

Designing Signals for People: Philadelphia

April 16, 2026



Office of
Multimodal
Planning

Philly signal basics



↙ Metaphor for Philly signals

For better or worse, they're basically fixies. The typical signalized intersection:

Pre-timed

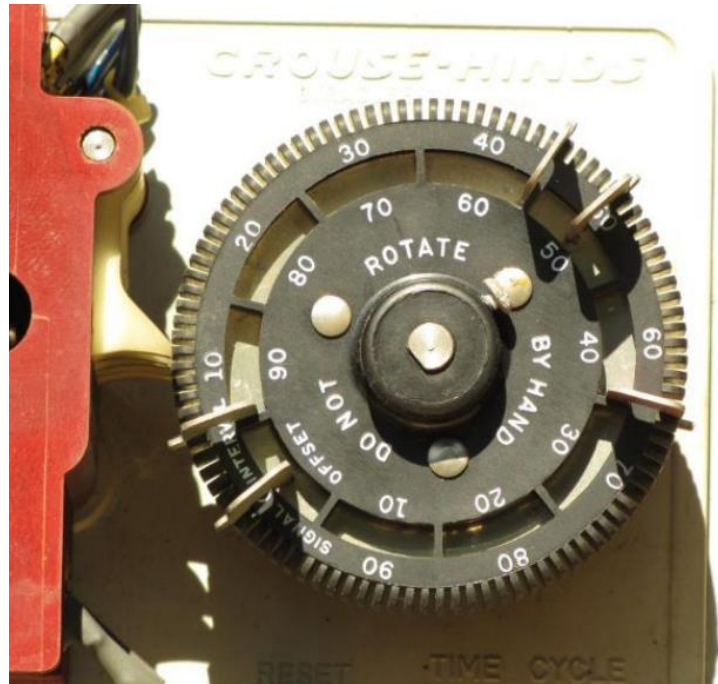
Ped recall

2-phase

Short cycle lengths

...and these are our signal controllers

Almost 1,200 of our signalized intersections run on electromechanical controllers ($\approx 37\%$)

