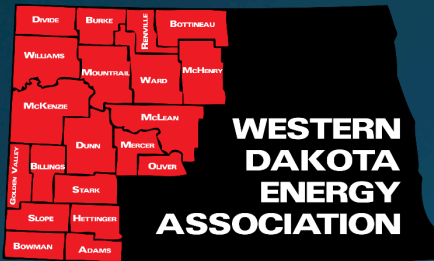


Wise Roads

Weather Information System to Effectively
Reduce Oilfield Delays and Disruption

Supplemental Application
to Secure Meteorological Services

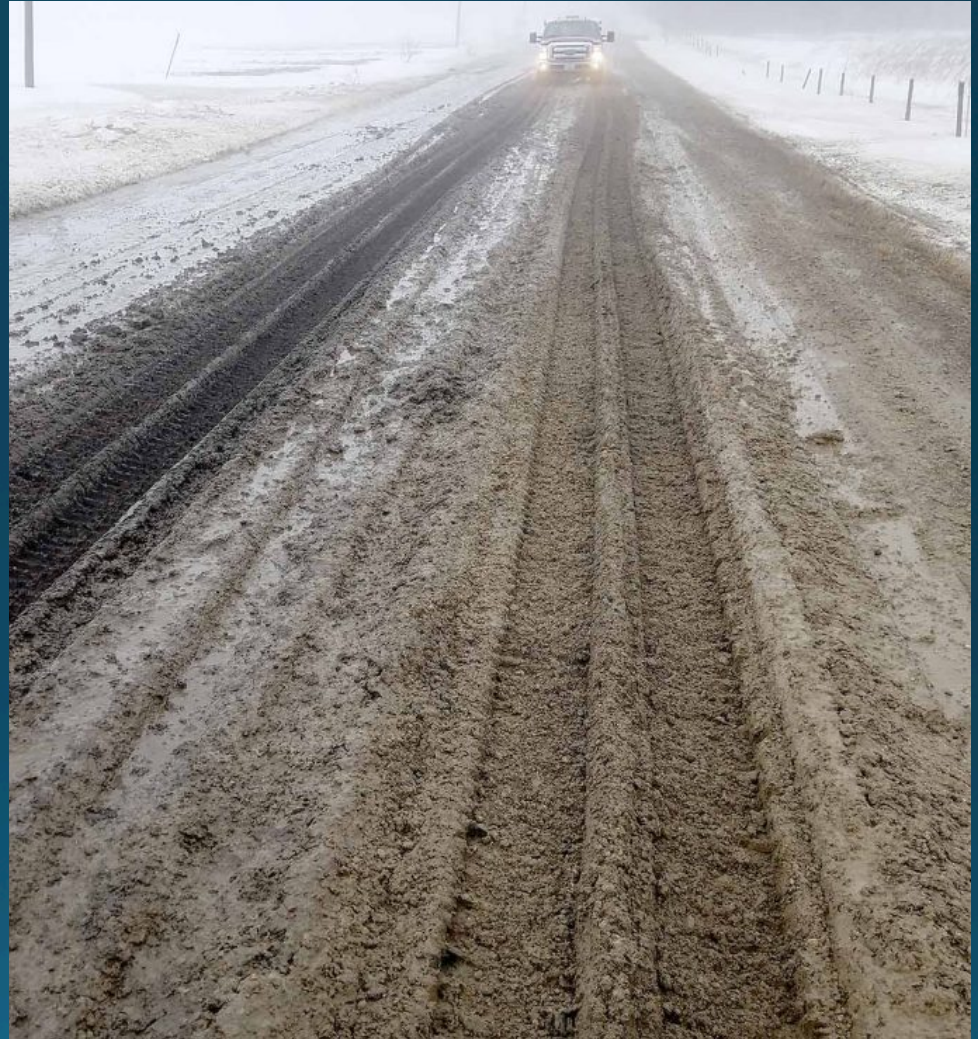


Presented by Geoff Simon and Daryl Ritchison
to North Dakota Oil & Gas Research Council
October 14, 2019



Problem: When inclement weather strikes, local governments impose weight restrictions on gravel roads that prohibit the movement of oilfield truck traffic until road conditions improve.

