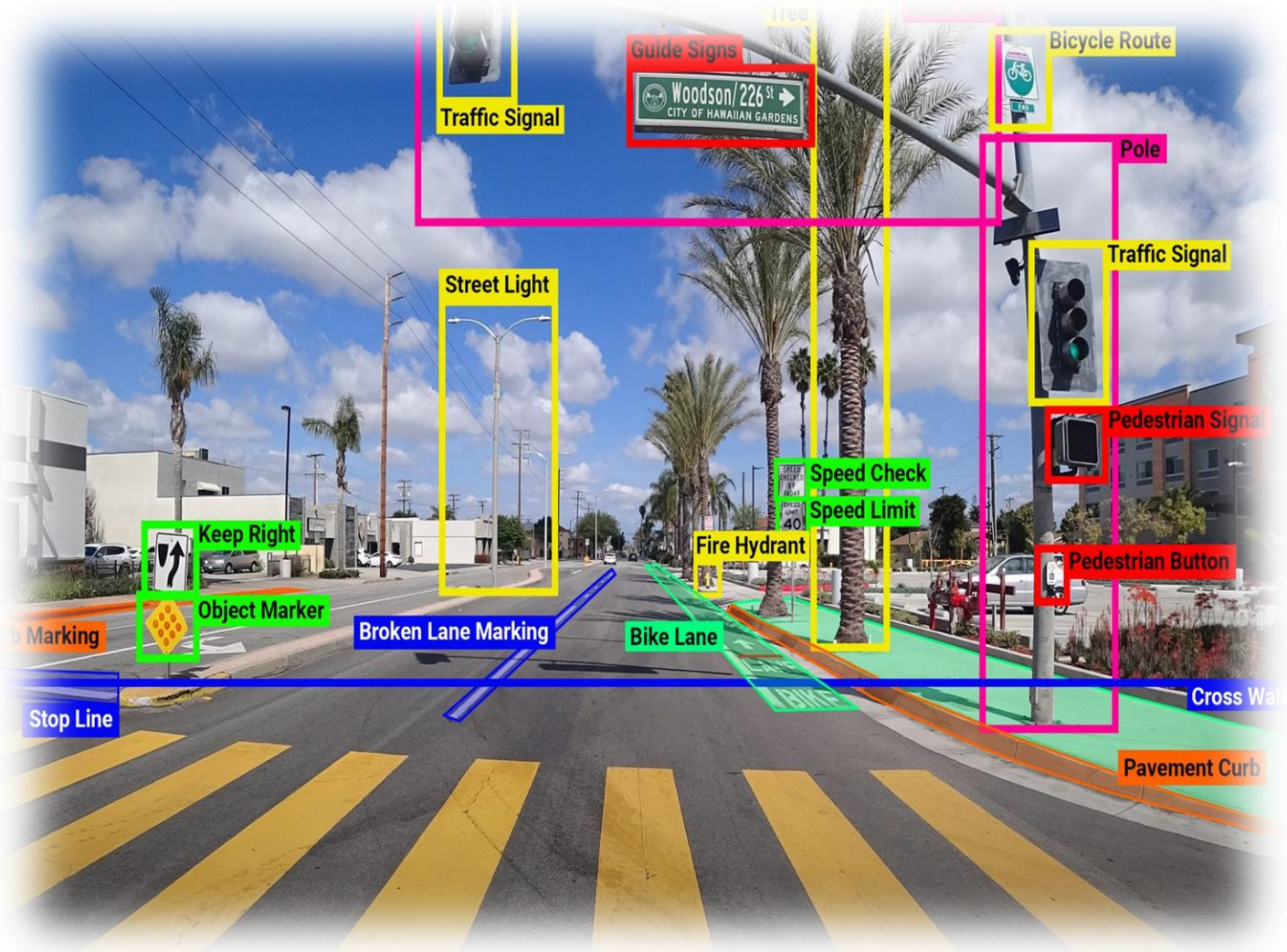
CITY OF SANTA MARIA, CALIFORNIA

AI-Powered Street Right-of-Way Asset Inventory

Our story: the problem we set out to solve, how we chose our approach, what it took, and what it means for pavement management



2026 FHWA Build a Better Mousetrap
Innovative Project Award Winner

SANTA MARIA Smart City Safe City

Santa Maria All-America City

NCE

AUDIENCE POLL

Does your agency use AI for pavement management, asset management, or both?

