

Iowa DOT & StreetLight InSight®

MODELING, FORECASTING & TELEMETRICS TEAM –SYSTEMS
PLANNING BUREAU



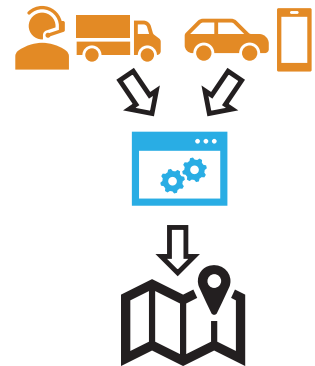
What is StreetLight and the Insight® Tool?

StreetLight harvests “Location-Based Services” and “Navigation-GPS” device data

- Characteristics:
 - Data roughly covers 10% of the US adult population
 - Monthly data periods from 2014 to present
 - Data is wiped of identification prior to release to StreetLight

Processes the data via their Route Science® Technology

- Characteristics:
 - Average spatial precision is better than 25 meters (less than 70 yards)
 - Temporal-precision, one-hour intervals, weekends and weekdays



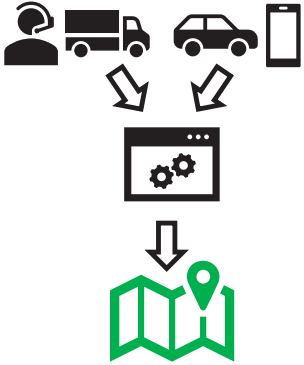
What is Streetlight & the Insight® Tool?

The InSight® web app can query data to show [Iowa account functionality only]

- Origin-Destination Analysis
- Origin-Destination Analysis with a Middle Filter
- Zone Activity Analysis

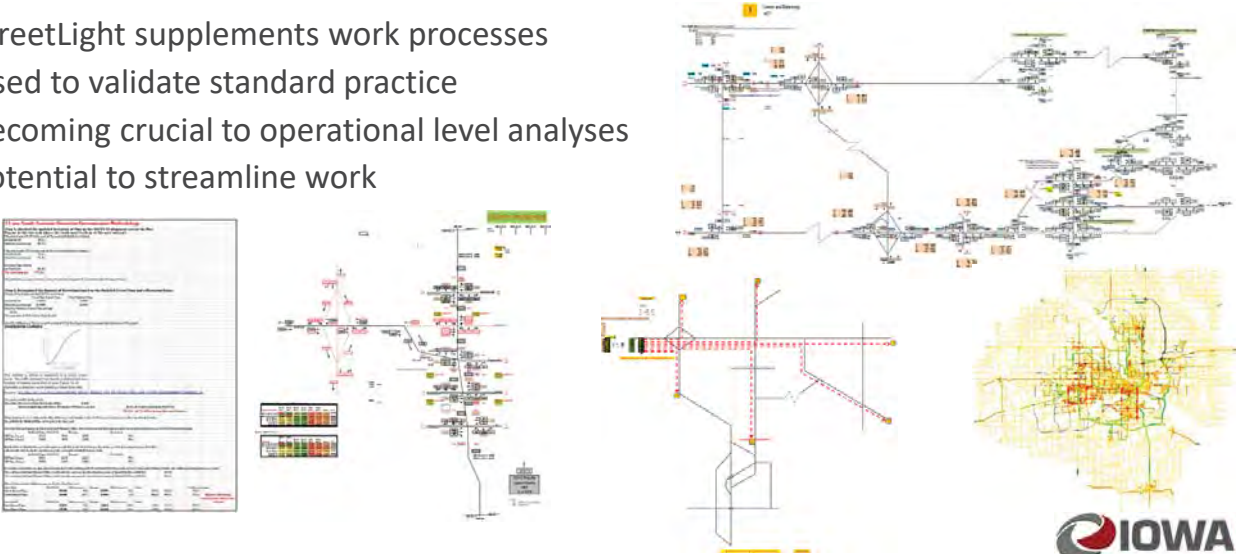
Basics of an analysis setup within the InSight® web app

- Via a GIS portal, create polygons over the areas you wish to understand the traffic behavior of
- Select the type of data as well as the time period
- The request is entered into a queue and processed by StreetLight
- Results are returned to be visualized or downloaded; as a shapefile, or csv



Iowa DOT Practice and StreetLight

StreetLight supplements work processes
Used to validate standard practice
Becoming crucial to operational level analyses
Potential to streamline work



StreetLight Tiers

Iowa DOT has the middle tier, Advanced Analytics.

We previously had Essentials and have tested Multimode.

	ESSENTIALS	ADVANCED ANALYTICS	MULTIMODE
<i>Analyses included:</i>			
Core Transportation Behavior Origin-Destination, Zone Activity, Trip Attributes (Speed, Travel Time, Length and Circuity), Average Annual Daily Traffic (AADT)	✓	✓	✓
Turning Movement Counts Intersection counts for 3-4 leg intersections, Peak Hour Factor	✓	✓	✓
Traffic Analysis Select Link, Traveler Attributes (Demographics, Trip Purpose), O-D with Pre-set Geography	✓	✓	✓
Analysis Time Period Settings Day Types, Day Parts, Monthly Data Period, 15-minute bin day parts	✓	✓	✓
Operations & Congestion Management Segment Analysis (Segment trip speed, speed percentiles including 85 th percentile, travel time, VMT/VKT, vehicle hours of delay (VHD), length and circuity), Top Routes	✗	✓	✓
Granularity for Special Events Custom Specific Dates	✗	✓	✓
Commercial Vehicle Metrics Freight metrics for medium and heavy duty trucks	✗	✓	✓
Active Transportation Metrics Bicycle and Pedestrian Metrics	✗	✗	✓
Transit Metrics Bus and Rail Metrics	✗	✗	✓



