DECEMBER 2021

# Digitizing the Curb:

## Curb Inventory Pilot Project

IBI GROUP

CurbIQ

urban movement labs

# Table of Contents

# Executive Summary

CurbIQ™ and Urban Movement Labs partnered in Summer 2021 to demonstrate a method for quick and scalable curb inventory in North American cities. Using three Los Angeles neighborhoods and a subset of neighboring Maywood as study areas to test CurbIQ's methodology, CurbIQ validated a process to inventory curb regulations at scale.

The mapping technology tested in Los Angeles is called **augmented mobile mapping**, an approach that uses machine vision to collect images of curbside signage from a car. It goes without saying that a car can cover city streets much faster than walking can - what was tested was whether this technology could collect curb regulations accurately and comprehensively. Our control surveying approach was manual surveying; pedestrian surveyors walked the curbs with a SharedStreets CurbWheel and documented the regulations seen via the CurbWheel app. This pilot found that augmented mobile mapping worked remarkably well in moderate- to low-density areas, and that surveying conducted by pedestrians was required for accurate results in denser areas.

In the end, this pilot demonstrated that a **blended surveying approach**, comprising of mobile mapping in low- to-medium-density areas and pedestrian surveying in dense areas, is **a scalable and economical solution to digitize curbs in cities across North America.**

This result has significant implications for planning, regulating, and monetizing the use of curb space in cities. For years, cities have maintained that a digital curb inventory would allow them to plan and manage their curbs in a myriad of innovative ways, reflected locally in the Los Angeles Department of Transportation's (LADOT) Code the Curb Initiative. However, the time and cost associated with collecting and maintaining that data has been a barrier. These results show that residential and low-density commercial streets, which make up the majority of rights-of-way in North American cities, can be surveyed in up to one eighth the time it takes to map via pedestrians, with cost savings following accordingly.

Curbside data is critical to facilitate curb management tools like dynamic curb regulations and pricing, which allow for greater mobility and access for people and businesses on our streets. With mobile mapping on the table, these tools are one step closer to becoming a reality.

# Pilot Overview

## Project Purpose

As demand for curb space continues to grow amidst a rapidly changing transportation landscape, cities must be proactive in managing shifting needs and new curb space demands. To effectively inform curb management, a comprehensive dataset is necessary to identify existing regulations and guide regulatory changes. In 2016, the Los Angeles Department of Transportation launched Code the Curb: an initiative to survey and digitally document the City's network of traffic signs, painted curbs, and other regulatory tools along streets. However, identifying a scalable approach to digitize curb assets in contexts with complex curb regulations is difficult without understanding the capabilities of existing technologies.

This pilot provided an opportunity to understand how CurbIQ's curb inventory technology can address the challenge of digitizing Los Angeles' curbspace. Launched jointly by CurbIQ and Urban Movement Labs, this pilot tests the feasibility and scalability of augmented mobile mapping across a diversity of densities and land use patterns in Los Angeles County. As a control case for manual surveying, pedestrian surveyors used SharedStreets' CurbWheel and CurbWheel app to collect data. Understanding the challenges of these two methodologies and the tradeoffs between them informs a path to efficiently create a digital curbspace inventory.

With this context in mind, this pilot project sought to answer the following questions:

1. WHAT ARE THE BENEFITS AND CHALLENGES OF AUGMENTED MOBILE MAPPING?
2. HOW DOES LAND USE CONTEXT IMPACT THE COMPLETENESS, ACCURACY, AND PRECISION OF AUGMENTED MOBILE MAPPING SURVEY DATA?
3. WHAT IS THE OPTIMAL SOLUTION TO COLLECT CURB DATA AT SCALE?


CurbIQ's curb mapping technology collects the posted curb regulations and translates them into a digital inventory that can be used to inform regulations in a dynamic fashion that better meets the needs of communities.

# Methodology: How Were Curb Regulations Digitized?

CurbIQ paired modern computer vision technology with standard mobile mapping tools to create a semi-automatic sign collection system that captures curbside regulations. CurbIQ's blanket term for these data collection, processing, and standardizing processes is Curb Converter. For this pilot project, CurbIQ first deployed **augmented mobile mapping** surveyors to drive along streets and collect georeferenced street-level images. These images were processed by Curb Converter to detect signs, read their associated text, and infer their geographic location.

To understand the effectiveness and scalability of mobile mapping, a 100% accurate control dataset was needed for this pilot. This control dataset was created for each study area using a **SharedStreets' CurbWheel**, a surveying measurement wheel that communicates with a mobile app to manually collect curbside regulations. This control dataset provides an opportunity to understand the benefits and tradeoffs of augmented mobile mapping.

Once the augmented mobile mapping and CurbWheel datasets were collected and processed, the team standardized the data through Curb Converter, which generated a digital inventory based on the data collected. The detection rate, comprehension rate, and location accuracy of the data were then analyzed by comparing the control inventory (CurbWheel) to the mobile mapping approach.

To limit additional cost barriers, the equipment used for this pilot project consisted of standard mobile phones (Apple and Android Operating Systems). The equipment was used both for mobile mapping and CurbWheel data collection purposes.

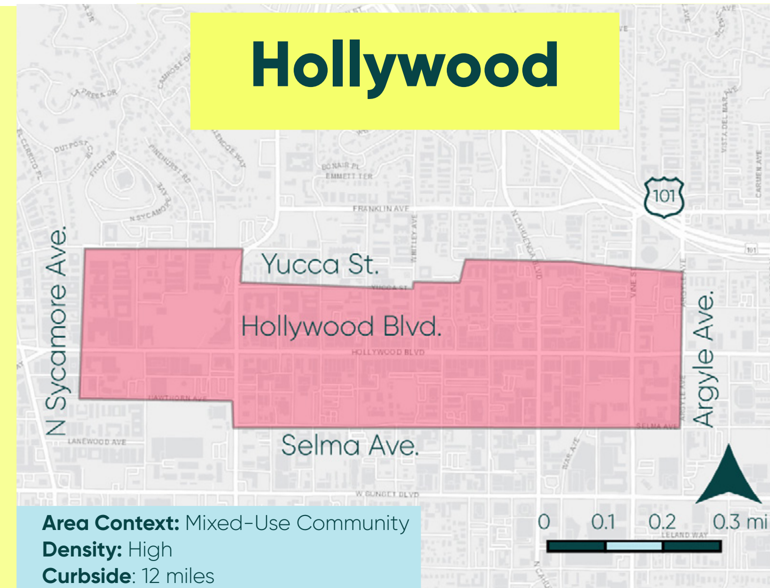
FOR **AUGMENTED MOBILE MAPPING**, PHONES WERE AFFIXED TO CAR DASHBOARDS TO CAPTURE IMAGES WHILE SURVEYORS DROVE TO COLLECT DATA

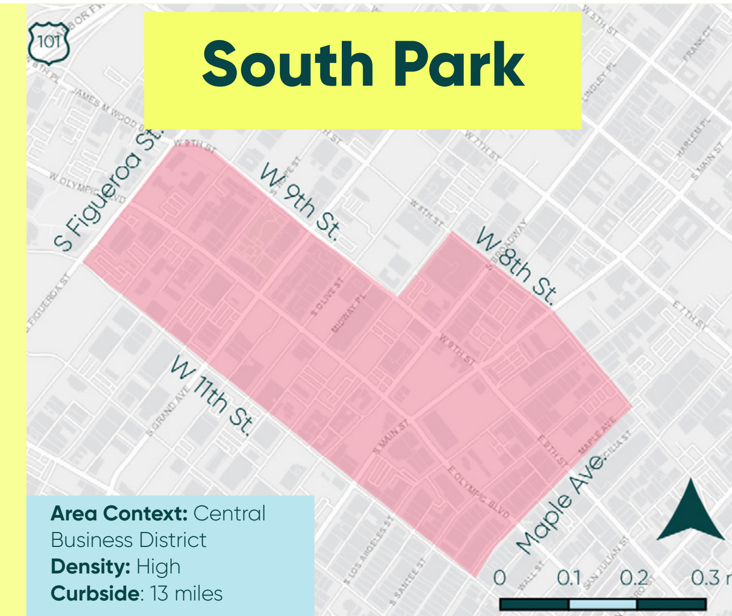
FOR **PEDESTRIAN SURVEYING**, SURVEYORS USED SHAREDSTREETS' OPEN SOURCE CURBWHEEL

