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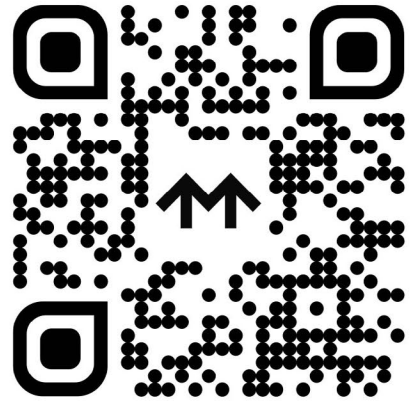
Understanding the Global Parking Industry

May 2022



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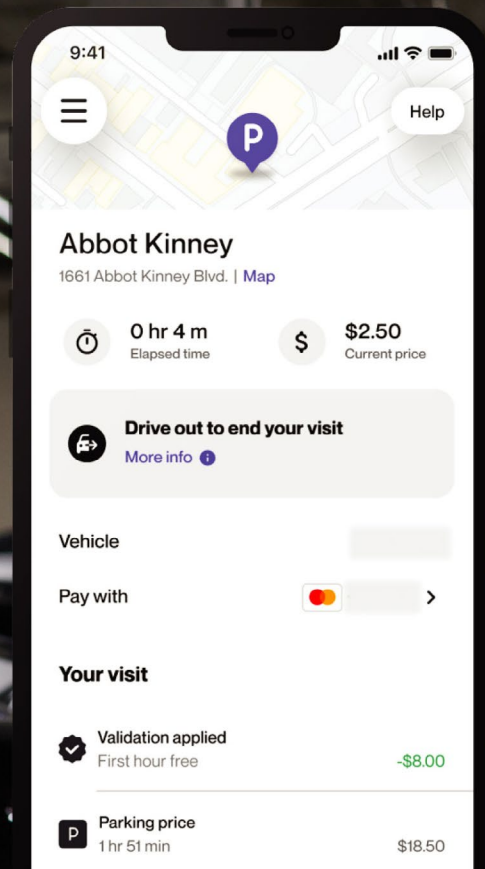
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One of the earliest municipal parking lots in the United States was built in 1922 in Los Angeles. Over the last 100 years, the global parking industry has grown to an estimated valuation of nearly \$100 billion worldwide.

Many older parking structures will eventually be converted to other uses, and newer facilities are often equipped with solar panels, electric-vehicle charging stations, stormwater management, or multimodal options such as bike racks or public transportation. Technology is also allowing more

cars to be stored in smaller spaces where that is cost effective. While some cities are likely overbuilt for public and private parking, the intelligent use and management of parking facilities is essential to economic growth in the 21st century.

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UL10: THE ART OF PARKING

BY RON NYREN

FEBRUARY 11, 2022

Ten inventive approaches to stashing vehicles enliven the urban environment.

Parking was supposed to be obsolete by now, with millions of autonomous vehicles roaming the roads and private car ownership plummeting. As long as tech companies' self-driving dreams await fruition, parking structures are still the best way to house vehicles en masse, but they do not have to be monolithic concrete blots on the landscape. Architects are transforming them into works of art with innovative facades, using glazing to enhance visibility in the surrounding area at night and incorporating alternative energy and stormwater management systems. Creative bicycle parking solutions encourage the use of alternative forms of transportation while enhancing the public realm.

The following 10 projects—all completed during the past five years—include a parking structure beneath a canal, aluminum skins that double as works of public art, a kinetic mesh of polycarbonate, an undulating landscape that harbors bicycles under its hills, and a car-handling facility that serves as a canvas for artists' digital light installations.

1. Albert Cuyp Parking Garage Amsterdam, Netherlands

Canals help keep Amsterdam from flooding, but they also take up a significant amount of land. In the De Pijp neighborhood, constructed at the end of the 19th century without the automobile in mind, parked cars have long crowded the narrow streets. So the borough of Amsterdam-Zuid (Amsterdam South) and the municipality of Amsterdam teamed up to tuck parking underneath the Boerenwetering Canal. Designed by local firm ZJA, the long, narrow structure



(ZJA)



(ZJA)

contains two levels with 600 parking spaces. Ten percent are set aside for visitors; the rest are earmarked for residents with a parking permit.

Glass pedestrian entrances and long one-way ramps along the roadways on both sides of the canal provide access and allow plenty of daylight to stream into the structure below. Above the surface, emergency exits and vents are minimalist in design. Because of the underground parking, the city was able to turn almost all surface parking spaces in the surrounding area into playgrounds, squares, and green spaces. Completed in 2018, the garage also includes spots for 60 bicycles.



(Gresham Smith)

2. Asheville Regional Airport New Parking Garage Asheville, North Carolina

As Asheville Regional Airport's passenger traffic rose, finding an open parking space in its surface parking lots became harder. So the regional airport authority decided to replace 400 surface spaces with a five-story structure that accommodates public parking for 1,100 cars on the upper levels as well as 224 spots for rental cars on the ground level. Because the site is in front of the terminal building's entrance, the authority asked the designers, Gresham Smith's Charlotte Aviation studio, to give the new garage an aesthetically appealing appearance.

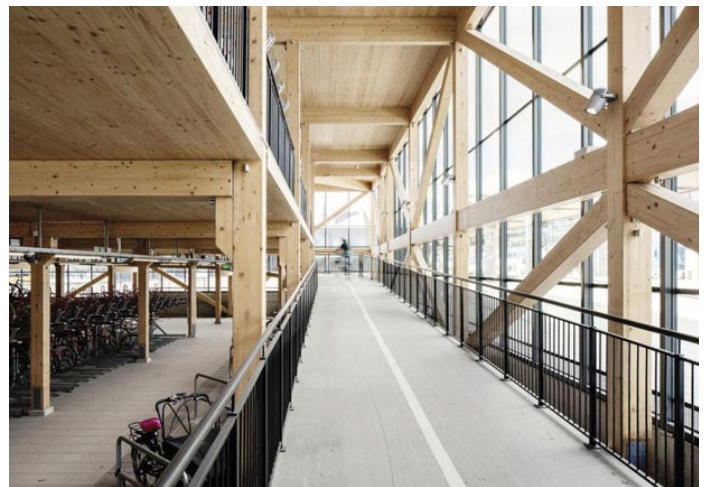
Both east and west elevations feature a 300-foot-long (90 m) metal screen wall custom-perforated with a supergraphic that embodies the local Blue Ridge Mountains. The perforations let in fresh air and shield occupants from the elements. Precast concrete spandrel panels on the north and south elevations are embossed with mountain ridge imagery as well. A steel-framed canopy protects pedestrians crossing to the terminal's ticketing lobby and baggage claim area. The structure opened in 2018.

3. Bicycle Garage Kungsängen, Sweden

The World Wide Fund for Nature (formerly the World Wildlife Fund) declared Uppsala, Sweden, the 2018 winner of its One Planet City Challenge for its progress in fighting climate change, in part for its success

in increasing daily bike trips to more than a third of all travels within the city. In 2019, Uppsala further burnished its bike-friendly reputation by opening a bicycle garage at Uppsala Central Station. With two floors connected by a wooden ramp, the triangular building can hold up to 1,200 bicycles for commuters.

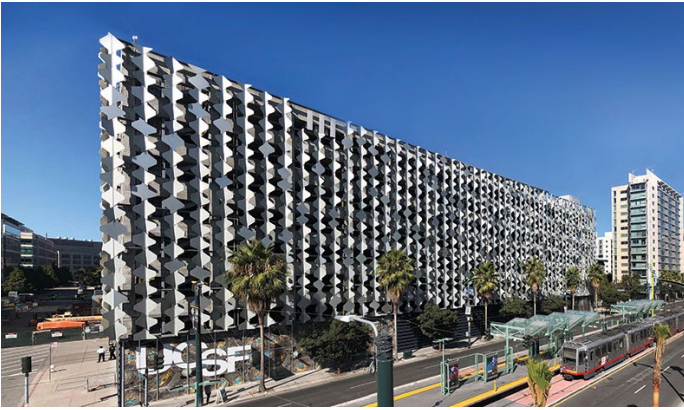
The exposed wood structure is equipped with glass facades and black steel molding, providing a high degree of transparency. In the winter months, Uppsala receives as little as six hours of daylight per day. The extensive glazing allows the building to serve as a lantern at night, illuminating the surrounding area for enhanced safety. Lighting on the underside of the wooden beams can be programmed to change colors, evoking the northern lights. Designed by Stockholm-based Tengbom, the garage includes a vegetated roof topped with solar panels.



(Felix Gerlach)



(Felix Gerlach)



(IwamotoScott)

4. Cellular Origami **San Francisco, California**

The University of California, San Francisco, held a design competition to create a new facade for its existing Third Street parking structure in Mission Bay. The previous channel glass facade had failed and been removed in 2015, exposing worn concrete. Meanwhile, prominent new buildings like the Chase Center arena and Uber’s headquarters were in the works across the street. The university wanted to strengthen its identity at this edge of campus. Local firm IwamotoScott Architecture won the design competition with Cellular Origami, which references spiraling strands of DNA in a nod to research taking place at the institution.

Completed in 2020, the new facade consists of silvery anodized aluminum panels cut into four shapes. Organized into vertical strands, these “petals,” each folded in one of five different combinations of angles, reflect daylight at varying degrees of intensity over the course of the day. At night, the panels reflect the light emanating from the nearby Chase Center, eliminating the garage’s need for additional exterior illumination.

5. Center Street Parking Garage **Berkeley, California**

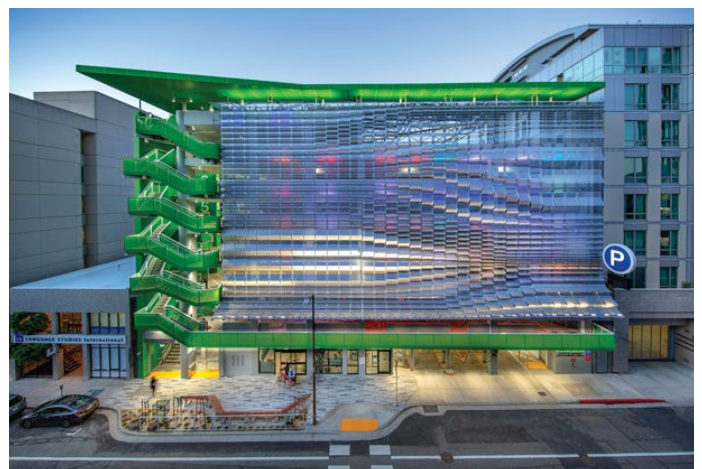
Home to a number of theaters and other performing arts venues, Berkeley’s Downtown Arts District long relied on a 1950s parking garage that offered an

inadequate 420 spaces and no longer met seismic safety standards. The city demolished the structure and replaced it with an eight-level, 720-space garage on the same tight midblock site. Local design architect Marcy Wong Donn Logan Architects, working with architect of record International Parking Design Inc. of Oakland, gave the new building an appropriately artistic presence, equipping its two street facades with sharply folded, perforated steel panels in more than 20 sizes, arranged to suggest two waves flowing in opposite directions.

Programmable LEDs project a color-changing light show onto the metal panels at night. Well-lit, open-air staircases occupy one corner of each facade, red on one side and green on the other for easy wayfinding. Sustainability-minded elements include rooftop solar panels, valet parking for 250 bicycles, electric vehicle charging stations, carshare parking, bioswales to capture rainwater, and a micro-grid hub for emergency power. The garage opened in 2018.

6. Karen Blixens Plads **Copenhagen, Denmark**

Copenhagen reportedly has more bicycles than people, but its success as a bike-friendly city comes with a challenge: where to park them all. This was especially true at one of the biggest public squares in the city, Karen Blixens Plads, which occupies the heart of the University of Copenhagen



(©Billy Hustace Photography)



(©Brad Feinknopf)

campus. Long a merely functional parking area to house bicycles, the space has been remade as a hybrid park and public square, weaving in a variety of places for recreation and meeting, and accommodating up to 2,000 parked cycles.

Local architecture firm Cobe created a new surface of hills and valleys to connect the campus's three main entrances and the nearby Metro station. With equal amounts of hardscape and landscape, the square provides a transition between Amager Commons—a nature reserve—and buildings. Parking spots are tucked beneath three concrete-domed hills as well as in covered and uncovered “bicycle beds” sunk slightly into the terrain. At night, lighting illuminates the hills from within. Completed in 2019, the square also incorporates rainwater collection and stormwater management systems.



(Simon Devitt)

7. Ohio Center Garage Columbus, Ohio

On a spot once occupied by a loading dock for the Greater Columbus Convention Center, a new parking structure contains space for 650 cars as well as displays a work of kinetic art by Sebastopol, California–based environmental artist and sculptor Ned Kahn. Three 3,000-foot-long (900 m) swaths of polycarbonate mesh ripple in the breeze on the structure's eastern facade. In material and form, Kahn's sculpture complements the convention center's long ribbonlike forms, which in turn reference the rail yards that previously occupied the site.

Dubbed Silver Lining, the artwork lends aesthetic appeal to the back of the convention center and serves as a landmark for drivers on the nearby viaduct. Designed for the Franklin County Convention Facilities Authority by local architecture firm Schooley Caldwell, the six-story Ohio Center Garage links to both the convention center and its existing underground garage. The garage opened in 2020.

8. POAL Car Handling Facility Auckland, New Zealand

The Ports of Auckland play a major role in the metropolitan area's freight logistics and transport sector. Part of that role involves offloading new and used imported cars, storing them temporarily, and sending them on to dealerships. To free up room on the waterfront and enhance its aesthetic appearance, the Ports of Auckland asked the local branch of Plus Architecture to design a vertical storage building that would allow ships to offload 200 cars per hour.

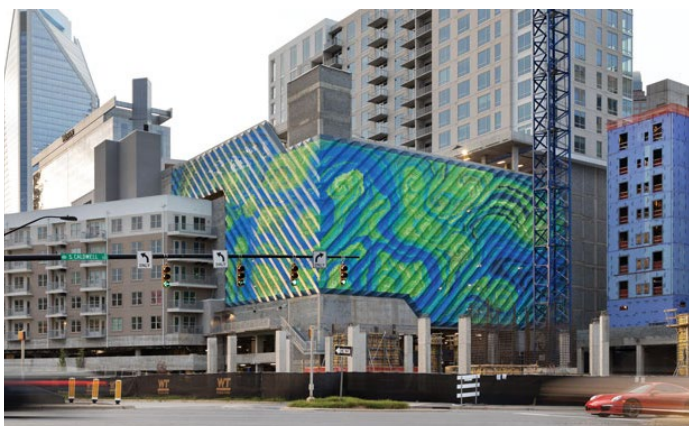
The western and southern walls of the car-handling facility were wrapped with a 360-foot-long (110 m) digital light wall. Visible at night from land and sea, it hosts large-scale digital installations by local and international artists. Opened in 2020, the building has a 50 percent permeable



facade. The southern wall includes what is billed as the world’s largest soil-based vertical garden, with more than 3,800 plants (most of them New Zealand natives) watered by built-in sensors.

9. Wanderwall Charlotte, North Carolina

When the Charlotte office of Crescent Communities planned Novel Stonewall Station, a 459-unit mixed-use development along Interstate 277 in Uptown Charlotte, the eight-story parking deck held the potential to serve as a visual barrier between Uptown and the South End neighborhood on the other side of the highway. To prevent this, the developer collaborated with the local nonprofit Arts and Science Council to choose an artist who could turn the structure into a work of public art, as easily read from the freeway as from the sidewalk.



Brooklyn, New York–based Marc Fornes/ THEVERYMANY crafted an aluminum screen wall that folds across the south and east walls and embodies the swirl of activity in the district, with eight stories of folded panels in saturated blues and greens. The ultra-thin panels are perforated to let air and daylight through. Completed in 2019, the facade hangs over the parking deck as one continuous piece, with no secondary support structure needed.

