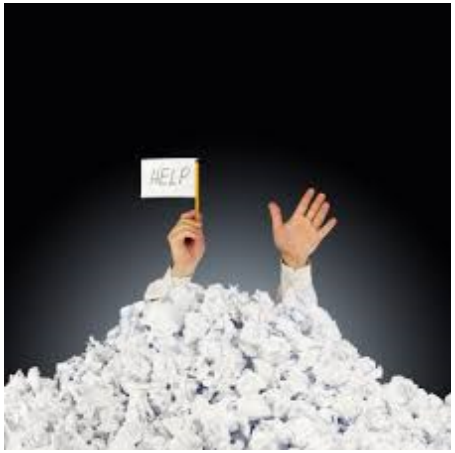
Parsing Through the Data – What Do You Really Need for Winter Maintenance?

The "Old Way"



TOO MUCH DATA!

LOOKING BACK

REMENBER WHEN – WE HAD LIMITED DATA!

SO WHAT DATA REALLY MATTERS?

Let's take a look!

"Data Gathering" Tools

- Traffic safety network
- Automated vehicle location (AVL)
- Infrared temperature sensors
- Route optimization/equipment
- RWIS – fixed and mobile
- Asset Management Software

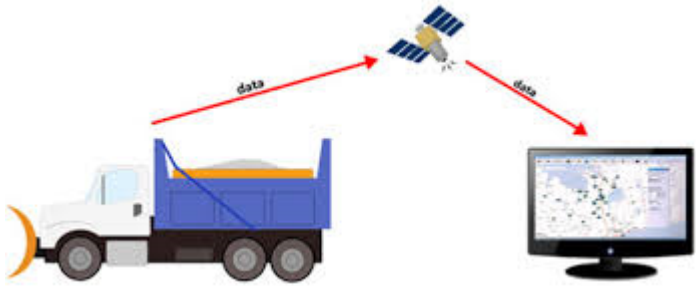
Sensors/Controllers

Data From Trucks

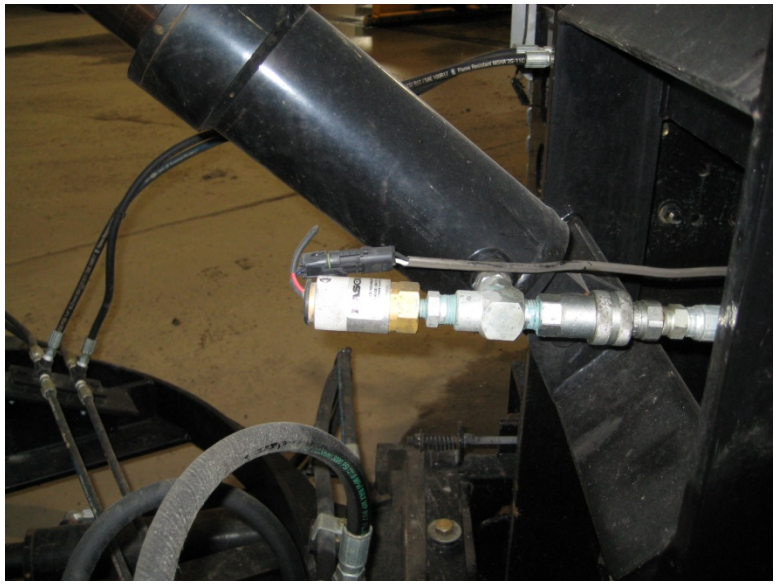
- Operator information
- Supervisory benefit
- Historical value
- Pavement condition variances
- Engine Diagnostics (newer models)

Automated Vehicle Location (AVL)

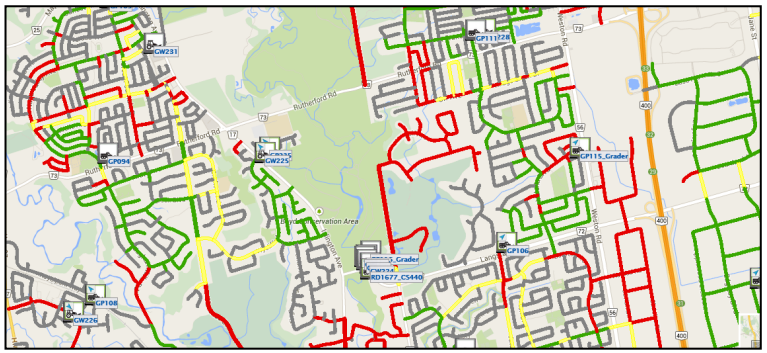
- Connected to controllers/plows
- Transmit real-time data
- Customer support
- Material management tool
- Contractor management

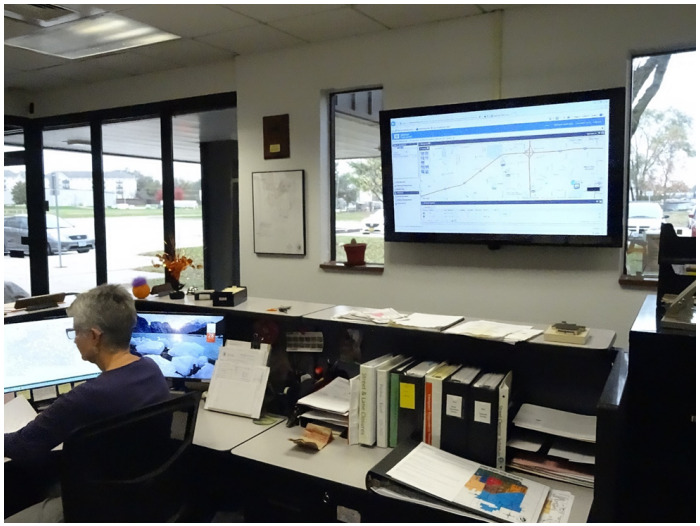


AVL - Controllers & Sensors



Live Operations Data





Reporting Capability

- Material usage
- Vehicle status
- Customer service
- Winter operations
- GIS data points