Solution: Provide accurate weather information, especially precipitation data, to allow road managers to more precisely identify roads that require temporary weight restrictions, and exclude those that do not.





Oil industry truckers justifiably complained that road restrictions are at times imposed more broadly than necessary.

Local Government and Oil Industry Roundtable - Watford City 12/12/18

Wise Roads Project

- Install research-grade weather stations in areas with heavy oilfield traffic
- Make data publicly available through NDAWN network & LoadPass restriction map
- Provide training to road managers through LTAP



Scope of Wise Roads Project

- Install up to 50 weather stations in the oil-producing counties
- Prioritize areas with significant drilling and production activity
- Locate stations to fill gaps in existing RWIN (DOT) and NDAWN networks
- Stations will be owned by NDAWN, operational costs covered by WDEA



Expected Benefits of the Project

- More narrowly defined local road restrictions and more geographic zones established
- Significant savings to oil industry thru improved productivity and reduced revenue loss due to shut-in wells
- Use of weather data for research to evaluate the performance of road building materials
- Ancillary benefits to agriculture producers, i.e., soil temperature, precipitation, wind speed, etc.

From: LoadPass Notification System
<cms@loadpasspermits.com>
Sent: Tuesday, July 09, 2019 10:05 AM
To: Geoff Simon <geoff@ndenergy.org>
Subject: Notice from Dunn : Restriction Added:
Zone 1 County Gravel roads

LoadPass Notification

The following restriction has been added:

County: Dunn

Active Date: 7/9/2019

Road: Zone 1 County Gravel roads

URL: <https://permits.loadpasspermits.com/n/1613>

Due to the wet conditions, we will be restricting Zone 1 to 12,000GVW at 10:00am mst until further notice.

At this time all other zones will remain open. Please refer to the Zone map for location.