Answer in the Zoom poll, or type your letter in the chat.

- **A** Not yet
- **B** Exploring or piloting it
- **C** Yes, for pavement management
- **D** Yes, for asset management
- **E** Yes, for both

PART 1 · THE PROBLEM

Where We Started

No citywide inventory

No complete, current GIS inventory of signs, curb ramps, sidewalks or markings. The City was starting from scratch.

Sidewalk gaps unknown

No reliable picture of where sidewalk was missing, so gaps were hard to plan, prioritize and budget.

Manual meant months

A walking survey of 239 centerline miles would tie up staff and put crews next to traffic.

Sound familiar? Most cities our size are in the same position.

PART 1 · THE PROBLEM

It Started with a Sidewalk Question

The question

Where are our sidewalks missing? We needed a defensible map of sidewalk gaps.

The realization

A mobile mapping drive captures the whole street, not just the sidewalk.

The bigger answer

Sidewalks plus eight more asset layers, extracted from the same drive.

326 mi

of sidewalk mapped

309

corners with no curb ramp

9

asset layers, one drive

The Options We Weighed

Walking survey

- Staff or consultants walk every block
- Slow and labor-intensive
- Crews exposed to traffic
- Snapshot only; hard to repeat

Imagery + hand tagging

- One drive captures every street
- Technicians tag assets at a desk
- ~150 signs per day per technician
- Effort repeats for every asset type

Our choice

Imagery + AI extraction

- One drive captures every street
- AI finds and attributes all asset types
- People review instead of tag
- Repeatable each survey cycle

What we weighed: cost, staff time, crew safety, speed, and whether we could repeat it.