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Material Management

City of West DesMoines - Salt Usage Report for WestDemoines 315A FA

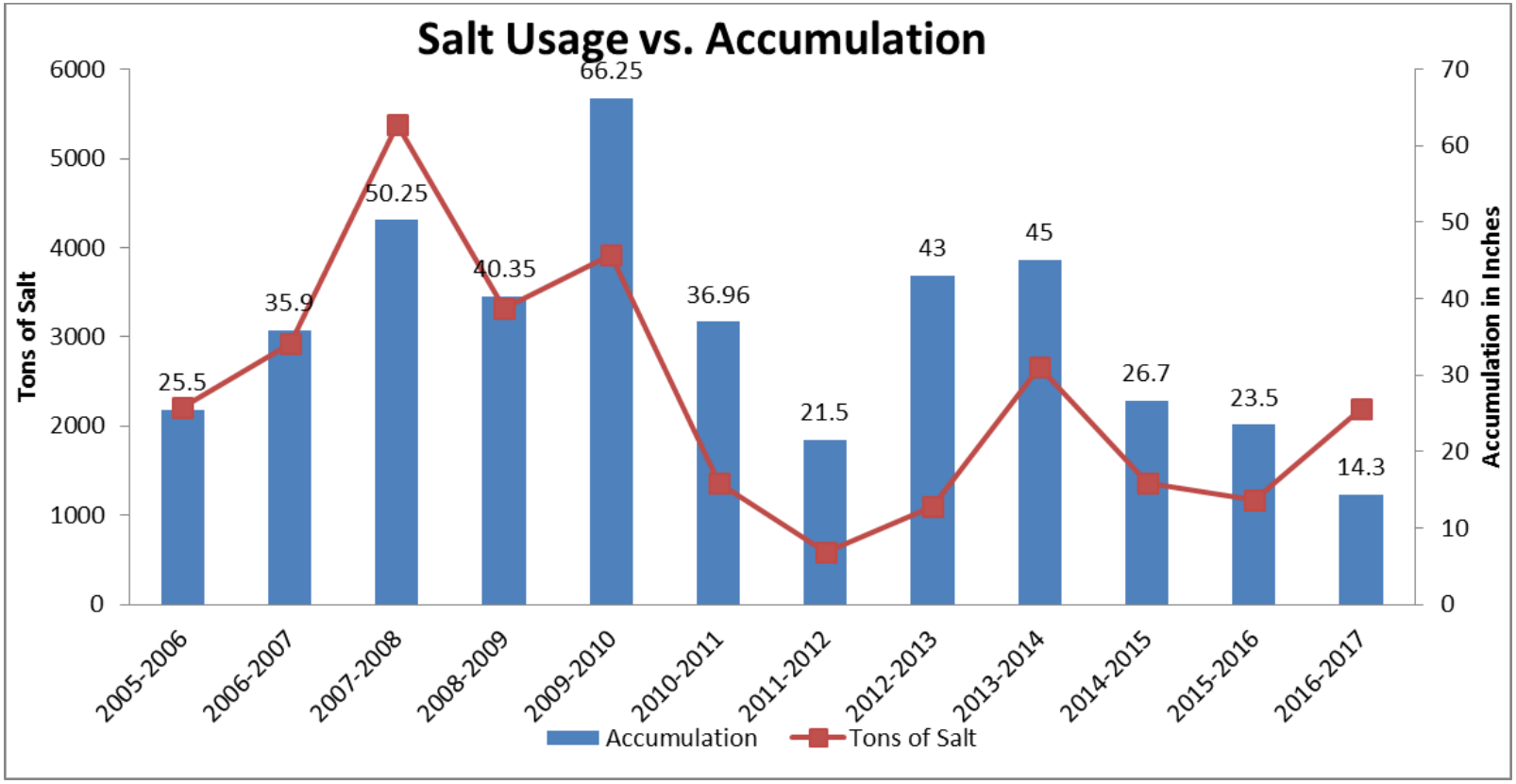
Report period	From dd/MM/yyyy HH:mm	to dd/MM/yyyy HH:mm
	24/03/2013 08:00	24/03/2013 13:00

Vehicle Name : WestDemoines 315A FA

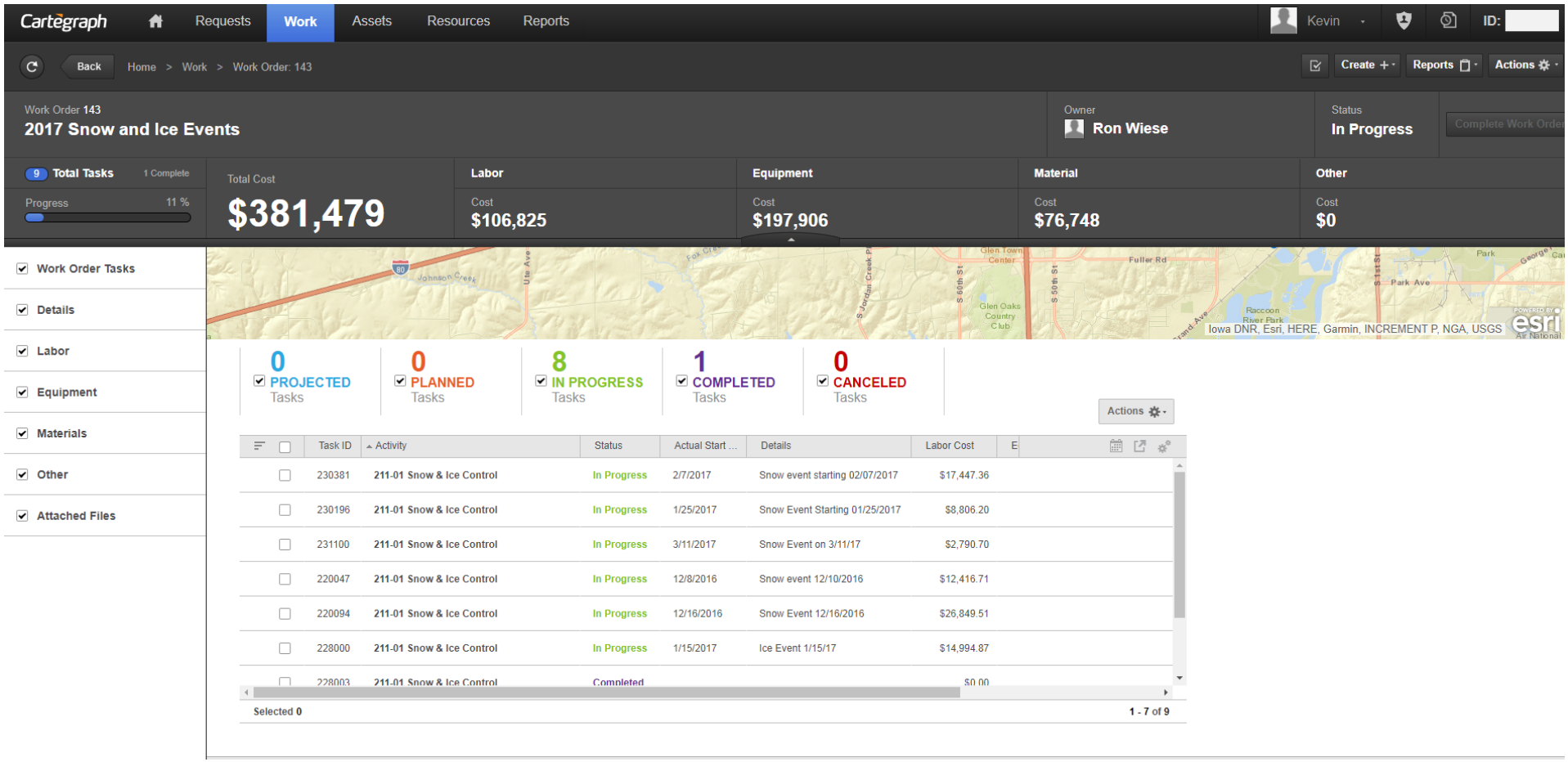
Date D M Y	Start Time	End Time	Miles Spread	Dead Head	Serviced Miles Total	Salt Used (lbs)	Granular Rate
03/24/2013	9:35	12:15	6.77	16.22	22.98	1,307	107
Totals:						**1,307**	**107**