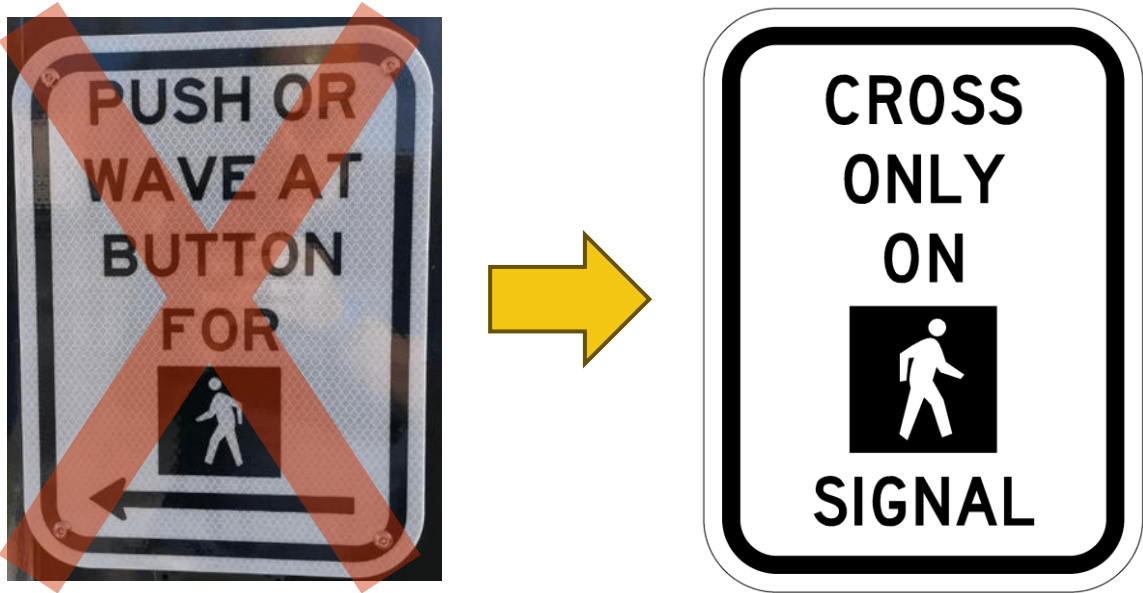


Simple Upgrades

Touchless APS

Basically, passive detection

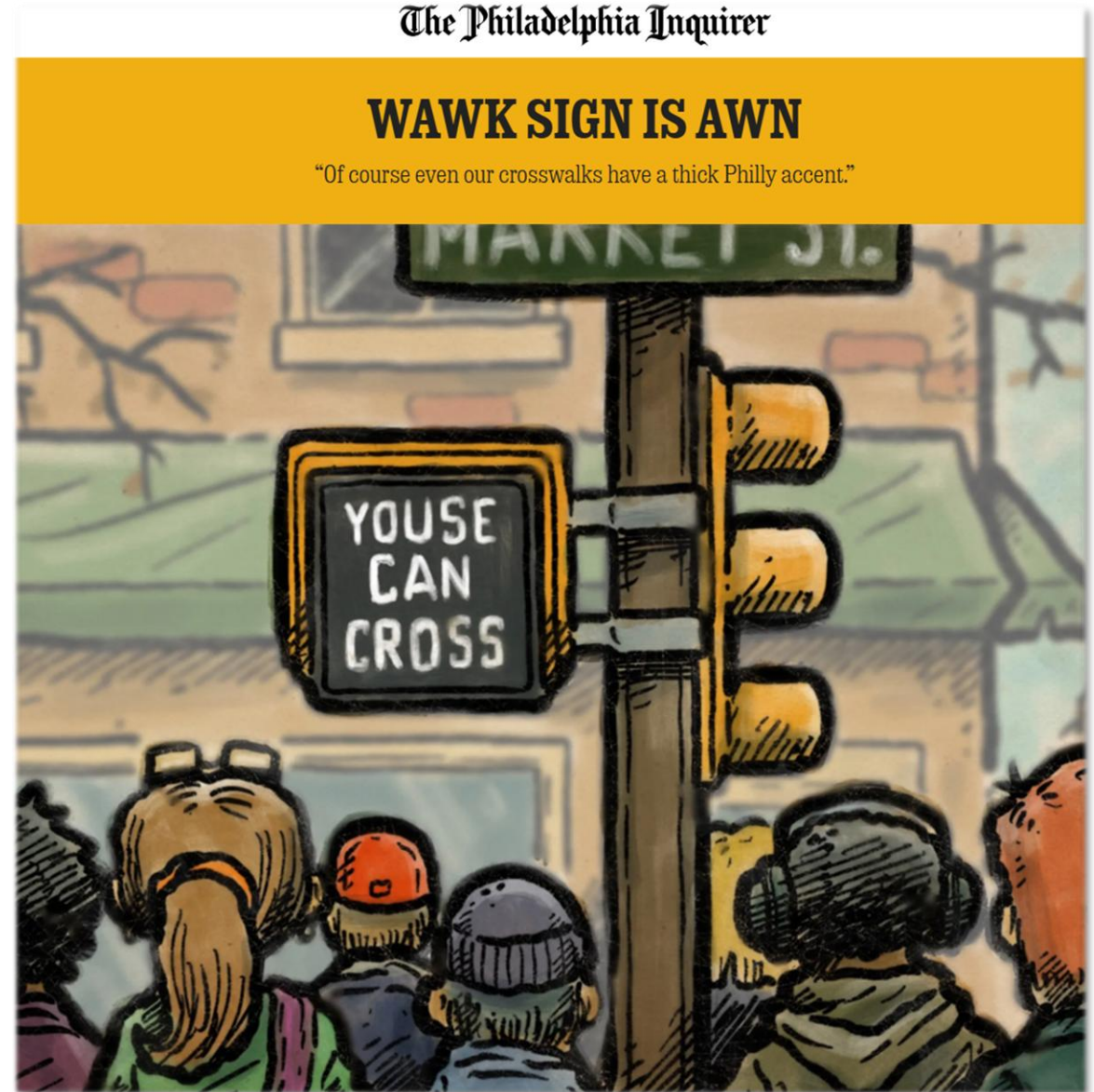
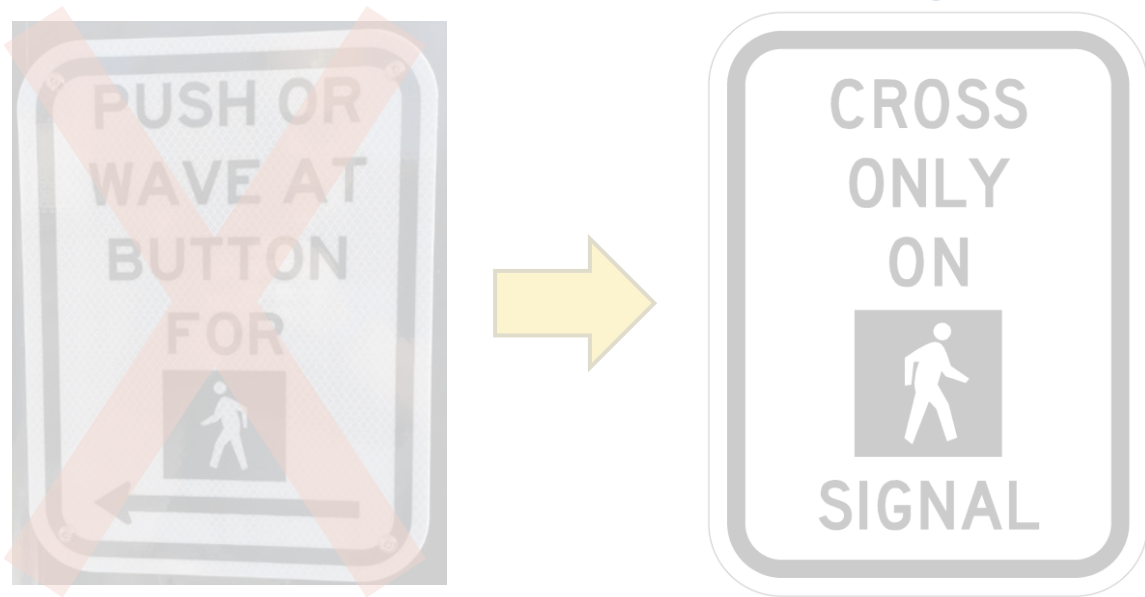
With ped recall, getting the sign right:



Touchless APS

Basically, passive detection

With ped recall, getting the sign right:



Left turns and VRUs



6am-9pm: protected only
Overnight: flashing yellow arrow (w/ shorter cycle)

Busy crosswalk

Typical guidance is based on vehicular conflict factor or if 3+ opposing lanes
Think of bike lane or crosswalk as that third lane
Drivers often less focused on ped/bike conflicts





Emergency flash red

MUTCD says major street
should flash yellow

If a pedestrian needs to cross
the approach, we feel strongly it
should (shall even!) flash red

Implementing as we update
timings

A 24-hour perspective on safety

Considering 24-hour impacts

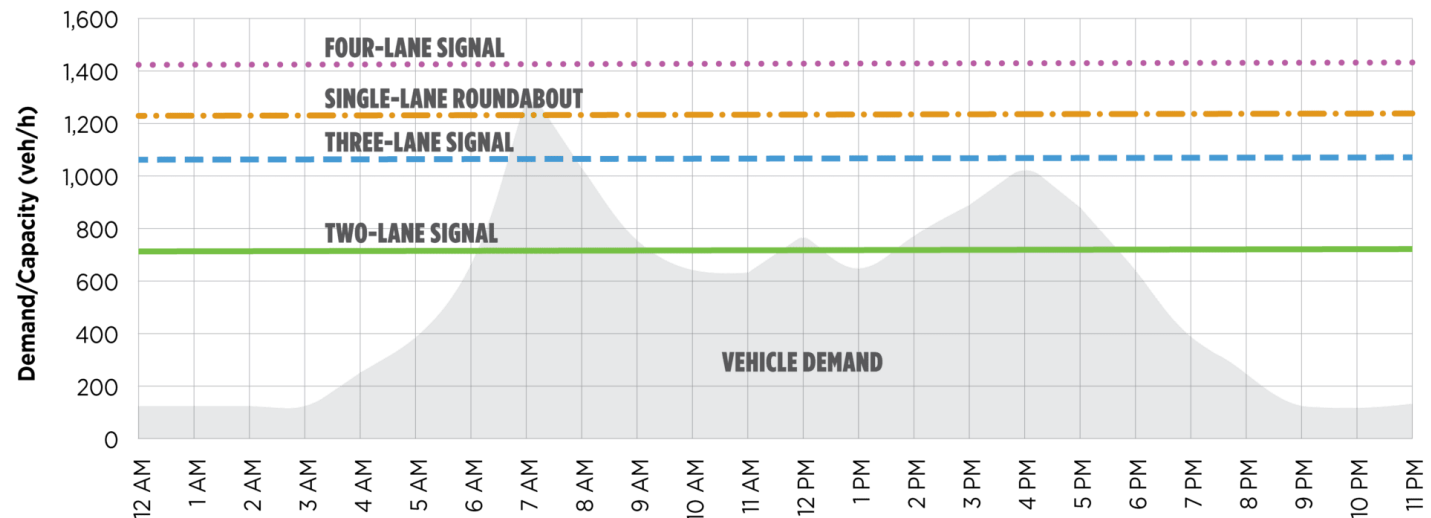
[NCHRP 1036](#) introduced the [24-Hour Capacity Framework](#)

