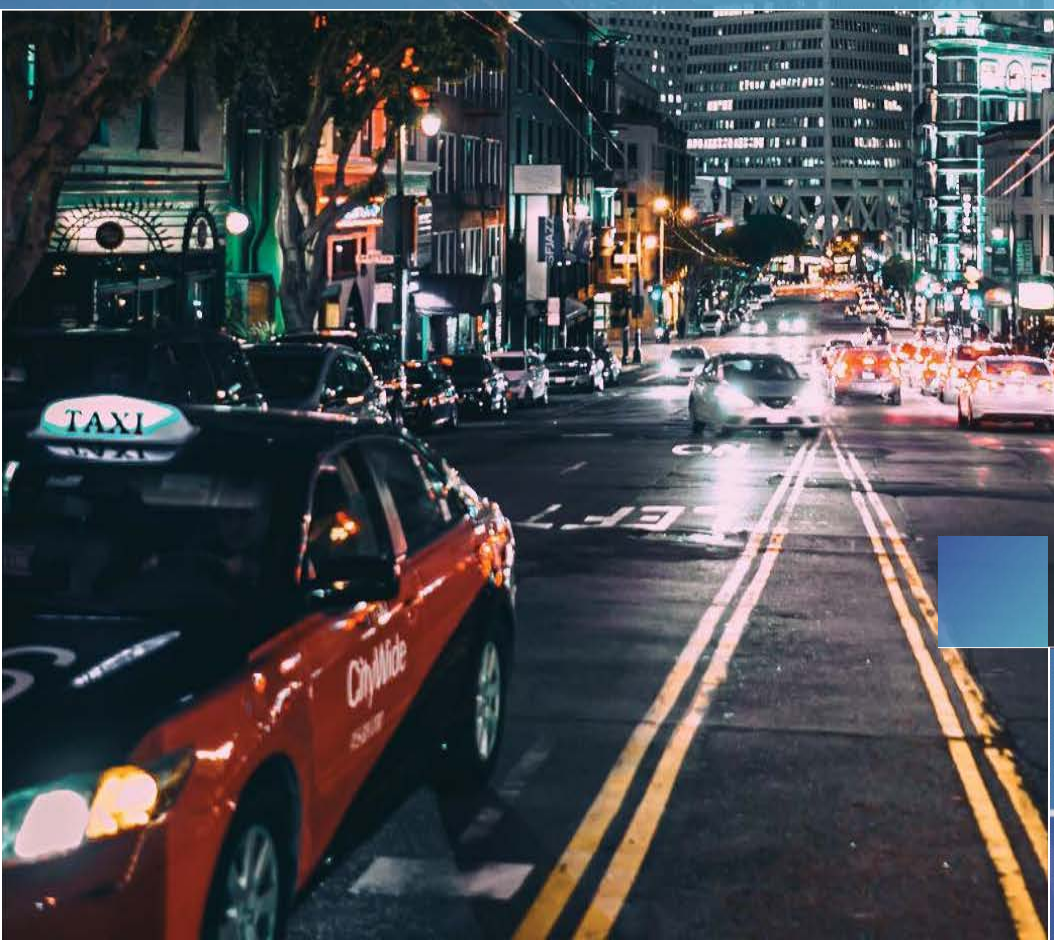
AUTONOMOUS VEHICLES

PERSPECTIVE PAPER

Technical Addendum



HORIZON

Metropolitan Transportation Commission

Autonomous Vehicles Perspective Paper

Technical Addendum

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1.1 Purpose of the Technical Addendum

This Technical Addendum accompanies the *Autonomous Vehicles Perspective Paper* published under **Horizon**, a regional initiative exploring a range of external forces that have the potential to fundamentally alter the region's trajectory. The purpose of the Perspective Paper is to present a set of planning strategies for the Bay Area to seize the opportunities and meet the challenges that AVs are likely to introduce. This Addendum augments those strategies with example applications, providing specificity and metrics – a high-level blueprint – for analysis and possible implementation when relevant and appropriate. The example applications described here should be considered in the context of the Horizon guiding principles and the range of likely implications AVs could present.