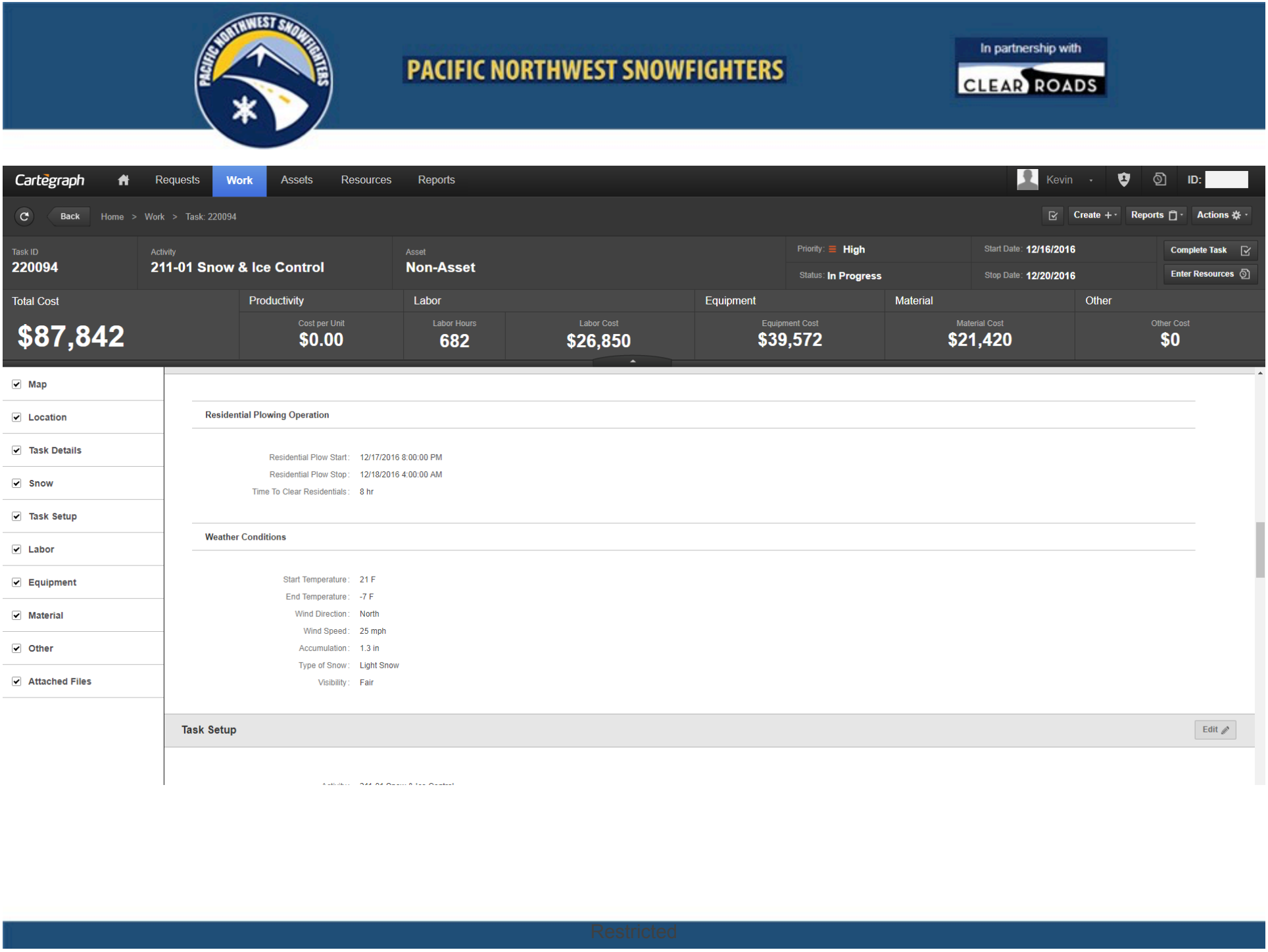
Supervisor's signature

RESULTS!


Salt Usage vs. Accumulation
Tons of Salt
Accumulation in Inches
6000
5000
4000
3000
2000
1000
0
70
60
50
40
30
20
10
0
25.5
35.9
50.25
40.35
66.25
36.96
21.5
43
45
26.7
23.5
14.3
2005-2006
2006-2007
2007-2008
2008-2009
2009-2010
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015
2015-2016
2016-2017
Accumulation
Tons of Salt

Asset Management Programs




PACIFIC NORTHWEST SNOWFIGHTERS
In partnership with
CLEAR ROADS
Cartegraph
Requests
Work
Assets
Resources
Reports
Kevin
ID:
Back
Home > Work > Task: 220094
Create
Reports
Actions
Task ID
220094
Activity
211-01 Snow & Ice Control
Asset
Non-Asset
Priority: High
Status: In Progress
Start Date: 12/16/2016
Stop Date: 12/20/2016
Complete Task
Enter Resources
Total Cost
$87,842
Productivity
Cost per Unit
$0.00
Labor
Labor Hours
682
Labor Cost
$26,850
Equipment
Equipment Cost
$39,572
Material
Material Cost
$21,420
Other
Other Cost
$0
Map
Location
Task Details
Snow
Task Setup
Labor
Equipment
Material
Other
Attached Files
Residential Plowing Operation
Residential Plow Start: 12/17/2016 8:00:00 PM
Residential Plow Stop: 12/18/2016 4:00:00 AM
Time To Clear Residentials: 8 hr
Weather Conditions
Start Temperature: 21 F
End Temperature: -7 F
Wind Direction: North
Wind Speed: 25 mph
Accumulation: 1.3 in
Type of Snow: Light Snow
Visibility: Fair
Task Setup
Edit