Designing for peak hour operations and the dangers of excess capacity

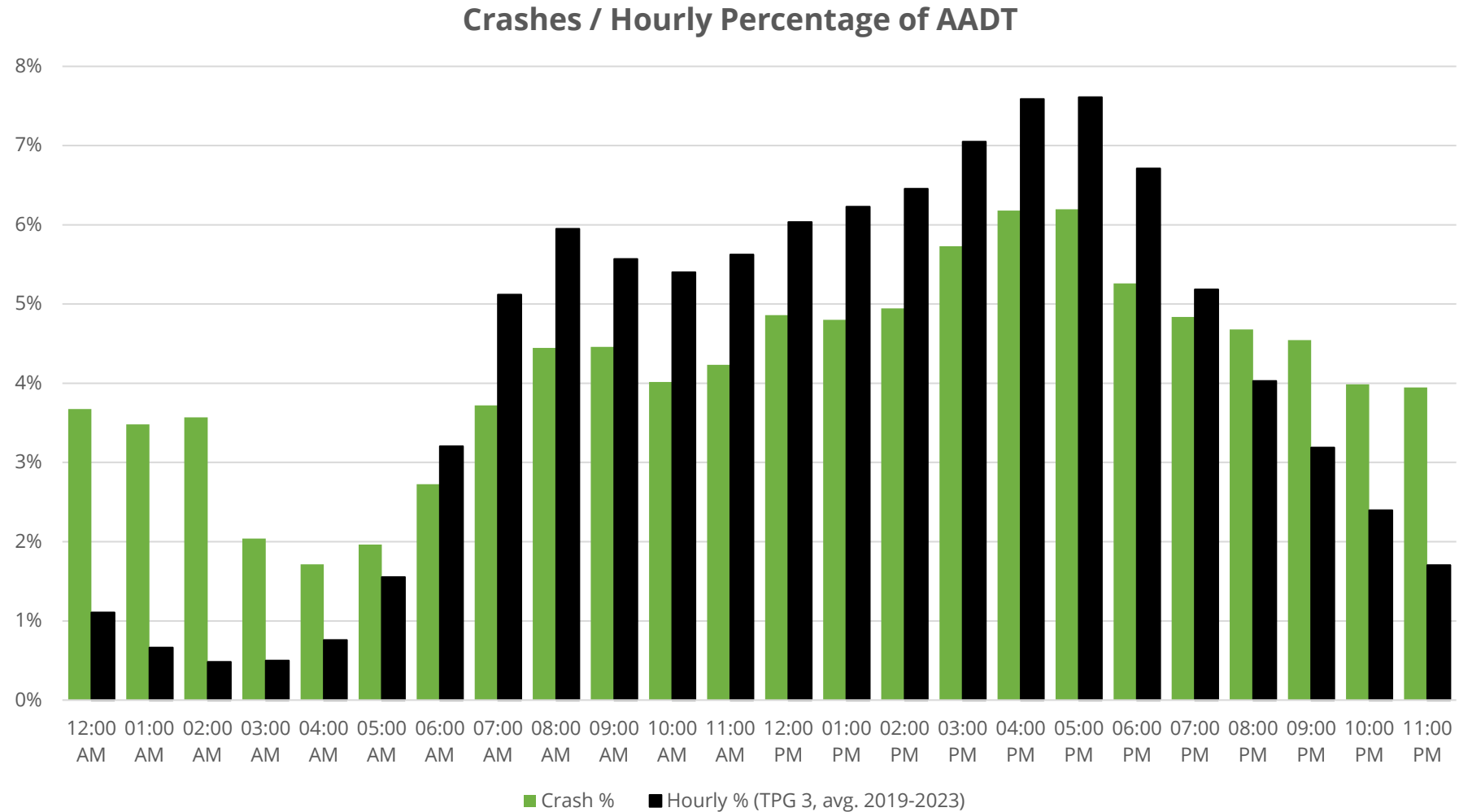
Our side project:

Studying volumes, speeds, and crashes on our multilane arterials to quantify the impacts of excess capacity in Philadelphia

