



## Case Study: Pennsylvania Department of Transportation (PennDOT) Integrating INRIX Probe Data into Planning, Operations, Performance, and Public Communication



### Background

The Pennsylvania Department of Transportation (PennDOT) is responsible for nearly 40,000 miles of roadways, one of the largest statewide road networks in the US. To effectively operate its network, PennDOT operates four Regional Traffic Management Centers (RTMC) located across the state. The RTMCs focus on the 'core network' of roughly 4,000 miles of Interstates and other key arterials.

PennDOT has been using INRIX probe data since 2011 and has conducted a myriad of studies that include incident detection / incident timeline by geography / congestion cause by incident type. Findings from these studies proved the INRIX probe data is accurate, useful, and cost-effective.

In 2017, PennDOT took the next step to incorporate the probe data across projects, programs, and processes.

### Approach

Using vast amounts of granular probe data, engineers and planners mapped the complete mile-by-mile picture of the roadway network. INRIX GPS data enables PennDOT to identify whether congestion, delays, or high collision areas are due to road design, road operation, driver behavior or some combination.

The data enabled PennDOT to rank and develop projects, identify and rank safety and operational strategies, identify public information opportunities and, finally, share the plan with stakeholders.

### Key points

- Data is used to identify chokepoints and plan capital and operations projects
- Data is used to demonstrate the effectiveness of projects upon completion
- Data is shared with partners to create safer roads and better work zones
- Data is used to inform the most effective staffing plans

## PennDOT data in action

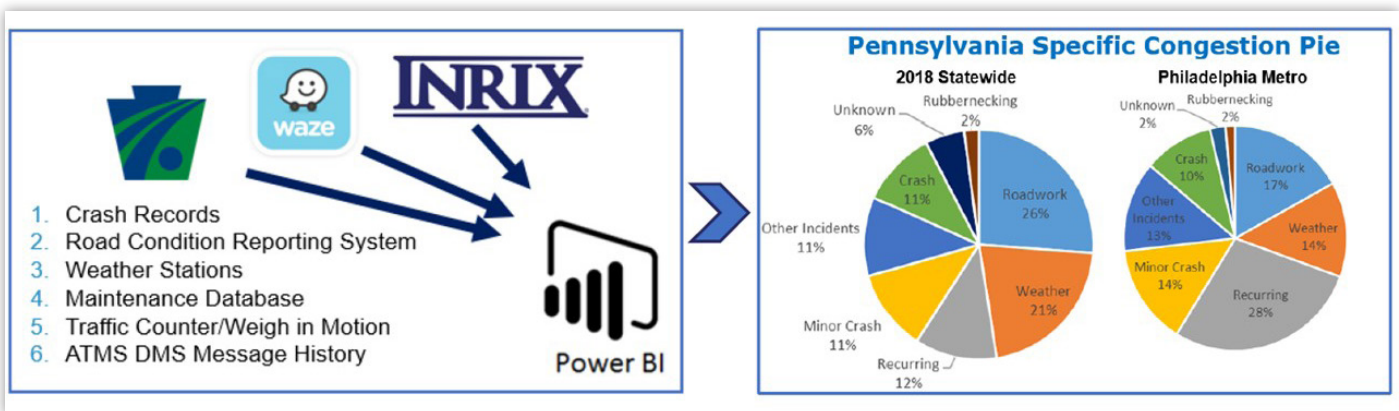
### Investments:

PennDOT uses a data-driven, performance-based approach to identify the smartest place to invest limited transportation dollars.

- Historic and real-time traffic flow identifies consistent chokepoints and bottlenecks.
- Heat maps identify and visualize precise time of day and locations for all bottlenecks.
- Visualizations present data in a way that stakeholders understand and can act on.

### Project performance:

Combined with other reporting tools, the rigorous data analysis fed detailed after-action reports which were shared internally and externally to demonstrate the right project was built in the right place.



