PROJECT SIDEWALK

CROWD + AI TOOLS TO MAP & ASSESS SIDEWALK ACCESSIBILITY

Jon E. Froehlich
University of Washington

SciStarter Live
Jan 10, 2022

DESIGN USE BUILD

MAKEABILITY LAB

CREATE

UIC

PAUL G. ALLEN SCHOOL OF COMPUTER SCIENCE & ENGINEERING

UNIVERSITY of WASHINGTON

SIDEWALKS ARE CRITICAL PUBLIC INFRASTRUCTURE

Thapar *et al.*, 2004 ; Nuernberger, 2008

Source: https://americanhistory.si.edu/


NO CURB RAMPS
CHANEL
ONE WAY
DIESEL


PHYSICAL OBSTACLES


FedEx
INCOMPLETE SIDEWALKS

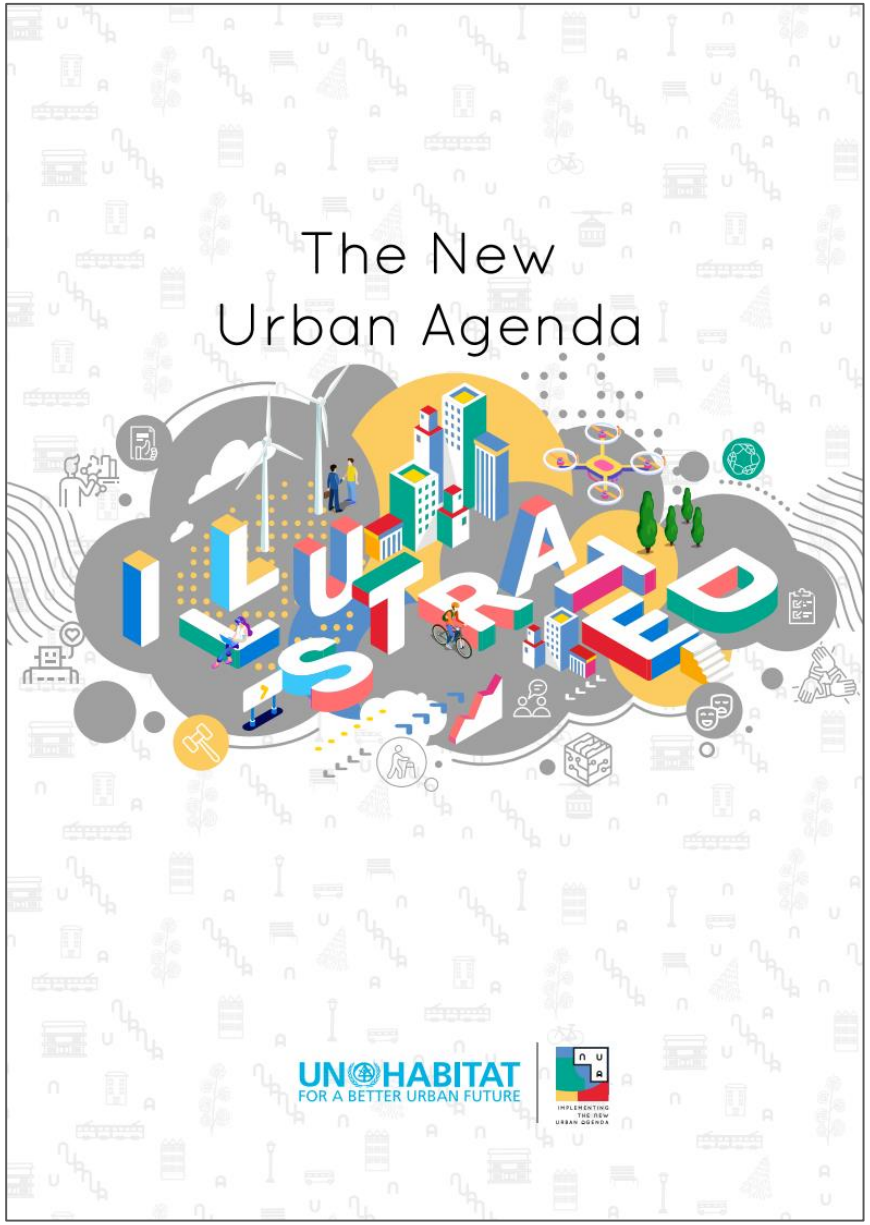

SURFACE PROBLEMS


PHYSICAL OBSTACLES
NO CURB RAMP
SURFACE DEGRADATION

This **designed inaccessibility** contributes to and further reinforces **systemic inequalities** in economic opportunity and access to basic health and educational services for people with disabilities

- UN NEW URBAN AGENDA 2020

See Section 1.1.3




"INJUSTICE ANYWHERE IS A THREAT
TO JUSTICE EVERYWHERE."
Martin Luther King, Jr.

Los Angeles Times

SUBSCRIBE

CALIFORNIA

L.A. agrees to spend $1.3 billion to fix sidewalks in ADA case

A buckled sidewalk at 4th and Main streets in downtown L.A. (Gary Friedman / Los Angeles Times)

BY EMILY ALPERT REYES | STAFF WRITER

APRIL 1, 2015 3:34 PM PT

Los Angeles is pledging to spend more than $1.3 billion over the next three decades to fix its massive backlog of broken sidewalks and make other improvements to help those with disabilities navigate the city as part of a tentative deal being described as a landmark legal settlement.

The proposed agreement would resolve a lawsuit filed by attorneys for the disabled, who argued that crumbling, impassable sidewalks and other barriers prevented people in wheelchairs or others with mobility impairments from accessing public pathways in violation of the Americans With Disabilities Act.

The final terms must still be approved by a federal judge, but attorneys described it as

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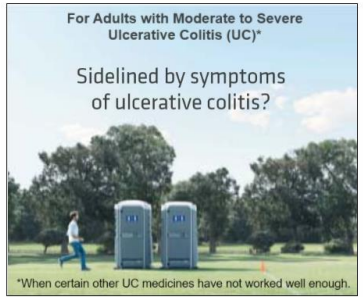

The New York Times

Suit Seeks to Make Sidewalks More Accessible for Disabled New Yorkers

Give this article

By Matt F

July 30, 20

Arguin
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ccess
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The Seattle Times

Seattle may have to spend millions making sidewalks more accessible to people with disabilities

Originally published April 3, 2017 at 6:30 am | Updated April 17, 2017 at 11:28 am

1 of 2 | Seattle city employees work on building sidewalks and a curb ramp on Southwest Admiral Way in West Seattle on Thursday. (Erika Schultz/The Seattle Times)

The city is headed toward a court settlement that could end up costing millions of dollars to make sidewalks more usable for people with disabilities.

Share story

By David Gutman

Seattle Times staff reporter


THE PROBLEM IS
NOT JUST A LACK
OF ACCESSIBLE
SIDEWALKS
A LACK OF DATA

The National Council on Disability notes that there is **no comprehensive information** on "the degree to which sidewalks are accessible" in cities.

National Council on Disability, 2007
The impact of the Americans with Disabilities Act: Assessing the progress toward achieving the goals of the ADA

BACKGROUND

STUDY OF OPEN DATA ON SIDEWALKS

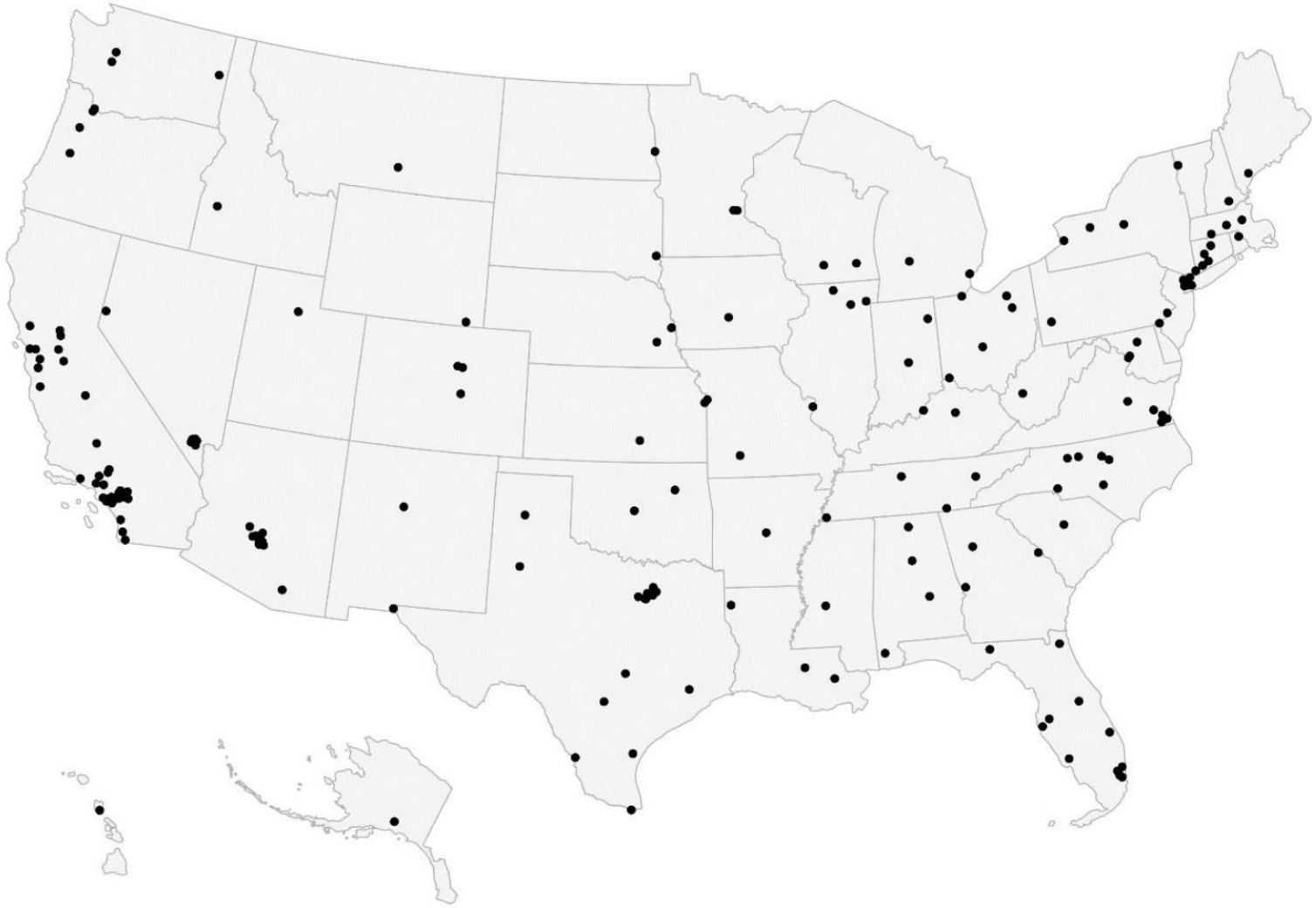
178 US CITIES

54% OPEN STREET DATA

20% SIDEWALKS

10% CURB RAMPS

<5% BASIC ACCESSIBILITY INFO



Source: Shiloh Deitz. 2020. *Free Movement: Enhancing Open Data to Facilitate Independent Travel for Persons with Disabilities.*

BACKGROUND

STUDY OF ADA TRANSITION PLANS

Cities 102 (2020) 102720

Contents lists available at ScienceDirect

Cities

journal homepage: www.elsevier.com/locate/cities

Are communities in the United States planning for pedestrians with disabilities? Findings from a systematic evaluation of local government barrier removal plans

Yochai Eisenberg*, Amy Heider, Rob Gould, Robin Jones

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ARTICLE INFO

Keywords:
Accessibility
Disability
Sidewalks
Urban policy
Equitable planning

ABSTRACT

Cities with many pedestrian barriers can inhibit community mobility, access to services, and social participation for people with disabilities. Although National Disability Rights policies have been enacted in several nations, it is unclear what progress local governments have made in developing plans and implementing accessibility improvements to the pedestrian infrastructure. The purpose of this study was to evaluate the existence and quality of city plans used to remove barriers for pedestrians with disabilities. We conducted a systematic evaluation of American's with Disabilities Act (ADA) transition plans, for a stratified random sample of local cities and counties. An expert panel developed a quality appraisal tool that we used to evaluate plans. Among the 401 government entities reviewed, only 13% (54) had ADA transition plans readily available. Just seven of the 54 plans we acquired met all the minimum criteria required. Based on those reporting barriers, an average of 65% of curb ramps and 48% of sidewalks were *not* accessible. Many communities across the US have not developed ADA transition plans for pedestrian infrastructure or have developed low-quality plans. This case study provides insight on local level implementation of barrier removal plans whose lessons may apply inside and outside of the US.

1. Introduction

In communities around the world, people with disabilities experience multiple, interrelated barriers in the built environment that can lead to social exclusion and isolation. Barriers are encountered on pathways and routes that are used for walking/rolling in cities globally (Baris & Uslu, 2009; Gell, Rosenberg, Carlson, Kerr, & Belza, 2015; Haselwandter et al., 2015; Meshur, 2013), as part of transportation (Rosenberg, Huang, Simonovich, & Belza, 2013), at community recreation sites (Rimmer, Riley, Wang, Rauworth, & Jurkowski, 2004; Vasudevan, 2016), and public buildings generally (Banda-Chalwe, Nitz, & De Jonge, 2014; Evcil, 2009; Gleeson, 1997). Based on the social model of disability and the International Classification of Functioning, Disability and Health (ICF), environmental barriers impacting the pedestrian environment are seen as a cause of disablement. State and local policy interventions that require improving access to walking/rolling on city pathways and other aspects of the built environment can facilitate numerous aspects of independent living, social participation, and employment for all people, and especially people with disabilities (Hammel et al., 2015). Accessible communities benefit people with disabilities as well as older adults, both of whom represent growing populations around the world (Institute of Medicine, 2007; United Nations, 2001).

Several countries around the world have adopted national policies to address built environment barriers. Some countries address environmental barriers through antidiscrimination legislation, such as the Americans with Disabilities Act (ADA) in the US and the Disability Discrimination Act in the UK. It is also common for National, State, or local governments to adopt a set of building standards that require new construction and renovations to follow guidelines for accessible design of the physical environment (Imrie, 2000). Although the enactment of federal policies and the adoption of standards are notable benchmarks and significant achievements in improving accessibility internationally, sparse research to date has been conducted regarding the implementation of such policy related to the built environment at the State or local level.

It is unclear whether cities and other local governments have developed plans for removing environmental barriers to accessibility or

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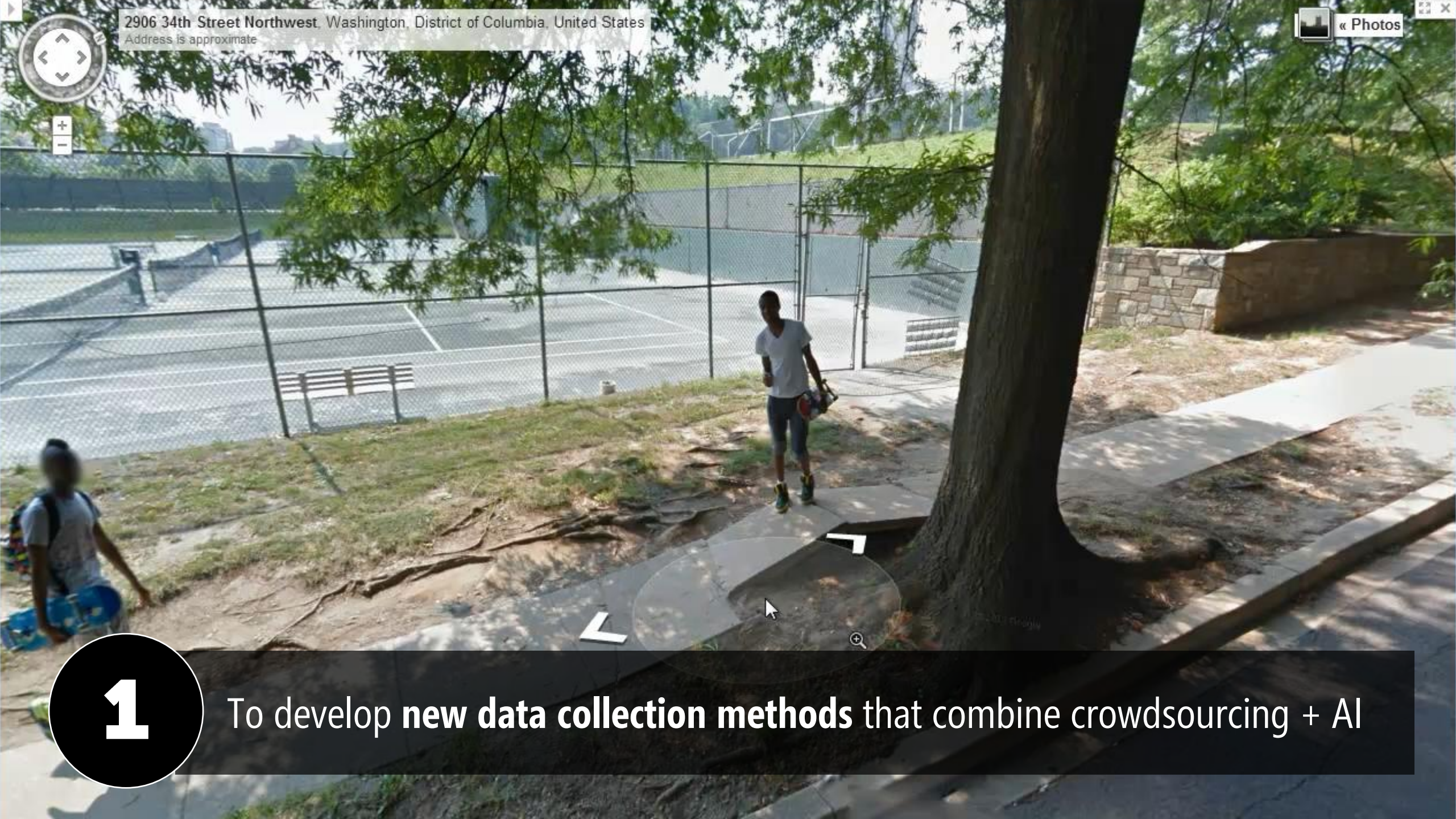
401 LOCAL GOVERNMENTS

13%
w/ADA transition plans

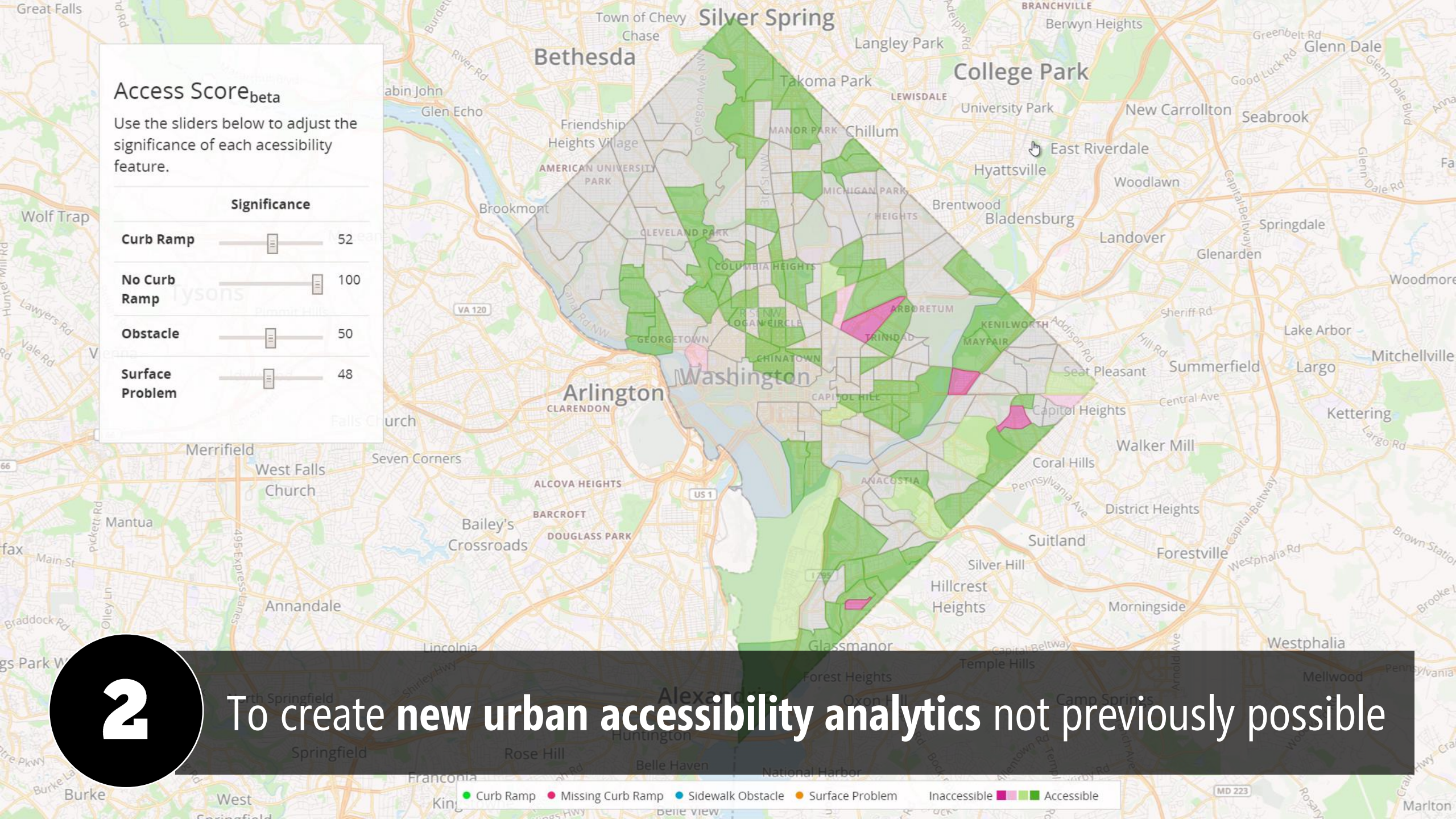
1.7%
Met minimum requirements

Source: Eisenberg, Y., Heider, A., Gould, R., & Jones, R. (2020). Are communities in the United States planning for pedestrians with disabilities? Findings from a systematic evaluation of local government barrier removal plans. Cities, 102, 102720.

We are pursuing a **two-fold solution**



1 To develop **new data collection methods** that combine crowdsourcing + AI



2 To create **new urban accessibility analytics** not previously possible

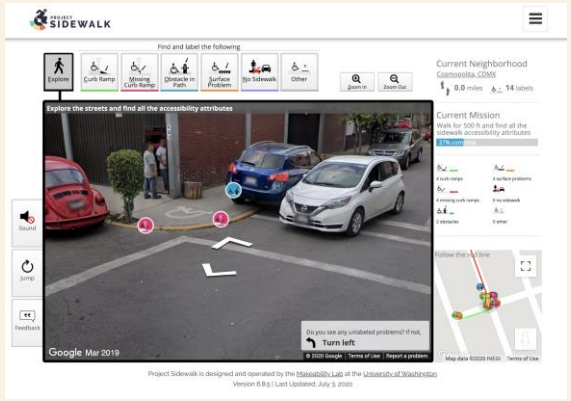
TRY IT!

PROJECT SIDEWALK

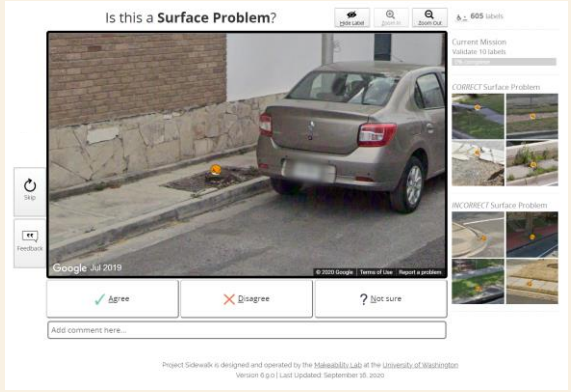
http://projectsidewalk.org

ONLINE MAP IMAGERY

REMOTE CROWDSOURCING INTERFACES



Labeling missions



Validation missions

HUMAN LABELS

MACHINE LEARNING

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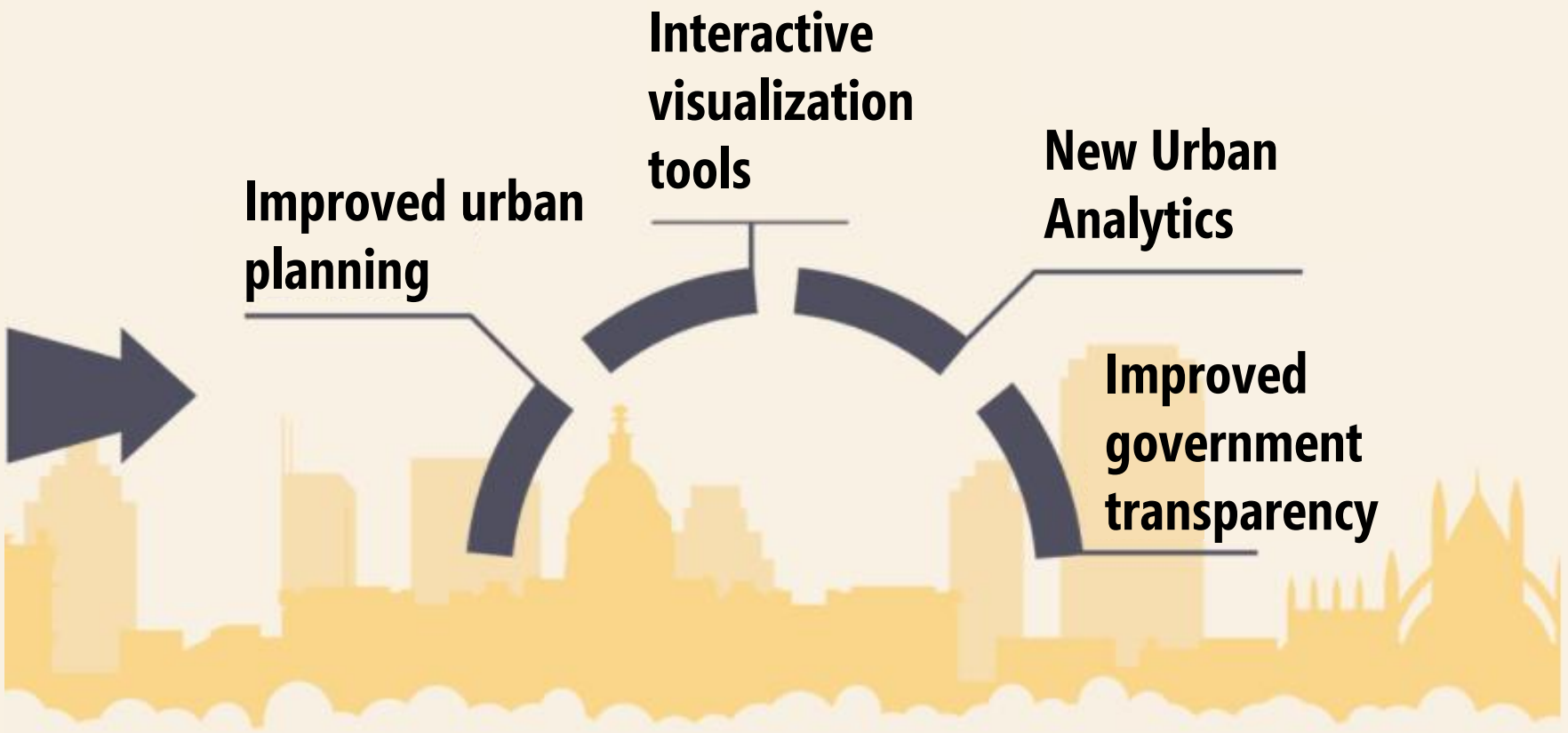
HTTP://PROJECTSIDEWALK.IO

OUTCOMES

MACHINE LEARNING



PROJECT SIDEWALK
HTTP://PROJECTSIDEWALK.IO

Tohme: Detecting Curb Ramps in Google Street View Using Crowdsourcing, Computer Vision, and Machine Learning

Kotaro Hara[1,2], Jin Sun, Robert Moore[1,2], David Jacobs, Jon E. Froehlich[1,2]
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Computer Science Department, University of Maryland, College Park
{kotaro, jinsun, dwj, jonf}@cs.umd.edu; rmoore15@umd.edu

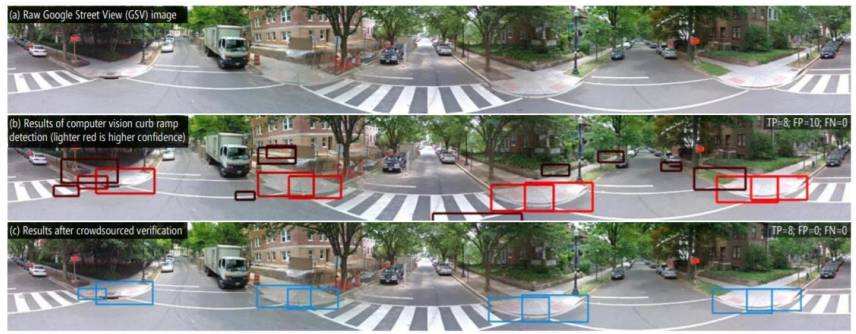

Figure 1: In this paper, we present *Tohme*, a scalable system for semi-automatically finding curb ramps in Google Streetview (GSV) panoramic imagery using computer vision, machine learning, and crowdsourcing. The images above show an actual result from our evaluation.