10. Wynwood Garage Miami, Florida

In 2009, the Miami office of Goldman Properties commissioned international artists to create murals on the large windowless exterior walls of six warehouses in a former garment manufacturing neighborhood. That helped spark revitalization, drawing art galleries, shops, bars, and eateries, but it also made open parking spaces harder to find. Goldman Properties brought in local architecture firm Wolfberg Alvarez and Partners to design an eight-story mixed-use parking structure and Oakland, California–based Faulders Studio to craft an architectural skin that spoke to the artistic surroundings.

The skin consists of 1,500 unique, irregularly shaped white aluminum panels ranging in height from three feet (1 m) to six stories. Protruding white fins and

perforated borders define the edges of panels, and the perforations bring daylight and air to the interior. Completed in 2019, the building includes shops on its ground floor and offices at the top level.

RON NYREN is a freelance architecture and urban design writer based in the San Francisco Bay area.



SOLUTION FILE: SHARED PARKING LEADS TO CREATIVE SOLUTIONS

BY WILL MACHT
AUGUST 31, 2021



A rendering of Kirkland Urban at buildout. The site overlooks the 7.5-acre (3 ha) Peter Kirk Park and is close to City Hall in the original town center. Seattle lies across Lake Washington in the distance. (CollinsWoerman)

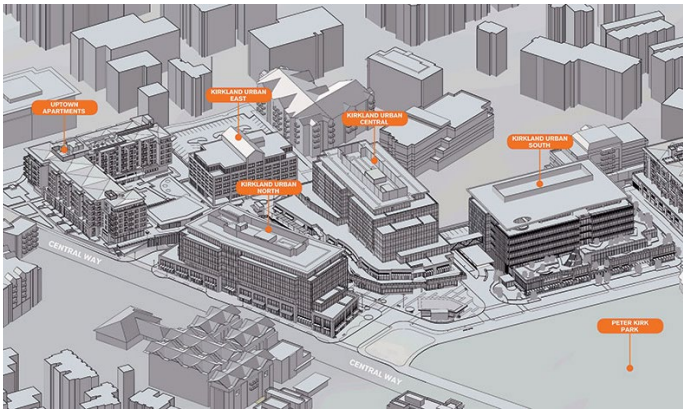
A redevelopment of a 1980s strip center in a suburban town programs urban-style mixed uses with 1,500 fewer parking spaces than would have been required without sharing.

Demand for more affordable class A and creative office space served by a mixture of uses in a more urban setting has led to a newer form of mixed-use development in suburban towns.

Referred to as “surban,” these developments meld the amenities of urban places with the convenience of smaller, less-congested, and more walkable suburban environments.

Both urban and suburban developers still usually build single-use buildings. Urban developers typically build single-use office, apartment, or hotel buildings, some with a modicum of retail space at their bases, supported by underground parking for the users of that building. Suburban developers typically build single-use retail, office, apartment, or hotel buildings surrounded by parking lots. Major reasons for this dichotomy are that available downtown sites are rarely large enough for truly mixed-use projects, and that large suburban sites are often not zoned for mixed uses.

In recent years, however, developers have seized the opportunity to create larger-scaled, functionally integrated, mixed-use surban developments to replace outmoded closer-in strip centers. These new developments truly meet ULI’s three-part



A labeled key to component buildings. (CollinsWoerman)

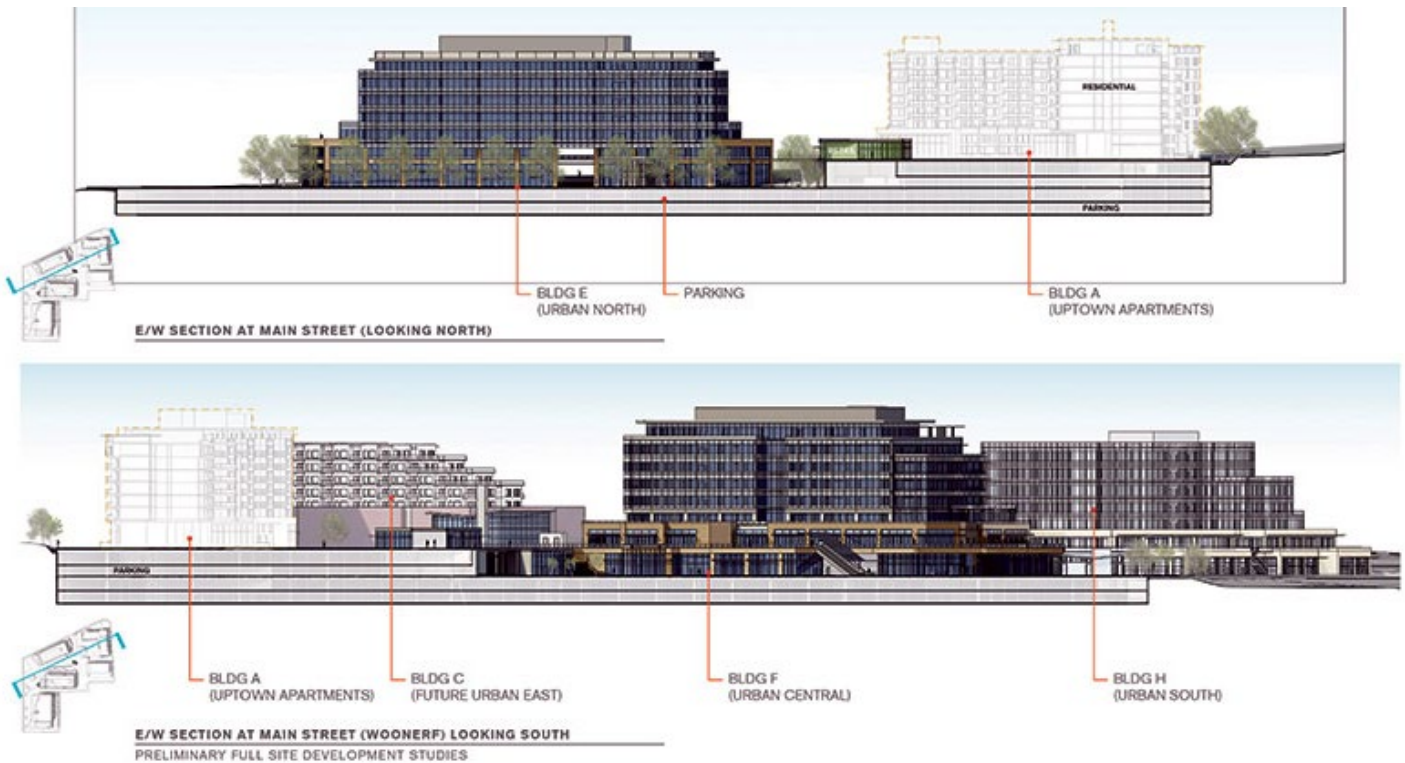
definition of mixed use: they have three or more revenue-generating uses; they are physically and functionally integrated; and they are developed according to coherent, design, construction, economic, market, and management plans.

Urban Development Opportunities

Bellevue, Washington-based Talon Private Capital found just such an opportunity at Parkplace Center, an 11.5-acre (4.7 ha) strip center in nearby Kirkland,

built in 1980 and anchored by a 25,000-square-foot (2,000 sq m) QFC grocery. The site at Central Way and Sixth Street overlooked the 7.5-acre (3 ha) Peter Kirk Park, with Seattle across Lake Washington in the distance, and was just 1,500 feet (460 m) away from City Hall in the original town center. The town had been founded in 1888 by Peter Kirk, a British-born businessman who had formed Kirkland Land and Development Company, which bought thousands of acres of land for the new town he envisioned as the “Pittsburgh of the West.”

The real estate arm of Prudential Insurance, Prudential Global Investment Management (PGIM Real Estate), and Seattle developer Touchstone Corp. bought Parkplace Center in 2007 for \$59 million with the intent to develop a 1.8 million-square-foot (167,000 sq m) mixed-use project incorporating 1.2 million square feet (111,000 sq m) of office space in five buildings, a 175-room hotel, a luxury sports club, and 300,000 square feet (28,000 sq m) of retail space, including a grocery



Four levels of parking are tucked under eastern sections of the project and two continuous levels are tucked under the whole site, increasing the space efficiency of the parking floor plates and making the shared parking pool more efficient. (CollinsWoerman)

store. The overall development required about 5,000 parking spaces. However, in the aftermath of the Great Recession, the economics of that program appeared problematic, and a new approach was needed.

In 2013, PGIM brought in a local partner, Talon Private Capital, to reenvision the project, renamed Kirkland Urban in fall 2015. Talon proposed what it considered a more feasible phased development program consisting of 650,000 net rentable square feet (60,000 sq m) of office space; 165,000 square feet (15,000 sq m) of retail space (including a more upscale 50,000-square-foot (4,600 sq m) QFC grocery, doubling its size; a 54,000-square-foot (5,000 sq m), nine-screen cineplex; and 300 apartments—for a total of 1.1 million square feet (102,000 sq m) served by 2,000 underground parking spaces. That mix produced an average shared parking ratio of only about 1.5 spaces per 1,000 square feet (93 sq m), far below conventional suburban ratios but higher than typical downtown ratios.

Functional Integration

That development program's mix of uses could produce synergies that functionally integrate those uses.

For example, the apartment units would be particularly desirable to employees of tech-oriented office tenants, who would rely on the services of the on-site retail/grocery/restaurant and



The recent state of completion of Kirkland Urban. The red-brick Parkland Place office building has not yet been replaced by Kirkland East. (CollinsWoerman)

theater components, which could in turn generate premium rents for all uses while decreasing demand for additional parking. The cinemas could take advantage of the mostly vacant office parking in the evening as well as stimulate restaurant businesses in the more profitable evening hours. And the availability of a large pool of shared parking could increase the efficiency of each expensive underground parking space while lowering the total parking count, which would reduce development costs, thereby helping make the whole mixed-use project more feasible.

Physical Integration

Talon's smaller development program also would take maximum advantage of the slope of the site, which descends more than 35 feet (11 m) from east to west. Seattle-based architecture firm CollinsWoerman used the slope to tuck four levels of parking under eastern sections of the project, as well as two continuous levels under the whole site. That increased the space efficiency of the parking floor plates, resulting in less space wasted on circulation ramps. Even more important, those larger floor plates make the shared parking pool more efficient because users of different components can find and occupy vacant spaces in the larger contiguous shared parking pool more quickly.

Building the parking floor plates on such a significant slope also meant that the need for expensive excavation would be reduced. Still, depending on which expenses are included, the parking cost ranged from \$35,000 to \$45,000 per space, says William Leedom, managing director at Talon.

CollinsWoerman was also able to take advantage of the slope to make the site more urban. Large grocery stores have mostly blank walls because refrigerated fixtures, walk-in cooler supply rooms, ovens, and service facilities need to be placed on the perimeter. Architects buried the bulk of the grocery store, the loading docks, and most of the

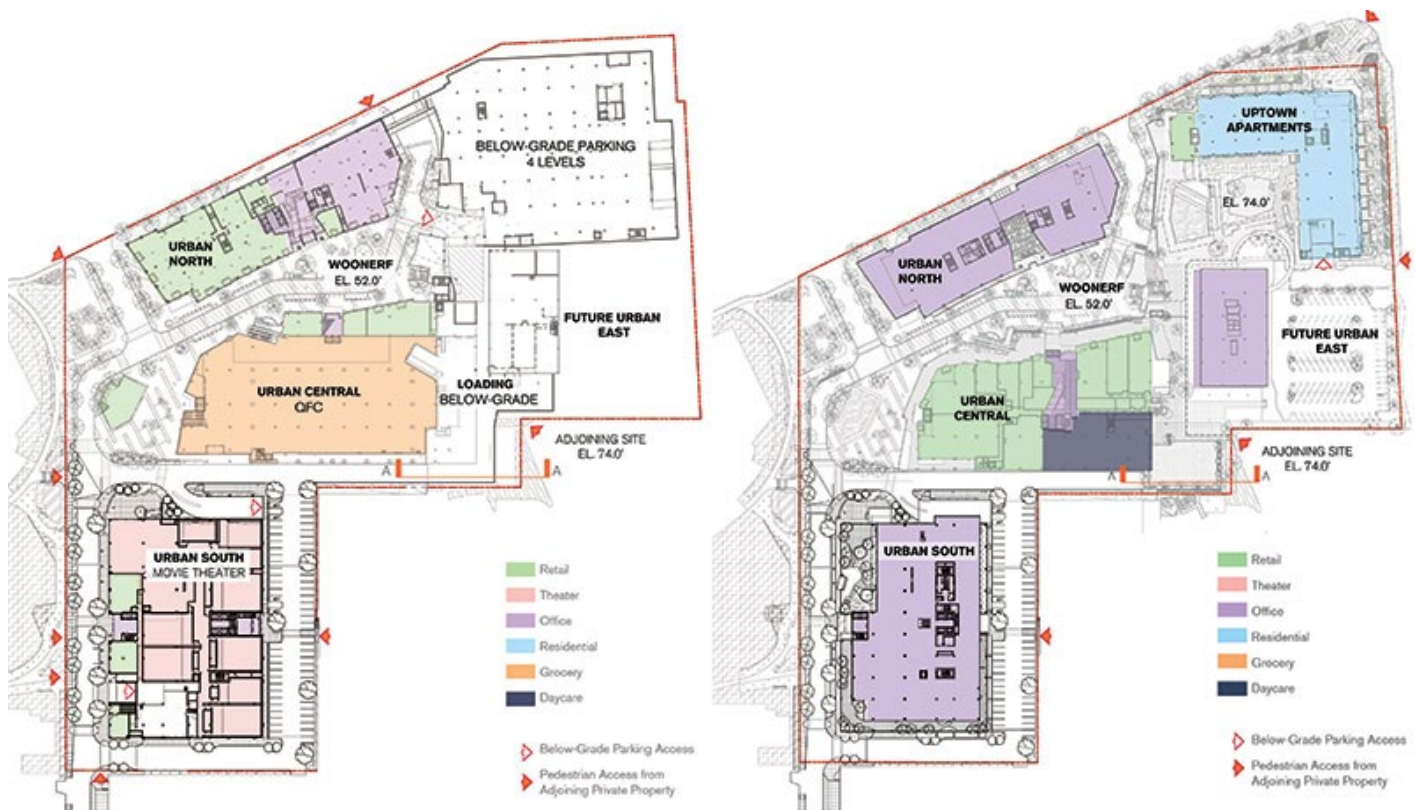
perimeter walls in the slope. Unlike the practice of most suburban grocers, all loading for QFC is done below grade. Cinemas also have long stretches of blank walls, and the architects were able to bury them into the slope as well. Yet both the grocery and the cineplex have entrances that open onto the lower park level, which yields views across Peter Kirk Park and Lake Washington beyond.

To tie the uses of the site together, architects threaded through the site a woonerf—a “living street” mainly for pedestrians here, but also allowing light auto traffic and short-term parking—from Central Way at the northeast down to Peter Kirk Park on the west. About 50,000 square feet (4,600 sq m) of retail space flanks the woonerf on the plaza level. In addition, about 14,000 square feet (1,300 sq m) of space is occupied by a Bright Horizons preschool, which has an outdoor play area on the main plaza level above the QFC underground loading facilities.

Office Component

The office space is divided into four buildings—Urban North, Central, South, and East. Urban North and Central were completed in 2019, and Urban South will follow in 2022. Urban East will be the last phase of the project developed.

Leedom said there were “several reasons to divide the office component into several buildings—view corridors, what we felt were correct floor plates given the likely tenants, input from QFC on their store size, existing tenants on the site during the construction of phase one, the necessity to keep the older QFC store open, and risk of building more space than could be absorbed at once.” The office buildings are seven- to eight-story, post-tensioned concrete structures, reflecting the size of development risk the venture wanted to take on, notes Leedom. Later, a skybridge between the Urban Central and South buildings will be added to connect Google workspaces.



The site plan shows the mixture of uses at the lowest level, with the QFC grocery loading and service areas located underground, below a plaza that contains an outdoor play area for a daycare center. About 50,000 square feet (4,600 sq m) of retail space is located on the plaza level flanking a woonerf that ties together the apartment, office, and retail components.