Types of Analyses

Turning Movement Counts

- Analyze the movement of vehicles in an intersection to determine traffic that moves left, right, or continues straight

Zone Activity

- Analyze traffic starting in, stopping in, or passing through one group of locations

Origin-Destination

- Analyze traffic that travels from one group of locations to another group of locations

Segment Analysis

- Get trip information for a specific road segment from one pass-through gate to another

AADT

- Measure Average Annual Daily Traffic

Top Routes

- See the most popular routes for trips between locations

Trips to or from Pre-Set Geography

- Look at specific trips that come and go from a selected zone to industry-standard areas



Additional Information

Trip Attributes

- Trip Duration
- Trip Length (in mph)
- Speed
- Circuity

Traveler Attributes

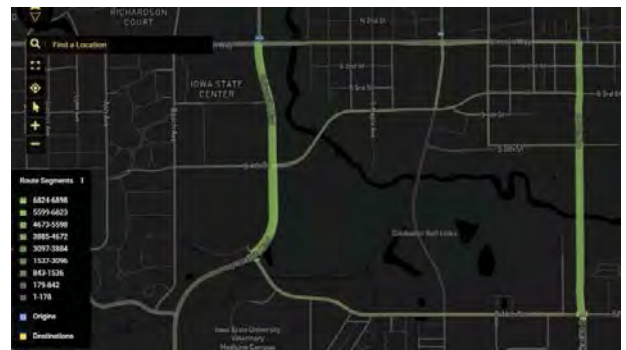
- Trip Purpose
- Income
- Education
- Race
- Ethnicity

Most Used Analysis Types

Top Routes

Top Routes analyses are used to analyze volume on all possible routes between points, and is useful when analyzing the most commonly taken routes between two or more points. This type of analysis returns results in segments.

This is an example of a Top Routes analysis we ran. It sought to determine the most common routes travelers take while going from north of the Coldwater Golf Links golf course in Ames to south of it and vice versa. Multiple origin and destination points were set. This images shows that these points can be toggled on or off, for example, this picture shows only the routes between the points north of the extension to the points south of the extension.



Most Used Analysis Types

Origin-Destination

Origin-Destination analyses can be used to analyze traffic between multiple points. Users set their own origin and destination points. This analysis can also be run with middle filters, or points that are passed through between origins and destinations. These analyses are useful when analyzing traffic between customizable locations, whether two points on the same block, or two points miles away.

This analysis studied travel patterns in the Omaha-Council Bluffs area through key corridors (I-29, US 75, etc.)



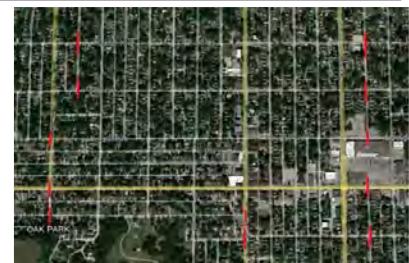
Most Used Analysis Types

Segment Analysis

Used to analyze road segments pre-set by StreetLight. They are useful when analyzing volume, congestion, speed, and travel time on roads.

The major difference between this and an Origin-Destination analysis is that a Segment Analysis is the only way to return data on congestion and traffic by StreetLight Volume.

This analysis studied road segments near a road reduction project in the Des Moines area.



Ames Travel Shed

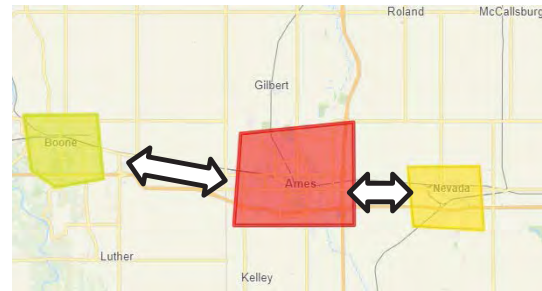
Purpose: To demonstrate a simple application of the tool

Geographic Extent: One zone defining Ames, Boone and Nevada each

Expectations: Want to see which community Ames interacts with most

101 for interpreting the InSight® results

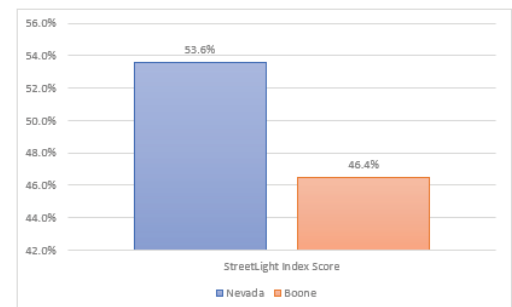
- Trip population is sampled to create the data set
- The data set is factored to become an index
- The index does not represent a count
- Results meet a minimum sample size threshold
- Sample will change when analysis is rerun



Ames Travel Shed

Outcome: Be aware of the what the App is showing you

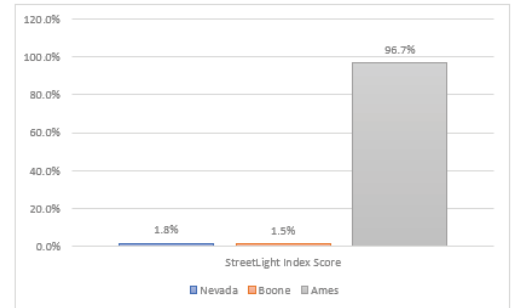
- The results of the InSight® App will only show you results specific to your defined geographies
 - Nevada is the destination for 54% of Ames originating traffic between the communities defined
 - Boone is the destination for 46% of Ames originating traffic between the communities
- This is misleading if you are not careful, adjustment to the definition is needed