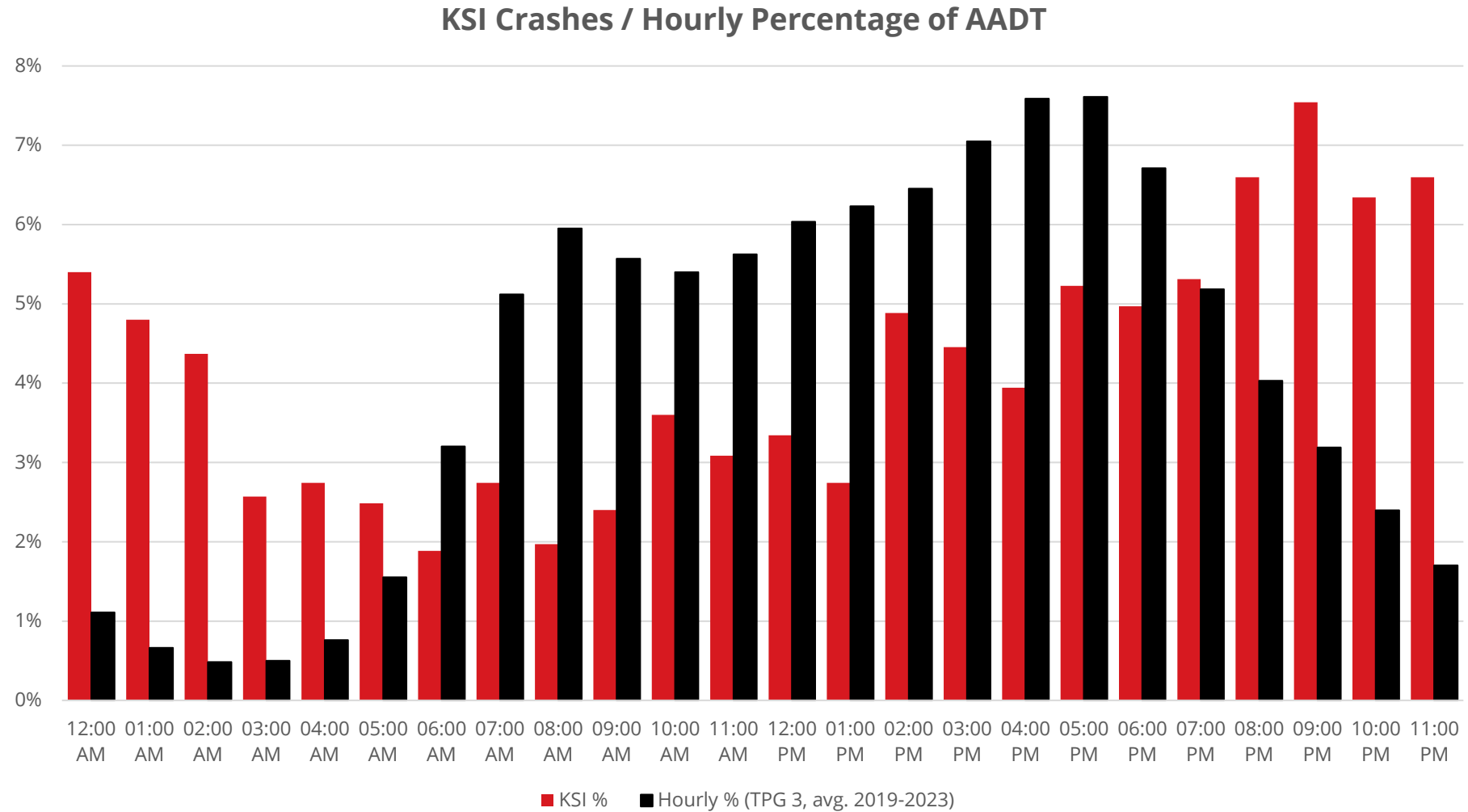
ALL-DAY INTERSECTION ASSESSMENT



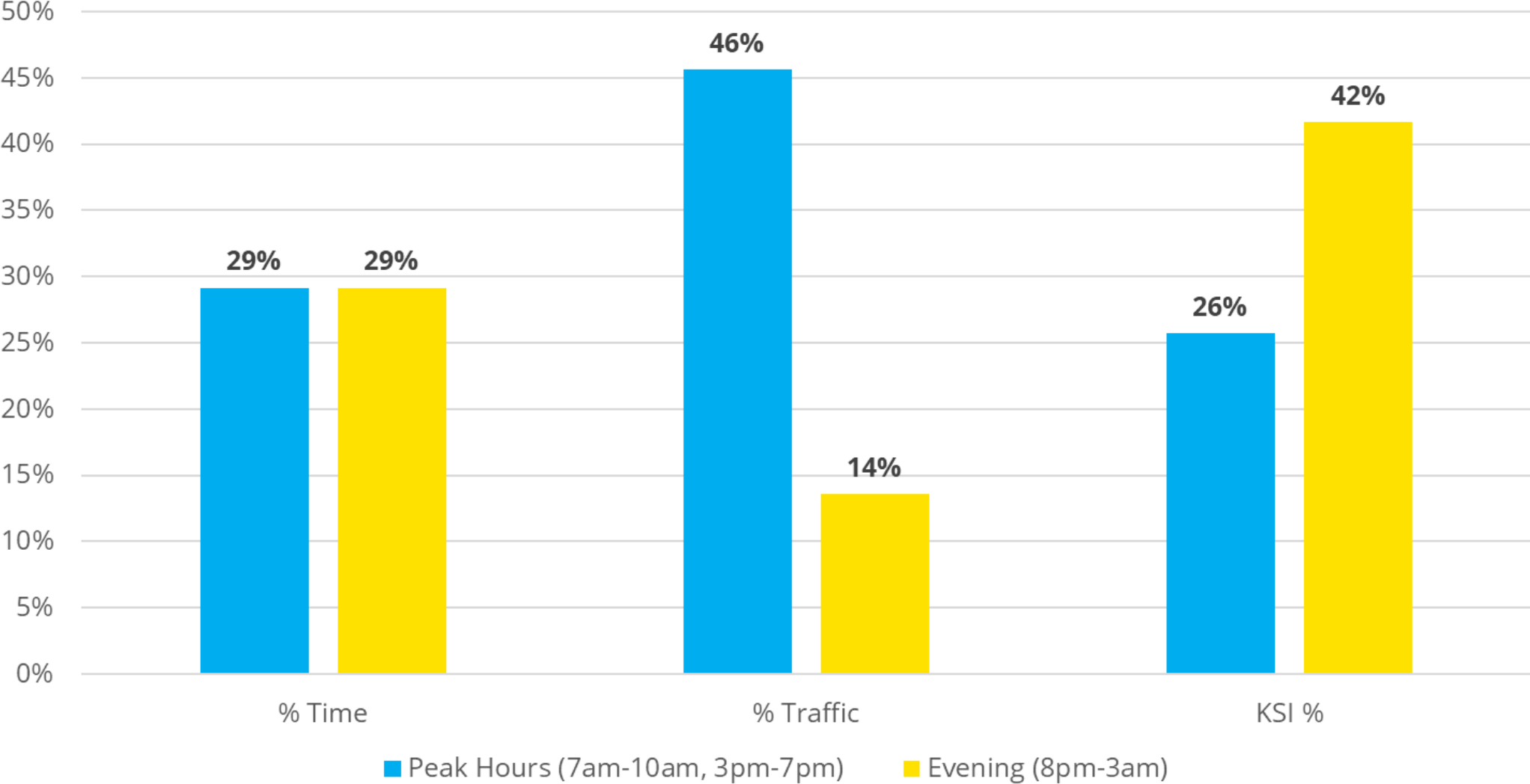
While overall crashes trend with traffic demand...



...Focusing on severe crashes tells a different story



On multilane arterials, people are killed and seriously injured most often when congestion is at its lowest points of the day



Minimizing stale green

Goal to reduce **speeding opportunities**

Research from Dr. Peter Furth ([Safe Waves study, 2024](#))

Easiest places to do this:

- 1) One-way streets
- 2) Fully actuated signals

Speeding opportunity:

Event of a thru vehicle approaching an intersection on a stale green when there is no vehicle ahead of them for 5 seconds.

Pre-timed signals limit our possibilities, but a few concepts...