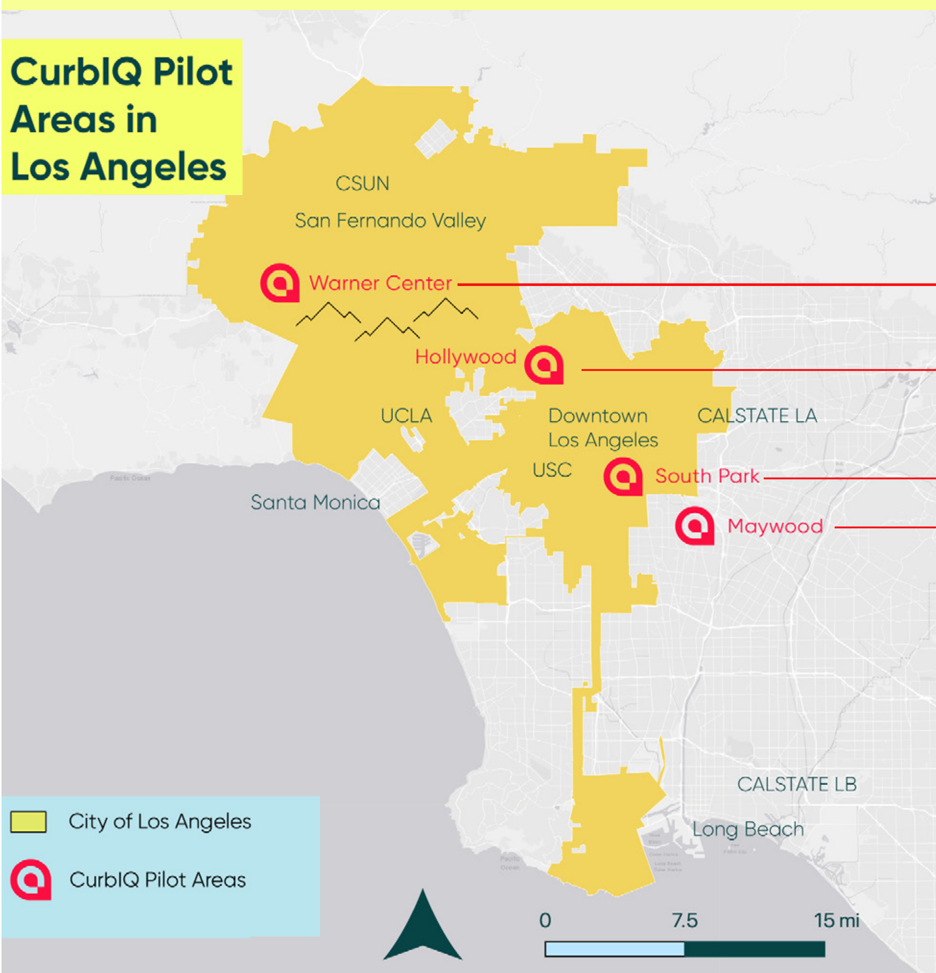
## Where Was Data Collected?

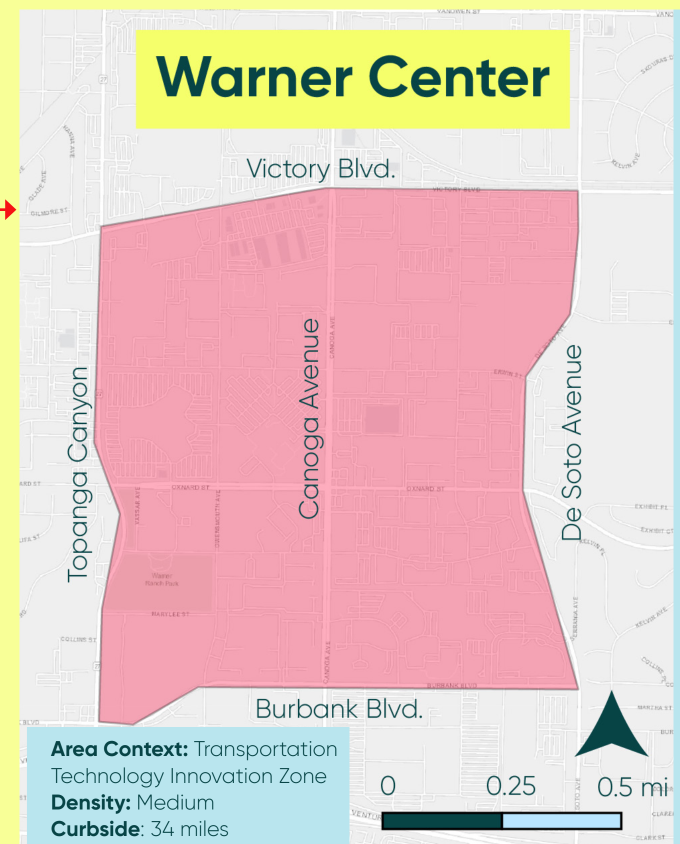
In Los Angeles, curbside management challenges vary from community to community. Three distinct neighborhoods in Los Angeles and an area of neighboring Maywood were chosen to reflect the breadth of land use contexts in Greater Los Angeles. These neighborhoods represent dense downtown, high-to-mid density commercial, semi-industrial, and suburban residential contexts. Together, these neighborhoods provide an understanding of how this data collection methodology could perform across Los Angeles and beyond. Criteria used to select the pilot areas include:

- Areas that are undergoing other transportation and technology pilot projects by UML partners that could benefit from curbside data;
- Areas that cover diverse neighborhoods with different economic levels, demographics, and transportation infrastructure to help create equitable curbside solutions; and
- Areas with varying density, land uses, and curbside restrictions.



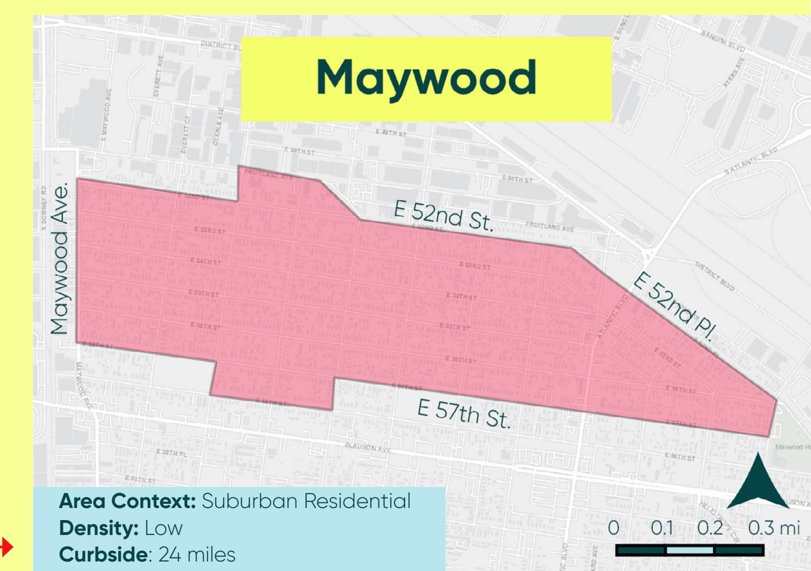




### WARNER CENTER TRANSPORTATION TECHNOLOGY INNOVATION ZONE

In February 2021, the Los Angeles City Council designated the Warner Center as the first Transportation Technology Innovation Zone in L.A. This urban proving ground is an area where innovators can work with the community and the city to test transportation technology projects in a real-world environment.



# What Did We Learn?

As the CurbIQ team reflected on the data collection process, analyzed data accuracy, and developed the study area inventories, 5 key lessons emerged. These lessons are highlighted below.

## 1 AUGMENTED MOBILE MAPPING WORKS

Car-mounted cameras that capture GPS location can be used to detect, locate, and read most parking signs under the right circumstances. The key challenges to this method are potential visibility obstructions caused by tall vehicles in busy areas, and the disruptive "urban canyon effect" that concentrated high-rise buildings have on GPS signals.

## 2 LOW- TO MEDIUM-SCALE LAND USE CONTEXTS ARE IDEAL CANDIDATES FOR MOBILE MAPPING

In low to medium density, where buildings are generally a few storeys high or shorter and sign obstructions are rare, augmented mobile mapping is very successful. In fact, in low- to medium-density neighborhoods, the results are nearly perfect. This type of building typology is reflective of most North American cities.

## 3 DENSE URBAN AREAS REQUIRE PEDESTRIAN SURVEYORS

Food trucks and towers and paint, oh my! Downtowns and other dense environments are not ideal settings for augmented mobile mapping. Although cameras were rarely obstructed by vehicles, the "urban canyon" effect created by tall buildings obstructed GPS signals, resulting in geolocation errors. Additionally, curb regulations are more frequently designated by non-signage means here, like curb paint; these regulation indicators are often blocked by cars and are therefore challenging to catch. Pedestrian surveying methods ensure better accuracy in these contexts.

## 4 OPTIMAL ROUTING IS A CHALLENGE

Routing a mobile mapping survey optimally to cover every street in each direction only once is challenging. This is particularly true in denser downtown neighborhoods, like South Park, where one-way streets and turning restrictions must be accounted for. The complicated driving environment creates an opportunity to improve data collection methodologies to be more efficient by optimizing surveying routes. The lessons from this pilot are informing IBI's parametric design team to develop a tool that can automatically optimize data collection routes.

## 5 DRIVING IS FASTER THAN WALKING

The results show that you can reduce surveying time to nearly a quarter in low- to medium-density areas by driving. However, the analysis showed that augmented mobile mapping can be made even faster: all streets were driven twice in this pilot to account for obstructions, but the data shows that low- to medium-density areas rarely have any obstructions and can safely be driven once without impacting data quality. This suggests that augmented mobile mapping could be up to eight times faster than pedestrian surveyors!

# Results and Discussion

The Digitizing the Curb Pilot Project helped to understand how to best leverage different methodologies to develop a digital inventory of curb regulations. Throughout this process, challenges, trade offs, and opportunities were identified to incorporate in future applications and refine data collection strategies in the future. This section highlights discussions that emerged as we reviewed the results of this pilot.

The key metrics referred to throughout this section are defined below.