Ames Travel Shed

Outcome: Be aware of the what the App is showing you [continued]

- To understand the behavior of the observed data, the results need to be adjusted
- The default App settings do not include internal activity
 - Ames is the destination for 96.7% of all Ames originating traffic for the total areas defined
 - Nevada is the destination for 1.8% of all Ames originating traffic for the total areas defined
 - Boone is the destination for 1.5% of all Ames originating traffic for the total areas defined
- This is still misleading, as traffic certainly travels to other areas

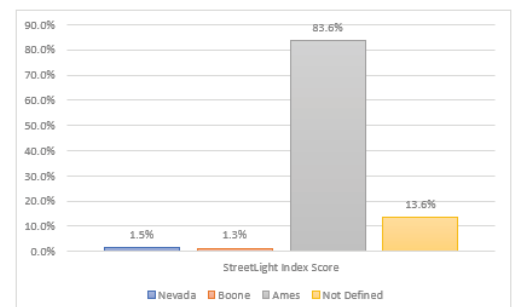


Ames Travel Shed

Outcome: Be aware of the what the App is showing you [continued]

- To understand the behavior of the observed data, the results need to be adjusted
- When you realize that there are geographies that you did not define
 - 83.6% of all Ames originating traffic stays within Ames
 - Nevada is the destination for 1.5% of all Ames originating traffic
 - Boone is the destination for 1.3% of all Ames originating traffic
 - Undefined areas are the destination for 13.6% of all Ames originating traffic
- The key to understanding the data is use of excel and pivot tables

Row Labels	Ames	Boone	Nevada	Grand Total
Ames	662641	10456	11933	685030
Boone	9900	119984	355	130239
Nevada	12191	366	33402	45959
Grand Total	684732	130806	45690	861228

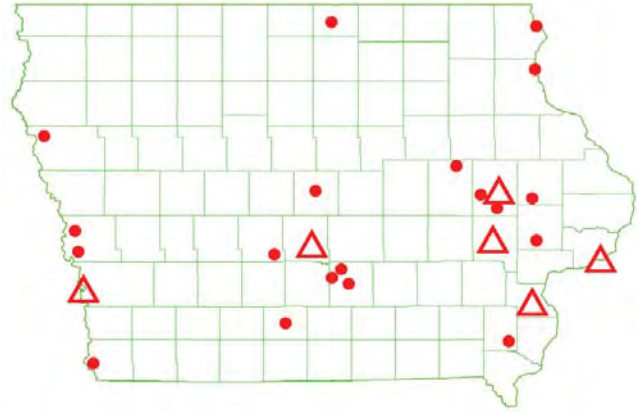


Iowa DOT & StreetLight Insight®

Thoughts & takeaways on StreetLight & Insight®

Pros

- Is a powerful tool and is being updated continuously
- Can support analysis that formerly required empirical data to base assumptions
- Iowa DOT has used it for nearly 300 analyses



Iowa DOT & StreetLight Insight®

Thoughts & takeaways on StreetLight & Insight® [continued]

Cons

- Should become part of the process, not replace entirely your standard work
- Items for consideration and where we use caution
 - Use of the tool versus downloading of the data [very specific to your *defined geographies*]
 - StreetLight Index versus count [*proportional to a sample only*]
 - Count estimation process [*ongoing development based on machine learning*]
 - Small index value validity [*rural area especially*]
 - Trip-length limitations [*lack of trip-chaining*]
 - Sample size limitations [*rural areas specifically*]
 - Date comparison [*must run separately*]



Local Agency's Experience With Streetlight Data

Iowa DOT MPO/RPA Quarterly Meeting
March 23, 2022



Why Big Data & Analytics Platforms?

- **Comprehensive regionwide network data coverage** (the equivalent of what would require many field sensors)
- Many platforms have **built-in analytical capabilities** that would be very difficult to achieve in-house (limited staffing, coding knowledge, resources, funding, etc.) even if we had access to big data streams or a vast amount of field sensor data.
- Supports a **performance-based planning approach** (performance measures; project identification, prioritization, and evaluation for MTPs & TIPs; regionwide trends)
- Support for **small & large scope efforts**: Traffic Impact Studies, Corridor Studies, Speed Studies, Bike-Ped Master Plans, etc.
- Potential Integration w/ **Travel Demand Model development**

Choosing Streetlight (Procurement)

- RFP Process
 - Sent out to multiple providers & posted online on the MPO & City of Ames website; two responses (Streetlight & INRIX)
- Why Streetlight Data?
 - **Well-rounded tool** (lots of different data types & analytical capabilities)
 - Good **support for custom zones** (can use your own TAZs, road segments, & can manually draw zones in their platforms)
 - Felt **“beginner” friendly**, not a sharp learning curve
- We continue to meet with data & analytics providers that reach out to us (like Replica & Wejo) to stay current on what all is out there.
 - We do also have a free subscription with Strava Metro for Bike/Ped aggregated data.

