



PARKING IN THE AGE OF UBER AND AVs

An overview created by Walker Consultants



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Autonomous vehicles are currently being developed and most industry experts believe these vehicles will be available within the next decade, first to ride-hailing companies (or transportation network companies, TNCs), like Uber and Lyft, and then to consumers. AVs could disrupt transportation since households would likely need fewer cars to meet transportation needs. For example, one AV could drop off a family member, and drive itself to pick up another. Once the service is driverless, it is generally expected that the cost of using ride-hailing for daily travel for urban residents will be 30 to 50% less than owning a personal vehicle. Numerous players, including tech companies like Google, Apple and Amazon as well as auto manufacturers such as Ford and GM, are reportedly planning to enter the ride-hailing market and competition will likely be strong. If many urban residents then give up their cars and use TNCs, personal vehicle ownership rates could decline significantly and parking could be significantly impacted.

Walker has developed a series of whitepapers looking at the development of AVs and their possible impact on parking in the future. These white papers include:

- *Levels of Autonomy*
The stepping stones to driverless vehicles
- *AV Challenges and Benefits*
Many issues can and will affect the timeline
- *Ride-hailing Impacts on Parking*
Understanding TNC impacts today to understand the future if/when TNCs go driverless
- *The 90% Fallacy*
Why a 90% reduction, as some project, in parking won't happen
- *Timing of AVs and Parking Disruption*
When and how much will parking be impacted?
- *Airport Parking in the Age of Uber*
What airports need to know to manage change today and plan for the future
- *IT Connectivity in the Age of AVs*
AVs, Connected Cars and Big Data hold the potential for revolutionary change in parking
- *Designing Parking Structures for the Future*
What you need to consider in planning new parking structures, today
- *Adaptive Reuse of Parking Structures*
What is practical to design today...and what isn't

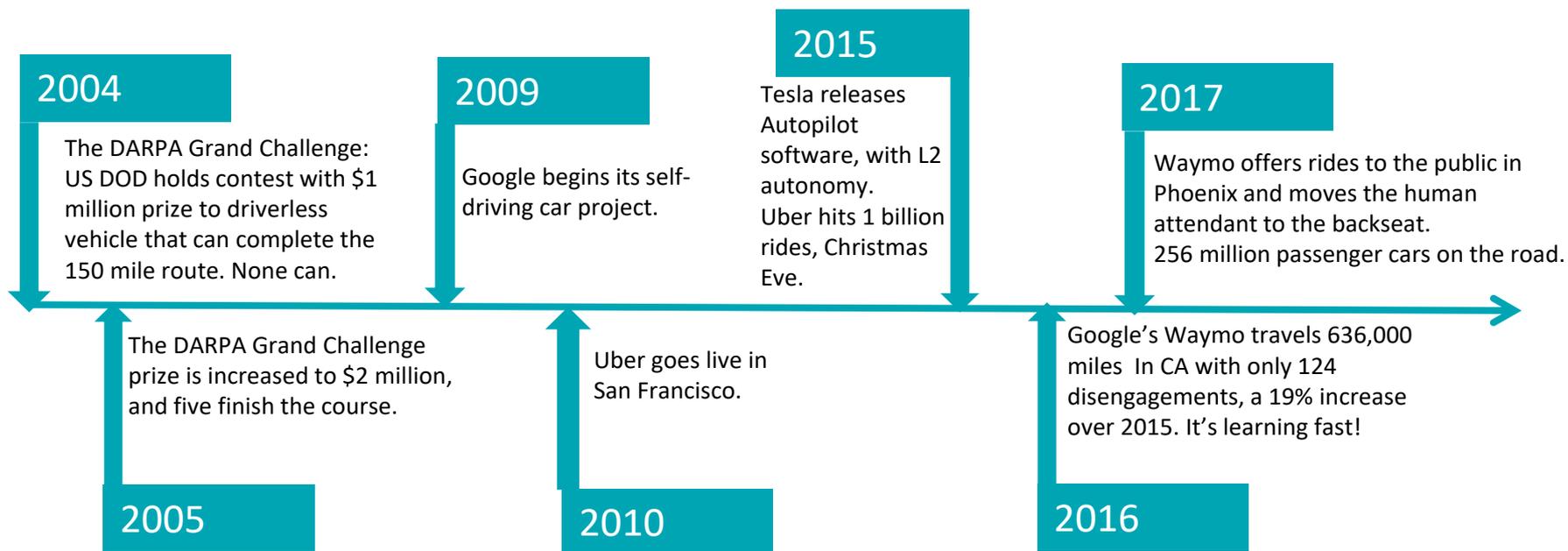
This paper summarizes the “big picture” of our findings.

