



***Standing International Road Weather  
Commission  
2016 Conference***

**AVL/GPS/MDSS for Improving Winter  
Maintenance Operations**

**Presented by:**

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Roadway Operations Engineer

Michigan Department of Transportation

**MIDOT**

# Outline

- AVL/MDSS Contract
  - AVL Website
  - MDSS Website
- New for Winter 2015/2016
- Future Goals

# AVL/MDSS Contract Overview

**AVL:** Automated Vehicle Location

**MDSS:** Maintenance Decision Support System

- Awarded Contract to Delcan Technologies (now part of Parsons)  
September 15<sup>th</sup>, 2013



- Contract is for 3 years with options for 2 additional years.
- Vendor is responsible for providing weather forecast and treatment recommendations

**MIDOT**

# Data Collection

## AVL/MDC Units

*(310 WMTs currently active)*

- Air and pavement temps
- Plow Blade up/down
- Wing plow & Towplow usage
- Camera images
- (120 WMTs currently equipped)*
- Spreader information
  - material type
  - application rate
  - amount used
- Engine code data

## MDSS (Iteris)

- Weather forecasting
- Pavement condition
- Treatment recommendations



WMTs

AVL Provider  
(Parsons)

MDSS Provider  
(Iteris)



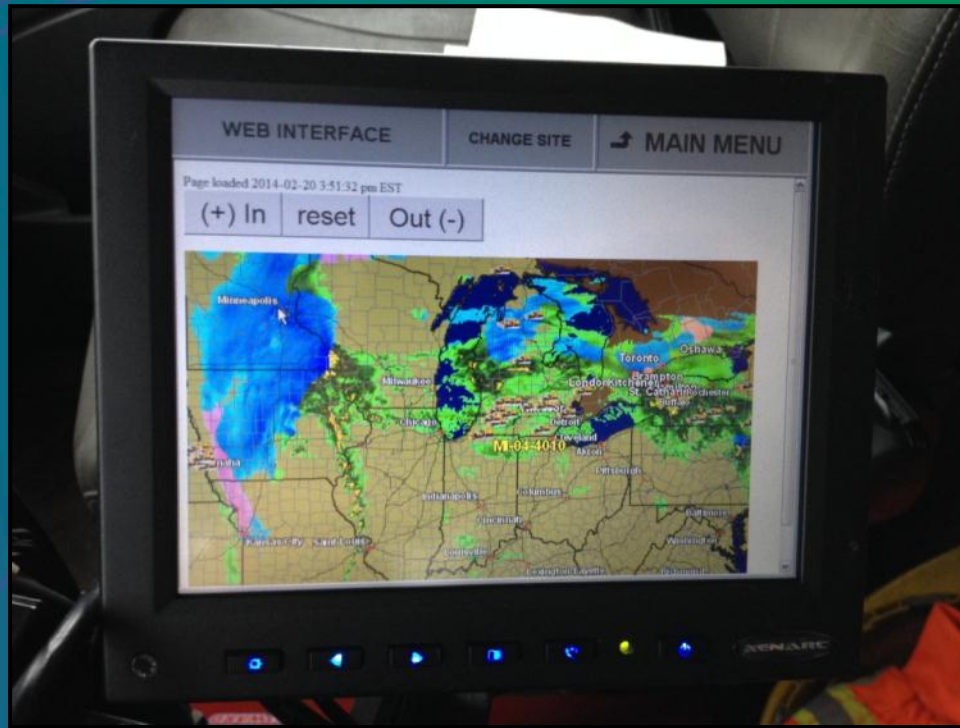
Secure  
Website(s)



Authorized Users

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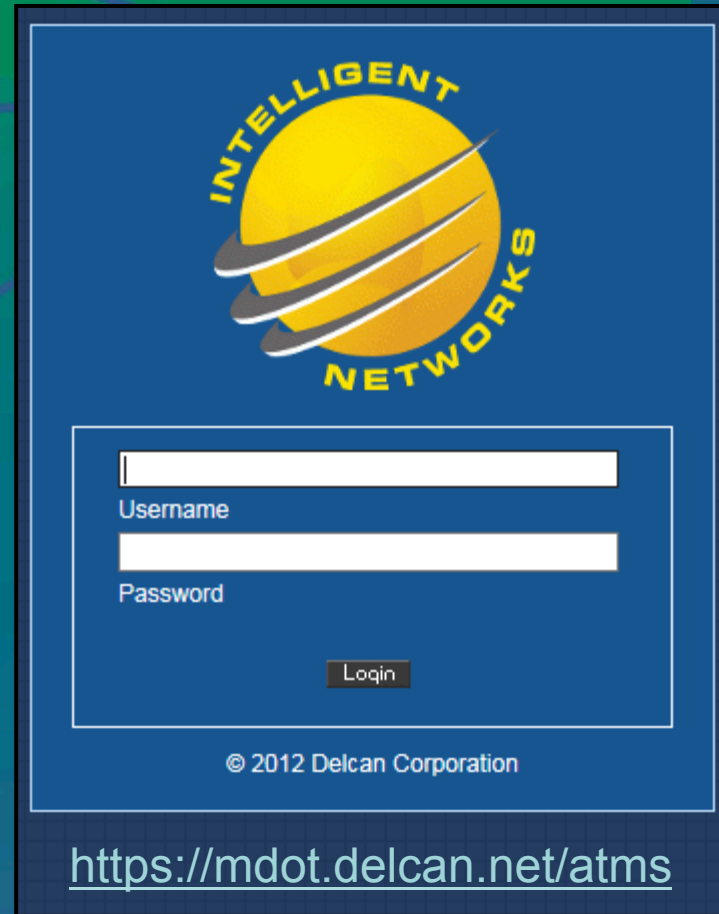
# In-Truck Touch Screen



# AVL Website

## Features:

- Near-Real Time Data
  - Maintenance Operations
  - Camera Images
- Historical Information
  - Breadcrumbs
- AVL Reports



The screenshot shows the login interface for the AVL Website. At the top center is the logo for Intelligent Networks, which consists of a yellow sphere with three white curved lines passing through it, surrounded by the text "INTELLIGENT NETWORKS" in a circular arrangement. Below the logo is a white rectangular box containing two input fields: the top one is labeled "Username" and the bottom one is labeled "Password". A dark grey "Login" button is positioned below the password field. At the bottom of the white box, the text "© 2012 Delcan Corporation" is displayed. Below the white box, the URL <https://mdot.delcan.net/atms> is shown in a dark blue bar.

# AVL Website

The screenshot displays the AVL website interface. On the left is a map of Michigan with several green truck icons. A tooltip for vehicle 04-4032 shows: Speed: 17 mph, Belly Blade: down, Right Blade: up, Solid Rate: 350.2 lb/mi. On the right, a 'Viewer' window for vehicle 04-4032 shows: Name / Tag: 04-4032, Description: 7-0009, External Link: Camera Image. Below the map is a 'List' table:

Status	Name	Region	Garage	Timestamp	Belly Blade	Solid Rate	Road Te
	04-4003	University	Brighton				
	04-4006	SW Region	Coloma	2014-02-05 22:25:25	up	0 lb/mi	
	04-4007	Bay	Saginaw Eastside	2014-02-05 09:11:50	down	0 lb/mi	

Below the list is another 'Viewer' window for vehicle 04-4007 (Fleet ID# 0566cf95b9a4c6fb24aa13e3a2f74ae) showing: Name / Tag: 04-4007, Description: 7-0001, External Link: Camera Image. A table below this viewer shows:

Field Name	Value
Solid Material	Sodium Chloride
Target Solid Rate	300.2 lb/mi
Actual Solid Rate	0.0 lb/mi
Liquid Material	Calcium Chloride
Pavement	other
Belly Blade	down
Right Blade	down
Actual Liquid Rate	0.0 gal/mi
Speed	8 mph

To the right of the viewer is a 'Camera Image' window showing a truck on a snowy road at 07:44:51 on Wed Feb 05 2014. The truck is spreading material on the road.