ABSTRACT

Building on recent prior work that combines Google Street View (GSV) and crowdsourcing to remotely collect information on physical world accessibility, we present the first "smart" system, *Tohme*, that combines machine learning, computer vision (CV), and custom crowd interfaces to find curb ramps remotely in GSV scenes. Tohme consists of two workflows, a human labeling pipeline and a CV pipeline with human verification, which are scheduled dynamically based on predicted performance. Using 1,086 GSV scenes (street intersections) from four North American cities and data from 403 crowd workers, we show that Tohme performs similarly in detecting curb ramps compared to a manual labeling approach alone (F-measure: 84% *vs*. 86% baseline) but at a 13% reduction in time cost. Our work contributes the first CV-based curb ramp detection system, a custom machine-learning based workflow controller, a validation of GSV as a viable curb ramp data source, and a detailed examination of why curb ramp detection is a hard problem along with steps forward.

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Author Keywords
Crowdsourcing accessibility, computer vision, Google Street View, Amazon Mechanical Turk

INTRODUCTION

Recent work has examined how to leverage massive online map datasets such as Google Street View (GSV) along with crowdsourcing to collect information about the accessibility of the built environment [22–26]. Early results have been promising; for example, using a manually curated set of static GSV images, Hara *et al.* [24] found that minimally trained crowd workers in Amazon Mechanical Turk (turkers) could find four types of street-level accessibility problems with 81% accuracy. However, the sole reliance on *human* labor limits scalability.

In this paper, we present Tohme[1], a scalable system for remotely collecting geo-located curb ramp data using a combination of crowdsourcing, Computer Vision (CV), machine learning, and online map data. Tohme lowers the overall human time cost of finding accessibility problems in GSV while maintaining result quality (Figure 1). As the first work in this area, we limit ourselves to sidewalk curb ramps (sometimes called "curb cuts"), which we selected because of their visual salience, geospatial properties (*e.g.,* often located on corners), and significance to accessibility.

[1] Tohme is a Japanese word that roughly translates to "remote eye."

Deep Learning for Automatically Detecting Sidewalk Accessibility Problems Using Streetscape Imagery

Galen Weld[1], Esther Jang[1], Anthony Li[2], Aileen Zeng[1], Kurtis Heimerl[1], and Jon E. Froehlich[1]
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[2]Department of Computer Science, University of Maryland, College Park, USA
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ABSTRACT

Recent work has applied machine learning methods to automatically find and/or assess pedestrian infrastructure in online map imagery (*e.g.,* satellite photos, streetscape panoramas). While promising, these methods have been limited by two interrelated issues: small training sets and the choice of machine learning model. In this paper, aided by the recently released Project Sidewalk dataset of 300,000+ image-based sidewalk accessibility labels, we present the first examination of deep learning to automatically assess sidewalks in Google Street View (GSV) panoramas. Specifically, we investigate two application areas: automatically *validating* crowdsourced labels and automatically *labeling* sidewalk accessibility issues. For both tasks, we introduce and use a residual neural network (ResNet) modified to support both image and non-image (contextual) features (*e.g.,* geography). We present an analysis of performance, the effect of our non-image features and training set size, and cross-city generalizability. Our results significantly improve on prior automated methods and, in some cases, meet or exceed human labeling performance.

Author Keywords
Neural networks, accessibility, sidewalks, computer vision

ACM Classification Keywords
I.2.10. Artificial Intelligence: Vision and Scene Understanding; I.2.6. Artificial Intelligence: Learning

INTRODUCTION

Sidewalks should benefit all of us. They provide a safe, environmentally-friendly conduit for moving about a city. For people with disabilities, sidewalks can have a significant impact on independence [47], quality of life [38], and overall physical activity [17]. While mapping tools like Google and Apple Maps have begun offering pedestrian-focused features, they do not incorporate sidewalk routes or information on sidewalk accessibility [23], which limits their utility and disproportionately affects people with disabilities. A key challenge is data: Where does it come from? How is it collected?

Traditionally, sidewalk audits—which gather data on the presence and quality of sidewalks—are performed via in-person inspections by city transit departments or community volunteers. However, these audits are expensive, labor intensive, and infrequent. [1] Moreover, the resulting data is in disparate formats, is not typically open (*i.e.,* published online), and is not intended for end-user tools [23, 50]. To expand who can collect sidewalk data and to improve data granularity and freshness, researchers have introduced smartphone-based tools [15, 46, 52] as well as instrumented wheelchairs [35, 39, 51, 57], both of which capture sidewalk information *in situ* as it's experienced. However, these tools have been limited by low adoption, small geographic coverage, and high user burden (*e.g.,* requiring users to take out their phones, load an app, take a picture, annotate it, and upload it) [20, 23].

To partially address these scalability issues, researchers have begun developing automated methods for sidewalk assessment using machine learning and online imagery (*e.g.,* satellite photos [10, 8], panoramic streetscape imagery [31, 32, 59]). While still early, these complementary approaches promise to dramatically decrease manual labor and cost. However, they have been limited by two interrelated issues: small training sets and the choice in machine learning model—both of which negatively impact performance. In this paper, we attempt to address both of these issues.

We present the first examination of deep learning methods to automatically assess sidewalk accessibility in terms of *curb ramps*, *missing curb ramps*, *surface problems*, and *sidewalk obstructions* from widely available streetscape imagery. Our work is enabled by the recently released Project Sidewalk open dataset, which contains a corpus of 300,000+ image-based sidewalk accessibility labels collected via remote crowdsourcing in Google Street View (GSV) [55] (Figure 1). Specifically, we investigate two application tasks using GSV panoramas: automatically *validating* crowdsourced labels and automatically *labeling* sidewalk accessibility issues.

Our research questions include:

- **R1:** How well does our machine learning approach perform across our two tasks (validation and labeling)?
- **R2:** What is the impact of additional, non-image related training features on performance?
- **R3:** How does classification accuracy change as a function of training data amount?
- **R4:** How well does our model generalize across cities?

To address these questions, we trained two sets of deep convolutional neural networks using ResNet-18 [33]—one set for

[1] As one example, the Seattle Department of Transportation completed their first ever sidewalk assessment in 2016, which took 14 interns nearly a year to complete. [1]

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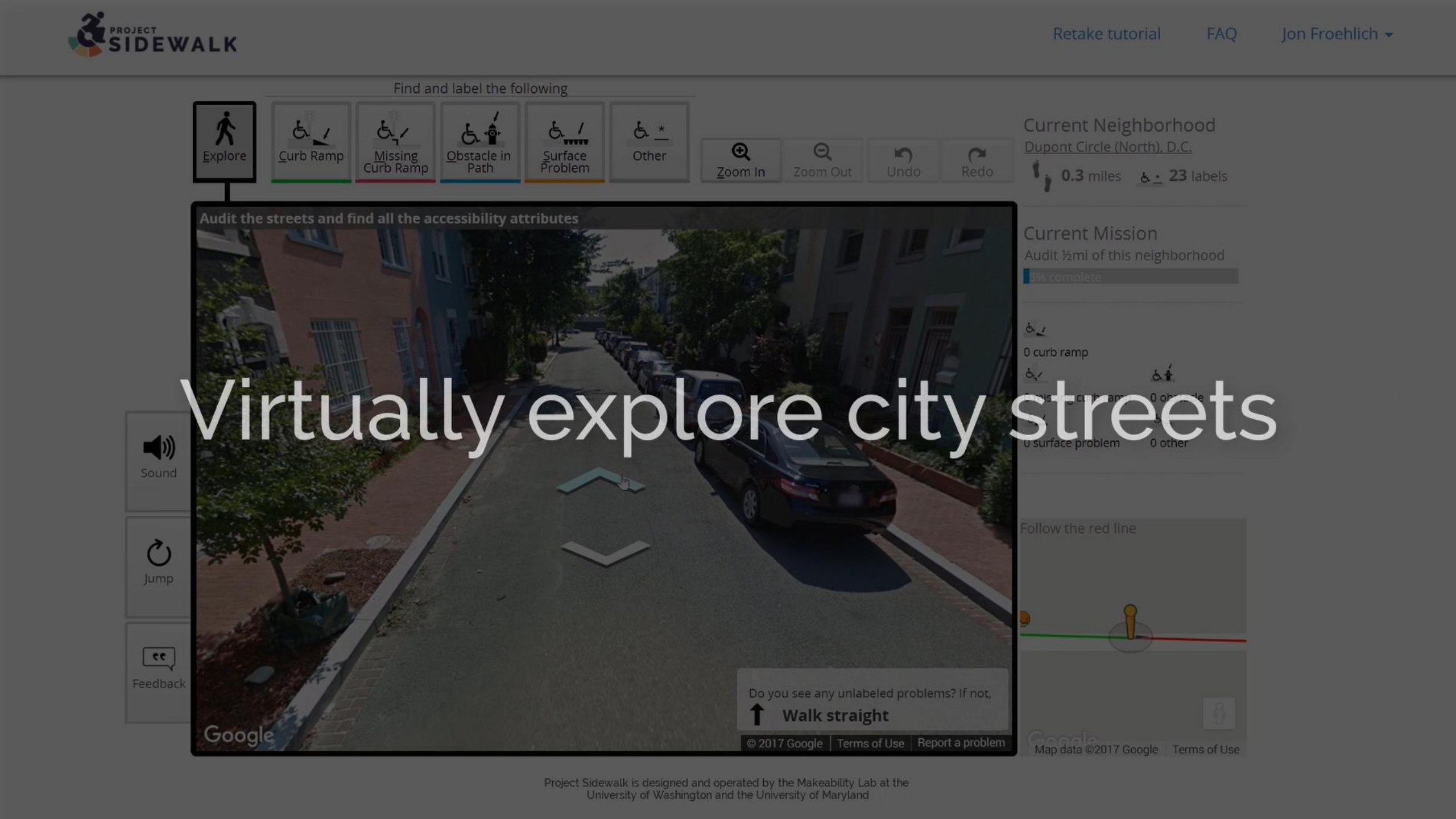
DOI: 10.1145/3308561.3353798


PROJECT SIDEWALK
Retake tutorial
FAQ
Jon Froehlich
Find and label the following
Explore
Curb Ramp
Missing Curb Ramp
Obstacle in Path
Surface Problem
Other
Zoom In
Zoom Out
Undo
Redo
Current Neighborhood
Dupont Circle (North), D.C.
0.3 miles
23 labels
Current Mission
Audit ½mi of this neighborhood
0% complete
0 curb ramp
0 surface problem
0 other
Audit the streets and find all the accessibility attributes
Virtually explore city streets
Sound
Jump
Feedback
Follow the red line
Do you see any unlabeled problems? If not,
Walk straight
Google
© 2017 Google
Terms of Use
Report a problem
Map data ©2017 Google
Terms of Use
Project Sidewalk is designed and operated by the Makeability Lab at the
University of Washington and the University of Maryland

PROJECT SIDEWALK

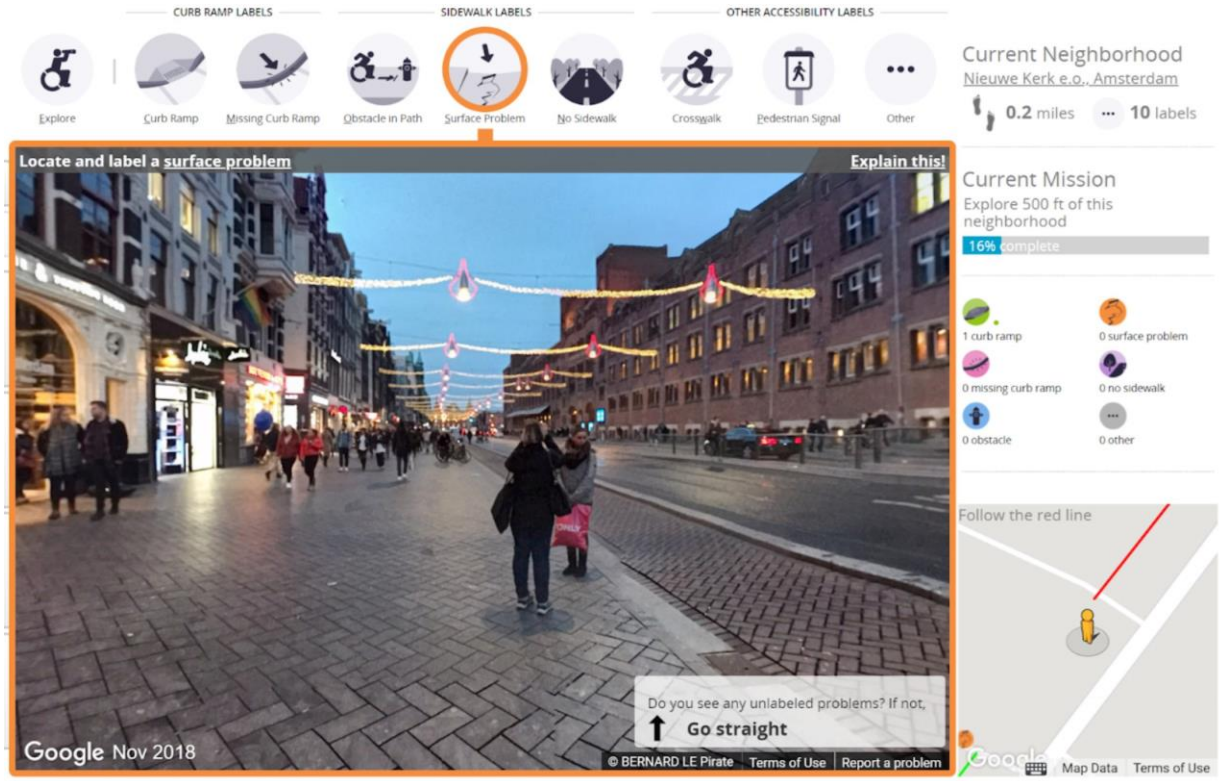
REMOTE CROWDSOURCING

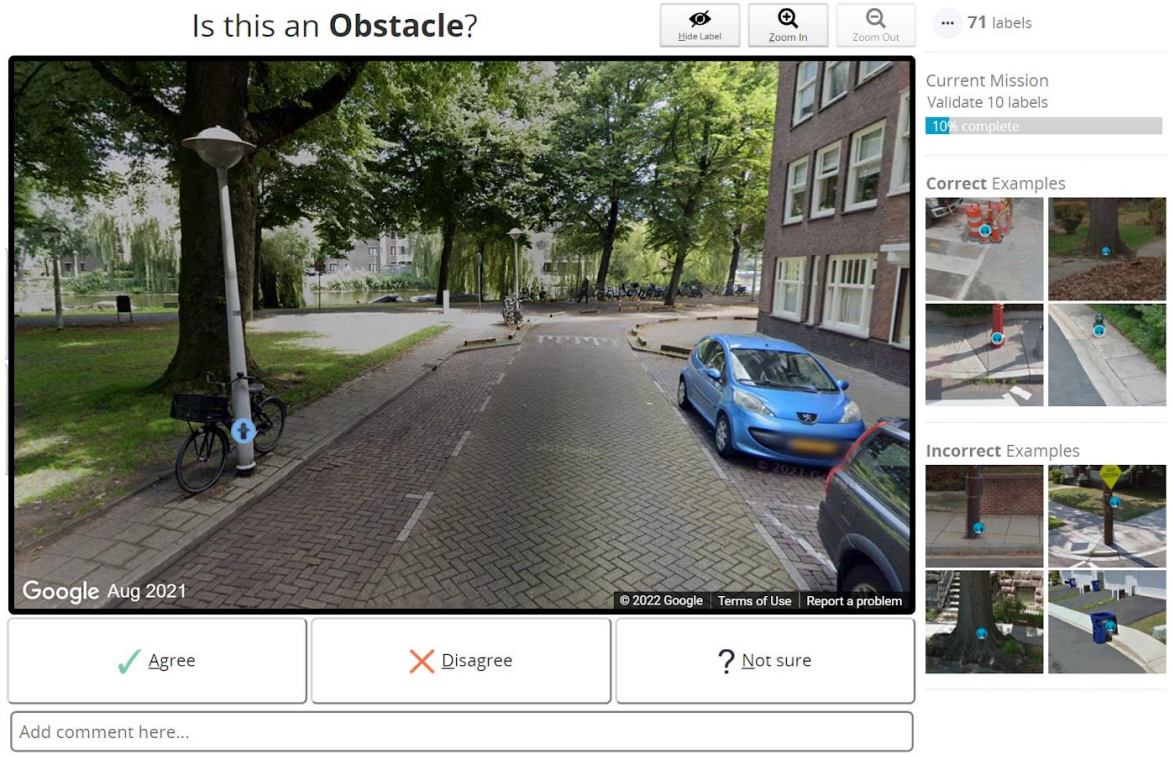
LABELING MEXICO CITY FROM GERMANY!