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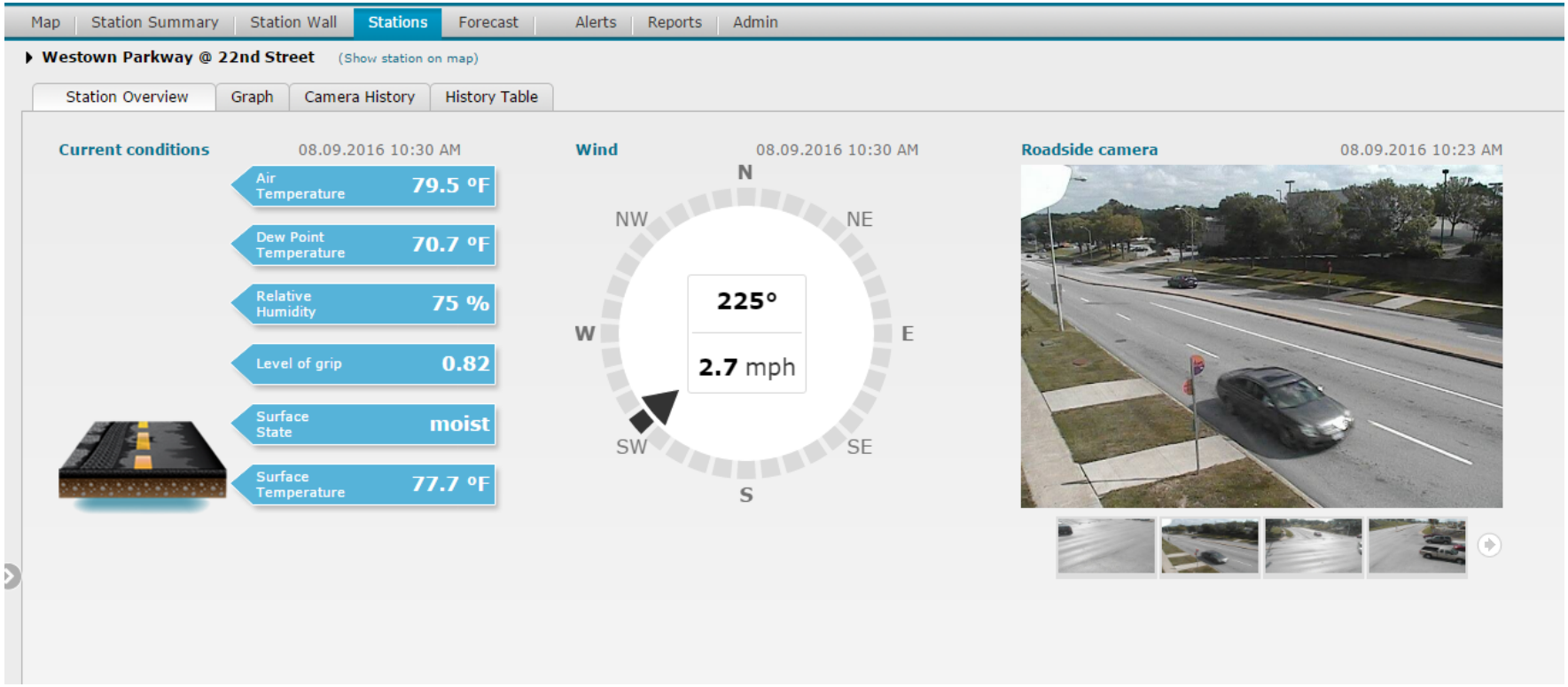
Views - WDM Traffic Operations Center

Road Weather Information Systems – "RWIS"

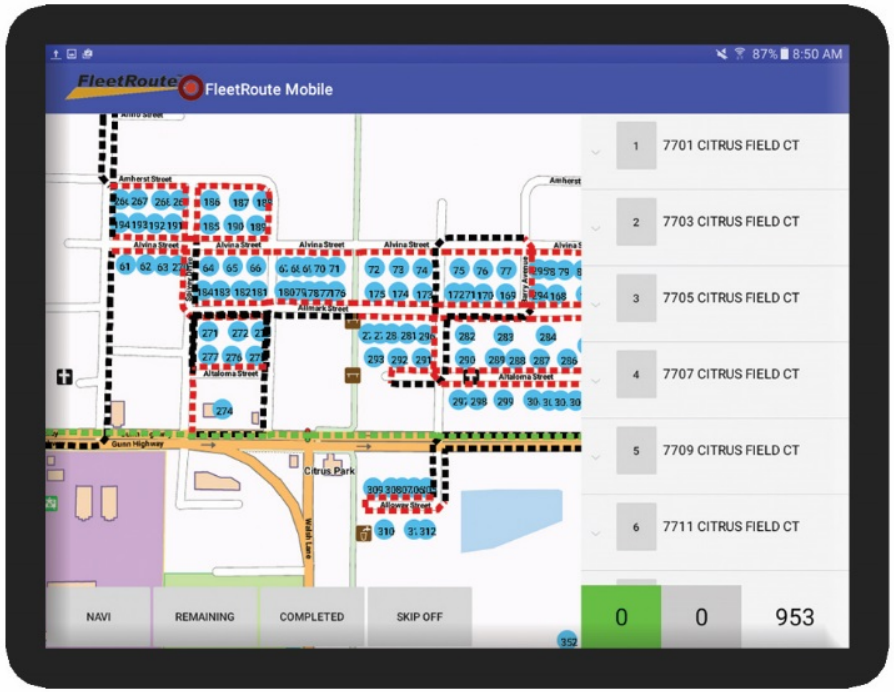
Information/Data

- Road friction
- Pavement/sub-surface temperatures
- Relative humidity
- Pictorial history of road conditions
- Surface condition