## Real-time Data

- Operational
- Engine
- Camera Images

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# AVL Website

## Historical Operations Playback (Breadcrumbs)

The screenshot shows the AVL website interface. The main map displays several vehicles (represented by icons) on a road network. A 'Viewer' window shows 'Fleet ID# e8003b30a09548c3afa43c6a27801cbe' and the date '2014-02-20 10:49:30'. An 'AVLHistory' window is open, showing a 'Breadcrumb Map' with a date range from 'Start: 3/2/2014' to 'End: 3/2/2014'. A vehicle information popup is visible, listing: Vehicle: 04-1, Speed: 37 mph, Belly Blade: down, Right Blade: up, Solid Rate: 200 lb/mi. The bottom of the interface features a 'Truck Guidance Landmarks' bar and a standard Windows taskbar with icons for Internet Explorer, Google Chrome, Excel, PowerPoint, Word, and PDF Reader.

This detailed screenshot shows the 'AVLHistory' breadcrumb map and its associated data panel. The breadcrumb map shows a vehicle's path along a road, with a scale bar indicating 500m and 1000ft. The data panel includes the following sections:

- Breadcrumb Date Range:** Start: 3/2/2014 15:55, End: 3/3/2014 15:55. A button reads 'Find All Vehicles with Breadcrumbs'.
- Status Field Selector:** A list of fields including Current Liquid Material, Air Temperature, Surface Temperature, Precipitation, RPM, Oil Pressure, Coolant Temperature, and Engine Time.
- First Breadcrumb of selected vehicle(s):** Mon Mar 03 2014 10:26:04 GMT-0500 (Eastern Standard Time)
- Last Breadcrumb of selected vehicle(s):** Mon Mar 03 2014 15:46:03 GMT-0500 (Eastern Standard Time)
- Primary Vehicle:**

<input checked="" type="checkbox"/>	04-4048	92 of 1016	37.28 mph	Heading: 339°
-------------------------------------	---------	------------	-----------	---------------
- Additional Vehicles (select max of 4):**

<input type="checkbox"/>	DTI_TEST	n/a	0 mph	Heading: 0°
<input type="checkbox"/>	04-3836	n/a	0 mph	Heading: 0°
<input type="checkbox"/>	04-4006	n/a	0 mph	Heading: 0°
<input type="checkbox"/>	04-4036	n/a	0 mph	Heading: 0°

At the bottom, there is a 'Start Playback' button with the timestamp 'Fri Oct 10 2014 15:01:44 GMT-0400 (Eastern Daylight Time)' and a playback progress slider.



# AVL Reports

**Reports:**

By First Letter | By Date | By Models

**AVL-MDOT2**

- Blade Usage Season Summary
- Blade Usage Summary (Region)
- Blade Usage Summary by Day O...
- Current User Created After Date
- Engine Diagnostics
- Geofence Summary (Direction) ...
- Geofence Summary (Garage)
- Geofence Temperature Data
- Idle Time Report by Region OFS
- Last Vehicle Data
- Liquid Material Usage (Daily)
- Material Usage (Daily)
- No Reported Vehicle Data Since
- Salting Speeds Compliance for ...
- Salting Speeds Compliance Rep...
- User Activity
- Vehicle Health Check
- Vehicles

## Commonly Used Reports for Winter Maintenance

Blade Usage  
Material Usage  
Salting Speed Compliance  
Vehicle Health Check  
Engine Diagnostics  
Geofence Summary

MDOT

# FY 2016 Salt Speed Compliance and Efficiency\*

2/16 - 3/1

## Salt Usage and Effectiveness

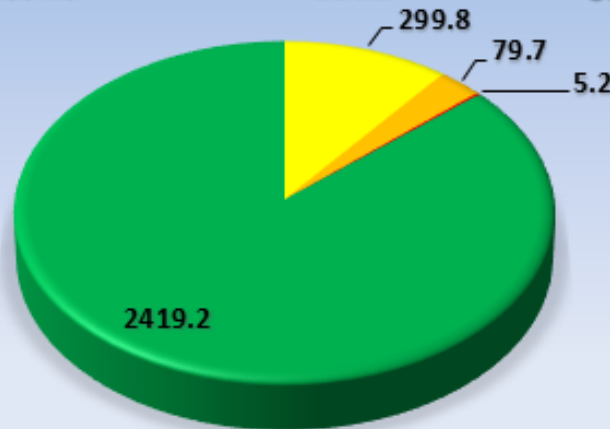
Region: SW Region

Date Range: 2/16/2016 to 3/1/2016

Total Salt Spread (tons)  
2804.0

Total DSE (tons)\*\*  
384.8

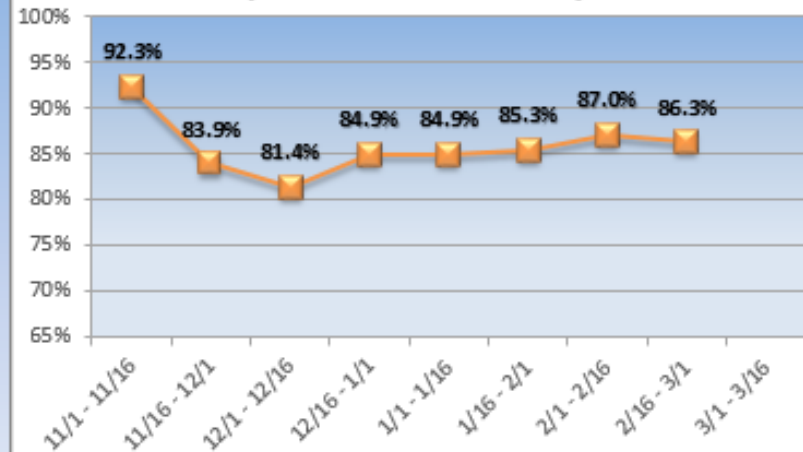
Salting Efficiency  
86.28%



- DSE 25 - 35mph (tons)
- DSE 35 - 45mph (tons)
- DSE Above 45mph (tons)
- OSE (tons)

Diminished Salt Efficiency (DSE) \*\*  
Optimized Salt Efficiency (OSE)

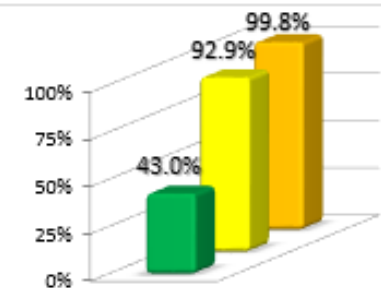
## Winter 2015/2016 Salt Efficiency: Southwest