### Partner collaboration

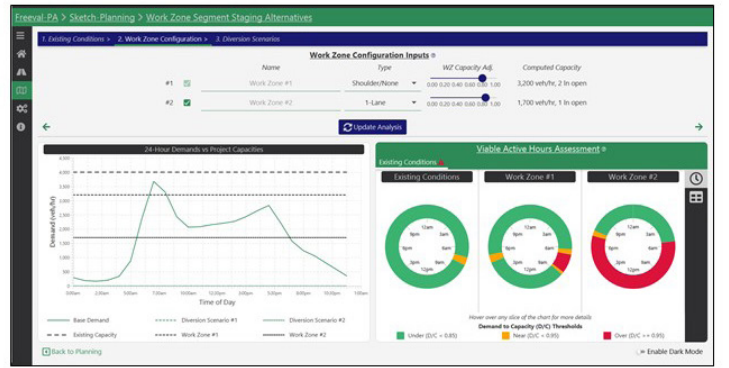
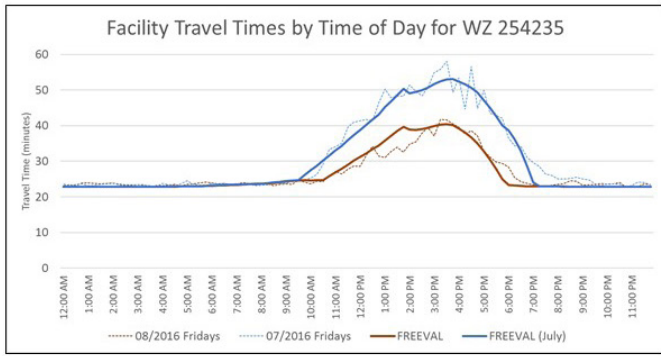
Construction and operations can't solve every congestion or safety issue, detailed data can be shared with partners for collaborative, inter-agency strategies.

- First responders benefitted. During routine Traffic Incident Management reviews, TSMO engineers broke down clearance timelines, shared data and collaborated on better ways to clear roads more quickly and safely.

### Design

Data is shared with construction teams to plan the most efficient, least impactful, and safest work zone.

- Data populates various tools to calibrate scenario models based on past work zones, historical travel times, user delay, queueing and speeds.



## Traffic Managements and Operations

Proactive alerts and detailed congestion analyses lead to faster and more effective incident response.

- Probe data pinpoints when and where congestion begins, marks queue length, and duration.
- All incident data is archived and retrievable for after-action reports.
- With several years of incident data, PennDOT expanded of hours of key TMCs to address very specific patterns identified with INRIX data.

Every minute of incident delay multiplies traffic queues by a factor of four, and increases the risk for secondary crashes

The likelihood of a secondary crash increases by 2.8% for each minute the primary incident continues to be a hazard

FHWA –“Traffic Incident Management (TIM) Performance Measurement: On the Road to Success”

| Source          | District | Road   | Direction  | AlertType         | Severity   | Congestion | Reported Time          | Status         |
|-----------------|----------|--------|------------|-------------------|------------|------------|------------------------|----------------|
| Waze/Inrix      | D04      | I-80   | Westbound  | Congestion(Inrix) | 2-Moderate | 2.84 miles | 6:07 PM (a minute ago) | active (v.40)  |
| RCRS/Inrix      | D05      | US-22  | Eastbound  | Incidents(Inrix)  | 2-Moderate | 1.59 miles | 6:04 PM (4 mins ago)   | active (v.2)   |
| Waze/RCRS/Inrix | D06      | I-76   | Eastbound  | Congestion(Inrix) | 2-Moderate | 2.20 miles | 6:01 PM (7 mins ago)   | active (v.34)  |
| Waze/Inrix      | D06      | I-95   | Southbound | Congestion(Inrix) | 2-Moderate | 2.56 miles | 5:57 PM (11 mins ago)  | cleared (v.34) |
| Waze            | D08      | US-30  | N/A        | Minor Accident    | 1-Low      | N/A        | 5:56 PM (11 mins ago)  | active (v.1)   |
| Waze/Inrix      | D04      | I-81   | Northbound | Incidents(Inrix)  | 3-High     | 0.00 miles | 5:53 PM (15 mins ago)  | active (v.11)  |
| Waze/Inrix      | D06      | I-476  | None       | Incidents(Inrix)  | 3-High     | 0.38 miles | 5:51 PM (17 mins ago)  | active (v.15)  |
| Waze/Inrix      | D04      | I-80   | Westbound  | Incidents(Inrix)  | 3-High     | 1.49 miles | 5:51 PM (17 mins ago)  | active (v.9)   |
| Waze/RCRS/Inrix | D05      | US-22  | Eastbound  | Congestion(Inrix) | 2-Moderate | 2.41 miles | 5:51 PM (17 mins ago)  | active (v.4)   |
| Waze/Inrix      | D05      | US-22  | Westbound  | Congestion(Inrix) | 2-Moderate | 1.31 miles | 5:43 PM (25 mins ago)  | cleared (v.6)  |
| Inrix           | D08      | US-30  | None       | Incidents(Inrix)  | 2-Moderate | 0.00 miles | 5:38 PM (30 mins ago)  | active (v.1)   |
| Waze/Inrix      | D04      | I-80   | Westbound  | Congestion(Inrix) | 2-Moderate | 2.07 miles | 4:20 PM (an hour ago)  | active (v.34)  |
| Waze/Inrix      | D04      | I-80   | Westbound  | Congestion(Inrix) | 3-High     | 3.90 miles | 3:36 PM (2 hour ago)   | active (v.15)  |
| Inrix           | D05      | US-222 | Northbound | Incidents(Inrix)  | 3-High     | 2.03 miles | 3:27 PM (2 hour ago)   | active (v.1)   |