Talon was able to prelease about half the office space in the Urban North and Central buildings, Leedom says, with two leases to technology companies. Seattle business-intelligence company Tableau Software, which develops data-visualization software, leased three floors totaling 92,000 square feet (5,800 sq m). Kirkland-based internet provider Wave Broadband, which builds fiber optic infrastructure, signed a 10-year lease to occupy 88,000 square feet (8,200 sq m) in one of two eight-story towers. When Wave was bought by San Francisco private equity company TPG Capital, it worked with owners to terminate its lease in 2018 so Google could occupy Wave's former premises. With half the office space for its first phase pre-leased in 2015, Talon was able to access debt markets to begin demolition and construction, says Leedom.

Although PGIM had intended the project as a long-term-hold investment, in fall 2019, Google bought all of Kirkland Urban, its then two mixed-use office buildings, two retail buildings, and parking garage, minus the 185-unit Uptown apartments, for \$400.7 million (based on a real estate excise tax report) in addition to another \$35 million for a two-acre (0.8 ha) parcel on which Urban East is to be built. In December 2019, the entitlement to build another 115 apartments was transferred to office space, bringing the total allowed office space to 925,000 square feet (86,000 sq m). If average office space per employee is calculated at 150 square feet (14 sq m), that would provide space for as many as 6,000 employees.

Comfort and efficiency drove additional innovation. Variable refrigerant flow (VRF) mechanical systems were used to help achieve a Leadership in Energy and Environmental Design (LEED) Gold rating. VRF systems are ductless and use variable-speed motors to deliver precise amounts of refrigerant to zoned heat exchangers that provide either heating or cooling to different parts of the building, increasing comfort for tenants and reducing expenses for owners



The wonerf threads through the entire site and becomes the unifying public space that ties together uses and users.



The slope of the site, which descends more than 35 feet (11 m) from east to west, allowed architects to bury the bulk of the blank walls of the grocery store, loading docks, and cinemas in the slope.

Retail Component

The 165,000-square-foot (15,000 sq m) retail component was initially driven by the city's requirement that the developer build one square foot of retail space for every four square feet of the 650,000-square-foot (60,000 sq m) office component. With the commitment of QFC to double its store size to 50,000 square feet (4,600 sq m) and iPic to lease a 54,000-square-foot (5,000 sq m) cineplex for a dine-in-theater concept, a significant percentage of the requirement was met.

Apartment Component

The 185-unit apartment building called Uptown at Kirkland Urban, at the highest corner of the site at Central Way and Sixth Street, is a five-story wood-framed structure over a concrete podium. Roof



Kirkland Urban's office/retail buildings can be seen from Peter Kirk Park.



The grocery and cineplex have entrances that open onto the lower park level, yielding views across Peter Kirk Park and Lake Washington.

decks look over Lake Washington and Seattle in the distance. Talon codeveloped the apartments with Minneapolis-based Ryan Companies US Inc.

The unit mix is 26 percent studio, 47 percent one-bedroom, and 27 percent two-bedroom/two-bathroom apartments. Many of the two-bedroom units are two-story lofts. The apartments range from 481 to 1,406 square feet (45 to 131 sq m), and rents range from \$1,950 to \$4,645 per month. Rents for the unassigned garage parking range from \$90 to \$125 per month.

Shared Parking

Only mixed-use development programs can create the opportunity to share parking, increasing the efficiency of each expensive stall and reducing the total parking needed to support a more intensive use of the land. The predominant use in this program mix is office space, which

requires one space for each 350 square feet (33 sq m)—a 2.86:1 parking ratio of spaces per 1,000 square feet (93 sq m) under the city zoning code. Restaurants require an 8:1 ratio under the code, and apartments a 1.38:1 blended ratio based on Uptown's unit mix. The total number of parking spaces under the code for that program was 3,747.

But actual parking demand in a mixed-use project varies by use, time of day, day of the week, and by season. If a developer can reasonably project actual demand according to those factors, the quantity of parking needed can be substantially reduced.

Leedom hired Seattle-based Heffron Transportation to forecast parking demand and needed supply. Heffron projected a maximum cumulative peak parking demand of 2,287 cars at noon on a weekday at full buildout, including a 377-space reserve supply for commercial and residential uses. That represents a difference of 1,460 parking spaces between the code-required spaces and the projected maximum demand, a potential cost savings of \$65.7 million in development costs. Even under conservative assumptions, that equates to a 1.7:1 weighted parking ratio versus the 2.8:1 parking ratio required by code without consideration of shared parking.



The original Parkplace Center, an 11.5-acre (4.7 ha) strip center, was built in 1980 and anchored by a 25,000-square-foot (2,300 sq m) QFC grocery. (CollinsWoerman)



A large number of apartments have been built in areas of the town adjacent to the original center, now transformed into Kirkland Urban. (CollinsWoerman)

Kirkland Urban retains a third-party parking manager to manage parking for maximum efficiency. A reserve parking supply of 15 percent vacancy is targeted to reduce the time a customer must circulate to find an open space. Price is also an important factor. Retail parking at Kirkland Urban is free for four hours with a validated purchase. Otherwise, daily parking costs range from \$5 to \$35, depending on duration. Monthly parking is \$125.

Office parking is also allocated. "Office parkers have their own access cards, and with our garage parking system you can see if an office tenant has gone over their allotment by number of cars and charge for that as appropriate per their lease," Leedom says. Of the spaces provided, 135 are reserved for apartment use and rented unassigned to residents. "We have a parking management company, gate arms, and ticket system to make sure everybody is playing by the rules of our parking easement, which is on the title as part of the condominium declaration," he says.

The mix of uses in the development program is paramount in determining the efficiency of shared parking. Even if parking were built to maximum capacity for periodic weekday noon peaks of 2,287 spaces, and for 7 p.m. Saturday weekend demand peaks, only 1,200 spaces would be needed for evening and weekend users, leaving 1,087 spaces vacant. That suggests that, if market demand

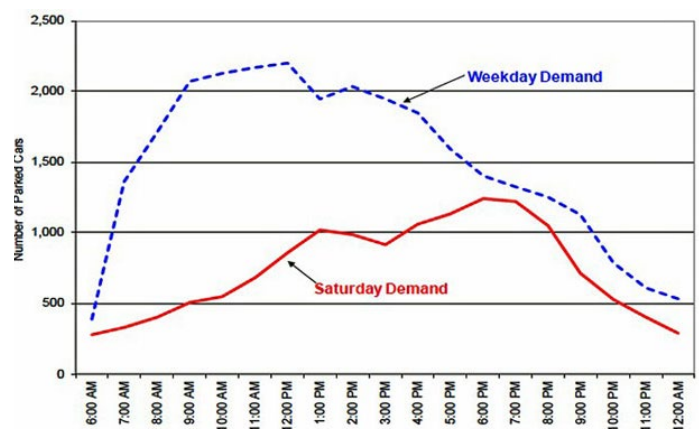
existed, more than 1,000 hotel rooms could be developed with no additional spaces required, even assuming a liberal parking ratio of one space per unit.

Surban Prototype

Kirkland Urban suggests that a new breed of developers is creating mixed-use surban prototypes at a more intensive scale, on sites larger than most urban projects but smaller than most suburban projects, and with uses more mixed and integrated physically and functionally than either of those others.

In many ways they are more complex than either. Building different uses on top of common parking requires careful planning of such things as structural bay sizes and plumbing chases.

But the benefits of such surban projects can outweigh their costs and complications. Places with on-site offices, apartments, groceries, restaurants, brew pubs, wine bars, and theaters offer a greater level of urbanity than single-use urban or suburban projects. That urbanity can drive premium rents and lower vacancies. Contiguous floor plates of integrated parking that serve many uses are occupied during



Traffic engineers forecast a maximum cumulative peak parking demand of 2,287 cars at noon on a weekday at full buildout, including a 377-space reserve supply for commercial and residential uses. The difference between the 3,747 code-required spaces and the actual maximum demand of 2,287 was 1,460 parking spaces, representing a potential savings on construction costs of \$65.7 million. (Heffron Transportation)

more hours of the day and week than their single-use counterparts. That greater efficiency reduces the total amount of expensive structured parking necessary, supports more intensive use of the land, and increases development value—and with it the tax base of the town. Kirkland Urban’s taxable value, excluding the 1,706-space parking structure, was \$315 million at the completion of its first phase.

WILLIAM P. MACHT is a professor of urban planning and development at the Center for Real Estate at Portland State University in Oregon and a development consultant. (Comments about projects profiled in this column, as well as proposals for future profiles, should be directed to the author at macht@pdx.edu.)

Shared Parking, Third Edition, published by ULI, ICSC, and the National Parking Association, is available in paperback (\$155.95) or with Excel model (\$649.95) at bookstore.uli.org.

INTERACTIVE ULI REPORT SHARES BEST PRACTICES TO COMBAT OVERSUPPLY OF PARKING

BY ULI STAFF
JUNE 28, 2021

ULI has launched a first-of-its-kind central resource cataloging innovative parking policy reforms intended to promote more efficient use of land and creation of healthier neighborhoods.

Though cities across the United States and beyond have long required new developments to provide a set number of off-street parking spots, research shows that these requirements can lead to an oversupply of parking.

ULI’s searchable, filterable database, titled “Parking Policy Innovations in the United States,” allows users to access information on more than 50 policies from cities across the United States. It is complemented by five fact sheets that detail various elements of reforms, including how these reforms influence real estate development projects, transportation choices, and goals related to social equity, affordable housing, livability, and city finances. ULI will periodically

update the database and provide opportunities for users to suggest policies for potential inclusion.

“U.S. cities have struggled for a long time to balance parking supply and demand but are now updating policies to better manage their parking inventories,” says Matt Norris, director of the Institute’s Building Healthy Places Initiative. “The centralized resource that ULI has created will be helpful to real estate and land use professionals, in both the public sector and private sectors, to learn from best practices across the country and encourage more efficient parking solutions.”

Parking policy reforms highlighted in the database include eliminating minimum parking requirements for development projects, enabling developments and businesses to share parking facilities, and using technology solutions to efficiently manage the supply of on-street parking.

“These types of reforms have been shown to reduce traffic and associated emissions,” says Norris. They can also free up resources for cities to invest in transit and other infrastructure and can lead to lower real estate development costs—meaning more profitable projects and opportunities to support housing affordability.”

Users of the interactive database will be able to sort policies by year or location and can also filter results by the lead agency responsible for the policy. Policies can also be sorted according to “applicability”—whether a policy applies citywide, near transit, or in specific districts, for instance—well as policy type. These policy types include

- reduction/elimination of parking minimums;
- parking maximums/caps;
- shared parking;
- unbundled parking;
- transportation demand management;
- in-lieu fee;
- demand/performance-based pricing; and
- parking benefit district.

ULI’s research highlights several trends that have influenced parking reforms, including:

- Historically high construction costs—particularly in dense urban areas—are contributing to housing unaffordability, especially when the high costs of building on-site parking are factored in.
- Changing shopping preferences, along with an oversupply of retail businesses, are leaving acres of vacant parking lots at shopping malls and retail power centers.
- The popularity of human-powered transportation, such as walking and bicycling, and the growth of delivery services and the availability of shared mobility services are reducing the need for individuals to own cars and park them.
- Advances in technology are promoting more efficient management of the existing parking supply through information technology that shares the location of available spaces, supports real-time dynamic pricing, and helps make use of shared parking options easier.
- At the same time as municipalities are increasing their focus on sustainability, livability, and social equity, a growing body of research shows that many current parking requirements promote development patterns that worsen traffic congestion, contribute to air pollution, raise housing costs, prevent walkability, and penalize those without automobiles.

SHARED PARKING: HOW FUTURE MOBILITY TECHNOLOGY MAY DRIVE PARKING DEMAND

BY MARY S. SMITH
APRIL 20, 2020

This article is adapted from *Shared Parking, Third Edition*, published this spring by ULI, ICSC, and the National Parking Association. The book, 209 pages, is available in paperback (\$155.95) or with Excel model (\$649.95) at bookstore.uli.org.

Most experts expect that the part of the infrastructure first and most affected by autonomous vehicles (AVs) will be parking. By 2025, many new cars are expected to have “autonomous parking,” through which the car will be able to park itself in a parking facility without human intervention, even if the vehicle is not L5—the highest level of vehicle autonomy on a scale of L0 to L5.

Many manufacturers already offer some form of parking assistance, including Audi, BMW, Chrysler, Ford, Jaguar, Jeep, Tesla, Toyota, Volkswagen, and Volvo. In 2015, Mercedes-Benz became the first manufacturer to offer fully autonomous parking in a production model—i.e., the car can find a stall and park itself after dropping off the driver and passengers at the front door.

Unfortunately, most drivers think they can drive and park better than the systems on their cars or are frustrated by the much slower autonomous parallel parking operation; thus, a fair proportion of those who have this technology rarely use it. As noted in a 2017 article in *Popular Mechanics* (Ezra Dyer, “The Fallacy of the Self-Parking Car”), owners are far more likely to use the lane changing, backup cameras, speed control, or other advanced driver assistance system functions today. More recently, it is increasingly recognized that parking areas are highly complex, with pedestrians in



the “roadway” and cars backing out of stalls. As with AVs in general, the timeline to widespread autonomous parking is still not predictable.

The first benefit of autonomous parking will be more cars parking in the same area. If passengers are dropped off and the car goes to park itself, no space is required for door opening at the stall. As many as six cars will be able to park in the space of five. That alone is up to a 20 percent increase in parking capacity.

When planning new shared parking projects today, it is thus helpful to remember that parking capacity is likely to increase—fairly significantly—even as parking demand goes down. This is yet another

reason to design a “just enough, no regrets” parking supply today. One would expect that perhaps as soon as 2025, building owners wishing to take advantage of the ability to gain spaces would start providing special areas for such vehicles to park and slowly expand those over time, reducing the parking area for driver-parked vehicles. At the same time, space for pickup and drop-off will be required, possibly in one location at grade or on each parking floor where autonomous parking occurs.

Obviously, it will take time for older cars without AV technology to be retired from service and time for the parking technology to be widely used. It will take even longer for a significant number of AVs to be driving around empty of passengers on public roadways.

If L4/L5 vehicles are sold to individuals, some families may be able to cut back to one car and use a ride-hailing service or other mobility options for some trips. At times, the family car will drive one family member to one activity and return to take another to a different activity. Parking can also be off site from destinations or the vehicle can go back home to park and perhaps recharge the battery during the workday.

However, the biggest game-changer for roads and parking demand (total cars parked at one time) is the marriage of ride-hailing services with AVs. Many expect that most urban dwellers will give up car ownership altogether while others are more skeptical that that vision will come to pass. Certainly many persons can benefit from improved mobility at lower cost. Aging baby boomers may be able to stay in their homes longer and get to doctor appointments and grocery stores more easily. Persons with mobility disabilities may have far better access to a mainstream lifestyle than with today’s paratransit services (a.k.a. dial-a-ride) at far lower cost to the public transit system. Teenagers can get to sports practices without disrupting parents’ work schedules. Lower-cost transportation options will provide improved mobility and choice

of jobs for the working poor. Commuters can work or read and relax on the trip to and from the place of employment, which some worry will cause people to move yet farther out from central cities.

One other key point about the marriage of AVs and ride hailing exists: it increases vehicle-miles traveled (VMT) compared with the alternatives. There seems little doubt that congestion caused by transportation network companies (TNCS) such as Uber and Lyft is a growing problem in Manhattan as well as in certain other locations, including airport terminal curbs and in dining and entertainment centers. Studies of the potential for shared TNC rides almost uniformly show that even at maximum sharing, an overall increase in VMT will occur because of empty travel between paid trips. However, the fact remains that over two-thirds of U.S. VMT in 2018 was by private cars, and recovering excess space allocated to parking will significantly benefit the urban form.

Proponents of shared autonomous vehicle (SAV) rides believe that the best way to get benefit from AVs in cities is to have a significant migration to SAV rides rather than individual TNC rides. A 2018 Yale report (“Will Self-Driving Cars Usher in a Transportation Utopia or Dystopia?”) concluded that the “trifecta” of electric, shared, autonomous vehicles has potential for huge environmental benefits. And the reverse is true: if AVs are not shared and electric, the Yale report says, there will be “more gridlock, more pollution and more emissions . . . and to avoid the latter, public policy and regulations will have to force:

- EVs [electric vehicles],
- limited miles driven empty, and
- incent SAV rides.”