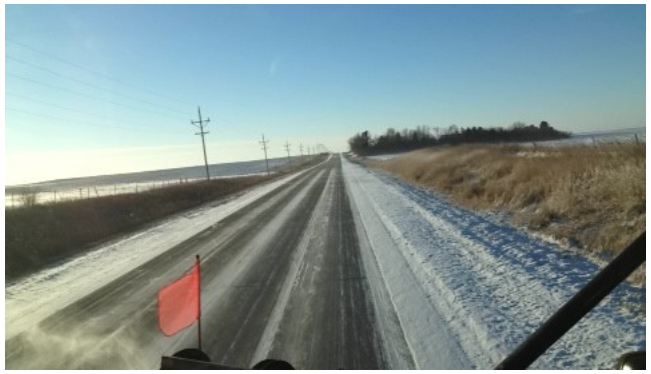
LIVE/RECORDED ROAD DATA

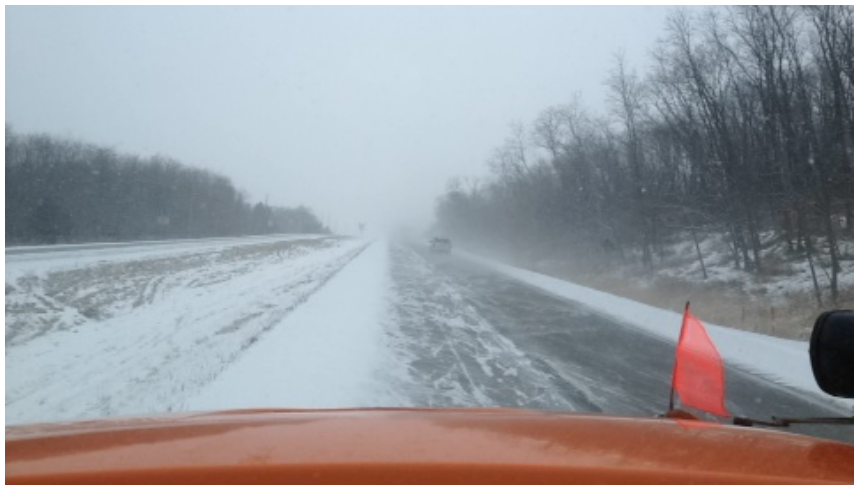


Route Optimization



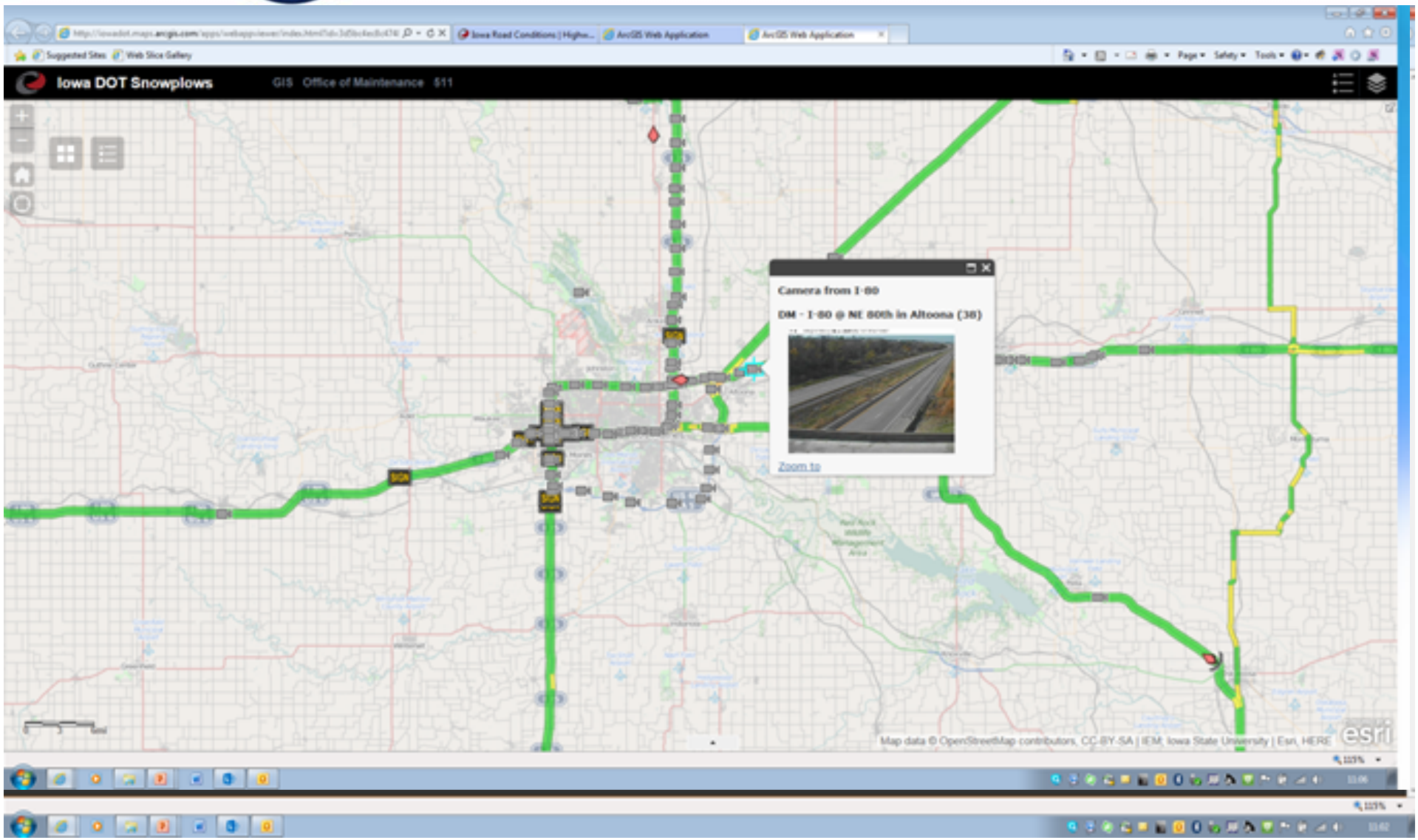
Iowa DOT Dashboard Cams



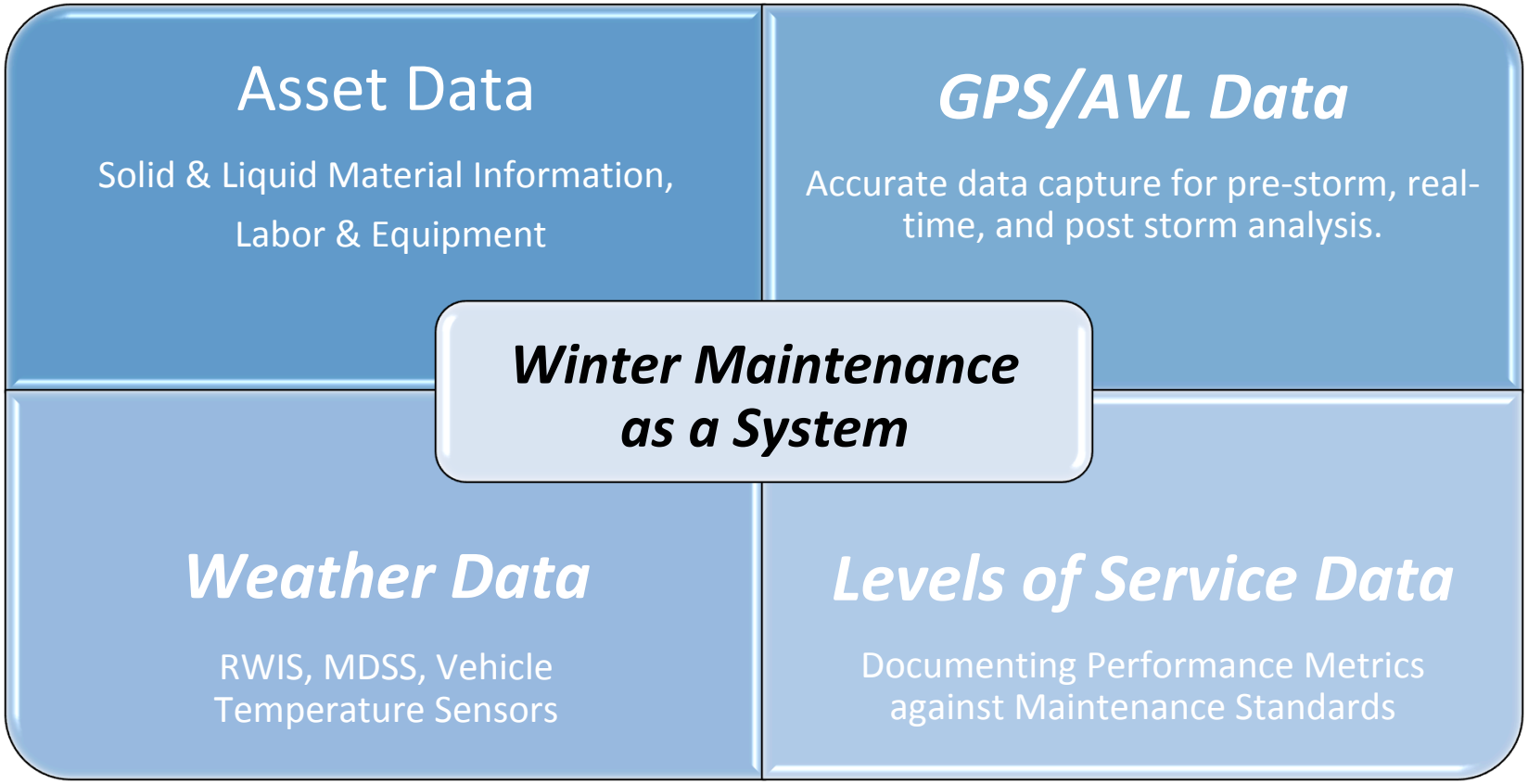