Source: Edgar Martínez, Liga Peatonal

PROJECT SIDEWALK

TWO DATA COLLECTION MISSIONS



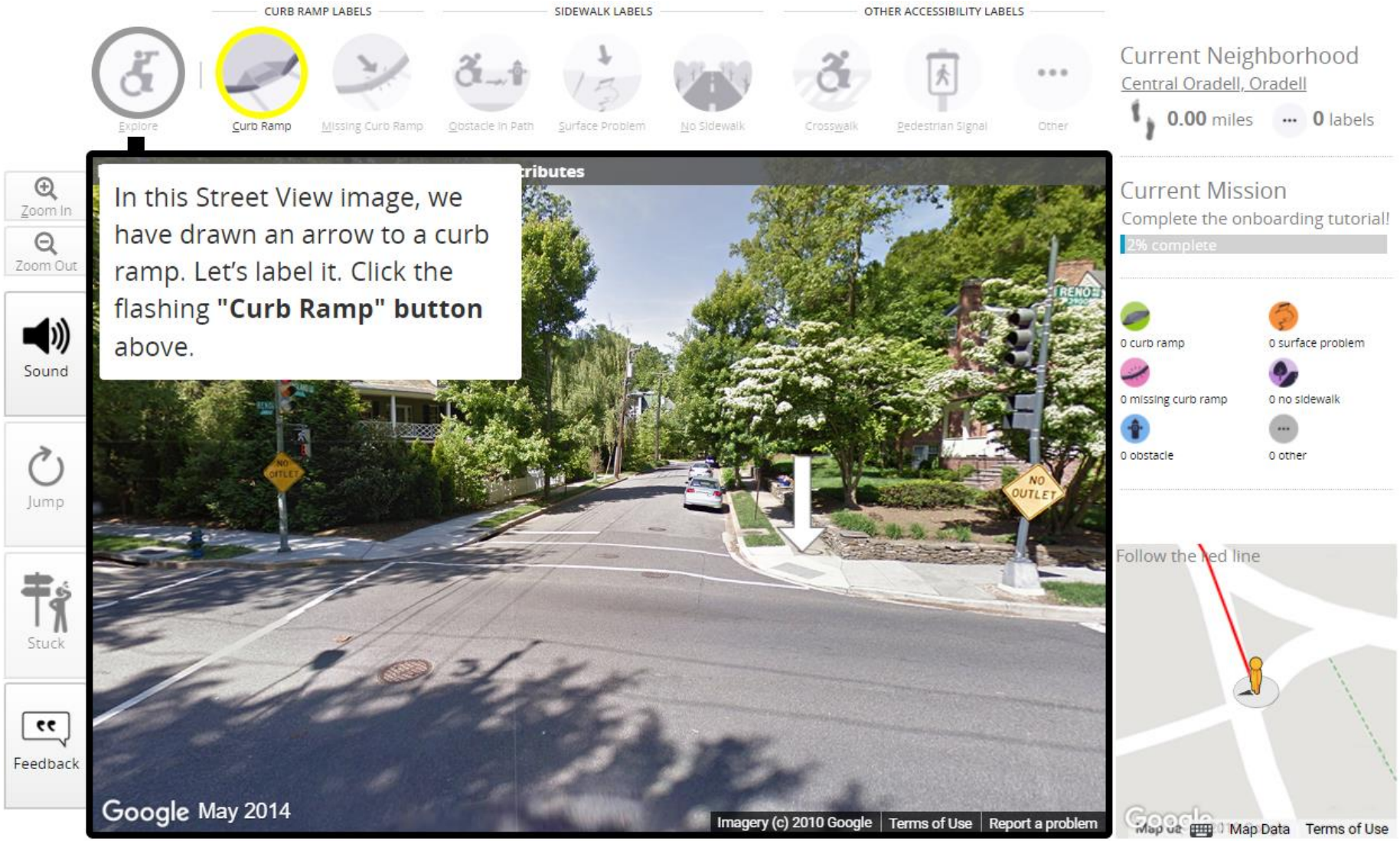


1 FIND, LABEL, & ASSESS SIDEWALKS

2 VALIDATING & CORRECTING LABELS

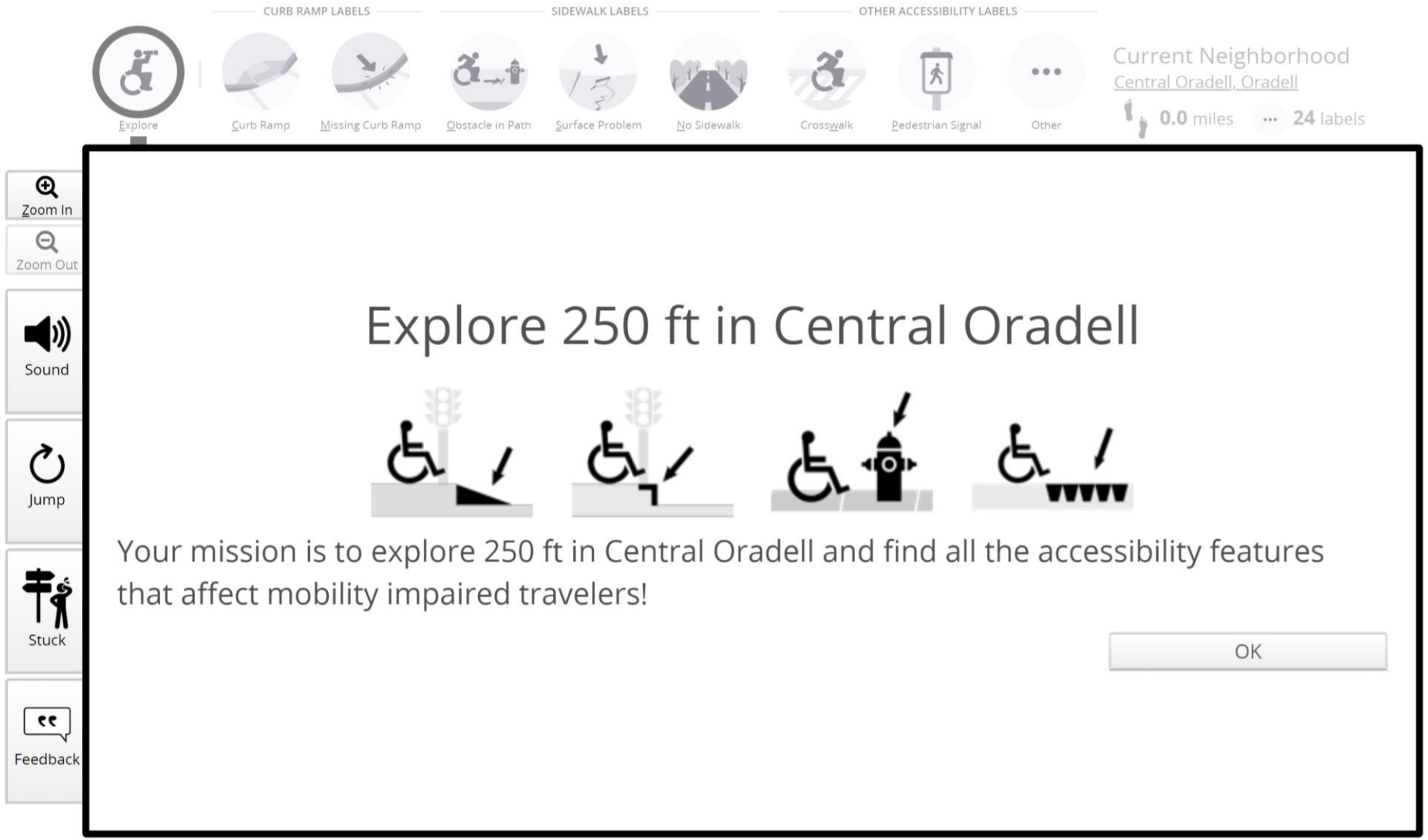
PROJECT SIDEWALK

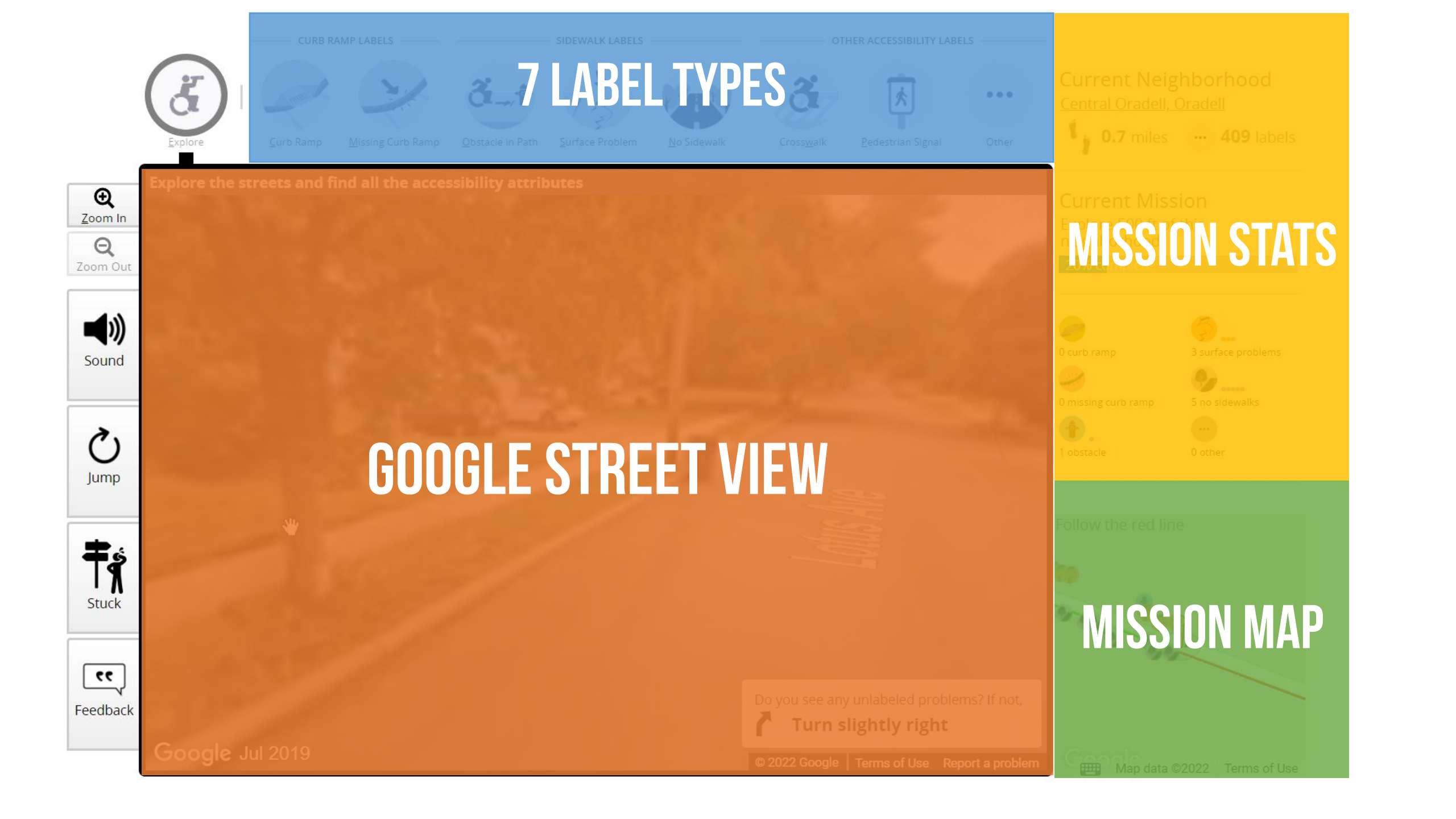
FIRST MISSION: INTERACTIVE TUTORIAL



PROJECT SIDEWALK

EXPLORATION MISSION




CURB RAMP LABELS
SIDEWALK LABELS
OTHER ACCESSIBILITY LABELS
7 LABEL TYPES
Explore
Curb Ramp
Missing Curb Ramp
Obstacle in Path
Surface Problem
No Sidewalk
Crosswalk
Pedestrian Signal
Other
Current Neighborhood
Central Oradell, Oradell
0.7 miles
409 labels
Current Mission
MISSION STATS
0 curb ramp
3 surface problems
0 missing curb ramp
5 no sidewalks
1 obstacle
0 other
Zoom In
Zoom Out
Sound
Jump
Stuck
Feedback
Explore the streets and find all the accessibility attributes
GOOGLE STREET VIEW
Do you see any unlabeled problems? If not,
Turn slightly right
Google Jul 2019
© 2022 Google
Terms of Use
Report a problem
Follow the red line
MISSION MAP
Map data ©2022
Terms of Use

CURB RAMP LABELS | SIDEWALK LABELS | OTHER ACCESSIBILITY LABELS

Explore | Curb Ramp | Missing Curb Ramp | Obstacle in Path | Surface Problem | No Sidewalk | Crosswalk | Pedestrian Signal | Other

Zoom In

Zoom Out

Sound

Jump

Stuck

Feedback

Current Neighborhood

Central Oradell, Oradell

0.0 miles | **33** labels

Current Mission

Explore 250 ft of this neighborhood

0% complete

4 curb ramps

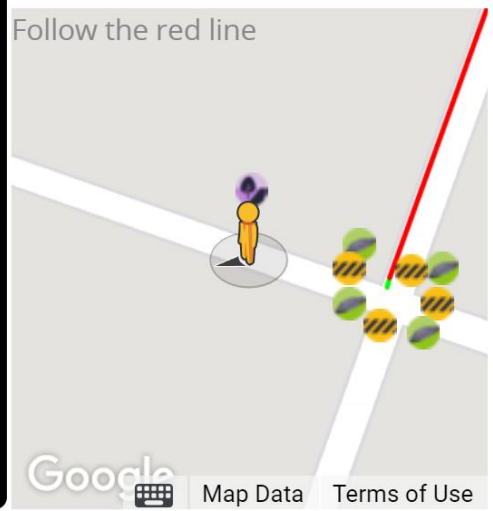
0 surface problem

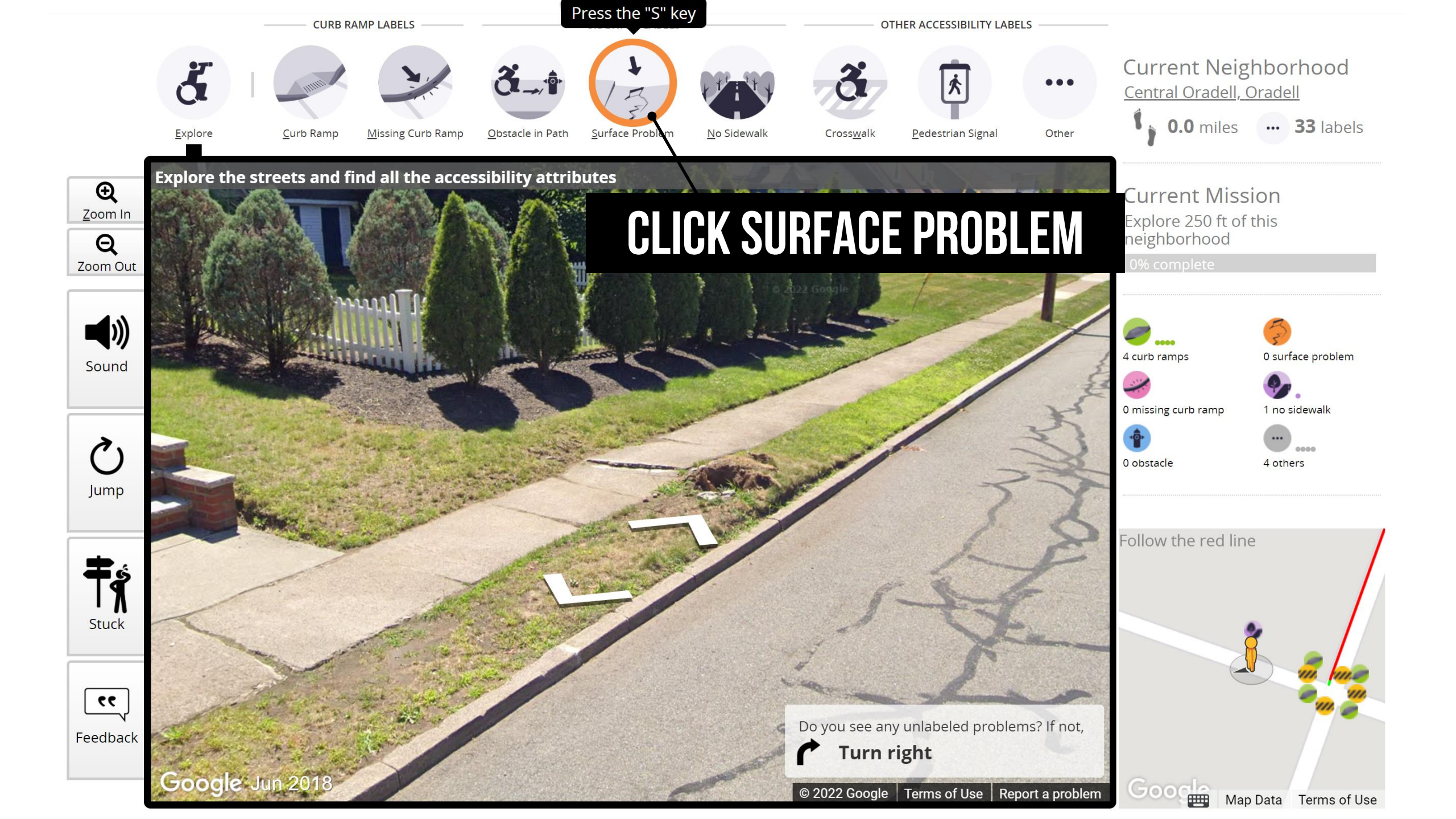
0 missing curb ramp

1 no sidewalk

0 obstacle

4 others




Press the "S" key
CURB RAMP LABELS
OTHER ACCESSIBILITY LABELS
Explore
Curb Ramp
Missing Curb Ramp
Obstacle in Path
Surface Problem
No Sidewalk
Crosswalk
Pedestrian Signal
Other
Current Neighborhood
Central Oradell, Oradell
0.0 miles
33 labels
Explore the streets and find all the accessibility attributes
CLICK SURFACE PROBLEM
Zoom In
Zoom Out
Sound
Jump
Stuck
Feedback
Current Mission
Explore 250 ft of this neighborhood
0% complete
4 curb ramps
0 surface problem
0 missing curb ramp
1 no sidewalk
0 obstacle
4 others
Follow the red line
Do you see any unlabeled problems? If not,
Turn right
Google Jun 2018
© 2022 Google
Terms of Use
Report a problem
Google
Map Data
Terms of Use

CURB RAMP LABELS | SIDEWALK LABELS | OTHER ACCESSIBILITY LABELS

Explore | Curb Ramp | Missing Curb Ramp | Obstacle in Path | Surface Problem | No Sidewalk | Crosswalk | Pedestrian Signal | Other

Zoom In

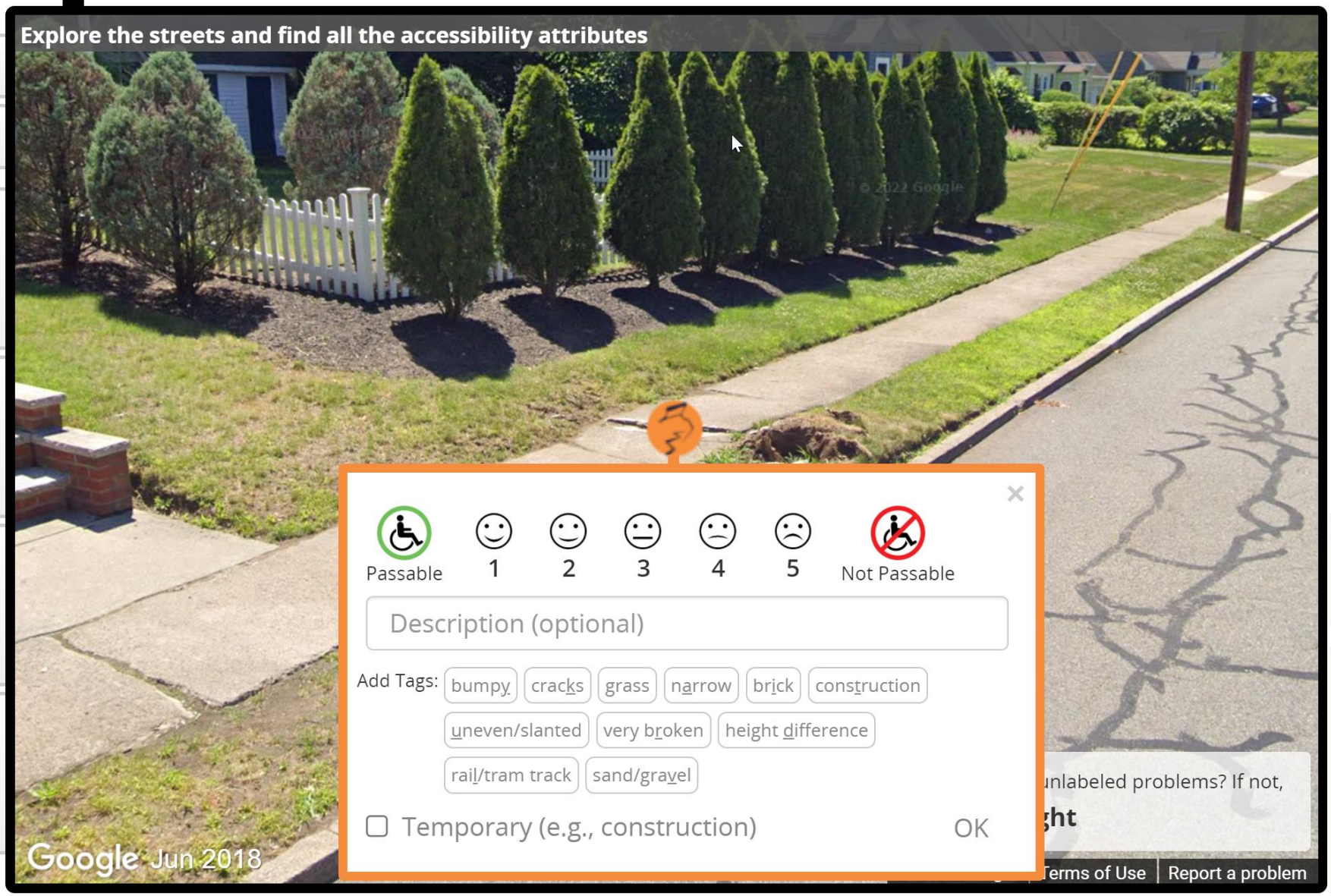
Zoom Out

Sound

Jump

Stuck

Feedback



Current Neighborhood

Central Oradell, Oradell

0.0 miles | **34** labels

Current Mission

Explore 250 ft of this neighborhood

0% complete

4 curb ramps

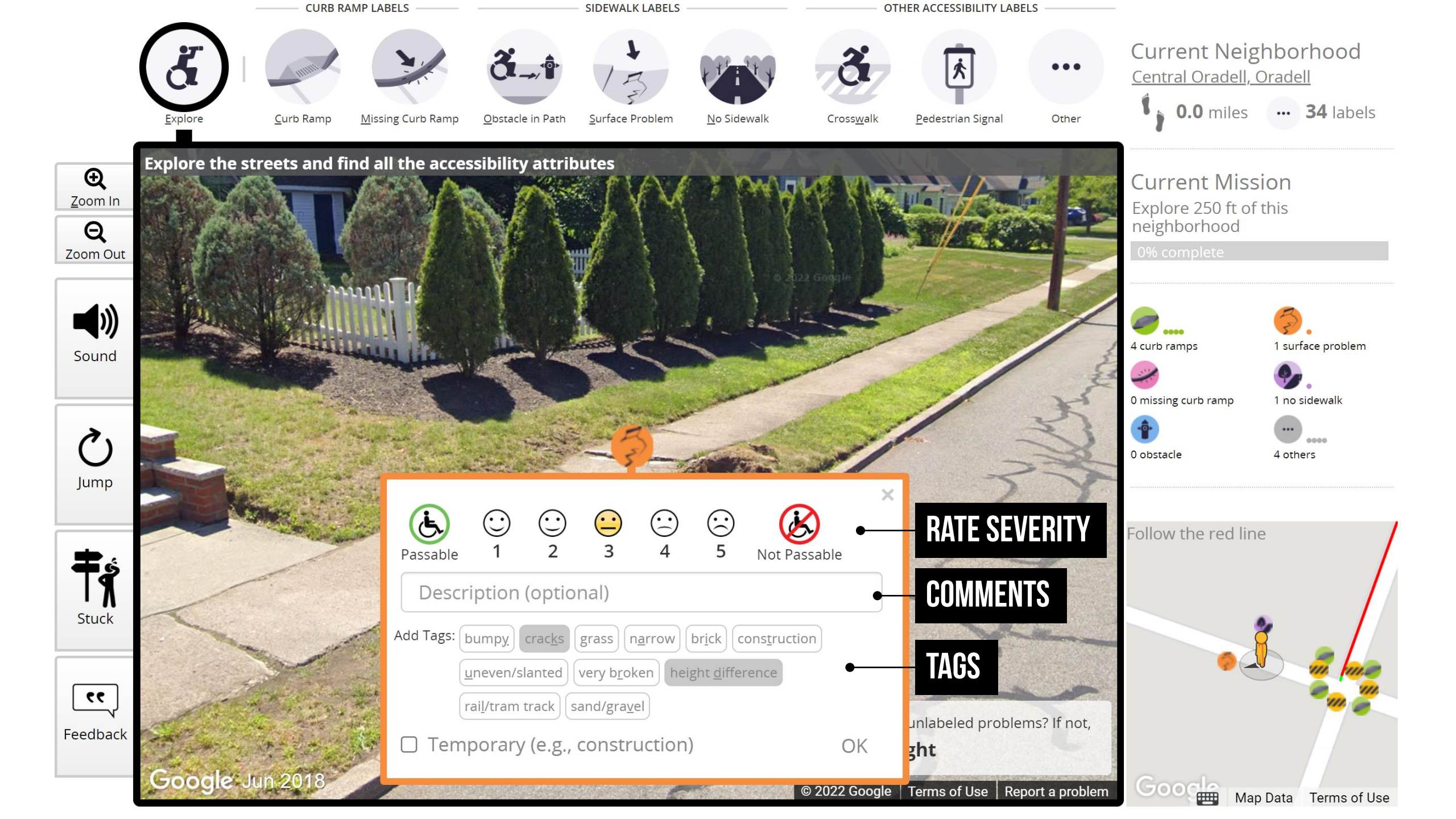
1 surface problem

0 missing curb ramp

1 no sidewalk

0 obstacle

4 others


CURB RAMP LABELS
SIDEWALK LABELS
OTHER ACCESSIBILITY LABELS
Explore
Curb Ramp
Missing Curb Ramp
Obstacle in Path
Surface Problem
No Sidewalk
Crosswalk
Pedestrian Signal
Other
Current Neighborhood
Central Oradell, Oradell
0.0 miles
34 labels
Zoom In
Zoom Out
Sound
Jump
Stuck
Feedback
Explore the streets and find all the accessibility attributes
Current Mission
Explore 250 ft of this neighborhood
0% complete
4 curb ramps
1 surface problem
0 missing curb ramp
1 no sidewalk
0 obstacle
4 others
Passable
1
2
3
4
5
Not Passable
RATE SEVERITY
Description (optional)
COMMENTS
Add Tags:
bumpy
cracks
grass
narrow
brick
construction
uneven/slanted
very broken
height difference
rail/tram track
sand/gravel
TAGS
Temporary (e.g., construction)
OK
unlabeled problems? If not,
ght
Google Jun 2018
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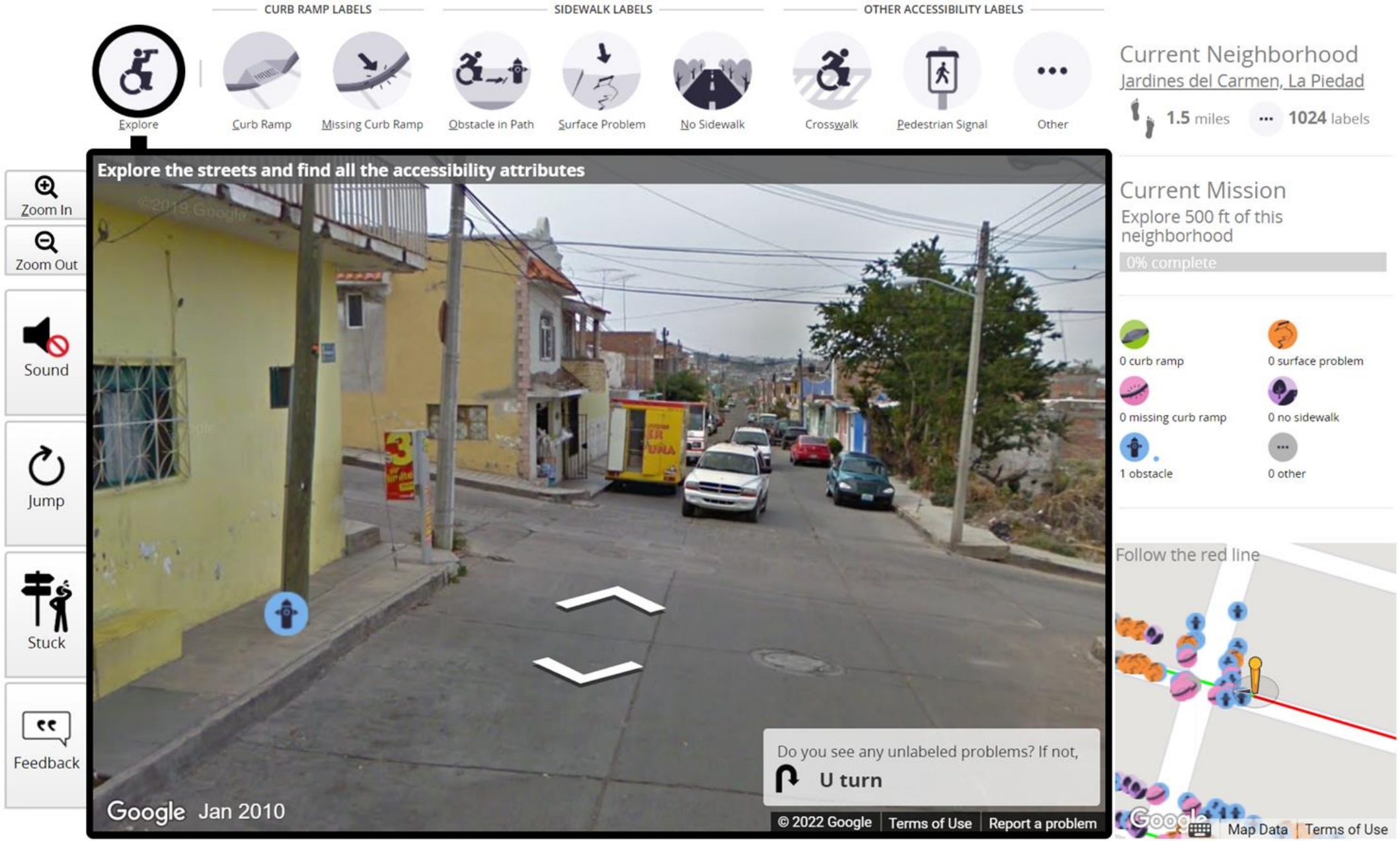
Terms of Use
Report a problem
Follow the red line
Google
Map Data
Terms of Use


CURB RAMP LABELS
SIDEWALK LABELS
OTHER ACCESSIBILITY LABELS
Explore
Curb Ramp
Missing Curb Ramp
Obstacle in Path
Surface Problem
No Sidewalk
Crosswalk
Pedestrian Signal
Other
Current Neighborhood
Jardines del Carmen, La Piedad
1.5 miles
1024 labels
Explore the streets and find all the accessibility attributes
Zoom In
Zoom Out
Sound
Jump
Stuck
Feedback
Current Mission
Explore 500 ft of this neighborhood
0% complete
0 curb ramp
0 surface problem
0 missing curb ramp
0 no sidewalk
1 obstacle
0 other
Follow the red line
Do you see any unlabeled problems? If not,
U turn
Google Jan 2010
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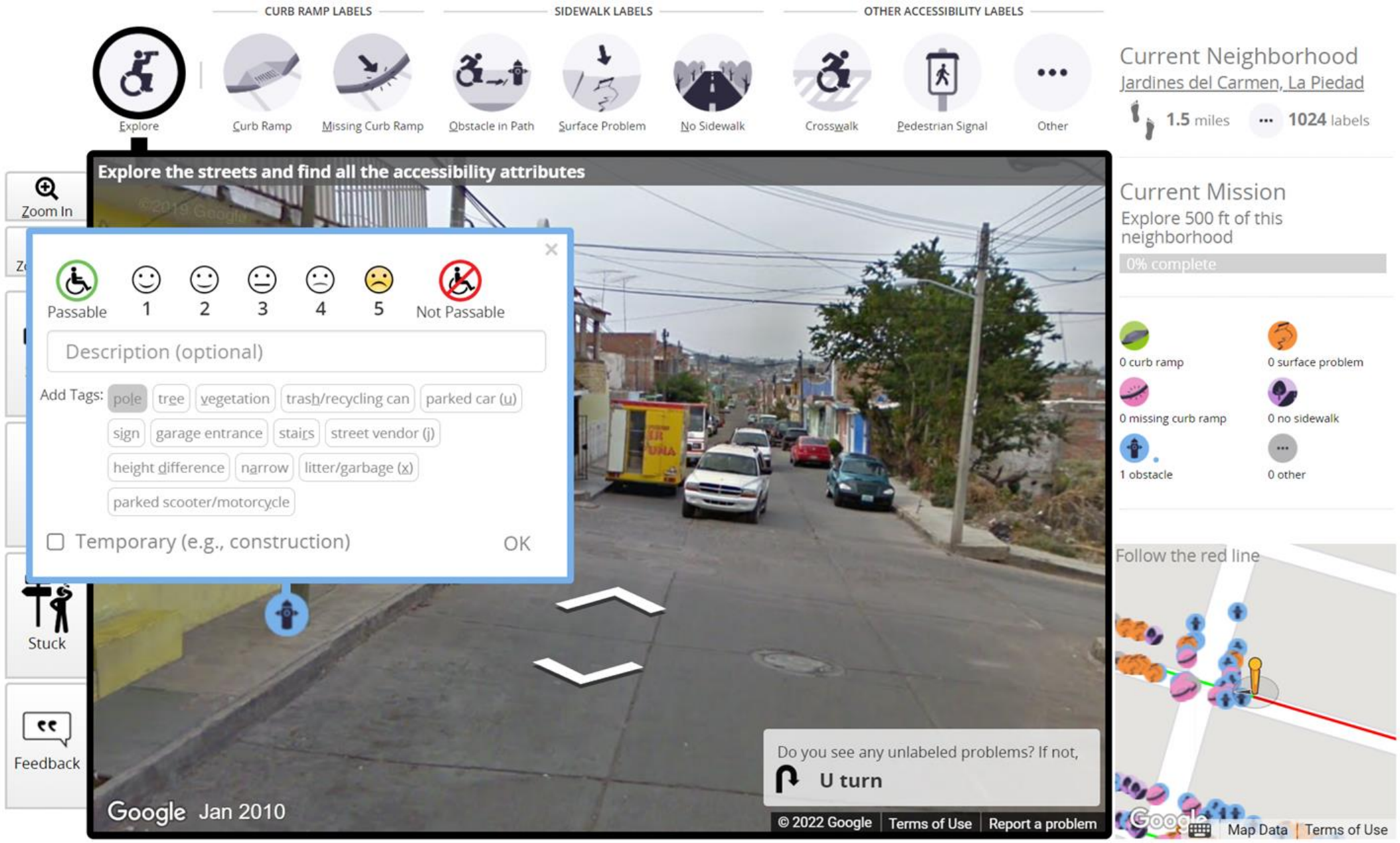
Report a problem
Map Data
Terms of Use