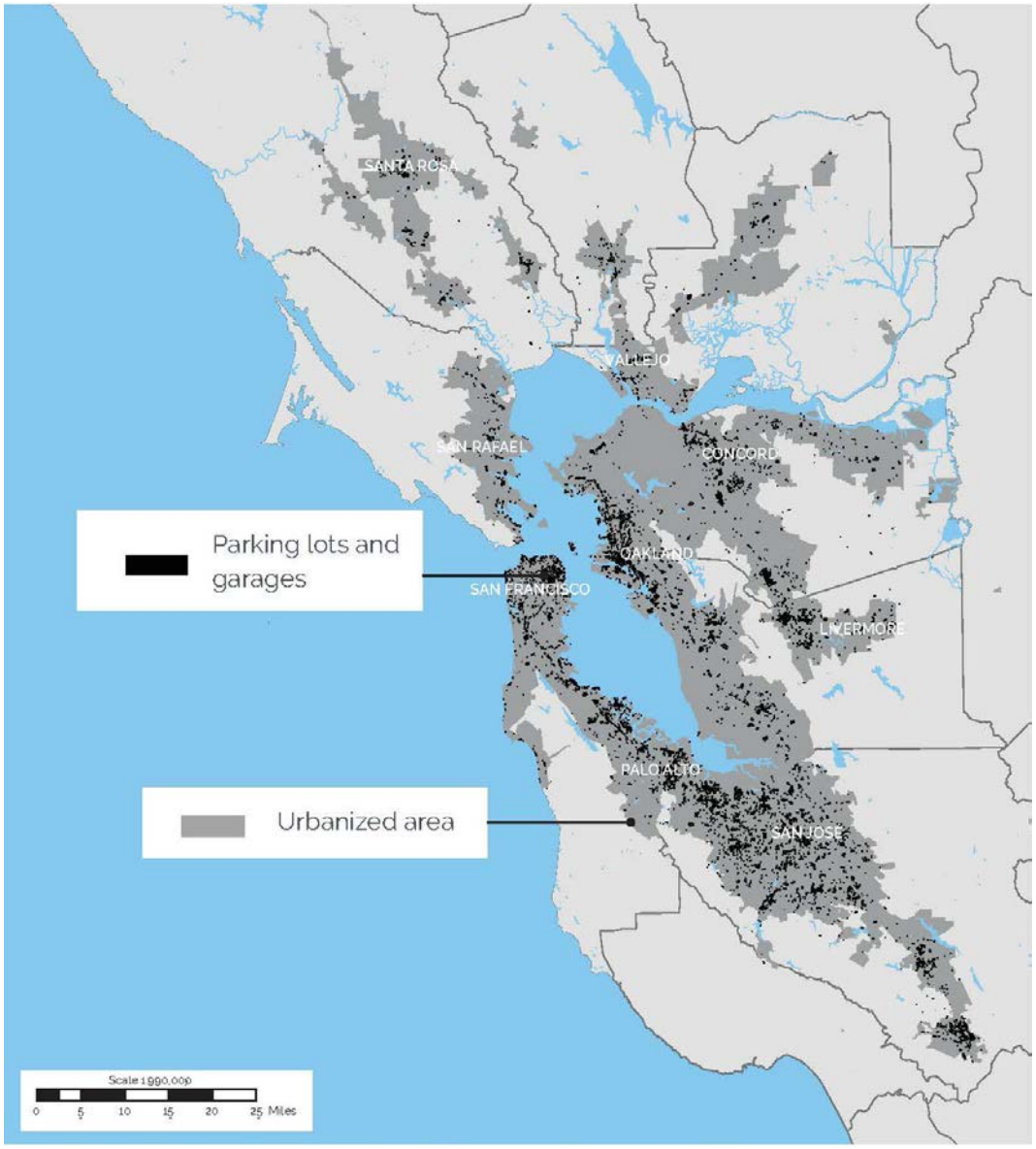
1.2 Affordable Example Application

Housing Opportunity Sites in an Autonomous Future

AVs are highly likely to reduce parking demand no matter the business models that proliferate. Shared fleet models are most likely to reduce parking, since each fleet vehicle will be able to provide dozens of trips a day in urban areas with minimal parking or staging. These shared models will reduce car ownership, resulting in lower parking demand. This business model is likely to flourish in urban and suburban locations where shorter trips and shorter waiting times allow services to compete with car ownership in convenience. Even owned AVs in more suburban or rural environments will reduce parking demand by making consolidated parking easier. At destinations with high densities of people, remote parking will allow for reduced and consolidated parking. Examples include transit stations, educational and employer campuses, airports, and stadiums.

This reduction of parking demand with AVs will free up land for other uses, such as housing. Amid the Bay Area's affordability crisis and growing population, it is essential to increase the supply of housing, particularly housing affordable to a larger portion of the population. **Figure 1** shows clustering of off-street parking lots and garages in the urbanized Bay Area. If these areas were redeveloped into housing, hundreds of thousands of new housing units would be added. Additionally, household garages could be redeveloped into accessory dwelling units and on-street parking could be redesigned with bike lanes, parklets, and landscaping to improve access and quality of life.

Figure 1: Housing opportunity sites in an autonomous future



The map displays the abundance of parking lots and garages across the Bay Area. In a future with a high penetration of autonomous vehicles, some communities may repurpose some of these locations for other uses as parking demand decreases.

The most appropriate locations for increased housing supply and decreased parking include:

- **Priority Development Areas.** Priority Development Areas (PDAs) have been previously identified for future growth and are typically accessible by transit services. The process to identify PDAs has already been completed, suggesting local and regional preferences for development efforts, making many of these locations ideal for early and intensive housing development. As part of *Horizon*, MTC is taking a fresh look at potential growth strategies, including a focus on PDAs and other areas that perform well in terms of VMT per capita, access to opportunity, and other measures. These may be the most appropriate places to evaluate the impact of redeveloping parking for other uses.

- **Major cities and downtowns.** All three major cities – San José, San Francisco, and Oakland – are candidates for focused housing growth, because they are:

    - mobility rich, allowing residents, workers, and visitors to travel to, from, and within the cities;

    - activity centers in which shared transportation (such as transit and shared rides) is common; and

    - locations in which demand for compact housing is already high.

