City of Philadelphia
Interconnected Signalized Corridors

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Presenters:

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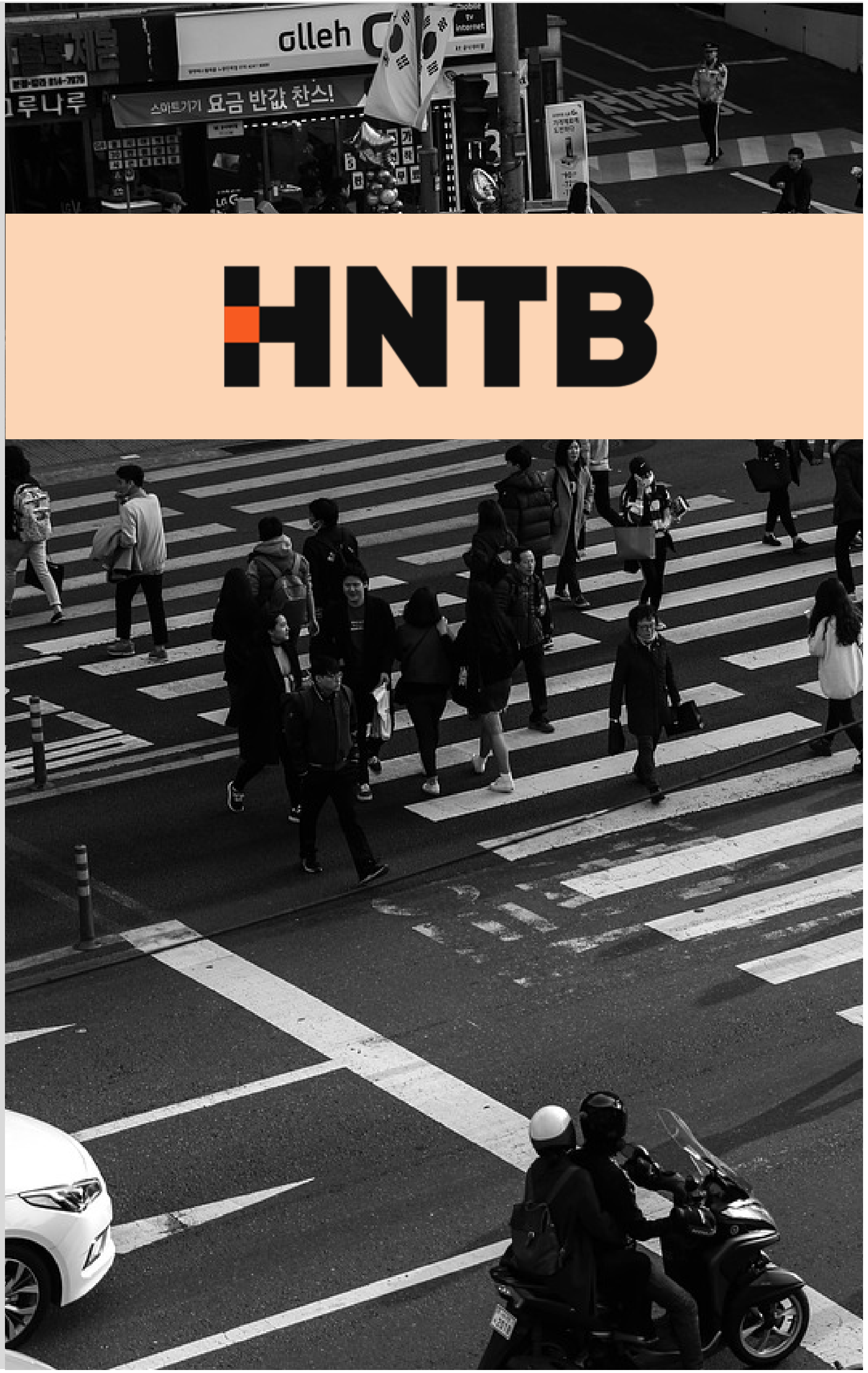
AGENDA

- Project Description
- Typical Signal Upgrades
- Corridor Interconnectivity
- Traffic Operations Center
- Questions (End of Session)