CURB RAMP LABELS
SIDEWALK LABELS
OTHER ACCESSIBILITY LABELS
Explore
Curb Ramp
Missing Curb Ramp
Obstacle in Path
Surface Problem
No Sidewalk
Crosswalk
Pedestrian Signal
Other
Current Neighborhood
Jardines del Carmen, La Piedad
1.5 miles
1024 labels
Explore the streets and find all the accessibility attributes
Zoom In
Stuck
Feedback
Passable
1
2
3
4
5
Not Passable
Description (optional)
Add Tags:
pole
tree
vegetation
trash/recycling can
parked car (u)
sign
garage entrance
stairs
street vendor (j)
height difference
narrow
litter/garbage (x)
parked scooter/motorcycle
Temporary (e.g., construction)
OK
Current Mission
Explore 500 ft of this neighborhood
0% complete
0 curb ramp
0 surface problem
0 missing curb ramp
0 no sidewalk
1 obstacle
0 other
Follow the red line
Do you see any unlabeled problems? If not,
U turn
Google Jan 2010
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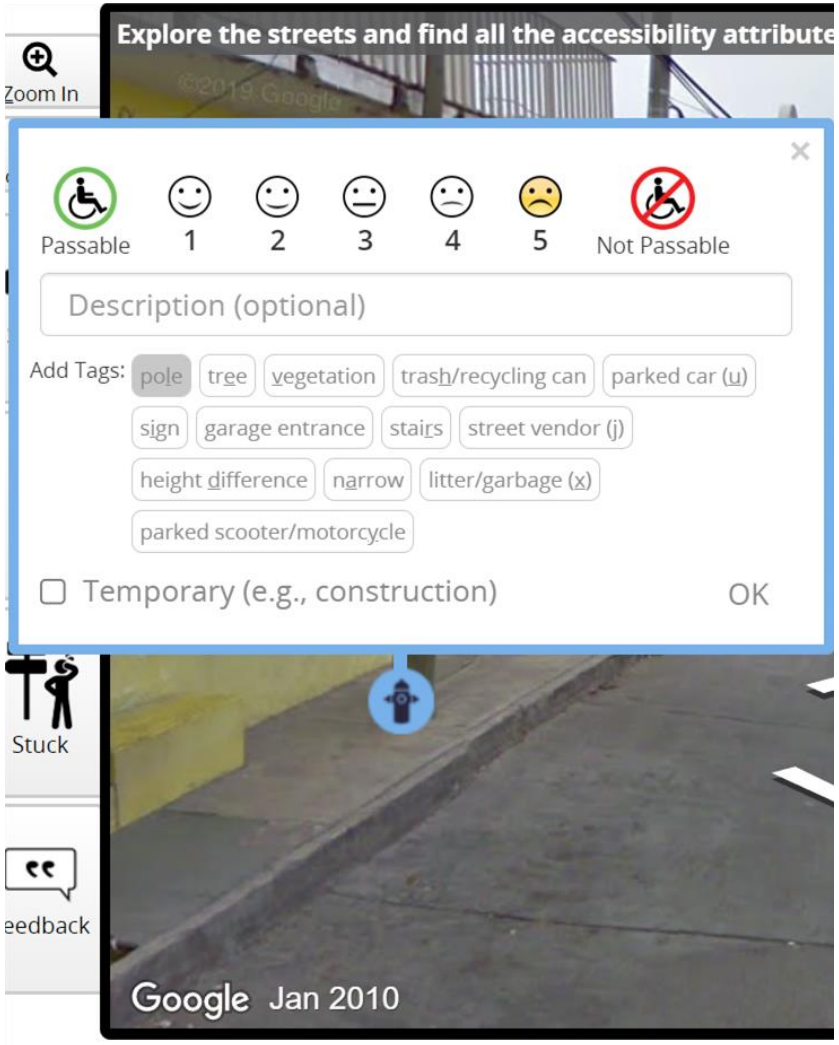
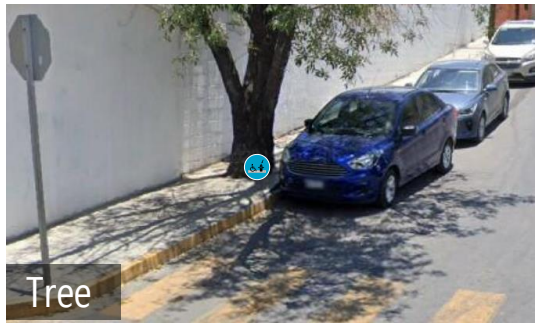
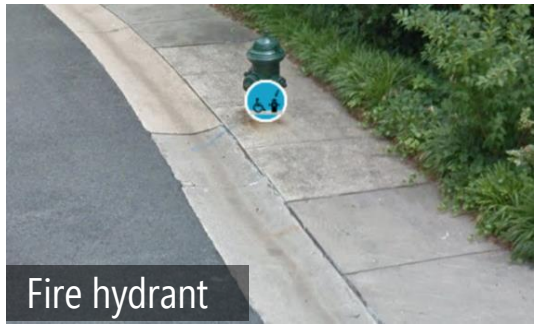
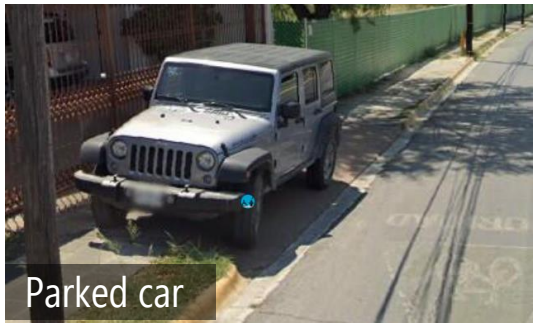
Report a problem
Map Data
Terms of Use

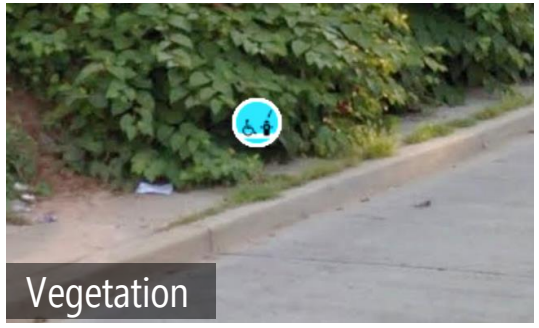
EXAMPLE OBSTACLE TAGS





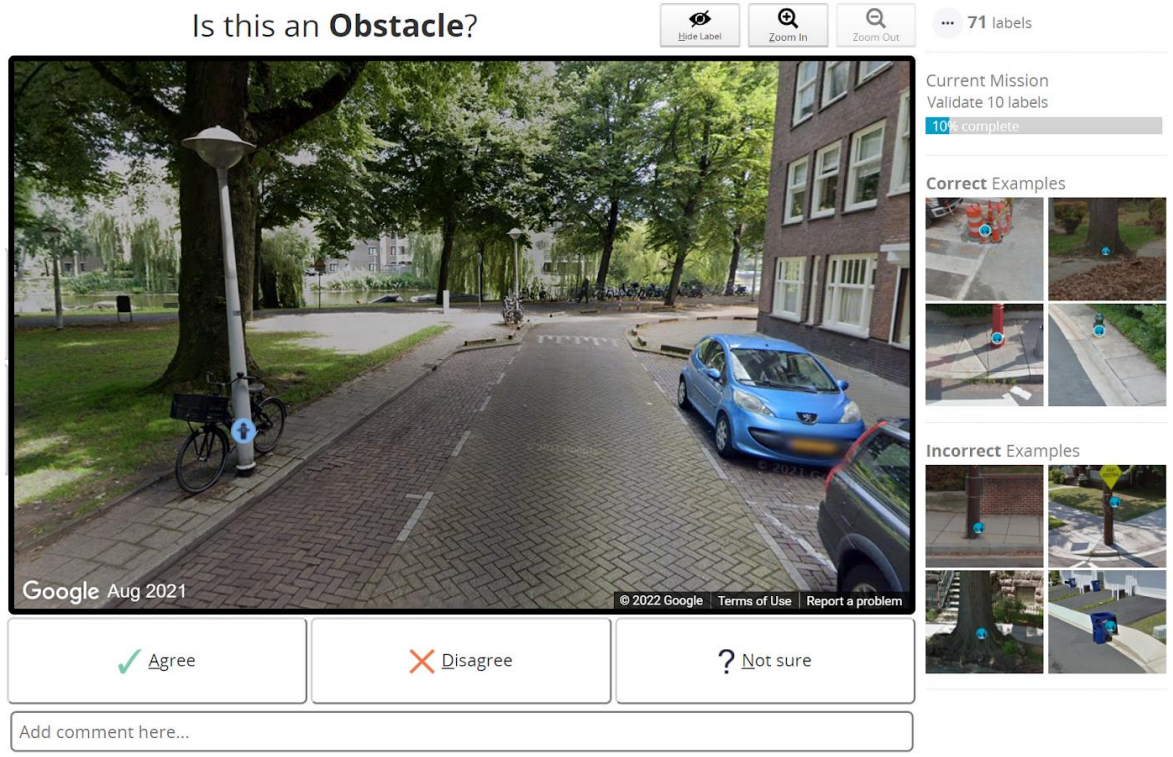






PROJECT SIDEWALK

TWO DATA COLLECTION MISSIONS



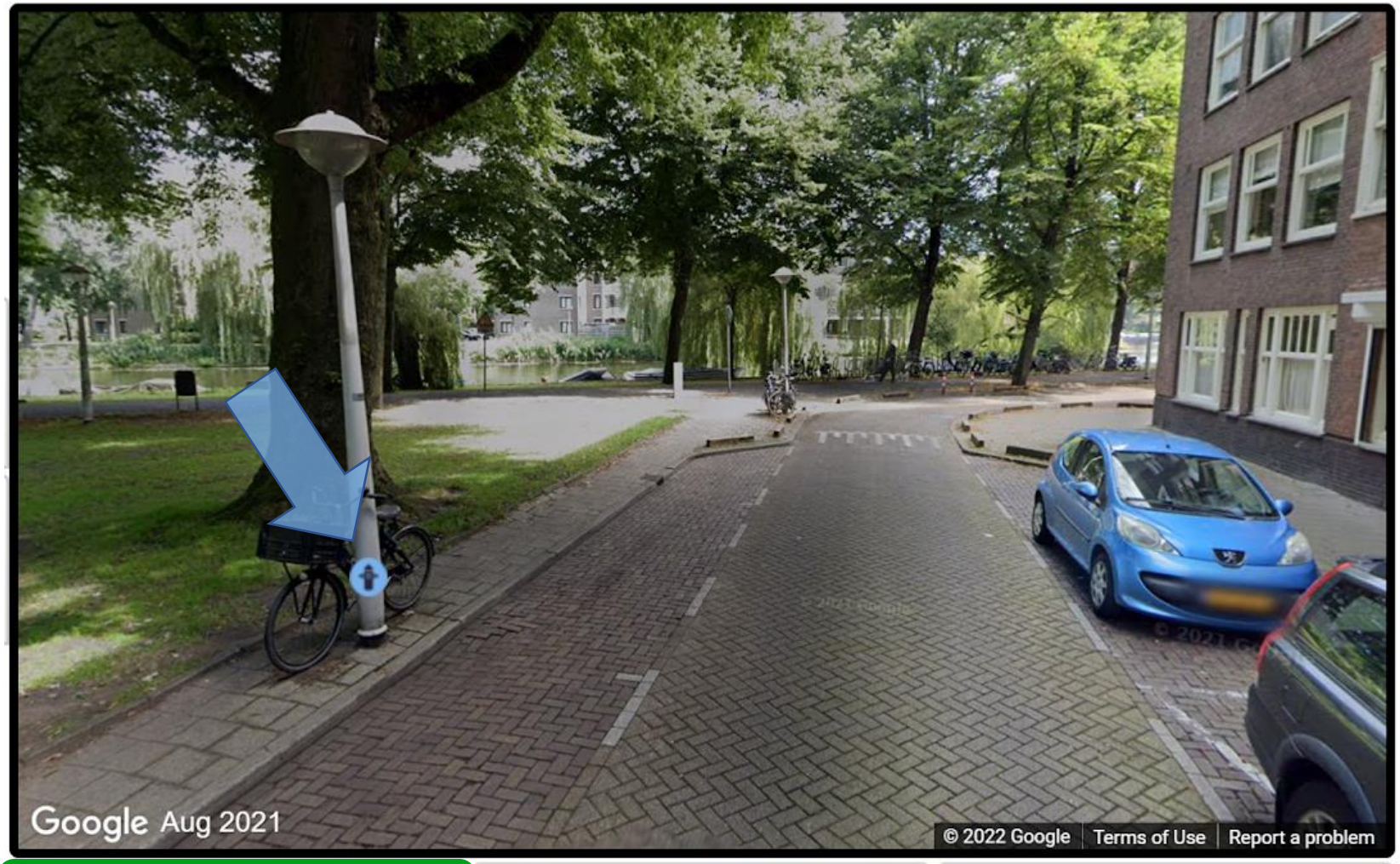
1 FIND, LABEL, & ASSESS SIDEWALKS

2 VALIDATING & CORRECTING LABELS

Is this an **Obstacle**?

Hide Label | Zoom In | Zoom Out

71 labels



✓ Agree | ✗ Disagree | ? Not sure

Add comment here...

Current Mission
Validate 10 labels
10% complete

Correct Examples

Incorrect Examples

Is this a **Missing Curb Ramp**?

Hide Label | Zoom In | Zoom Out

1113 labels

Current Mission
Validate 10 labels
50% complete

CORRECT Missing Curb Ramp

INCORRECT Missing Curb Ramp

✓ Agree | ✗ Disagree | ? Not sure

Add comment here...

Is this a **Missing Curb Ramp**?

Hide Label | Zoom In | Zoom Out

1113 labels

Current Mission
Validate 10 labels
50% complete

CORRECT Missing Curb Ramp

INCORRECT Missing Curb Ramp

✓ Agree | ✗ Disagree | ? Not sure

Add comment here...

Hide Label

Is this a **Surface Problem**?

Zoom In | Zoom Out

9 labels

Skip

Feedback

✓ Agree

✗ Disagree

? Not sure

Current Mission

Validate 10 labels

90% complete

Surface Problem

NOT a Surface Problem

Is this a **Surface Problem**?

Hide Label | Zoom In | Zoom Out

3337 labels

Skip

Feedback

✓ Agree

✗ Disagree

? Not sure

Add comment here...

Current Mission

Validate 10 labels

0% complete

Correct Examples

Incorrect Examples

Is this an **Obstacle**?

Hide Label | Zoom In | Zoom Out

934 labels

Skip

Feedback

✓ Agree | ✗ Disagree | ? Not sure

Add comment here...

Current Mission
Validate 10 labels
0% complete

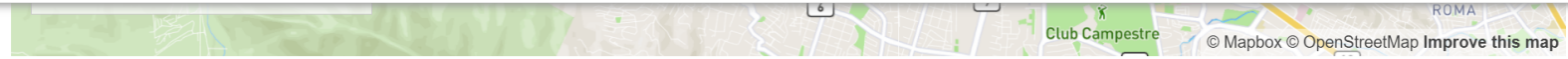
Correct Examples

Incorrect Examples

Image source: montgomeryplanning.org


Image source: montgomeryplanning.org
ONLY MARK BARRIERS IN THE PEDESTRIAN PATH
Frontage Zone
Pedestrian Zone
Planting/ Furnishing
Curb Zone
Bike Facility
Buffer

We also try to make Project Sidewalk **fun** and **educational**



Your missions	Distance	Labels	Validations	Accuracy
140	2.03 mi	568	1249	90.7%

Achievements

Missions

Congratulations, you've earned all mission badges!

Distance

Thanks for helping! **2.97 more miles** until your next achievement.

Labels

Great job! **432 more labels** until your next achievement.

Validations

Amazing work! **3751 more validations** until your next achievement.

Overall Leaderboard

Leaders are calculated based on their labels, distance, and accuracy

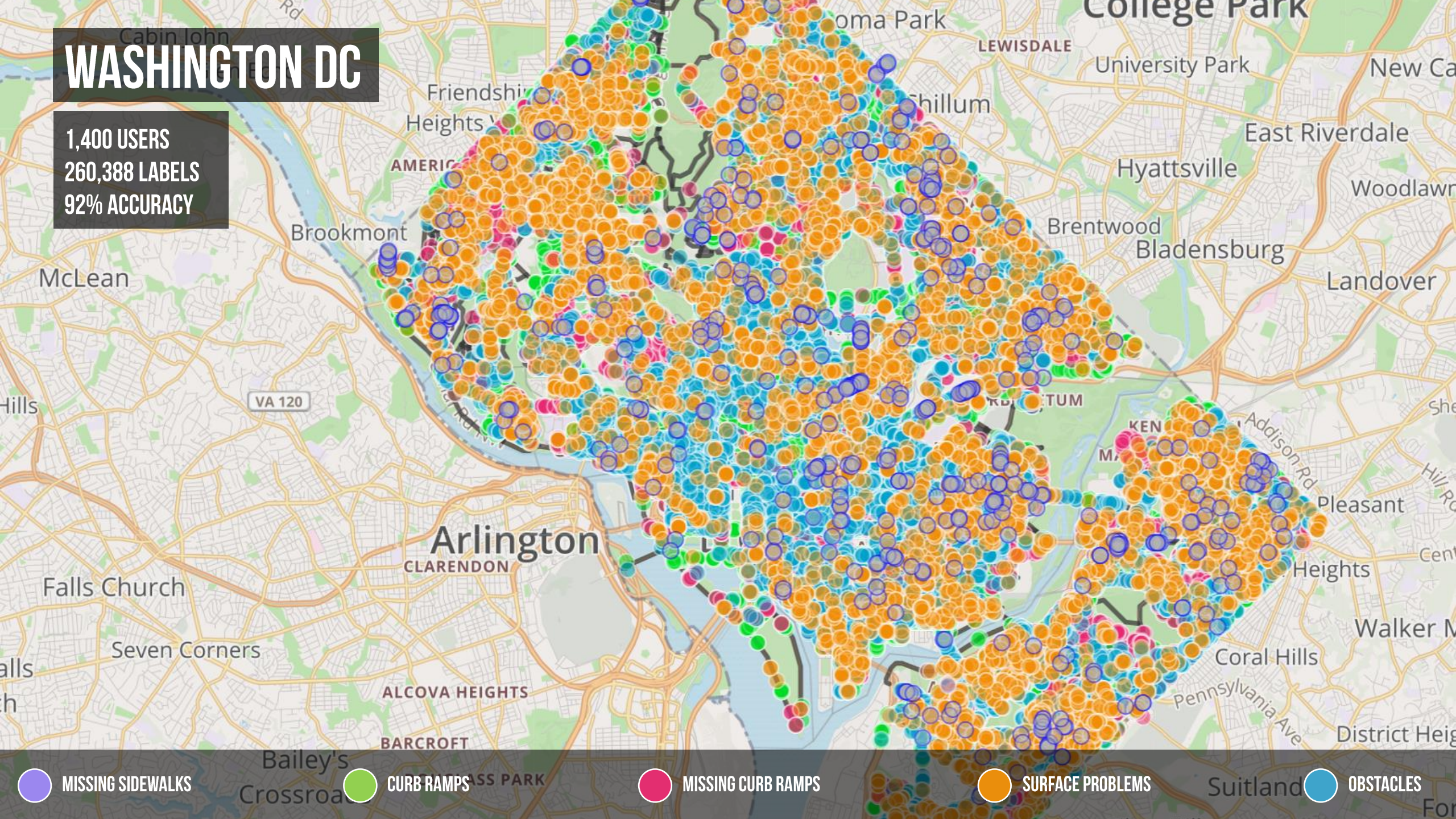
#	Username	Labels	Missions	Distance	Accuracy
1	mariana.velasco	2894	150	9.6 miles	85.3%
2	maria	1918	51	9.0 miles	89.1%
3	abarragan99	1895	81	2.7 miles	86.5%
4	marian.trevino	1543	66	9.4 miles	82.2%
5	dordaz	1483	46	3.5 miles	84.2%
6	Gerardo R	1274	86	5.4 miles	87.6%
7	mariagarza	1205	62	9.4 miles	87.2%
8	ana.alvarezc	1053	63	9.8 miles	84.8%
9	Gari01234	848	62	4.6 miles	89.1%
10	Luis Gonzalez	812	59	9.7 miles	94.1%

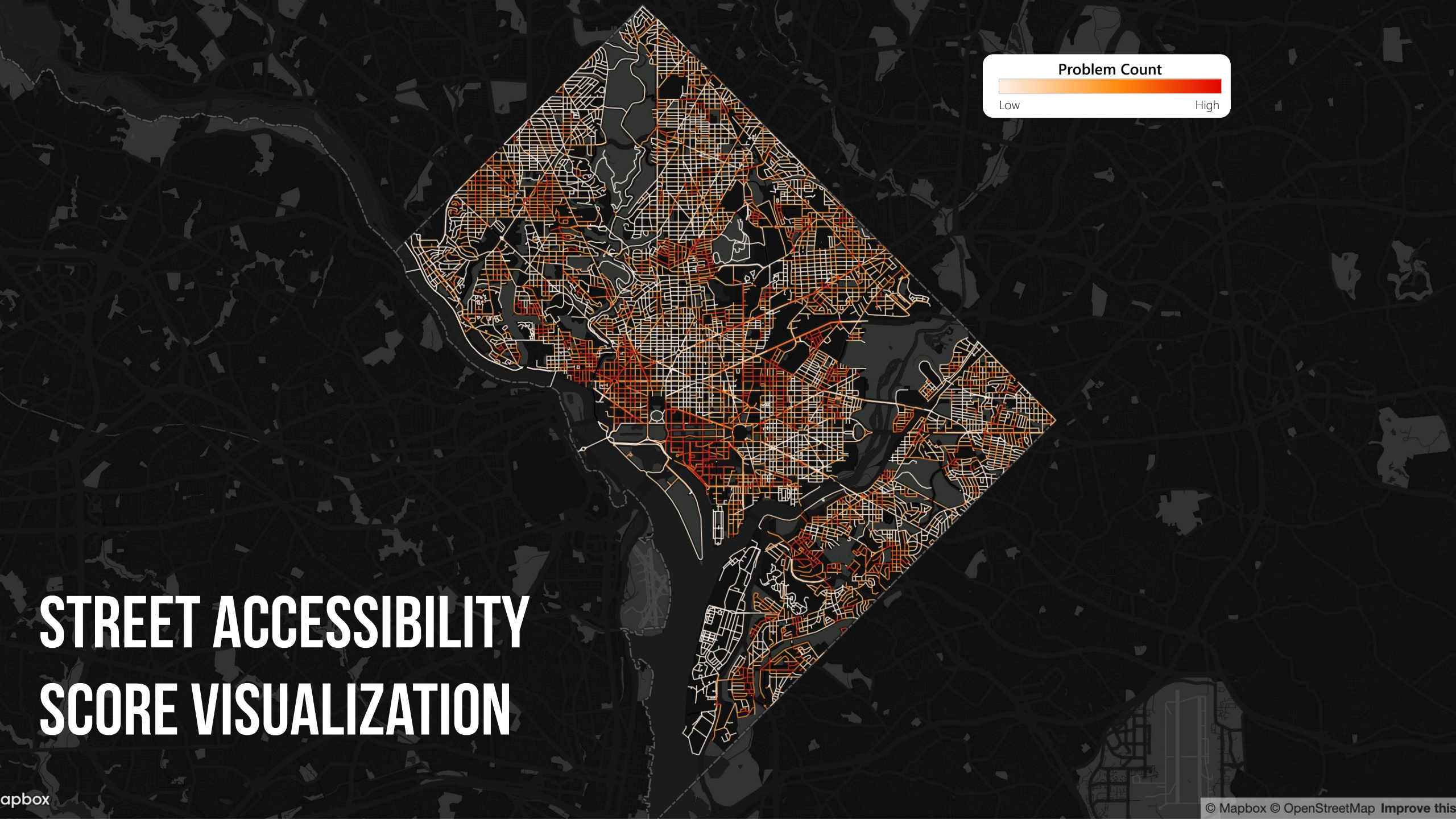
Want to make it into the Top 10? Start exploring!