Some Providers



Current Subscription

- Multi-Modal Tier
- \$99K/year
 - Planning Funds (TPWP)
 - City of Ames’ Regional Count Program
- Three-year contract (w/annual opt-out option)
- 20 Seats for Staff (MPO/COA/CyRide); 5 Seats for Consultants (Revolving)
- Unlimited Analyses & Analysis Zones within the Ames Area MPO boundary
- All modes (car, bus, walking, cycling, transit) and all locations (all areas/all roadways)

<https://www.streetlightdata.com/streetlight-data-plans-and-pricing/>

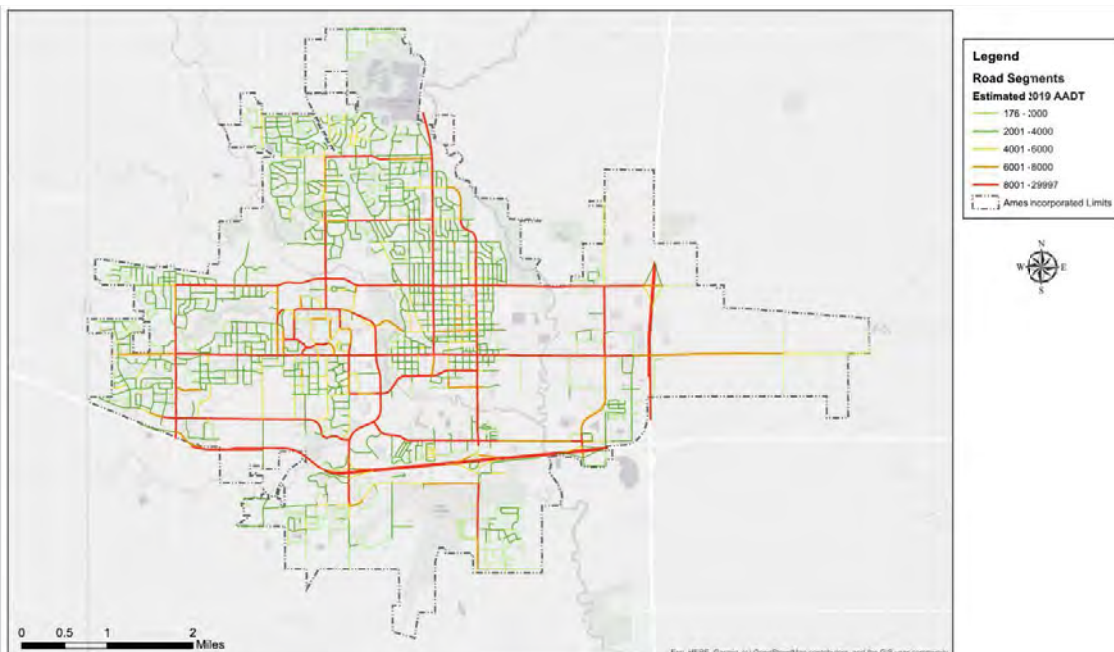
	Essentials	Advanced	Multimode
MODES			
Bicycles & Pedestrians			☑
Bus & Rail			☑
Medium or Heavy-Duty Commercial Trucks		☑	☑
Personal Vehicles	☑	☑	☑
CORE TRANSPORTATION METRICS			
Origin-Destination	☑	☑	☑
AADT, MADT, & Hourly Traffic Counts	☑	☑	☑
Turning Movement Counts	☑	☑	☑
Select Link	☑	☑	☑
Routing		☑	☑
VMT/VKT & Vehicle Hours of Delay (VHD)		☑	☑
TRIP ATTRIBUTES			
Speed Percentiles	☑	☑	☑
Trip Speed & Length	☑	☑	☑
Travel Time	☑	☑	☑
Trip Circuity	☑	☑	☑
TRAVELER ATTRIBUTES			
Inferred Trip Purpose (Home & Work Locations)	☑	☑	☑
Demographics	☑	☑	☑
SOFTWARE FEATURES			
On-Demand Access to Mobility Metrics in U.S. & Canada	☑	☑	☑
Geofence: Ability to Measure In and Around Any Location	☑	☑	☑
Output: CSV, 3D Map Visualizations, Tables and Charts	☑	☑	☑
15-Minute Data Granularity	☑	☑	☑

Some Uses so Far

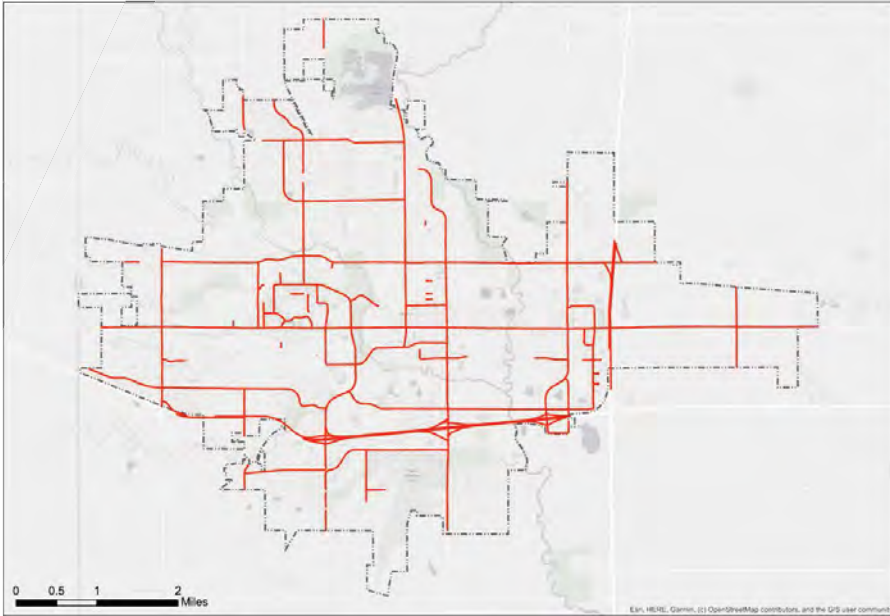
- AADTs & Intersection TMC
- TAZ Analyses
- Vehicle O-D Behavior & Route Choices
- Speed Studies (Speed Trends)
- Corridor Studies
- Traffic Impact Studies