Does the United States have the will to force SAV rides? Incentives (a.k.a. subsidies) for electric vehicles have not worked well. Although the industry has celebrated passing 1 million plug-in sales since 2010, less than 0.4 percent of the 260 million cars

on the road as of the end of 2018 were plug-in. New York has been trying for 15 years but has yet to apply a congestion tax in Manhattan. The U.S. Congress cannot find the will to raise the gasoline tax to pay for crumbling bridges and roads.

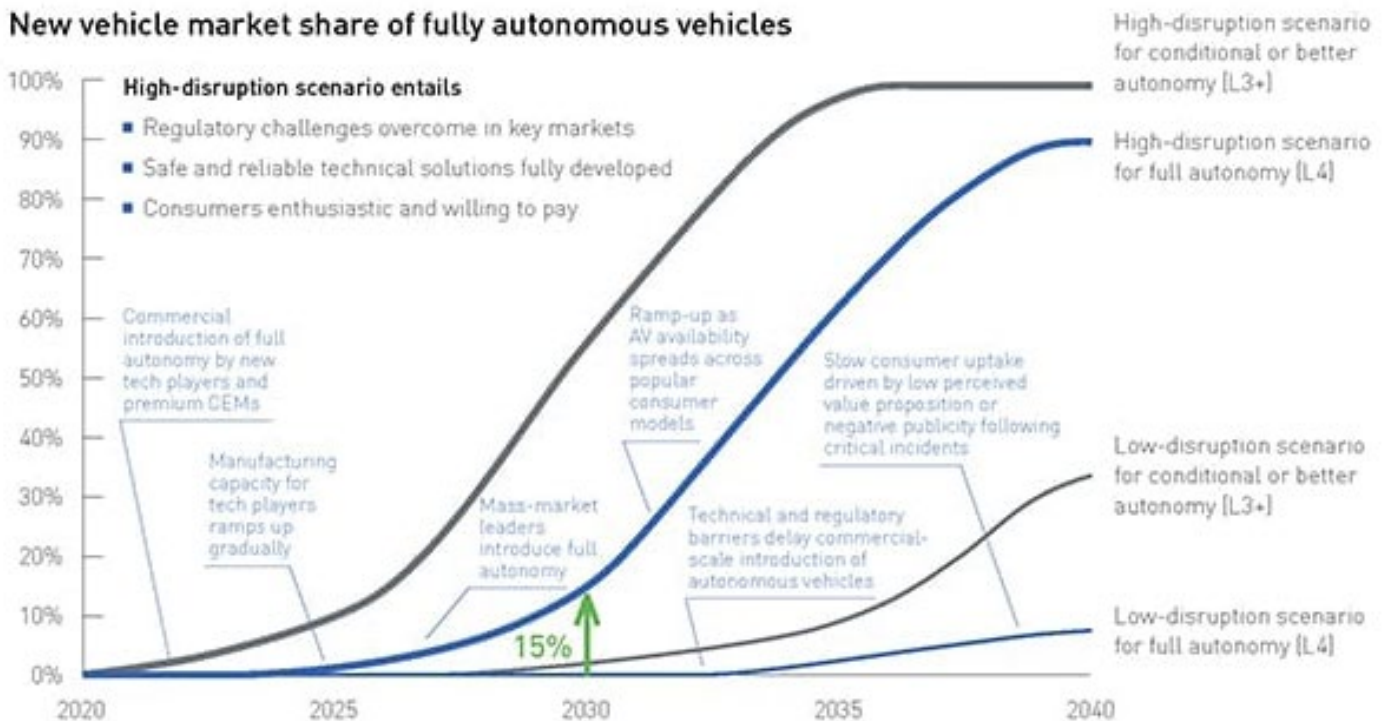
When owning an electric vehicle is cost-beneficial (as many predict could occur within the next decade), the gas tax will significantly decline. This would occur at the same time city revenue from parking might decline, while at the same time significant need exists for upgrading and then maintaining the city's infrastructure to be "smart" so that it can take advantage of all the potential benefits of AVs.

With the state of urbanization in the United States, it seems impossible for SAV rides to eliminate 90 percent of parking across an entire city, as projected

by some studies and seized on by those promoting designing new parking facilities to be converted to other uses in the future. The academic studies on which this figure is based look at trips (not parking) that stay within a specific area, as noted by Wenwen Zhang and others in their 2015 journal article "Exploring the Impact of Shared Autonomous Vehicles on Urban Parking Demand" (Sustainable Cities and Society). First, this is not all trips, but only those that stay within the defined area. Second, the studies found that parking is reduced less than the trips or vehicles, by a factor of about 90 percent, as Zhang and Subrajit Gubathakurta found in their 2017 journal article "Parking Spaces in the Age of Autonomous Vehicles" (Transportation Research Record). If, indeed, 90 percent of trips in any one area are TNC, then the reduction in parking is about 80 percent.

FIGURE 1 Projections of Autonomous Vehicle Sales in United States

Subject to progress on the technical, infrastructure, and regulatory challenges, up to 15% of all new vehicles sold in 2030 could be fully autonomous



Source: McKinsey.

“Transforming Personal Mobility,” a 2013 study of the potential vehicle ownership in the Ann Arbor, Michigan, metropolitan statistical area (MSA) found a much lower potential reduction in vehicle ownership, but only assumed individual TNC rides, not shared. That study found a potential reduction in cars on the road of 51 percent, with a reduction of 60 percent in privately owned vehicles. Using the 90 percent factor for parking, the reduction of parking across the MSA would be 54 percent. A 2018 study, “Driverless Future,” by Arcadis, HR&A Advisors, and Sam Schwartz Consulting, found that the reduction in parking will vary primarily according to residential density by area and overall. It found the following potential reductions in personal vehicle commuting trips in each of three MSAs: New York, 46 to 60 percent; Los Angeles, 36 to 44 percent; and Dallas, 21 to 31 percent.

And most important, will everyone even in dense urban areas choose shared rides? The proponents hope a significantly lower cost of SAV rides, compared with the cost of owning, operating, and parking a car, will cause the shift. A 2017 disruption scenario by the think tank RethinkX, offered in the study “Rethinking Transportation 2020–2030,” projects a 95 percent reduction in passenger miles traveled by 2030. A key assumption is that the cost of SAV rides will be 25 percent of that for owning a new car and half the cost of owning a paid-off vehicle. Further, RethinkX assumes that widespread TNC service occurs by 2021, resulting in the collapse of both new and used car sales by 2024 and the abandonment of existing vehicles.

Although the report concedes that rural residents will have little adoption of TNC rides, it did not seem to consider that 30 percent of VMT today is in rural areas. Further the RethinkX conclusion essentially requires not only the 53 percent suburban population, but also the 14 percent in urban clusters (towns of less than 50,000 population) to give up cars and use TNCs for all rides. Although rural population continues to slowly decline, 95 percent of passenger miles traveled by TNCs simply is not likely, particularly by 2030.

Assuming that people will give up cars and choose shared rides is, in itself, a huge leap. Studies of TNC use typically find two key motivators of TNC use: difficulty and/or cost of parking (which knocks out use for most local trips in suburbs) and avoiding drinking and driving. A 2017 survey of TNC riders at an airport—where parking costs for local residents are relatively high, as are alternative ground transportation costs for visitors to the region—found that 75 percent chose TNC rides for convenience and only 25 percent were motivated primarily by cost.

As Deloitte noted in the article “Tempering the Utopian Vision of the Mobility Revolution” in January 2019, “There are a few ‘immutable truths’ about consumer behavior: 1) Consumers are unwilling to compromise, 2) their usage patterns are difficult to change, and 3) they don’t like sharing.” A 2018 study for the California Department of Transportation, “The Future of Autonomous Vehicles,” concluded, “Most notably, we find private ownership of AVs will prevail after a transition period.”

It is still useful for developers of parking to understand the possible magnitude of a future reduction in parking and a timeline. A reasonable consensus among business consulting firms seems to be that AV sales will be 15 to 20 percent of the market by 2030. Most, however, only discuss the percentage of AV sales and/or the percentage of vehicle sales to TNCs, not vehicles on the road. Walker Consultants used 2016 “high disruption” and “low disruption” projections of vehicle sales from McKinsey & Company (as seen in figure 1), population growth projections by the U.S. Census Bureau, and U.S. vehicle scrappage rates from automotive consultant IHS to project the vehicles on the road, which is rarely discussed in the literature. McKinsey estimated that for each AV sold to TNCs, sales of private vehicles would decline by 2.3 vehicles.

A point worth noting: the projected sales of L4/L5 AVs are 90 percent of the market in 2040 for the McKinsey high disruption scenario and

only 10 percent for the low disruption scenario—an indication of all the hurdles that must be overcome for AV use to become common.

The vehicle sales calculations for the high scenario are represented in figure 2. The first thing gleaned from the sales figure is how many L0 to L3 vehicles will be sold in the United States (the gray area) before L4 and L5 vehicles are available, even with 15 percent of new vehicles being L4/L5 by 2030.

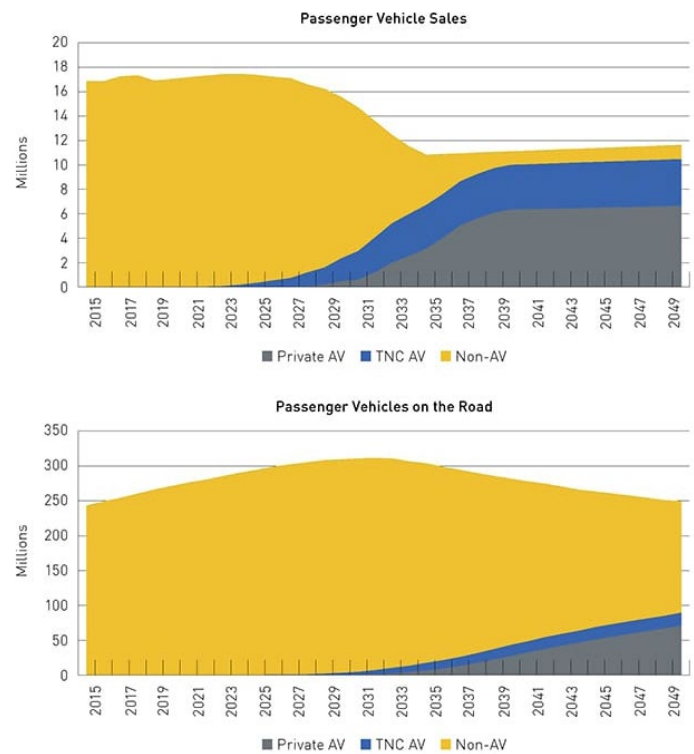
With an average age of over 11 years for privately owned vehicles and more than 20 percent still on the road at 20 years of age, it will take a long time to get non-AVs off the road, even at a high disruption scenario, as seen in the lower graph in figure 2. By 2030, 150 million L0 to L3 vehicles would be sold.

At full adoption, Walker’s calculations result in two-thirds of vehicles on the road being private and one-third TNCs. However, because of the miles driven per year by TNCs, 72 percent of miles would be accounted for by TNCs compared with 28 percent by private vehicles. Given that the final 2018 figures from the U.S. Department of Transportation indicate 30 percent of VMT was on rural roads, while accepting that rural population as a percentage of total population continues to decline, this is truly a reasonable high disruption scenario.

Walker then converted the vehicles on the road to high and low disruption scenarios for parking demand in the United States. The figure 3 projection for parking demand disruption without population growth would apply to the average U.S. building that has a fixed quantity of land use—that is, the average residential building or the average office building. The graph for parking demand with population growth would apply to places where activity grows with population, including downtowns, airports, universities, and the like.

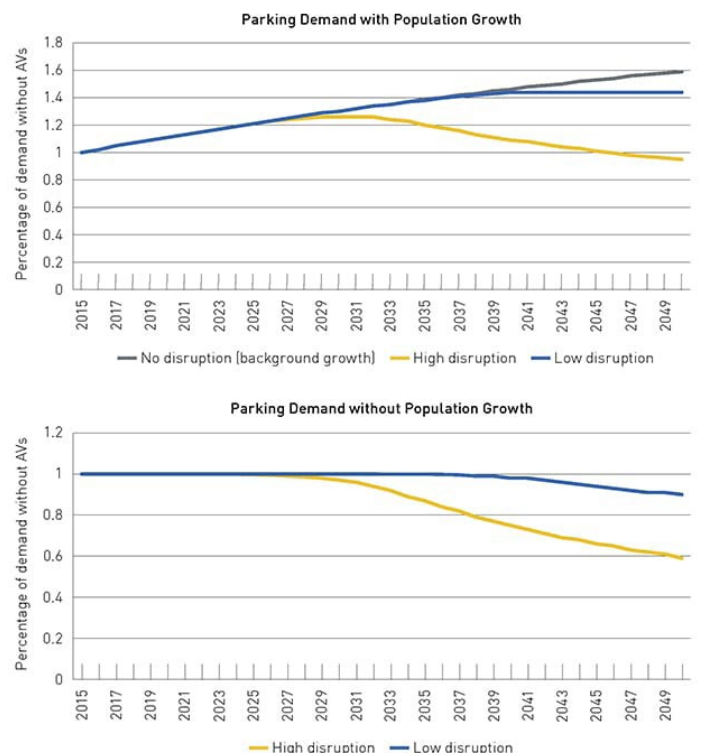
The graphs represent an average reduction in parking across the United States; given that 53 percent of

FIGURE 2 High-Scenario Vehicle Sales Projection and Vehicles on the Road



Source: Walker Consultants, “Parking in the Age of Uber and AVs,” January 29, 2018, Summary-White-Paper-1.pdf, <https://walkerconsultants.com/blog/2018/01/29/parking-age-uber-avs/>.
Note: AV = autonomous vehicle, TNC = transportation network company

FIGURE 3 Parking Demand Projections



Source: Walker Consultants’ conversion of vehicles on the road to parking demand, with and without population growth.

U.S. population is in the suburbs, it would tend to be applicable to many suburbs and the many cities without significant public (and particularly rail) transit in the United States. In such cases, parking demand would be projected to increase until about 2030 and then begin to decline, returning to roughly 2018 levels by 2050. Only then would the overall parking demand in the downtown of the average U.S. city begin to decline significantly.