## Salt Speed Compliance

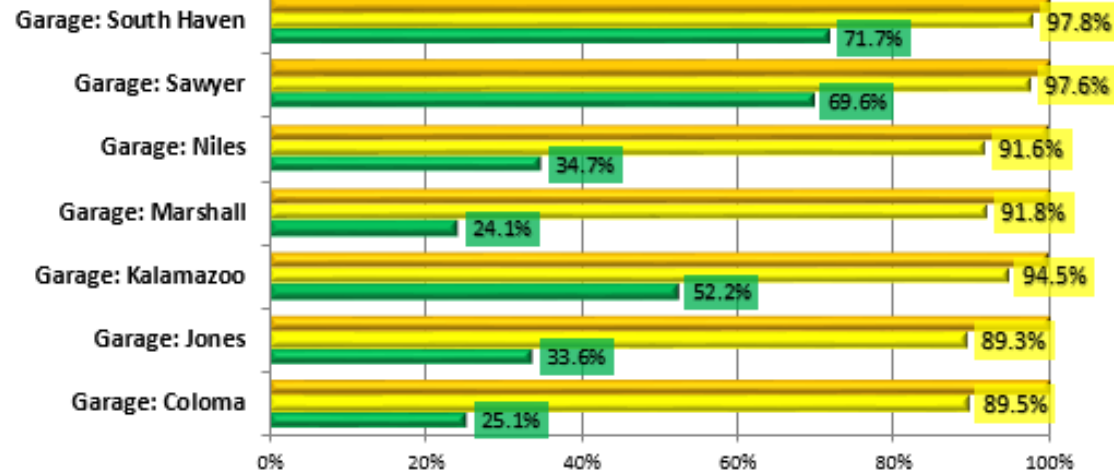
Region: SW Region

Date Range: 2/16/2016 to 3/1/2016



\* Efficiency based on AVL salt speed compliance data and empirical data from the MDOT Salt Bounce and Scatter Studies. Data assumes standard spreaders used.

\*\* Salt applied at speeds faster than 25 mph increases the bounce and scatter which diminishes salting efficiency.

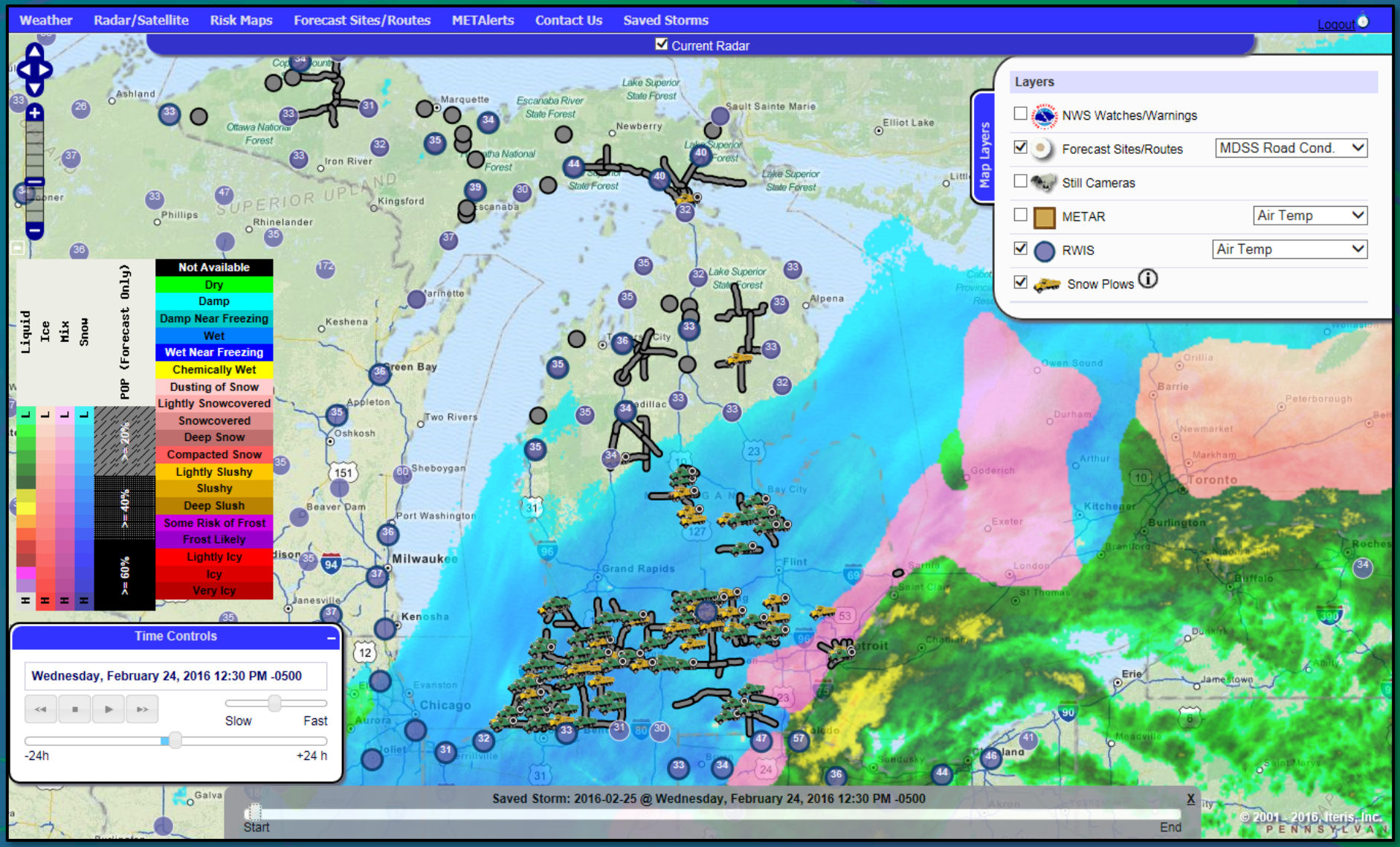


## Garage Speed Data

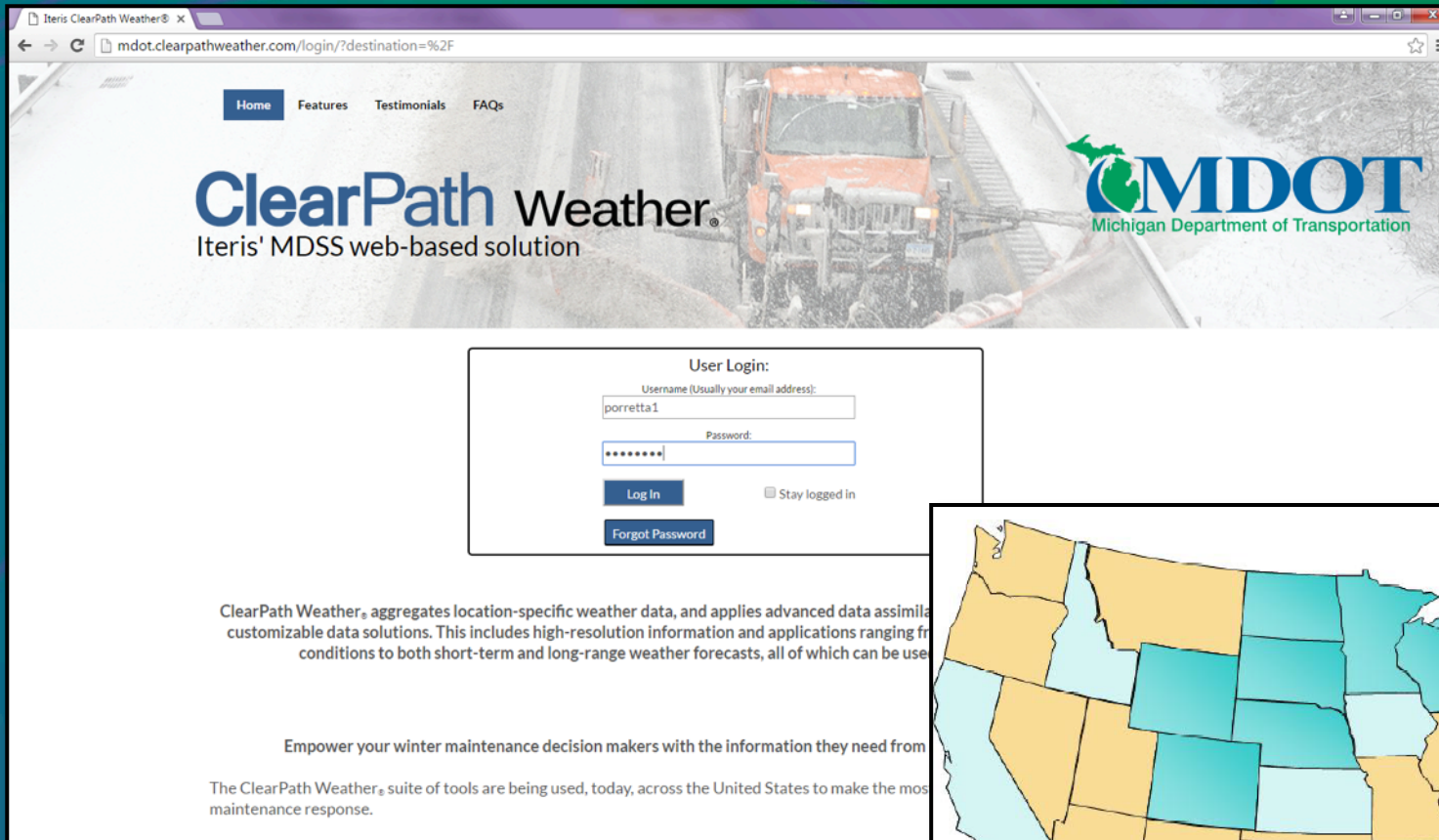
- 45mph Compliance
- 35mph Compliance
- 25mph Compliance