Use Cases

City of Ames – 2019 AADTs



City of Ames – Bicycle Selection Guide



AADT ≥ 6K
 SL ≥ 30MPH

FIGURE 3: BICYCLE FACILITY SELECTION

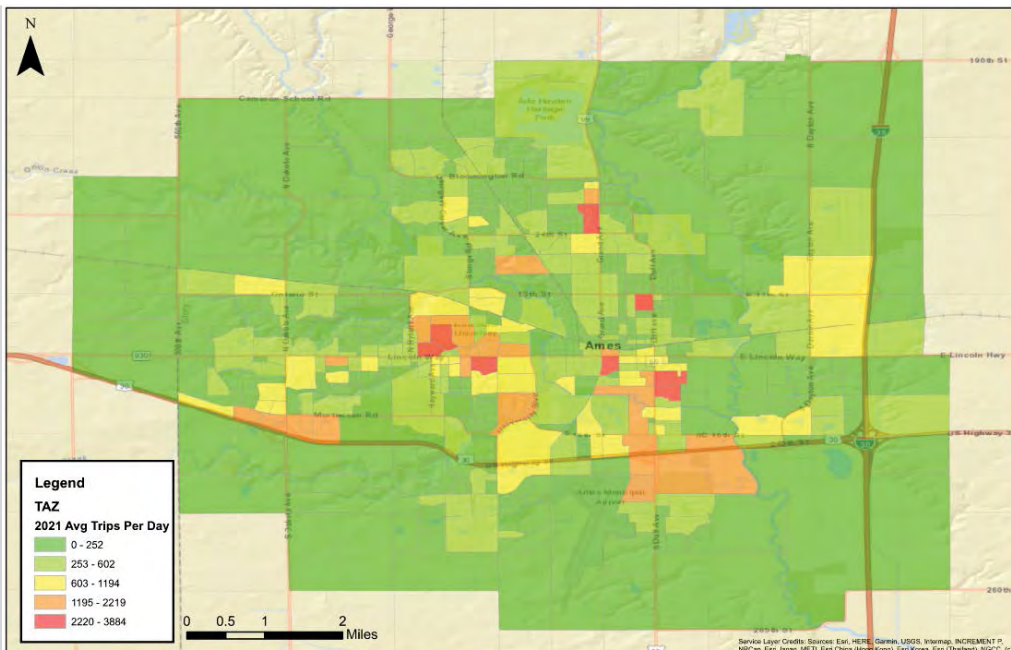


*To determine whether to provide a shared-use path or separated bike lane, consider pedestrian and bicycle volumes or, in the absence of volume, consider land use.
 **Advisory bike lanes may be an option where traffic volume < 4K ADT

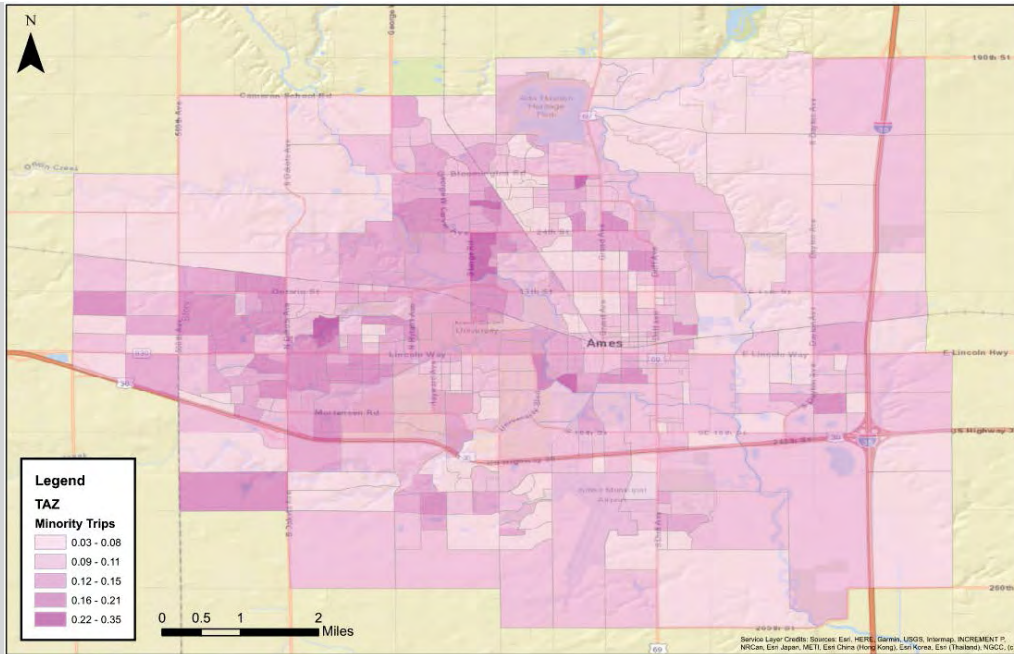
*pg. 37 of Ames Complete Street Plan

<https://www.cityofames.org/home/showpublisheddocument/47852/636747597415130000>

TAZs – 2021 Average Daily Trips



TAZs – 2021 Ratio of Trips by Minority Racial Groups

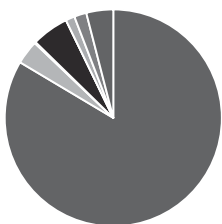


Project Level Trip Demographic Data

(Lincoln Way Resurfacing Project)