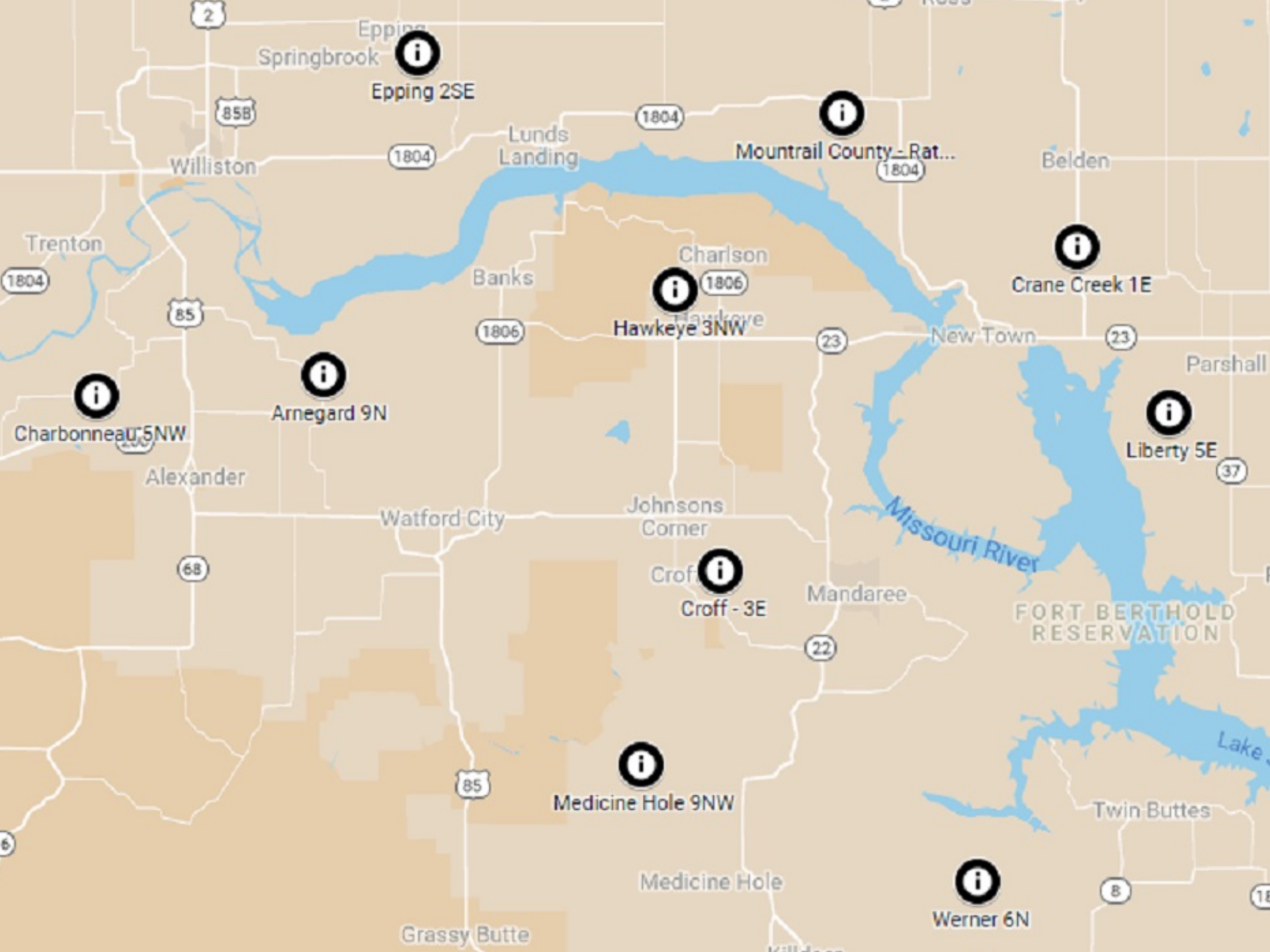
[Load Pass Zone Map](#)

