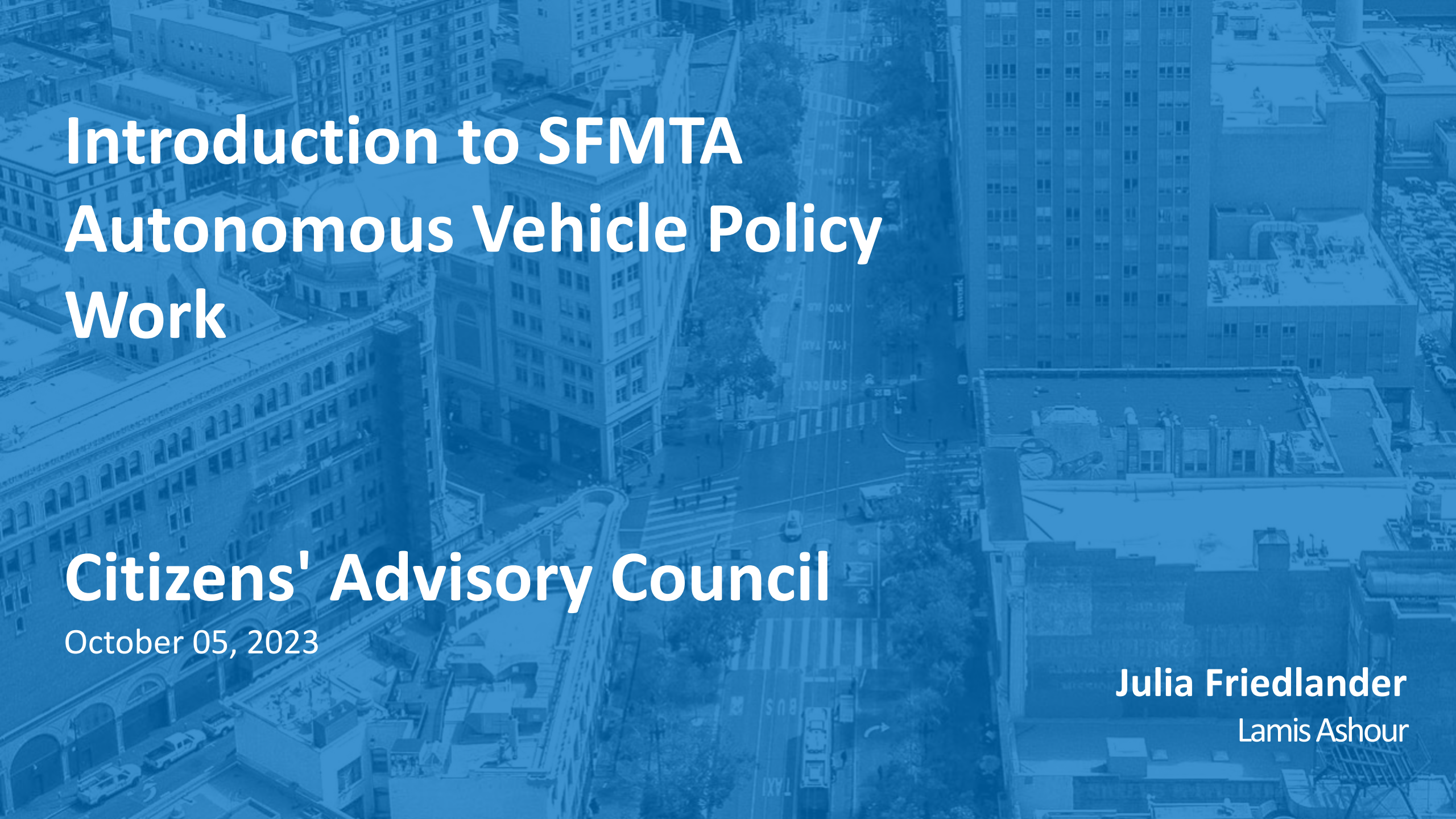

Introduction to SFMTA Autonomous Vehicle Policy Work

Citizens' Advisory Council

October 05, 2023

Julia Friedlander
Lamis Ashour

City, State, & Federal AV Roles

City Role:

- **Adopts** traffic regulations, identifies proper use of street lanes & curbs
- **Designs and deploys** traffic control devices
- **Enforces** curb regulations & rules of the road
- **San Francisco:** as an early testing city, share observations with industry, regulators & stakeholders

State Role:

- **DMV**: licensing for human drivers
- **DMV**: issues testing & commercial permits for AVs on public roads
  - w/safety drivers
  - w/o safety drivers
- **CPUC**: issues permits for *carrying passengers* in AVs

Federal Role:

- **NHTSA**: sets minimum safety standards for vehicle features (FMVSS) to limit unreasonable risk and prevent injuries & fatalities
- **NHTSA:** approves exemptions from safety standards
- **NHTSA**: investigates defects & mandates recalls

AV Policy Work to Date

Industry Engagement

- Meetings with operators to discuss City policy priorities (esp. Cruise, Waymo, Zoox)
- Coordination of discussions with first responder agencies

Development of Regulations

- Actively engaged with state & federal regulatory agencies & proceedings
- CA: DMV, CPUC
- Federal: National Highway Traffic Safety Administration (NHTSA), Federal Highway Administration (FHWA), Transportation Research Board (TRB)

City & County Collaboration

- Collaboration with SFCTA
- Support & inform efforts of League of Cities, California Cities Transportation Initiative (CACTI), National Association of City Transportation Officials (NACTO)

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“SAE Level 4” AV Industry: Vision & Status in SF

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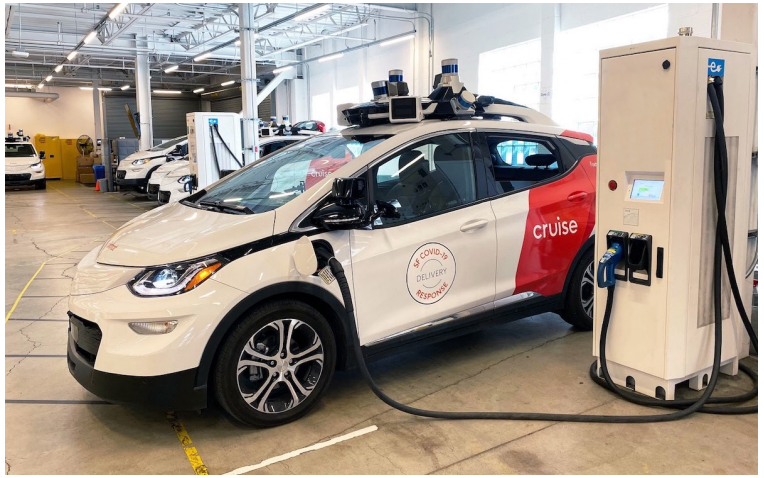
Industry Vision for Automated Driving

Safety: eliminate crashes caused by human driver error

Expand mobility for people with disabilities & others with few transportation options

Reduce greenhouse gas emissions



Reduce congestion

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Today

Coming Soon

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SAE Level 4 Automated Driving in San Francisco

ZOOX

- Testing with safety drivers in vehicle with conventional human controls

- Testing without safety drivers
- **UPDATE Aug 10 2023:** Received CPUC permit to offer commercial driverless service throughout city with no limits on hours of service or fleet size

- Testing without safety drivers
- **June 2022:** Received CPUC permit to offer commercial driverless service in limited area from 10 pm to 6 am
- **UPDATE: Aug 10 2023:** Received CPUC permit w/o limits on service hours and fleet size
- **UPDATE Aug 18 2023:** DMV asked Cruise to reduce fleet size 50% during investigation of incidents

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San Francisco AV Policy Foundation

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Private Emerging Mobility Service Goals

For any new private mobility service, we ask whether it will:

- Allow our streets to move more people and reduce travel time?
- Reduce greenhouse gas emissions (per capita or per person mile traveled)?
- Improve safety of transportation network - especially for vulnerable road users?
- Provide better mobility choices, especially for:
  - People with disabilities?
  - Low income and historically underinvested communities?
- Support economic recovery and resilience?

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SF Street Space Geometry Problem