Race



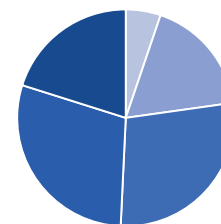
- White
- Black
- Indian
- Asian
- Islander
- Other Race
- Multiple Races
- Hispanic

HH Income



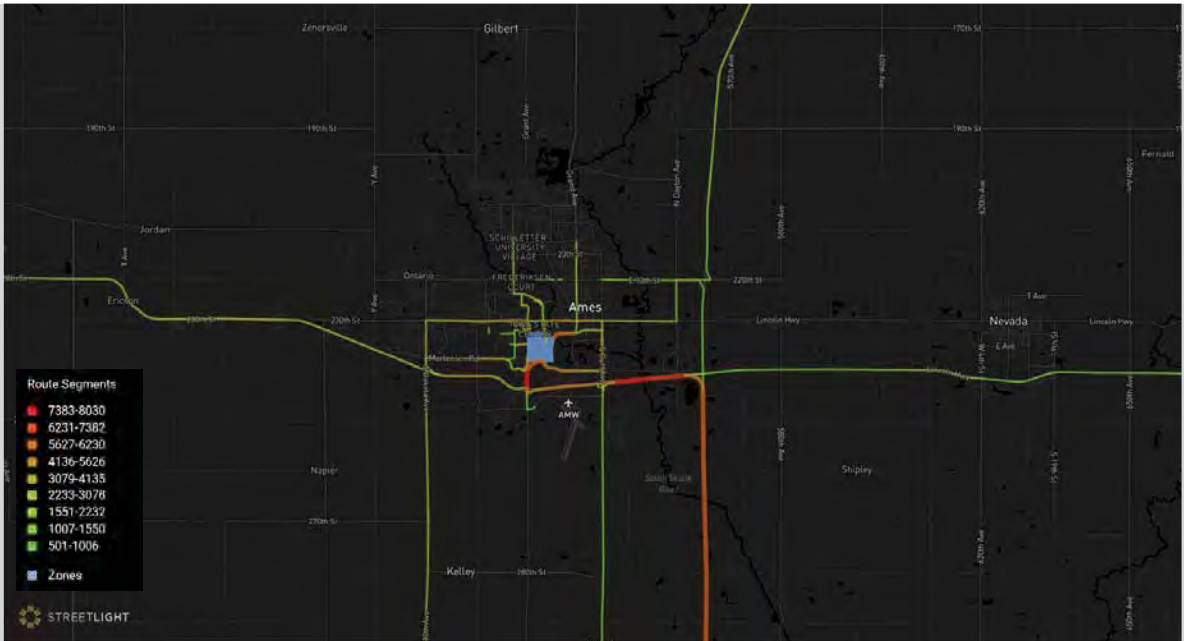
- Less than 20K
- 20K to 35K
- 35K to 50K
- 50K to 75K
- 75K to 100K
- 100K to 125K
- 125K to 150K
- 150K to 200K
- More than 200K

Education

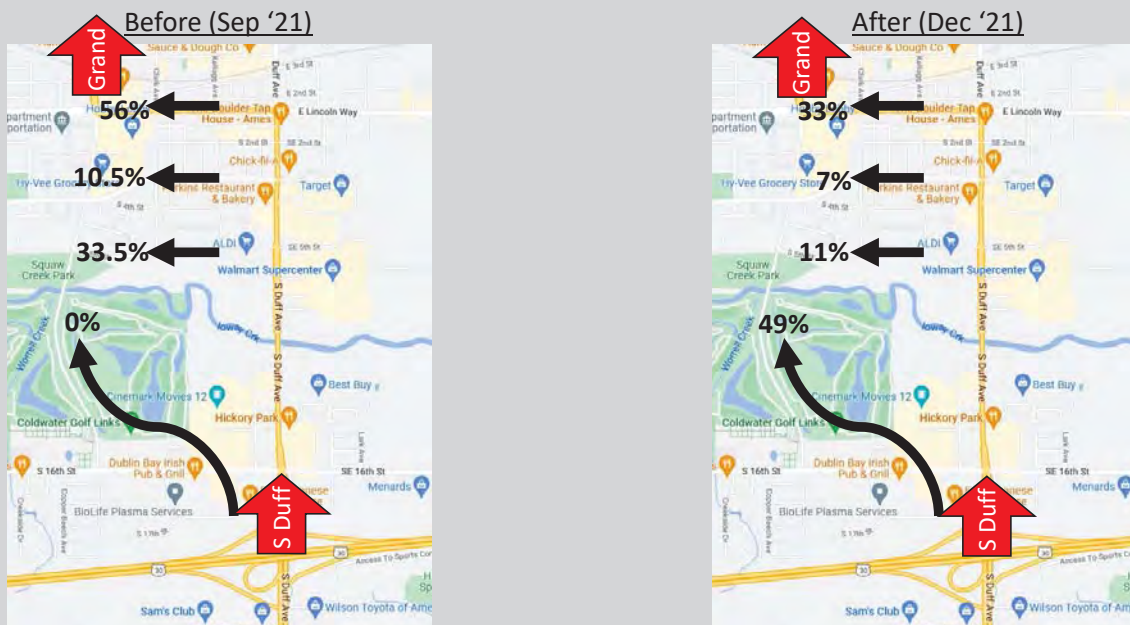


- No High School Diploma
- High School Diploma
- Some College
- Bachelor's Degree
- Graduate Degree