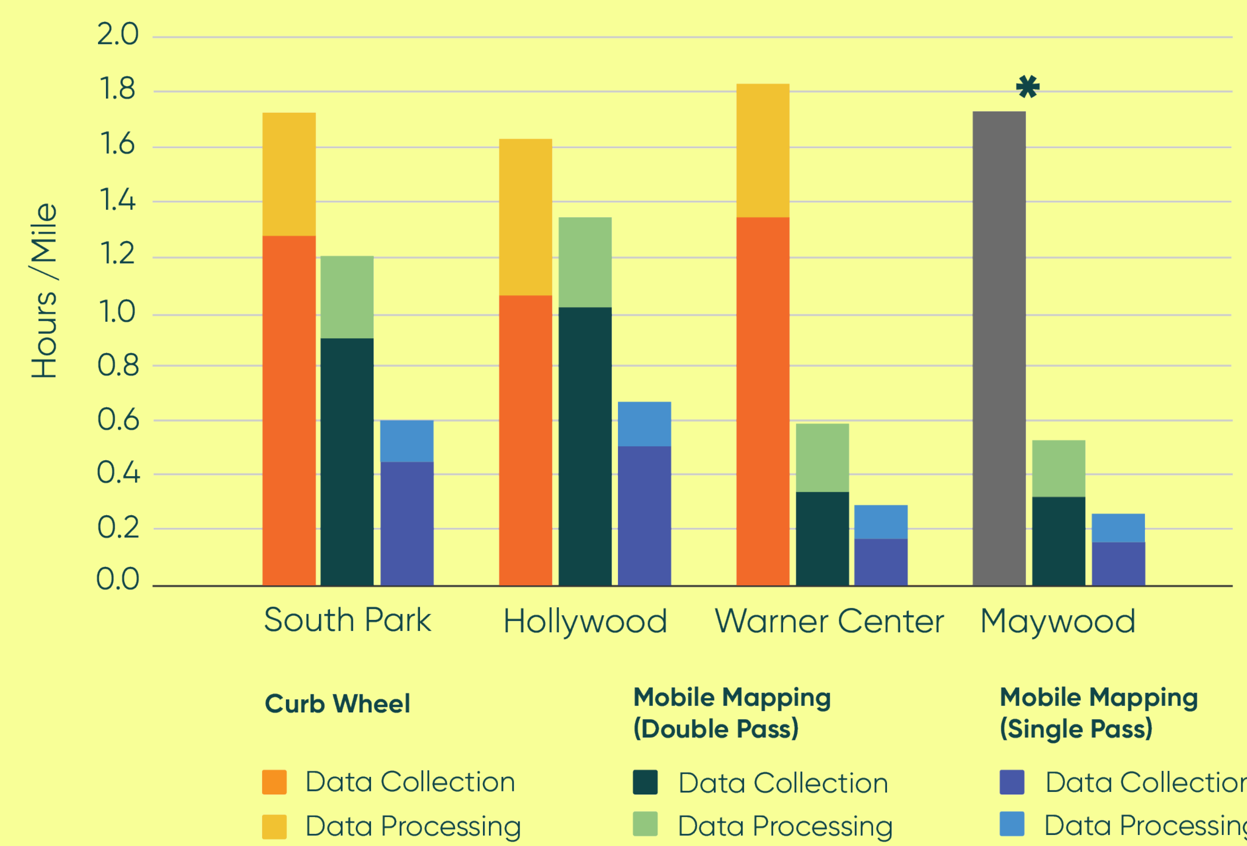
- **Detection** is when CurbIQ's computer vision models find a sign in the survey images.
- **Comprehension** is when a sign's regulations can be fully read and understood.
- **Geolocation** is physically locating a sign in geographic space.

Data quality has been assessed according to three metrics: detection rate (the % of signs detected), comprehension rate (the % of detected signs that were perfectly comprehended) and geolocation precision (the error between a detected sign's determined location and its actual location). The term **accuracy** is used to reference the proportion of signs that were detected, comprehended, and geolocated acceptably.

## Saving Time: Scaling Up and Trimming Down

It was quickly clear that augmented mobile mapping resulted in significant time savings compared to pedestrian surveyors, but the question is how much quicker. When driving each street twice in each direction in these relatively small pilot areas, augmented mobile mapping proved to be nearly four times faster than pedestrian surveyors in equivalent areas. In low- to medium-density areas, where streets can safely be driven only once in each direction without sacrificing quality, **augmented mobile mapping would be nearly eight times faster than pedestrians surveying.**

**Figure 1.** Time Spent on Data Collection and Processing




*CurbWheel was not completed for the Maywood area. Manual surveying time for Maywood was estimated based on time to manually survey in other areas.

An aspect that is hard to capture in a pilot is how processes can get more efficient with scale. **CurbIQ has seen these economies of scale with surveying in their past work, especially with augmented mobile mapping and the data processing involved.** Steps like model training for image detection and template creation for signage types completed during the pilot take a fair amount of resources in the beginning but come to save time and money as the surveyed area grows. This lends itself well to augmented mobile mapping as it is best used for larger areas of low and medium densities.

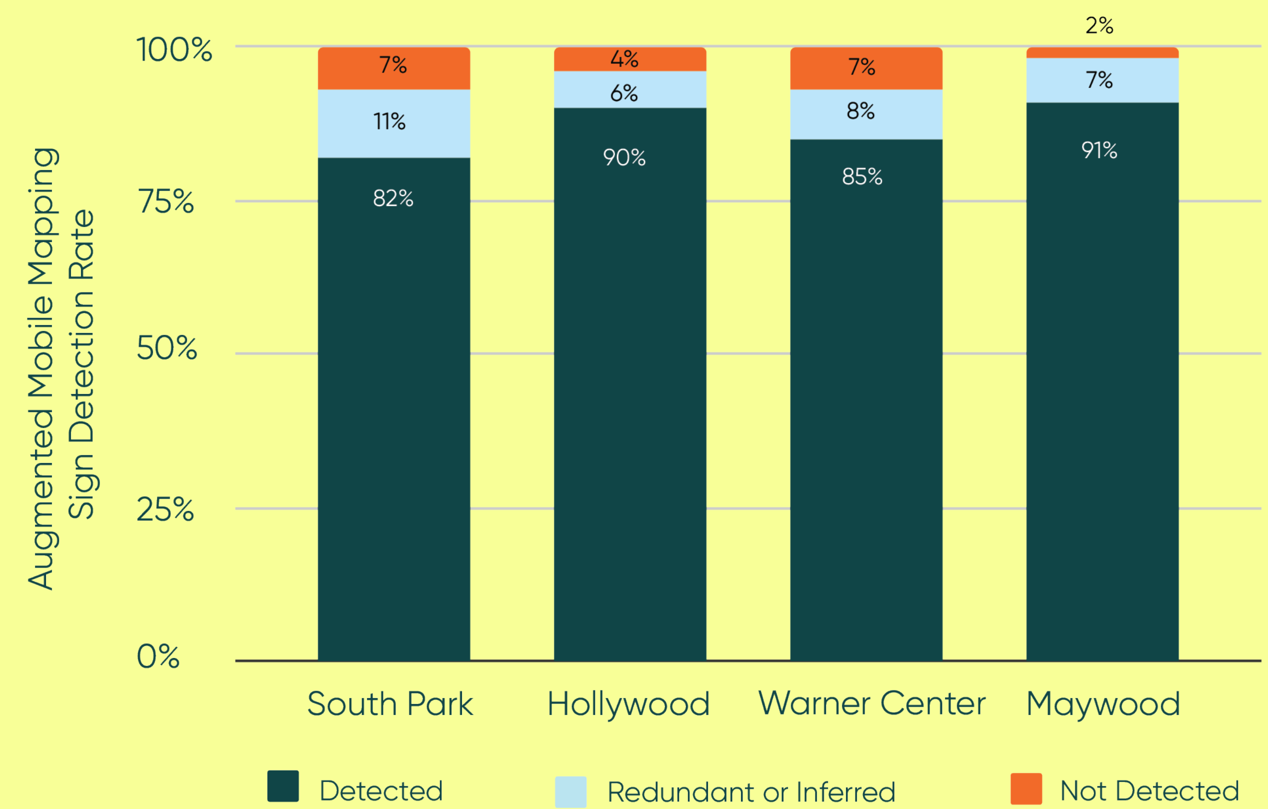
This pilot also validated a significant time saving strategy that had been previously debated. The augmented mobile mapping process initially involved surveying all areas twice at different times to capture signs that may have been missed due to large vehicles or temporary road closures. Results show that an additional pass provided limited benefits, as almost no additional signs were detected. Additionally, a second pass also creates the need to filter out duplicate detections, adding more time for already limited returns. **Limiting surveying to a single pass results in augmented mobile mapping being up to eight times faster than CurbWheel**, further reducing costs while maintaining an acceptable level of accuracy.

## Trade offs of Mobile Mapping: Sign Detection and Content Comprehension

The first metric to assess the effectiveness of augmented mobile mapping is to see how well it can actually detect curbside signage. **CurbIQ's models and methodologies were successful in detecting over 90% of signs after inference in all study areas**, with less dense areas having results ranging from 96-98%.

Though detection rates are high, the study areas helped identify opportunities for improvement. Stacked signs in Hollywood and unique accessible permit signs in Maywood initially proved difficult for CurbIQ models to detect. But this is exactly why training data is used for models. A citywide approach would involve testing on all sign types, so that any outlier signage could be captured and comprehended as collection continued at scale.