PACIFIC NORTHWEST SNOWFIGHTERS

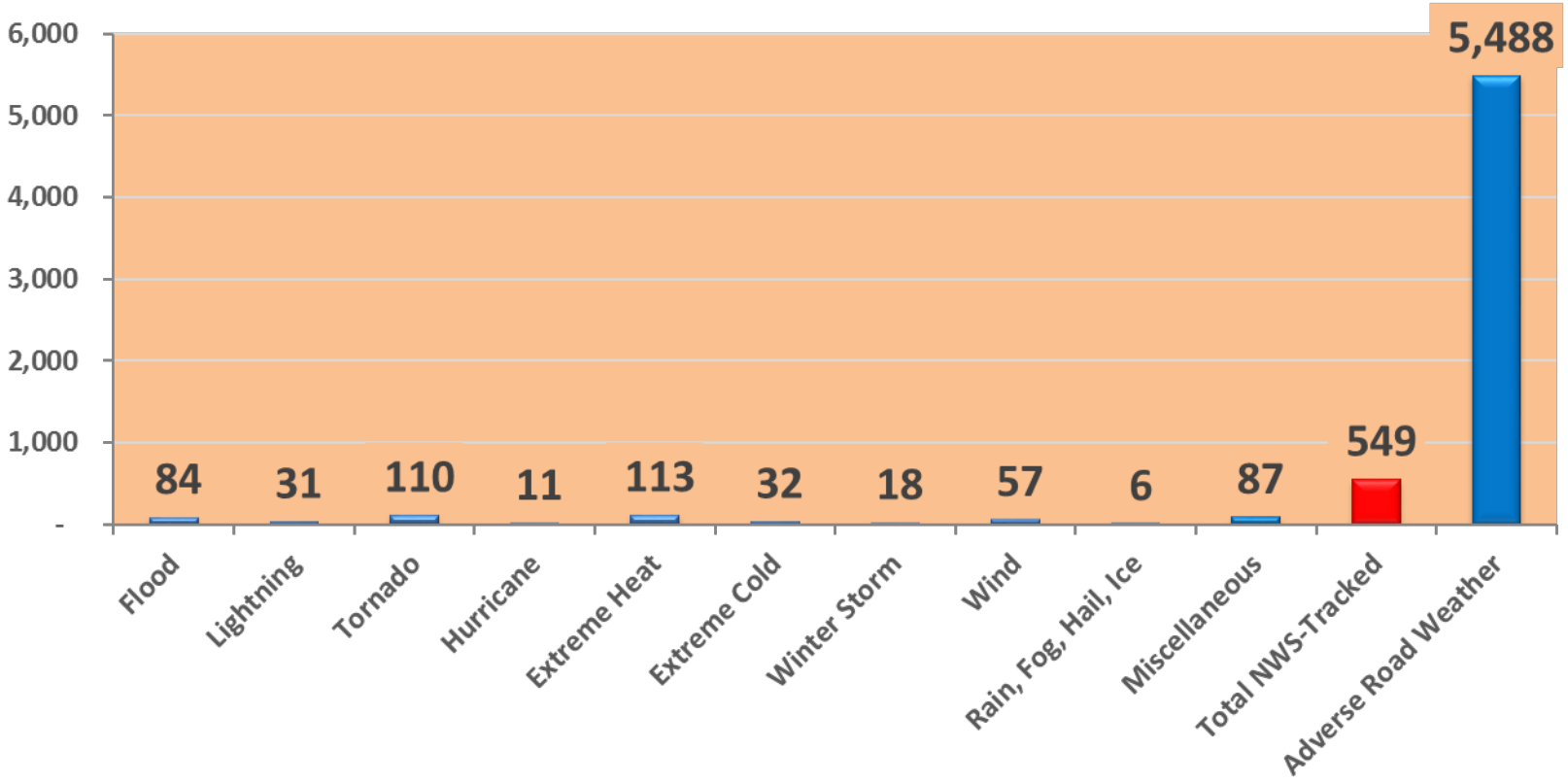
In partnership with CLEAR ROADS



Combining Data Driven Programs



Adverse Weather-Related Fatalities (10-yr. Annual Average 2006-2015)



FHWA Initiatives

A “sneak peak” at what is going on!