LEVELS OF AUTONOMY

The Society of Automotive Engineers has categorized six levels of automation, which have subsequently been adopted by the National Highway Traffic Safety Administration (NHTSA).¹

- Level 0 has no automation.
- Level 1 has function-specific automation such as adaptive cruise control.
- Level 2 has a combination of automated functions that work together, such as today's Teslas.
- Level 3 automation will provide a complete set of functions for self-driving, but will still require a driver at the wheel to take over control in the event of the system's inability to deal with a problem.
- L4 vehicles can be driverless, but only in specific areas that have been mapped and where operations have been tested.
- L5 vehicles will be able to operate driverless in any conditions, in any area. Snow and heavy rain are among the conditions that have yet to be solved before L5 can become a reality.

Where we are today...



WHY AV's? Who benefits, who doesn't

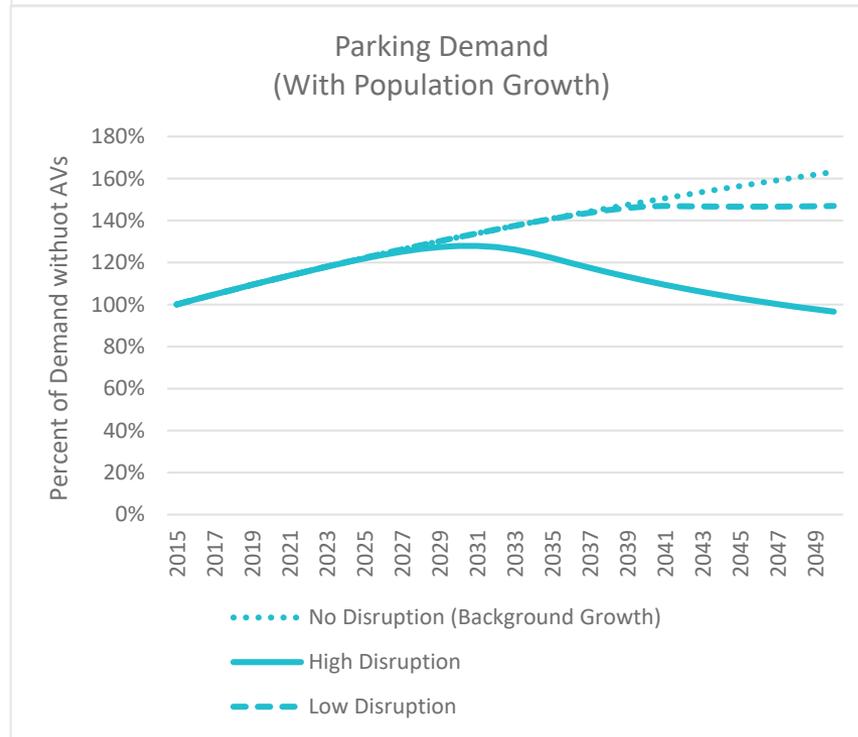
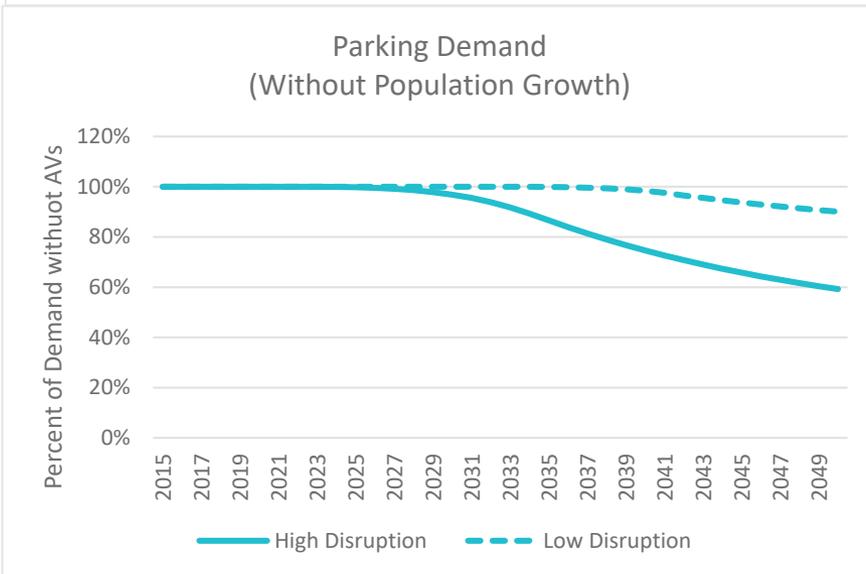
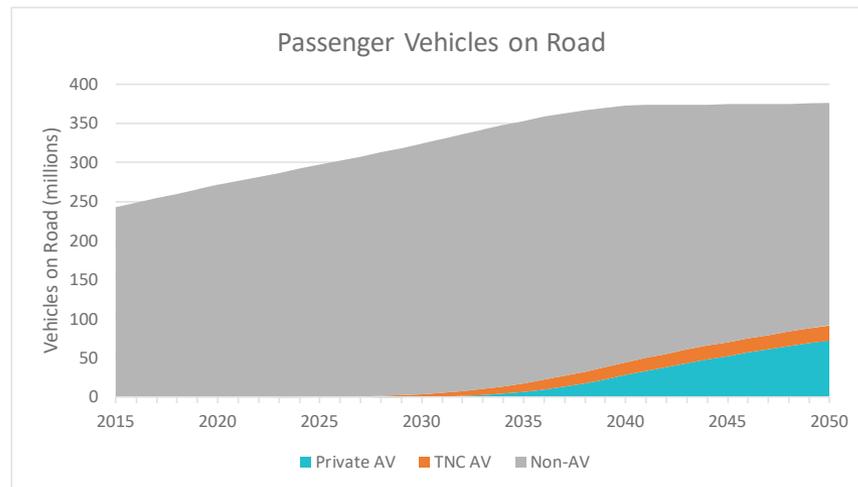
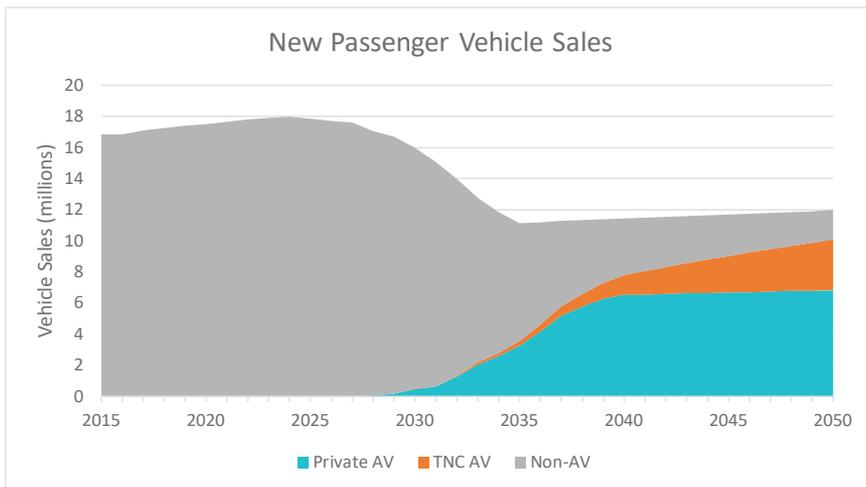
BENEFITS OF AVS:

- Safety: Up to 90% reduction in accidents, fatalities and injuries. AVs won't drive drunk, distracted or dangerously aggressive.
- Significant reduction in household transportation costs and increased household disposable income
 - When driverless, TNC use for all local rides will be 30 to 50% less than owning car for urban dwellers.
 - Reduced cost of transit due to driverless vehicles. TNCs will solve the first mile/last mile problem for transit. Unsustainable bus routes will be eliminated. Transit will focus on mainlines.
 - Paying for a personal AV will be a lot easier if household is able to reduce the number of vehicles owned.
 - Potential revenue from sponsorship & services (Starbucks on commuter buses), info/entertainment further reduces cost to riders.
 - Decreased cost of goods and services, due to driverless freight and deliveries
- Reduction in congestion due to vehicles talking to each other and infrastructure like traffic signals which optimizes roadway utilization. (Cost of congestion in US is \$300 billion.)
 - Reduction in pollution and dependence on foreign oil, particularly due to increased use of electric vehicles by TNCs.
- Reduction in stress of driving, particularly commuting.
- Increased productivity.
- Improved mobility for the elderly, disabled and poor that can't/shouldn't/don't drive.
- Reduction in area required for parking will enhance the urban fabric. Parking closest to destinations will no longer be critical.
- Significant improvements in parking management due to connected vehicles, with dynamic parking, parking availability with reliance on signs, and gateless parking if/when all vehicles have an IP address and a credit card on file.

CHALLENGES OF AVS:

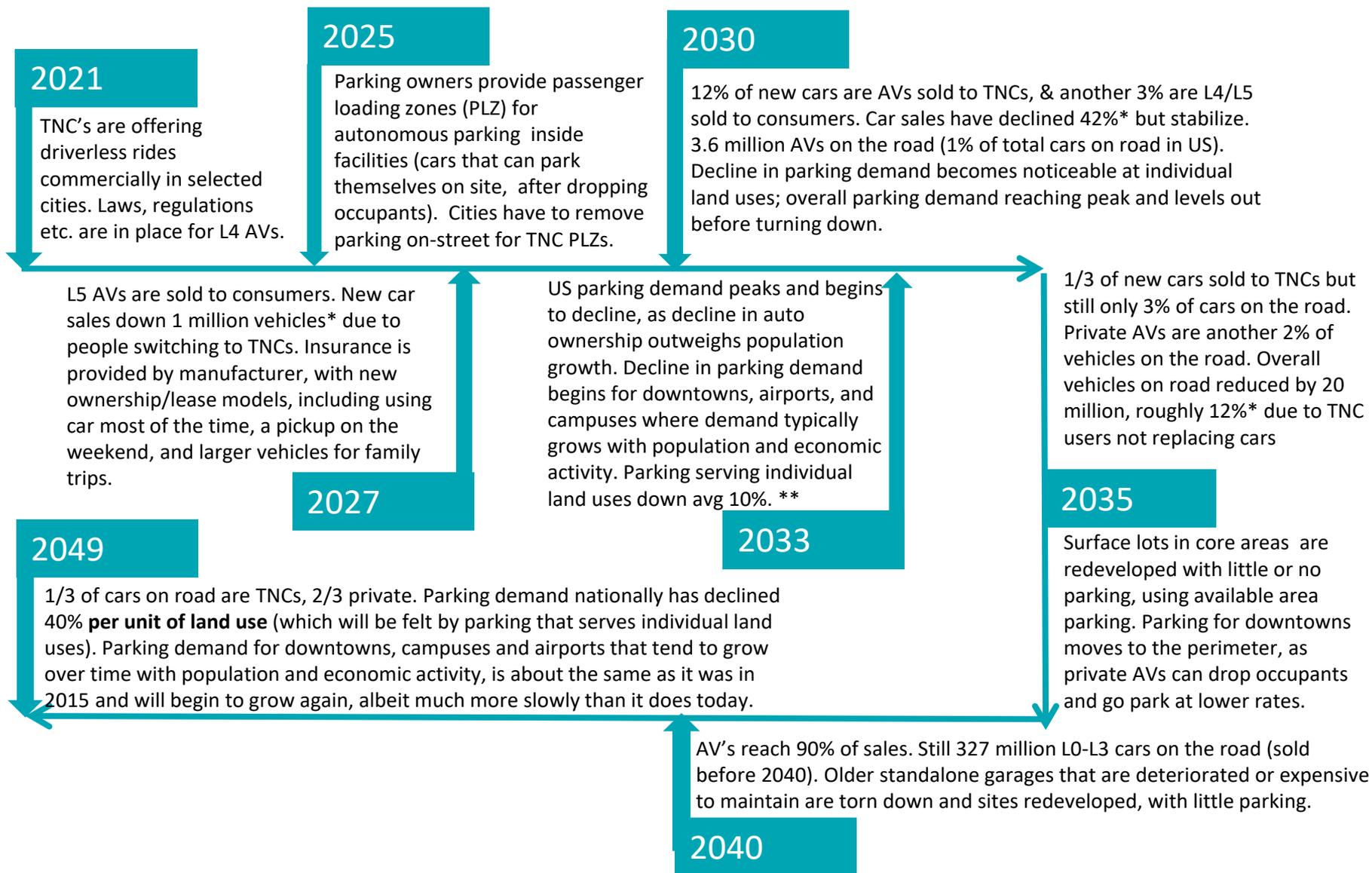
- Consumer Acceptance: Likely to be the biggest influence on timeline and ultimate penetration of AVs.
 - Only 22% of consumers today say they trust AVs or are willing to pay for L4/L5 vehicles. About 50% do expect to ride in AVs in the future. Studies show however, that those that have L2 features on cars are more likely to say they will trust and use AVs.
 - Serious accidents with L3 vehicles could significantly impact and delay acceptance with AVs.
 - There will be a long and difficult transition period when there are still many L0/1/2 vehicles on the road.
- Experts think that "shared" or pooled TNC rides (UberPool rather than Uber X) will be necessary to avoid significant increases in traffic due to vehicles driving around empty. Will consumers accept pooled rides?
- Significant technical and cost of technology issues to reach L5. While the US government indicates full intent to approve AVs, there are a lot of regulatory, legal and insurance issues to be resolved.
- Significant improvements in infrastructure are required for full benefits of AVs to be achieved: upgrading traffic signals, mapping, and communication grid, etc. How will it be upgraded and maintained, when we can't find the money to repair crumbling bridges?
- Cybersecurity is a looming issue yet to be resolved.
- TNCs will result in loss of gas taxes, on-street parking and revenue (for passenger loading).
- Huge disruption of jobs and businesses in transportation, auto manufacturing/service/repair, insurance.