**Figure 2.** Augmented Mobile Mapping Sign Detection Rate

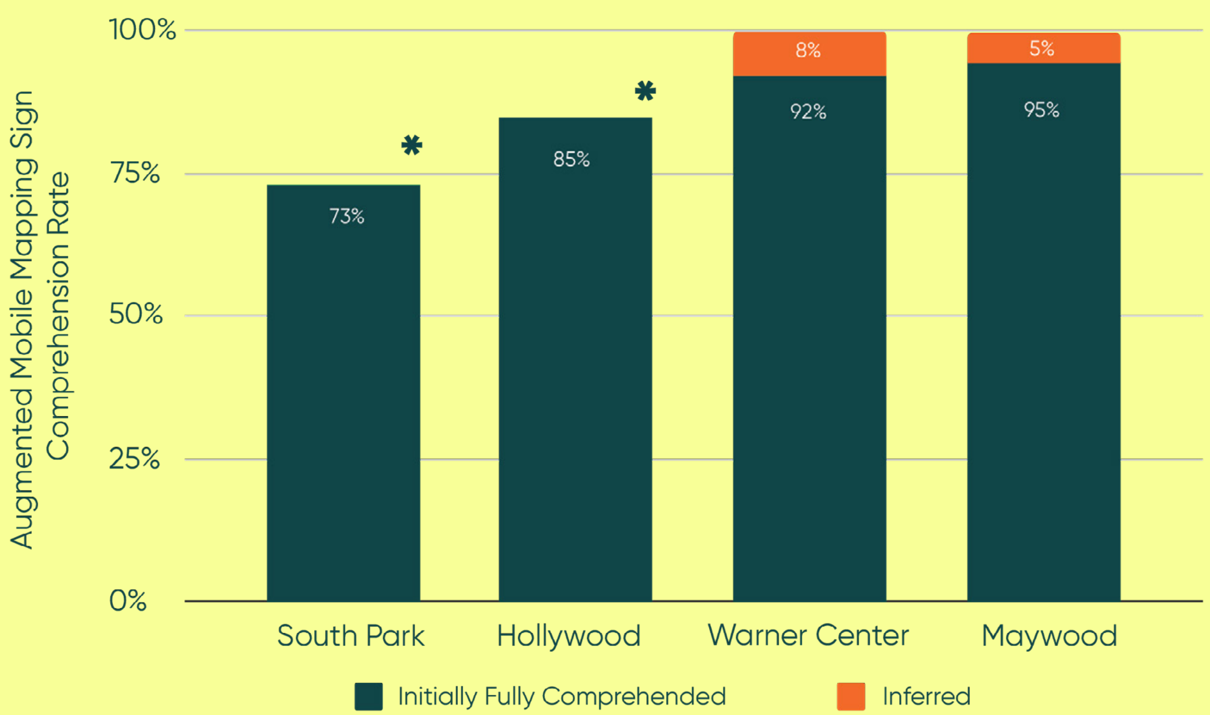



What good is detecting a sign if it can't be read? To ensure this isn't a problem, **CurbIQ's team developed and used a sign content comprehension system that's 99.9% accurate** in low- to medium-density areas. This was accomplished by supplementing the model with a manual Quality Control (QC) process to verify the populated sign text. For images with blurry or obscured text, staff can automatically infer sign content based on adjacent signs in low- and medium-density areas.

CurbIQ's QC process ensures that signs are properly read in low and medium densities. Although this content QC system adds time to the process, it is essential to ensure accurate curb regulation info. CurbIQ continues to improve their models and streamline QC processes, but this manual check provides the peace of mind that signs are being read correctly.

As previously noted, working in larger areas allows CurbIQ's models to "learn" and improve their recognition of signage within a jurisdiction. The sign images collected through this pilot project provide a basis for CurbIQ models to learn from, which then allows for faster QC in the future while continuing to provide manual intervention as needed.

**Figure 3.** Augmented Mobile Mapping Sign Comprehension Rate

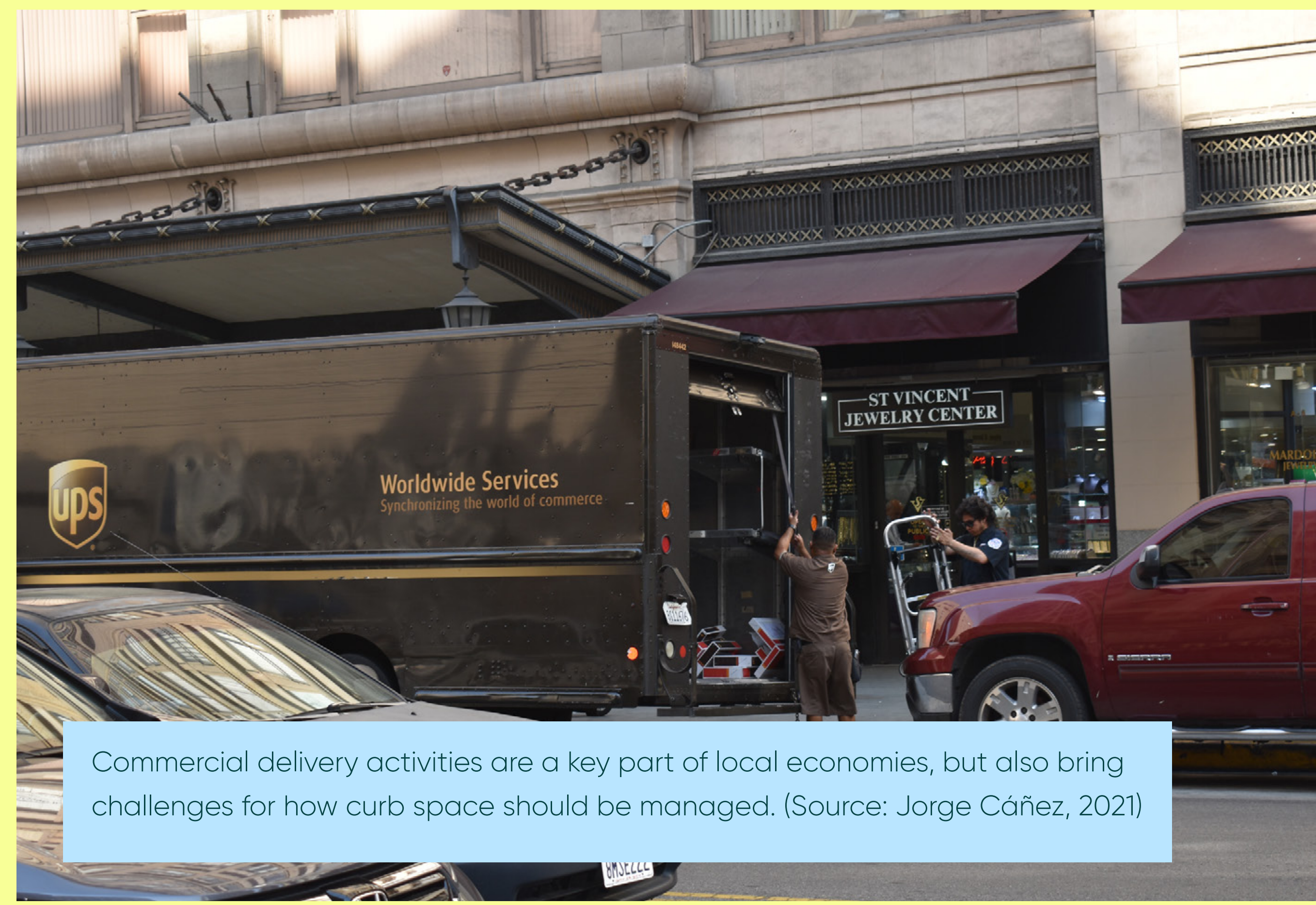



*CurbIQ's content inference analysis was not applied to Hollywood and South Park; their curb regulation signs are too dense and overlapped for accurate automatic content inference. This could be done for the vast majority of signs with a more rigorous manual inference process, if needed.

# Trade offs of Mobile Mapping: Sign Geolocation Precision

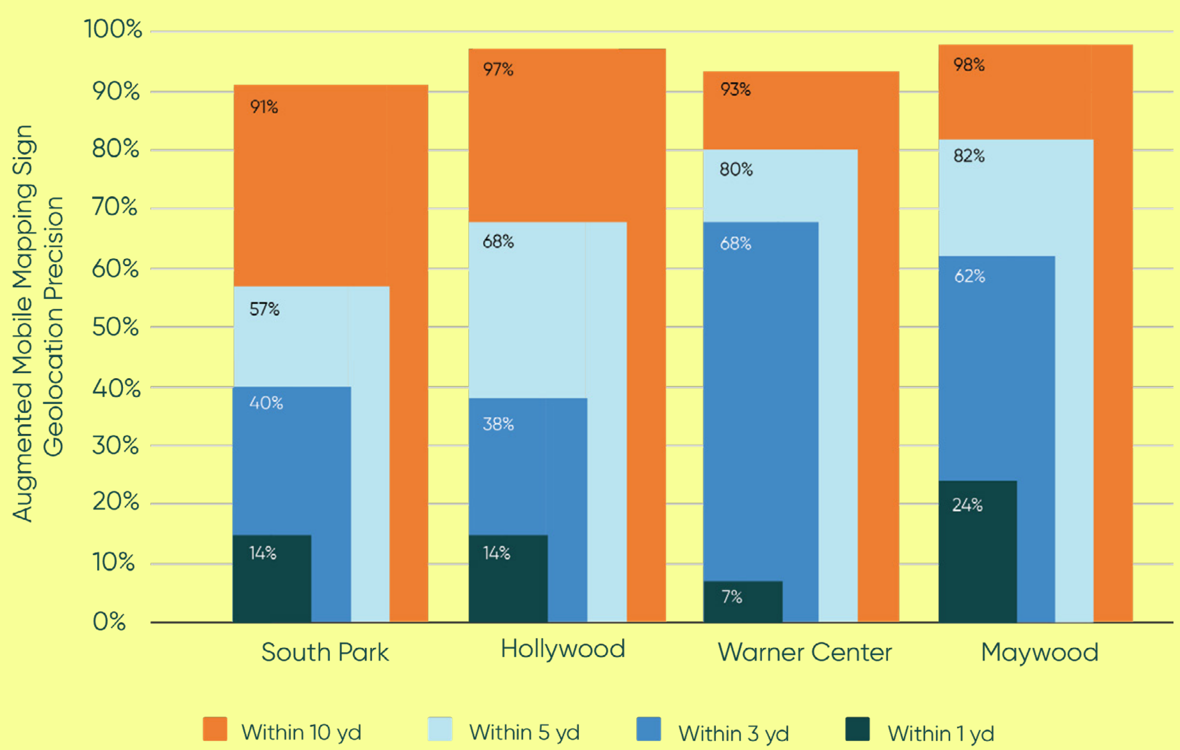
Detecting and comprehending signs is only half the battle. It is also important to ensure signs are located accurately to ensure the corresponding regulations are represented correctly. CurbWheel's linear referencing system via the measurement wheel provides precise location data. This pilot sought to understand how closely mobile mapping could replicate CurbWheel in this regard.