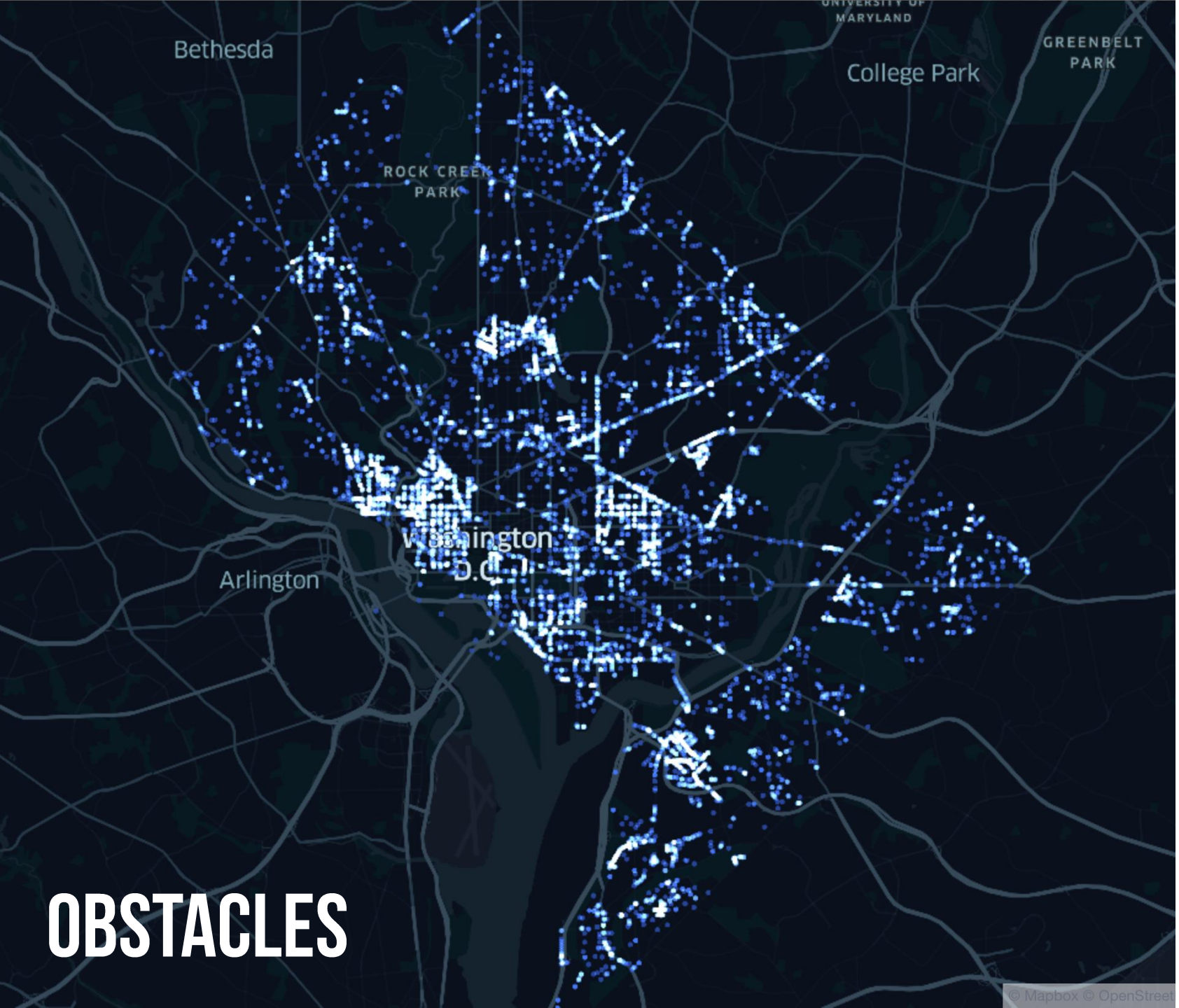
PILOT DEPLOYMENT IN 2017

Washington DC

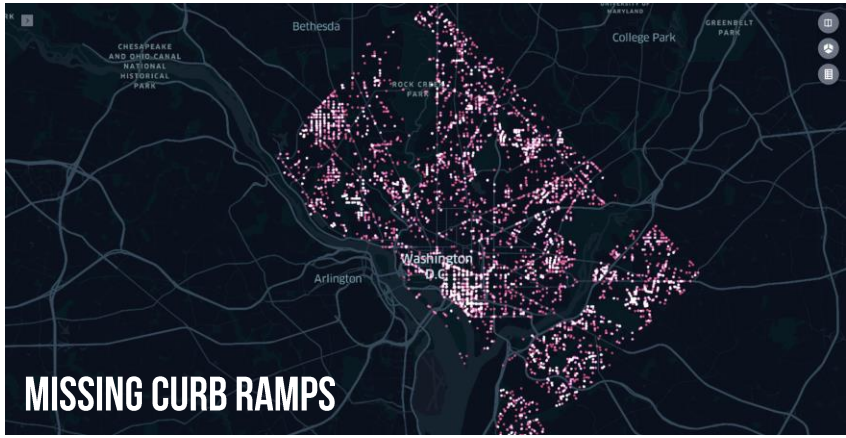
PROJECT SIDEWALK


WASHINGTON DC
1,400 USERS
260,388 LABELS
92% ACCURACY
College Park
LEWISDALE
University Park
East Riverdale
Hyattsville
Brentwood
Bladensburg
Landover
Brookmont
McLean
VA 120
Arlington
CLARENDON
Falls Church
Seven Corners
ALCOVA HEIGHTS
BARCROFT
Coral Hills
Pleasant
Addison Rd
Pennsylvania Ave
MISSING SIDEWALKS
CURB RAMPS
MISSING CURB RAMPS
SURFACE PROBLEMS
OBSTACLES

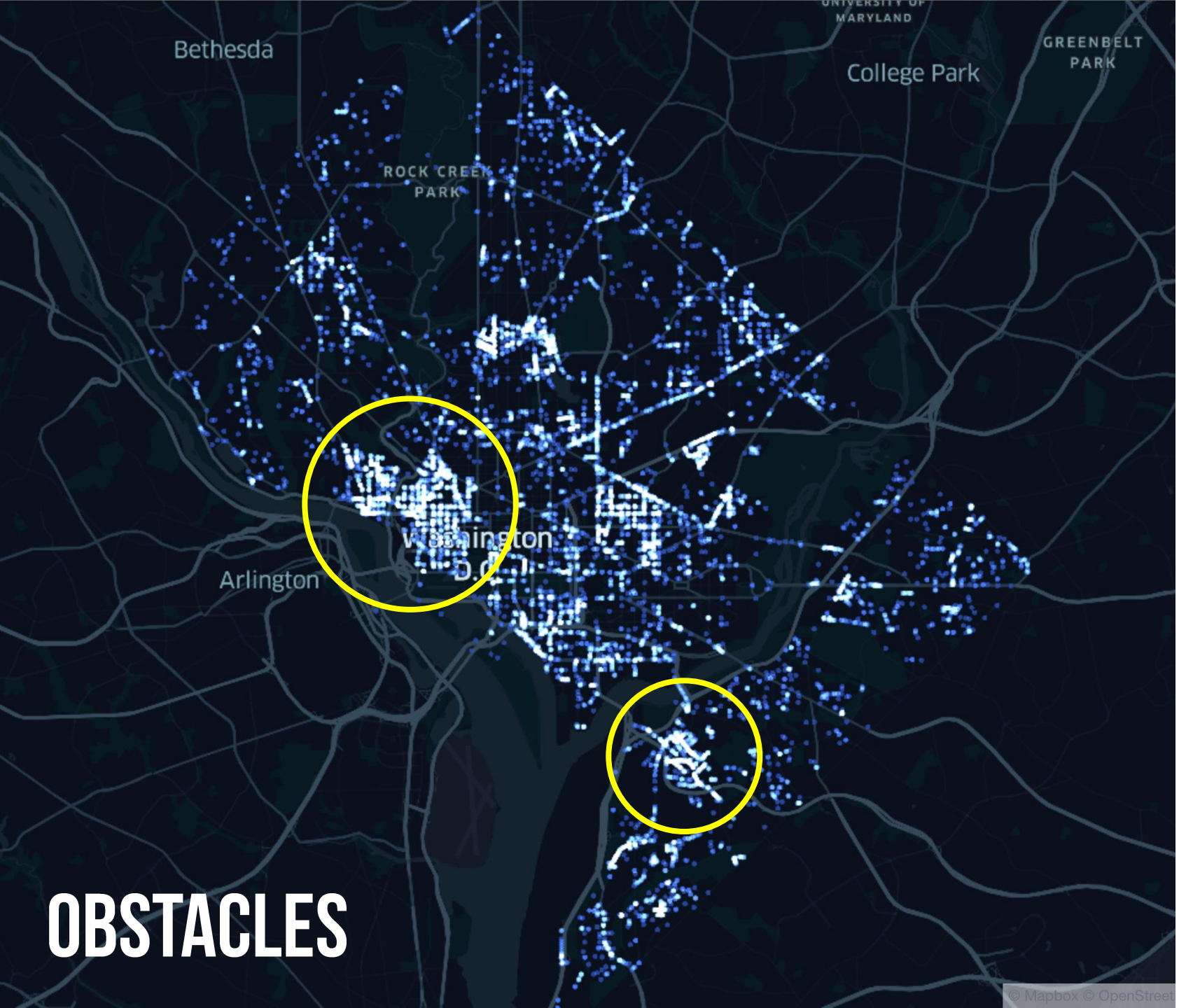

Problem Count
Low
High
STREET ACCESSIBILITY
SCORE VISUALIZATION
apbox
© Mapbox © OpenStreetMap Improve this


Bethesda
UNIVERSITY OF MARYLAND
College Park
GREENBELT PARK
ROCK CREEK PARK
Washington D.C.
Arlington
OBSTACLES

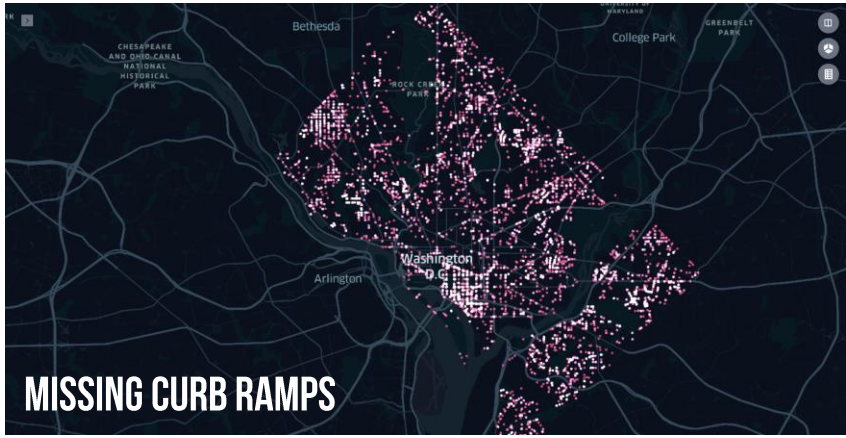

Bethesda
College Park
Arlington
CURB RAMPS


Bethesda
College Park
Washington D.C.
Arlington
MISSING CURB RAMPS

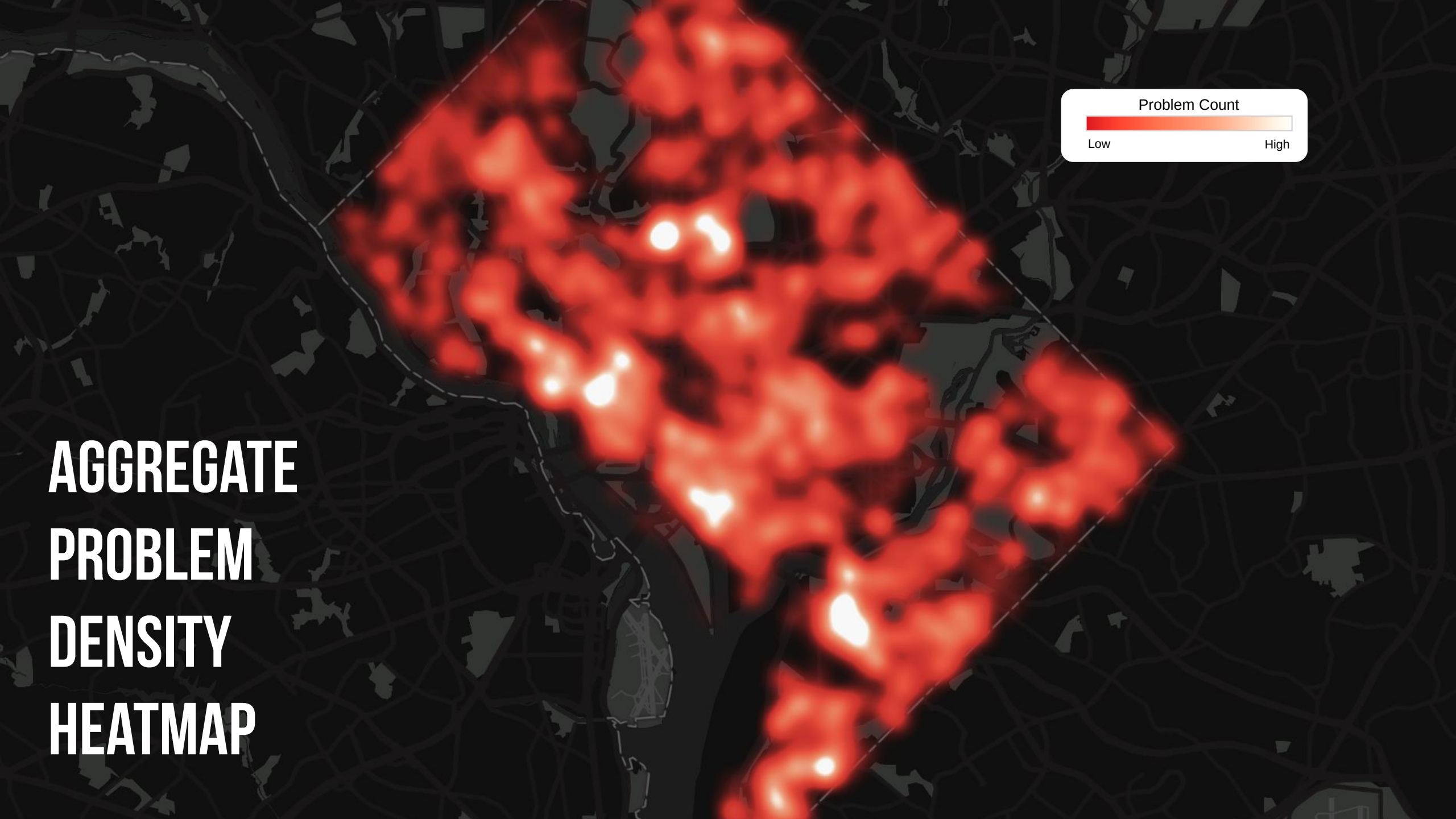

Bethesda
College Park
Washington D.C.
Arlington
SURFACE PROBLEMS


Bethesda
College Park
GREENBELT PARK
ROCK CREEK PARK
Arlington
OBSTACLES


CURB RAMPS


MISSING CURB RAMPS


SURFACE PROBLEMS



AGGREGATE PROBLEM DENSITY HEATMAP

AGGREGATE PROBLEM DENSITY HEATMAP

Problem Count

Low High

Anacostia

Lower socio-economic area

92% Black, 5% Non-Hispanic White, 3% Other

Problem Count

Low High

Georgetown

Highly affluent, historic area

82% White, 8.7% Asian, 6.2% Black,

Anacostia

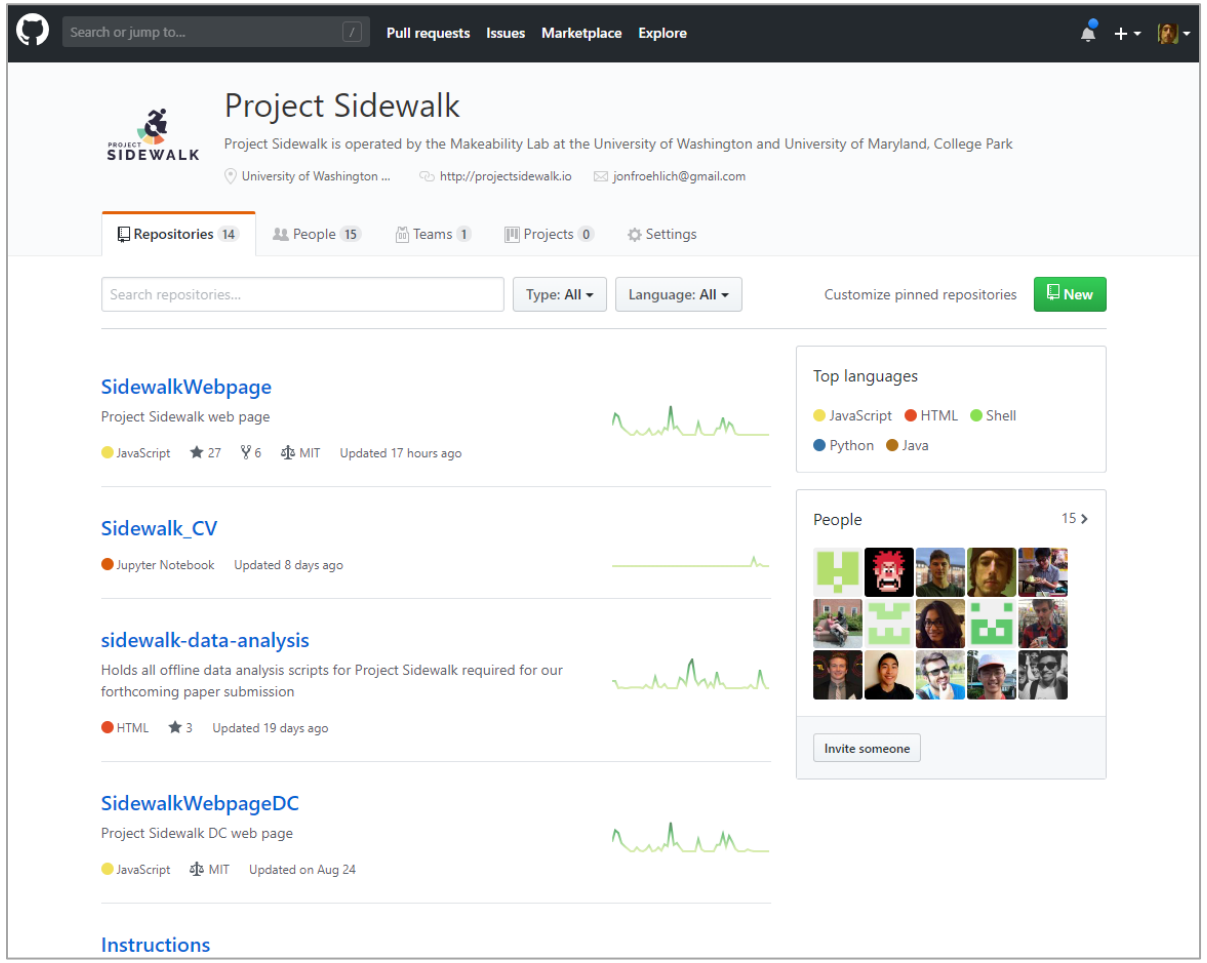
Lower socio-economic area

92% Black, 5% Non-Hispanic White, 3% Other

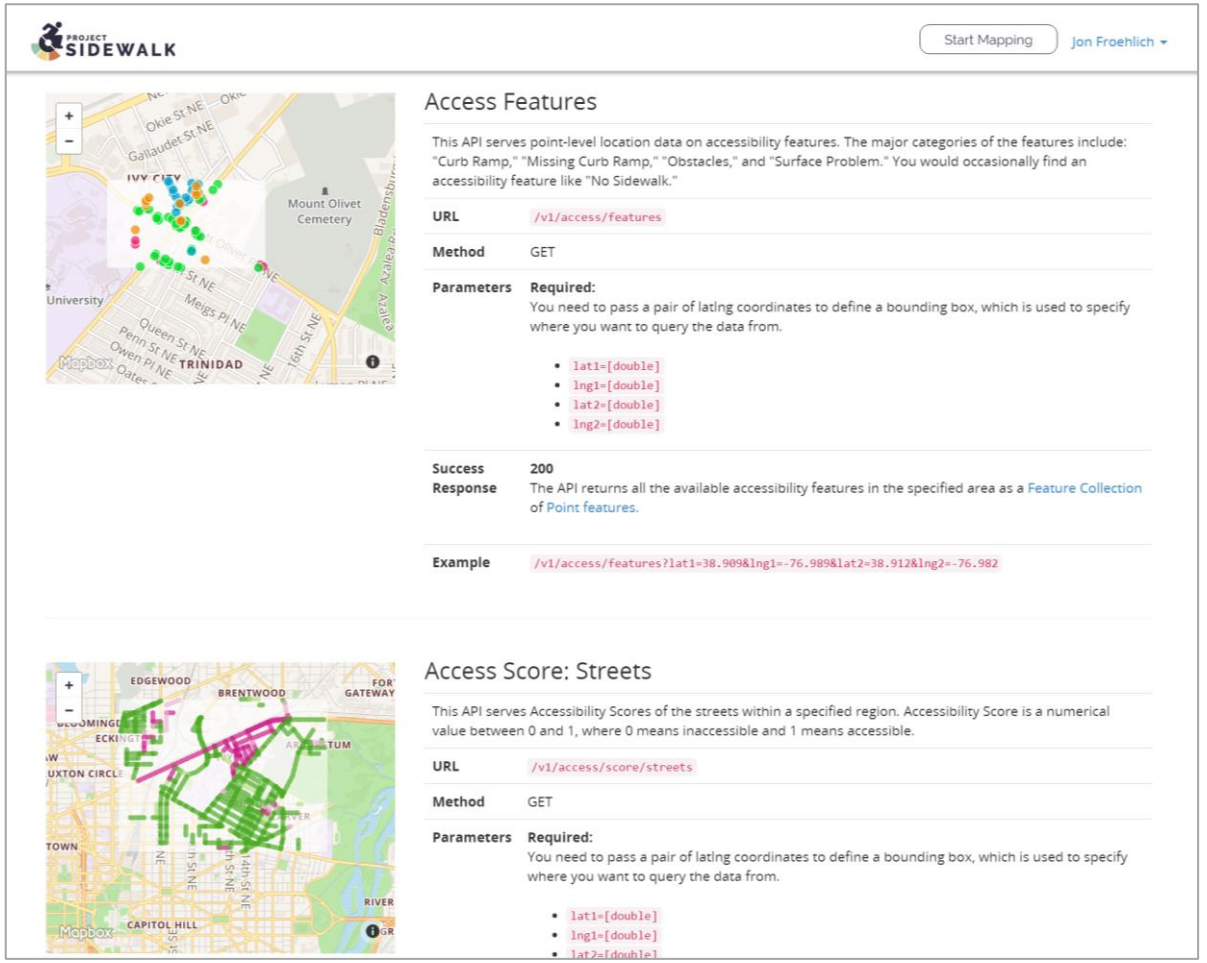
This is the potential of **data-driven urban accessibility analytics** using Project Sidewalk data.

PROJECT SIDEWALK

ALL OUR CODE + DATA IS 100% OPEN SOURCE



https://github.com/ProjectSidewalk

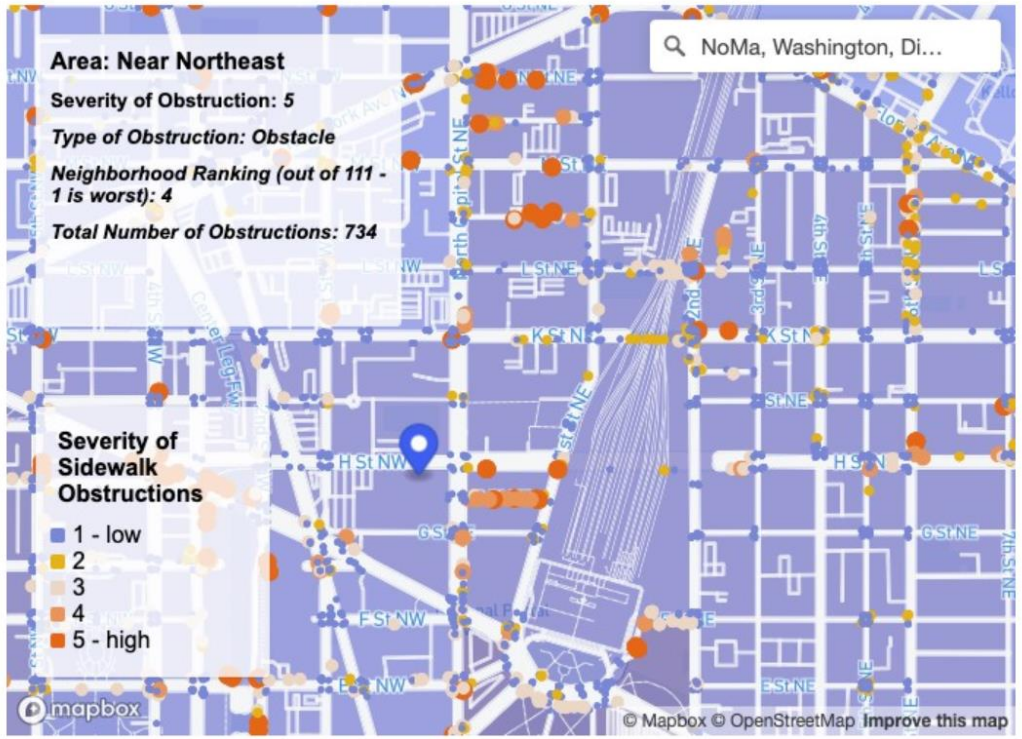


http://projectsidewalk.io/api

A city is only as accessible as its sidewalks. This map shows DC's are often blocked.

WALKING By Barbara Moreno (Guest Contributor) September 10, 2019 32

SHARE



A snapshot of sidewalk obstructions on NoMa's streets. by the author.

When Washingtonians like myself look for new apartments, we pay close attention to the walk score of a neighborhood. Any score upwards of 90 on a hundred point scale marks an area as a "walker's paradise," meaning major needs such as grocery stores and transit are within walking distance. However, what is *not* factored into the walkability score is the actual condition of the sidewalks.