    Large to medium city downtowns are also priorities as these areas similarly generally have mobility options, concentrations of activity, and existing demand for relatively compact housing. Examples include: Fremont, Napa, Palo Alto, Pleasant Hill, Richmond, San Mateo, and San Rafael.

- **Parking-rich areas.** PDAs and downtowns with less than 85% parking occupancy in the peak period should be prioritized for more housing and less parking. Areas with relatively large amounts of parking will generally see the largest decreases in gross parking demand with the adoption of shared AV mobility services.

At the municipal level, implementing parking maximums and instituting or maintaining urban growth boundaries will help encourage more compact, affordable development and curb sprawl. Parking maximums will help prevent oversupply from becoming obsolete. For example, municipalities could require a maximum of 2.5-3.0 spaces per 1,000 square feet of office development while collaborating with developers to forgo parking construction entirely. These fees could be directed to managing district parking and bolstering district multimodal options. Generally, municipalities should move away from localized parking at all levels.

A three-tiered parking redevelopment plan can help municipalities transform their existing parking supply into housing:

1. **Surface lots** in core areas will be the earliest candidates for redevelopment. Whether public or private, these parking properties will be the least expensive and least logistically complex redevelopment efforts. Additionally, new housing of surface lots in core areas will be located in ideal for locating housing in transportation and activity-rich areas.
2. **Parking structures** will be the next candidates for housing conversion, since structures (again, whether public or private) will generally be located near other uses of interest. However, they will be more expensive and logistically challenging to demolish and redevelop compared with surface lots.
3. **Basements and podium structures** will likely be redeveloped last, since their integration with buildings makes them the most difficult to repurpose for other uses, unless they were intentionally designed to be repurposed.