This pilot found that accuracy tends to be inversely correlated with the density of the area surveyed. High-density areas have more geolocation issues than other areas. This trend is amplified by the fact that low- to medium-density areas typically have fewer instances of overlapping and changing curb regulations, so minor imprecisions in sign location are less unlikely to impact regulation data and the data's end-users.




Commercial delivery activities are a key part of local economies, but also bring challenges for how curb space should be managed. (Source: Jorge Cáñez, 2021)

**Figure 4.** Augmented Mobile Mapping Sign Geolocation Precision




Most signs are geolocated within 5 yards (one car length) of their actual locations. In lower- and medium-density contexts, such as Warner Center and Maywood, most signs were identified within 3 yards of their physical locations. Results showed that virtually every sign was located within 10 yards (about two car lengths) of its actual location, which is more than sufficiently precise to understand curbside inventory at scale.





# Density Impacts on Collection Methods

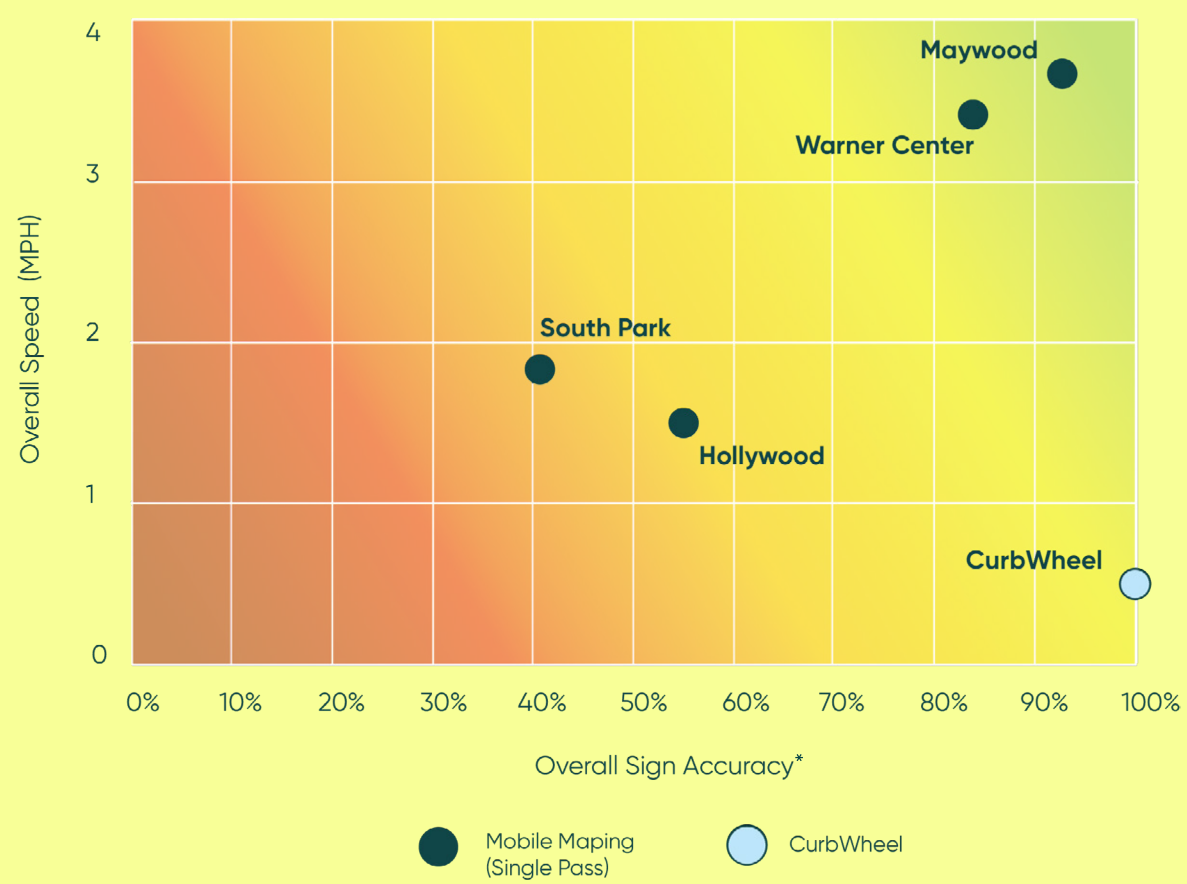
These results show that augmented mobile mapping works and is a valuable tool to collect curb regulations in cities. Above all, they show that augmented mobile mapping performs better in low- and medium-density areas compared to the high-density areas. Mobile mapping was the fastest and most accurate in the residential community of Maywood, and it was the least accurate in the South Park neighborhood of Downtown Los Angeles.

This additional time in dense areas was primarily caused by the prevalence of one-way streets, turning restrictions, and congestion most commonly representative of Downtown areas. The loss of accuracy came down to limited GPS reception, more obscured and text-heavy signs, and increased frequency of overlapping and dynamic regulations that comes with these dense areas.

Though downtown contexts present these challenges, **cities in North America are predominantly characterized by low- to medium-density land use patterns**. Los Angeles is no different — large portions of the city are composed of less-dense land uses, which correspond with less dynamic curbside information. Therefore, augmented mobile mapping is a viable option in most contexts for fast, scalable mapping technology of curb regulations. Looking at the numbers, this density divide and corresponding solution becomes even more clear. **By having augmented mobile mapping as a data collection solution, cities are able to trade marginal precision in low-density areas for significant time and cost savings.**


The density of land uses and activity changes the preferred mode for data collection. In urban areas, such as Downtown Los Angeles where bus stops, bus lanes, bicycle facilities, outdoor dining, and parking all compete. In lower-density communities, parking dominates demand. (Source: Jorge Cáñez, 2021)

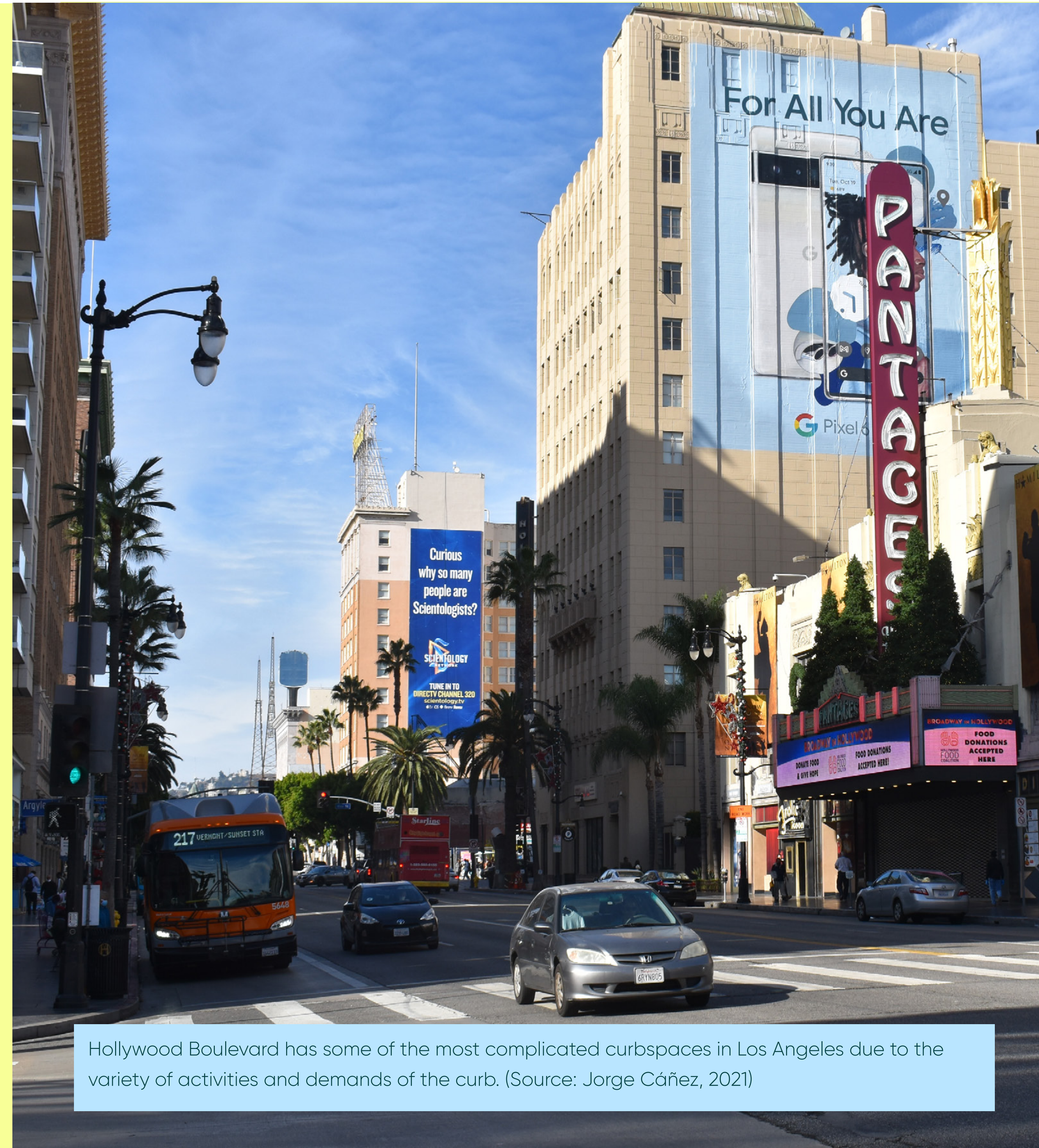
## **Figure 5.** Speed vs. Accuracy Rate




*For South Park and Hollywood, where signs are very close together, an acceptable error is within 5 yds (one car length). In Warner Center and Maywood, where signs are more spread apart, an acceptable error is within 10 yds (two car lengths).