# What is MDSS?

## Maintenance Decision Support System




# MDSS Website



Home Features Testimonials FAQs

## ClearPath Weather

Iteris' MDSS web-based solution



**User Login:**

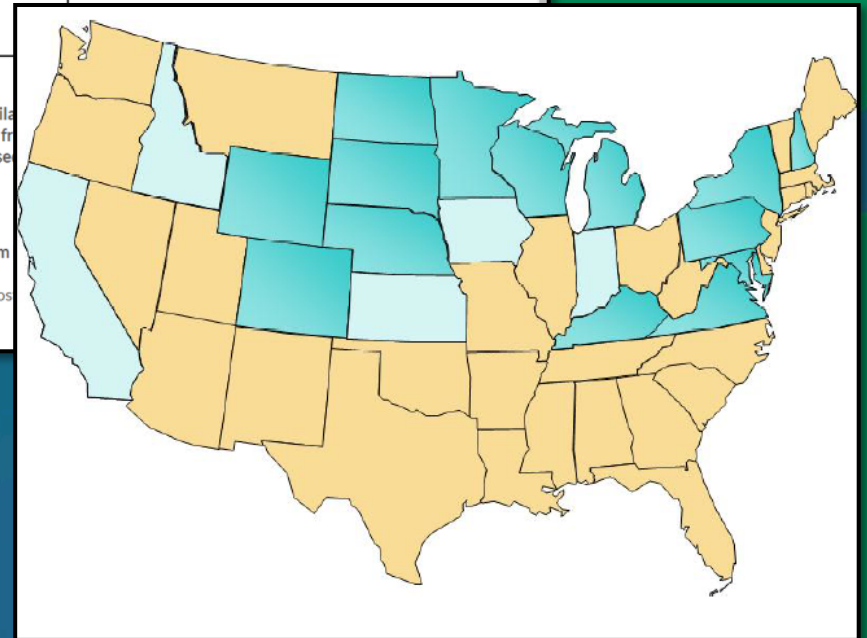
Username (Usually your email address):  
porretta1

Password:  
\*\*\*\*\*

Stay logged in

ClearPath Weather aggregates location-specific weather data, and applies advanced data assimilation and customizable data solutions. This includes high-resolution information and applications ranging from real-time conditions to both short-term and long-range weather forecasts, all of which can be used to make better maintenance decisions.

Empower your winter maintenance decision makers with the information they need from the ClearPath Weather suite of tools are being used, today, across the United States to make the most effective maintenance response.



# MDSS Website

**MI-04-4020**  
 Reported at Wednesday, March 23, 2016 7:37 PM -0400

Speed	24
Lane	N/A
Plow Position	Plow Down
Material	WSaCa
Material Rate	400
Road Condition	N/A
Weather Condition	N/A
Air Temperature	30.02
Pavement Temperature	24.08
Image time	Mar 23 7:35 PM -0400

**M-72 East**  
 US-131 east to Manistee River Rd.

MDSS Percent Ice	100%
MDSS Mobility Index	80
MDSS Road Temperature	31 °F
MDSS Road Condition	Snowcovered
Weather Alerts	Light Snow
Road Alerts	Dusting of Snow
Blowing Snow Alerts	No Risk
Maintenance Alerts	Chemicals Recommended