Maximum Parking Reductions

Using the population by projected location of residency in 2018, one might conclude that the *maximum* reduction in vehicle ownership (and residential parking) and the *maximum* reduction in destination parking will be as follows:

- Dense urban areas** (7 percent of U.S. population): A high disruption scenario might indeed achieve a maximum of nearly 100 percent reduction in vehicle ownership and 90 percent reduction in destination parking by those residents who both live and work inside the center city limits (if SAVs are widely accepted to handle rides that are not convenient by transit). However, the parking by these residents is already reduced significantly by transit, walking, and biking. Figure 4 presents the car ownership in eight cities determined to qualify as dense urban areas. Significant variation still exists in the percentage carless, from 17 percent in Honolulu to 36 percent in Washington, D.C., and then a big jump to 55 percent in New York City. Further, some residents of these areas reverse commute to destinations outside the city limits. In addition, one must remember that less than one of five city trips are commute trips, according to the Federal Highway Administration. Take Boston as an example. According to the U.S. Census Bureau, it had an estimated population of 685,094 in 2017, with 4.84 million in the Greater Boston MSA. According to the 2017 American Community Survey, 34 percent of Boston (city) households are already carless. As of 2015, there

FIGURE 4 **Carless Households in Dense Urban Cities**

	Carless households	Total households	Percent carless
Honolulu	22,181	127,595	17%
Miami	32,788	161,605	20%
Chicago	280,942	1,042,579	27%
San Francisco	108,391	356,797	30%
Philadelphia	180,335	582,594	31%
Boston	90,119	259,324	35%
Washington, D.C.	100,65	276,546	36%
New York City	1,716,231	3,128,246	55%

Source: American Fact Finder 2013–2017 ACS 5-Year Estimates, Selected Housing Characteristics table for each city listed.

were 380,000 off-street parking spaces citywide (not counting on-street spaces and those in private residential driveways and garages), with about 77,800 spaces in the downtown, according to the 2016 study *Future of Parking* in Boston by Better City and Nelson\Nygaard Consulting Associates Inc. About 37 percent of residents who work in the city commute by auto, compared with 64 percent for those commuting into the city. A 2017 study by the Boston Transportation Department, “Go Boston 2030,” notes that about 42 percent of the morning peak-hour trips to destinations in Boston are by residents of Boston. Conversely, about 98,000 city residents (who generate about 37 percent of the morning peak-hour trips originating inside the city) commute to work outside the city limits during the morning peak hour, largely by car. At least some of those people will not give up cars, so the reduction of residential parking within the city limits will be somewhat less than

FIGURE 5 A Scenario for Reduction of Parking in Boston

	Auto trips 2010 ^a	Percent	Reduction	Future trips
Auto trips by residents in a.m. peak hour				
Residents of Boston trips within city	41,451	47%	90%	4,145
Residents of Boston trips outside city	47,665	53%	67%	15,889
Total resident trips in a.m. peak hour	89,117	100%	78%	20,034
Potential reduction of resident parking for a.m. peak-hour trips^b			70%	
Auto trips to Boston destinations needing parking, a.m. peak hour				
Trips into Boston	11,275	73%	67%	37,092
Trips within Boston	41,451	27%	90%	4,145
Total trips to Boston destinations in a.m. peak hour	152,726	100%	73%	41,237
Potential reduction of parking for a.m. peak-hour trips^c			66%	

Source: Wenwen Zhang and Subhrajit Gubhathatorta, "Parking Spaces in the Age of Shared Autonomous Vehicles: How Much Parking Will We Need and Where?," *Transportation Research Record: Journal of the Transportation Research Board* (January 1, 2017).

^aTrips per Go Boston 2030 Vision and Action Plan, https://www.boston.gov/sites/default/files/go_boston_2030_-_full_report_to_download.pdf. People who carpool adjusted by 2.19 persons per car, per ACS for commuting to work in city of Boston.

^b4.5 percent reduction in parking for each 5 percent reduction in trips.

90 percent. For the purposes of this discussion, a two-thirds reduction is assumed of vehicle trips by residents who reverse commute and by those who commute into Boston. Figure 5 summarizes a rough calculation of the reduction in morning peak-hour trips and a rough estimate of the potential reduction of parking demand for those vehicles in Boston. This is certainly not total parking but is a way of better understanding how the parking demand across even a dense urban city would decline somewhat less than 90 percent. For Boston, it is projected that parking at residences overall could decline 75 percent at a high disruption scenario, and parking for commuters and other trips that occur during the peak hour could decline 66 percent, which means parking for those users would be 34 percent of what it is today—significantly reduced, but not to 10 percent as estimated by many urbanists. A projection by the Boston Consulting Group in 2018 estimated that 30 percent of all trips within the city limits would ultimately be TNC, roughly half that of the peak-hour trip calculation in the figure.

- **Urban areas** (13 percent of U.S. population): These could achieve a maximum of perhaps 67 percent reduction of vehicle ownership and perhaps up to 60 percent reduction in destination parking overall in a high disruption scenario.

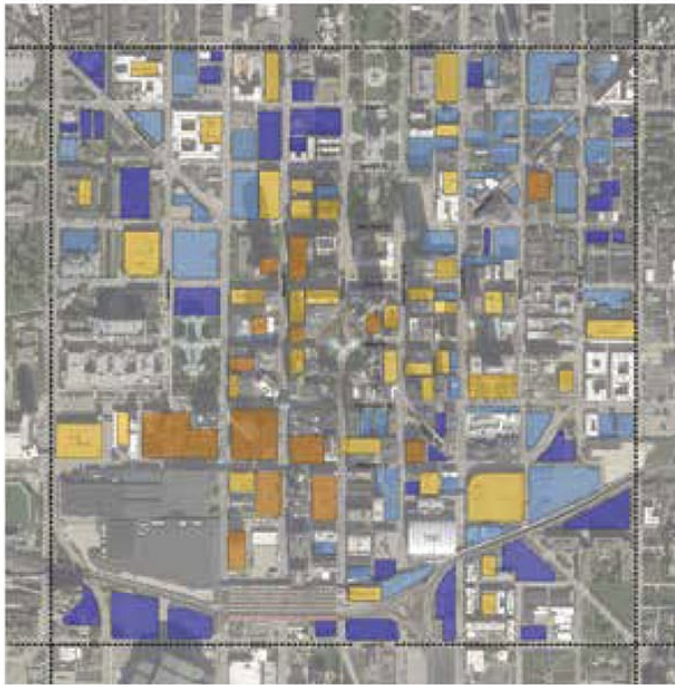
- **Suburbs** (53 percent of U.S. population): These could achieve an average reduction of 45 percent in car ownership (largely because families would be able to reduce the number of cars owned per household) and a 40 percent reduction in destination parking. A 2015 University of Michigan study, "Driverless Vehicles: Fewer Cars, More Miles"—which looked at the maximum reduction in U.S. vehicle ownership if one privately owned AV per household can make all trips—found a reduction of 2.1 vehicles per household today to 1.2 vehicles per household, a decline of 43 percent. Many of those in the study who could reduce car ownership by having a private AV handling all family trips are the same households that can reduce car ownership by using TNCs. In addition, note that paying for a more expensive AV is a lot easier if it eliminates the need for a second car as well.
- **Urban clusters and rural areas** (27 percent of U.S. population): Virtually all analysts agree there will be little or no use of TNCs, much less SAV rides, in what the Census Bureau defines as urban clusters and rural areas. Parking may be reduced slightly if one privately owned AV will be able to drop the rider and go on another trip or go back home until needed. However, given the distances driven in such areas and the fact that parking is likely free, almost all private AVs are more likely to be parked at destinations in these areas.

Absorption of AV Impacts over Time

The timeline developed by Walker, based on multiple sources, shows maximum impact of AVs not occurring until 2050 even in the high disruption scenario. The parking market in a downtown or a campus with multiple parking facilities will absorb the changes in demand over time.

New developments will be built on surface lots or redeveloped sites and will use existing

FIGURE 6 **Downtown Indianapolis
Parking Supply**



Legend

- Public Parking Lot
- Private Parking Lot
- Parking Garage Stand Alone
- Parking Garage w/other Structure

Source: Walker Consultants using Google Earth image.

parking spaces that are underused because of the decline in parking demand. Parking may migrate to the perimeter, allowing a denser core.

It also must be remembered that significant TNC vehicle staging, cleaning, and recharging (if vehicles are electric) will be required, particularly if rush-hour commuting and events are to be accommodated. In addition, the increasing use of food delivery may require parking resources at both ends of the trip; these may displace vehicle trips to the same venue and be shorter in parking duration, but still reflect automobile parking needs.

Thus, a continuing need for some existing parking resources is likely, including some in prime locations, to facilitate shorter and faster “empty” trips even if parking demand for private vehicles declines.

It is certainly possible that parking structures can be converted to other uses in the future. However, given that most areas requiring parking structures have a mix of existing surface lots and parking structures of varying ages and conditions, it is far more likely that the older facilities will be redeveloped before it makes sense to entirely convert a parking structure built in 2020. It could be decades before a new parking structure built by, say, 2020 would need to be converted. (Figure 6 shows the parking supply in downtown Indianapolis as an example.)

Further, any future tenancy will be constrained by the initial parking configuration.

Summary

Consider the following urban living trends:

- Urban living is holding its own but not growing as a percentage of total population.
- Suburbs and less dense cities are growing, and rural population is declining.
- Even in dense urban cities, most households are not yet carless.

One can hypothesize that as little as 20 percent of the U.S. population lives in truly dense urban neighborhoods where households could easily go carless because of SAVs, and then, likely—in fact, preferably—in combination with transit, walking, biking, and micro-mobility. Unless rides are shared, the cost of using TNCs will be about the same as that of owning a vehicle, according to most projections. Only shared rides would make TNC use cost-effective, and shared rides are simply not going to be practical for persons living in rural areas and urban clusters, nor for many living in suburbs.

Will all the remaining users in urban and dense urban areas choose shared rides? Not likely! That is not to say that ride hailing and autonomous vehicles will not have a significant effect. However, the idea

that 90 percent of parking demand in a metropolitan area, much less the United States overall, will disappear is simply not achievable because of demographics and population density alone.

Shared parking will remain a key component of sustainable development for the future; however, “just enough” parking today is more important than ever before.

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DEVELOPERS REDUCE PARKING VIA CAR SHARING

BY WILL MACHT
AUGUST 19, 2019

This article appeared in the 2019 Summer issue of *Urban Land* on page 64.

Incentivized by city parking policies, private developers provide fewer parking spaces or increase density in new projects.

Increasingly, cities are using parking policies to stimulate shared mobility through alternatives to personal ownership of automobiles. In the recent adoption of its 2040 plan that permits duplexes and triplexes in most single-family-detached zones, the city of Minneapolis commits to “lead by example in city-owned parking facilities by supporting carpools, vanpools, and shared mobility vehicles which encourage private parking facility owners to do the same.” Car sharing generally refers to a fleet of vehicles offered for short-term rental by private or nonprofit companies.

The city of Austin, Texas, amended its zoning code to reduce minimum off-street parking requirements by “twenty (20) spaces for every car-sharing vehicle provided in a program that complies with its requirements,” under which it approves binding contracts between developers and car-sharing



Lincoln Ventures’ 2204 San Antonio is an 18-story student housing project one block from the University of Texas at Austin. University neighborhoods are prime locations for car sharing because of their density, limited parking, and younger demographic groups who seek a less car-centric lifestyle. (Lincoln Ventures)

Property name	Number of units	Number of spaces	Parking ratio	Car2go spaces	Spaces reduced	Bedroom count	Ratio (park/BR)
Ruckus	46	37	0.80	1	20	167	0.22
Ruckus 2.0	67	84	1.25	2	40	239	0.35
2204 San Antonio	166	193	1.16	5	100	567	0.34
	279	314	1.13	8	160	973	0.32

companies to gain reductions of up to 40 percent of required off-street spaces. Nick Vetsch, a market specialist for car2go, a car-sharing service owned by Daimler AG, the Stuttgart, Germany-based automobile company, says that on just three Austin projects alone, Austin developer Lincoln Ventures reduced parking spaces by 160. He says that at about \$35,000 per structured parking space, that equates to about \$5.6 million.

And he notes that in about three years, the Austin program eliminated the need for about 1,100 parking spaces, saving developers over \$38.5 million. Lincoln Ventures' 2204 San Antonio is an 18-story student housing project located in a dense urban neighborhood one block from the University of Texas at Austin. Its two Ruckus projects are seven-story-tall student housing buildings about two blocks from that campus. Vetsch says that university neighborhoods are one of the prime locations for car sharing not only for their density and limited parking, but also for their younger demographic groups, who seek a less car-centric lifestyle. He says that sometimes several students gather together to use car2go for one-way trips to a common destination. Vetsch notes that cities like Austin do not have frequent transit service during nighttime when many students return from events.



Lincoln Ventures' two Ruckus projects are seven-story student housing buildings about two blocks from the University of Texas at Austin campus. (Lincoln Ventures)

One-Way versus Round-Trip Model Competitors

Zipcar, a competing car-sharing service now owned by its parent, Parsippany, New Jersey-based Avis Budget Group, the largest car-sharing service with 12,000 vehicles, is in more than 360 American cities in 42 states and has cars at over 600 universities in North America. Zipcar operates primarily a round-trip model under which the car must be returned to the location from which it was taken.

With 5,700 vehicles and 1.23 million members in North America, car2go operates a one-way-trip model that



In some cities, specific spaces are designated for car-share parking. (Yaletown Bia)



Most of the cities in which car2go operates now provide on-street parking within an agreed-upon home area that is free to the user, although not always free to the service company, which may pay for actual time used or a fixed fee per car in its fleet, or may have free use of on-street spaces designated for car-share use only. (Car2-go-ny)

enables a member to pick up the nearest car and park it anywhere within the home area of the city in which it is located. With rates that vary among cities, car2go has a \$5 membership application fee but no annual membership fee. In Austin, it charges \$0.47 per minute, \$19 per hour, or \$89 per day. Vetsch says that average trips are under 20 minutes and cost \$6 to \$8. Zipcar has a \$25 membership application fee and a \$7 monthly fee. A typical Zipcar charge is \$7 to \$10 per hour (one-hour minimum) and between \$60 and \$90 per day, depending on the car. Car2go rents Mercedes

Smart ForTwos, and Mercedes CLA and GLA sedans. Zipcar rents a variety of vehicles including Honda Civics and CRVs, Jeep Renegades, and some pickups.

Stimulus of Free Parking

Car-sharing services include gas, insurance, cleaning, maintenance, and parking. Parking pricing can be a significant motivator to use car-sharing services, especially where downtown parking is scarce or expensive, or both. Most of the cities in which car2go operates (Seattle, Portland, Vancouver, Calgary, Montreal, Minneapolis, Denver, Austin, San Diego, New York City, Chicago, and Washington, D.C.) now provide on-street parking within an agreed-upon home area that is free to the user, although not always to the service company, which may pay for actual time used or a fixed fee per car in its fleet, or may have free use of on-street spaces designated for car-share use only. Parking that is free to the user can be an important stimulus to use the service compared with parking rates in office buildings and apartments that can often exceed \$300 per month.

Most of the cities in which car2go operates now provide on-street parking within an agreed-upon home area that is free to the user, although not always free to the service company, which may pay for actual time used or a fixed fee per car in its fleet, or may have free use of on-street spaces designated for car-share use only. (Car2-go-ny)

In May 2018, New York City faced considerable opposition when it announced that it would be reserving 285 parking spaces for exclusive use by Zipcar and Enterprise CarShare during a two-year pilot program under which the companies pay a one-time \$765 licensing fee to participate, no fee for the on-street spaces, but monthly parking fees for use of the city's municipal lots for 55 of the cars. The city government justified its action on the basis that a single shared car serves approximately six to 10 users, lessens the reliance on individual cars, and reduces traffic congestion and greenhouse gases.



At the Grand Apartments in the Lower Downtown (LoDo) district of Denver, San Francisco-based Shorenstein Properties developed 508 units with 446 parking spaces (a 0.9 parking ratio) at 1777 Chestnut Place in two buildings—a 12-story brick-faced building and a 24-story glass building. They share a single car2go car and space. (Shorenstein Properties LLC)



At RiDE at RiNo (River North), the Denver-based McWhinney investment and development company developed 84 micro-studio units in a five-story building at 3609 Wynkoop Street with 42 parking spaces (24 of which are surface spaces), including four car2go spaces to ameliorate its lower 0.5 parking ratio. Proponents of car sharing say that a single shared car can serve six to 10 users, so the building's effective parking ratio could be closer to approximately 0.8 space per unit. (Christopher Carvell Architects PC)

However, opponents argue that whenever a shared car is in use, a parking spot reserved for its use remains empty, thereby reducing parking supply; and the more the shared car is used, the more it contributes to congestion and pollution. New York followed San Francisco's example a year earlier in which the San Francisco Municipal Transportation

Agency (SFMTA) approved a program to allocate 1,000 on-street parking spaces for exclusive use by car-sharing companies for rates between \$54 and \$156 per space per month. The move drew opposition similar to that seen in New York, but it also gained support, its staff said, from among the city's 140,000 car-share members.

Ride hailing refers to individually owned cars offered through a network for single trips (e.g., Uber and Lyft), while ride sharing refers to multiple passengers in such a car with similar trip destinations (e.g., Uber Pool). Car sharing requires parking spaces in congested locations. Ride hailing and ride sharing do not, but they generate more vehicle miles traveled (VMTs) since cars must travel to and from hailed rides.