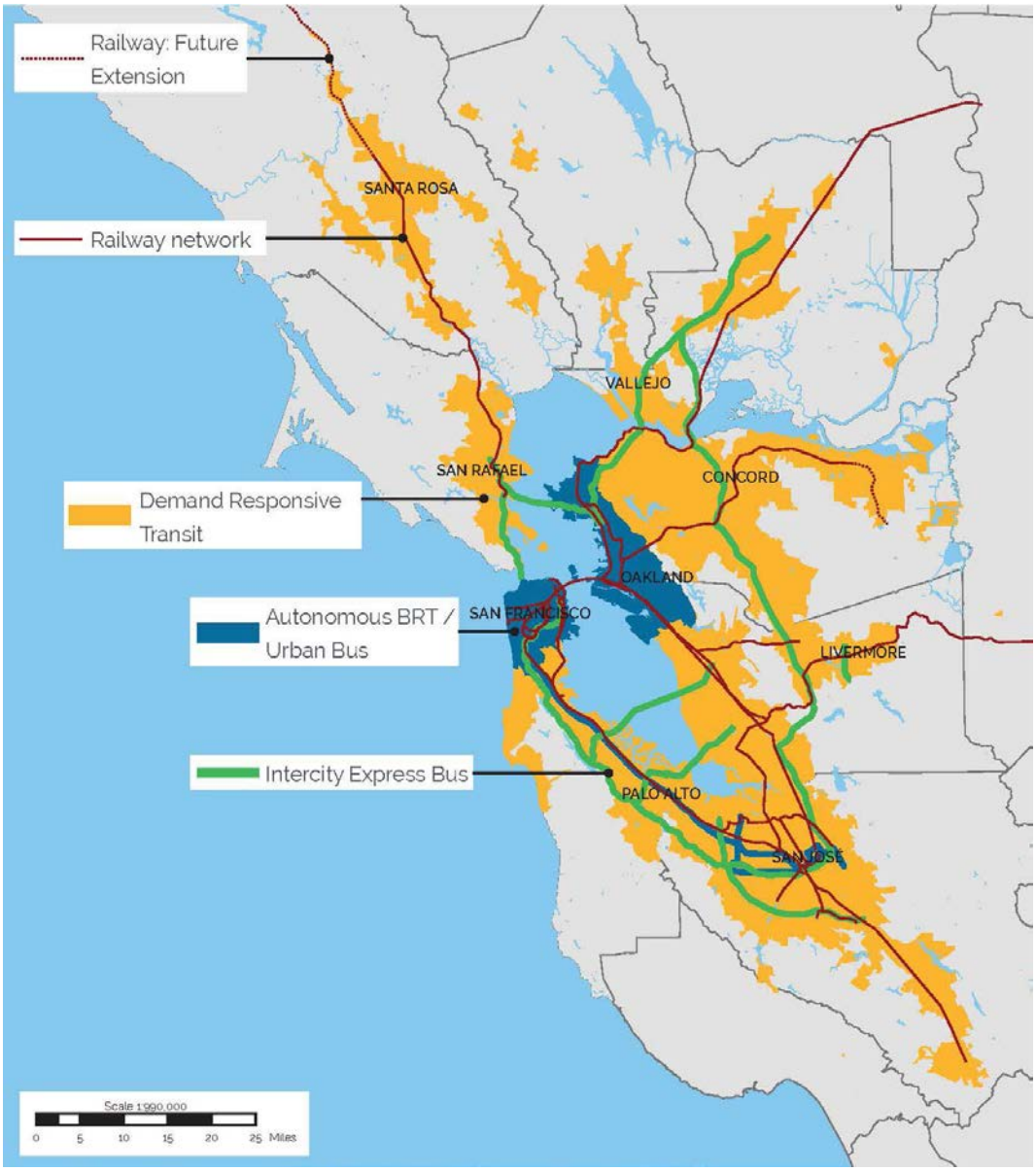
1.3 Connected Example Applications

1.3.1 Transit

Regional Autonomous Demand-Responsive Transit

Transit agencies will have the opportunity to leverage AV technology and digital platforms to provide more cost effective, demand-responsive service. Transit is likely to evolve on two different pathways depending on the built environment (i.e., urban, suburban, or rural): high-capacity, high-frequency regional trunk lines and demand-responsive local service. Trunk lines – such as rail lines and bus rapid transit – reliably and frequently connect activity centers. Fixed-route bus service in low-density areas could be replaced by demand-responsive, door-to-door, and first-/last-mile services provided by AVs. **Figure 2** shows a generalized example of how such investments could transform transit in the region. Additionally, MaaS models and public-private partnerships should be considered to optimize user experience, improve regional transit governance, and deliver more efficiency across all services.

Figure 2: Regional autonomous demand-responsive transit



Investment in the region's core transit lines, including key rail and bus lines, along with autonomous, demand-responsive connecting services throughout urban, suburban, and rural areas could improve connectivity and access throughout the Bay Area.

Future scenario(s) should be developed that include three types of transit: existing high-capacity transit, new high-capacity transit, and new demand-responsive transit.

1. **Existing high-capacity transit:** In the future, existing rail and BRT corridors should operate with higher frequency and potentially higher speeds. The highest TCRP[1] Quality of Service (QOS) thresholds for fixed-route transit should be targeted, including reliable and safe service, average service frequencies of at least 5 minutes, service spans exceeding 20 hours of service per day, on time performance of 95% or better, and travel time that is at least as fast as individual automobile trips.

   For bus rapid transit (BRT), changes in bus sizes should be considered for individual routes, subject to several variables including future operating costs, ridership, frequency, and the availability of vehicle models. For example, for the highest demand routes, it is likely that 60' articulated buses, or potentially double-deck buses will be needed to provide sufficient capacity. Other routes might be better served by operating traditional 40' buses at higher frequencies.

2. **New high-capacity transit:** A network of new autonomous BRT and express bus networks should be assumed:

   a. **Regional autonomous express buses** linking major activity centers in the region and connecting all suburban and urban activity centers. For example, express bus networks could be provided on major highway corridors including those with express or HOV lanes (e.g., US 101 in Marin, San Mateo, and Santa Clara Counties; I-80 and I-680 in Solano, Contra Costa, and Alameda Counties; I-580 in Alameda County; and I-85 in Santa Clara County). The design of the highway infrastructure should be symbiotic with the provision of regional express bus services – buses should have unencumbered and direct highway access, stations should be highway adjacent and preferable in-line, and land uses should support these emerging transit hubs. High-quality TCRP[2] Quality of Service (QOS) thresholds for fixed-route transit should be targeted and highway design should enable the delivery of those service aspirations. Targets should include service frequencies of at least every 10 minutes, spans of service exceeding 15 hours of service per day, on-time performance of 95% or better, and travel time that is equal or superior to the autonomous vehicle.

[1] Transit Cooperative Research Program, Transit Capacity and Quality of Service Manual, 3rd Edition
[2] Transit Cooperative Research Program, Transit Capacity and Quality of Service Manual, 3rd Edition

b. **Autonomous BRT** should operate on major arterial streets in relatively high-density corridors with exclusive rights-of-way or on corridors where pricing provides free-flow conditions. Example corridors could include:

    i. Geary Boulevard and 19th Avenue in San Francisco,
    ii. San Pablo Avenue in Contra Costa and Alameda Counties,
    iii. Mission Boulevard in southern Alameda County,
    iv. Shattuck Avenue and Martin Luther King Junior Way in Berkeley and Oakland, and
    v. Routes 522 or 523 in Santa Clara County.

3. **Autonomous demand-responsive transit:** These services would replace fixed-route bus services with demand-responsive service operated by either private or public entities and generally operating with smaller vehicles than traditional 40’ buses. Candidate locations for demand-responsive transit will have relatively low performance fixed routes. Criteria include routes with:

    a. Farebox recovery less than 50% and
    b. Operating cost per rider greater than $10/ride.

    Demand-responsive shared ride options create a suite of transportation options that include door-to-door trip chaining (e.g. autonomous paratransit), single ride service, and first/last-mile transportation to high-capacity transit.