Forecast  
 Iteris | Ten Day Forecast | NWS

TABLE | GRAPH | TABLE | TEXT

**Time Controls**  
 Saturday, April 2, 2016 11:50 AM -0400

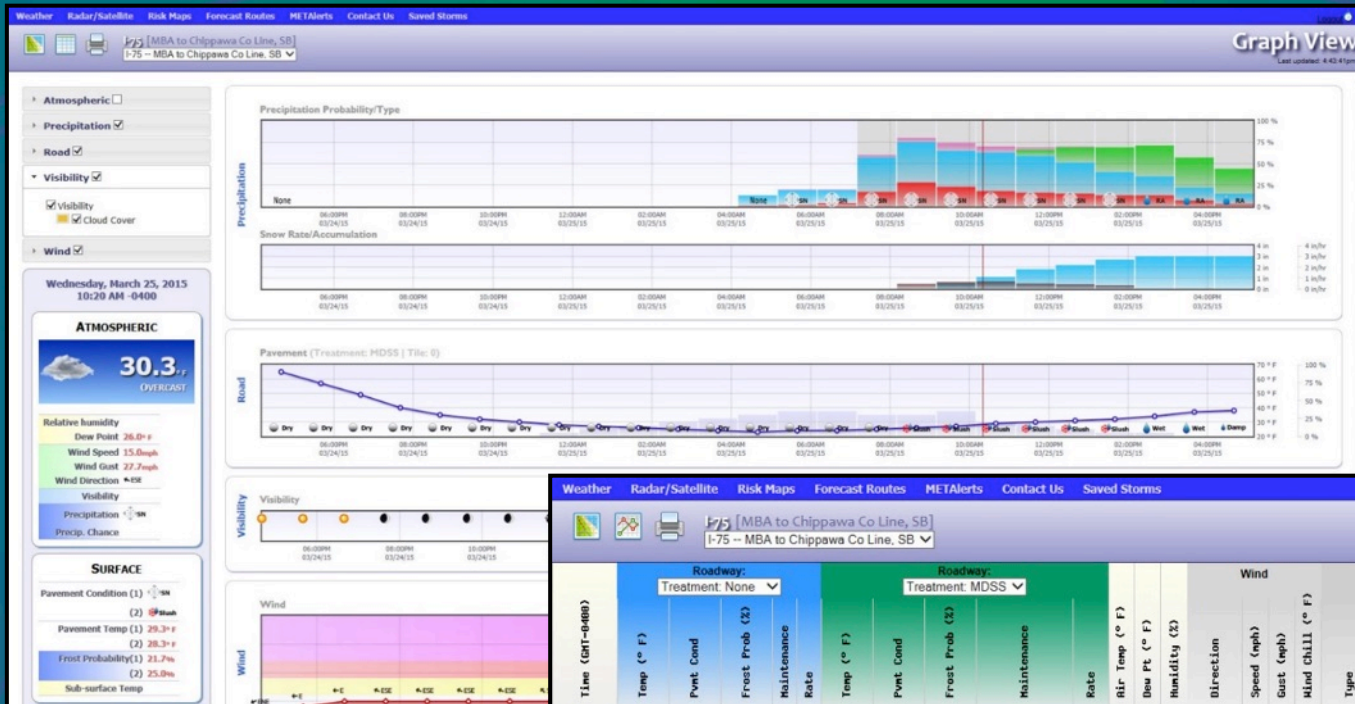
Navigation: << | ■ | >>

Speed Control: Slow | Fast

Time Range: -24h | +24h

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# MDSS Website



**Snow Route Treatment Recommendations**  
*\*\* (Rates per 12' Lane mile, not 24')*

**Weather Forecasting per Snow Route** (table and graph)

**Table View**  
Last updated: 4:24:03pm

Time (GMT-0400)	Roadway: Treatment: None				Roadway: Treatment: MDSS				Rate	Air Temp (° F)	Dew Pt (° F)	Humidity (%)	Direction	Speed (mph)	Gust (mph)	Wind Chill (° F)	Precipitation						Vis Obs	Time (GMT-0400)				
	Temp (° F)	Pvnt Cond	Frost Prob (%)	Maintenance Rate	Temp (° F)	Pvnt Cond	Frost Prob (%)	Maintenance Rate									Precip Prob (%)	Liq Rate (in/hr)	Liq Rec (in)	Ice Rate (in/hr)	Ice Rec (in)	Sn Rate (in/hr)			Sn Rec (in)	Cloud Cover	Visibility (mi)	
Tue 3pm	38	Dry	0	---	38	Dry	0	---	---	28	21	75	45E	10	---	19	---	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	---	Tue 3pm
Tue 9pm	34	Dry	0	---	34	Dry	0	---	---	27	20	76	45E	9	---	18	---	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	---	Tue 9pm
Tue 10pm	31	Dry	0	---	31	Dry	0	---	---	26	21	81	45E	10	---	16	---	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	---	Tue 10pm
Tue 11pm	29	Dry	5	---	29	Dry	5	---	---	26	21	81	45E	11	---	16	---	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	---	Tue 11pm
Wed 12am	28	Dry	5	---	28	Dry	5	---	---	26	21	81	45E	10	---	16	---	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	---	Wed 12am
Wed 1am	27	Dry	10	---	27	Dry	10	---	---	25	20	81	45E	10	---	15	---	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	---	Wed 1am
Wed 2am	25	Dry	15	---	25	Dry	15	---	---	24	20	84	45E	12	---	13	---	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	---	Wed 2am
Wed 3am	25	Dry	25	---	25	Dry	25	---	---	24	21	87	45E	12	---	13	---	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	---	Wed 3am
Wed 4am	24	Dry	25	---	24	Dry	25	---	---	24	20	84	45E	12	---	13	---	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	---	Wed 4am
Wed 5am	23	Dry	30	---	23	Dry	30	---	---	24	20	84	45E	13	10	12	SN	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	---	Wed 5am
Wed 6am	24	Dry	35	---	24	Dry	35	---	---	25	21	86	45E	13	10	13	SN	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	---	Wed 6am
Wed 7am	24	Dry	30	---	24	Dry	30	NaCl	225	26	21	84	45E	14	21	14	SN	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	---	Wed 7am
Wed 8am	25	Dry	30	---	25	Dry	25	---	---	26	22	86	45E	14	23	14	SN	40	0.00	0.00	0.00	0.00	0.45	0.00	0.50	---	Wed 8am	
Wed 9am	27	SN	25	---	26	Slush	25	NaCl	150	27	24	86	45E	15	24	15	SN	40	0.00	0.00	0.00	0.00	0.63	0.25	0.50	---	Wed 9am	
Wed 10am	29	SN	25	---	28	Slush	30	---	---	28	25	87	45E	15	28	19	SN	40	0.00	0.00	0.00	0.00	0.89	1.11	0.25	---	Wed 10am	
Wed 11am	30	SN	15	---	29	Slush	15	---	---	30	26	88	45E	15	30	20	SN	40	0.00	0.00	0.00	0.00	0.48	1.8	0.50	---	Wed 11am	
Wed 12pm	31	SN	10	---	30	Slush	15	---	---	31	27	89	45E	14	28	23	SN	40	0.00	0.00	0.00	0.00	0.41	2.2	0.50	---	Wed 12pm	
Wed 1pm	32	CompSN	5	---	32	Slush	10	NaCl	---	33	27	77	45E	13	23	24	SN	40	0.00	0.00	0.00	0.00	0.32	2.7	0.50	---	Wed 1pm	
Wed 2pm	32	CompSN	10	---	33	Slush	5	---	---	34	28	80	45E	11	26	26	RA	70	0.01	0.00	0.00	0.00	0.01	3.0	5.00	HAZE	Wed 2pm	
Wed 3pm	32	CompSN	10	---	35	Wet	0	---	---	35	29	80	45E	11	27	27	RA	70	0.01	0.01	0.00	0.00	0.01	3.0	5.00	HAZE	Wed 3pm	

150 lbs of Prewet Salt (w/ Brine)  
 Start Time: Wed 8:23am  
 End Time: Wed 10:03am

150 lbs of Prewet Salt (w/ Brine)  
 Start Time: Wed 8:23am  
 End Time: Wed 10:03am





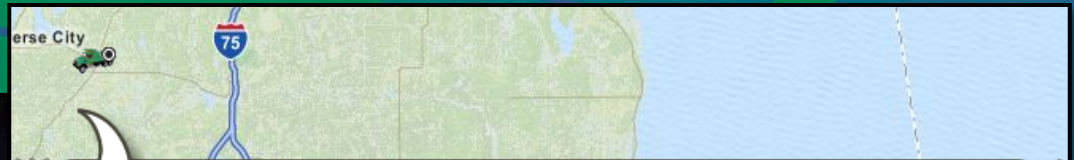
# New for 2015/2016

- In-Truck condition reporting pilot
- RWIS/ESS data on MDSS site
- Snow plow locations on MiDrive
- MDSS Mobile App
- Local Agency access to MDSS

# In-Truck Condition Reporting

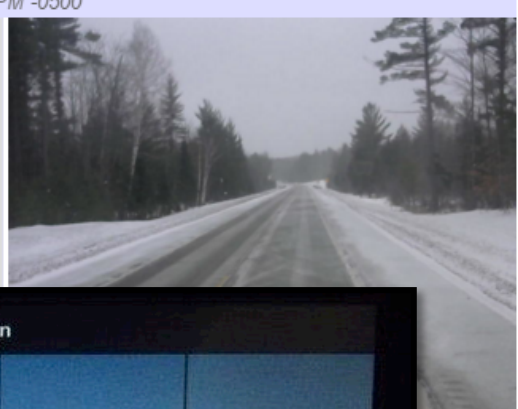
04-4029 03/03/16 11:22:02 AM

SPREADER	TRUCK
<b>Solid Material</b> UNKNOWN <b>Solid Rate</b> 200 lb/mi <b>Liquid Material</b> UNKNOWN <b>Prewet Rate</b> UNKNOWN <b>Direct Rate</b> 26 gal/mi	Plow Treat Air 57 °F Road 57 °F  
SNOW	WEATHER
<b>Roadway</b> UNDER 2" <b>Adjacent</b> UNDER 2"	<b>Visibility</b> OVER 1/4 mile CLEAR <b>Precipitation</b> SNOW <b>Wind</b> CALM (0-10)