ALSO OF INTEREST

WALKING
A pedestrian-only block in Alexandria may become a reality this spring 8

TRANSIT ANALYSIS
The good, the bad and the unexplained: what you need to know about the WMATA budget 27

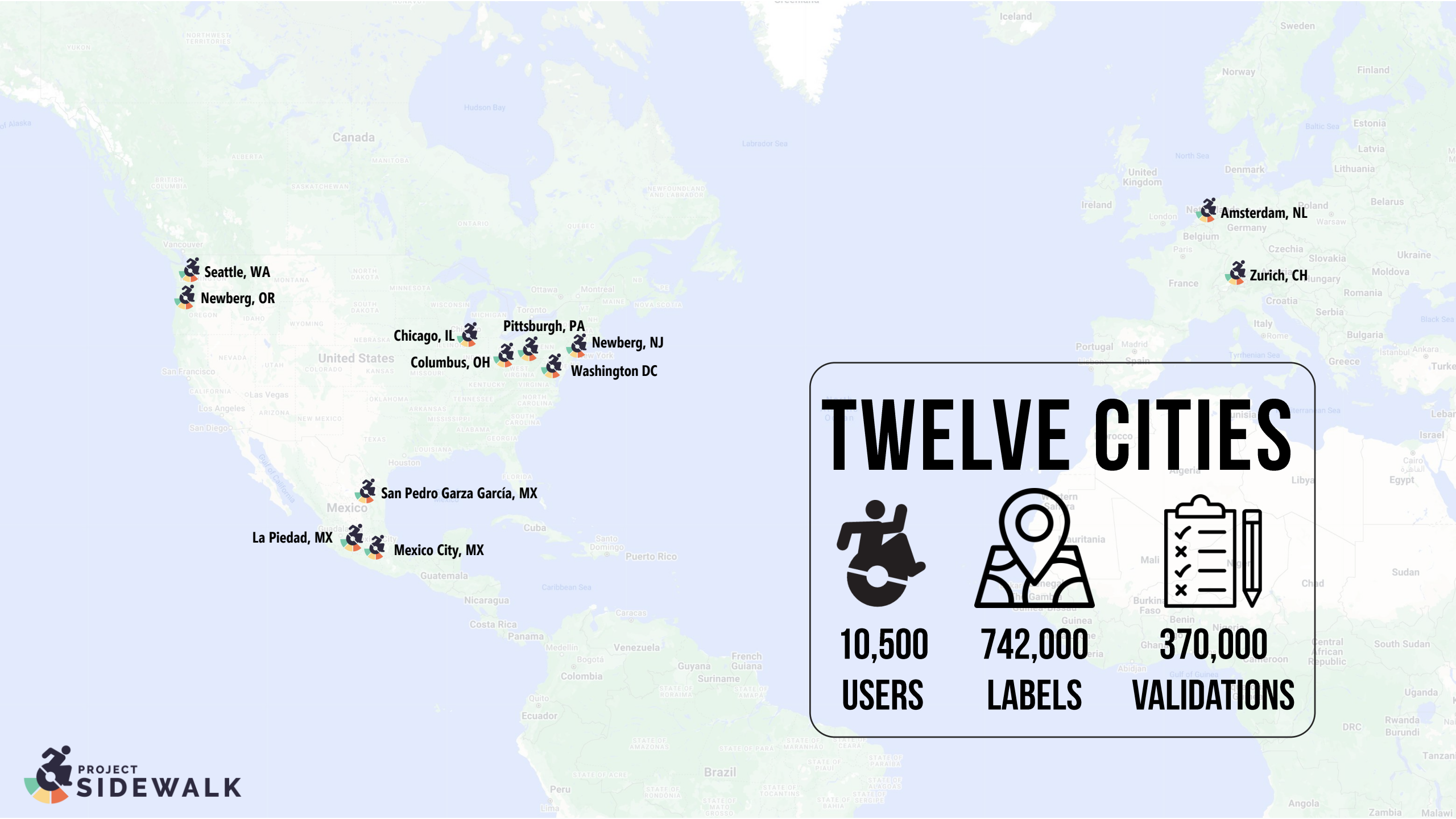
DEVELOPMENT
Innovation Center Metro won't get a corporate name (for now), but a lot is already happening there. 17

TRANSIT
Baltimore's transit system is not meeting residents' needs. Can this plan change that? 17

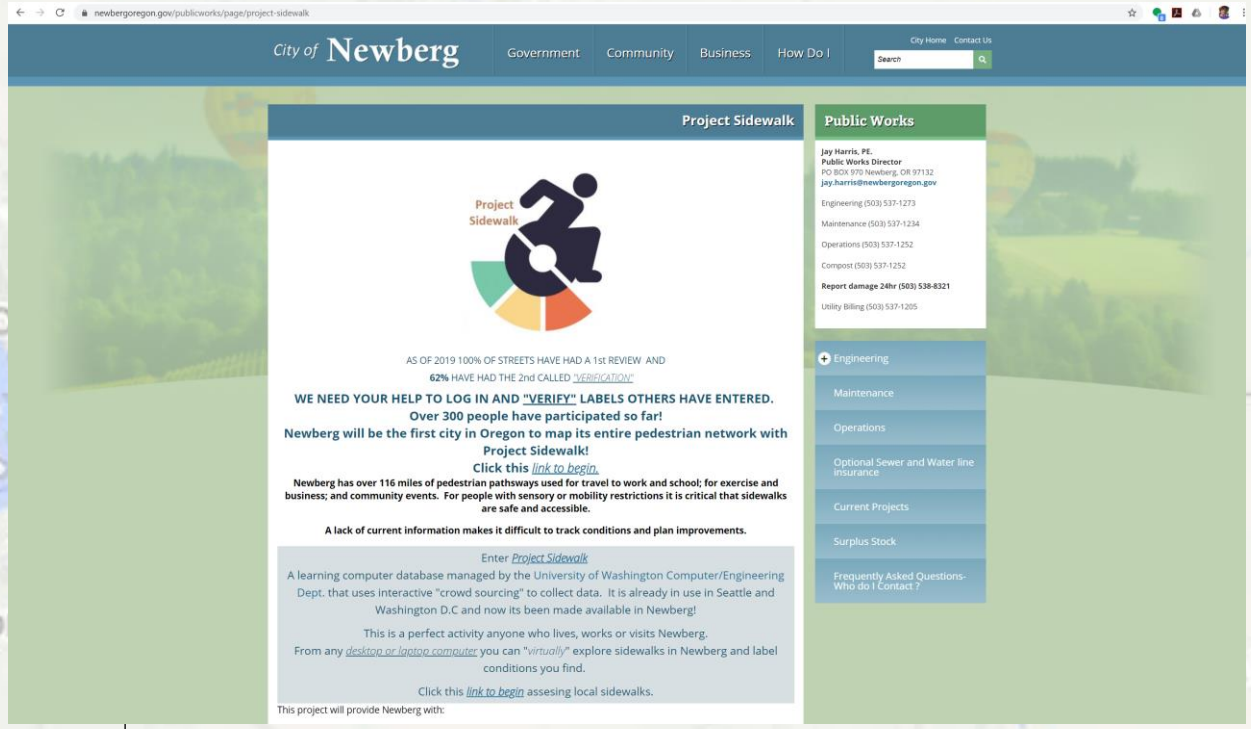
Get daily updates via email

TEN CITIES
IN NORTH AMERICA

PROJECT SIDEWALK


Seattle, WA
Newberg, OR
Chicago, IL
Pittsburgh, PA
Newberg, NJ
Columbus, OH
Washington DC
San Pedro Garza García, MX
La Piedad, MX
Mexico City, MX
Amsterdam, NL
Zurich, CH
TWELVE CITIES
10,500
USERS
742,000
LABELS
370,000
VALIDATIONS
PROJECT SIDEWALK

Your efforts are **making a difference**.
Transforming **policy**.
Informing **urban design**.
Creating better, more **equitable transit networks**.



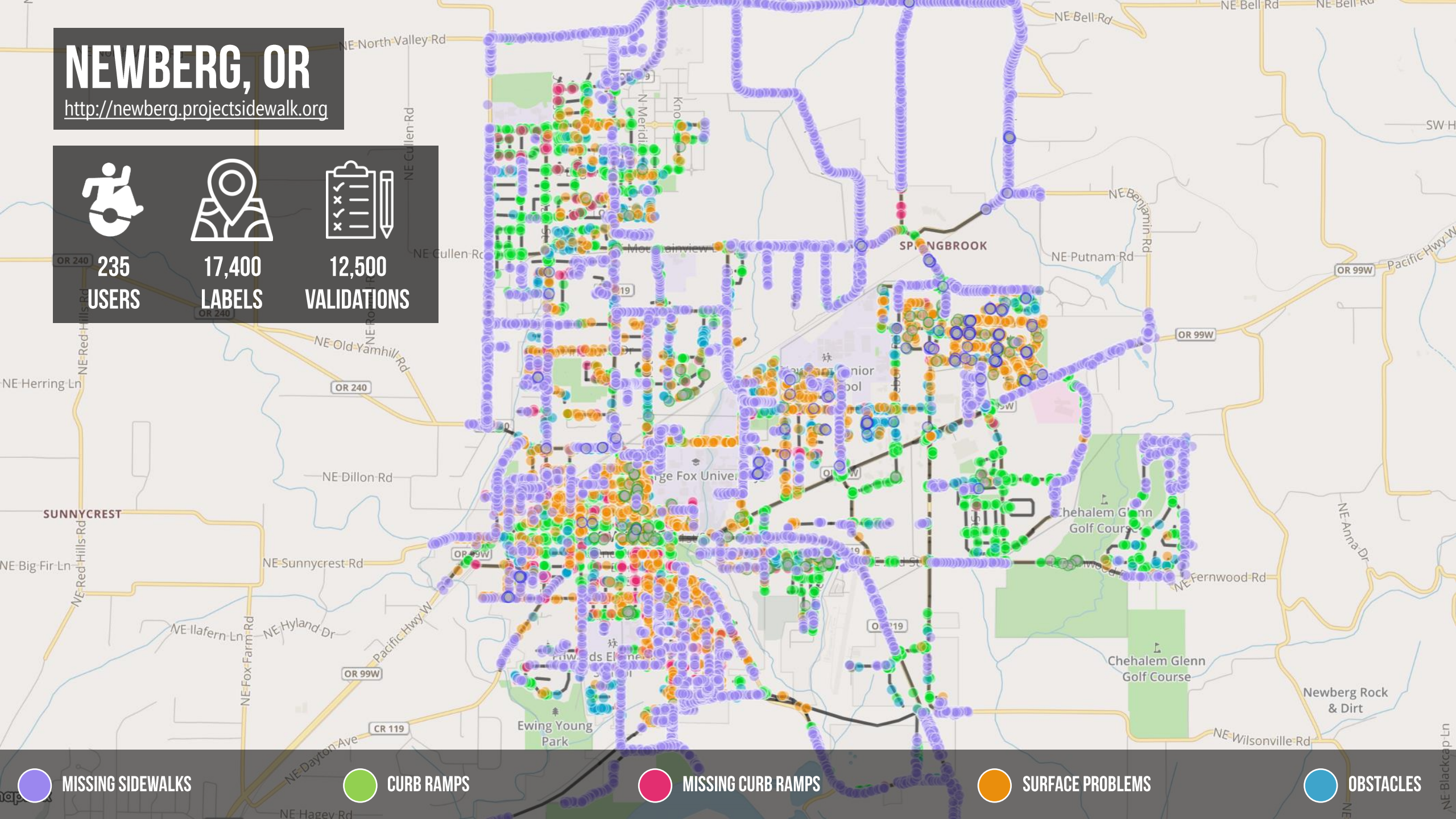
Newberg, OR

http://newberg.projectsidewalk.org

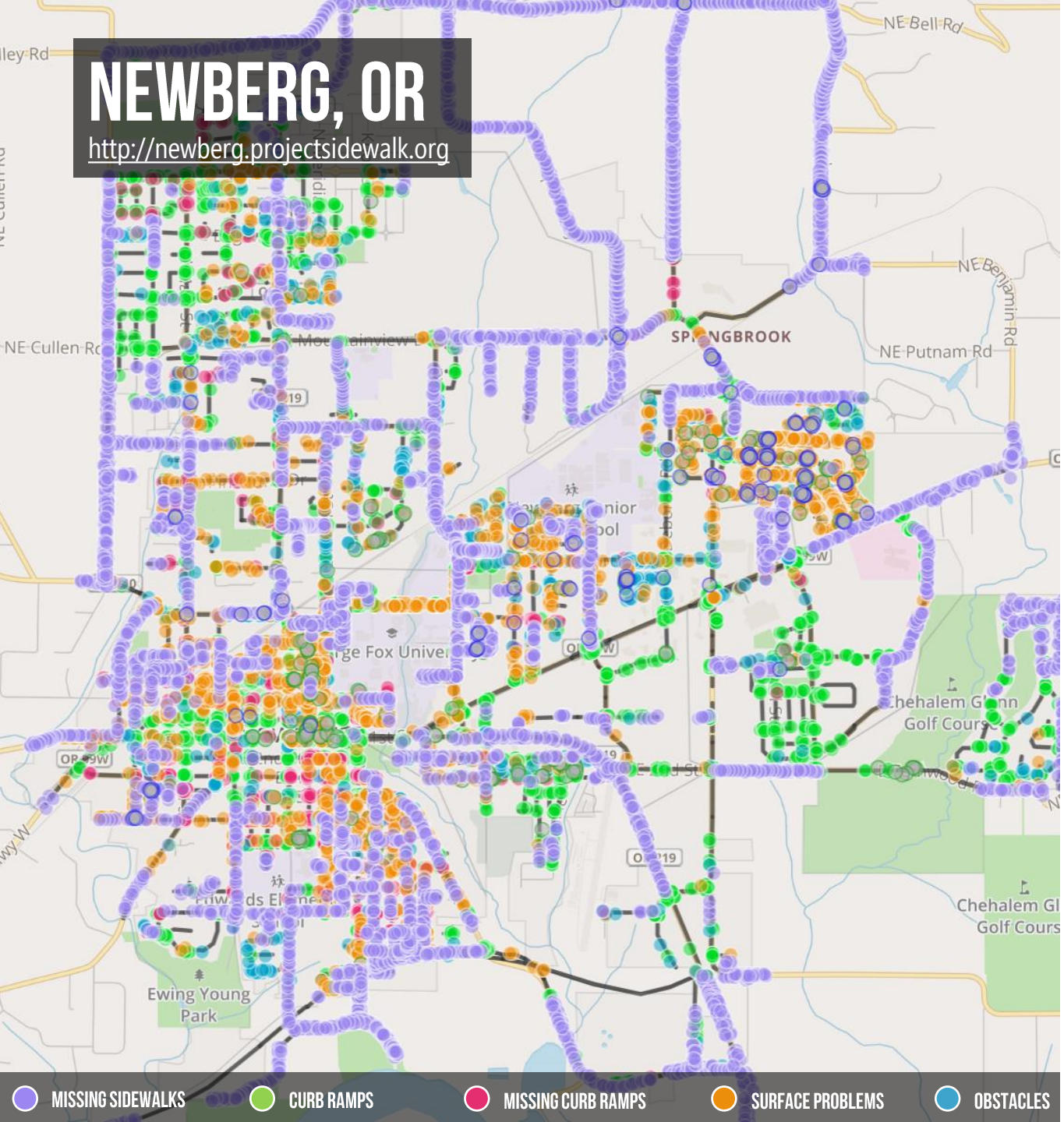
NEWBERG, OR

http://newberg.projectsidewalk.org

235	17,400	12,500
USERS	LABELS	VALIDATIONS



MISSING SIDEWALKS | CURB RAMPS | MISSING CURB RAMPS | SURFACE PROBLEMS | OBSTACLES



City of Newberg
January 30 at 9:29 AM ·

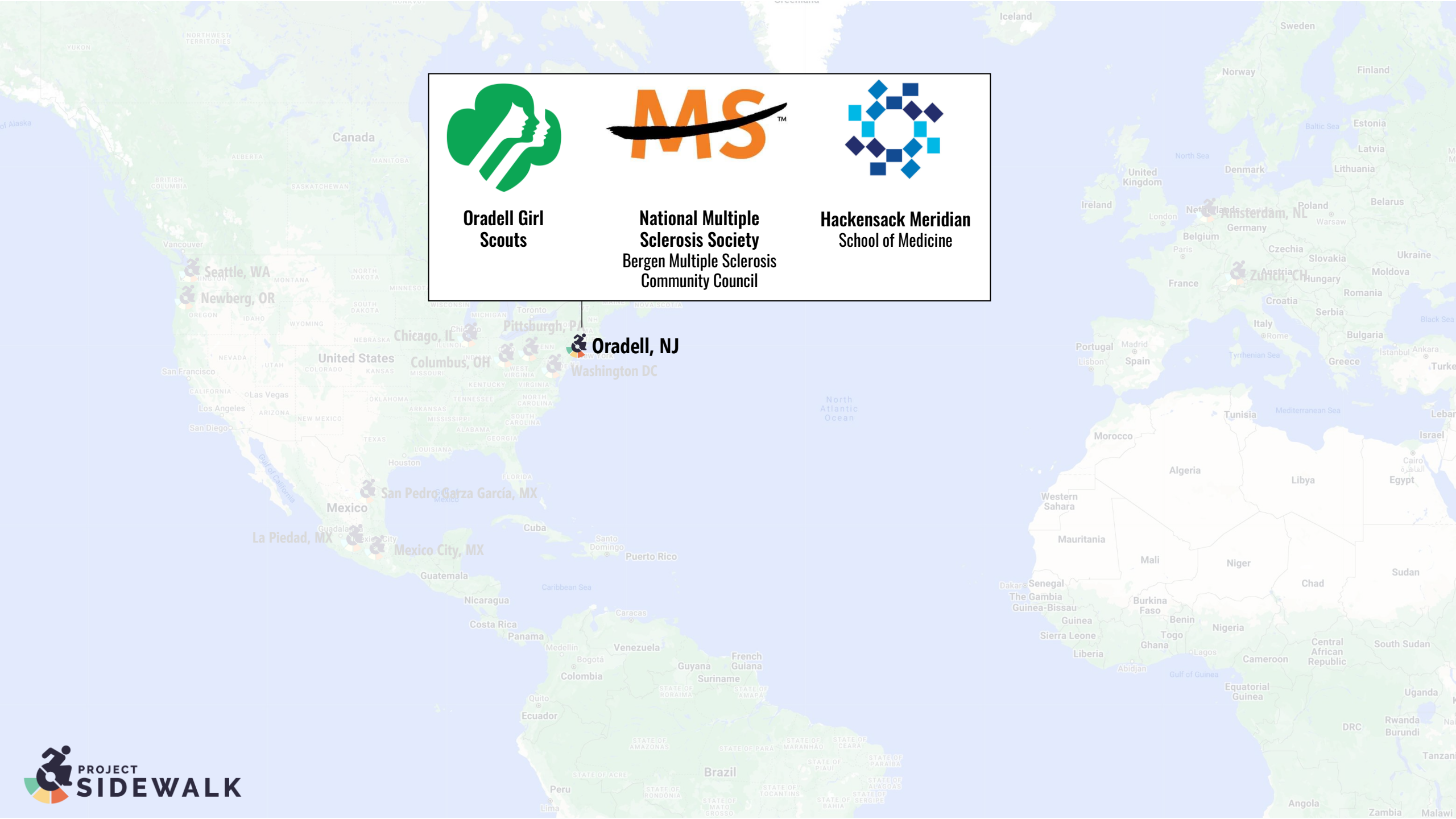
Like Page

Congratulations and THANK YOU to the citizens of Newberg for putting in the work to map 100% of Newberg through Project Sidewalk. That's over 107 miles covered with 264 local users who contributed to the data.

This information will be used to identify areas in Newberg that need sidewalks, need sidewalk repairs, and need to be updated to become more accessible. Through your efforts, Newberg can become a safer, more accessible community.

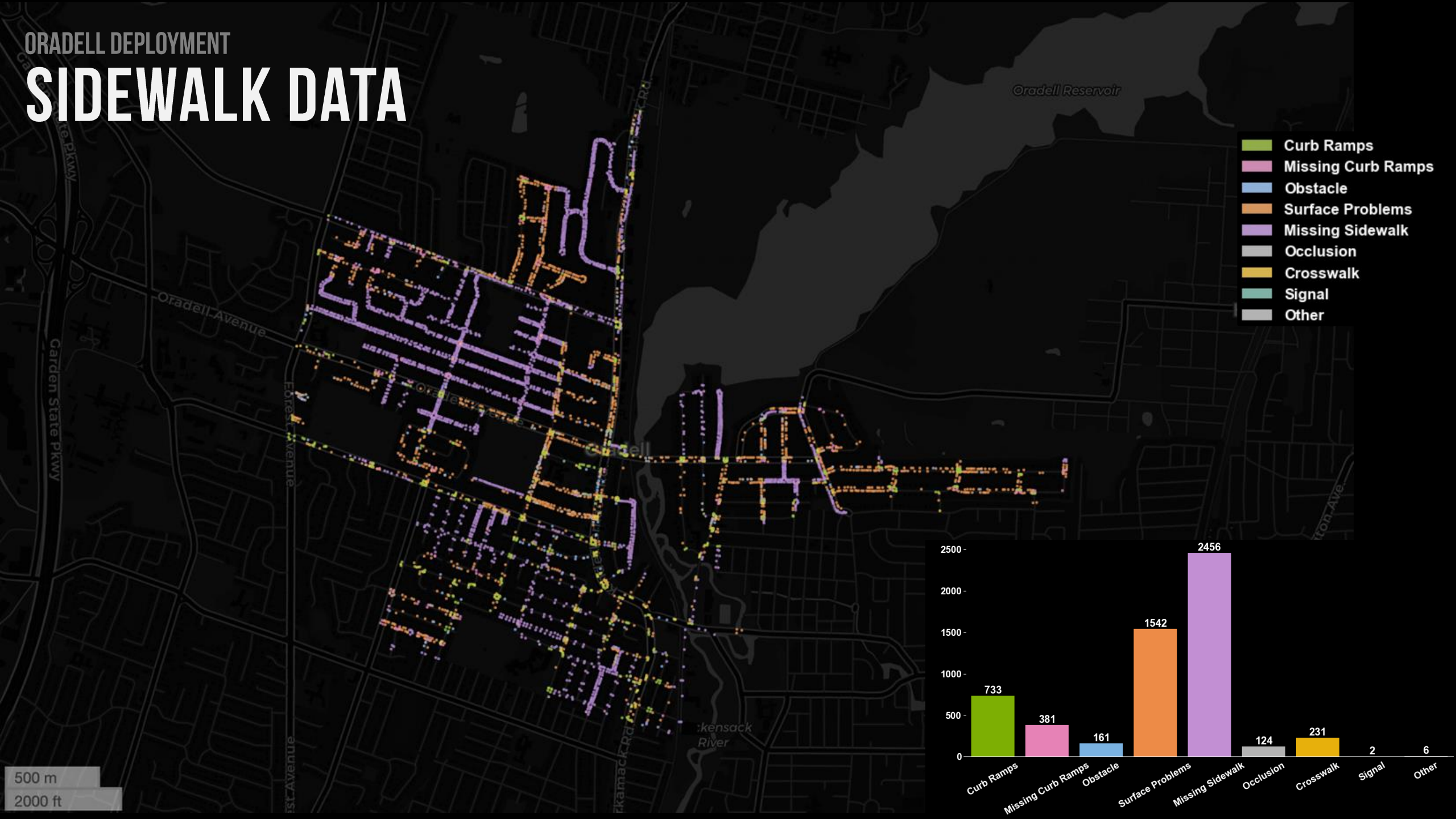
Looking to help? Verifications are still needed for the collected data. Click the link below to learn more.

SIDEWALK-NEWBERG.CS.WASHINGTON.EDU
sidewalk-newberg.cs.washington.edu


Oradell Girl Scouts
National Multiple Sclerosis Society
Bergen Multiple Sclerosis Community Council
Hackensack Meridian School of Medicine
Oradell, NJ
Seattle, WA
Newberg, OR
Chicago, IL
Columbus, OH
Pittsburgh, PA
Washington DC
San Pedro Garza García, MX
Mexico City, MX
La Piedad, MX
Amsterdam, NL
Zurich, CH
PROJECT SIDEWALK

ORADELL DEPLOYMENT

SIDEWALK DATA



Surface Problems

1,542 labels

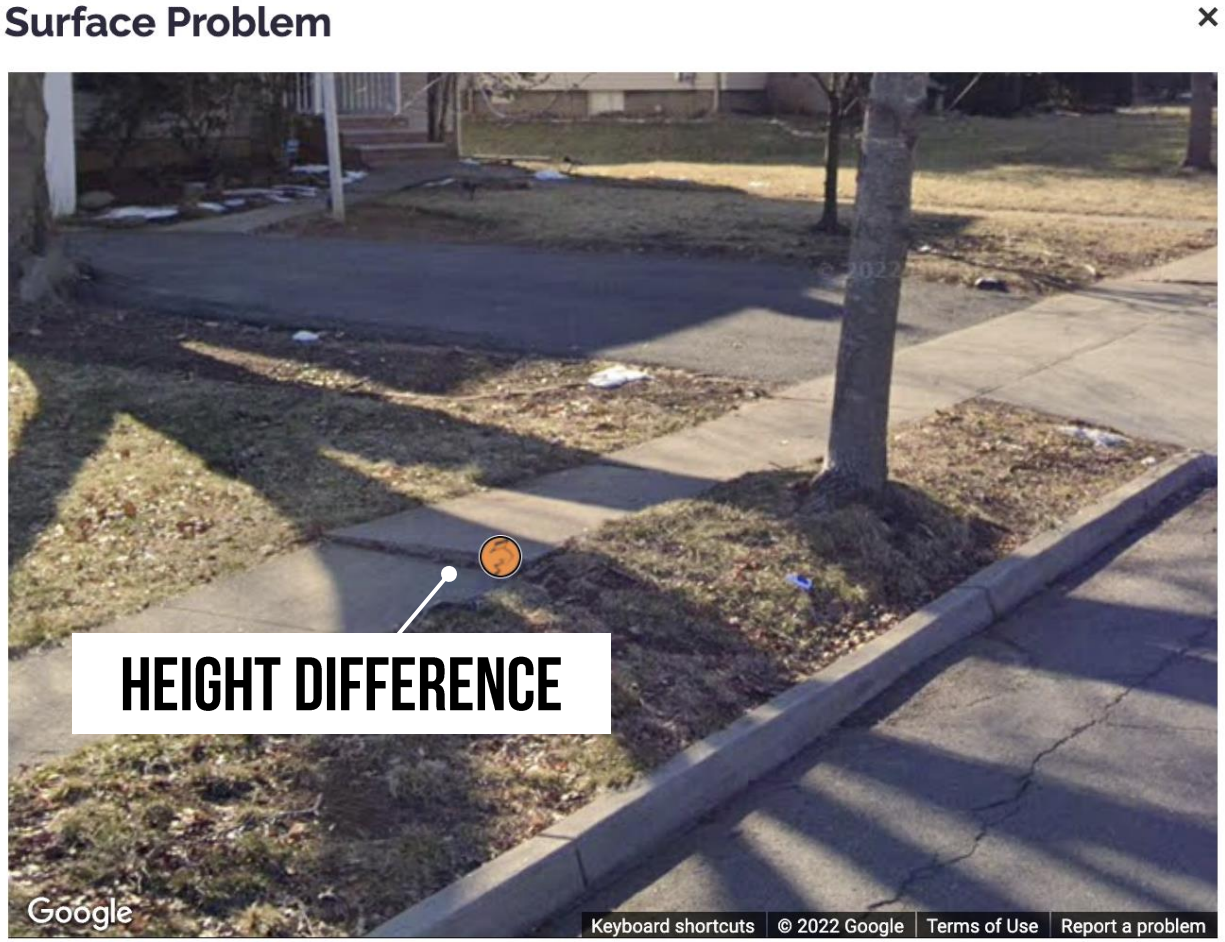
Missing Sidewalks

2,456 labels

ORADELL DEPLOYMENT

TAG ANALYSIS

Surface Problem Tags	Count	% of Surface Tags	Avg Severity (SD)
height difference	**1455**	**29.0%**	**1.96 (0.99)**
cracks	**1256**	**25.0%**	**1.71 (0.79)**
uneven/slanted	**1031**	**21.0%**	**2.34 (1.02)**
grass	547	11.0%	1.46 (0.63)
very broken	235	5.0%	2.44 (1.04)
bumpy	177	4.0%	2.25 (0.92)
n/a	90	2.0%	2.00 (1.02)
narrow sidewalk	88	2.0%	2.59 (0.93)
brick/cobblestone	74	1.0%	1.95 (0.72)
sand/gravel	47	1.0%	2.26 (0.94)
construction	2	0.0%	4.00 (n/a)
street has no sidewalks	1	0.0%	3.00 (n/a)