Overall, this pilot found that augmented mobile mapping in low- to medium-density areas was much faster than CurbWheeling and nearly as accurate. In contrast, mobile mapping in high-density areas didn't save much time over CurbWheeling, and was far less accurate.

In the graph above, overall collection accuracies and speeds for mobile mapping are compared to the speed and accuracy of CurbWheeling those same areas. CurbWheeling average speed is used; actual CurbWheeling speeds were 0.57 +/- 0.03 mph.  Overall accuracy is calculated as the percentage of signs that were detected, comprehended, and geolocated within an acceptable positioning error.

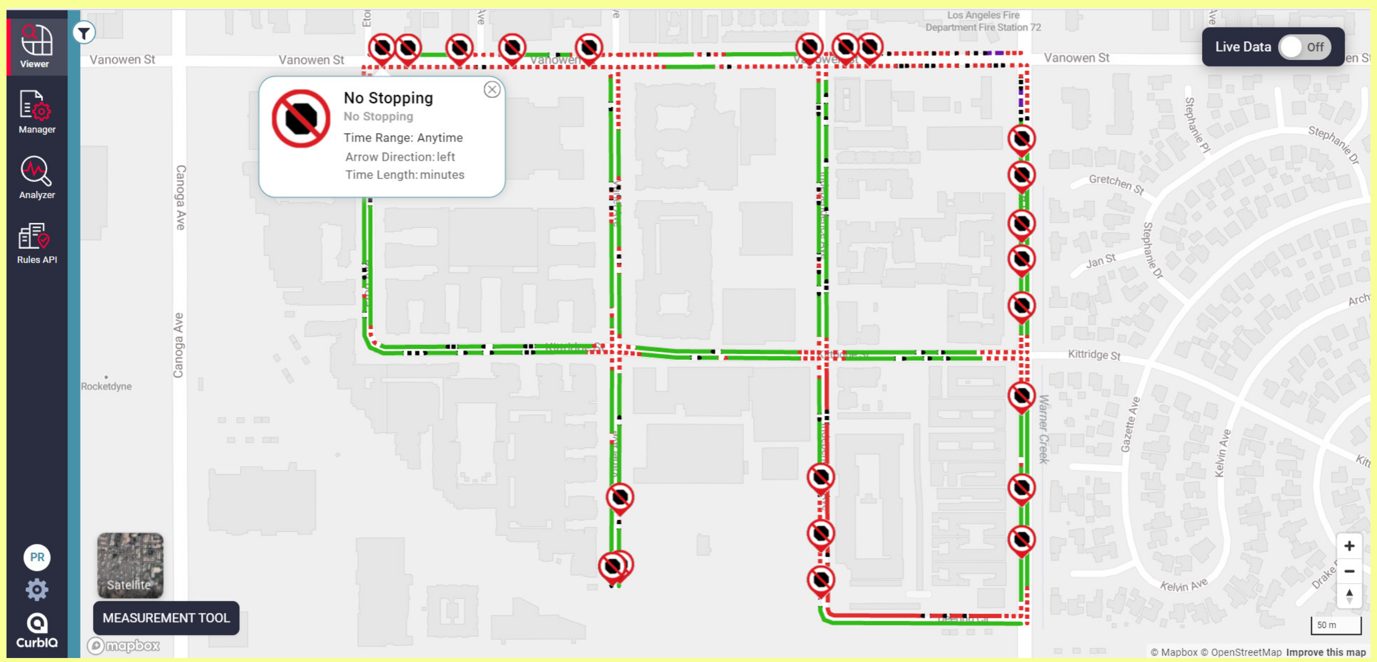



Hollywood Boulevard has some of the most complicated curbspaces in Los Angeles due to the variety of activities and demands of the curb. (Source: Jorge Cáñez, 2021)

# Pulling the Data Together

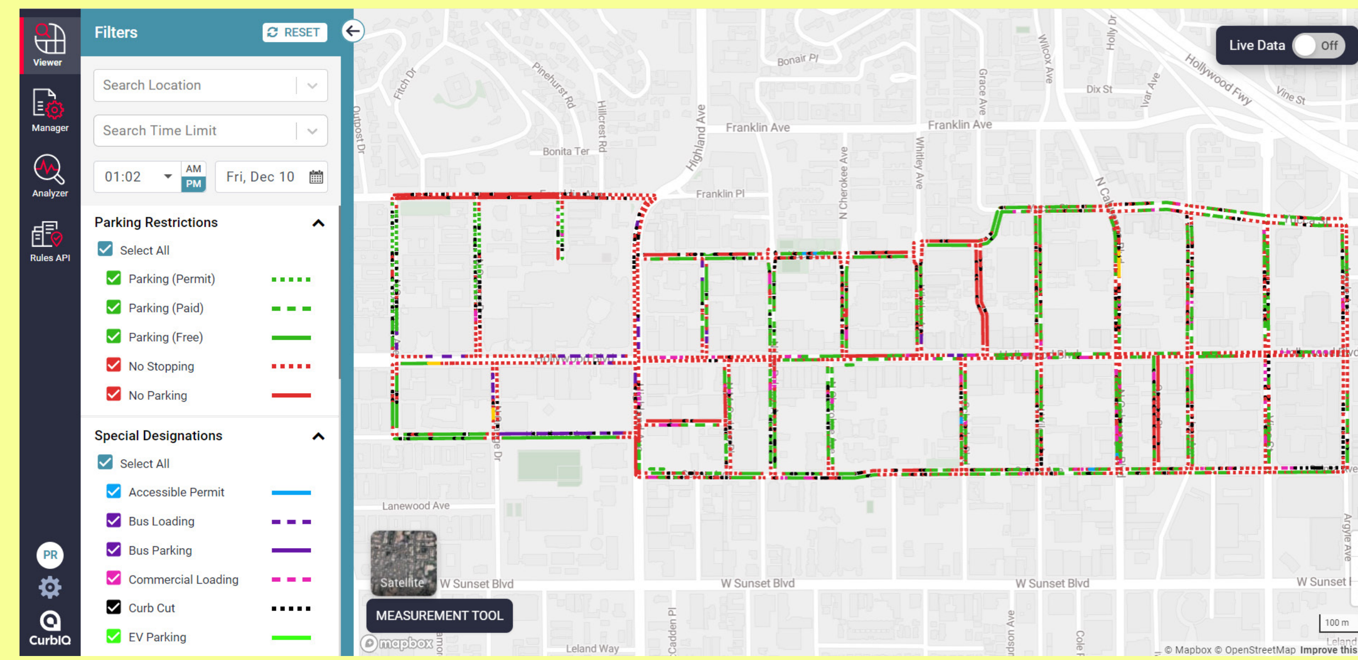
The following screenshots of CurbIQ's Curb Viewer show curb inventory maps generated with data collected. The maps are interactive and allow users to identify the regulations on a specific block. An overview of some of Curb Viewer's capabilities can be seen **here.**

## **Figure 6.** Warner Center Study Area Curb Inventory in Curb Viewer




DID YOU KNOW: 56% OF CURBSIDE IN WARNER CENTER IS DESIGNATED AS FREE PARKING.