**MI-04-4029**  
Reported at Monday, February 29, 2016 12:39 PM -0500

Speed	30
Lane	N/A
Plow Position	Plow Down
Material	DSalt
Material Rate	247
Road Condition	Snow Covered / Icy Spots
Weather Condition	Snow Flurries
Air Temperature	24.80
Pavement Temperature	29.12



Select Road Condition

DRY	WET	TRACK BARE	CENTER BARE	SNOW COVERED
SNOW PACKED	SNOW ACCUMULATIONS	DRIFTING	ICE COVERED	SPOT ICE
BLACK ICE	FROST	SLUSH	SNOW COVERED / ICY SPOTS	

Previous ... Back Next Page



# MDSS Website with RWIS

(MIFFL) ✕

US-131 @ County Line Rd

Thursday, March 3, 2016 6:45 AM -0500

Atmospheric		Surface	
Air Temp	-4 °F	Sensor 0	▼
Dew Pt	-8 °F	Sfc Temp	9 °F
Visibility	10 mi	Sfc Cond	☉ Dry
Precip Type	None	Sub Temp (NA)	13 °F
Wind Speed	1 mph	Sub Temp(0.79)	13 °F
Wind Gust	3 mph	Sub Temp(3.79)	21 °F
Wind Dir	↙ NE	Sub Temp(6.79)	26 °F
		Sub Temp(9.79)	28 °F
		Sub Temp(12.79)	29 °F
		Sub Temp(18.79)	31 °F
		Sub Temp(24.79)	31 °F
		Sub Temp(30.79)	31 °F
		Sub Temp(36.79)	31 °F
		Sub Temp(42.79)	32 °F
		Sub Temp(48.79)	31 °F
		Sub Temp(54.79)	32 °F
		Sub Temp(60.79)	32 °F
		Sub Temp(66.79)	33 °F
		Sub Temp(72.79)	33 °F

History		Forecast	
RWIS	Iteris	Ten Day Forecast	NWS
TABLE	TABLE	TABLE	TEXT
GRAPH	GRAPH		



# Snow Plows on MiDrive



[www.Michigan.gov/drive](http://www.Michigan.gov/drive)

Trucks visible when :

- Driving >10mph
- & Within 50ft of trunkline
- & Plow down and/or spreading material



Jump to a Location  
Enter Zip or City    
[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