Space for transit riders-pedestrians

Space for cyclists

Space for solo drivers

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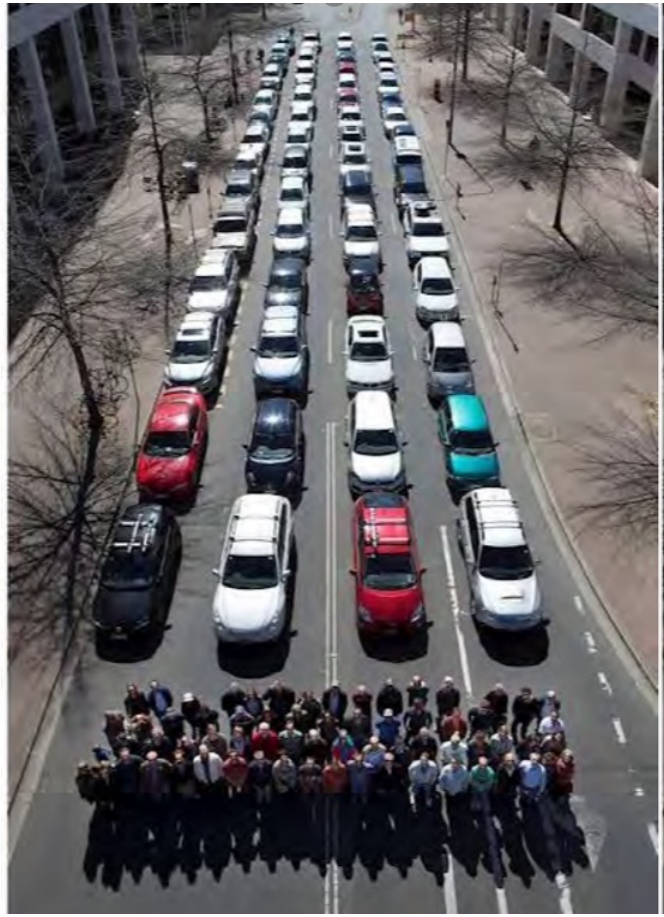
Will AVs Change Street Space Geometry?

Solo Driver Cars



TNC Cars
(Uber/Lyft)

AV Cars??

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Learning from TNC History: Claims vs. Research

TNCs Will…	Evidence/Research Results	AV?
Reduce congestion	**No.** TNC driving caused 51% of increased travel delay in SF 2010-2016	??
Reduce VMT	**No.** TNC driving caused 47% of increased VMT in SF 2010-2016. 40% of TNC VMT = deadheading (no passenger).	??
Serve 1st / last-mile	**No.** ~ 1% of TNC trips in Bay Area in 2018-19 made a transit connection	??
Facilitate car-free lifestyle	**No.** The # of vehicles/household remained unchanged in SF 2010-2019. A UC Davis 'chauffer study' simulating AV service found 85% increase in user VMT	??
Carry more passengers	**No.** TNCs have the same average occupancy as trips made in private vehicles.	??
Expand mobility for non-drivers	**Limited.** Less than 1% of TNC trips in Bay Area are made by people > 75 years. Wheelchair accessible trips required litigation & legislative mandate after years of advocacy.	??

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AV Operations & Street Safety

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All Streets are Not Equally Challenging

- GM: When comparing San Francisco to Phoenix: *"our San Francisco vehicles predict an average of 32 times as many possible interactions as those in Phoenix."*
- GM: *"San Francisco challenges our self-driving system more because, as the number of objects increase, there are exponentially more possible interactions with objects that the self-driving system must consider."*

Maneuver / Scenario	San Francisco	Phoenix Suburbs	Ratio
Left turn	1462	919	1.6:1
Lane change	772	143	5.4:1
Construction blocking lane	184	10	19.1:1
Pass using opposing lane	422	17	24.3:1
Construction navigation	152	4	39.4:1
Emergency vehicle	270	6	46.6:1

Per 1,000 miles of autonomous driving

Source: 2018 Voluntary Safety Self-Assessment filed by General Motors with NHTSA

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AV Safety Optimism

Positive driving practices observed:

- Apparent compliance with posted speed limits
- Attention to details like stopping before limit lines

But measured safety performance is still uncertain:

- No industry-regulator consensus on how to validate AV driving competency
- No state or federal minimum safety performance standards
- No monitoring of compliance with rules of the road (& some clear violations)
- Complaints of erratic driving & failure to yield right of way to pedestrians
- Planned & unplanned stops that create hazards & violate Rules of the Road
- AV miles driven too few to effectively compare to human crash rates

Measuring Safety Impact of Driverless AVs

- Primary indicator for Vision Zero: serious injury & fatality crashes
- Crashes = “lagging Indicator”
- Safe Systems approach to driverless AV assessment calls for additional “leading indicators”