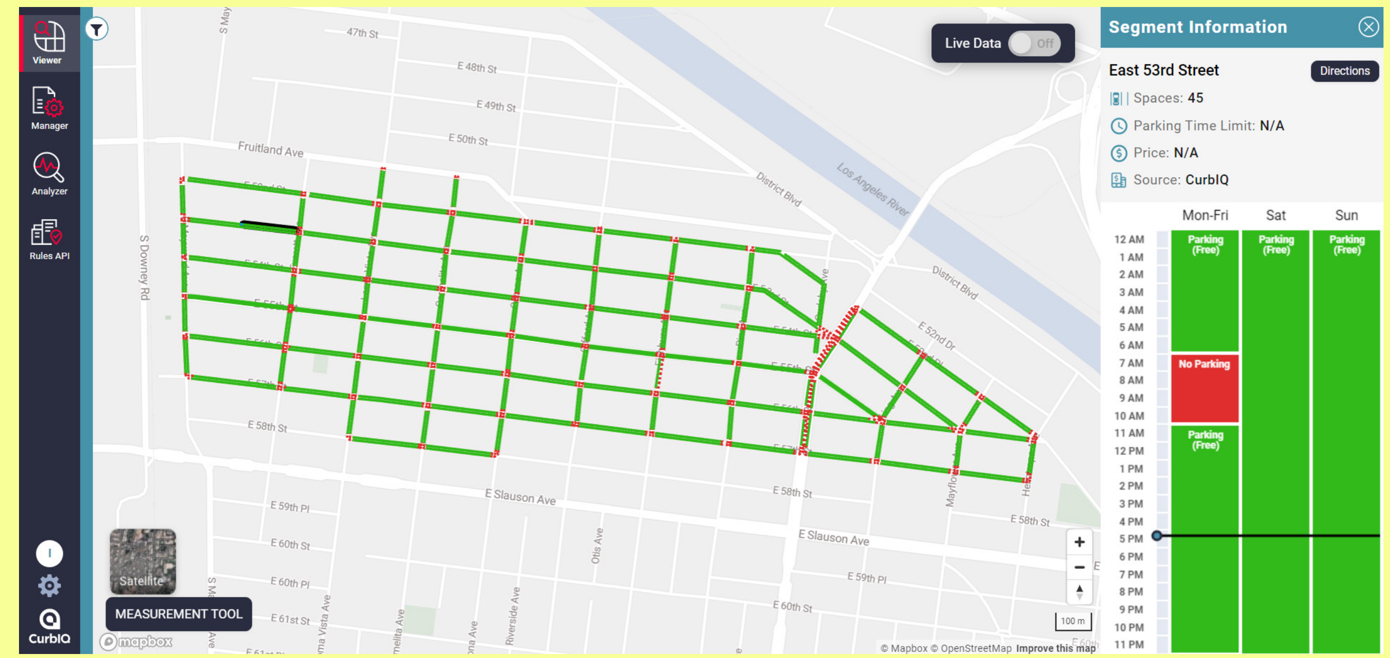
## **Figure 7.** Hollywood Study Area Curb Inventory in Curb Viewer




DID YOU KNOW: THERE ARE OVER 13 DIFFERENT TYPES OF CURB DESIGNATIONS IN HOLLYWOOD INCLUDING MAILBOX DEPOSIT, TOUR BUS LOADING, AND TAXI CAB STANDS.

**Figure 8.** South Park Study Area Curb Inventory in Curb Viewer


**Figure 9.** Maywood Study Area Curb Inventory in Curb Viewer




DID YOU KNOW: THERE ARE 77 DIFFERENT COMMERCIAL LOADING ZONES IN SOUTH PARK COMPRISING OF OVER 4% OF TOTAL CURBSPACE.

DID YOU KNOW: THERE ARE 18 ACCESSIBLE PARKING SPOTS AND 4 DIFFERENT STREET SWEEPING SCHEDULES IN THE MAYWOOD PILOT AREA.

# Evaluating Results Against UML's Pillars of Success

Urban Movement Labs frames pilot projects around 5 pillars of success to understand how new technologies can improve mobility for communities. For each pillar, qualitative and quantitative metrics are used to contextualize the findings in this report for cities.

## 1 OPERATIONAL STEWARDSHIP

Because the potential applications of this tool are based on its accuracy, this pilot measured the accuracy of sign detection and comprehension. That is why this report focuses on quantitative results for how augmented mobile mapping fared, in terms of detection, accuracy, and comprehension. Signs were detected at a rate of 93% – 98%, read at a rate close to 100% and were mapped in a digital database with over 80% geolocation accuracy with CurbIQ's Curb Converter processes in the areas we propose using mobile mapping (See Figure 2 and Figure 3).

## 2 CLIMATE SUSTAINABILITY

Collecting curbside data doesn't directly reduce GHG emissions, but this data can be used to help mobility companies and private vehicles make more efficient journeys, in turn reducing emissions. One example of this would be using a digital curb inventory to help cities identify the ideal locations for Zero Emission Delivery Zones, and understand potential tradeoffs associated with them. Moving forward, augmented mobile mapping can support local sustainability efforts by conducting surveys via electric vehicles.

## 3 ECONOMIC DEVELOPMENT

The various issues that occur when trying to balance curbside use and access for businesses are well known. Having a complete dataset helps policy makers make informed decisions to implement regulations that meet the needs of community members and local businesses. Improved curb management means more customers visiting local businesses, better opportunities to improve last-mile deliveries, and assisting new models of expanded outdoor business activities on sidewalks or in the adjacent roadway. This also applies to large events, like the LA 2028 Olympics, as better managed curbsides can ensure more organized, successful events.

## 4 COMMUNITY BENEFITS

Community benefits are less about the data collection itself, but more about what can be done with the data to benefit a community and address their needs and wants. This data can help policy makers make informed curb zone allocation decisions that make space for people, communal spaces, new mobility services, and non-auto mobility services to be accessible to community members that in turn improve the public realm. Improved curb management can also reduce the need for expensive off-street parking, which can benefit the community by providing more land for housing, jobs, and/or recreation.

## 5 MARKET FIT

It doesn't matter how great these processes are if they are not economically feasible. This pilot project highlights the time required to collect and process data on a per-mile basis so that cities can understand the resources required to perform this work at scale. Time required to collect and process data ranged from 0.5 to 4 miles per hour depending on the context and methodology (See Figure 1).

An extended curb and parklet at Silverlake Triangle in Los Angeles brings new use for curb space in the community.
(Source: Jorge Cáñez, 2021)

# Applying What We Learned

## Improving the Process

As this pilot progressed, the CurbIQ team thought critically of ways to improve the augmented mobile mapping process. The four main changes identified to improve the data collection process are summarized in the table below, highlighting the performance indicators that are expected to improve with each change.

### a DRIVE EACH STREET ONLY ONCE IN EACH DIRECTION

In the augmented mobile mapping surveying conducted for this pilot, each two-way street was driven twice in each direction, and each one-way street four times. This was initially necessary as a third-party system was being used for sign detection and geolocation, and it needed many images of the same sign to perform well. CurbIQ replaced that system with their own models and processes, which only need a single pass with a collection vehicle in each direction to perform well.

### b OPTIMIZE DRIVING ROUTES

Routing on the fly is challenging. To address this challenge, CurbIQ is teaming up with their colleagues at IBI Group Los Angeles to develop parametric routing tools that can propose optimized routes for collecting data that all but eliminate doubling the coverage of any street.

### c CAPTURE IMAGES AT HIGHER FREQUENCY

Capturing high frequency images takes up a lot of space on cameras and cloud storage systems, but this pilot has demonstrated that the higher quality is essential when collecting at scale. The reason: lower frequency caused some signs to be captured further away making for some blurrier images, and in very rare cases, signs were completely missed. A small increase in capture rate is an easy solution to eliminate these problems and make augmented mobile mapping more precise by collecting more high-quality images.

### d CONTINUE TO TRAIN MACHINE VISION MODELS

The great thing about machine learning is that it gets better the more you use it and train it! Continued data collection and processing results in training of models that improve the effectiveness of machine vision applications in collecting and interpreting data. This was observed as data collection during this pilot improved some of CurbIQ's models, like being able to identify uniquely-colored accessible permit signs or comprehend common terms used across specific neighborhoods.

Together, the lessons from this pilot will improve the performance of augmented mobile mapping across the board.

| | Collection Time | Post-processing Time | Detection Rate | Sign Geolocation | Sign Compre-hension |
|---|---|---|---|---|---|
| **Future Process Revision** | | | | | |
| Drive each street only once in each direction | √ | √ | | | |
| Optimize driving routes | √ | √ | √ | √ | √ |
| Capture images at a higher frequency | | | √ | √ | √ |
| Continue to train machine vision models | | | √ | √ | √ |

# Final Thoughts

So what was learned? Firstly, augmented mobile mapping makes a lot of sense in low- to medium-density areas. In these zones, augmented mobile mapping saves lots of time in data collection and processing while maintaining high accuracy and detection results. In high density and high activity areas, pedestrian surveying tools can be used to collect curb asset data, regulation data, and much more.

This pilot provides lessons to help refine and scale solutions for entire cities. A blended solution of augmented mobile mapping and pedestrians conducting manual surveys can enable cities to get the curb asset and regulation data they are looking for while cutting down on costs compared to what was possible with past technologies. But what exactly does this blend look like? Using a breakdown of road types in cities and the fact that 65%* of roads are not in the city core or dense urban areas, it is estimated that for **cities like Los Angeles the breakdown of CurbIQ's solution is 90% augmented mobile mapping and 10% pedestrian surveyors.**

This calculation would need to be fine-tuned on a city-by-city basis, but this paints a promising picture for the future of curb digitization. The fastest, cheapest collection method works very well in the areas that make up the bulk of cities. Now it's just a matter of hitting the streets and converting the data to get on the path to better curbside management.

## The Curbside Management Spectrum

This report focuses on the collection and inventory of curb data for improved curbside management, but it is far from the only aspect. Data visualization, keeping information up to date, analyzing curbside supply and demand to make more informed decisions, and providing data to end-users are all vital components to curbside management.

CurbIQ pairs their data collection technology with a suite of tools for curbside data collection, visualization, management, analysis, and data sharing. To learn more about CurbIQ's suite of products and services, visit **curbiq.io.**


Posted signage reflects the complicated nature of curbside regulations in Hollywood, which benefit from being digitized to facilitate a clearer understanding for users.
(Source: Jorge Cáñez, 2021)

* UN Habitat 2013 Study : Relevance of Street Patterns and Public Space in Urban Areas

# About Us

## Urban Movement Labs

Urban Movement Labs is a mobility-innovation organization that links government, businesses, and community members to modern technology solutions to help solve transportation challenges in the City of Los Angeles. Urban Movement Labs aims to make Los Angeles the model city for safe, sustainable, equitable, and efficient movement of people and goods and replicate these learnings around the world.

