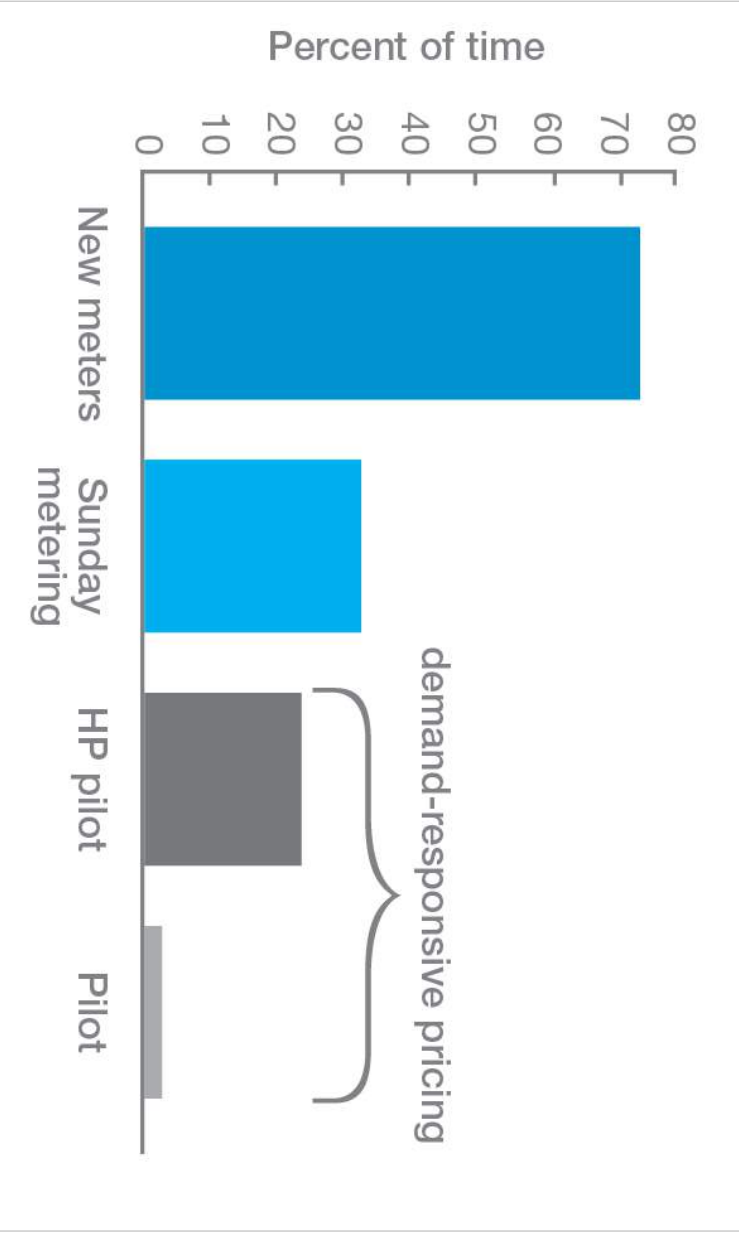
Food product, general retail, misc sales tax receipts
SFpark pilot and all other areas
2006 to 2008 and 2011 to 2013



Additional findings

Change in percent of time parking was available

Change in percent, before to after, occupancy less than 90%
New meters, Sunday metering, and demand-responsive pricing