Lower cycle lengths

Lower progression speed

Avoid large clusters

Break up coordination zones



Reducing off-peak cycle lengths

Mostly 60 sec cycles...but not everywhere

Where longer cycles exist → reduce off-peak cycles as much as possible

First focus area: N. Broad St

North Broad

Cycle Length: 100 sec

South Broad

Cycle Length: 60 sec

N. Broad has **over 5x the KSI rate**

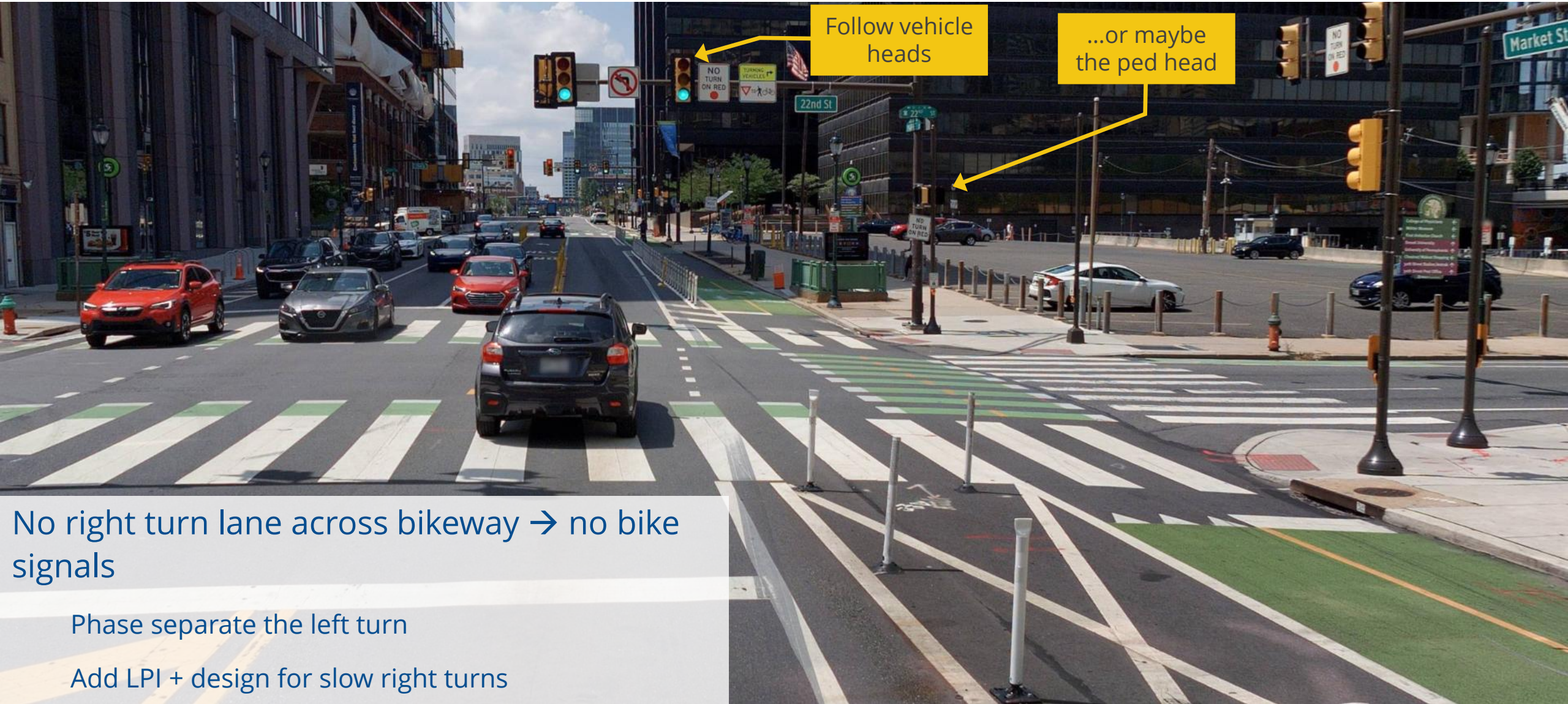
...and **over 7x the KSI rate between 8pm and 6am**

Bike signal examples

Market St & 22nd St



Market St & 22nd St



Follow vehicle heads

...or maybe the ped head

No right turn lane across bikeway → no bike signals

Phase separate the left turn
Add LPI + design for slow right turns

Market St & 22nd St



Walnut St & 63rd St



Walnut St & 63rd St



Old signal equipment → replacement in design

Parking-separated bike lane installed through PennDOT paving

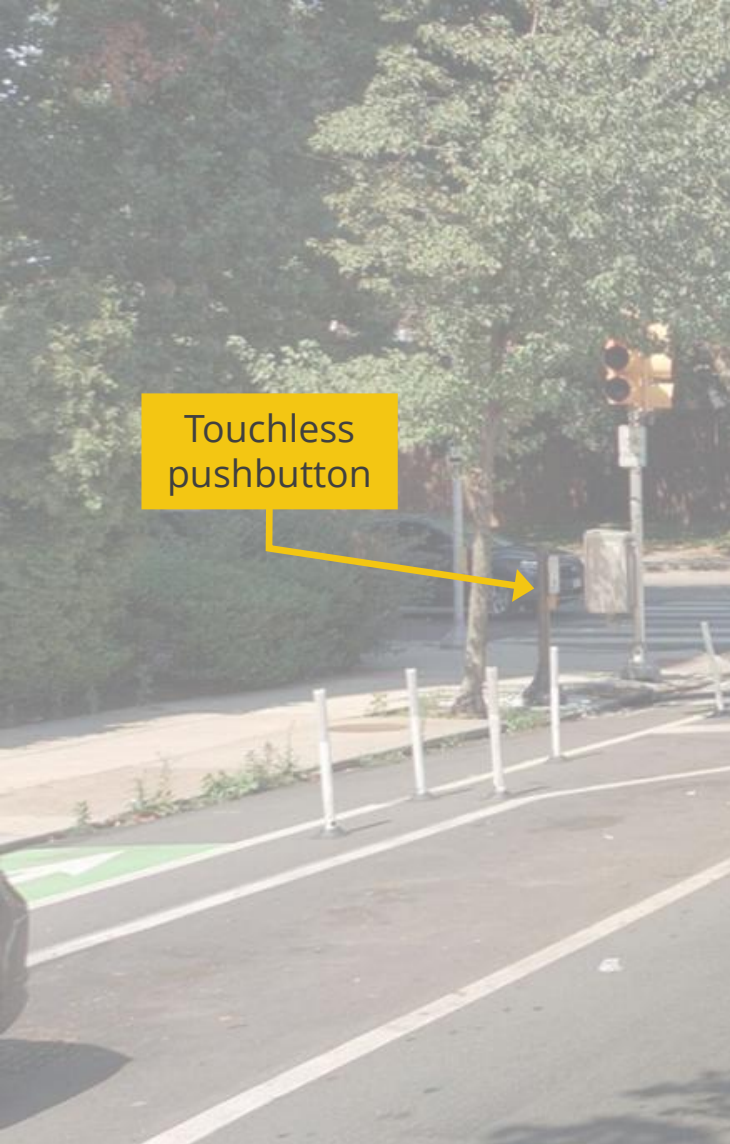
Existing phasing – actuated ped crossing of 63rd

Walnut St & 63rd St



Creative solution as stopgap:
Touchless pushbutton to call bike phase
(concurrent with ped crossing)