PART 3 · WHAT IT TOOK

From Kickoff to Dashboard

1

Set the scope

Which assets and attributes the City needed

City + NCE

2

Drive every street

Mobile mapping of 239 centerline miles

NCE

3

AI extraction

Models find, classify and locate each asset

NCE

4

Quality control

Completeness, consistency and liability checks

NCE

5

City review

Staff check results against local knowledge

City

6

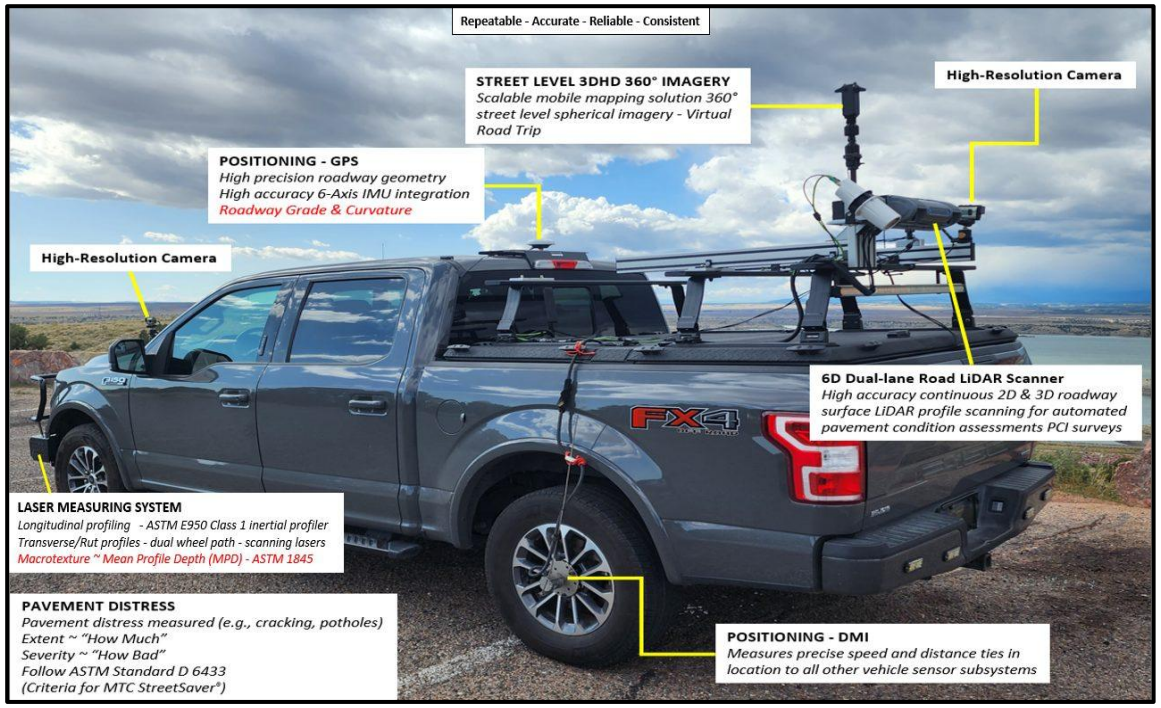
Go live

Web GIS dashboard for City staff

City + NCE

City time went to scope and review. Collection and image processing were handled by the consultant team.

One Drive Captures Every Asset





The vehicle: high-resolution and 360° cameras, LiDAR, and GPS/IMU so every image is located.

The imagery: driveway aprons, signs, light posts, curbs and ramps are all in the frame.

How the AI Learns



Engineers label each asset and its attributes, such as sign type, post type and MUTCD code.

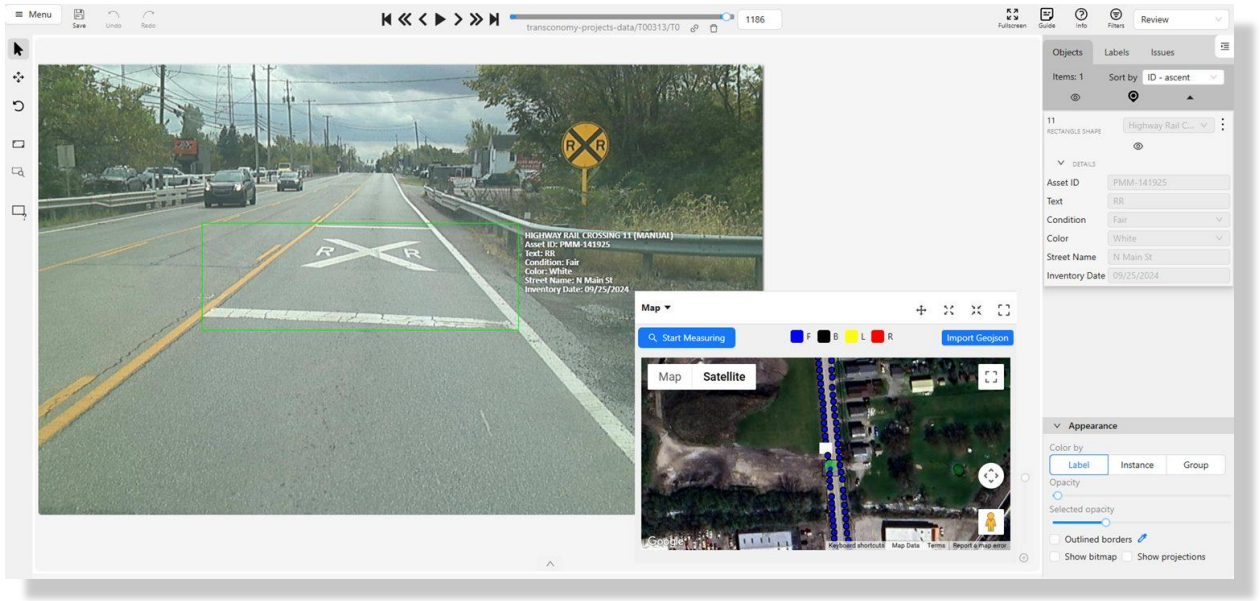
1. **Prepare data** 40,000–50,000 labeled images per asset
2. **Train** Mostly open-source models; iterative
3. **Deploy** Run on signs, markings, ramps and more
4. **Locate** Calculate each asset's latitude and longitude
5. **Retrain** Improve on edge cases over time

584,000
sign images labeled

80 / 20
train / validate split

4 models
detect, classify, read, post

Who Checked What



Review tool: image, detection, attributes and map in one view

AI finds. People confirm.
Multiple human checks before the City sees the data.