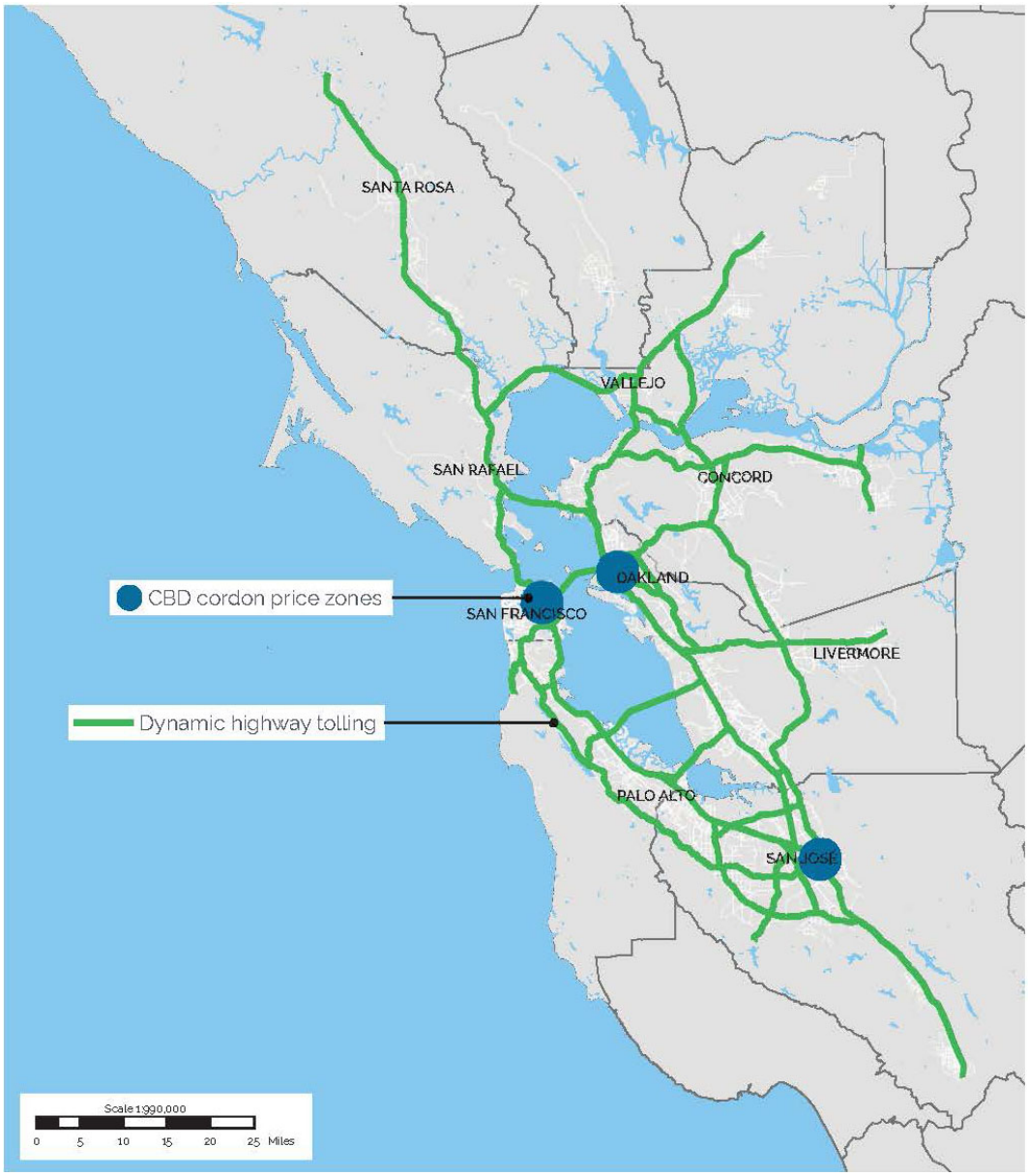
1.3.2 Pricing

Dynamic Pricing Opportunities in an AV Future

Regional, coordinated, and dynamic road pricing will improve efficiency and quality of the entire transportation network by leveling the playing field for all modes and providing a more nimble and effective means to nudge travel choices. Similarly, street and curb pricing for downtown cores will ensure that cities are adequately prepared to meet the complexities of a growing demand for curb space, which will only increase moving forward. Additionally, curb pricing could help offset parking revenues lost. Pricing both road and curb use fairly will help mitigate congestion and safeguard the important role of public transit within the larger transportation network.

Figure 3 shows how such a pricing network could alleviate congestion in the Bay Area. The green lines show a possible network of dynamically priced corridors and the blue dots highlight the downtown of the region's major cities that may benefit from cordon pricing.

Figure 3: Dynamic pricing opportunities in an AV future



A dynamic pricing system throughout the Bay Area's major corridors and in the three major cities would improve congestion and provide funding to transit and active mobility.

Pricing scenario(s) should be studied consisting of combinations of three different applications: corridor pricing, cordon pricing, and curb pricing.

1. **Corridor:** Corridors to be considered for dynamic pricing should be those that experience the most congestion, including those with existing or planned express lanes. Candidates include any freeway corridors where average speeds are less than 35 mph in peak periods (consistent with MTC's definition of "congested delay"). Pricing should be on a per-mile basis, with price levels variable based on prevailing speeds in real time.