Expected Benefit: Road Condition

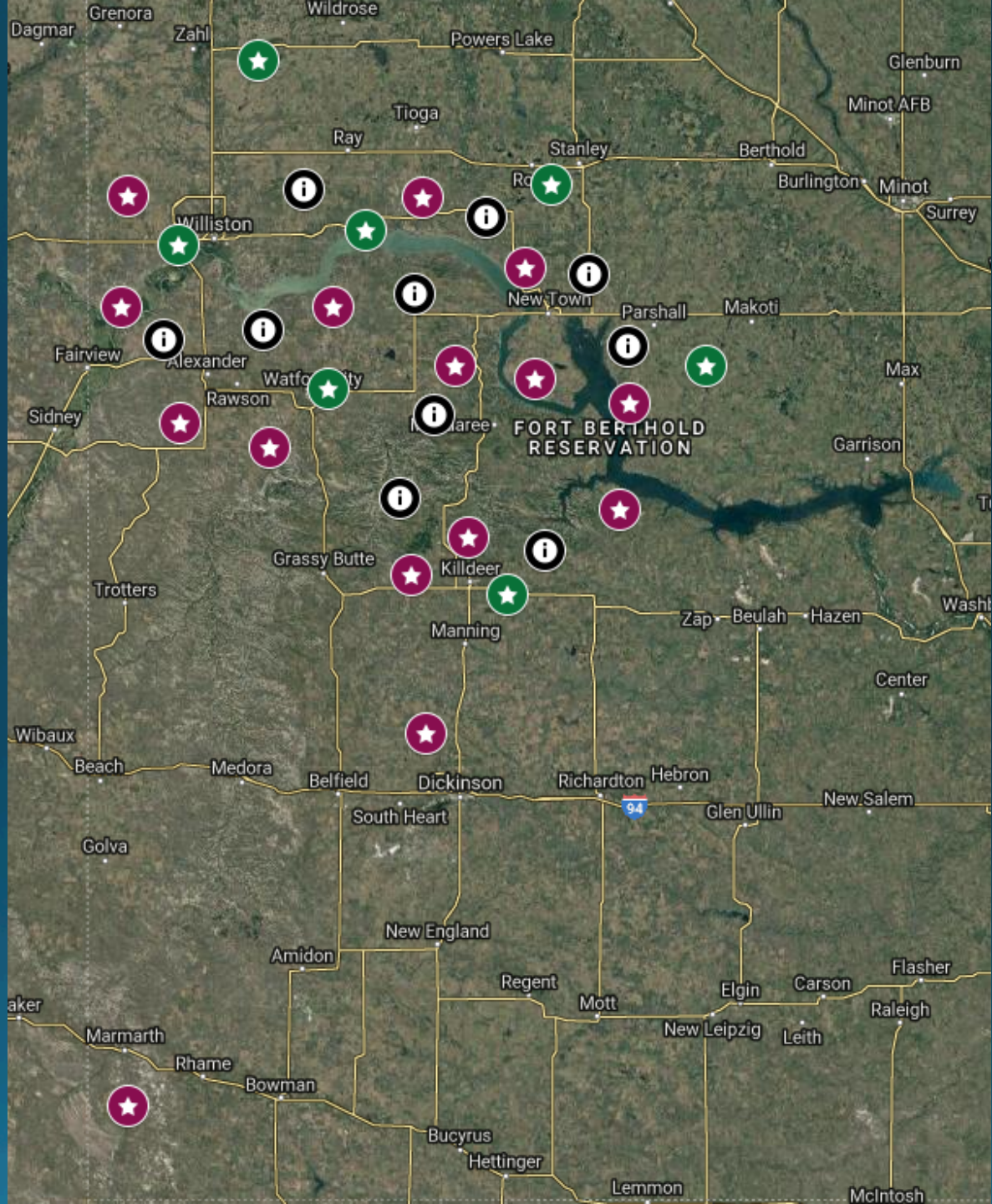
2019-10-10 11:50:47 AM

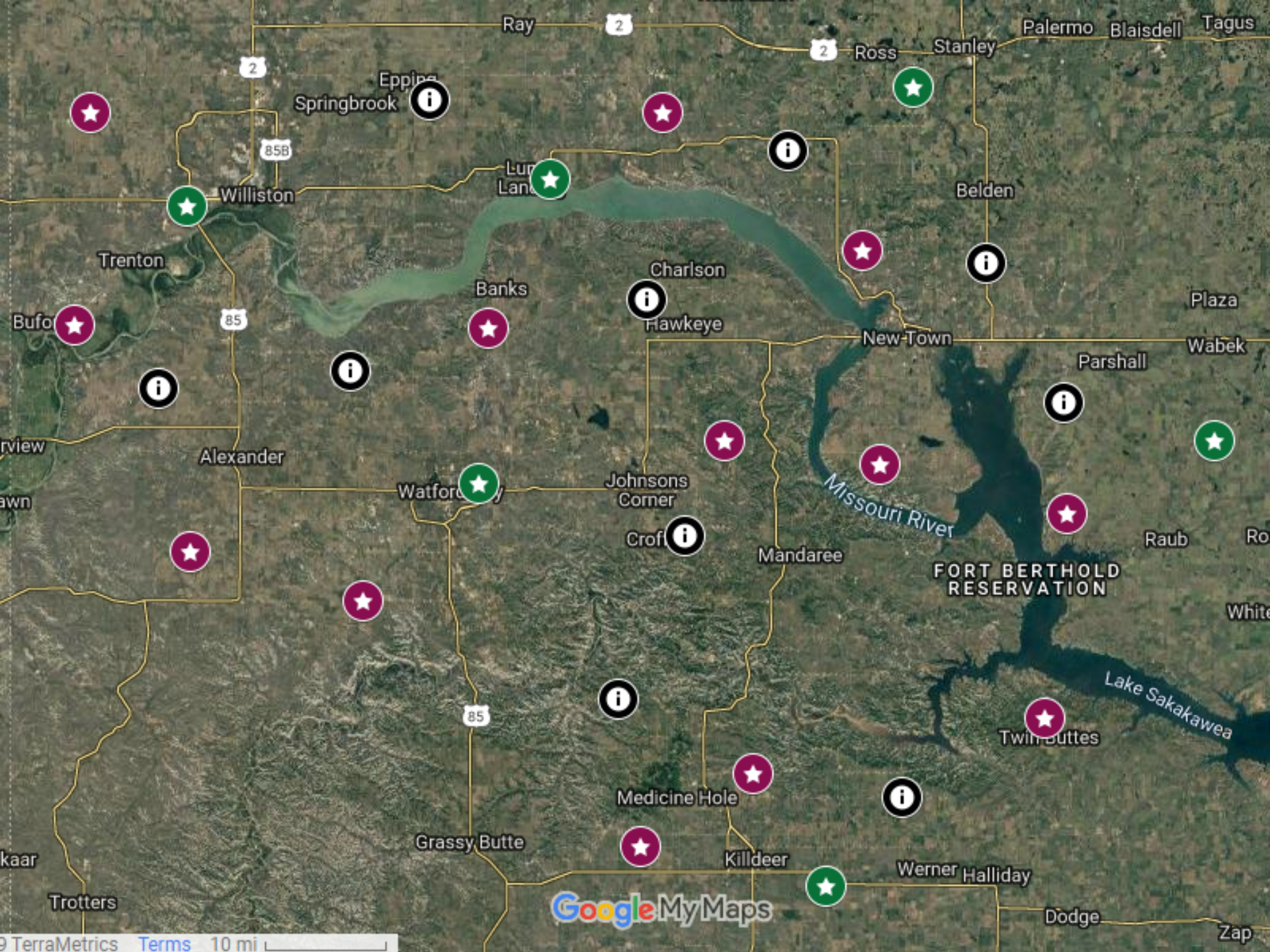


NDAWN - 4NW Rat Lake



The next 15
Wise Roads
stations
are being
installed
this fall





Meteorologist Job Responsibilities

- Installation and maintenance of Wise Roads weather stations.
- Test and analyze new weather equipment (additional sensors to WISE Roads stations)
- Provide training of cloud services and the NDAWN website to stakeholders in the project
- Perform data mapping services utilizing GIS software



Meteorologist Job Responsibilities

- Provide detailed forecasts for potential rain events using LoadPass notifications
- Collaborate with counties to provide LoadPass notifications of roads impacted by heavy rain
- Provide analysis of soil/road temperatures and melting snow impacts in the winter months
- Collaborate with Upper Great Plains Transportation Institute on road research