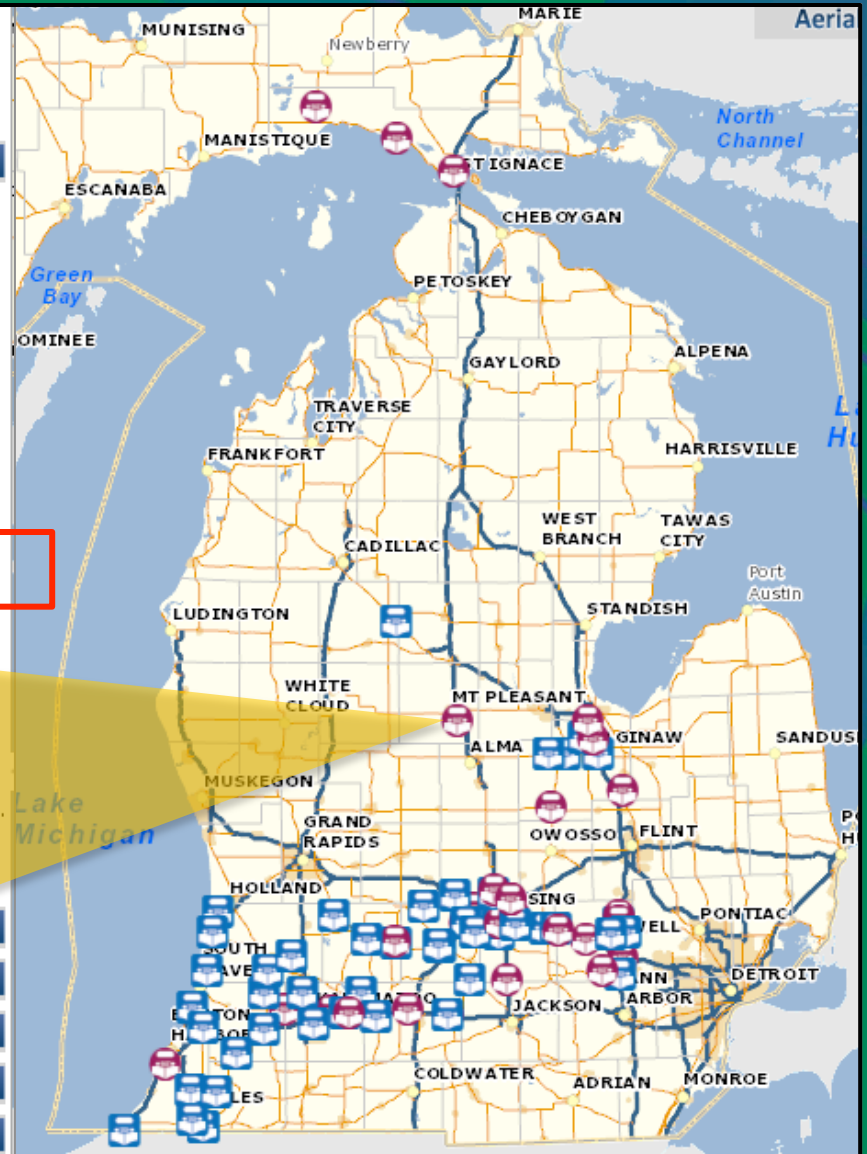
Bridge Legend

Corridor Legend

Traffic Incidents

Construction Search

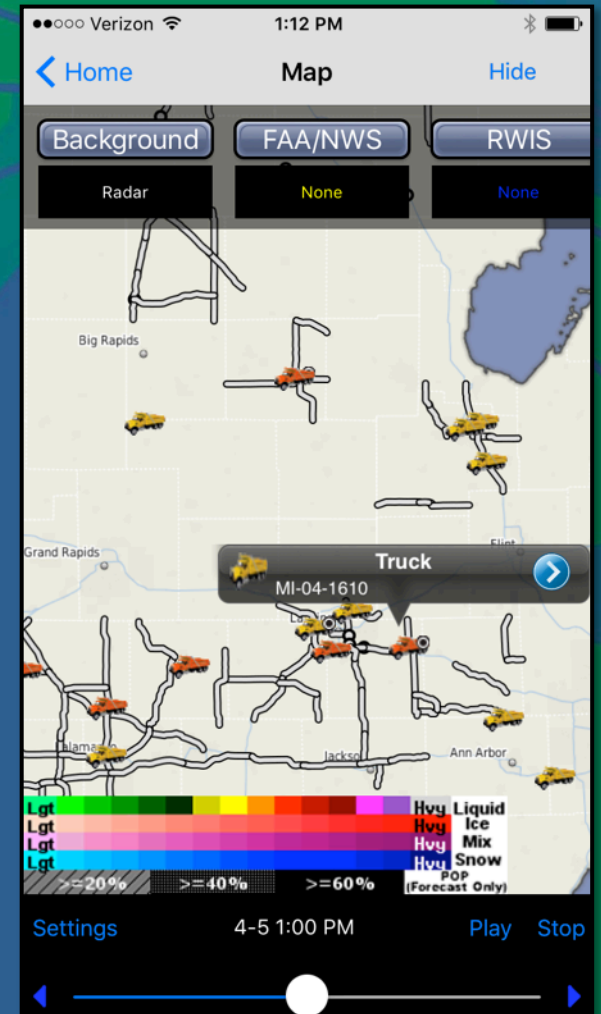
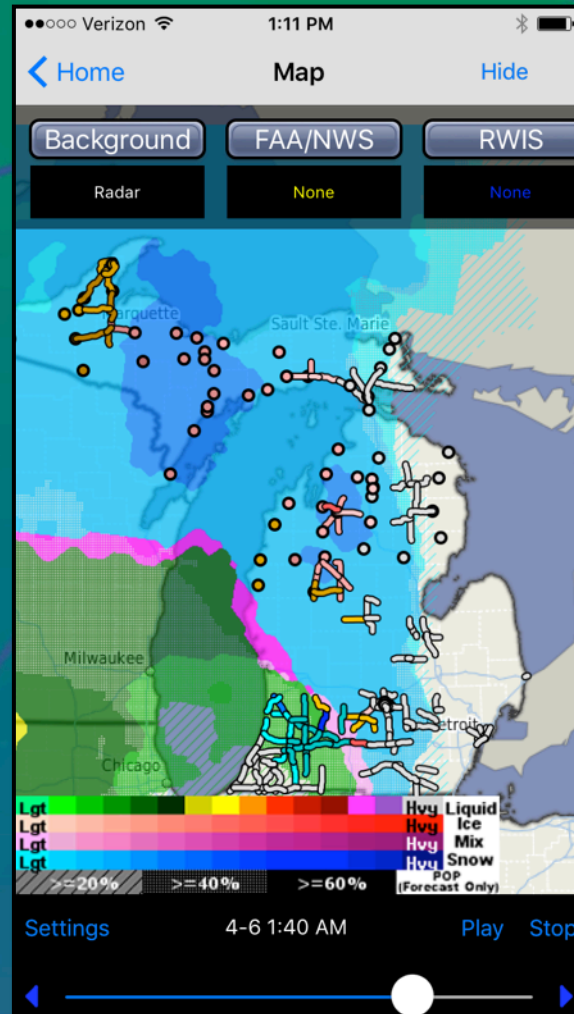
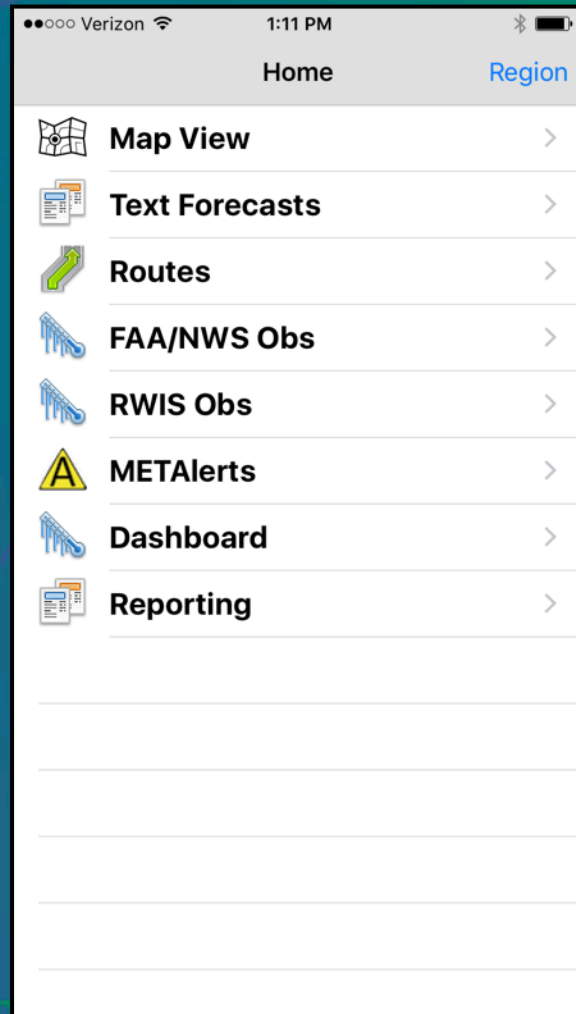
Weather