City and State Incentives

In Denver, the zoning code allows parking space reductions of five required off-street spaces for each on-site car-sharing program space provided. In Portland, for every car-sharing parking space that is provided, the motor vehicle parking requirement is reduced by two spaces, up to a maximum of 25 percent of the required parking spaces. Denver also issues on-street parking permits to car-sharing companies for \$850 per vehicle, but users can park cars in those spaces free, without time limits. The states of Colorado, Minnesota, and Florida exempt car-sharing vehicles from the daily car rental fees charged for conventional car rentals, or they charge reduced fees. Arlington County, Virginia, provides reductions of up to 50 percent of minimum parking requirements for car-sharing agreements that are at least three years in duration.

In order to obtain parking reductions, developers must execute agreements with approved car-sharing companies acceptable to the city. Building owners must provide access to the agreed-upon number of spaces reserved for car-sharing vehicles outside any gate-restricted areas so



Denver-based Urban Villages Group developed the 74-unit, 10-story Vita Flats at 101 Grant Street in the South of Broadway (SoBe) district with 25 off-street surface parking spaces and an Enterprise CarShare rental. (Urban Villages Group)



In order to obtain parking reductions, developers must execute agreements with approved car-sharing companies acceptable to the city. Building owners must provide access to the agreed-upon number of spaces reserved for car-sharing vehicles outside any gate-restricted areas so that any member of the public who is a member of the service can access the cars. (car2go)

that any member of the public who is a member of the service can access the cars. (car2go)

Developers in and around downtown Denver have contracted to use car2go at varying numbers. At the Grand Apartments in the LoDo (Lower Downtown) district of Denver, San Francisco-based Shorenstein Properties developed 508 units with 446 parking

spaces (a 0.9 parking ratio) at 1777 Chestnut Place in two buildings—a 12-story brick-faced building and a 24-story glass building. They share a single car2go car and space. At RiDE at RiNo (River North), the Denver-based McWhinney investment and development company developed 84 micro-studio units in a five-story building at 3609 Wynkoop Street with 42 parking spaces (24 of which are surface spaces), including four car2go spaces to ameliorate its lower 0.5 parking ratio. Car-share proponents say that a single shared car can serve six to 10 users, so its effective parking ratio could be closer to approximately 0.8 space per unit. The Denver-based Urban Villages Group developed the 74-unit, 10-story Vita Flats at 101 Grant Street in the SoBo (South of Broadway) district with 25 off-street surface parking spaces (0.3 per unit), including an Enterprise CarShare rental. While these three projects collectively saved developers building 30 spaces under the code, they were apparently selected more for competitive reasons than to increase effective parking ratios.

To obtain parking reductions, developers must execute agreements with approved car-sharing companies acceptable to the city. Typical agreements must last for an extended period of years. The owner must provide access to the agreed-upon number of spaces reserved for car-sharing vehicles outside any gate-restricted areas so that any member of the public who is a member of the service can access the cars. The car-sharing company agrees to market the service to tenants, insure and maintain the cars, monitor use, and report to the owner and to the city.

Office Car-Share Uses

Milan-based Bizzi & Partners Development—the developer of the 112-unit, 30-story 565 Broome condominium tower, designed by Renzo Piano, in Manhattan’s SoHo neighborhood—offers 24-hour access to car2go/ReachNow’s BMW 3 Series electric vehicles on site for owners who prefer that option rather than paying \$550,000



Milan-based Buzzi & Partners Development—the developer of the 112-unit, 30-story 565 Broome condominium tower, designed by Renzo Piano, in Manhattan’s SoHo neighborhood—offers 24-hour access to car2go/ReachNow’s BMW 3 Series electric vehicles on site for owners who prefer that option rather than paying \$550,000 for one of 40 private parking spaces in its robotic parking garage. (Buzzi & Partners Development)

for one of 40 private parking spaces in its robotic parking garage. (Buzzi & Partners Development)

Most of the parking reductions under codes are not limited to a specific use. There could be significant advantages for office building developers to provide car-share parking spaces where transit is available. Office tenants would have an incentive to take transit to the office and avoid monthly parking fees if they know that a shared car is available to take to less accessible meetings and for personal use during the day when needed. Vetsch says that car2go provides discounted business account options for

companies willing to offer car sharing as part of their mobility program. A statute passed in the state of Washington offers Commute Trip Reduction (CTR) tax credits to employers of more than 100 people of up to \$60 per employee per year for those who use the employer-sponsored car sharing regularly.

Some office developers have purchased small electric vehicles for tenant use to enhance efficient use of existing parking resources. The Russell Development Company in Portland bought a three-wheeled electric vehicle for its 200 Market office building. The capital cost of such a small vehicle can be less than that of a structured parking space, and building owners could include the operating costs of the vehicle in pro-rata common-area charges.

Hotel Car-Share Uses

Hotel developers also may benefit from including car-share parking spaces to reduce total numbers of parking spaces, or to more efficiently use the expensive parking spaces they do develop. Air travelers may prefer avoiding round-trip car rentals in favor of a one-way car-share trip between airports and hotels that do not have frequent transit at their arrival or departure times. Where hotels charge for parking, car-share vehicles—which do not incur such parking charges—may be more attractive to hotel guests or to their business employers. Some hotel guests may prefer to use car-share vehicles on an as-needed basis in preference to round-trip car rentals, which do incur parking charges in hotel garages. Car2go has partnerships with park-and-fly companies at several airport parking areas, and Zipcar vehicles are at more than 50 airports.

Some luxury hotels have purchased their own cars and offer their use to guests. For example, the Peninsula Beverly Hills offers a silver Rolls-Royce and six Nissan Infiniti cars. The Four Seasons Resort and Residences Vail in Colorado offers a Mercedes SUV for guest use. The Balboa Bay Resort in Newport Beach, California, offers



New York City–based Tishman Speyer partnered with Audi on a pilot program called Audi at Home to provide, for \$12 to \$22 per hour, eight luxury cars parked near the valet area of the 42-story, 656-unit Lumina condominiums in San Francisco, located in the South of Market (SoMa) neighborhood at Main and Folsom streets near the waterfront. (Tishman Speyer)

a Maserati. Also in California, the Carmel Valley Ranch in Carmel and the Epiphany Hotel in Palo Alto offer BMW i8s. The St. Regis Hotel in New York City offers its house Bentley with driver.

Luxury Condominium Car Sharing

Increasingly, condo developers are using car sharing as an amenity and as a service. Some developers of expensive condominiums are choosing to provide their own cars for use by unit buyers. New York City–based Tishman Speyer partnered with Audi on a pilot program called Audi at Home to provide, for \$12 to \$22 per hour, eight luxury cars parked near the valet area of the 42-story, 656-unit Lumina condominiums in San Francisco, located in the the South of Market (SoMa) neighborhood at Main and Folsom streets near the waterfront. It gets about 100 rentals per month. The developer limits other parking to one car per unit and gives buyers a \$10,000 credit if unused.



Burnaby, British Columbia–based Bosa Development’s 41-story, 215-unit Pacific Gate tower in San Diego offers four Mercedes-Benz vehicles—two sedans and two SUVs—leased by the condominium association for residents’ use, at no direct cost to residents. A portion of association dues goes toward transportation services. (Bosa Development)

Burnaby, British Columbia–based Bosa Development’s 41-story, 215-unit Pacific Gate tower in San Diego offers four Mercedes-Benz vehicles—two sedans and two SUVs—leased by the condo association for residents’ use, at no direct cost to residents, but a portion of association dues goes toward transportation services.

Developed by the New York City–based Albanese Organization, the 293-unit Solaire in Battery Park City in Lower Manhattan offers several BMW sedans through BMW’s subsidiary ReachNow. ReachNow and car2go are in the process of integrating

after a merger closed in January 2019. In a 293-unit building with only 55 parking spaces, that program allowed one resident to give up her car and save the \$700 per month she paid to park it.

Milan-based Bizzi & Partners Development—the developer of the 112-unit, 30-story 565 Broome condominium tower, designed by Renzo Piano, in Manhattan's SoHo (South of Houston Street) neighborhood—offers 24-hour access to car2go/ReachNow's BMW 3 Series electric vehicles on site for owners who prefer that option rather than paying \$550,000 for one of 40 private parking spaces in its robotic parking garage.

New York City developer JK Equities is developing 1000M, a Helmut Jahn–designed 323-unit, 74-story condominium tower at 1000 South Michigan Avenue in Chicago that will provide a luxury SUV and a driver to transport residents to places within a three-mile (5 km) radius.

Developers Use Car Sharing to Support Density

Because structured parking can cost more than \$40,000 per space, and because developers generally do not make money on building or selling parking spaces, but rather on the uses they support, careful developers want to build the fewest spaces possible and maximize their use. The lower the effective parking ratio, the more units that can

be supported by that parking. Over 18 years ago in a project called Gaia in Berkeley, California, developer Panoramic Interests' Patrick Kennedy provided two cars on triple-stacked mechanical park-lifts available for all tenants as an in-house car-sharing service in the 91-unit building. Kennedy noted, "If three private cars can be replaced by one shared car, and that one shared car is stored on a triple-stacked lift using the space equivalent to one-third that of the surface-parked car, then the space typically dedicated to one private car can be used to provide auto transport for nine households." (See William P. Macht, "Pioneering Park Lifts," *Urban Land*, February 2001, pages 30–31.)

With increased acceptance of car sharing nowadays, the multiplier may have doubled. That kind of efficiency can enable developers to add an additional floor of units, which is far more profitable than building parking spaces. And, they can increase density in urban and urbanizing areas. The next level of efficiency can come as developers of mixed-use projects, with different peak parking demands, encourage cities, lenders, and tenants to stimulate car sharing combined with shared parking.

WILLIAM P. MACHT is a professor of urban planning and development at the Center for Real Estate at Portland State University in Oregon and a development consultant.

TOWARD ZERO PARKING: CHALLENGING CONVENTIONAL WISDOM FOR MULTIFAMILY

BY DAVID BAKER AND BRAD LEIBIN
JULY 2, 2018



The 69 condos in 388 Fulton (left center) in San Francisco's Hayes Valley sold easily in 2017 without any structured parking being provided. (Bruce Damonte)

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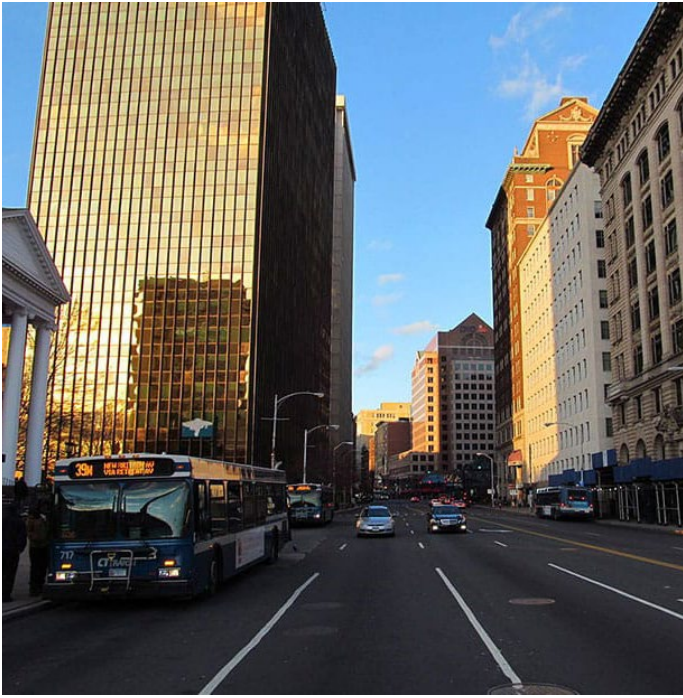
The rising popularity of human-powered transportation, walking and bicycling, and widespread availability of ride-hailing services like Lyft and Uber plus car-sharing services like Zipcar and Getaround, and the introduction of same-day delivery services have all reduced the need for individuals to own—and park—cars.

At the same time, costs of construction are at historic highs in dense urban areas, creating a challenge for developers to meet housing demand. Individual unit sizes are shrinking in response,

allowing greater density. However, with smaller units, the number of parking spaces goes up, too, if traditional parking ratios hold. High construction expenses result in a very high per-space cost for parking spaces, especially for structured parking, which can run \$50,000 or more for a single space.

In response to these factors, municipalities are changing the way they handle parking. Cities around the United States are eliminating minimum parking requirements for new developments.

Last year, officials in Buffalo, New York, removed parking minimums citywide for commercial and residential projects of less than 5,000 square feet



In 2017, Hartford, Connecticut, scrapped parking minimums across the city for commercial and residential developments, regardless of size. (John Phelan/Wikimedia Commons)

(465 sq m). Also last year, Hartford, Connecticut, scratched parking minimums across the city for commercial and residential developments, regardless of size. Many other municipalities have removed parking minimums for at least one part of the city or have lowered or removed minimums for certain uses. San Francisco has gone a step further, establishing parking maximums for downtown and nearby areas well served by public transit, capping the amount of parking that developers are allowed to build for multifamily housing.

Nevertheless, even multifamily housing developers who support creating walkable neighborhoods and prioritizing alternative forms of transit still think they need to follow traditional parking ratios or the units will not rent or sell. What follows are common concerns we have heard in our architecture practice, as well as the experiences and counterarguments we have come across that make us optimistic about reaching a future in which parking plays a much-diminished role in the urban environment.

1. Will planning commissions embrace attempts to reduce or eliminate parking?

About 20 years ago, a development proposal came before the San Francisco Planning Commission: a new restaurant with two residential units above and no parking spaces for the residents. Even though the project was small, dozens of neighbors showed up at the commission hearing to share their fears about the loss of street parking. The commission chairman responded by saying, “I moved from Manhattan to San Francisco so I could park.” The commission voted down the no-parking proposal. Back then, the primary concerns of neighbors of proposed projects were increased traffic and competition for street parking.

In the intervening years, as voter attitudes toward automobiles have changed, the San Francisco Planning Commission has reversed its approach.

In 2005, the commission established caps specifically addressing the amount of parking developers can build for multifamily housing downtown and nearby areas well served by public transit. The commission encourages projects with active uses on ground floors, and not requiring parking makes this easier by freeing space for commercial or residential use and obviating the need for a wide parking garage door on the street. Limiting driving also reduces infrastructural maintenance costs. Last year, San Francisco’s Transportation Demand Management Ordinance acknowledged that parking generates auto traffic (rather than the converse—that traffic is mainly caused by cars circling in the hunt for scarce parking, which is often the pro-parking argument).

2. What about irate neighbors?

Although some community groups still push developers to add parking, many neighborhood associations are now recognizing that car ownership is dropping. We recently designed a project in central San Francisco, the Brady Block, which will have about 600 new units of housing, a new office building, and



In place of parking in San Francisco, Curran House's ground floor includes community spaces, a peaceful courtyard, office space for the building developer, and additional affordable family-sized units. (Brian Rose)

new public realm and streetscape improvements on Market Street. The parking ratio is about 0.5 spaces per apartment. The local neighborhood group, the Hayes Valley Neighborhood Association, would have preferred that the ratio be 0:1, and, in fact, we were concerned members would come to the Planning Commission hearing to demand less than the 0.5 ratio. In the past, we would face local resident groups who would oppose projects for the opposite reason.

Urban advocacy groups have played a key role in changing public opinion. Locally, these include SPUR (San Francisco Bay Area Planning and Urban Research Association), Livable City, the San Francisco Bicycle Coalition, TransForm, and the San Francisco Housing Action Coalition, among others. They have been highly active in encouraging reliance on—and infrastructure support for—walking, bicycling, and transit, and they endorse developments that deemphasize reliance on the automobile.

3. Even if residents say they drive less, don't they really want to own a car?

We have not found this to be the case.

An example is one of our recently completed projects, Potrero 1010, a 453-unit mixed-use, mixed-income development in San Francisco's Potrero neighborhood. Developed by Chicago-based Equity Residential, Potrero 1010 has 0.65 parking spaces per unit, which was the city's allowed parking maximum, and the parking spaces are not bundled with the units but available for rent separately.

About half of the parking spaces are rented, while the others remain empty, indicating that the development could have succeeded with half the parking. The building promotes walkability and alternative forms of transit: it has extensive bike storage with bike repair stands, and it is organized around a new city-owned one-acre (0.4 ha) park accessible to the public via a midblock passage lined with active uses.