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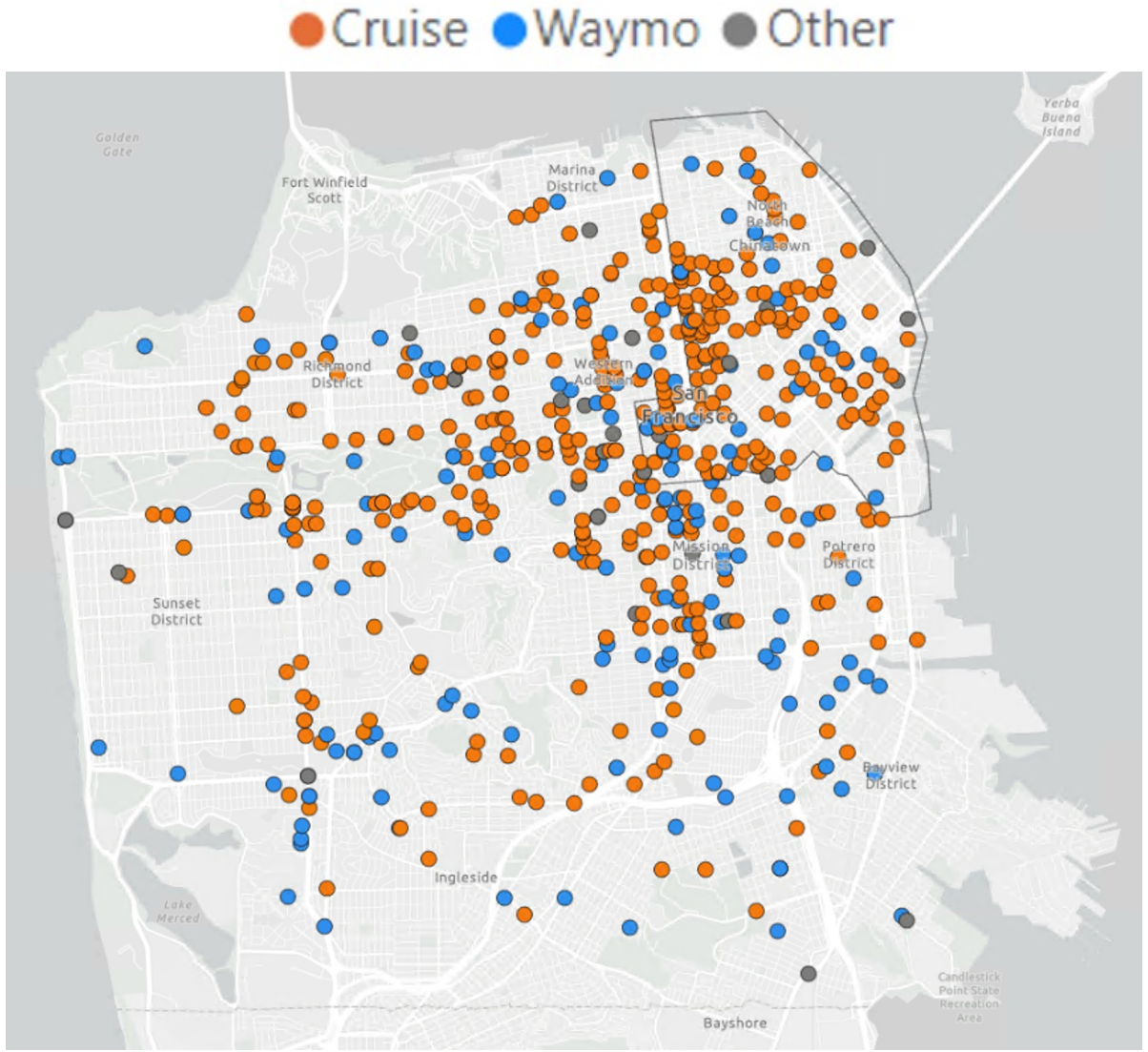
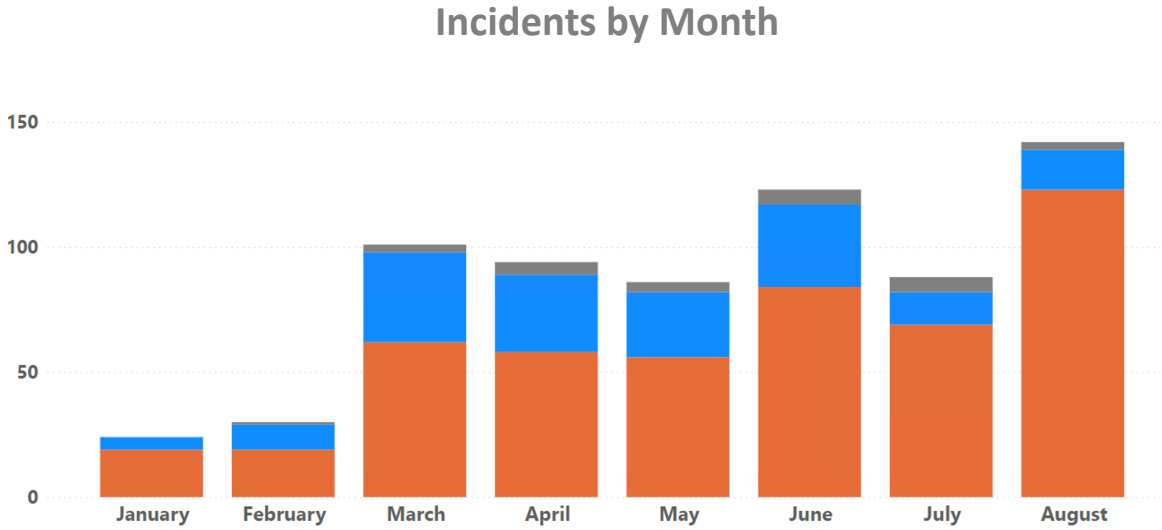
Reported Incidents: Leading Indicators?