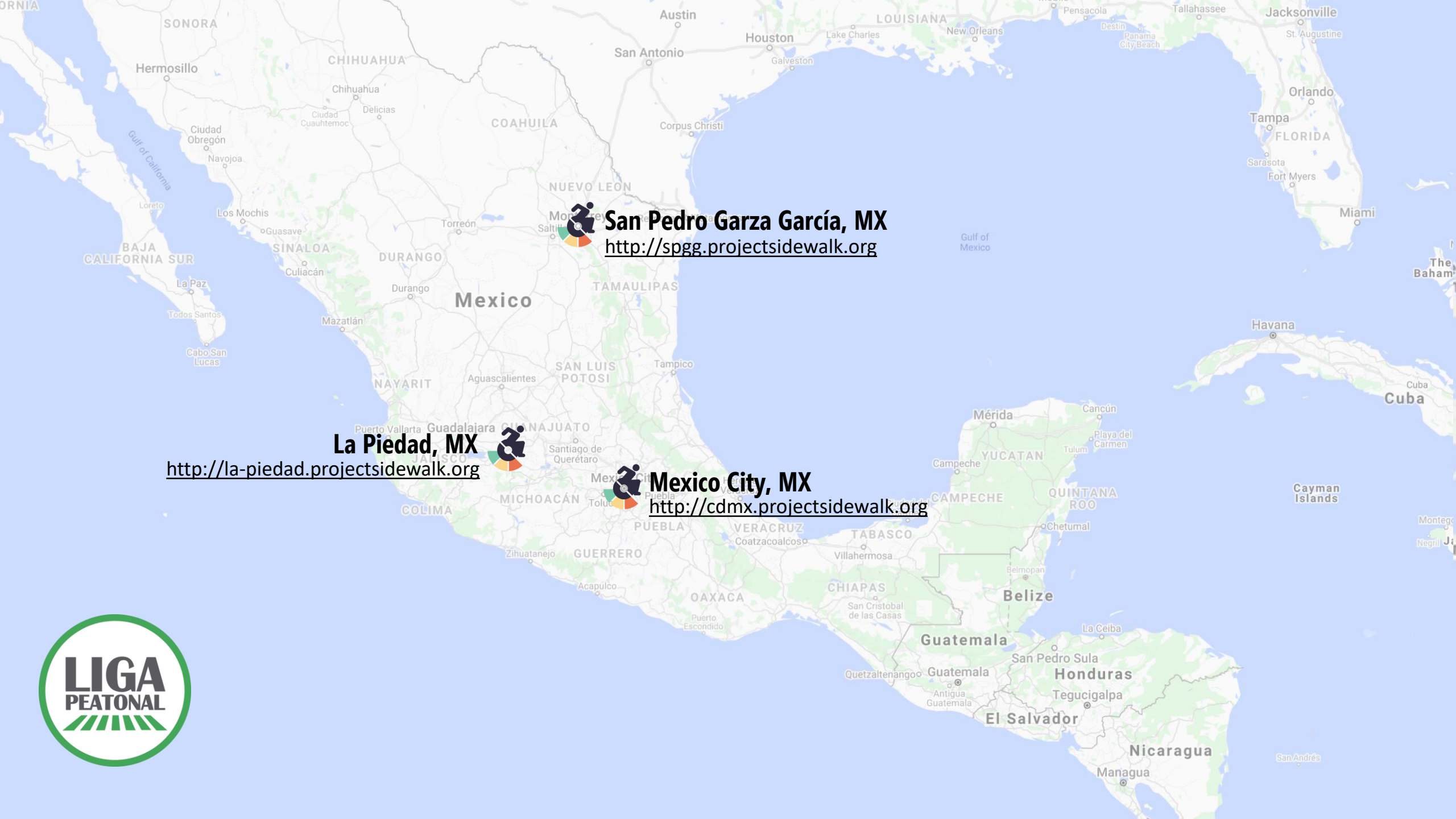
ORADELL DEPLOYMENT

HIGH SEVERITY (≥ 4) SURFACE PROBLEMS








San Pedro Garza García, MX
http://spgg.projectsidewalk.org
La Piedad, MX
http://la-piedad.projectsidewalk.org
Mexico City, MX
http://cdmx.projectsidewalk.org
LIGA PEATONAL
Mexico
Gulf of Mexico
Gulf of California
Austin
Houston
San Antonio
Corpus Christi
Hermosillo
Chihuahua
Ciudad Obregón
Navojoa
Los Mochis
Guasave
Culiacán
Durango
Torreón
Monterrey
Saltillo
Laredo
Lake Charles
New Orleans
Pensacola
Tallahassee
Jacksonville
Orlando
Tampa
Miami
Sarasota
Fort Myers
Havana
Cuba
Cancún
Mérida
Playa del Carmen
Tulum
Campeche
Chetumal
Belmopan
Belize
Guatemala
Quetzaltenango
Antigua Guatemala
San Pedro Sula
Honduras
Tegucigalpa
El Salvador
Nicaragua
Managua
Cayman Islands
Tampico
Aguascalientes
Guadalajara
Puerto Vallarta
Santiago de Querétaro
Coatzacoalcos
Villahermosa
San Cristobal de las Casas
Acapulco
Zihuatanejo
Puerto Escondido
Cabo San Lucas
La Paz
Todos Santos
Mazatlán
Loreto
SONORA
CHIHUAHUA
COAHUILA
NUEVO LEON
TAMAULIPAS
SINALOA
DURANGO
BAJA CALIFORNIA SUR
NAYARIT
SAN LUIS POTOSI
GUANAJUATO
JALISCO
COLIMA
MICHOACÁN
PUEBLA
VERACRUZ
GUERRERO
OAXACA
CHIAPAS
TABASCO
CAMPECHE
YUCATAN
QUINTANA ROO

Creemos un camino para todas las personas

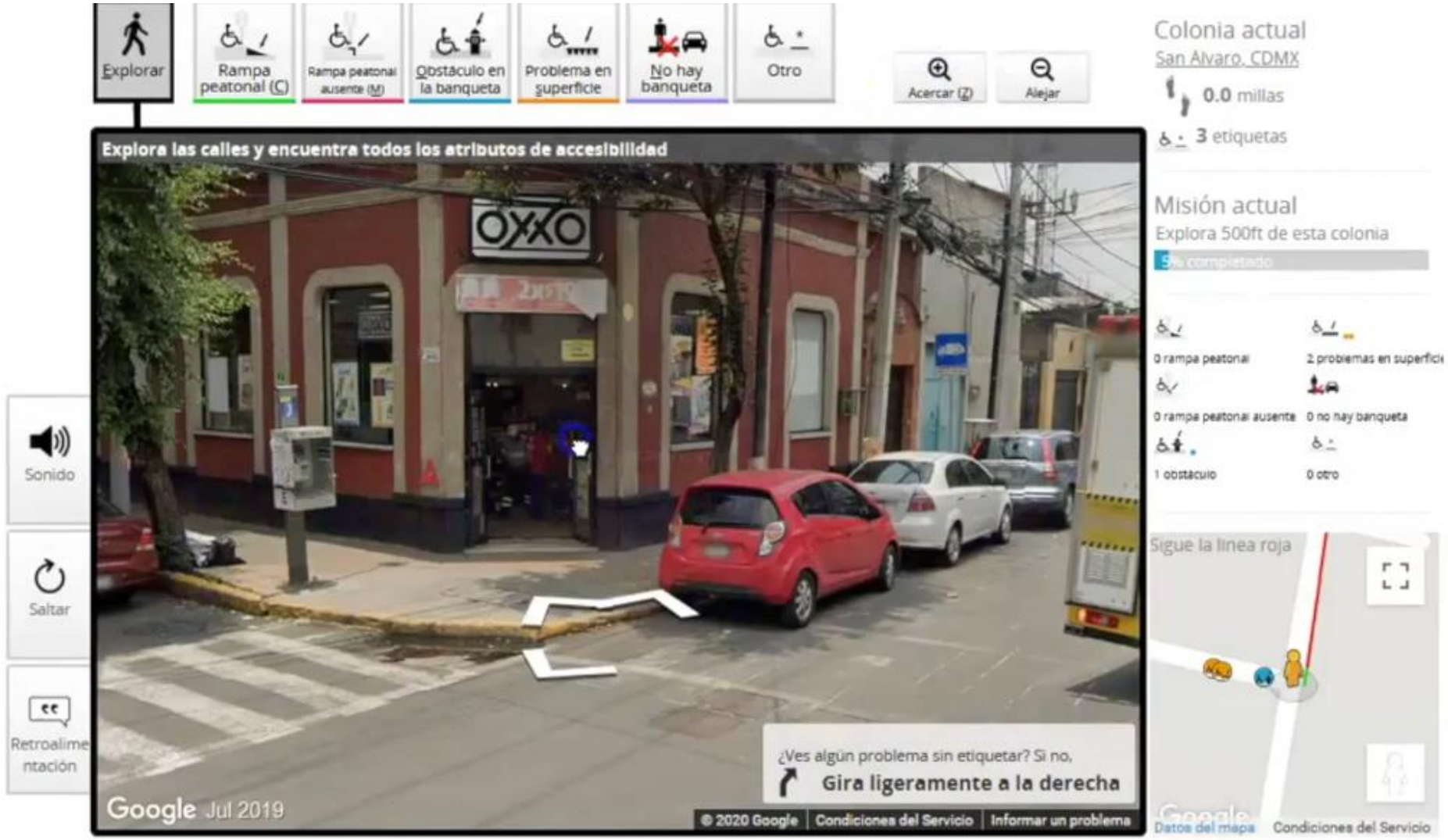
Comienza a explorar SPGG

También estamos en: Seattle, WA Columbus, OH Mexico City, MX Newberg, OR

Cómo puedes ayudar

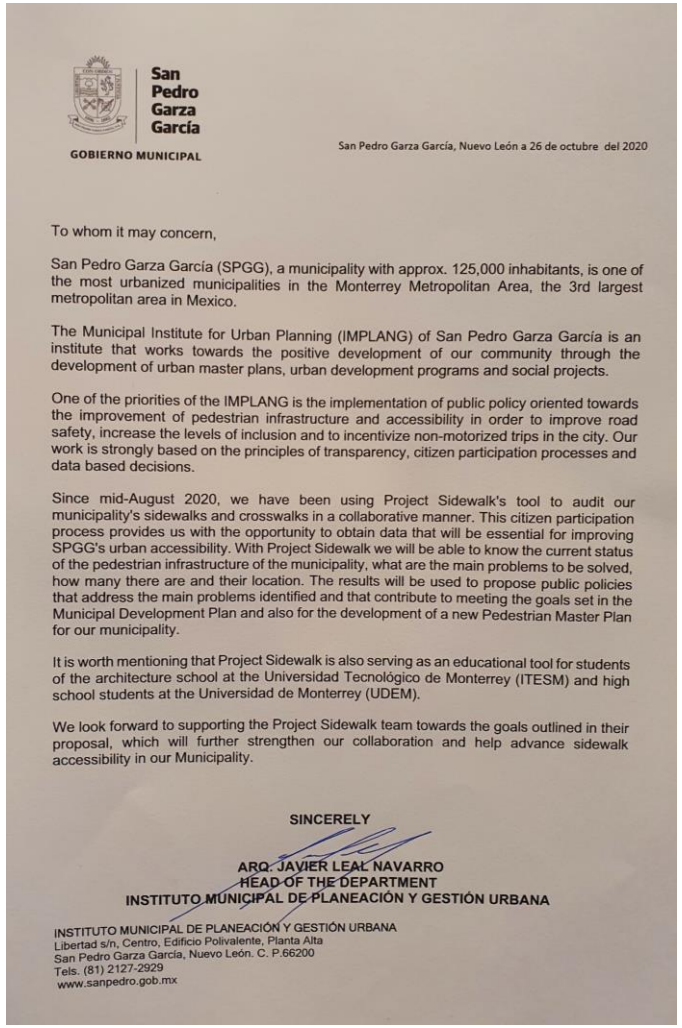
Explora virtualmente las calles de la ciudad para

Encuentra y etiqueta lo siguiente



PROJECT SIDEWALK MEXICO

SAN PEDRO, MX



San Pedro Garza García
GOBIERNO MUNICIPAL

San Pedro Garza García, Nuevo León a 26 de octubre del 2020

To whom it may concern,

San Pedro Garza García (SPGG), a municipality with approx. 125,000 inhabitants, is one of the most urbanized municipalities in the Monterrey Metropolitan Area, the 3rd largest metropolitan area in Mexico.

The Municipal Institute for Urban Planning (IMPLANG) of San Pedro Garza García is an institute that works towards the positive development of our community through the development of urban master plans, urban development programs and social projects.

One of the priorities of the IMPLANG is the implementation of public policy oriented towards the improvement of pedestrian infrastructure and accessibility in order to improve road safety, increase the levels of inclusion and to incentivize non-motorized trips in the city. Our work is strongly based on the principles of transparency, citizen participation processes and data based decisions.

Since mid-August 2020, we have been using Project Sidewalk's tool to audit our municipality's sidewalks and crosswalks in a collaborative manner. This citizen participation process provides us with the opportunity to obtain data that will be essential for improving SPGG's urban accessibility. With Project Sidewalk we will be able to know the current status of the pedestrian infrastructure of the municipality, what are the main problems to be solved, how many there are and their location. The results will be used to propose public policies that address the main problems identified and that contribute to meeting the goals set in the Municipal Development Plan and also for the development of a new Pedestrian Master Plan for our municipality.

It is worth mentioning that Project Sidewalk is also serving as an educational tool for students of the architecture school at the Universidad Tecnológico de Monterrey (ITESM) and high school students at the Universidad de Monterrey (UDEM).

We look forward to supporting the Project Sidewalk team towards the goals outlined in their proposal, which will further strengthen our collaboration and help advance sidewalk accessibility in our Municipality.

SINCERELY

ARQ. JAVIER LEAL NAVARRO
HEAD OF THE DEPARTMENT
INSTITUTO MUNICIPAL DE PLANEACIÓN Y GESTIÓN URBANA

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Tels. (81) 2127-2929
www.sanpedro.gob.mx

Project Sidewalk provides us with data that is **essential to improving San Pedro's urban accessibility**. With Project Sidewalk, we **know the main problems** to be solved, how many problems there are, and their location... The results will be used to inform a **new Pedestrian Master Plan** for our municipality.

San Pedro Garza García
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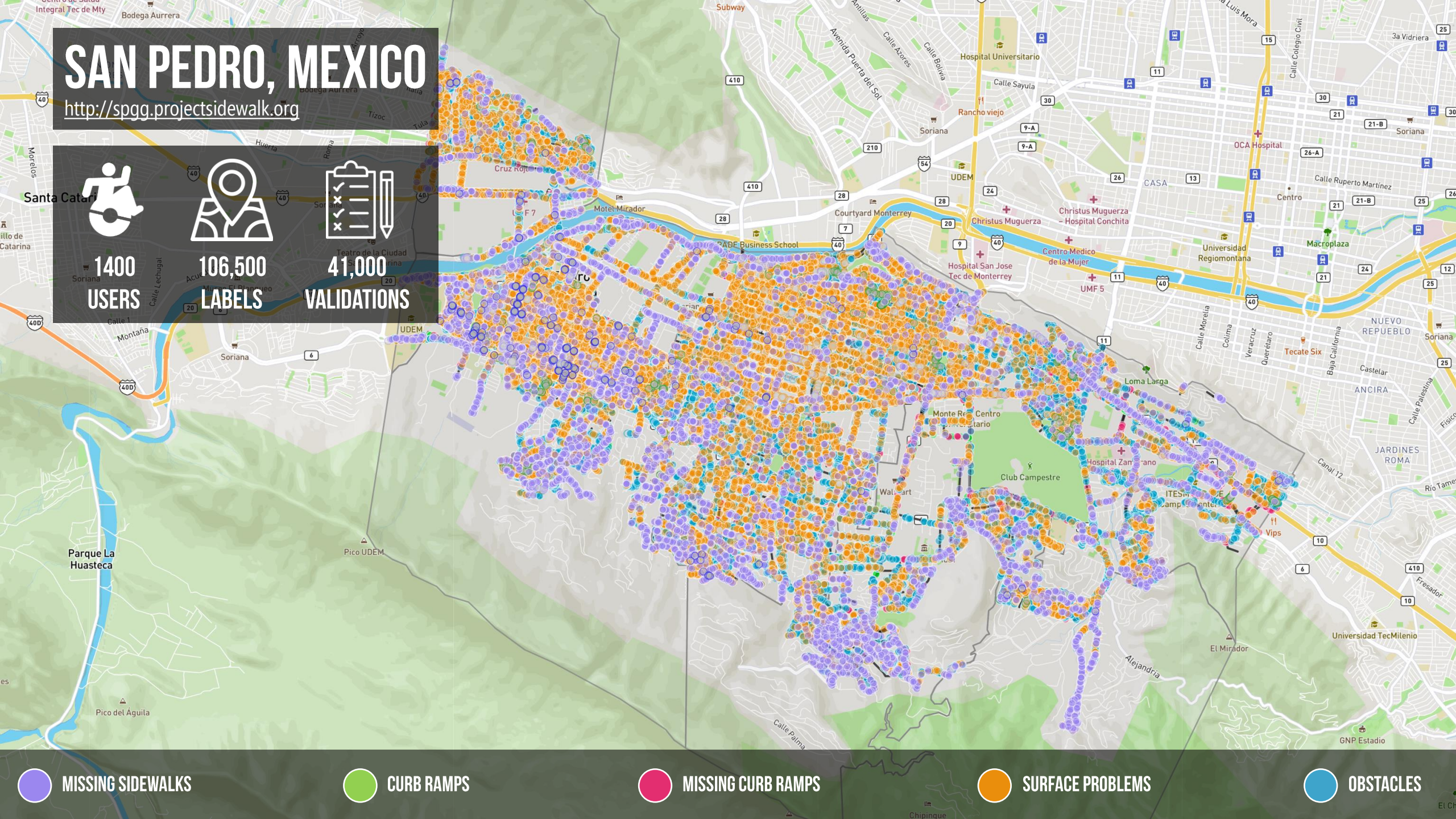
SAN PEDRO, MEXICO
http://spgg.projectsidewalk.org
1400
USERS
106,500
LABELS
41,000
VALIDATIONS
MISSING SIDEWALKS
CURB RAMPS
MISSING CURB RAMPS
SURFACE PROBLEMS
OBSTACLES

CURB RAMPS

SEVERITY RATING 5

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POR UN MEJOR FUTURO URBANO

ENFOQUE ACTIVISTA

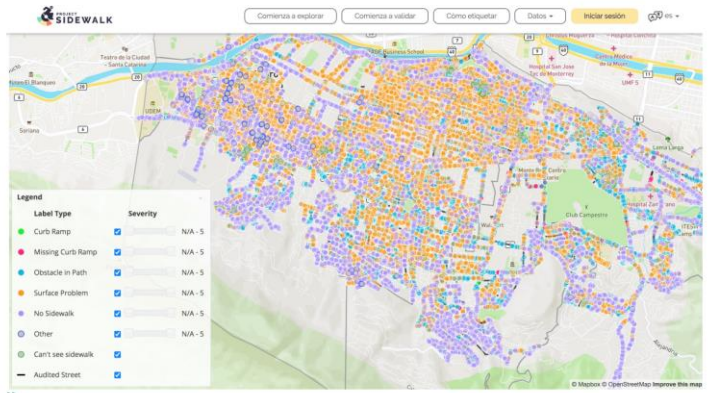
E

EvaluANDO: del activismo peatonal a la colaboración comunitaria para el registro de obstáculos en las banquetas

Escrito por
Claudina de Gyves y Ana Rodríguez

Ubicación
San Pedro Garza García, México

Palabras clave
activismo peatonal, movilidad sostenible, infraestructura peatonal, participación remota



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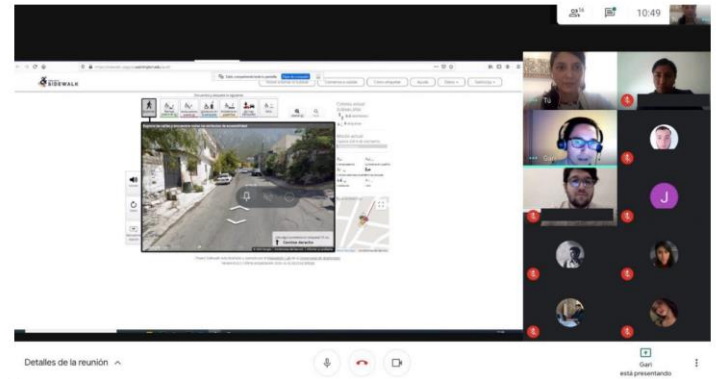
Fotografía 2. Mapa de etiquetas en Project Sidewalk
Fuente: Liga Peatonal (2021)

La vinculación fue posible gracias a que ya había un historial de activismo peatonal en la metrópoli y el acercamiento no fue solo con la Liga Peatonal como ONG, sino de la mano de Makeability Lab, un actor técnico-académico que mostró disposición a contextualizar su plataforma a las necesidades de las calles mexicanas. Aunado a este proceso, la situación por la COVID-19 detonó una serie de intervenciones en el espacio público por parte del municipio de San Pedro Garza García, enfocadas en promover la movilidad sostenible, destacando las ciclovías emergentes y la aceleración de otros proyectos en el espacio público que estaban en puerta. Todo esto generó un escenario adecuado para la colaboración de EvaluANDO SPGG, en la que todos los actores involucrados estaban conscientes de la importancia de contar con información precisa sobre las condiciones de las calles en el municipio.

Recientemente, en mayo de 2021, tras 9 meses de trabajo y con la participación de 1099 personas se lograron cubrir los 570.2 km de vialidades que tiene el municipio de SPGG y se generaron 105 177 etiquetas (Makeability Lab, 2021) en un ejercicio inédito a nivel nacional de participación ciudadana para ubicar los obstáculos de movilidad peatonal.

El caso de EvaluANDO SPGG destaca no solo por haber completado el mapeo del municipio y ser resultado de una colaboración multisectorial entre gobierno local, sociedad civil y academia, sino porque los resultados son ahora insumos valiosos del municipio para la creación de nuevos planes y proyectos. Los planes en proceso de elaboración, tanto de movilidad activa como de seguridad vial, con los resultados de EvaluANDO, ayudarán a identificar estrategias aterrizadas a la realidad y fomentar una mayor participación ciudadana, al involucrar a la población desde su diagnóstico y permitir la descarga de los datos generados en formato editable.



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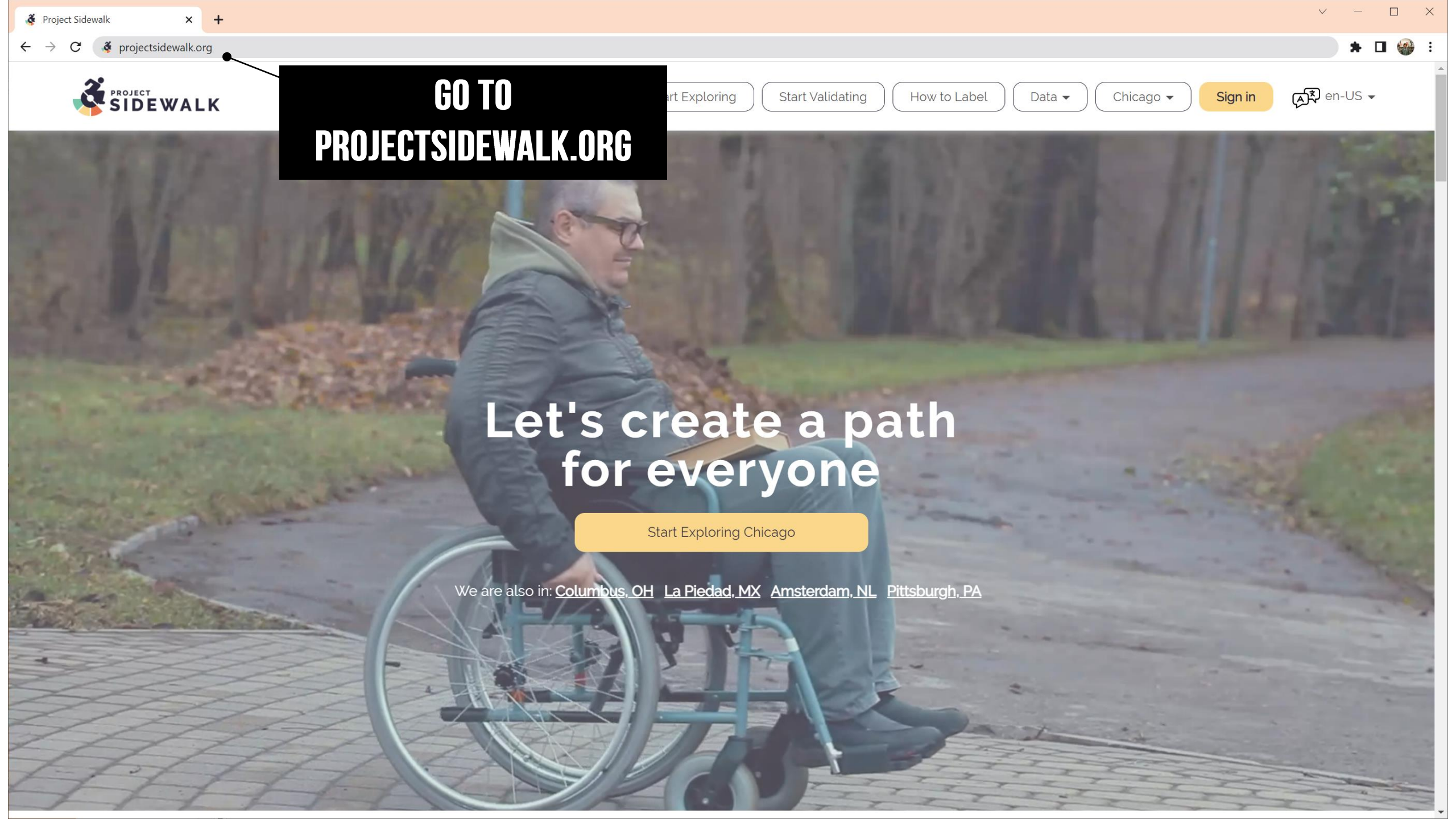
Fotografía 4. Mapatón San Pedro Garza García
Fuente: Liga Peatonal (2020)

En el proceso de levantamiento de información, Liga Peatonal trató de complementar el trabajo asincrónico e individual con cuatro eventos donde varias personas se conectaban de manera simultánea a probar la herramienta y resolver dudas sobre su funcionamiento. Se convocó a dos sesiones dirigidas a las personas ciudadanas del municipio, con el nombre de Mapatones, y otras dos orientadas a estudiantes universitarios, en formato de talleres en los que se les introducía al tema de movilidad peatonal y donde se generaron propuestas para atender los problemas principales.