Walker's Parking Demand Impact Projections:



Walker's analysis is based on McKinsey's "high disruption" scenario for sales of AVs, US DOT data on cars on the road and scrappage rates, and on US Census Bureau population projections.

TimeLine for AVs and Disruption of Parking (Walker High Disruption Scenario)



* Compared to what would have happened this year without AVs.

**Average nationally. More urban core, less suburban and very little impact rural.

WHAT PARKING INDUSTRY NEEDS TO THINK/PLAN/DO

Provide “just enough” parking, use mixed uses and shared parking, and allow flexibility to increase or decrease parking over time.

Cities and Airports need to prepare curb management and transition plans, to allow for changing pickup/drop off needs, and implement TNC use fees.

Plan for IT connectivity. Conduit pathways are key.

Plan for significantly increased EV recharging. Power management systems will reduce power requirements, which are bigger issue than number of charging units

Plan for passenger loading zones inside parking structures; a significant issue is 9’6” clear height required by ADA.

Do plan for some future changes, such as future retail at grade, adding floors, or converting the roof parking, residential wrap around the outside and strategic demolition at expansion joints.

Designing new parking structures for complete conversion is not likely to be cost-effective or appropriate for most facilities; see *Adaptive Reuse* whitepaper for the reasons why. While it may only cost 1% to increase floor to floor heights are many recommend, that merely puts off and actually increases the very significant costs to convert to other uses, which will still be constrained by parking design parameters.

ABOUT THE AUTHOR

Walker Consultants is the global leader in providing parking consulting and parking design services. Founded in 1965, we pioneered the field of parking consulting. Today the firm has over 300 employees delivering a wide range of parking planning, design, engineering, and restoration services.

The firm is based in the U.S. with 17 domestic offices and 1 in the United Arab Emirates, is ranked #240 in Engineering News Record’s Top 500 Design Firms and #13 in Building Design + Construction’s Giants 300 Engineering/Architecture Firms.

We serve a broad spectrum of markets including healthcare, education, government, aviation, residential, retail and commercial development, entertainment, hospitality and athletic venues. This diversity allows our staff the luxury of collaborating with a large cross section of client types and developing best practices for their specific development needs, helping them unlock the potential of their projects.