Part 5: Lessons learned



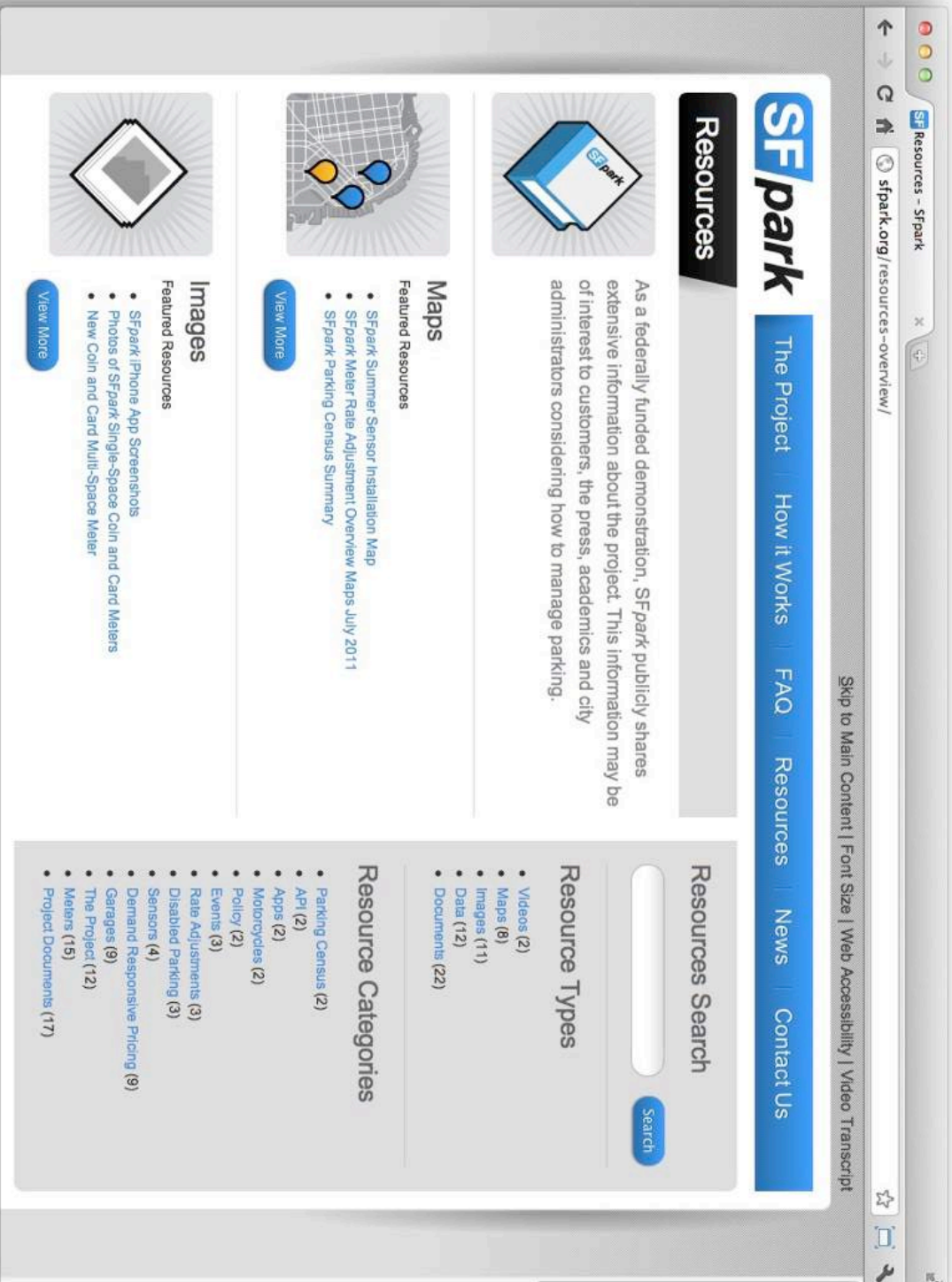
Lessons learned

- What worked well
 - Clear goals and policies
 - Transparent, rules-based, and data-driven process
 - Large investment in communication and customer experience
 - Simple user interface -- nothing overly complex
 - Relaxing and eliminating time limits
- What was challenging
 - This approach is very IT intensive
 - Parking sensors are a nascent product/industry
 - Culture change takes time
 - Recognizing parking management as tool
 - Emphasizing availability rather than turnover

Relevance for other cities (like Carlsbad)

- Parking as universal issue for quality of life and economic vitality
- A simple, low tech, low cost approach can deliver much of the benefit
 - Simply managing parking demand at all was the biggest factor
 - Occupancy data is critical but sensors aren't necessary
 - Pasadena, Redwood City, and Berkeley are useful California examples
 - Easy to implement strategies:
 - Seeing parking as a tool to achieve clear goals (e.g., economic development)
 - Parking census
 - Easy payment (meters, pay by phone)
 - Demand-responsive pricing, relaxed time limits, and manual data collection
 - Better signage, decals, identity
 - Wayfinding signage
 - Enhance experience at lots/garages
- Managing demand only works if you manage supply

SFpark.org/resources



Learn more



Thank you

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