Si bien este proceso ha permitido el involucramiento de adolescentes y jóvenes en el análisis crítico de su entorno urbano, todavía presenta oportunidades de mejora en la inclusión de personas que no tienen acceso a dispositivos de internet. Ante esta situación, sería conveniente explorar el ejercicio analógico del mapeo en sitio con herramientas impresas y más con el fin de fortalecer la convivencia vecinal y promover la organización, que con la precisión del levantamiento. En estos escenarios de atención a la población en condición de vulnerabilidad, tal vez destaquen otros elementos a mapear no tan relacionados con ser un obstáculo en las banquetas, sino ya más encaminados a una ausencia de infraestructura como la misma pavimentación de las calles, las banquetas o la falta de conectividad con otros sectores.

Además, en las reflexiones en torno al uso de la herramienta y las necesidades para el diagnóstico urbano incluyente, se identificó como área de oportunidad un mapeo con perspectiva de género, que pudiera incluir no solamente obstáculos en los trayectos identificados, sino también situaciones y elementos propios de la infraestructura que provocan una sensación de inseguridad, pero que no representan como tal un obstáculo, como sí lo hacen los muros ciegos, la falta de luminarias, los recovecos o terrenos baldíos.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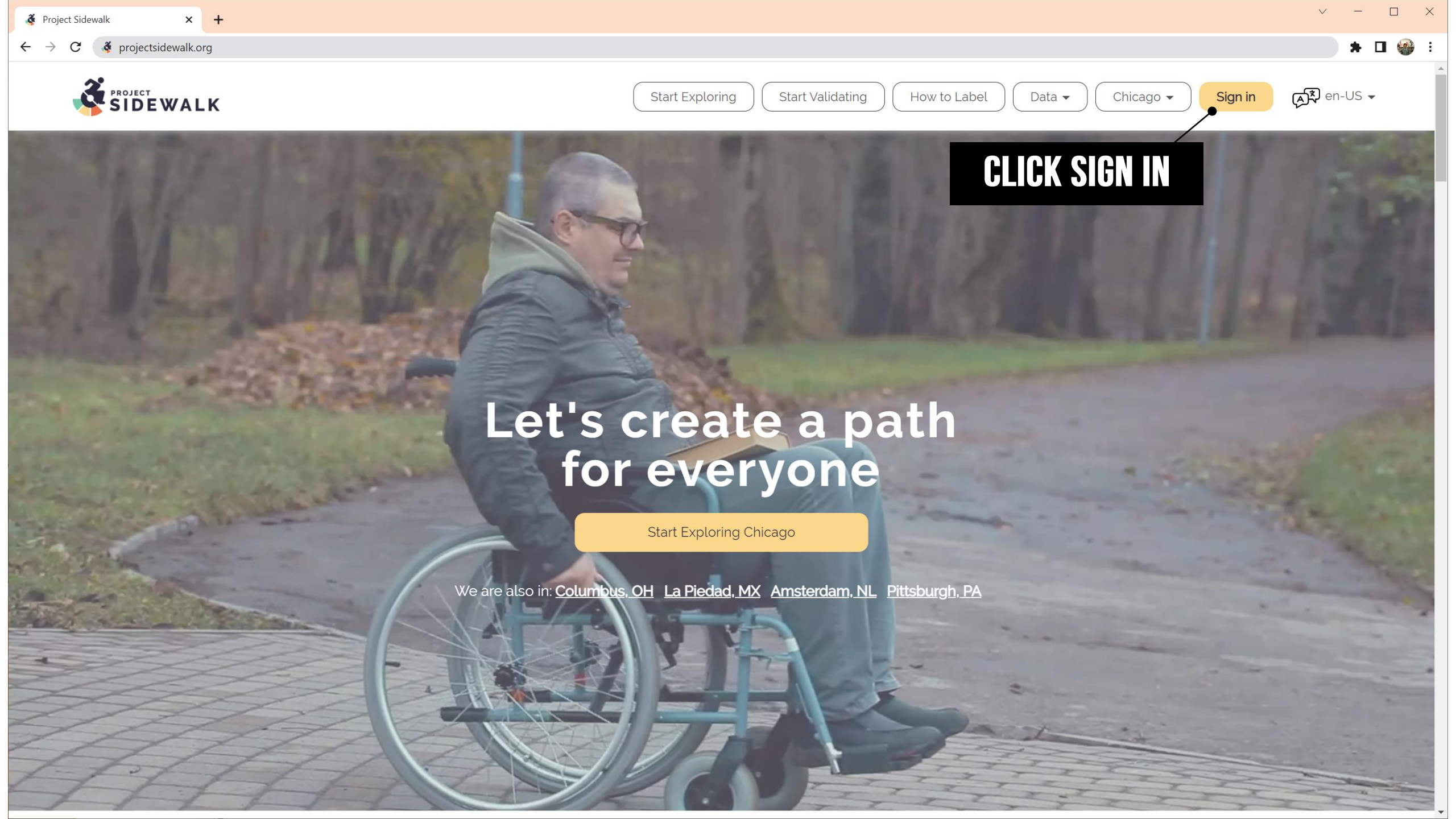
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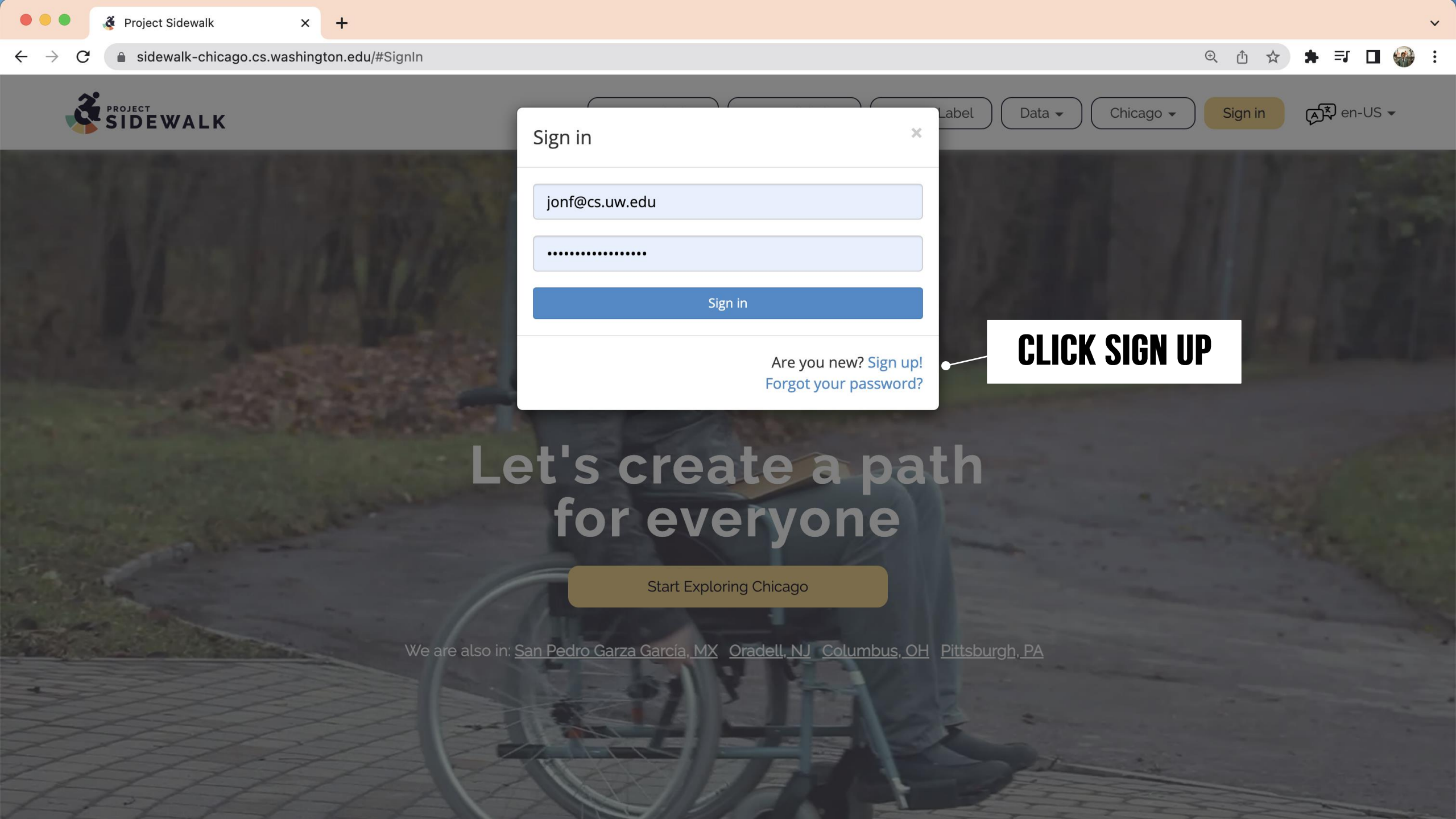
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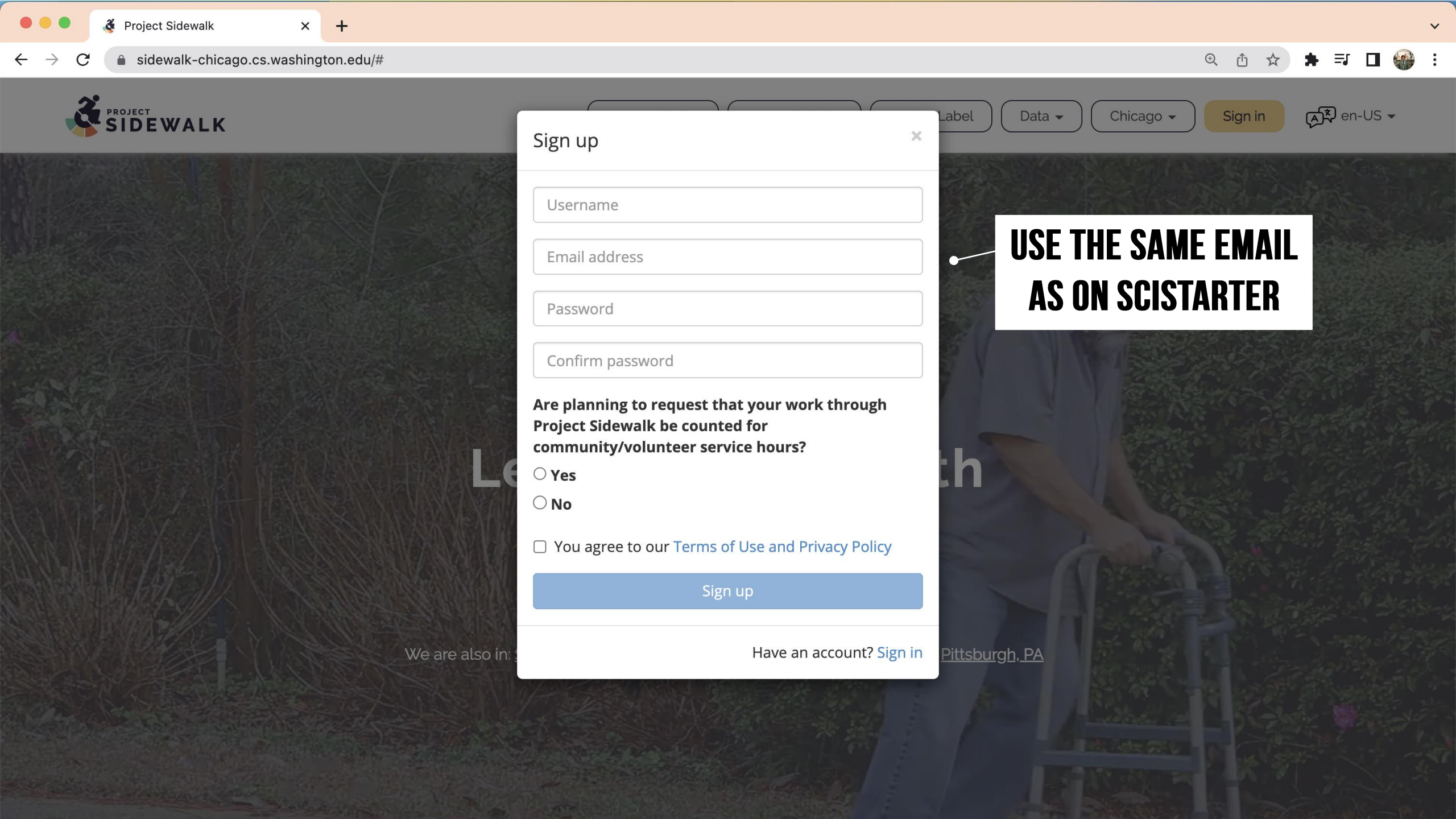
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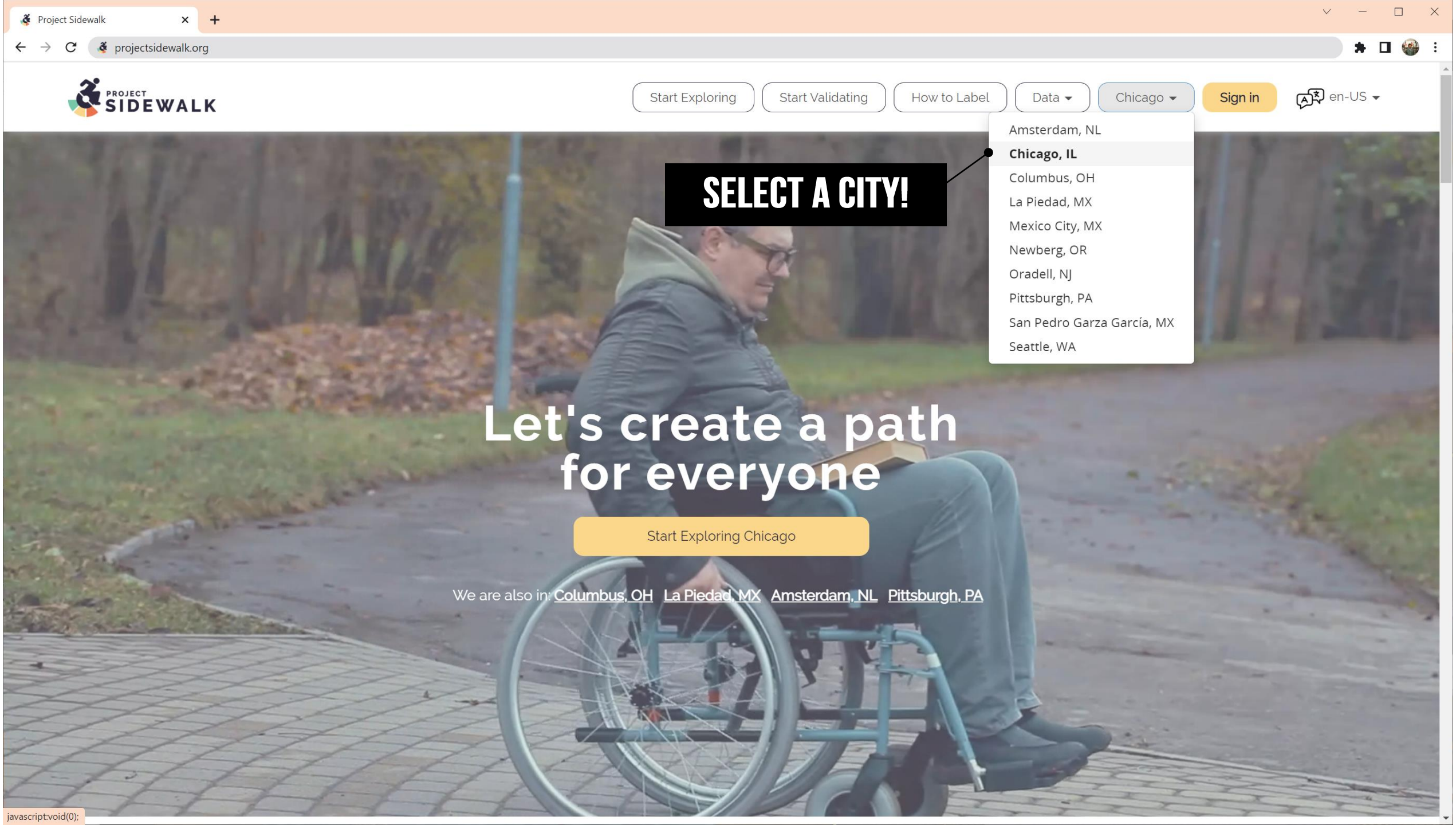
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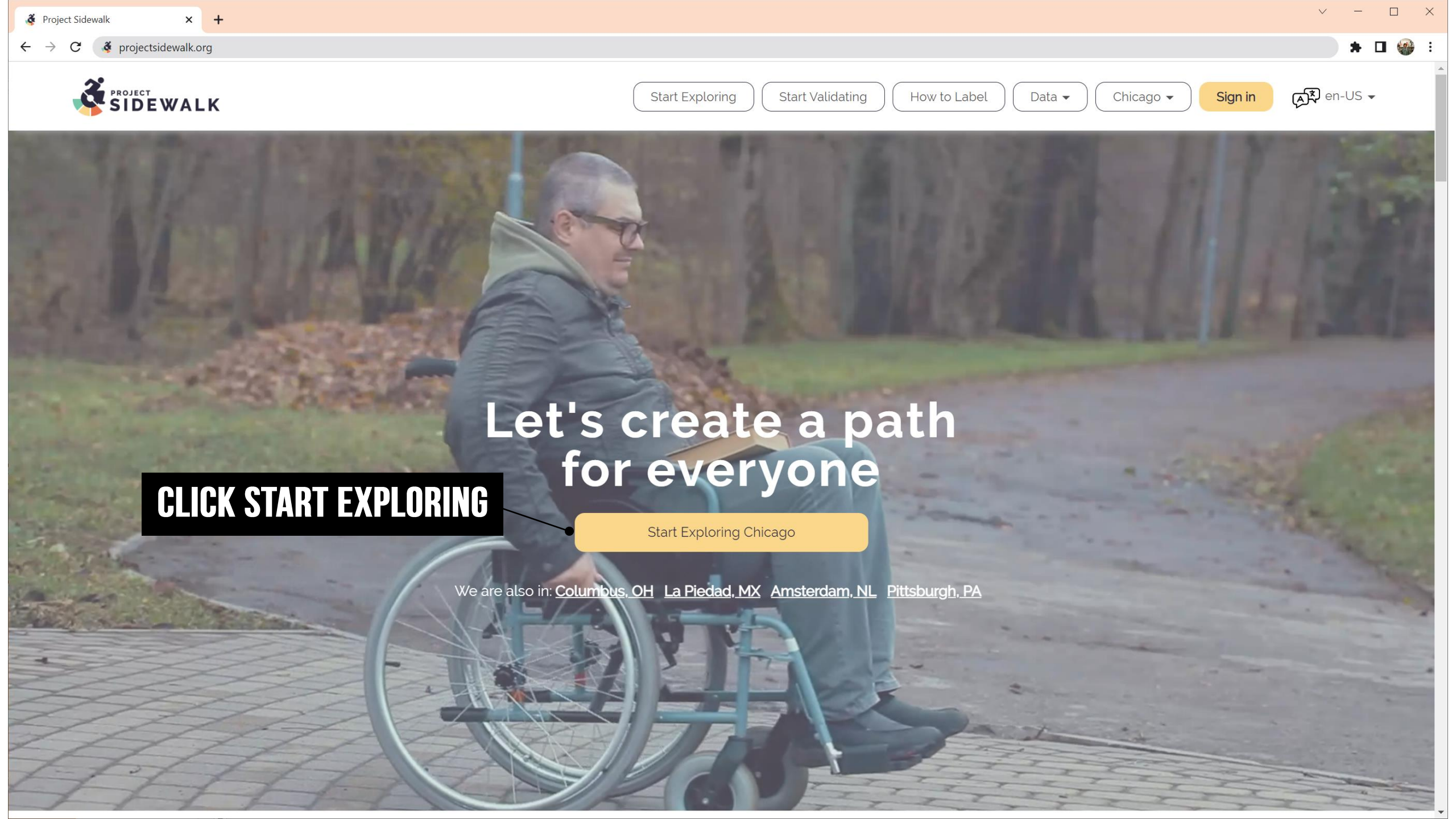
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Our mission: map and assess the world's sidewalks using remote crowdsourcing, artificial intelligence, and online satellite & streetscape imagery

Seattle, WA projectsidewalk.org Joined June 2016

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Project Sidewalk @projsidewalk · May 24, 2022

In collaboration with @el_colmich & @LigaPeatonal, we are now *live* in La Piedad, Mexico! Join our effort to map & assess sidewalk conditions in Mexican cities to improve safety, accessibility, and quality of life: la-piedad.projectsidewalk.org.

> **Liga Peatonal** @LigaPeatonal · May 23, 2022
> #EvaluAndoLaPiedad es una estrategia para recopilar, analizar y visualizar los obstáculos peatonales a través de @projsidewalk. Colabora con @makeabilitylab, @el_colmich y @LigaPeatonal para generar datos que vuelvan más accesibles las calles de La Pieded la-

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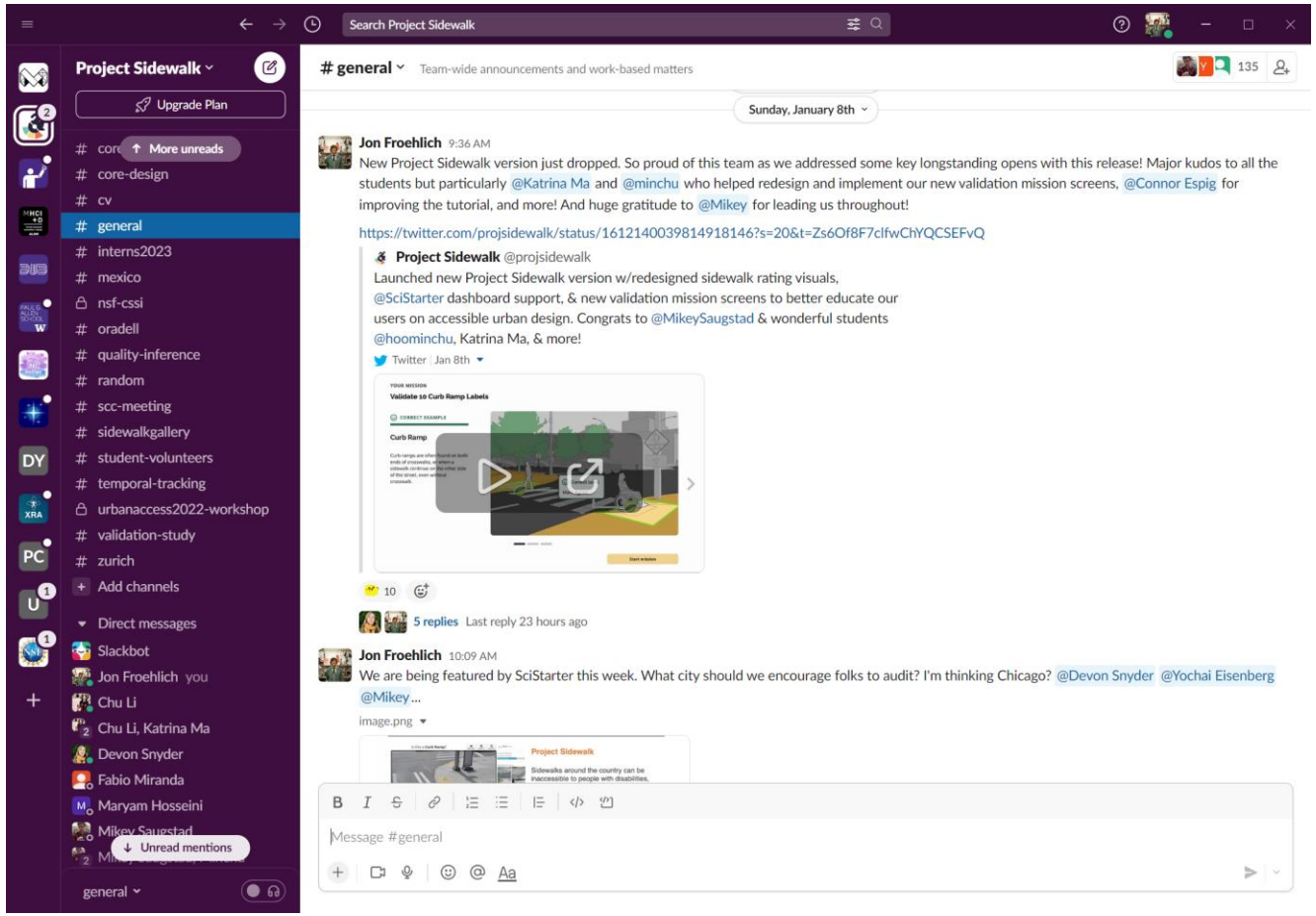

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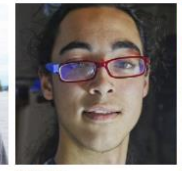

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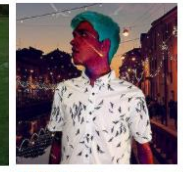

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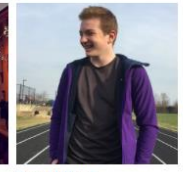

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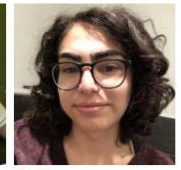

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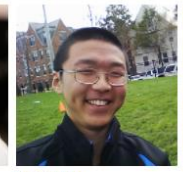

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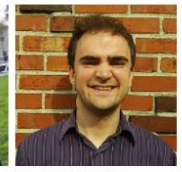

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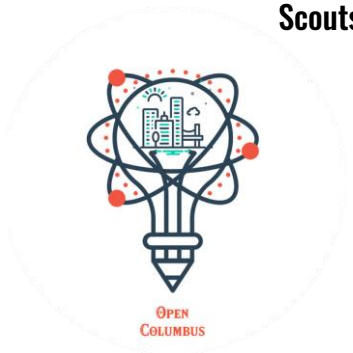
Oradell Girl Scouts

Hackensack Meridian School of Medicine



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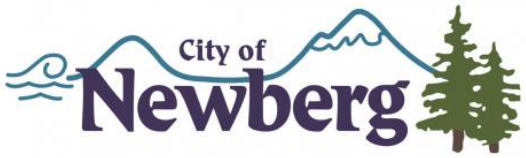

National Multiple Sclerosis Society
Bergen Multiple Sclerosis Community Council

ACKNOWLEDGEMENTS

PROJECT SIDEWALK FUNDING SOURCES

NSF #1302338, #2125087

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THANK YOU!

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