Walnut St & 63rd St



Walnut St & 63rd St



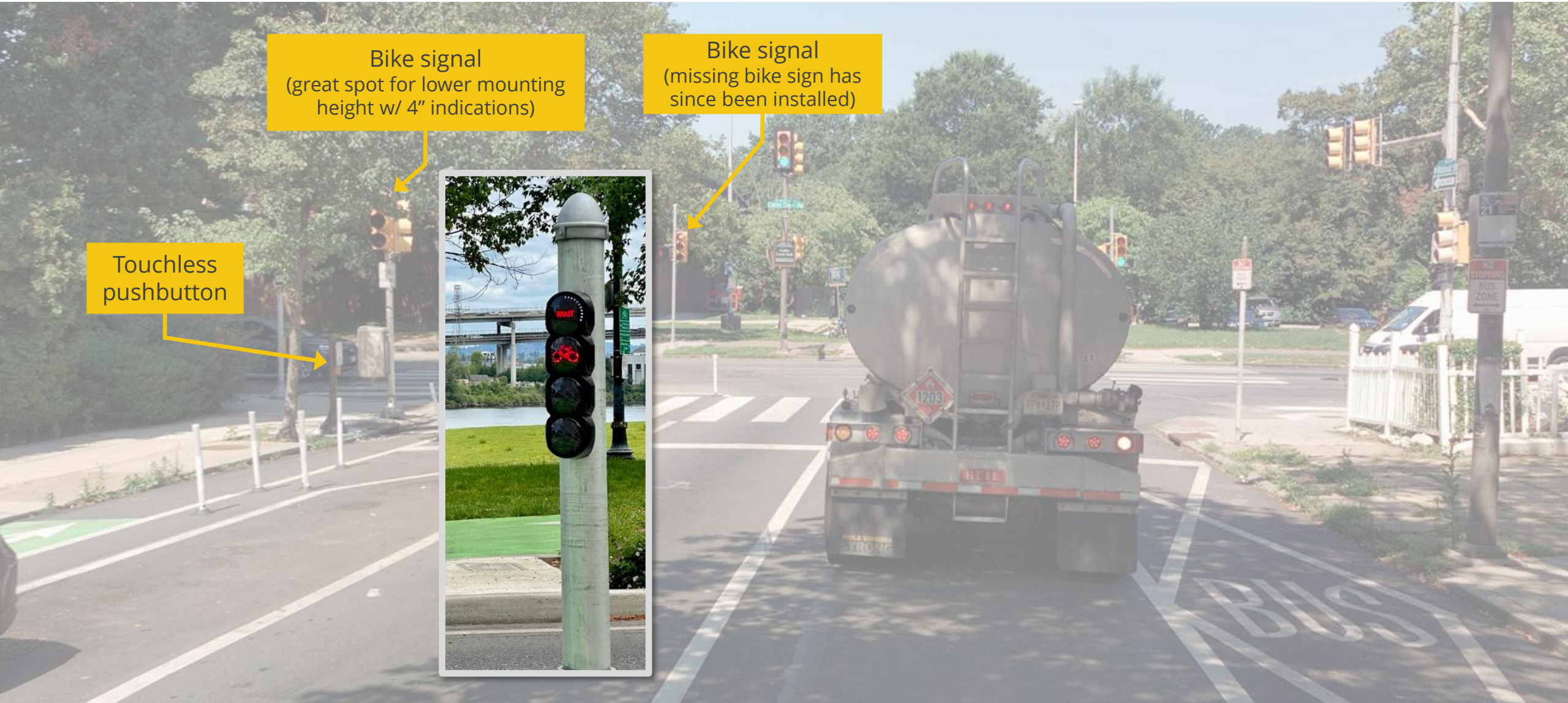
Bike signal
(great spot for lower mounting
height w/ 4" indications)

Bike signal
(missing bike sign has
since been installed)

Touchless
pushbutton

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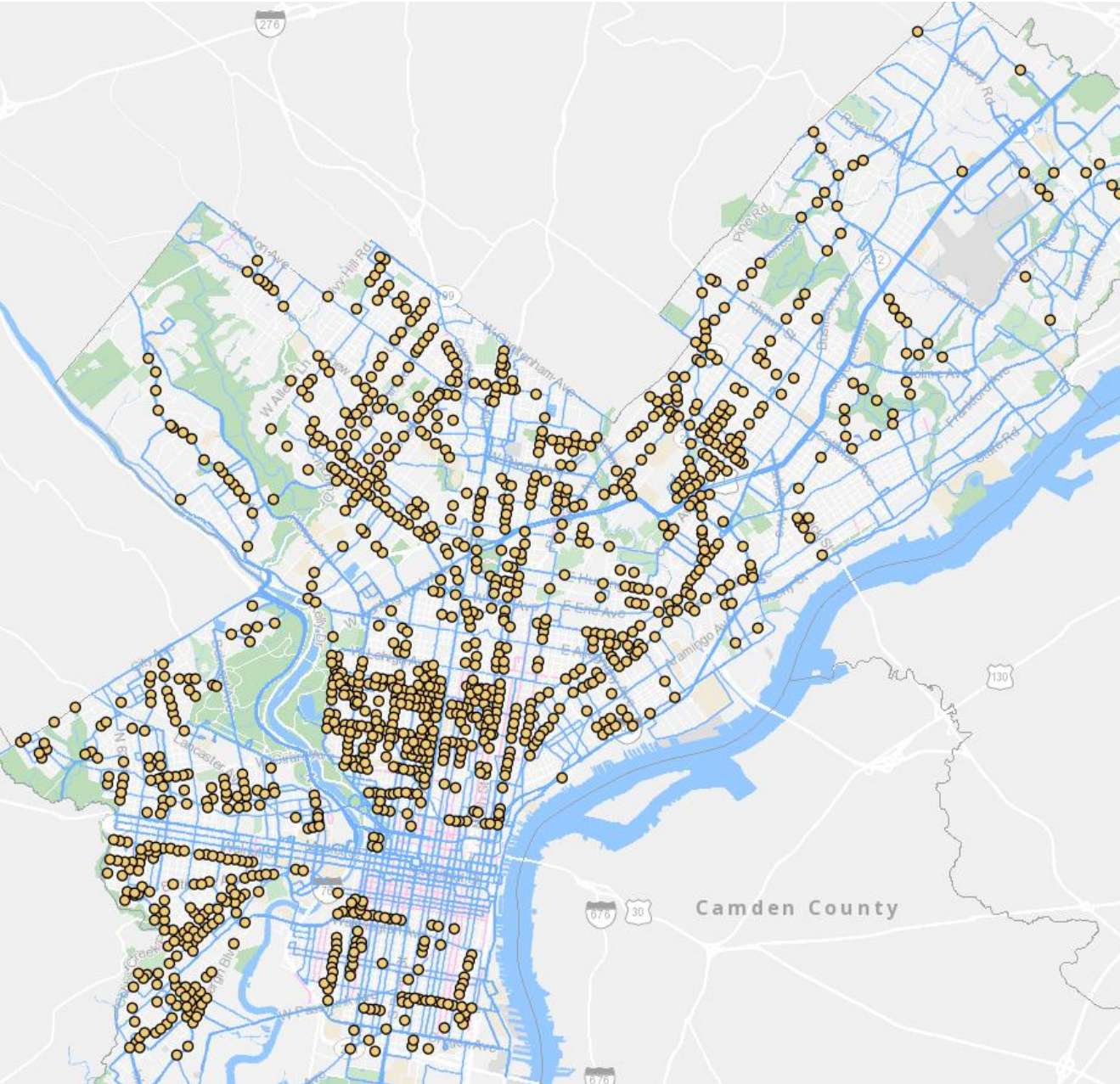
HSIP project:

Opportunity to replace pushbutton with passive detection (stop bar + advance loops)

Walnut St & 63rd St



**Sometimes the best signal
improvement is...removing them**



Remember those old controllers?

Replacement cost = \$\$\$\$

But should they be replaced?