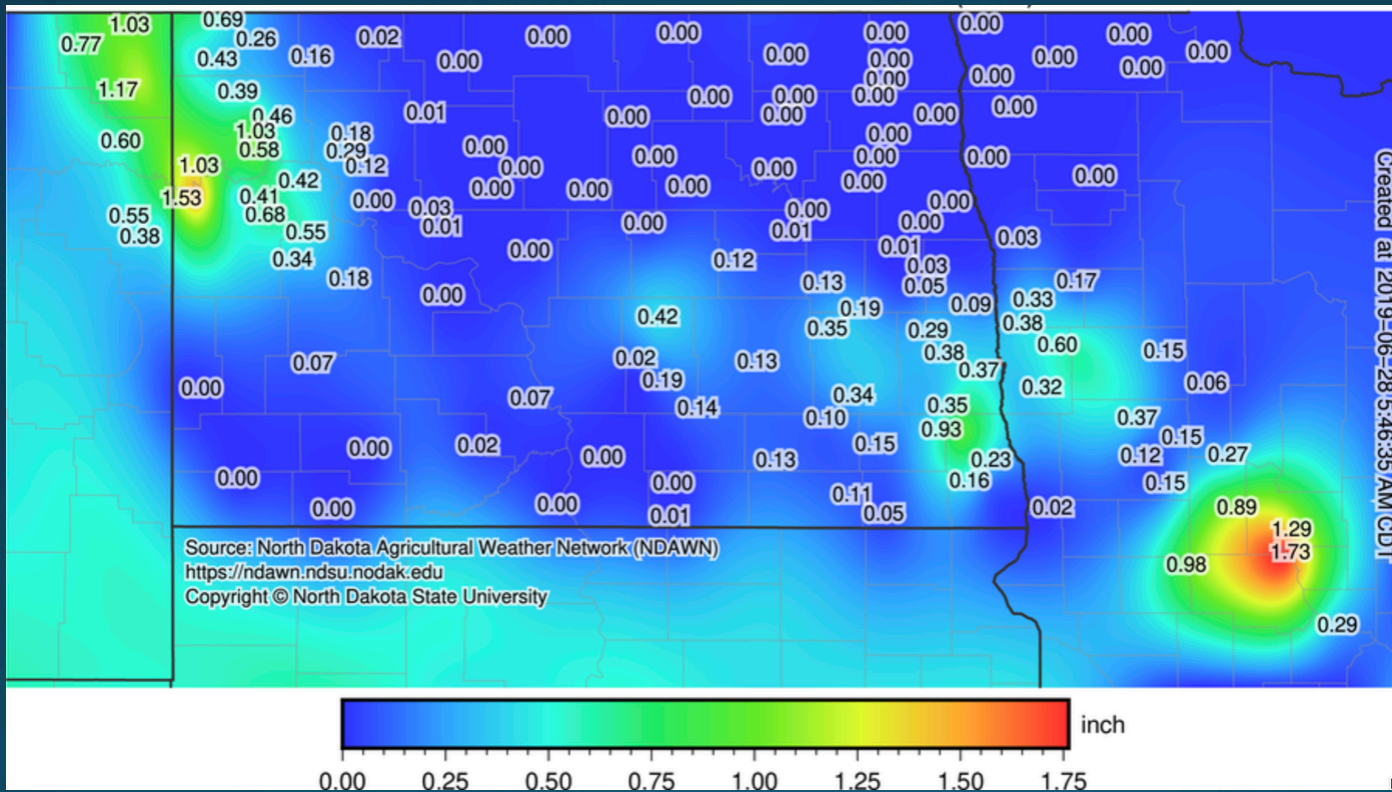


Wise Roads Meteorologist: Budget Details

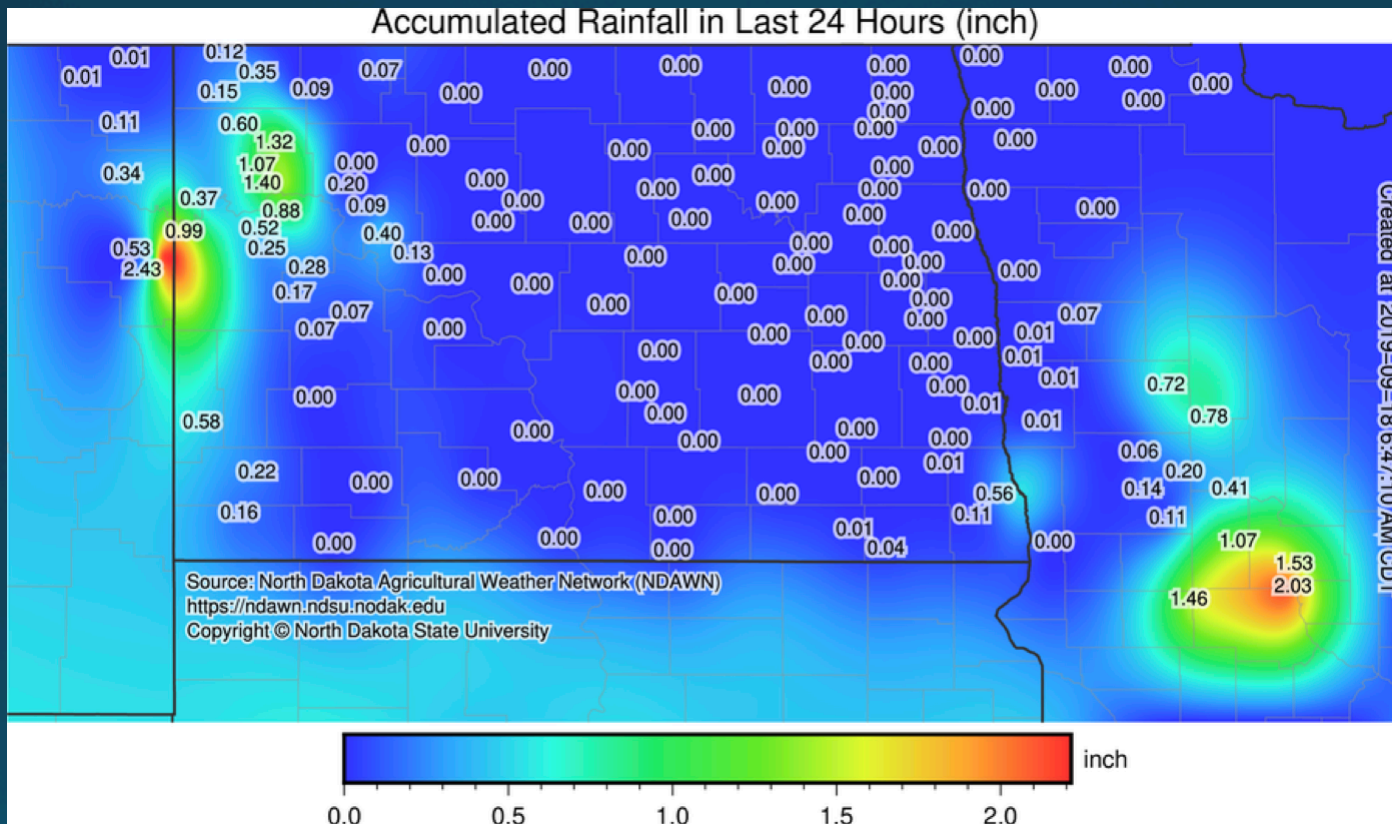
Expense Item	Cost
• Meteorologist Salary (21.5 months)	\$107,500
• Travel/lodging expenses	\$17,500
• Miscellaneous	\$5,000
Total	\$130,000

Measuring Wise Roads Success

- Establish baseline data regarding extent and duration of restrictions from LoadPass Road Restriction Notification System
- By comparing restrictions imposed with weather information, develop a “before and after” snapshot of local policy improvements
- Collaborate with UGPTI to monitor its progress in evaluating road building materials and report improvements that are developed
- Difficult to measure, but Wise Roads will produce improvements in government/industry relationship through improved communication and better understanding of each others’ needs and concerns
- Another intangible will be improved relationships with landowners who realize financial and management benefits from the project



June 28, 2019



September 18, 2019

Station Name
Liberty

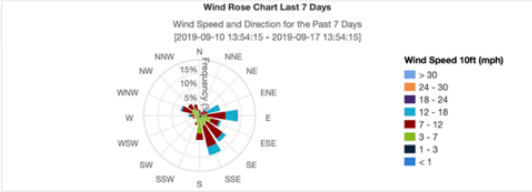
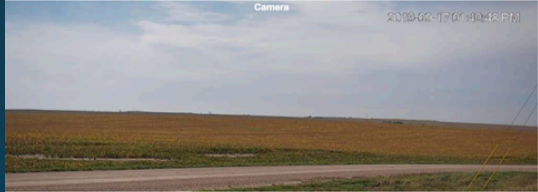
2019-09-17 13:52:00