2. **Cordon (zone) pricing:** Analysis for zone-based pricing should begin in the city centers of the Bay Area's three largest cities: San José, San Francisco, and Oakland. If successful, this concept could be expanded to other regional cities, such as Santa Rosa and Walnut Creek. The specific zones could be determined by density, levels of congestion, and/or geographic barriers. After determining the zone geography, a mechanism to price the zone will need to be assumed. Pricing would ideally be on a per mile basis, with price levels variable based on prevailing speeds in real time.

3. **Curb pricing:** Curb pricing could be applied as an alternative to or in addition to cordon pricing. This strategy should be focused within the most dense and highest activity areas of major cities where mobility services must utilize on-street curb fronts for passenger loading and unloading (San Francisco, high-activity locations in Oakland and San José, and in downtowns of smaller cities). Trips made by modes requiring curbs (e.g., AVs, taxis, TNCs, and microtransit) would be charged for each pick up or drop off, with pricing levels variable in real time based on the prevailing speeds in the local area and availability of curb space.

Three additional pricing mechanisms could help reduce congestion while improving multimodal services and infrastructure. First, a special licensing or infrastructure access fee could help fund necessary infrastructure investments to help services operate. These services would include all private services with possible exemptions for higher occupancy services and services targeting Communities of Concern. Second, compliance mechanisms or penalties will still be needed, since regulators cannot assume AV operators will obey the law. Instead of the current schedule of fines directed towards individual travelers, a new system will need to be created to effectively incentivize companies to create legal operations. Finally, mobility as a service platforms offer an opportunity for more tailored subsidies to specific user groups, such as low-income seniors.

In general, for every pricing mechanism considered, equity impacts will need to be thoroughly studied.

1.4 Diverse Example Application

Equitable AV Services

AV technology presents a tremendous opportunity to drastically improve service in Communities of Concern and correct transportation justice issues of the past. Today, Communities of Concern face numerous challenges related to accessibility including long waits and travel times and unreliable service for transit. Historically, these communities have faced inequitable service and discrimination across all modes, most recently with TNCs such as Uber and Lyft.[3] Without specific government mandates and oversight of mobility service providers, such as minimum service requirements set by the CPUC and informed by local governments, there is a real risk that Communities of Concern will be disproportionately negatively affected with the rise of AVs. With the right policies and transparency, such as mandatory data reporting, AV services could be an important value add, especially in the autonomous transit realm.

As a region, the Bay Area is positioned to lead in the transportation equity space and require accountability for all mobility service providers – public and private. This leadership will involve developing clear targets, forming realistic but ambitious equity metrics, monitoring progress actively, and requiring continual improvement. This improvement should be directed to specific equitable outcomes.

Critical to the concept of equitable AV services is a clear definition of Communities of Concern and performance targets that are updated regularly to meet dynamic community needs. Equally important are discrete outcomes that are tracked carefully by appropriate oversight bodies. Though equity analyses are required by Title VI of the Civil Rights Act of 1964 and the Environmental Justice Executive Order of 1994, the region elevated commitment to equity by adopting additional environmental justice principles in 2007. In 2016, MTC adopted an equity framework for the Bay Area which is embedded in its regional planning decision-making processes. The framework defines Communities of Concern and analyzes the benefits and burdens of various policies and investments across different population groups and geographies with existing conditions as the baseline. The equity analysis is updated in four-year cycles as part of the Regional Transportation Plan/Sustainable Community Strategy update.

Given the risks AVs pose to maintaining and enhancing mobility in diverse communities, more rigorous community engagement and target setting will be needed moving forward. SFMTA's Muni Service Equity Strategy may serve as a helpful model for the region as it considers implications not just of capital

[3] Ge, Y., Knittel, C., MacKenzie, D., and Zoepf, S. 2016. Racial and Gender Discrimination in Transportation Network Companies. National Bureau of Economic Research. DOI: 10.3386/w22776.
Retrieved from:
https://faculty.washington.edu/dwhm/wpcontent/uploads/2016/10/TNC_Main_NBER.pdf

investments, but also of service provision. With a focus on seniors and the disabled, the Equity Strategy considers the performance of transit lines in underserved areas compared to peer lines in other parts of San Francisco for equity indicators like crowing and on-time performance. Pairing this analysis with direct community outreach, SFMTA has developed a data-driven approach to best meet the needs of the most vulnerable populations in the city in a timely and actionable way. SFMTA tracks performance in five different categories:

- On-time performance
- Service gaps
- Crowding
- Transit travel time competitiveness (relative to driving)
- Accessibility-related customer complaints

Building on the Muni Service Equity Strategy, service provisions for Communities of Concern can be tracked and improved with a three-step program, using metrics to define the successes or failures of equitable mobility services:

1. **Establishing Baselines for Comparisons.** As mentioned above, existing conditions are used as the baseline framework for assessing Communities of Concern. To analyze service in real time, it may be more effective to compare Communities of Concern against comparable communities based on:
    a. Density,
    b. Land use types, and
    c. Accessibility to jobs, education, healthcare, grocery stores, open space, and other basic services.
2. **Transportation Service Levels.** Mobility service levels in Communities of Concern and comparable communities will need to be determined. Data to track should include:
    a. Response time (on average and throughout the day)
    b. Dropped or rejected ride requests
    c. Surge pricing or equivalent cost fluctuation
    d. Route selection
    e. Complaints

3. **Target Transportation Service Levels.** Service for Communities of Concern should be at least equivalent to service in comparable communities. Incentives to improve mobility above and beyond target levels should be available to mobility providers, both public and private. Incentives could include grant programs to improve transit service, upgrade loading facilities, and more.