Previous signal removal

Over 400 signals converted to all-way stops in Philadelphia between 1979-1988

1997 study produced the following CMFs:

0.76

all crashes

0.76

angle, left turn, and right turn crashes

0.71

rear end crashes

0.82

ped crashes



CRASH REDUCTIONS RELATED TO TRAFFIC SIGNAL REMOVAL IN PHILADELPHIA¹

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Abstract—The effect on intersection crashes of converting one-way street intersections in Philadelphia from signal to multiway stop sign control was estimated. Using crash and traffic volume data for a comparison group, regression models were computed to represent the normal crash experience of signal controlled intersections of one-way streets, by impact type, as a function of traffic volume. An empirical Bayesian procedure was used to estimate what would have been the expected number of crashes at the converted intersections had they not been converted. The empirical Bayesian estimates were compared with actual counts of crashes after conversion. Estimates were obtained for different classes of crashes categorized by impact type, day/night condition, and impact severity. Aggregate results indicate that replacing signals by multiway stop signs on one-way streets is associated with a reduction in crashes of approximately 24%, combining all severities, light conditions, and impact types. © 1997 Elsevier Science Ltd.

Keywords—Signal removal, Safety evaluation, Empirical bayesian, Generalized linear modeling

INTRODUCTION

One of the functions of traffic signals is to promote the safe entry and exit of vehicles at intersections. Traffic patterns, demographics, and other considerations can change, and intersections that once justified traffic signal control may no longer do so. The consequences of replacing traffic signals with other traffic controls on motor vehicle crashes and crash injuries have not been well understood, and often they have been misunderstood. The *Manual of Uniform Traffic Control Devices* says, "Many laymen believe that traffic signals provide the solution to all traffic problems at intersections" and "has led to their installation at a large number of locations where no factual warrant exists" (U.S. Department of Transportation, 1988, p. 4B-2).

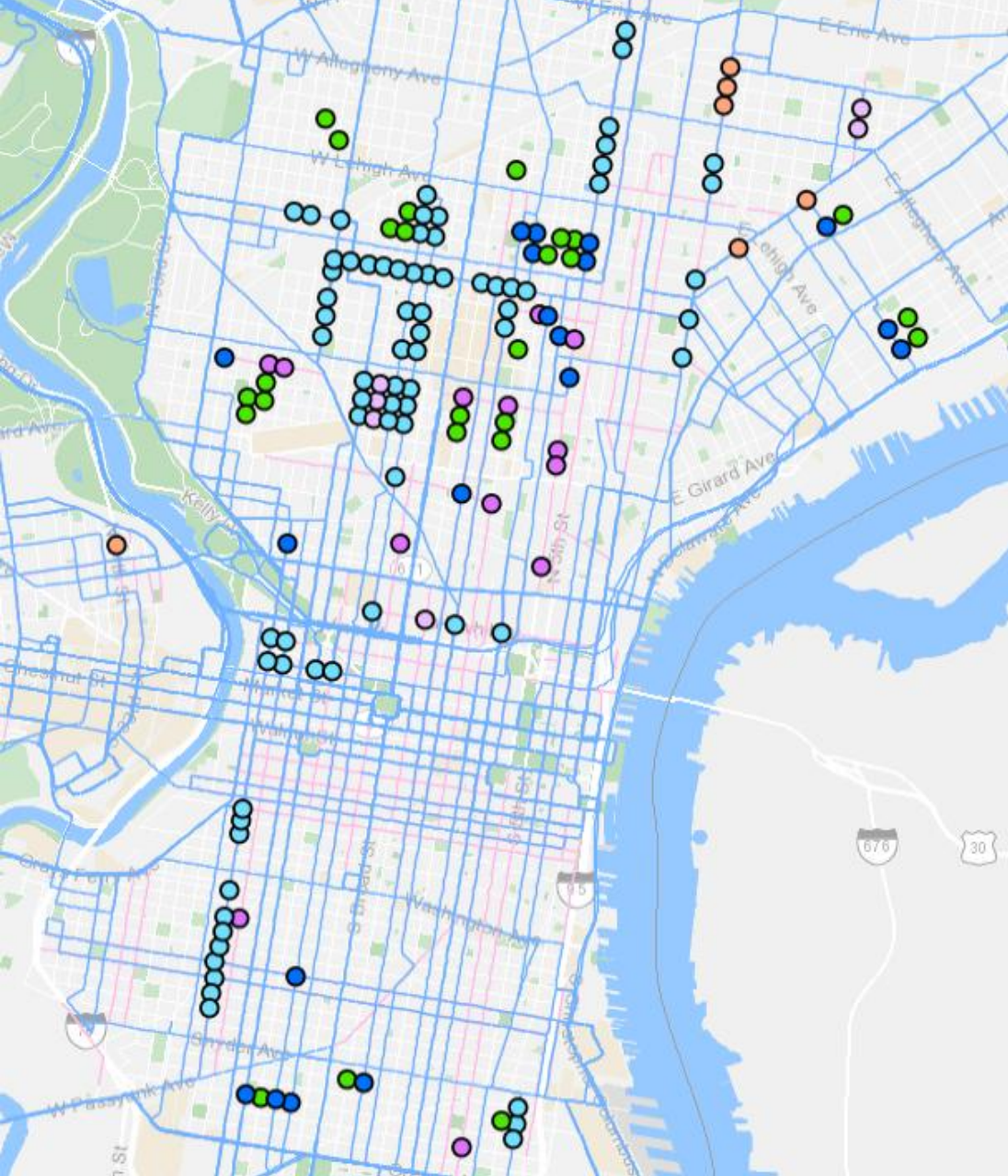
The only major study on signal removal was conducted more than 15 years ago by Kay, Neudorff, and Wagner (1980), based on 217 signal removals in

several U.S. jurisdictions. That study concluded that "intersections that are good candidates for signal removal are the ones with relatively low traffic volumes and annual accidents of at least 2 or more per year" (p. 4). The latter part of this conclusion was based on a before and after analysis of intersections grouped by the count of crashes in the before period. However, as Persaud (1988) points out, the finding that crashes increased where there were few crashes, and vice versa, is likely an artifact of the regression-to-the-mean phenomenon. Neudorff (1978) reported a moderate reduction in crashes following conversion of a small number of intersections from signal to stop sign control in one of the sites included in Kay, Neudorff, and Wagner (1980).

A signal removal program was undertaken in 1978 in the city of Philadelphia. The rationale for the signal removal program is described in a Philadelphia Department of Streets report. As of 1977, the City was legally bound to follow Pennsylvania Department of Transportation's traffic signal warrants, which have been interpreted as indicating that signals are not warranted at intersections with annual average

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¹Presented at the 1997 Annual Meeting, Transportation Research Board, Washington, D.C., U.S.A.