Urban Movement Labs provides a third space for collaboration, which prioritizes a community-first approach for local agencies, communities, and companies, to co-create and co-implement mobility solutions. Our aim is to match solutions to daily transportation challenges, then test them in real urban conditions within L.A.'s city limits in a way that provides community members with a sense of ownership via pilots that include community input and feedback.

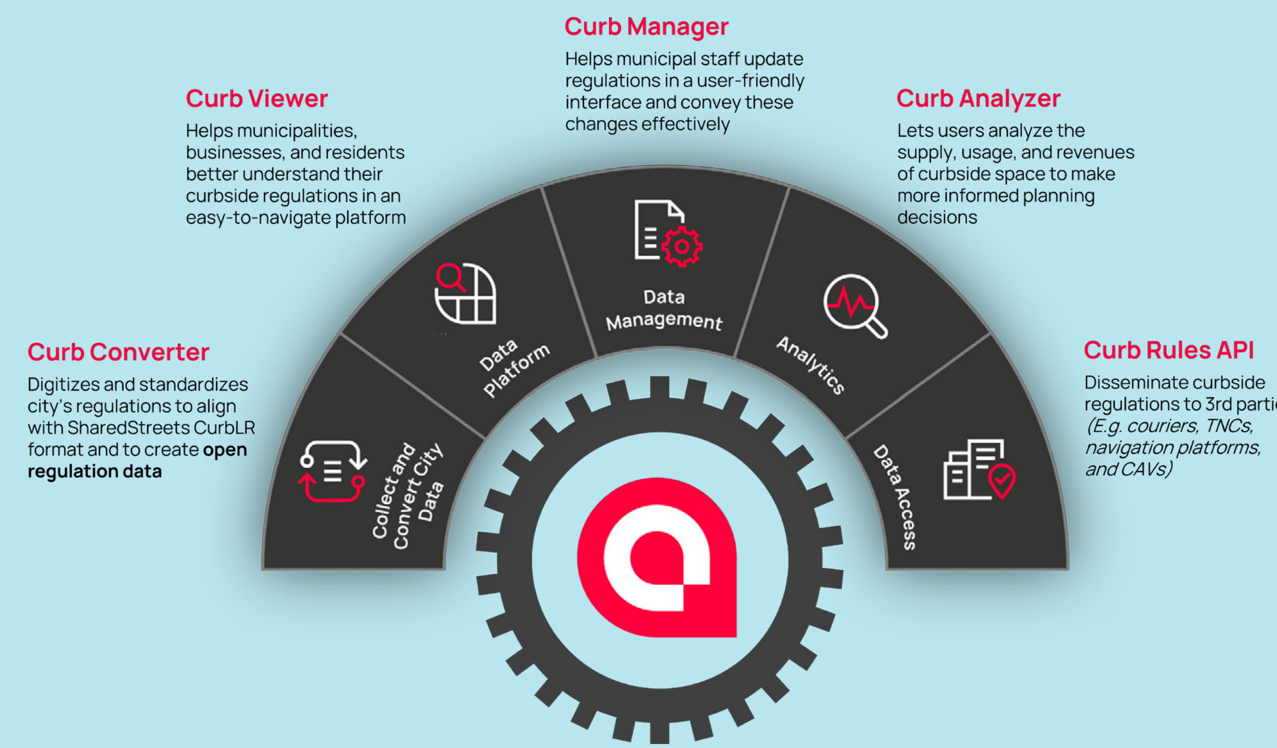
Urban Movement Labs is a 501(c)(3) public benefit corporation with the purpose of charitable and educational benefits for the community. It was first announced at LA CoMotion in November 2019 and incorporated in the State of California in 2020. UML received formal status as a 501(c)(3) organization effective June 9, 2020.

urban movement labs

## IBI Group and CurbIQ

You might know IBI Group as a global leader in professional services and consulting for urban environments. Perhaps less known is our work as software developers. We have been developing applications for governments and government agencies since the eighties. In the intervening decades, we have been busy building our products, each created in response to a specific need cities face. IBI is proud of our award-winning portfolio of products and all the ways they are helping to define the cities of tomorrow.

**CurbIQ** is a new addition to this suite of tools. It's a comprehensive parking, curbside, and asset management software solution. We developed it by leveraging our expertise in transportation engineering, parking strategies, and curbside management. CurbIQ helps cities, residents, and the public understand the mobility options at their curbs.




CurbIQ is comprised of five modules. Together, they cover a city's curbside data needs: from collection to visualization, management, analytics, and sharing. Our modules are being used by cities across the United States and Canada. In the U.S, IBI Group is using CurbIQ to assist their project with the Southern California Association of Governments (SCAG), which is North America's largest curbside management project to-date.

CurbIQ has been recognized in the **FHWA Curbside Inventory Report by ITE** (2021) as a proven curbside data collection and management product.

# Contact Us


## CURBIQ

Peter Richards

Product Director

contact@curbiq.io

**Website**
curbiq.io

**Twitter**
@curbiq

**LinkedIn**
linkedin.com/company/curbiq

**Youtube**
CurbIQ Youtube

## URBAN MOVEMENT LABS

Rogelio Pardo

Program Director

info@urbanmovementlabs.com

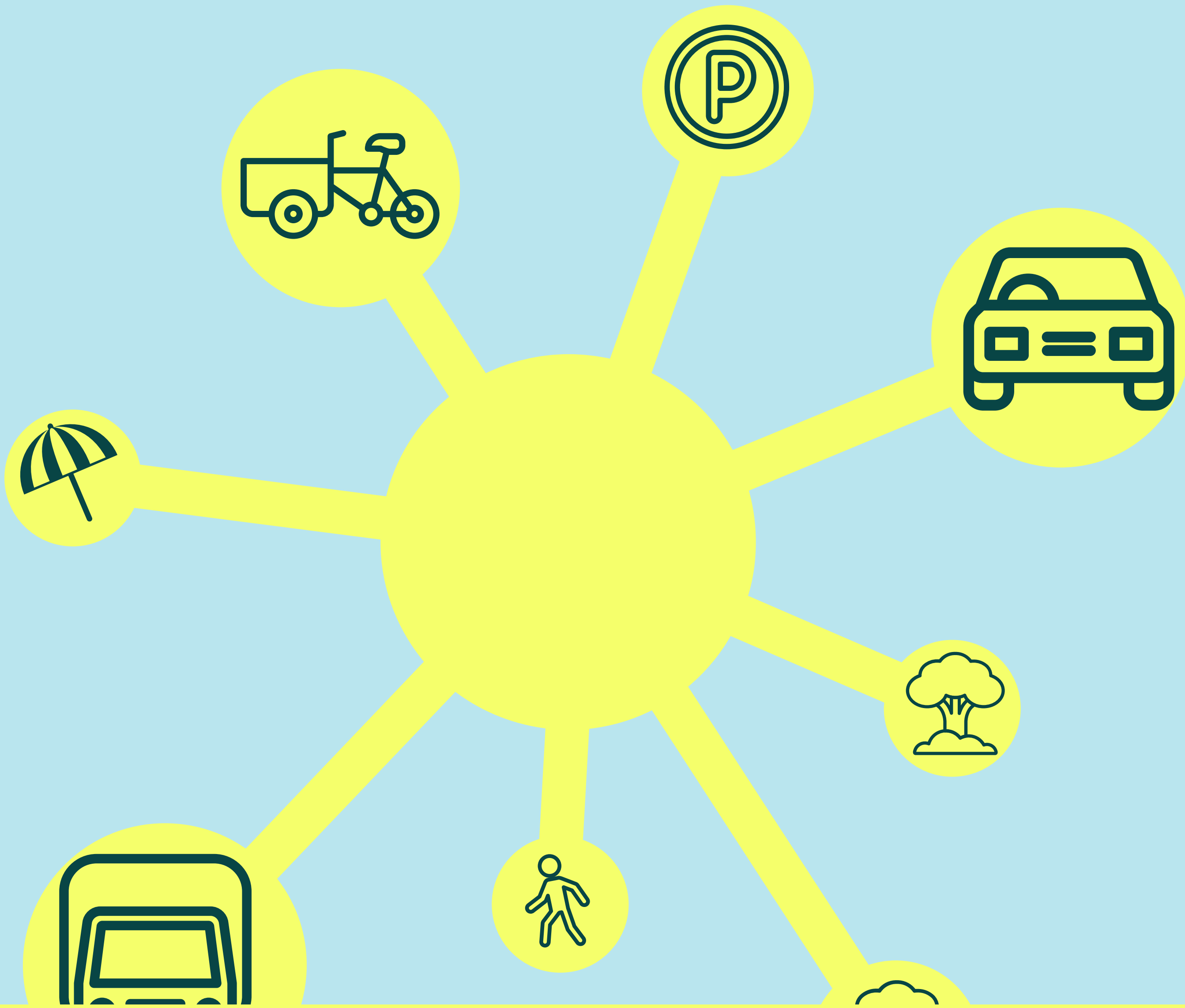
**Website**
urbanmovementlabs.com

**Twitter**
@UrbanMvmtLab

**LinkedIn**
linkedin.com/company/urbanmovementlabs

**Facebook**
/UrbanMvmtLab


Micromobility devices parking corral in Santa Monica, California (Source: Jorge Cáñez, 2019)



DECEMBER 2021

# Digitizing the Curb:

## Curb Inventory Pilot Project

IBI GROUP

CurbIQ

urban movement labs