January – August 2023



Primary Incident Types:

- Unplanned stops in travel lanes, including
  - Interference with emergency response
  - Interference with transit and/or street work
- Erratic driving

Report Sources: Public calls to 911 , City staff reports, Media & social media

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Low Impact Events are Relevant as Possible Leading Indicators

AV Low Damage Crash

AV v. Transit Near Miss

Intrusion Events

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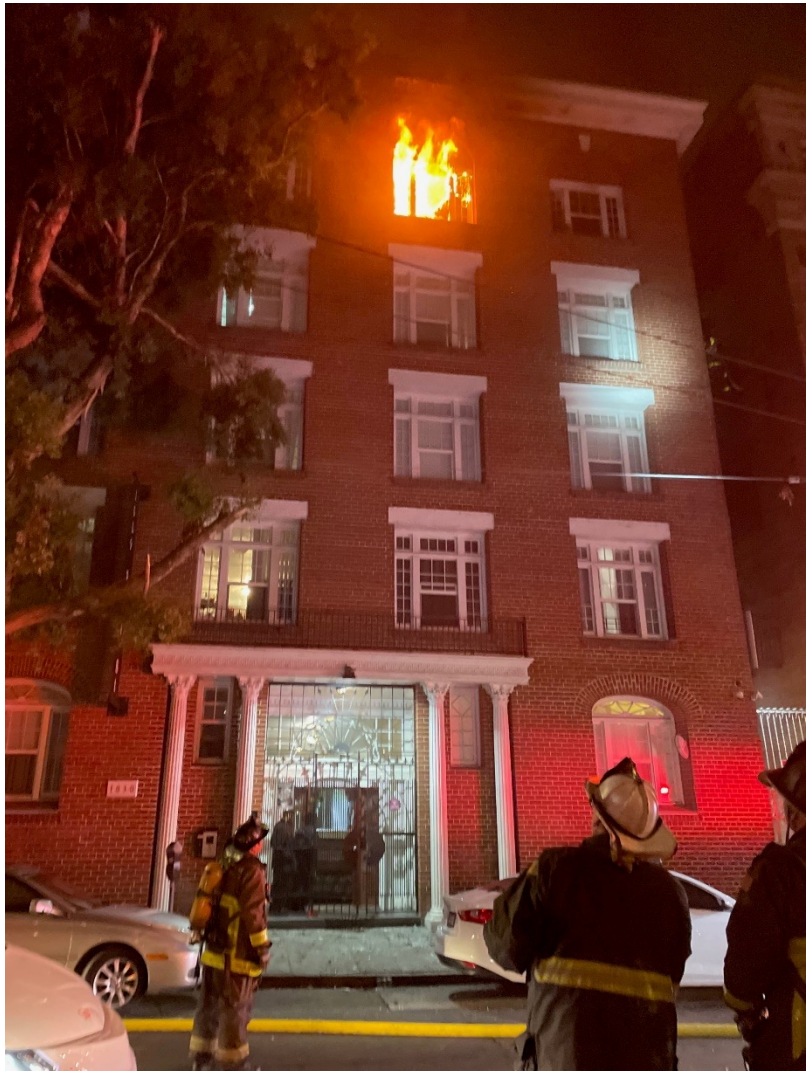
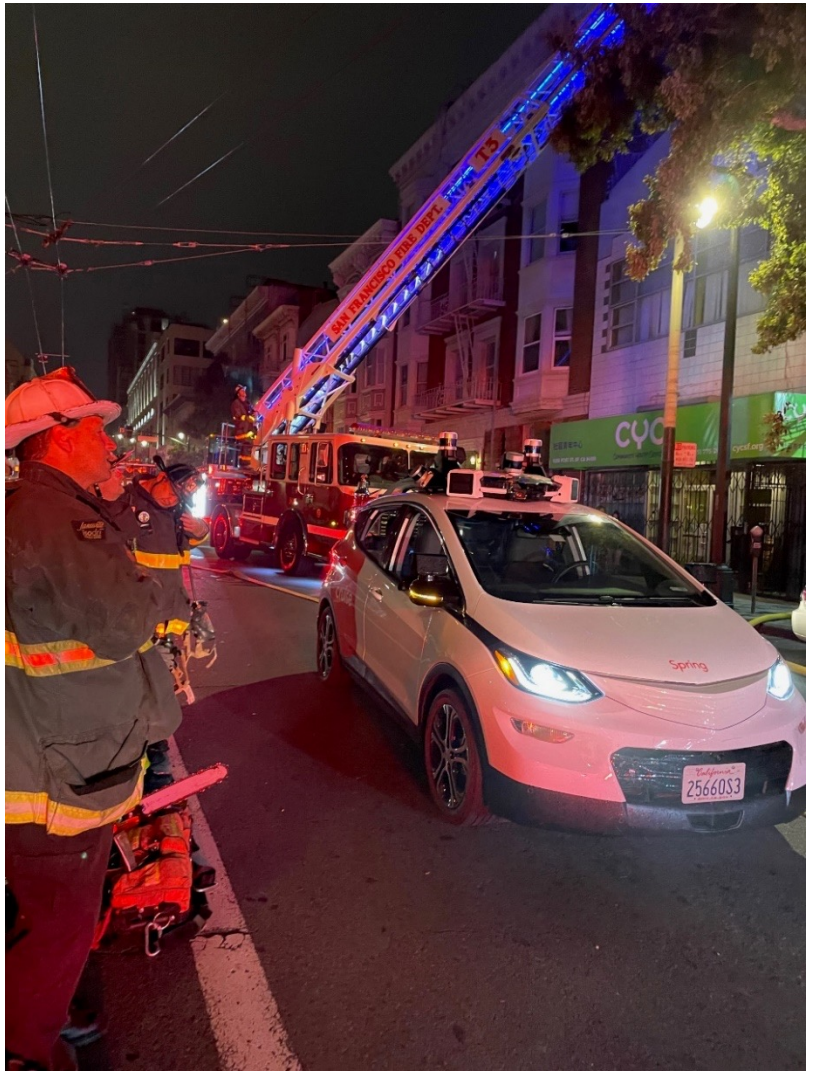
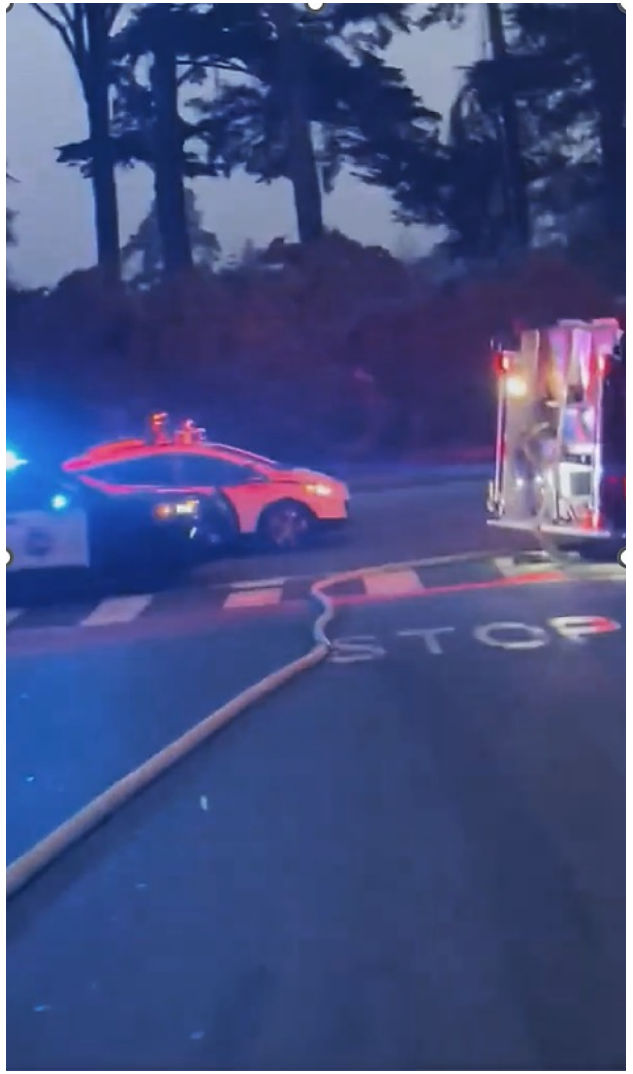
Obstructions Affecting SFFD Response