4. Renters may be willing to forgo cars, but what about condominium buyers?

We designed a no-parking condo building, 388 Fulton, in Hayes Valley, San Francisco, for local developer 7x7 Development, with 69 studio and two-bedroom market-rate units. Even with zero parking, the units sold out easily in 2016 and early 2017.

5. Don't residents prefer the security of driving in their own cars?

At 388 Fulton, most of the 35 325-square-foot (30 sq m) micro-unit studios were purchased by single women in their 20s and 30s. This challenges the idea that car ownership is perceived as safer even though parking garages are high-crime areas. With the ubiquity of ride-hailing services, residents can walk out their front door, hop in a vehicle, and get dropped off at their destination rather than risk having



The Brady Block, in design in San Francisco, will have 600 new units of housing, a new office building, a new public realm, and streetscape improvements on Market Street—plus a 0.5:1 parking ratio. (David Baker Architects)

to drive themselves, park several blocks from their destination, and walk the remaining distance, or walk through a parking garage getting to and from a car.

6. How can affordable-housing developers and operators help residents travel to jobs and schools without providing parking?

“While our priority is to provide housing, we do not want simply to pass the cost of parking on to our residents,” says Jerry Jai, senior project manager at East Bay Asian Local Development Corporation (EBALDC), an Oakland-based nonprofit provider of affordable housing. “If we don’t offer parking, does that limit job opportunities? What about costs due to towing, break-ins, and parking tickets?”

Jai notes that car ownership is not just about quality of life; it can also help parents transport their kids to school. “We don’t want to be in a patronizing position where we say to residents, ‘You should be able to get by without parking.’” However, Jai points to new sources of funding like California’s Affordable Housing and Sustainable Communities Program (AHSC) as a promising opportunity. “Sources like AHSC are exciting because they encourage affordable-housing developers to build in transit-rich areas and to increase transportation connections—bus, light rail, etc.”

Not paying to build parking can also free up money to provide other supportive resources to residents in need. In San Francisco’s Tenderloin neighborhood, Curran House, completed in 2005, has 67 affordable family apartments and no parking spaces. Most of the low-income residents cannot afford a car, and the central site has excellent public transit connections. Providing parking would have added several million dollars to the construction cost.

By not spending money—or dedicating space—for structured parking, the nonprofit housing developer, Tenderloin Neighborhood Development Corporation (TNDC), was able to provide additional units, a courtyard, space for supportive services, neighborhood-serving retail space, and office space for itself.

Our firm is working on another project with TNDC, 222 Taylor Street, just a block from Curran House on the site of a former parking lot. The design includes 113 affordable family apartments and no parking, reserving the ground level for a much-needed community grocery.

Now that Congress’s overhaul of the federal tax code has lowered the tax rate for corporations and federal affordable housing tax credit programs have less value to corporations, developers of affordable housing will be even more strapped for funds, and eliminating parking will become even more essential as a strategy for meeting housing demand.

7. Will lenders be willing to finance low- and no-parking developments?

Developers who plan to build multifamily housing and then sell it have to convince equity investors and loan committees to accept lower parking ratios. The investment community is often reluctant to embrace lower amounts of parking, fearing that renters and especially buyers will be turned off, particularly in places outside highly dense urban areas like San Francisco.

However, this is changing, says Will Goodman, vice president of San Francisco–based Strada Investment Group. “There is an evolution happening with the investment community to accept no parking or low parking,” he says. “We are seeing parking utilization rates go down in new buildings and technologies like ride share expanding. So, investors are increasingly buying into the story that most people don’t need parking day to day, especially if they are in an area that is near to transit and where traffic is bad. In these locations, people are typically not driving to work. They may want a car for weekend excursions, but it does not need to be on site.”

Particularly in super-hot markets like San Francisco, there are many precedents that investors can look at to understand that renters are willing to forgo on-site parking. But even in slightly cooler markets like downtown Oakland, Goodman says he is finding that investors are willing to take the risk.

Strada is about to break ground on a new luxury high-rise rental development in downtown Oakland, where there has not been a luxury high-rise completed since 2009. “All the comps are based on 2009 or pre-2009 parking-to-dwelling-unit ratios, which are 1:1,”



In San Francisco's Tenderloin neighborhood, 222 Taylor (left) is replacing a little-used parking lot with 113 homes for low-income residents and a neighborhood-serving grocery store. (David Baker Architects)

Goodman says. “There were some members of the investment community who were not comfortable with not providing parking. We were ultimately able to find the right investors who saw the project as representing the future of Oakland development. They understood that this is a project in an extremely transit-rich part of the city. Additionally, there are a number of garages nearby so that our residents could have a secure parking space off site.”

The simplest solution is for municipalities to put parking maximums in place for transit-rich areas, as San Francisco has done. These maximums change the culture, providing successful examples of developments with limited parking, which consequently makes it much easier for developers to persuade investors to get behind low- and no-parking developments.

Even in more car-oriented markets, some developers are seeing an opening for reducing parking. In Minneapolis, we are working with local developer Lander Group on a mixed-use residential project on a 1.5-acre (0.6 ha) site in the Lyn Lake neighborhood. It is in the conceptual design phase, and the developer aims to balance density and parking requirements with a desire to create a vibrant streetscape and public realm.

“The larger projects with institutional investors are going to be very cautious about reducing parking ratios,” says Michael Lander, founder and president of Lander Group. “But lenders are starting to understand that in some of the denser, more transit-rich markets there is not as much need for parking. And they know the enormous cost of parking. So there is beginning to be a changing of the status quo.”

8. Millennials may be forgoing car ownership, but are baby boomers still attached to owning their own cars?

Even many baby boomers are beginning to question the need for cars and parking, Lander says. “The

baby boomer generation in the Midwest is often still saying the same thing when it comes to proposed new developments: 'not enough parking, too much traffic.' It is a relearning process for baby boomers," says Lander. "When empty-nesters move downtown, they often bring two cars. But once they try the alternatives, like ride share, many of them reconsider the practicality of owning more than one vehicle."

9. Does this idea have traction beyond San Francisco?

Last year, San Francisco developer Panoramic Interests proposed building 1,031 market-rate apartments near the West Oakland station on the Bay Area Rapid Transit (BART) system and providing no parking for residents. The project is going through the approval process. Also in Oakland, EBALDC is looking for creative ways for projects to make economic sense despite rapid construction-cost escalation. One of these ways is reducing or eliminating parking. "The elimination of parking in one of our recent projects resulted in major savings, which made the difference between a feasible project versus one that was not," says Jai.

Even outside coastal markets, possibilities exist to minimize parking. "Midwestern cities like Minneapolis are different from denser, more transit-rich cities," Lander says. "There is more need for a car. So, I think there will still be a lot of auto mobility in the future, but

many more alternatives to private ownership like Uber and car-sharing services. This will significantly reduce the need for parking."

10. Is the preference for not owning a car just a short-term trend?

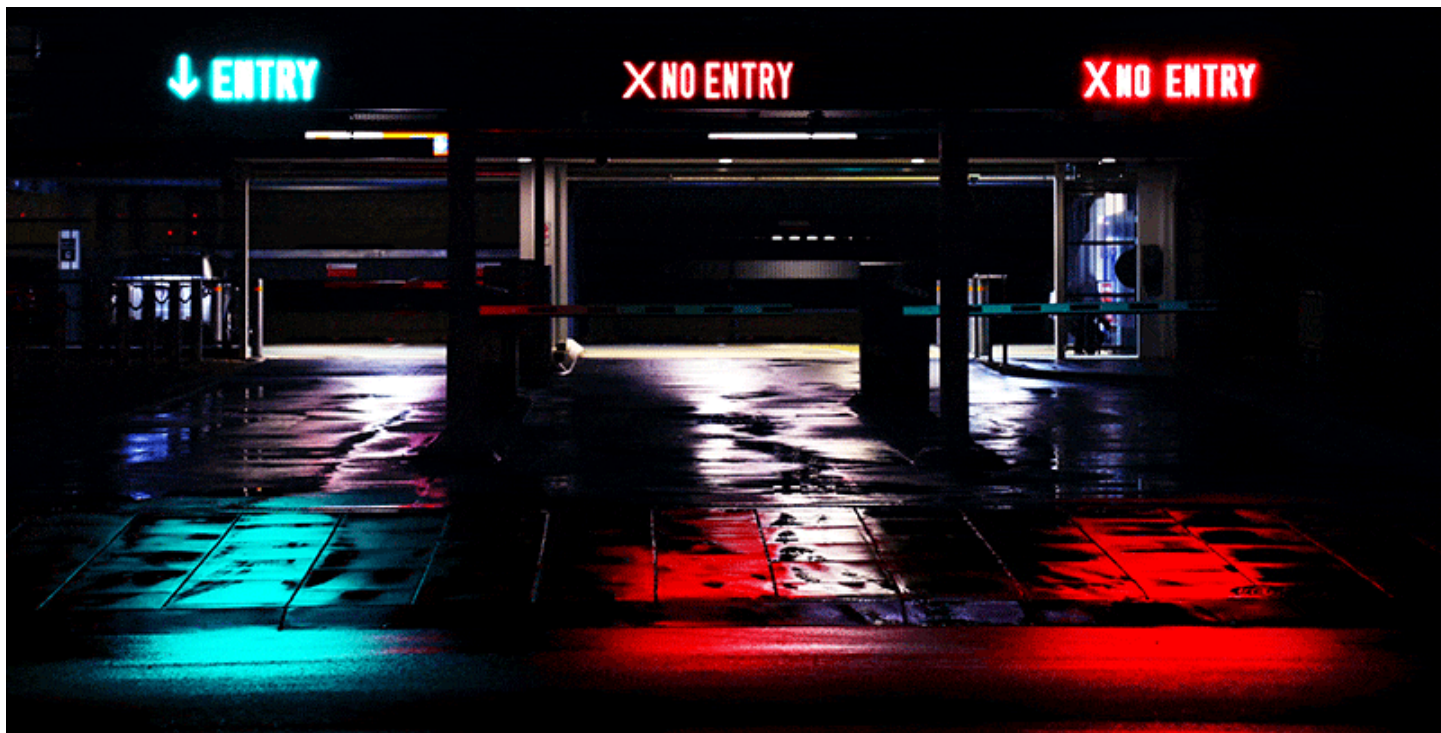
A future not dominated by privately owned cars may be a long way off, but increasingly the use of a car is becoming detached from the need for parking. In urban areas, driverless taxis are likely to hit the streets much sooner than anticipated. Waymo, Google's self-driving car project, has teamed with Fiat Chrysler Automobiles to announce plans to start offering driverless ride-hailing service in Phoenix by the end of this year. General Motors plans to launch a fleet of driverless taxis in multiple cities in 2019. At the same time, municipalities that once focused on providing ample street parking are now prioritizing bus stops, loading zones, bicycle lanes, and ride-hailing stops.

The days when multifamily housing developers must provide individual parking spaces are numbered. "Who knows? Perhaps in 20 years, no one will be having this debate because of autonomous vehicles, ride sharing, and improvements in public transportation," says Jai. "We need to remember that we are building housing that is supposed to last 50 years."

DAVID BAKER is a principal and **BRAD LEIBIN** is an associate at David Baker Architects in San Francisco.

CALCULATING THE COST OF EXCESS PARKING IN TRANSIT-ORIENTED DEVELOPMENTS

BY BETH MATTSON-TEIG
FEBRUARY 14, 2017



(Mike Wilson/Unsplash)

New research shows that transit-oriented developments (TODs) may be saddled with a surplus of parking that is taking a big bite out of project costs.

TODs have become a key economic development strategy for both urban and suburban communities that are trying to promote dense, walkable communities and reduce vehicle trip traffic. It may seem contrary to that goal, but developers still need to account for the parking needs of people who live, work, and shop in those mixed-use projects.

A new TOD parking study suggests that developers and planners need to rethink the formulas they are using to calculate parking, especially as it relates to more urban projects. The report, *Empty Spaces*, which was released by Smart Growth America in

partnership with the University of Utah's College of Architecture and Planning, found that even some of the top TOD projects in the United States had built too much parking. The study focuses on five case studies to illustrate parking supply and demand, as well as highlight some strategies solutions that TODs can use to reduce parking.

Plenty of compelling reasons explain why "rightsizing" parking stalls at TODs is a high priority for developers. Structured parking is expensive to build and is not the highest and best use for premium land next to transit stations. The per-stall cost on structured parking can range from \$19,000 to \$75,000 on the very high end in dense urban areas.



Tour: Transit + Housing Innovation = Remaking Neighborhoods | More on ULI Spring Meeting 2017

“Too much can render projects unviable financially and clearly can impact the affordability of whatever you have built,” says Chris Zimmerman, vice president for economic development at Smart Growth America. At the same time, parking also can be a critical factor in a project’s success, and too little parking can detract from the attractiveness and value of a project. “If we can make an adjustment on [parking], we might see a significant increase in the supply and perhaps also the affordability of transit-oriented development, which is why this new research is so exciting,” he says.

Rethinking Outdated Assumptions

Developers often rely on industry manuals such as the Institute of Transportation Engineers (ITE) *Trip Generational Manual* and the *ITE Parking Generation Manual* for guidance on parking. However, those data come from suburban locations that often have little pedestrian traffic. The *Empty Spaces* study provides quantitative support for the notion

TABLE 1
Estimated vehicle trips versus actual vehicle trips

TOD	ITE vehicle trip estimates	Actual vehicle trips	Actual trips as percentage of ITE estimates
Englewood, CO	13,544	9,460	69.8%
Wilshire/Vermont	5,180	2,228	43.0%
Fruitvale Village	5,899	3,056	51.8%
Redmond, WA	1,767	661	37.4%
Rhode Island Row	5,808	2,017	34.7%

(Transportation for America/Smart Growth America)

that parking that is required for urban TODs is substantially less than has previously been thought.

Specifically, the *Empty Spaces* report studied five specific mixed-use TOD projects that included the following:

- The Englewood, Colorado, TOD is an open-air, mixed-use development that replaced a former regional mall.
- The Wilshire/Vermont TOD in the Koreatown area of Los Angeles is situated in a very dense population and at a busy transit corner.
- Oakland, California’s Fruitvale Transit Village features a pedestrian plaza lined by retail businesses that is adjacent to a Bay Area Rapid Transit station.
- The Redmond, Washington, TOD in the Seattle region is a former park-and-ride lot and bus transfer facility that is now home to a mixed-use, multistory apartment and retail development.
- Rhode Island Row in Washington, D.C., is located on the site of a former surface parking lot for the Rhode Island Avenue Metro station.

In all five TODs studied, peak parking occupancy as a percentage of ITE parking supply guidelines was less than 50 percent. Englewood, which was the largest and most auto-oriented TOD, had the highest use percentage, with peak demand coming in at 46 percent of the recommended ITE amount. “In these developments, even though they are supplying a lot less parking than ITE suggests, they are not

using all of it,” says Reid Ewing, chief author of the report and a professor in the Department of City & Metropolitan Planning at the University of Utah. Fruitvale Village used the highest percentage of its available supply at 84 percent, while Englewood had the biggest surplus, with peak parking occupancy at 58.3 percent as a percentage of its supply.

TABLE 2
Peak parking occupancy as percentage of supply and ITE guidelines²

TOD	Peak parking occupancy as percentage of supply	Peak parking occupancy as percentage of ITE guidelines
Englewood, CO ³	58.3%	45.8%
Fruitvale Village	84.0%	19.0%
Redmond, WA	73.5%	41.6%
Rhode Island Row	63.6%	32.7%
Wilshire/Vermont	66.8%	33.0%

See footnotes below. (*Transportation for America/Smart Growth America*)

Lessons Learned

The research findings speak to the point that TOD developers can realize substantial savings and generate more value by better managing parking supply with demand. So why do these TODs use less parking than originally thought? One, there is more pedestrian traffic and more shared vehicle trips. In addition, TODs that charged parking fees, such as a pay lot for people who come to shop or an added monthly parking fee for apartment renters, ended up depressing the demand.