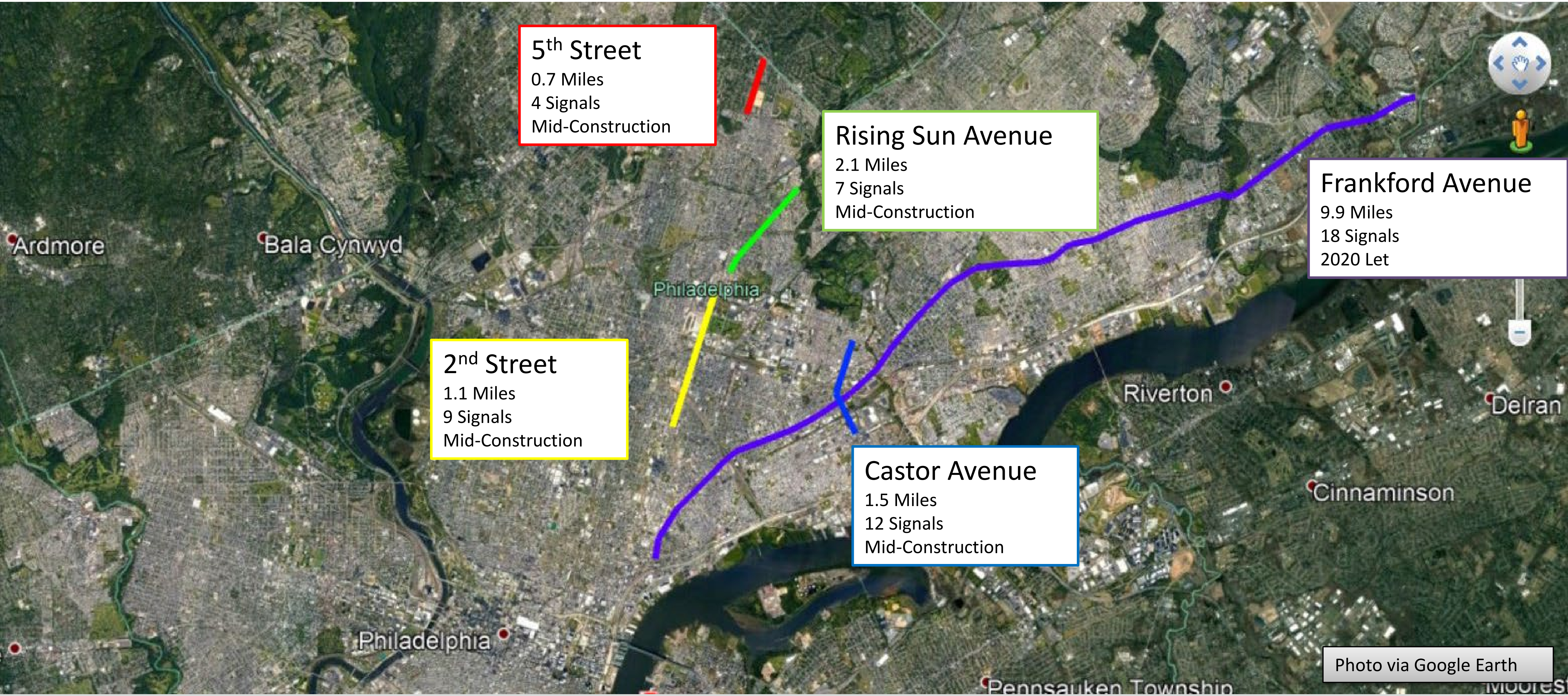
Project Description



PROJECT NEEDS

- Client: PennDOT, District 6-0
- Municipality: City of Philadelphia
- Project Objective: Safety Improvement
  - Identified as having higher than average crash rates.
  - Multiple crashes with injury.
  - Multiple crashes involving pedestrians.

PROJECT LOCATIONS



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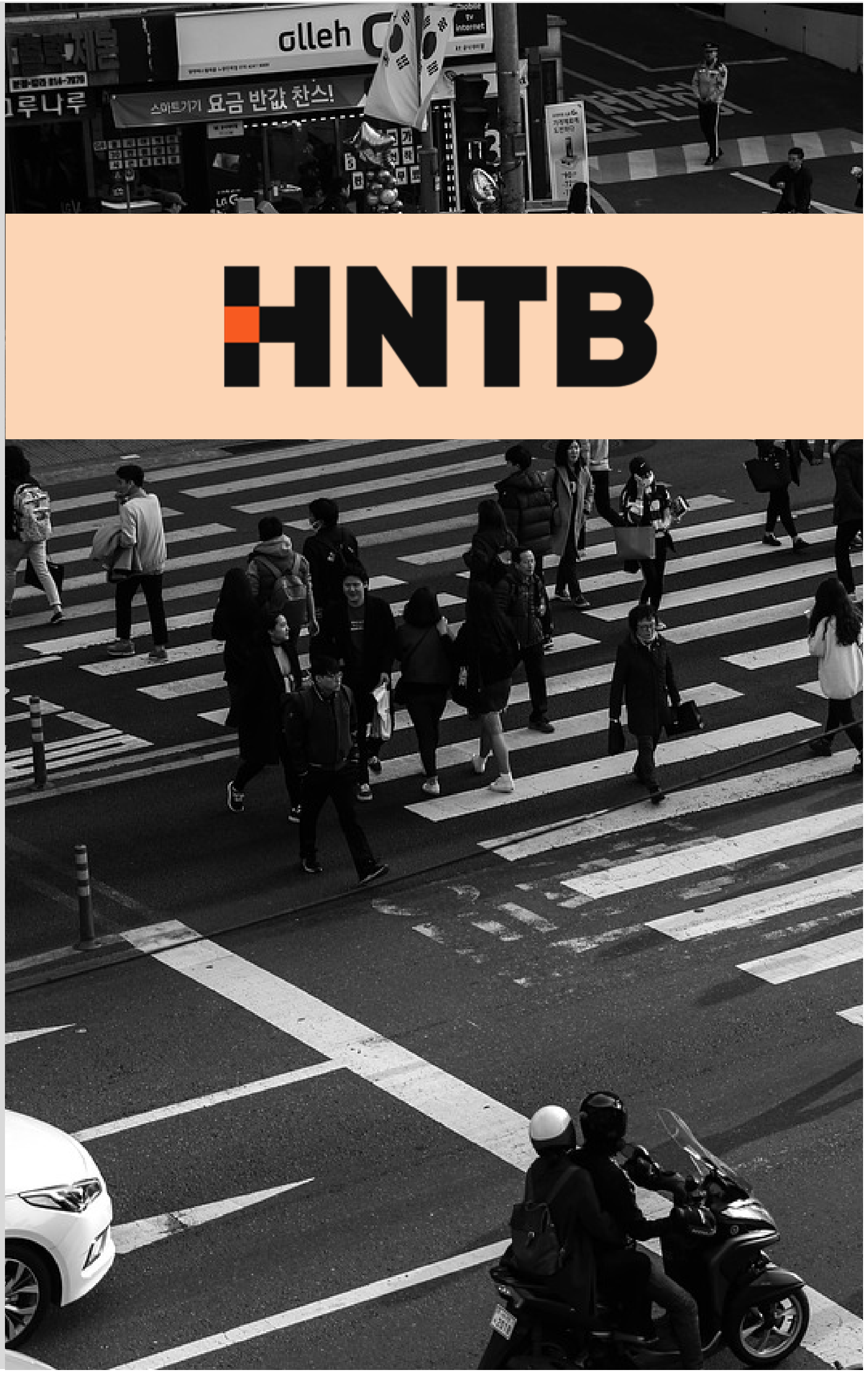
Typical Signal Upgrades