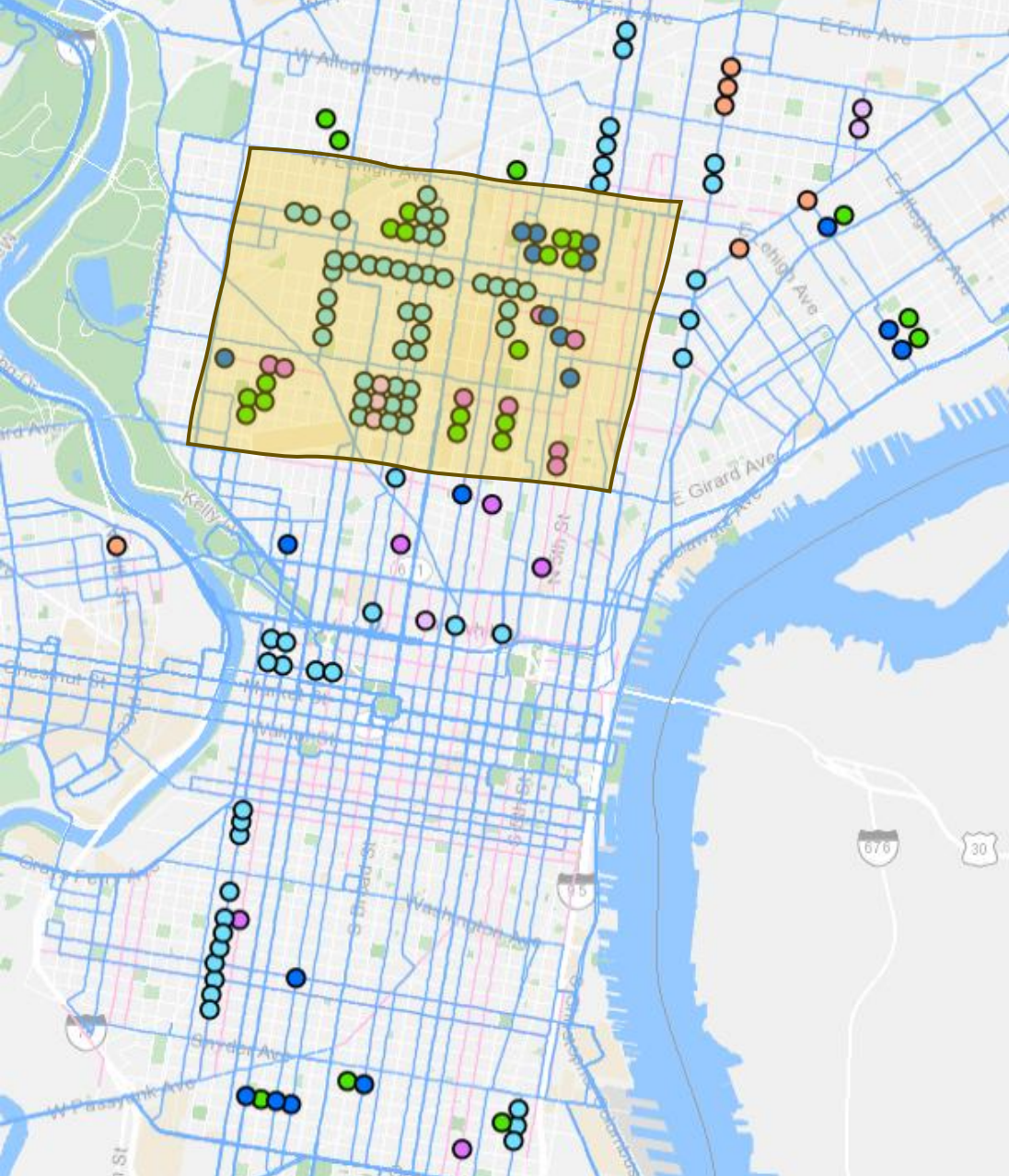
Prioritizing signal removal

Lowest hanging fruit:

Intersections of one-lane, one-way streets

Avoid state roads

Avoid frequent transit corridors



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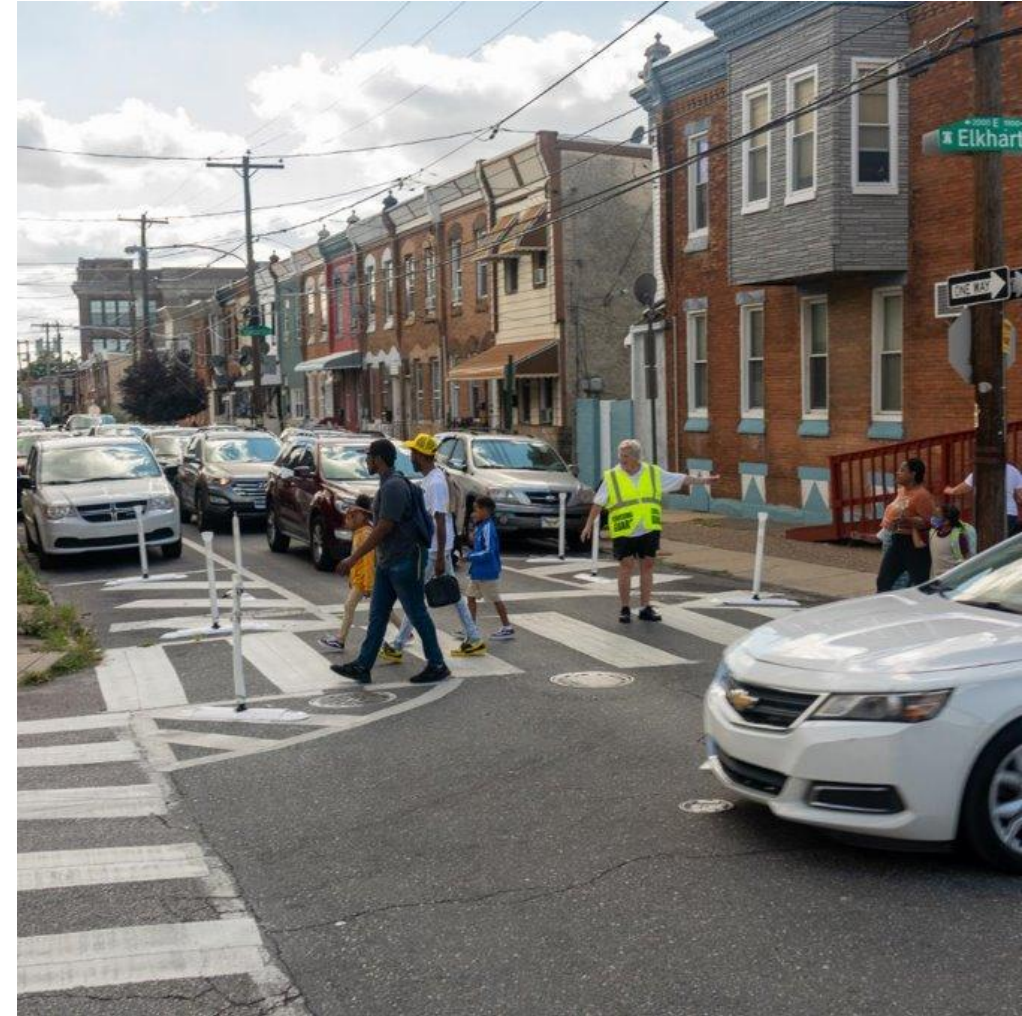
Large concentration of candidates in Lower North → **study coming soon**

Signal removal = challenging engagement

Felt as disinvestment

Combine signal removal with traffic calming

Calculating life cycle costs (and benefits) of signals vs. traffic calming



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