Jurisdiction over this data currently resides with the California Public Utilities Commission, who regulates transportation network companies. However, there is a need for statewide regulations to be informed by local conditions and community goals. MTC and major cities should collect and consolidate local Bay Area policy needs and lead negotiations.

1.5 Healthy Example Application

Vision Zero 2.0

AVs have the potential to introduce a paradigm shift in transportation-related public health issues. AVs are likely to greatly reduce driving error and resulting death and injury because they have much broader vision; do not get tired, impaired, or distracted; follow the rules of the road; automatically react with caution to unpredictability; and learn exponentially from a vehicles network. Additionally, AVs hold the promise of improving other public health outcomes – not just avoided death and injury from collisions – but also reduced rates of pollution-related illness like asthma, heart disease, and cancer from improved air quality with a shift to EVs. Other health benefits may include increased street safety, increased active mobility, and lower obesity rates.

AVs are likely to greatly assist cities in the Bay Area in meeting their Vision Zero goals for zero traffic-related deaths by 2024. A regional Vision Zero 2.0 strategy would elevate the goal of eliminating traffic fatalities to the regional level while also targeting other transportation-related health issues, including eliminating traffic-related deaths, nullifying cybersecurity vulnerabilities, and improving air quality.

A Vision Zero 2.0 strategy should involve at least four main elements:

Street Design

The benefit of safer motor vehicles should be amplified with aggressive construction of multimodal street design facilities. AV systems will use the operational design domain provided. In other words, AVs will respond to the environment, whether that environment is favors traffic or favors multimodal uses. If AVs encounter 20-foot lanes on multilane arterials, AVs will use the space given. If AVs encounter 10-foot streets bound by transit and bike lanes with wide sidewalks nearby, AVs will respond accordingly. AVs are agnostic to design. In other words, cities should lead street design efforts and AVs will operate within the design domain provided.

To advance Vision Zero with AVs, cities should prioritize these top five street design components:

1. Dedicated transit lanes with useful, easily accessible shelters;
2. Protected bicycle facilities, with the aim of building out a full city-wide bicycle network equivalent to city-wide vehicle networks;
3. High-visibility crosswalks at regular intervals to allow for safe, comfortable pedestrian accessibility;
4. Wider, more amenity-rich sidewalks that increase separation between pedestrians and traffic flow while improving community connections at the building front;

5. Reduced on-street parking in favor of regular, clear passenger loading, ideally linked with sidewalks wide enough for both pedestrian flow and passenger waiting.

Such components should be increasingly required with Complete Streets General Plan Elements with stricter requirements for implementation as well.

Roadway Operations

Enforcing or reducing speeds to 20 mph in downtowns and residential neighborhoods would facilitate a safer environment in a mixed autonomous-legacy vehicle fleet while also minimizing injury in the event of a collision. This lower speed requirement would be relevant for local streets in all contexts. For example, relatively small two-lane streets providing local access should be limited to 20 mph. Further, the 20 mph limit should apply to collector streets and arterials in central business districts or in areas with high concentrations of vulnerable road users, such as near schools, parks, and hospitals.

In addition to roadway operations, traffic safety should be a priority for AV regulations. Pedestrians and bicyclists should experience a safe street environment in any future transportation system. Therefore, AVs should be able to detect road users in all circumstances. Ideally, the region would collaborate with federal and state agencies – the Department of Motor Vehicles in particular – to ensure pedestrian and bicycle detection and protections are prioritized in any AV licensure program. In the event that AV systems fail to detect vulnerable road users, fines should be levied against AV operators.

More broadly, the region should work with state and federal authorities to require safety performance standards in a comprehensive range of local conditions. Just as the dummy crash test helped achieve significant gains in automotive safety, so new safety performance tests should be applied to autonomous vehicle systems. For example, AVs should be required to detect and respond to pedestrians in low light and extreme weather conditions. Only after an AV system passes such vision tests could it be licensed to operate on public roads. Additionally, the region should collaborate with the California Department of Motor Vehicles and the California Highway Patrol to develop ongoing programs to train local first responders to interact with AVs, AV operators, and AV passengers. Open dialogue between these entities and AV developers should focus on communication protocols in emergency situations.

The region should lobby the US Department of Transportation's Intelligent Transportation Systems Joint Program Office to advance the data standards that facilitate mutually beneficial data sharing. Ideally, these standards will be developed with input from local, regional, and state agencies as well as non-governmental organizations such as the Society of Automotive Engineers and the National Association of City Transportation Officials as well as a number of academic institutes and research organizations.

In general, ongoing monitoring and evaluation of safety performance should be a collaborative process between local, regional, and state regulators.