Before Signal Improvements

Photo via Google Earth

After Signal Improvements

Photo via Google Earth

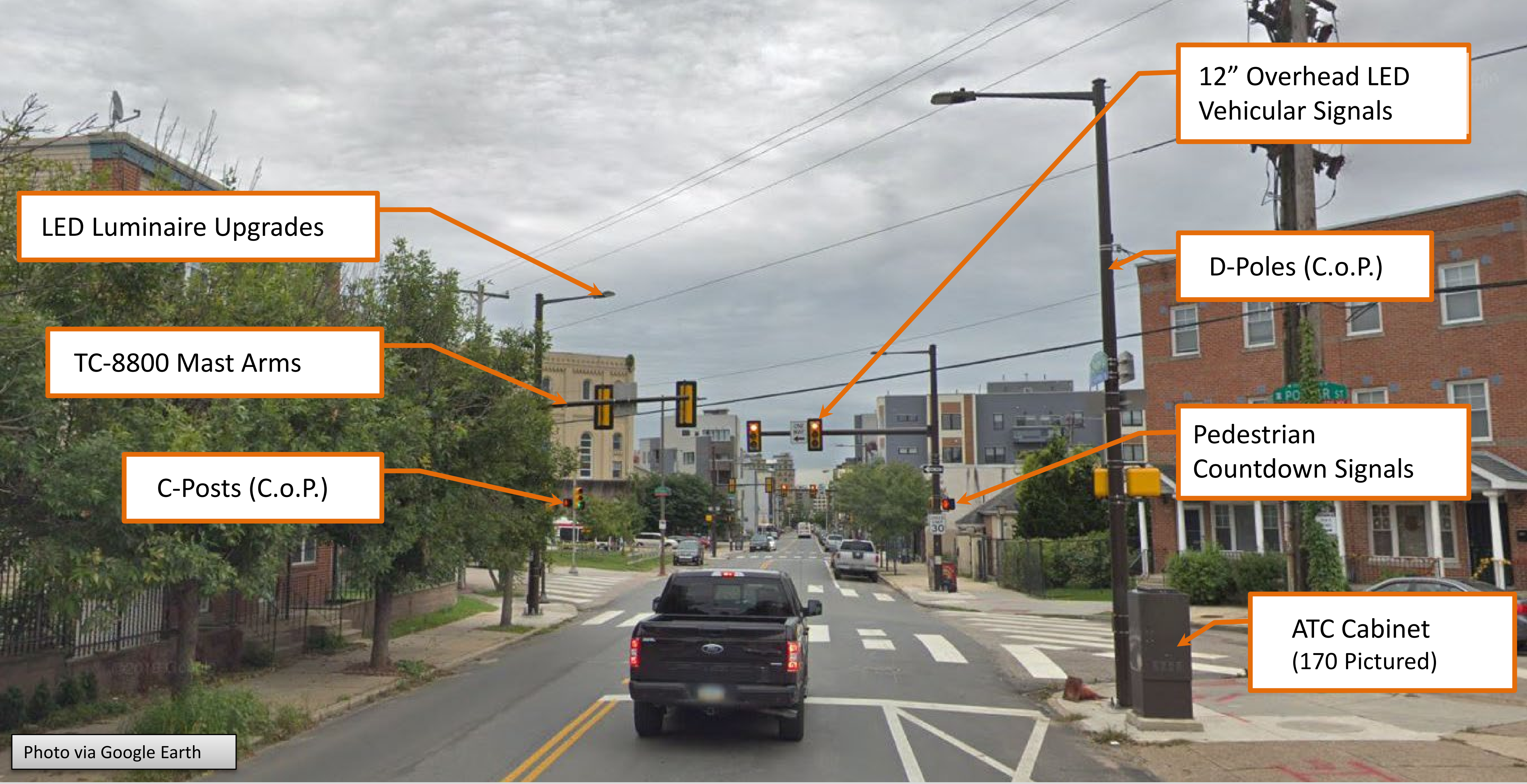


Photo via Google Earth

ADVANCED TRANSPORTATION CONTROLLER (ATC) CABINET

- Performance Advantages
  - Capable of managing even the most complex intersections using the most recent logic and algorithms
    - 16 – 32 Output Channels
    - 24 – 48 Input Channels
  - Full Serial Communication: SIU’s are faster and more capable than older BIU’s.
- Maintenance Advantages
  - Modular, pluggable design for quick parts changeout
  - Interchangeable components for storage/supply
  - Workforce familiarity

Photo via McCain Inc.

Photo via Econolite/Safetran

ADVANCED TRANSPORTATION CONTROLLER (ATC) CABINET

- Connectivity Advantages
  - Present
    - Can communicate with other new Controllers (ATC or 170) via Fiber Optic connections.
    - Can communicate with Philadelphia Traffic Operations Center via Fiber Optic connections.
  - Future