1 **Completeness**
Every street and every asset layer accounted for

2 **Consistency**
Spelling and values, the right sign facing the right way, inside the City's right-of-way

3 **Liability focus**
Thorough review of signs, ramps and sidewalks; spot checks elsewhere

Match Review Effort to Liability

High liability
Thorough review

- Regulatory and warning signs
- Curb ramps and missing ramps
- Sidewalk gaps and trip hazards
- Crosswalks and stop bars

30%+ record checked against its image

Moderate
Targeted review

- Street name and guide signs
- Pavement and lane markings
- Curb markings
- Driveway aprons

Review flagged and low-confidence records

Lower
Spot checks

- Trees and tree wells
- Light posts
- Other street furniture

Check a sample; fix patterns, not records

Spend reviewer hours where the agency carries the risk.

How Good Is Good Enough?

Completeness and accuracy of the delivered inventory



Set the target by how you'll use the data

1	**Citywide planning and budgeting**	AI + global QC	**~85–90%**
2	**Maintenance and work orders**	+ thorough review of signs and ramps	**~90%+ on liability assets**
3	**ADA program review and design**	+ LiDAR and field measurement	**Design-grade**

PART 4 · WHAT WE GOT

A Citywide Inventory from One Drive

239 mi
road network

16,602
traffic signs

17,989
driveway aprons

6,580
light posts

4,525
curb ramps

309
corners with no curb ramp

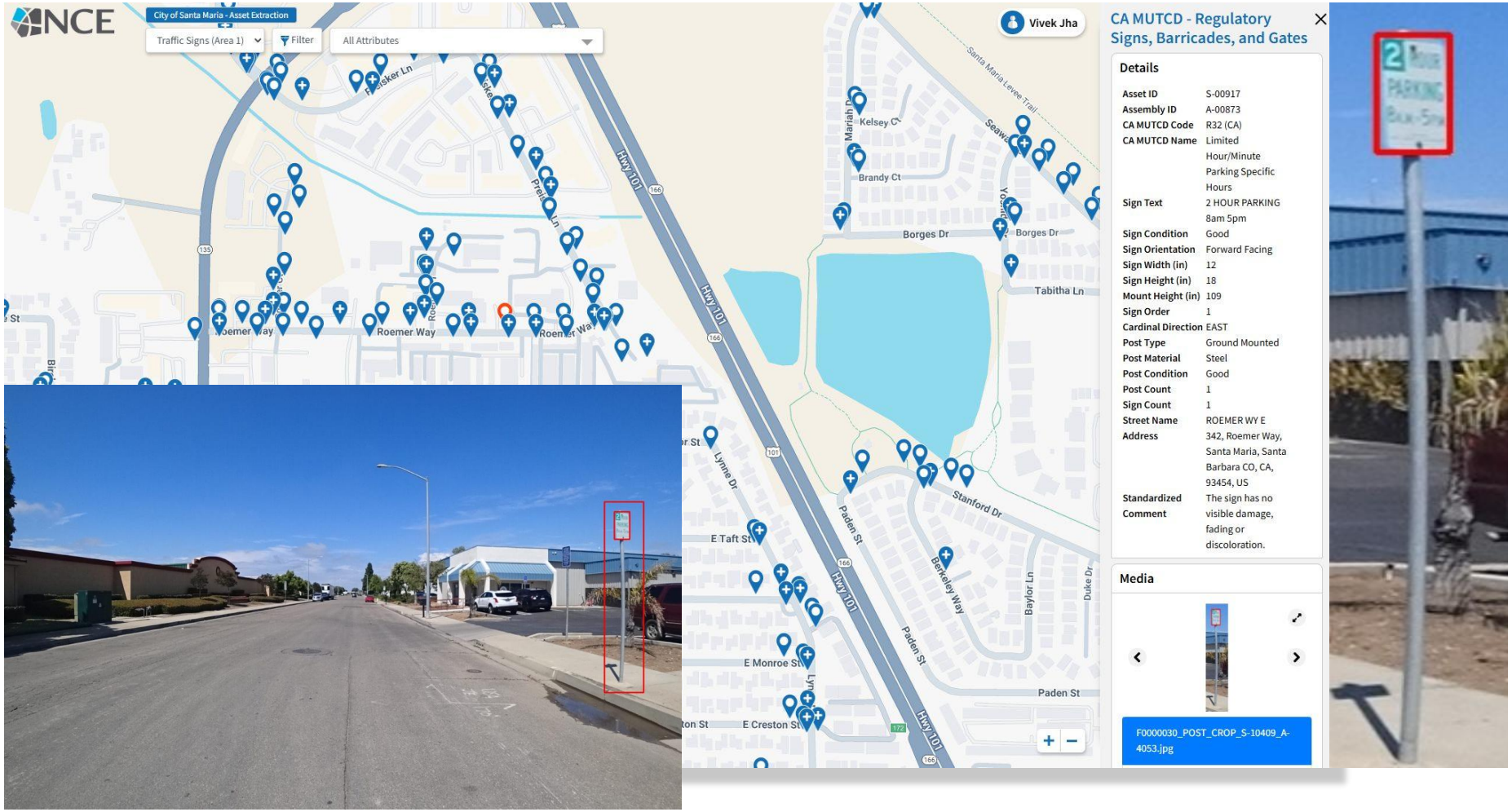
6,757
pavement markings

256 mi
lane markings

326 mi
sidewalk

357 mi
curb markings

Every Asset Comes with a Photo

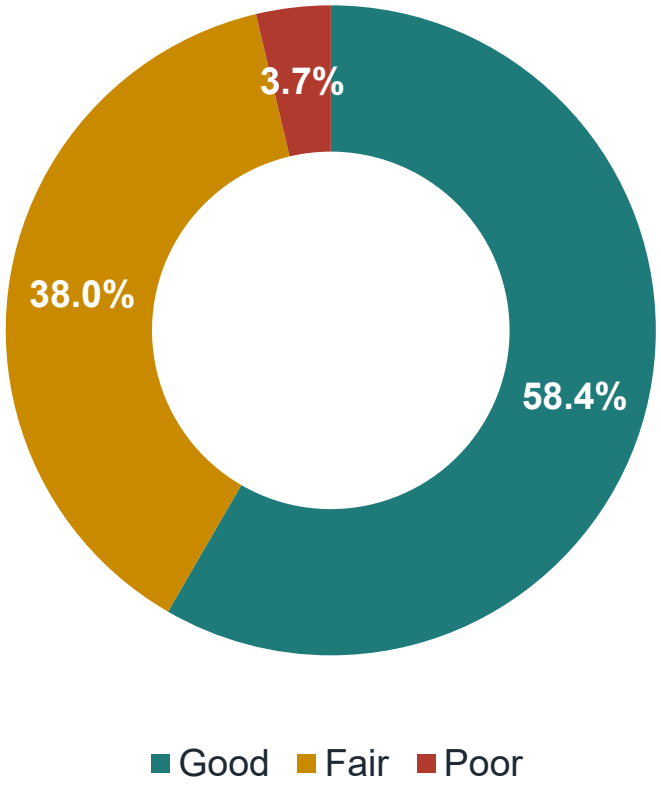


Click a sign, see the sign.

Type, MUTCD code, post, facing direction and condition are attached to each record, with the image that proves it.