Emissions

AVs could significantly worsen emissions and air quality if specific measures are not taken to encourage the highest level of efficiency possible. For AVs that operate on fossil fuels, eco-driving requirements would ensure the vehicles operate efficiently (e.g. smooth acceleration and traffic flow). In general, AVs that run on electricity are superior for emissions and air quality and should be prioritized. While many of the larger AV developers are already testing on and planning for electric fleets, the California Public Utilities Commission could require use of electric vehicles as a baseline requirement for offering public AV services. Likewise, the California Department of Motor Vehicles could accelerate the consideration of AV permit applications for AV developers using AVs.

Cybersecurity

Detecting and addressing hacking vulnerabilities should be a normal function of government as connected devices and systems becoming an increasingly common feature of community and transportation development. In addition to instituting a well-resourced bounty program to receive hacking vulnerability tips from the public, governments at all levels should be investing in cybersecurity. A key investment could include hiring Cybersecurity Officers to manage devices, data protocols, and funding programs. Such officers or specialists would be needed at two levels:

1. At the state and federal levels, the safety and security of vehicles should be investigated and ensured.
2. At the local and regional levels, the safety and security of infrastructure, such as local traffic signal systems, should be investigated and ensured.

1.6 Vibrant Example Application

"New Deal" for Mobility

Economists project the AV passenger economy will be a trillion-dollar industry.[4] Thus far, the AV industry has largely benefitted high-income earners in the information and technology space, with risk of threatening low- and middle-income jobs such as bus drivers or long-haul truckers. Moving forward, both industry and government agencies alike must consider the need for the economic prosperity spurred by AVs to inclusively and equitably benefit the Bay Area and its residents.

By prioritizing grassroots pilots and innovation within the AV industry and developing a comprehensive program to maximize economic benefits of AVs, the region's workers may have expanded opportunities because of this new technology. Jobs creation and prevention of job loss for low- and middle-income workers should take precedence for both agencies and industry alike through commitment to workforce development, manufacturing innovation, and goods and transit pilot programs.

These programs will accelerate workforce advancement while benefiting the larger Bay Area economy:

1. **Data and Information.** In a June 2018 report on the future of work with AVs, a group of researchers argued for the critical importance of employment data: "Any effective comprehensive workforce strategy requires information about the training activities of employers to round out the information collected from the educational system and workforce training providers."[5] Beyond basic employment information, data is needed on:
    a. Career satisfaction and ambitions
    b. Training and advancement
    c. Program efficacy
2. **Workforce Development.** A greater body of data about the existing workforce will clarify employment potential in the Bay Area. However, deeper study will be needed to develop concrete actions for workforce

[4] Seba, T. and Arbib, J. 2017. Rethinking Transportation 2020-2030. Rethinx. Retrieved from: https://tonyseba.com/portfolio-item/rethinking-transportation-2020-2030/; and Lanchot, R. 2017. Accelerating the Future: The Economic Impact of the Emerging Passenger Economy. Strategy Analytics. Retrieved from: https://newsroom.intel.com/newsroom/wp-content/uploads/sites/11/2017/05/passenger-economy.pdf

[5] Groshen, E., Helper, S., MacDuffie, J., and Carson, C. 2018. Preparing US Workers and Employers for an Autonomous Vehicle Future. Securing America's Future Energy. Retrieved from: https://avworkforce.secureenergy.org/wp-content/uploads/2018/06/Groshen-et-al-Report-June-2018-1.pdf.

development. Key questions to be investigated with a workforce development study include:

a. Given vehicle automation and related trends, what sectors of the regional economy and employment will be impacted?

b. Are there geographic concentrations of at-risk employment?

c. What skills will be needed in future workforce scenarios?

d. How can the workforce be regularly evaluated to receive continual investment?

3. **Partnerships and Working Groups.** Partnerships are foundational to equitable economic development. Partnerships with other interested entities, such as technology companies and labor organizations, can help bring all stakeholders to the table to develop training and educational programs while uncovering new innovations and the careers that support them. Through these partnerships, government can act as incubator for a new equitable economy. Specific stakeholders to engage include:

    a. Community colleges through the California Community College Association for Occupational Education (CCCAOE)

    b. Industry representative organizations such as the Silicon Valley Leadership Group and the Self-Driving Coalition for Safer Streets

    c. Employers:

        i. Government (transit agencies, cities),

        ii. Private mobility providers (logistics companies, taxi companies, TNC companies), and

        iii. Other employers (top Bay Area employers, as well as representative small business employers)

    d. Local and state unions representing transit drivers, taxi drivers, private transit drivers, truck drivers, mechanics, and others

    Through these partnerships, conversations about workforce and economic development can remain active. Critical topics for these conversations include unemployment insurance policies, a possible Universal Basic Income program, infrastructure employment programs, and a range of research and skills advancement programs.

4. **Enterprise Zones.** In addition to convening partnerships, the region can invest in grassroots economic development with enterprise zones – zoning that supports manufacturing, distribution, and specialized mechanics. These zones can be located near existing transportation facilities to build off existing expertise as well as in parts of the region with higher demand

for job centers. Through subsidies, tax relief, and other incentives for enterprise zones, the new economic gains AVs introduce can spur inclusive prosperity. Central to these enterprise zones, career and innovation incubators could connect workers to resources and opportunities while providing incubation for innovations in materials, manufacturing, mechanics, and other systems critical to the AV economy.