    - Can be modified to incorporate future technology such as CAV communication appliances.

Corridor Interconnectivity

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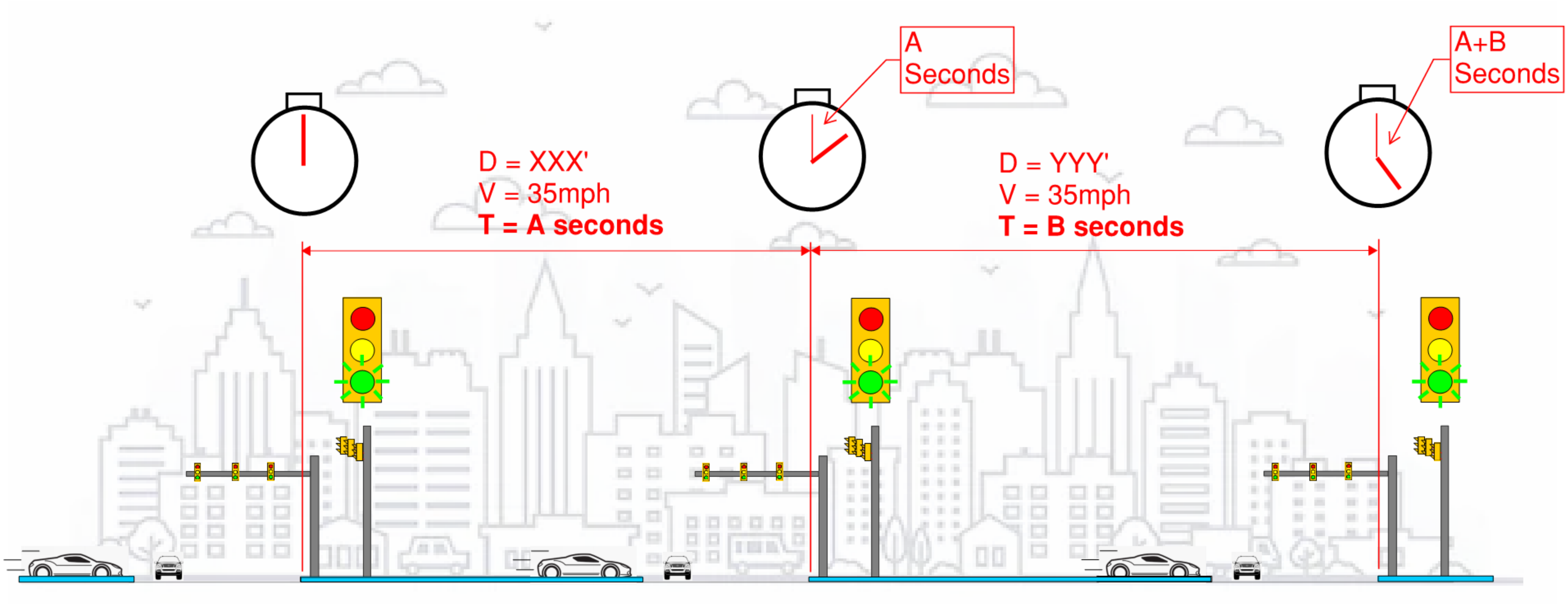
INTERCONNECTED SIGNALS – BASIC IDEA



INTERCONNECTED SIGNALS - METHODS

- <u>GPS Time Clock</u>
  - Pro – Cheap; no need for physical/radio connection
  - Con – Can float and become totally ineffective
- <u>Radio</u>
  - Pro – Does not require fiber, poles, or conduit for connection along a corridor
  - Con – Depending on distance between signals and obstructions, it can require signal boosters
- <u>Copper “Sync”</u>
  - Pro – Simple, effective, works with mechanical controllers
  - Con – Obsolete; limited in that no information is actually transmitted beyond an electrical pulse
- <u>Fiber Optic</u>
  - Pro – Nearly instantaneous communication; can carry significantly more information (including video)
  - Con – Installation can be costly/difficult when no utility poles are present for installation.