Integrating Mobile Observations (IMO)

- **Weather and road condition data collection** from fleet vehicles for a more comprehensive view of network conditions
- Advanced, vehicle-based technologies are deployed to **collect, transmit,** and **use** weather, road condition, and related vehicle data

Source: Minnesota DOT

Intended Outcome – Utilizing enhanced data for more informed system management
(maintenance, traffic, asset, performance)

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Why implement IMO?

Improve efficiency, enhance effectiveness, increase accountability

- Fill gaps in road weather observations
- Spur development of new applications
- Dramatically enhance existing systems
  - Aid in overall salt reduction strategies
  - Optimize the use of maintenance resources
  - Generate actionable, automated alerts and messages to TOC/TMCs, maintenance personnel, work zone teams
  - Provide traveling public with more timely and valuable information

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IMO Pilots

- Three states explored the feasibility of using vehicle-based data to improve transportation safety & mobility

Minnesota DOT	Michigan DOT	Nevada DOT
~590 Vehicles Data • Air Temperature • Relative Humidity • Surface Temperature • Wiper Status • Brake Status Camera Images AVL, Cellular, & DSRC	~15 IMO Vehicles + 310 Snow Plows Data • Air Temperature • Relative Humidity • Surface Temperature • Brake Status • Accelerometer Camera Images Cellular, DSRC, & WiFi	~60 Vehicles Data • Air Temperature • Relative Humidity • Surface Temperature • Wiper Status • Diagnostics Status Radio, Cellular, & DSRC

Source: FHWA

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Nevada IMO System Framework

Cellular **DSRC** **Radio**

In-Vehicle Equipment
- Weather sensors
- Vehicle sensors (OBU, CANBus)
- Equipment sensors (spreader)
- Location sensor (GPS)
- Radio(s)

NEVADA DOT

Applications & Management Strategies
- Winter Maintenance
  - Treatment Recommendations
  - Material Usage Tracking
- Traffic Management
  - Traveler Information
- Data Management Systems
  - Weather Data Environment
  - Vehicle Data Translator

Cellular **Radio**

Source: Nevada DOT
Used with permission

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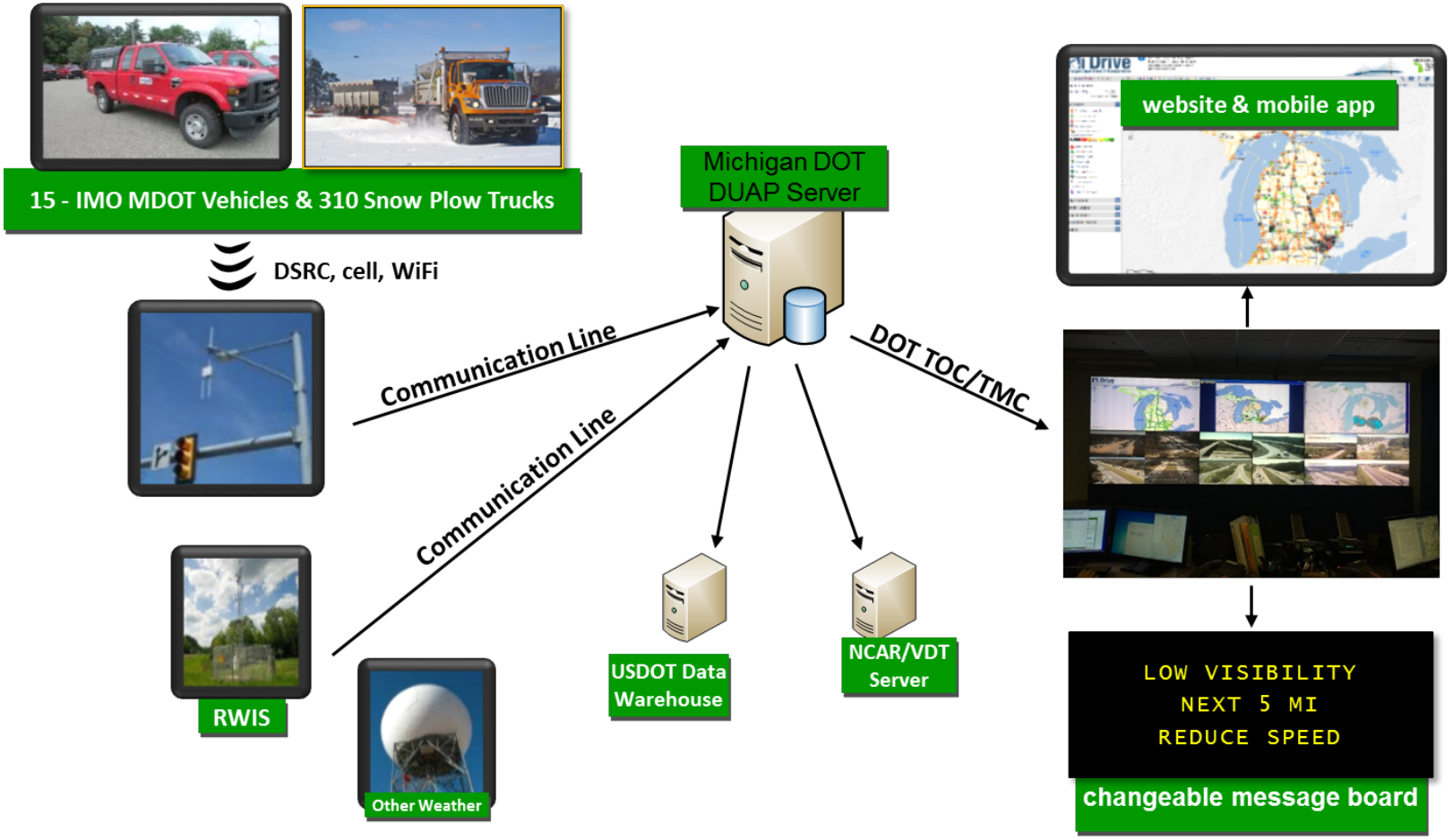
Michigan IMO System Framework