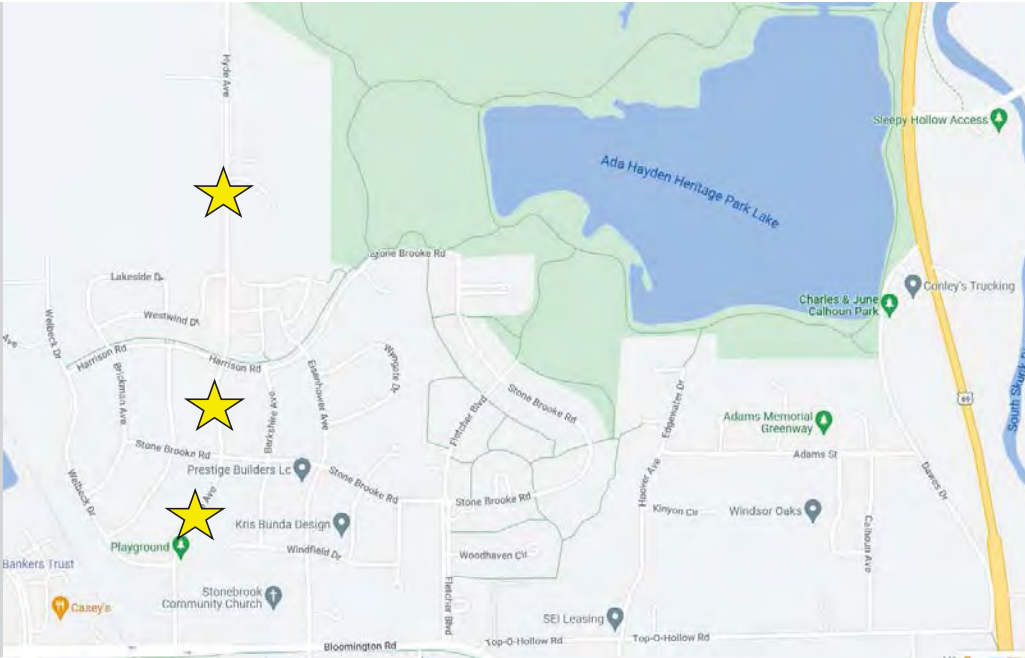
Top Routes Analysis – Jack Trice Stadium (9/11/21) (Going Home)



Top Routes Analysis – Grand Extension (9/11/21) (S Duff to Grand)



Speed Trends – Hyde Ave (2018-2021)



Speed Trends – Hyde Ave (2018-2021)

Y-Axis: Speed (MPH)
X-Axis: Quarter (2018 Q1 – 2021 Q3)

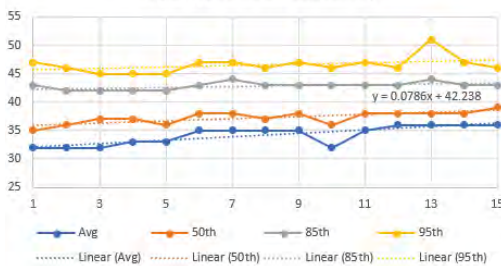
85th Percentile speed increased (linear trend):

0.3 MPH/yr

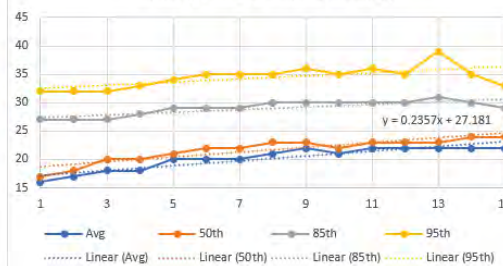
0.9 MPH/yr

0.8 MPH/yr

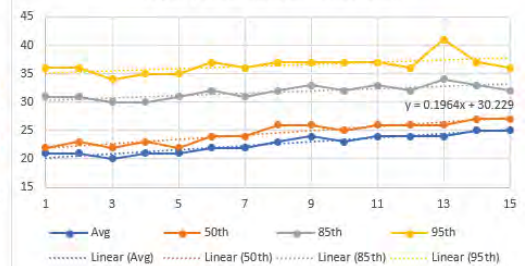
Hyde (Westwind - Audubon)



Hyde (Welbeck - Stone Brooke)



Hyde (Stone Brooke - Harrison)