Intrusions affecting SFFD use of essential equipment



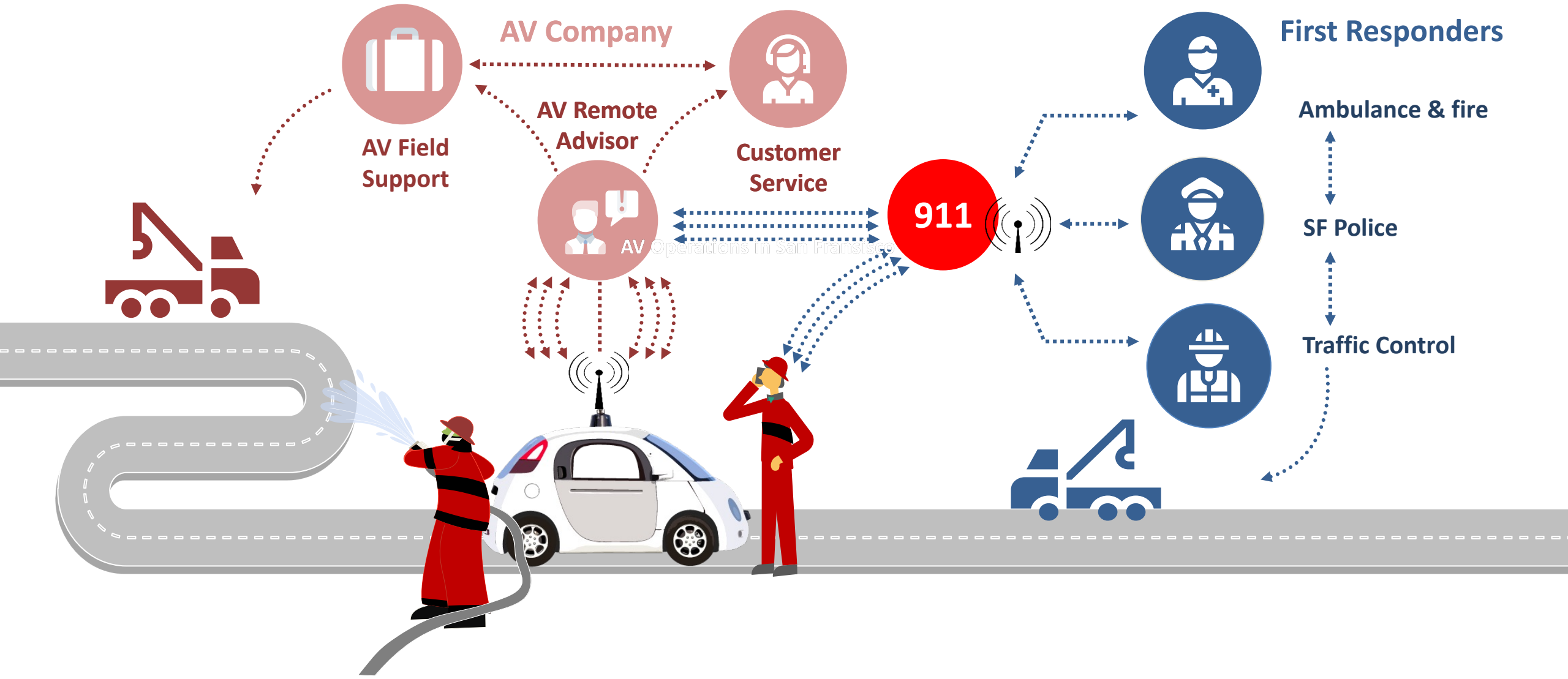
Obstruction at perimeter

Interference with routine emergency response & multi-AV outages raise disaster resiliency concerns

8/10/2023 (24th Street @Valencia)

8/11/2023 (Vallejo @Grant @Columbus)