### Inrix Incident Details

**Inrix v40:** Delays of three minutes and delays easing on I-80 Westbound in Hellertville. Average speed 25 mph.

**Waze v4:** Accident Minor, Hazard On Shoulder Car Stopped reported on this Congestion(Inrix).

**IncidentID:** 130252031

**Status:** active

**Severity:** 2-Moderate

**Impacting:** Yes

**Road:** I-80

**Type:** Congestion

**Direction:** Westbound

**Location:** between I-80 and I-80

**Reported Time:** Starts at 6/11/2020 3:34 PM, ends at 6/11/2020 6:45 PM.

**Delay Impact**

**Delay Minutes:** 3.00 mins

**Abnormal:** No

**Congestion Length:** 2.84 miles

**DMS SignBoard**

- DMS-04-044 located on Located on right side of roadway. 4.8 miles before Rt. 93 Exit 256, and 8.7 miles before I-81/I-80 Interchange. Old #23 is junk and will cut up in 2019

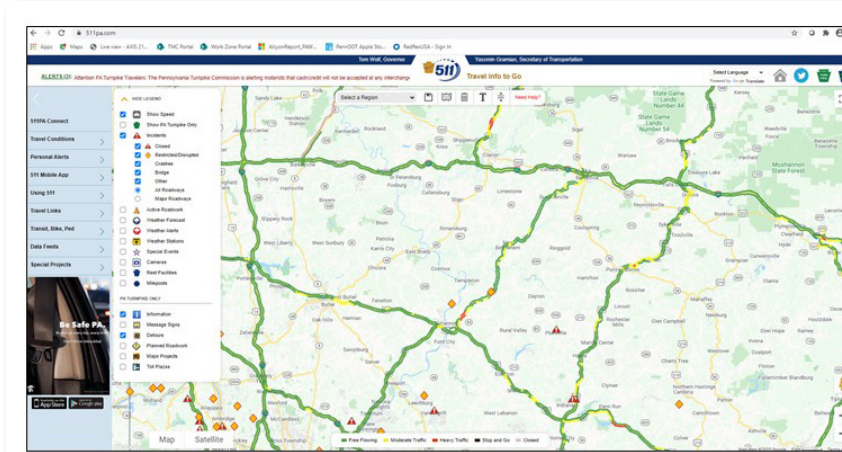
**Map** Satellite



## Public Use

Drivers make informed decisions anytime, anywhere because the information is timely and accurate

- The 511 PA map INRIX overlay populates travel time and delay information. The information is available to the public via in-vehicle traveler information, mobile devices and DMS.
- Smart Work Zones with probe data speed thresholds are being piloted to include dynamic queue protection messages upstream to alert drivers to unexpected changes in traffic patterns.
- Work zone portable messages signs are increasing wireless connectivity to allow for automated display of realtime information, most notably in work zones in rural areas where alternate routes can add significant travel time, and queue protection.



## Summary

PennDOT uses INRIX GPS probe data to plan for and manage daily operations, validate projects and programs, and provide the public with information to make their own travel decisions. This data is used throughout the department as follows:

- **Planning:** Regional traffic operations plans, identification of roadway deficiencies, project performance validation, partner collaboration, automated work zone speed management
- **Design:** Lane use determination, calibration and analytics, benefit cost, scenario and event planning, and smart work zone applications
- **Management and Operations:** Early event detection, situational awareness and event management, advanced notification, after-action reports and program audits
- **Performance Reporting:** Map-21, statewide performance audits, detailed operations reports
- **Public Use:** 511 real-time overlay, 511 IVR traffic report with delay information, Changeable Message Sign travel time messaging, slowdown and back of queue information

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