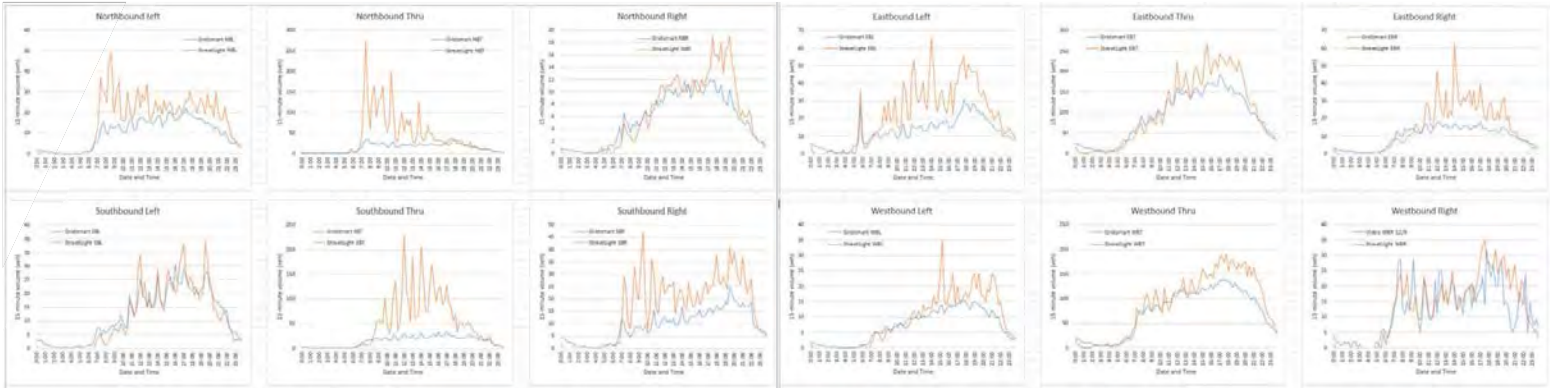
Potential Future Uses

1. More Regionwide Trends (TT Reliability, Volumes, OD-Behavior, etc.)
2. Travel Demand Model Development
3. More Corridor Studies (S Duff @/near US-30 Interchange, 190th St Corridor – North Ames)
4. More Traffic Impact Studies
5. More Speed Studies & Trends Analysis
6. Multi-Modal Planning Efforts (City of Ames Bike-Ped Master Plan, 2050 AAMPO MTP Update)
7. Before/After Studies (S Grand Extension, ITS Network & Adaptive Buildout, Intersection Capacity Improvements, etc.)

Data Validation & Comparisons

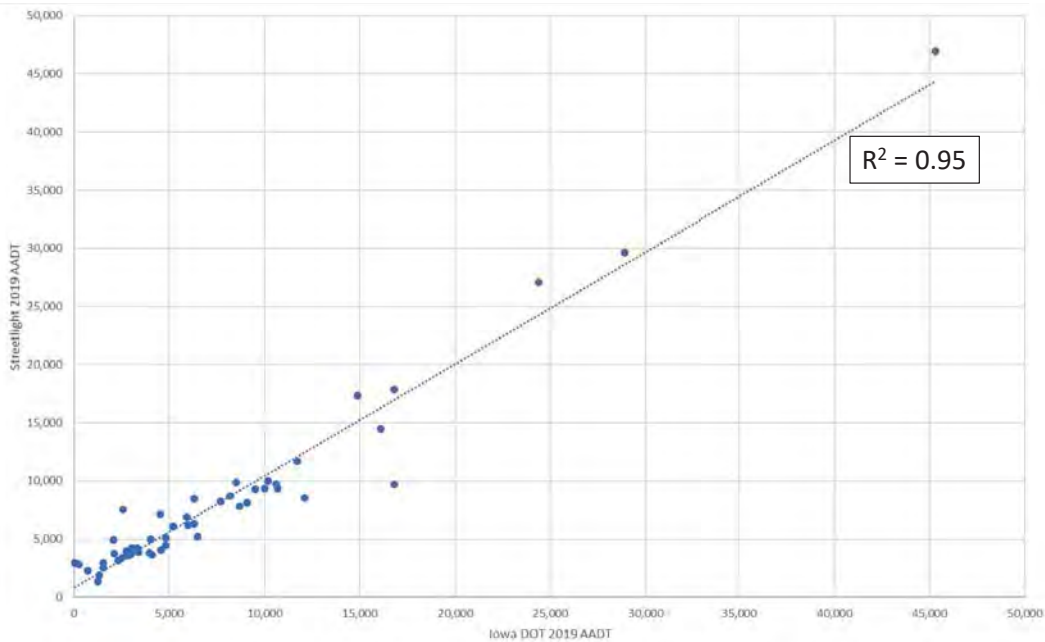
- Turning Movement Count (Lincoln Way & Beach)
- 2019 AADTs (Streetlight vs. Iowa DOT Counts)
- Speed Distribution Comparison (Ash Ave)

Lincoln Way & Beach Ave (Gridsmart vs. Streetlight)



While there is a rough correlation between Streetlight and video detection data for most movements, Streetlight has a lot of volume spiking behavior that doesn't occur in the field data. In general, when Streetlight differs from the field data it seems to be overestimating volumes in most cases.

2019 AADTs (Streetlight vs. Iowa DOT) – 50 Samples



Speed Distribution Comparison (Ash Ave)

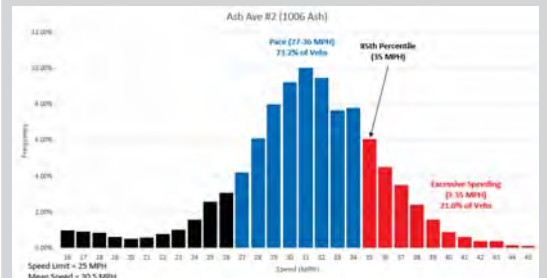


Data
9/21/20 – 10/5/20

Speed Distribution Comparison (Ash Ave)



Percentile	Radar	Streetlight
5	18	5
10	24	9
15	26	13
20	27	17
25	28	20
30	29	21
35	30	22
40	30	23
45	31	24
50	31	24
55	32	25
60	32	26
65	33	26
70	33	27
75	34	28
80	35	29
85	35	30
90	37	32
95	38	37



Conclusions & Final Thoughts

Pros

- Streetlight has been a very useful and versatile tool with a lot of analysis types and great custom analysis zone support.
- Not a steep learning curve that would require a “data scientist”. However, if you do have a data savvy person, Streetlight does have an API that you can work with.
- Potential integration possibilities with Travel Demand Models
- Supports a performance-based planning approach
- Constantly adding new features and seemingly improving their algorithms/data.

Cons

- Cost is high; potential cost-sharing possibilities with Iowa DOT & other Iowa MPOs/RPAs?
- Data might not be “perfect” based off a limited amount of data validation/comparisons
- 1-3 month time lag for data availability



Q & A