Source: Michigan DOT

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Examples of Motorist Advisory and Warnings

Variable Speed Limit Sign

Severe Weather Warning Sign

Dynamic Message Sign

WHITE OUT CONDITIONS
ON I-94
REDUCE SPEED

SLIPPERY ROADS
WB I-94
REDUCE SPEED

Source: Michigan DOT

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Mi Drive
Michigan Department of Transportation
Michigan.gov Home | MDOT Home | Contact Us | Disclaimer | Requirements
MICHIGAN.GOV Michigan's Official Web Site
Map | Construction | Camera | Links |
Jump to a Location
Enter Zip or City
Go
Save View as Default
Map Legend
Partial Construction Closure
Future Construction
Total Road Closure
Camera Image
Camera with Weather
Current Speed (mph)
0 1-10 11-20 21-30 31-40 41-50 51-60 61-70
Active Incident
Clearing Incident
Message Signs
Snowplows
Snowplows with Cameras
Truck Parking
Carpool Lots
Rest Areas
Roadside Parks
Passenger Airports
Public Airports
OR Just Display...
Major 2015 Projects
Bridge Legend
Corridor Legend
Traffic Incidents
Construction Search
Weather
Aerial View
Road View
Currently Plowing
Time at Location: 01/11/2016
HOLLAND
BENTON HARBOR
Allegan
Dowagiac
Niles
Sturgis
Three Rivers
Portage
Quincy
Hillsdale
Hudson
Brooklyn
Owosso
Mason
Stockbridge
0 10 20mi
Source: Michigan DOT

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IMO from a Local Perspective

- Cities, Counties and other agencies can:
- Equip fleets to collect critical data
- Work with State DOTs to share data
  - Access state-based Road Weather Information Systems to supplement data collected from fleets
- Work with private data vendors (e.g., INRIX, Waze) for complementary traffic data

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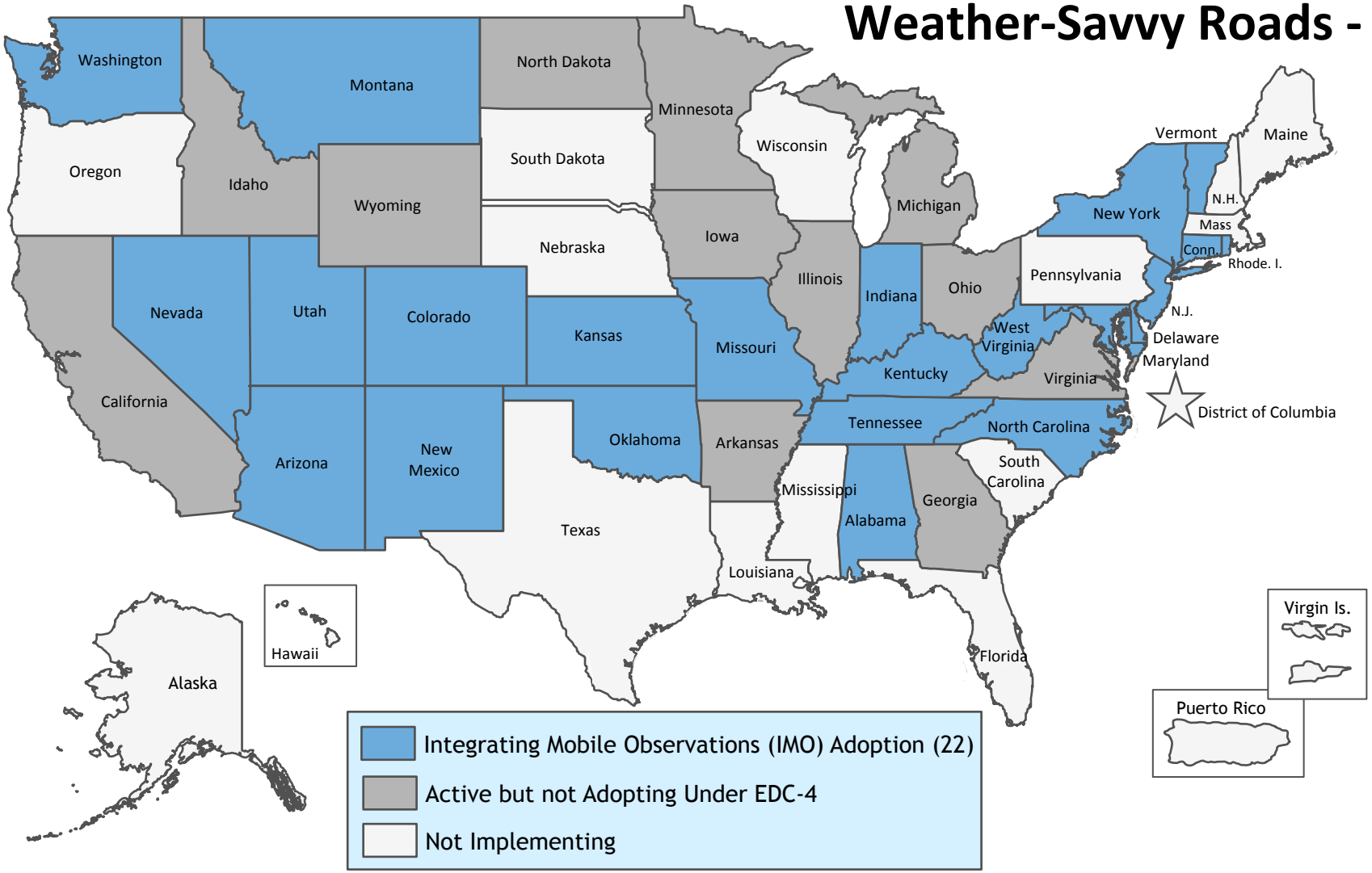
Weather-Savvy Roads - IMO



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Some Things to Think About

- What information does your agency need?
- "Garbage in – garbage out" – be careful!
- Too much information – now what?
- Liability issues

Budget Tools

- Asset management
- Dealing with facts (data driven)
- Public Safety “deterrent”
- Customer service surveys (LOS tool)
- Federal mandates/initiatives

Future Trends

- Autonomous vehicles
- More technology – less discretion
- Route optimization
- “Measuring performance”
- Enhanced information to the public

Challenges

- Stay on top of the trends
- What information to share
- Adapting to changes
- Desire for “more” data

Our Future Path

- More information for the public (public facing website)
- Enhanced equipment automation
- Route optimization
- Networking for more uniformity
- Watching/reacting to trends

THANK YOU!

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