What the Data Shows Us

Traffic sign condition (16,602 signs)



~615 signs rated Poor

~6,300 signs rated Fair

309 corners with no curb ramp

4,525 curb ramps, each with a detectable-warning tile attribute

PART 4 · WHAT WE GOT

What Doing It by Hand Would Have Taken

Desktop tagging (by hand)

150 signs/day per technician

~110 technician-days for 16,602 signs

~$80,000–$90,000 for signs alone

~350 technician-days for ~52,000 signs, aprons, lights, ramps and markings

AI extraction + human QC

16,602 signs from one drive

9 asset layers from the same imagery

No crews walking next to traffic

Staff time goes to review, not tagging

Manual tagging scales with staff hours. AI extraction scales with computing power.

PART 4 · WHAT WE GOT

Where the Inventory Can Go Next

Sign replacement program

~615 Poor signs are a ready starting list

ADA transition plan

309 corners without ramps, mapped and photographed

Sidewalk gap closure

A mapped basis for priorities and grant applications

Local Road Safety Plan

Sign and marking inventory to support safety analysis

Work orders and inquiries

Verify an asset from the office photo before a truck rolls

Capital planning

Right-of-way needs joined to pavement sections

Asset First, PMP Second: It Works Either Way

What Santa Maria did

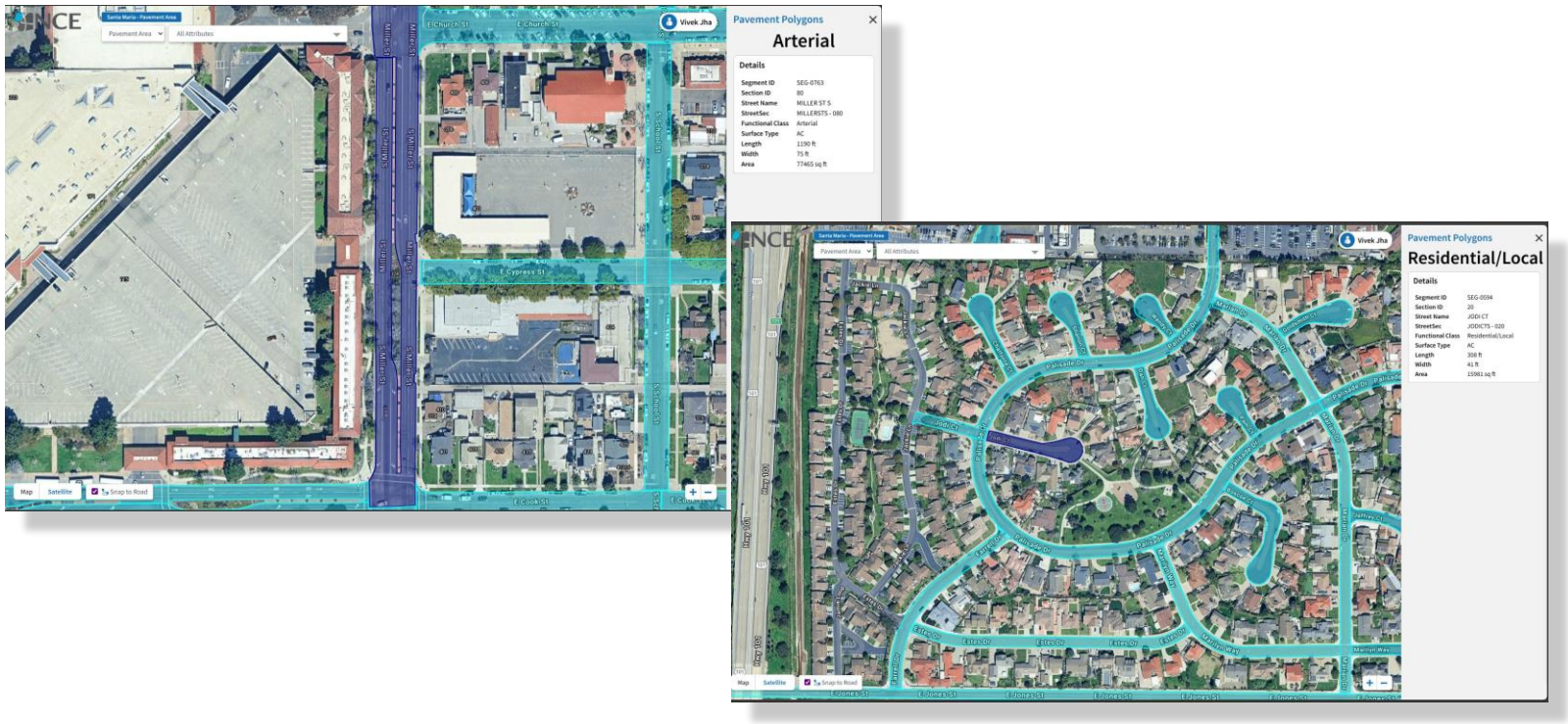
1. **Asset inventory first**
   Sidewalks, ramps, signs and markings mapped citywide
2. **PMP update second**
   Ramp needs and quantities already known when treatments are selected