MIDOT

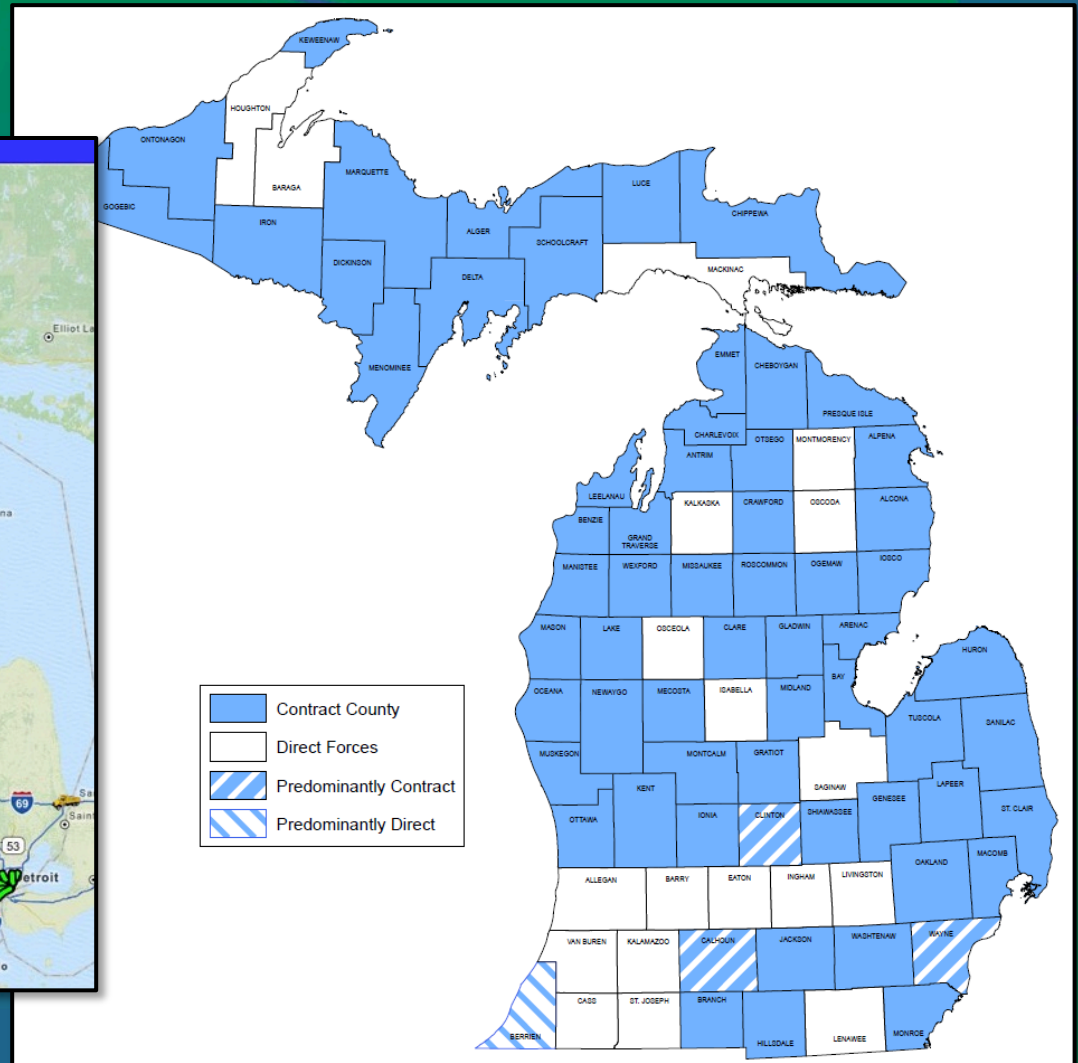
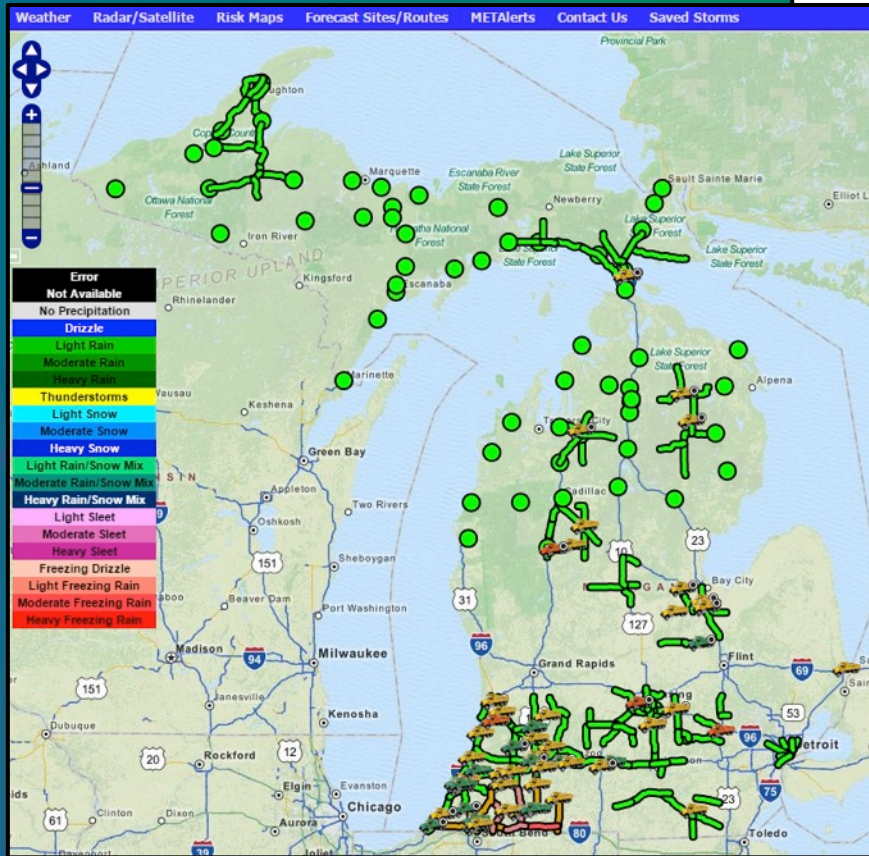


# MDSS Mobile App



MIDOT

# Contract County Access



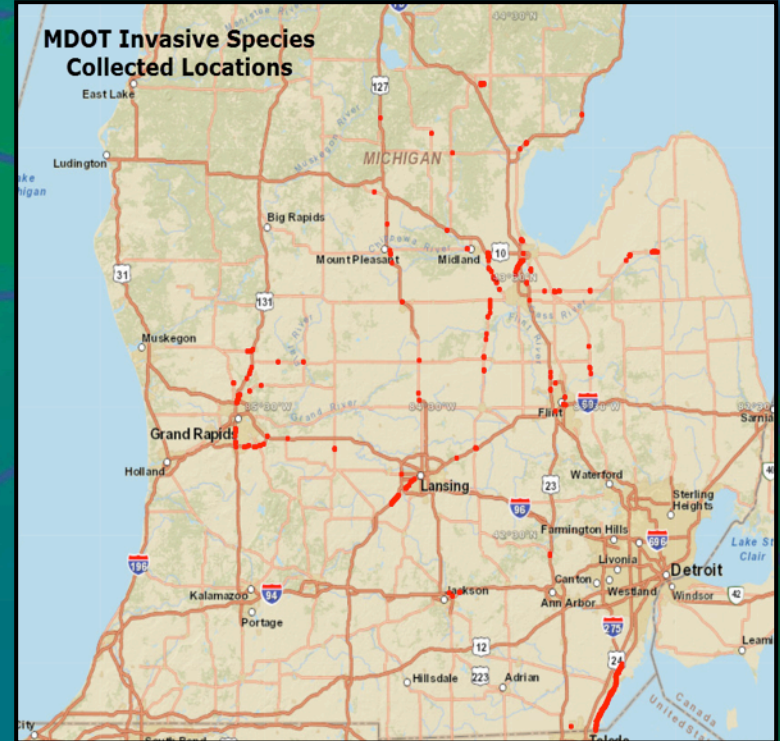
MIDOT

# Herbicide AVL Pilot

**When:** Summer 2016

**What:** Pilot Key Features

- 5 Trucks
- In-Truck touch screen monitor
- Electronic spray log
- Flow meter recording (on/off)
- GPS location on Map
- Invasive and Endangered Species locations display on monitor



MDOT Applicator Daily Spray Log '15							
NAME:	CERTIFICATION #	REGION:	DATE:				
<b>SPRAY LOCATION INFORMATION</b>							
COUNTY:	ROUTE / TRAVEL DIRECTION / REST AREA #			START TIME:	END TIME:		
SPRAY (VEGETATION, INSECTS) circle	LOCATION: (BROADCAST, SPOT, LEFT SHOULDER, RIGHT SHOULDER) circle			START MILE:	END MILE:		
<b>WEATHER</b>							
CONDITIONS:		TEMP:	WIND SPEED:	WIND DIRECTION:			
<b>BASIC SPRAY INFORMATION</b>							
WATER SOURCE:		LOAD #	SPRAY WIDTH:	ACRES THIS LOAD:			
<b>PURPOSE FOR APPLICATION: (CHECK ONE)</b>		<b>METHOD OF APPLICATION: (CHECK)</b>		<b>EQUIPMENT NUMBER</b>	<b>VEHICLE NUMBER</b>		
ROADSIDE WEEDS		INJECTION SYSTEM TRUCK					
GUARDRAIL		TANK MIX TRUCK					
REST AREA WEEDS		WEED SEEKER (PATCHEN)					
INSECT		KAWASAKI MULE					
BRUSH CONTROL		HAND GUN / HOSE REEL					
SHOULDER SPRAY		HAND HELD PUMP SPRAYER					
GROWTH REGULATOR (PGR)		TRACTOR MOUNTED SPRAYER					
PHRAGMITES		BROWN BRUSH MONITOR					
OTHER: SPECIFY		OTHER: SPECIFY					
<b>LOCATION NOTES:</b>							

**MDOT**

# Next Steps for MDOT

- Monitor Herbicide AVL Pilot
- Expand MDSS forecast routes to Contract County Areas
- Test out additional mobile app capabilities
- Continue to improve the accuracy of AVL reports
- Incorporating ITS Traffic cameras on website

# Thank you

Michigan Department of Transportation AVL/  
MDSS program questions:

Allison Porrett P.E.  
Operations Field Services  
(517) 636-4444  
porretta1@Michigan.gov



MIDOT