INTERCONNECTED SIGNALS – REQUIRED HARDWARE

- Fiber Optic Cable
  - Backbone Fiber
    - **48 Strands** – Daisy Chain Configuration
    - Ties in to controllers at beginning of corridor, end of corridor, and any other intersecting interconnected corridors.
    - Requires larger controller cabinet for larger patch panels.
  - Local Fiber
    - **24 Strands** – Daisy Chain Configuration
    - Ties in at all other "local" controllers.
    - Breaks off of backbone in aerial splice enclosure.
    - 12 fibers carry info to controller and 12 fibers carry info from the controller.

Photo via Google Earth

INTERCONNECTED SIGNALS – REQUIRED HARDWARE

- Fiber Optic Cable - Installation
  - Aerial Installation - Preferred
    - Hung from utility poles or Septa poles.
    - Runs from utility pole, to mast arm or D-pole, to drum junction box, to controller cabinet.
  - Underground Installation - Alternative
    - Run in designated City-owned interconnect conduit or in available utility duct bank.
    - Must be run in flexible fabric inner-duct.
    - Requires extensive conduit proving and potentially repair if it is being installed in existing conduit.
    - Requires manhole modification.
    - Vulnerable to fires/conduit damage

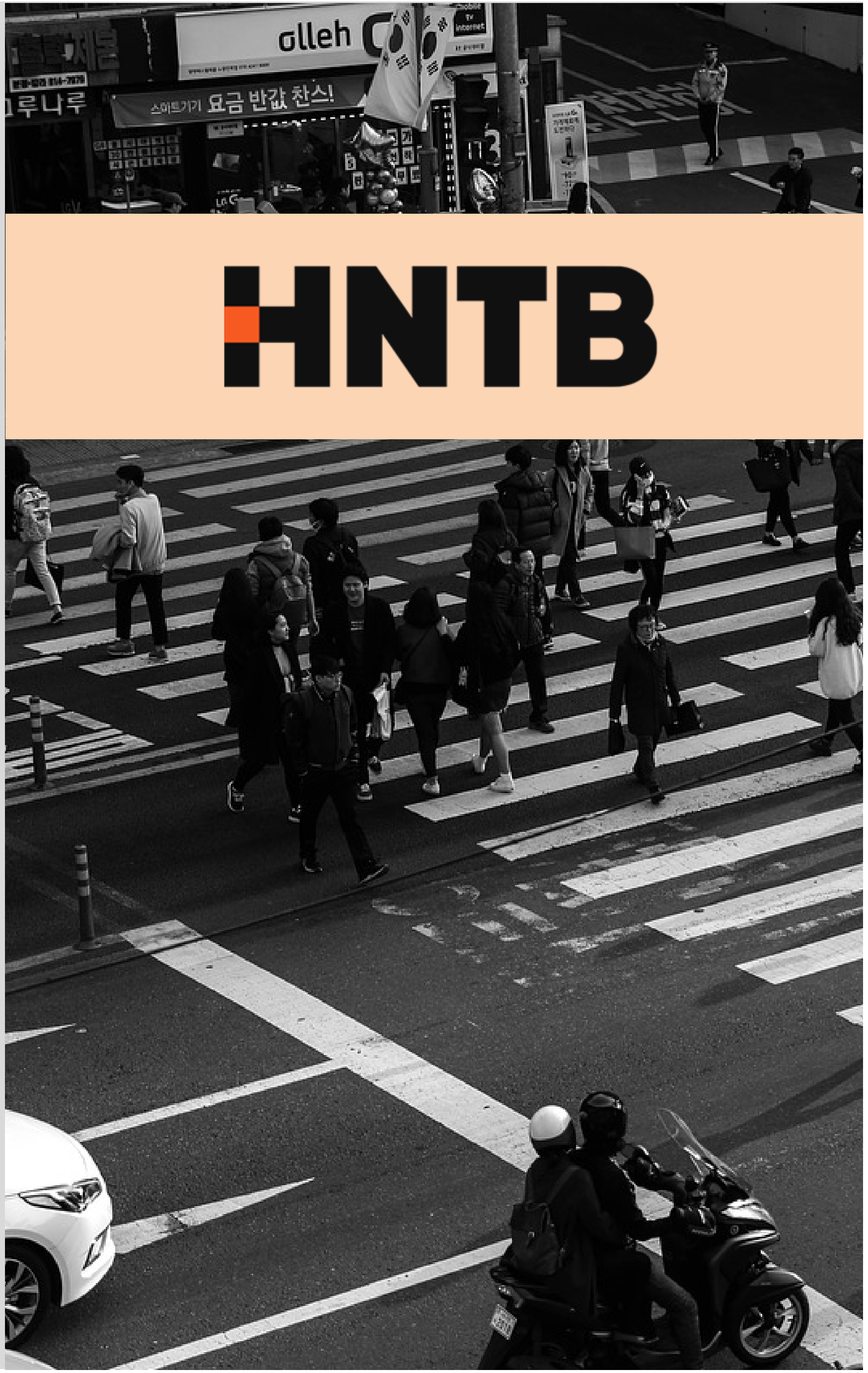
Photo via Google Earth

INTERCONNECTED SIGNALS – REQUIRED HARDWARE

- Fiber Optic Switches
  - Layer 2 Fiber Switch
    - Allows controller to send and receive info along fiber optic cable.
    - One installed per upgraded or new controller.
  - Layer 3 Fiber Switch
    - Allows the corridor to send and receive information from the City of Philadelphia Traffic Management Center.
    - One was installed per upgraded corridor to create a “Hub” for connecting to the TOC.