The more common path

1. **PMP survey first**
   Imagery collected to rate pavement condition
2. **Asset extraction second**
   The same imagery processed for right-of-way assets

Collect once. Whichever program comes first, the other can build on it at incremental cost.

Better Quantities Mean Better Budgets



Pavement area, sample sections

195,600 SF

in the existing database

218,200 SF

recalculated from imagery

+11.5%

area missing from the budget basis

PART 5 · THEN CAME THE PMP

Pavement + Right-of-Way = Real Project Cost

Pavement management
PCI, recommended treatment, pavement cost

+

ROW inventory
Missing ramps, sidewalk gaps, poor signs, markings

=

Total project cost
Section-by-section CIP estimate

Maintenance treatments

Slurry seal, chip seal, crack seal, fog seal

Generally do not trigger curb ramp upgrades

Alterations

Cape seal, microsurfacing, mill and overlay, reconstruction

Trigger ADA curb ramp upgrades at crossings

One example: missing curb ramps

10 streets in the paving program

19 corners with no curb ramp

19 × $10,000 (conservative) =

$190,000

not in the paving budget. Other assets work the same way.

Every Asset Can Carry a Cost

Curb ramps
Install or upgrade, each

Curb and gutter
Repair or replace, per linear foot

Sidewalk
Repair and close gaps, per square foot

Striping and markings
Restripe after paving

Traffic signs
Replace poor-condition signs

Manholes
Adjust to grade, each

Water valves
Adjust to grade, each

Drainage inlets
Modify or replace, each

Tied to each PMP section

PCI and treatment, plus the quantity and unit cost of every asset on that section

A more accurate initial cost estimate

Fewer surprises at design and bid

Need More Detail? Add LiDAR Selectively

Imagery + AI
The inventory layer

- What the asset is and where it is
- Type, attributes and visual condition
- Every street, every cycle
- Low processing cost per mile

LiDAR
The measurement layer

- Curb ramp running and cross slopes
- Landing size and sidewalk cross slope
- Vertical displacement and clearances
- New uses emerging as tools mature

LiDAR processing is expensive. Use image processing for the broad inventory, and point LiDAR at the corridors and assets that need measurement.

What We'd Tell Other Agencies

Start with a question, capture everything

We asked about sidewalks and got nine asset layers from one drive.

Define the rules first

Agree on assets, attributes and what counts as City right-of-way before models run.

Have a plan for what you find

Missing ramps and poor signs are now on record. Tie them to the ADA plan and sign program.

Put reviewers on liability

Signs and ramps get thorough QC; trees and light posts get spot checks.

Set accuracy by use

~90% serves planning; design-level work needs LiDAR and field measurement.

Collect once, in either order

Assets first or pavement first: the second program builds on the first.

Before You Start: Questions to Ask

Who owns the data?

Imagery and extracted layers: can you reuse, share and re-process them later?

Will it load as-is?

Does the schema match your GIS and work order system, or will staff reformat it?

How is accuracy measured?

Completeness and attribute accuracy, checked how, and what is your acceptance test?

What gets human review?

Which assets get 100% QC, and what QC records come with the delivery?

How will it stay current?

Can it be refreshed with each pavement survey at incremental cost?

What will it cost, per mile?

Base inventory, optional layers and LiDAR priced separately so you can choose.

Questions & Discussion



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