Human eye contact, simple gestures & on-site conversation are much faster than AV substitutes



Recent Efforts Addressing Emergency Response Interference

State Agency Meetings

- 8/7/2023: CPUC All Party Meeting to Address Safety Issues re AV interactions with First Responders
- 9/14/2023: DMV-CPUC-CHP Northern CA First Responder Roundtable with AV Industry

San Francisco Meetings

- Regular Meetings between SFFD, SFPD, Department of Emergency Management, SFMTA &
  - Cruise
  - Waymo
- Focus: software enhancements that achieve solutions and move toward standard practices

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AV Operations & Equity – Disability Access

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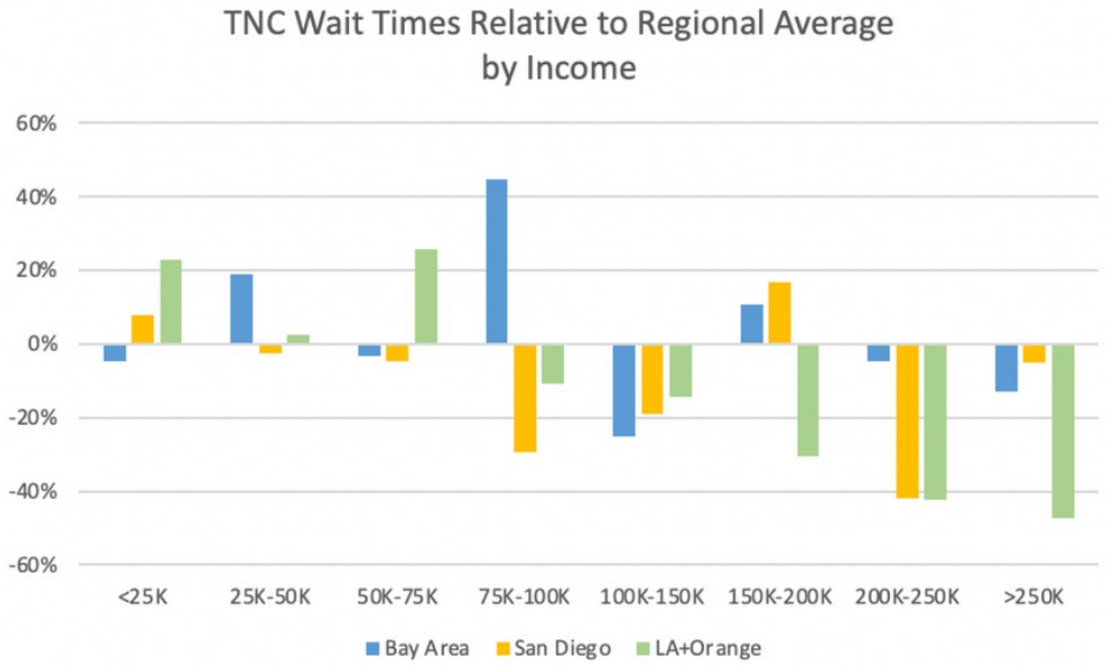
AV Operations: Equitable Access & Impacts?



CA study showed Uber/Lyft wait times vary by user income: AV Outcomes Unknown

AV disruption of transit operations burdens transit-dependent riders the most

AV Operations: Disability Access & Impacts

- No operator is currently testing wheelchair accessible AVs in SF, but
  - Waymo provide rides to WAV users
  - Cruise is developing accessible “Origin”
- Q: Is regulation needed to prevent race to the bottom where new inaccessible services compete against accessible legacy services?

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San Francisco Conclusions and Policy Advocacy

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AV Data for Policy & Accountability

Data reporting and public transparency is critical to evaluation of whether AV driving performance can achieve the vision without negative unintended consequences.

Data is needed:

- To analyze safety performance
- To analyze network and climate impacts
- To analyze equity access and impacts
- To analyze disability access and impacts

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Key Points of State & Federal Advocacy

- **Performance:** Permits should be based on performance, not just stated vision, across broad policy goals
- **Incremental Growth:** Growth should be incremental, not exponential, until safe driving competence has been demonstrated
- **Data collection:** Must be expanded to support development of performance standards and permit authorizations
- **Data transparency:** Data documenting performance should be available for public analysis -- with protections for personal privacy & trade secrets – and should be used to inform permit decisions
- **Collaboration not Preemption:** Federal, state and local agencies should collaborate across different areas of expertise

Thank you

SFMTA