Photo via Interlogix

Traffic Operations Center



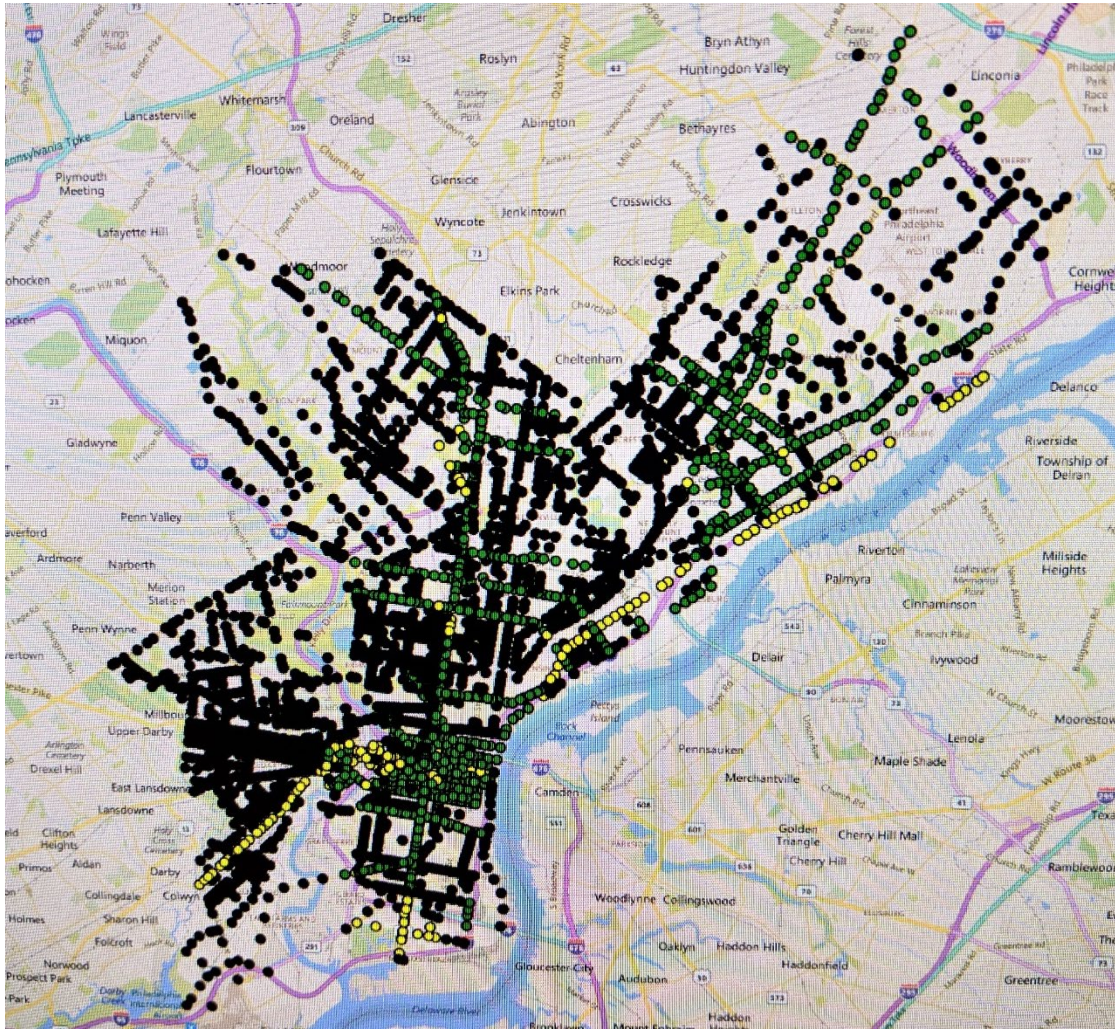
TRAFFIC OPERATIONS CENTER

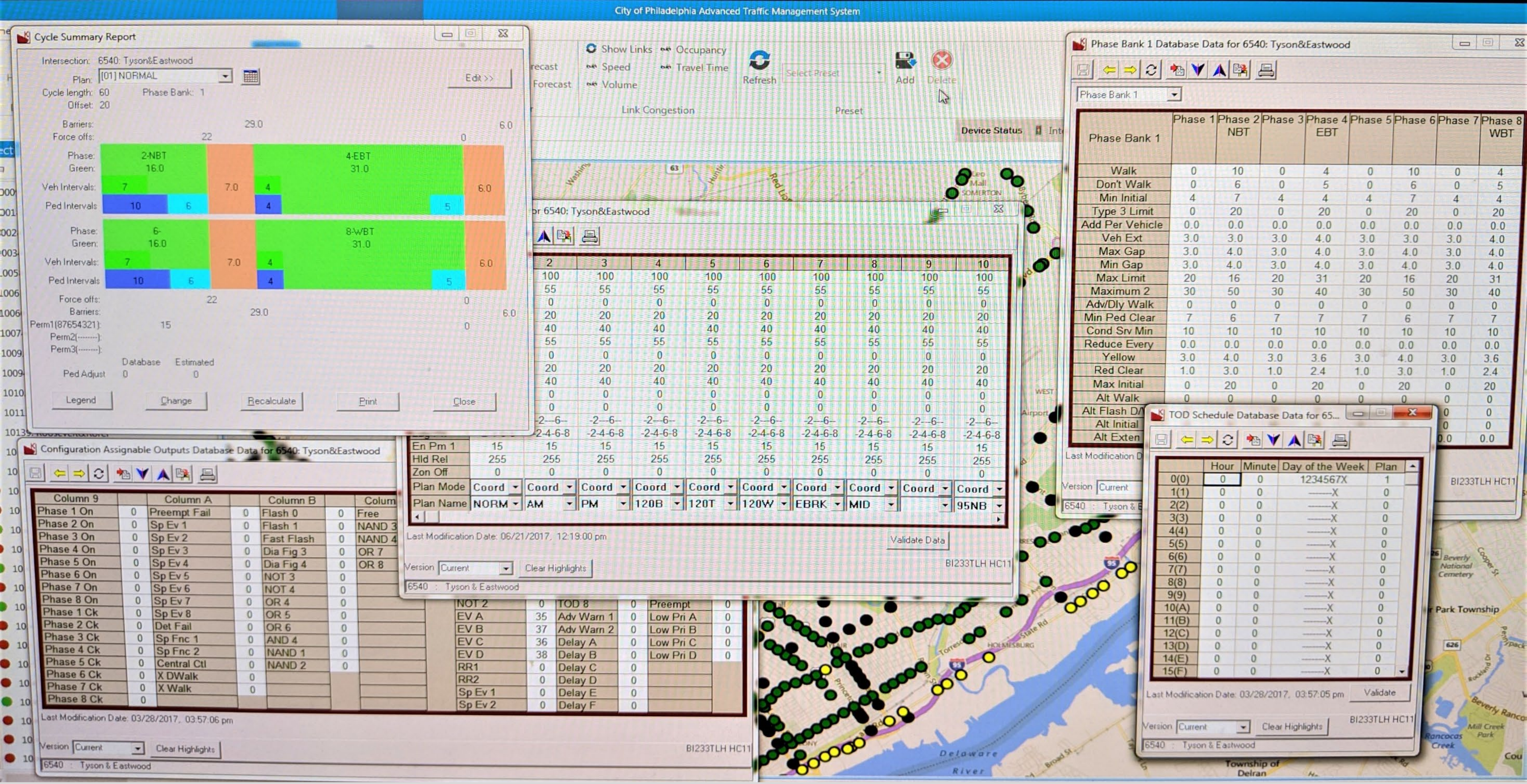
- Reduces the need for corridor-wide Synchro Modeling & requisite counts
- Allows for temporary timing modification for unforeseen events
- Proactive as well as reactive signal health monitoring
- Allows for informed product performance monitoring
- Data Analysis

TRAFFIC OPERATION CENTER – REAL TIME ADJUSTMENTS AND MONITORING

The most accurate modeling tool: **REAL LIFE**

- Synchro Modeling and required traffic counts are no longer required in all instances
  - Major phasing/lane configuration changes are an exception
- Begin with existing timing in new controllers
- Update to meet minimum timing requirements
- Optimize in real time