In addition, there is room for improvement even in those TODs studied. Only one of the five TODs—Englewood—had shared parking between the park-and-ride transit users and the TOD residents and shoppers. So, increasing shared parking is one opportunity to reduce parking supply as demand for different uses peaks at different times of the day, says Ewing. Another takeaway from the research is that developers need to work closely with the local jurisdictions that set codes and zoning dictating parking requirements. For example, the Redmond TOD worked proactively with the city of Redmond to set a new precedent for lower parking requirements in the region.

The additional research is helping both developers and city planners rethink parking requirements as the way that people use transit, vehicles, and other transportation alternatives is shifting. The TOD Group is currently working as the master developer on the Clear Creek Transit Village, a 21-acre (8.5 ha) TOD project in suburban Denver next to the Federal Boulevard train station for the metro’s Gold Line rail corridor.

“On the one hand, we want to create an environment that encourages people who want to live near transit to be able to move there without a car,” says John L. Renne, managing director at the TOD Group and director of the Center for Urban and Environmental Solutions (CUES) and associate professor in the School of Urban and Regional Planning at Florida Atlantic University in Boca Raton, Florida. “By the same token, we know that people are going to need to have access to a car for many of their trips,” says Renne.

The TOD Group is evaluating research data and best practices on different parking scenarios to create a maximum parking ratio for the project. In addition, the company developed a transportation management plan that provides guidance on how the company can create incentives to reduce parking use. For example, the project runs adjacent to a local bike path, and bicycle parking will be required on every block. As the project moves closer to the development phase, the developer also plans to contact organizations to have car sharing and bike sharing on site.

As part of its development agreement with the jurisdiction—in this case, Adams County—the TOD Group agreed to review parking at each phase of the project to evaluate how parking is being used to allow for flexibility to increase or decrease parking based on actual use. “One of the key costs of construction for any TOD is parking,” says Renne. “Building structured or

underground parking is very, very expensive. So, if you can reduce the amount of parking that you need to build, you can create other benefits, such as more housing affordability,” he says.

² Measures are aggregate.

³ The Denver region’s Englewood station remains the one exception or outlier in these findings. In an

effort to generate tax revenue from big-box retailers, the city of Englewood decided to build a “hybrid-TOD” that divides the development into zones of TOD and of big-box retail. The resulting parking supply and vehicular trip generation exceed the other TODs in this study. Even so, the study found the peak demand for parking at the hybrid-TOD still to be much lower than suggested in ITE’s guidelines.

FLEXIBLE PARKING STRUCTURES AS CIVIC CATALYSTS

BY WILL MACHT
NOVEMBER 24, 2014

A design challenge inspires a proposal for flexible parking structures that can house a range of uses—and spur mixed-use, transit-oriented development.

For urban planners who consider the automobile the major cause of the deterioration of cities, loss of community spaces, elimination of mixed uses, and decimation of urban street life, it may seem a contradiction to propose construction of parking structures as the cure. Yet that is precisely the intent and result of a proposal submitted in a design challenge sponsored by a nonprofit entity, supported by a regional foundation, and entered by leading architects and urban planners.

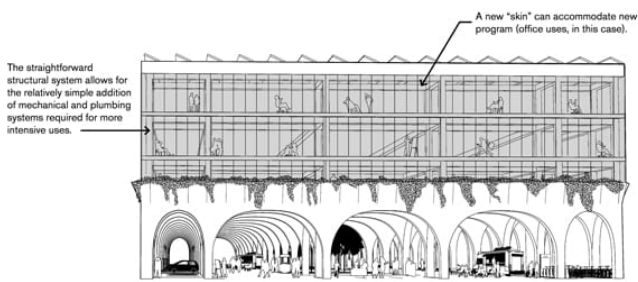
In suburban downtowns, where sufficient parking is still critical to operational viability, land prices and parking rates typically have not risen to levels that support the cost of structured parking. As a result, vast quantities of land are committed to surface parking in patterns that work against adequate numbers and concentration of the shops, restaurants, theaters, and cafés that draw enough patrons to activate those downtowns. Redevelopment



The flexible parking structure is located next to a colonnade under the adjacent Long Island Rail Road (LIRR) commuter rail line, which would be turned into a pedestrian spine through the heart of Rockville Centre’s downtown. The structure has 20-foot-tall (6 m) ceilings at grade to act as a covered plaza during off-peak parking hours in the evening and on weekends, when public markets and festivals can also spill out onto a contiguous open plaza. (Utile Inc.)

potential could be substantial. For example, more than 4,000 acres (1,600 ha) in and around Long Island’s downtowns are dedicated to parking.

In addition to being expensive, structured parking facilities are generally single-purpose, stand-alone structures that sit empty during evenings



The narrower two-bay prototype is also well-dimensioned for a future 120-foot-wide (37 m) office building. A new glass skin, accessible cores, and mechanical, plumbing, and electrical chases can be added to a flexible structure. (Utile Inc.)

and weekends and are filled only sporadically. In suburban downtowns near commuter rail lines or new light-rail extensions, weekday demand for park-and-ride facilities can overwhelm the parking supply, displacing the shorter-term parking needed to revitalize those downtowns. Yet most such expensive parking facilities lie fallow during evenings and weekends.

Facing this chicken-and-egg conundrum, the Long Island Index, a nonprofit organization funded by the Rauch Foundation—a Garden City, Long Island, family foundation intended to spark and sustain regional systemic change—organized a design challenge. The



Utile Design proposed 20-foot-high (6 m) ceilings on the floor at grade so that when the structure is mostly vacant, it could be used for a variety of civic uses, such as public markets, food carts, and festivals. In future years, at-grade parking might be limited and the perimeter bays used for more permanent shops and restaurants, with adequate parking provided on upper floors.

goal was to demonstrate how a suburban downtown setting can be transformed by such structures—when they are exceptionally well designed and feature innovative architectural, technical, operational, and financing strategies as part of a broader approach to managing downtown parking and mobility.

In response, architects and urban planners Tim Love, founding principal, and designer Elizabeth Christoforetti at Utile, a Boston-based architecture and urban design firm, developed a solution, dubbed “Civic Arches,” based on two principles.

First, parking structures need to be used for longer periods of the day and for different purposes, both public and private. With single-purpose parking—designated for support of office, retail, hotel, housing, or entertainment facilities alone—patterns of use are highly variable depending on the time of day, the day of the week, or the season. Such inefficiencies drive up the cost of building and maintaining parking structures.

Second, parking structures need to be designed as flexible structures that can accommodate transitions from parking alone to a variety of other uses as parking ratios decline with further mixed-use development and increased use of shared parking facilities and transit. Future functions for these properties should include civic, office, retail, hotel, housing, and entertainment uses. Cities evolve over time, and the functions of structures can change if they are designed for flexibility.

“The early 20th-century loft building was our model for how to design a flexible building that could be repurposed over time,” Love said of earlier prototypes that influenced Utile’s thinking. “Examples include the cast-iron loft buildings in Soho and the brick warehouses that the Boston Wharf Company built in the Fort Point District in Boston in the early 20th century. In most American cities, this type of building has been especially adaptable to residential and office conversion

because of the simple column grid, workable floorplate dimensions, the structural capacity, and large windows. We think that architects should focus more on future-use buildings rather than one-off structures that are customized for a very specific program. Unfortunately, architects are not typically trained to think this way.

"Parking structures need to be designed to accommodate transitions, from parking alone to other uses as parking ratios decline with further mixed-use development, shared parking, and increased transit."

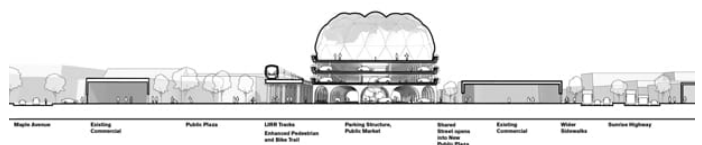
Love and Christoforetti searched for the optimal module that could be adapted to all potential future uses for the universal utilitarian structures. That module proved to be a 30-by-30-foot (9 by 9 m) bay. Standard parking bays for perpendicular parking are 60 feet (18 m) wide, allowing for 18-foot-deep (5.5 m) parking spaces flanking a 24-foot (7 m), two-way drive aisle. In their prototype design, to shift the columns of the 30-foot (9 m) bays out of the center of the drive aisle, 15-foot-wide (5 m) bays ring the perimeter of the structure.

Says Love, "A 30-foot bay is the ideal dimension for a structure that begins as a parking garage and can then be repurposed for office/flex space or housing in the future. An efficient parking configuration that uses a 30-foot bay requires the system to start with a 15-foot bay so that the first 30-foot bay is centered over the drive aisle. This is how, more generally, the two-dimensional systems sync up. Therefore, lateral parking bay dimensions for a 120-foot-wide [37 m] double-bay garage are 18-24-18 and 18-24-18 feet [6-7-6 m] while the corresponding grid is 15-30-30-30-15 feet [5-9-9-9-5 m]."

The proportions and dimensions of these flexible structures can also accommodate a variety of future uses. The three-bay-wide prototype structure Love and Christoforetti designed, for example, can accommodate a future double-loaded-corridor (units flanking a center hallway) residential building around a center courtyard, which would be formed by removing the center 60-foot-wide (18.3 m) inclined driving ramps. And comfortable hotel rooms could easily fit within a 15-by-30-foot (5 by 9 m) bay dimension. The narrower two-bay prototype also has suitable dimensions for a future 120-foot-wide (37 m) office building.

Different-sized retail shops and restaurants could fit within the 15-, 30-, 45-, and 60-foot (4.6, 9.1, 13.7, and 18.3 m) depths. Recreational uses would fit on the rooftops of the two- and three-bay structures. Tennis courts at 36 by 78 feet (11 by 24 m) can fit side-to-side with adequate access space on top of the two-bay structure. In fact, for the parking structure proposed for the Lot 3 surface parking lot in the village of Rockville Centre on Long Island, Utiile—at the request of local officials and as part of the design challenge—proposed five tennis courts, covered by a pneumatic bubble that would allow use of the area for indoor events and glow at night as a visual attraction to passersby on the adjacent Long Island Rail Road (LIRR) commuter rail line. The team even sited a 180-by-300-foot (55 by 91 m) soccer field on the rooftop of a three-bay structure to demonstrate its recreational flexibility.

Traditional parking structures have minimal ceiling heights of seven to eight feet (2.1 to 2.4 m) that



This sectional diagram shows the flexible parking structures flanking a new pedestrian spine under the LIRR colonnade. Civic uses for both an open plaza and an arch-covered plaza give a new urban heart to Rockville Centre.



Architects looked to earlier arched forms for bridges and viaducts, such as the conversion of a defunct suburban railway into the Viaduc des Artes in Paris.

preclude conversion to other commercial or civic uses. Utile proposed 20-foot (6 m) ceilings on the floor at grade so that when the structure is mostly vacant on evenings and weekends, it could be used for civic purposes such as a public market, a staging area for food carts, or festivals. In future years, the at-grade parking could be limited and the perimeter bays used for more permanent shops and restaurants, with adequate parking on upper floors, which Utile designed with 11-foot (3.4 m) ceiling heights to permit conversion to other uses.

The fact that Rockville Centre's sites mostly flank the LIRR also influenced Utile's design of the structures. Stout octagonal columns with prominent octagonal capitals form a colonnade that elevates the LIRR tracks. Utile would recapture that space as a covered pedestrian spine through Rockville Centre's downtown. The new flexible parking structures, with their high-bay, open first floors, would flank the colonnade and extend the public realm into covered and open plazas.

For centuries, the arch and vault have been used to create civic spaces. Utile looked to earlier arched forms for bridges and viaducts, such as those under the nearby Gowanus Expressway and Queensboro Bridge, and to the conversion of a defunct suburban railway into the Viaduc des Artes in Paris. The more gracious heights of the structures do not preclude utilitarian methods to construct them, Utile contends: it proposes use of efficient tilt-up

concrete construction for the arches. Running perpendicularly, such arches would buttress each other—much like in a Toyo Ito–designed library at Tama Art University in Tokyo—and create a rhythm of arched vaults that could give a monumental civic character to a suburban town lacking a civic venue. Hence the name Civic Arches for the concept.

The strong arched concept permits concrete floors above that are poured in place. They would be more flexible for future conversions than the more common, thinner, post-tensioned concrete floors. The tensioned cables embedded in such floors cannot be severed without compromising structural integrity, limiting the placement of plumbing, electrical and mechanical lines, and chases.

How is it possible that building new parking structures—adding parking spaces to suburban downtowns divided by a plethora of surface parking lots—can be economical despite the considerable expense? There are several reasons:

- **Shared parking.** Scattered surface parking lots, just like structured parking under a single office, residential, or hotel building, serve mostly a single use and are often vacant. They cannot support mixed uses. But centrally located parking structures of adequate size can offer a sufficient density of parking spaces to support an equivalent density of mixed uses. Until most goods and services are conveniently supplied within walking distance or served by high-frequency transit, residents will own and use cars that need to be parked. In fact, the less that car-owning residents of the mixed-use development use their cars, the more they will need spaces in which to park them.

So a higher density of uses requires a higher density of parking spaces—precisely the reverse of conventional wisdom. The way to economize on their construction, proponents reason, is to maximize their occupancy. And the only way to do that is to mix the uses that such spaces support, because then

the peak periods for one use complement those of another use with different peak periods. Furthermore, because structured parking can cost more than \$40,000 per space, and developers generally do not make money on building or selling the parking spaces but rather on the uses they support, careful developers want to build the fewest spaces possible and maximize their use through shared parking.

The Rockville Centre plan benefits because many of the uses in and near the project—such as recreation, theaters, and restaurants and cafés—have peak parking demands at times when LIRR commuter spaces are empty. Consultants anticipate such new mixed uses could create hundreds of new permanent jobs.

Redevelopment. The more than 4,000 acres (1,600 ha) of surface parking in and around Long Island’s downtowns represent large land banks more than one quarter the size of Manhattan, 35 minutes away from Rockville Centre on the LIRR. In fact, consultants note, when Morristown, New Jersey, which is twice the distance from Manhattan by train, constructed a \$10 million, 700-space downtown parking garage in 2000, it catalyzed more than \$60 million in new residential and commercial development in the immediate vicinity over the following five years. A second, 800-car downtown garage completed in 2008 at a cost of about \$16 million supported a new round of residential and commercial redevelopment totaling \$125 million.

Tax revenue. Gerard Giosa, a parking consultant and president of Old Bethpage, New York–based Level G Associates, estimates that based on projected development supported by flexible parking solutions, Rockville Centre will generate \$2 million of additional revenue annually from property and sales tax. In addition to forecasting property tax revenue from new housing, hotels, offices, and entertainment, Giosa says those attracted to suburban downtown living would spend about 30 percent of their discretionary income on shopping, eating, and entertainment.

Despite the long-term macroeconomic factors favoring development of such parking structures, financing of their construction can be a challenge. Giosa cites the Morristown Parking Authority as an example of a solution. The quasi-public agency, created to finance, develop, maintain, and operate the municipal parking system, developed the Morristown garages with 30-year tax-exempt parking revenue bonds it issued. Giosa says other public and/or private resources would likely be required to finance a project like Civic Arches in a town with lower parking rates. Utile suggests that the city or LIRR might be needed to facilitate such a project.

Utile contends that the answer to the putative contradiction of building parking structures to catalyze denser mixed-use development with revitalized urban street life lies not in the fact that they house more cars. Rather, the important point is that those cars support a greater density of a mixture of complementary uses in a central location where the structure is purposely designed to integrate civic uses in a covered public square adjoining an open one. Moreover, as the urban center evolves, Love and Christoforetti argue, architects and planners should design and proportion the structures so they can be converted to accommodate a wide variety of other uses that intensify the urbanity to which a city aspires and for which it plans.

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The Investor’s Guide to Commercial Real Estate (ISBN 9780874203493) is available through ULI’s online bookstore for \$124.95 (The Canadian price is \$149.95 and ULI members receive a 25-percent discount; for details, e-mail customerservice@uli.org or call 800-321-5011).