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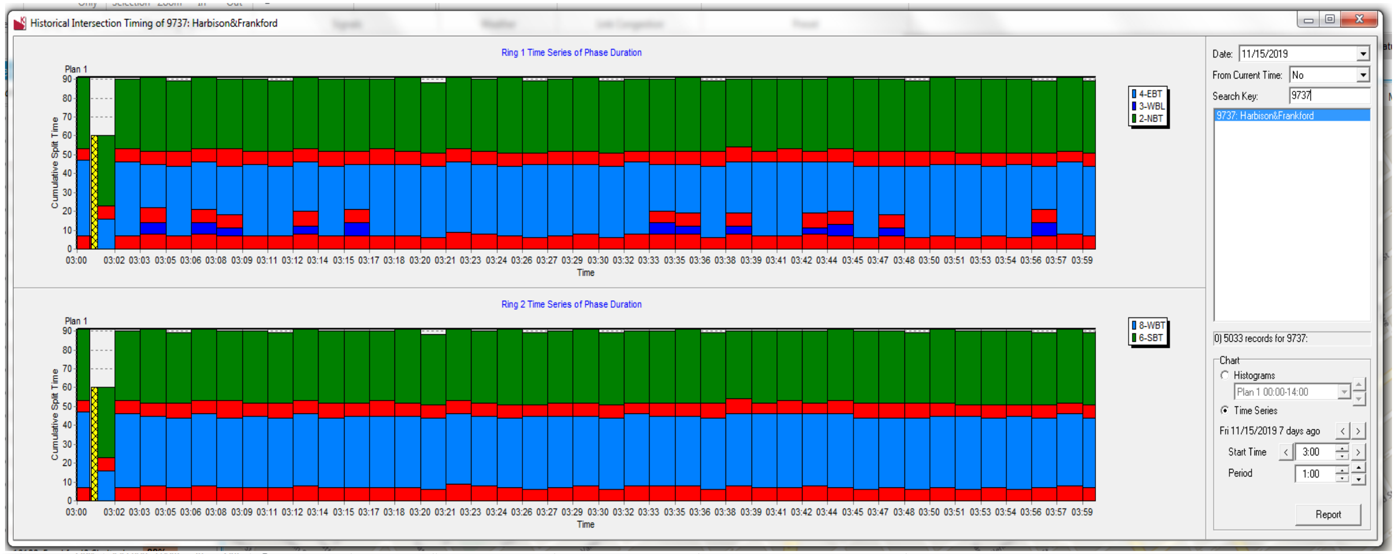
TRAFFIC OPERATION CENTER –
REAL TIME ADJUSTMENTS AND MONITORING

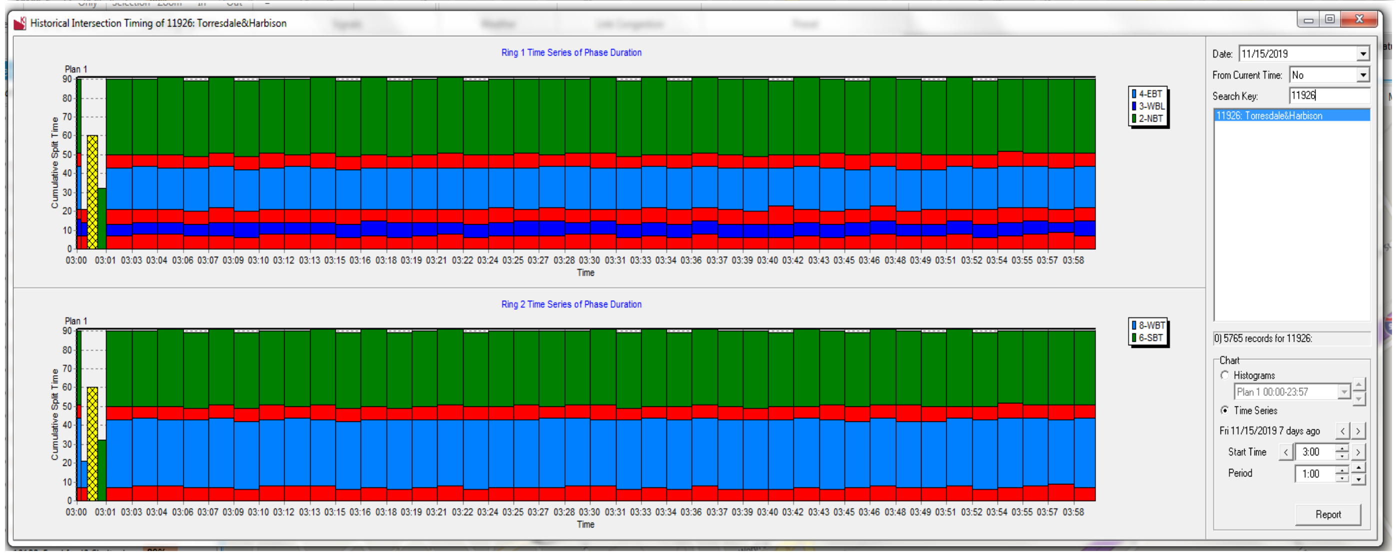
Monitor the performance in real time

- CCTV Camera Feed
- Field Observation
  - AM Peak
  - PM Peak
  - Off Peak
- Trial and Error
  - Changes can be undone with the click of a mouse.
- Temporary Adjustments for special needs
  - Ex: Accident on I-76 is flushing traffic onto surface streets

TRAFFIC OPERATION CENTER – SIGNAL HEALTH MONITORING

- Signals in flash
- Detection failure
- Pre-emption calls
- Phase Skips/Errors
  - Specific down to the exact cycle the error occurred.
- ITS Product Performance
  - What products work well
  - What products are frequently failing





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