Station Location

Map data ©2019 Imagery ©2019 TerraMetrics

Current Weather	
Air Temp	85.5 °F
Dew Point Temp	61.7 °F
Wind Speed	7.3 mph
Wind Direction From	162 Deg
Today's Total Rain	0 in
Peak Gust	10.2 mph
Relative Humidity	45 %
4" Bare Soil Temp	78 °F
4" Turf Soil Temp	69.2 °F

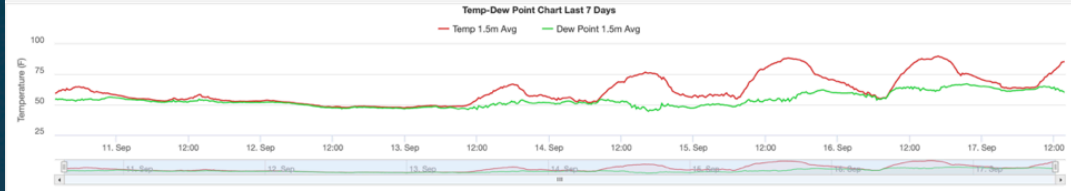
Daily High Temperature	
Time	Temperature (°F)
2019-09-17 01:00:00	85.6
2019-09-16 01:00:00	90
2019-09-15 01:00:00	88.5
2019-09-14 01:00:00	77.2
2019-09-13 01:00:00	67.2
2019-09-12 01:00:00	53.7
2019-09-11 01:00:00	58.3



Daily Low Temperature	
Time	Temperature (°F)
2019-09-17 01:00:00	63.2
2019-09-16 01:00:00	54.6
2019-09-15 01:00:00	54.5
2019-09-14 01:00:00	51.6
2019-09-13 01:00:00	47.8
2019-09-12 01:00:00	47.4
2019-09-11 01:00:00	52.6



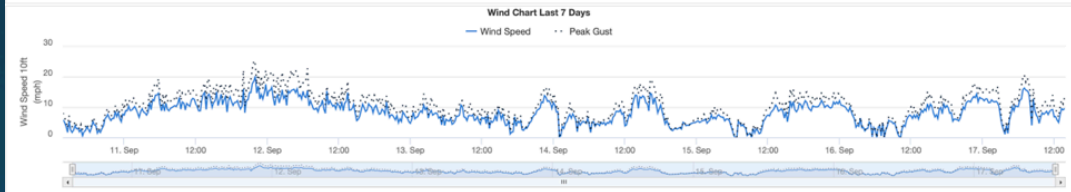
Daily Rainfall	
Time	Daily Rainfall (in)
2019-09-17 01:00:00	0
2019-09-16 01:00:00	0
2019-09-15 01:00:00	0
2019-09-14 01:00:00	0
2019-09-13 01:00:00	0
2019-09-12 01:00:00	1.73
2019-09-11 01:00:00	0.81



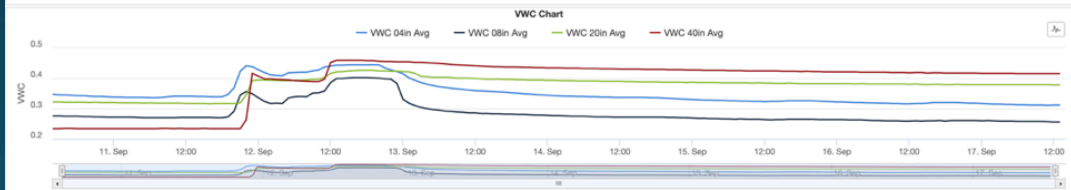
Current Wind Direction

2019-09-17 13:52:00

Notes From NDAWN Staff

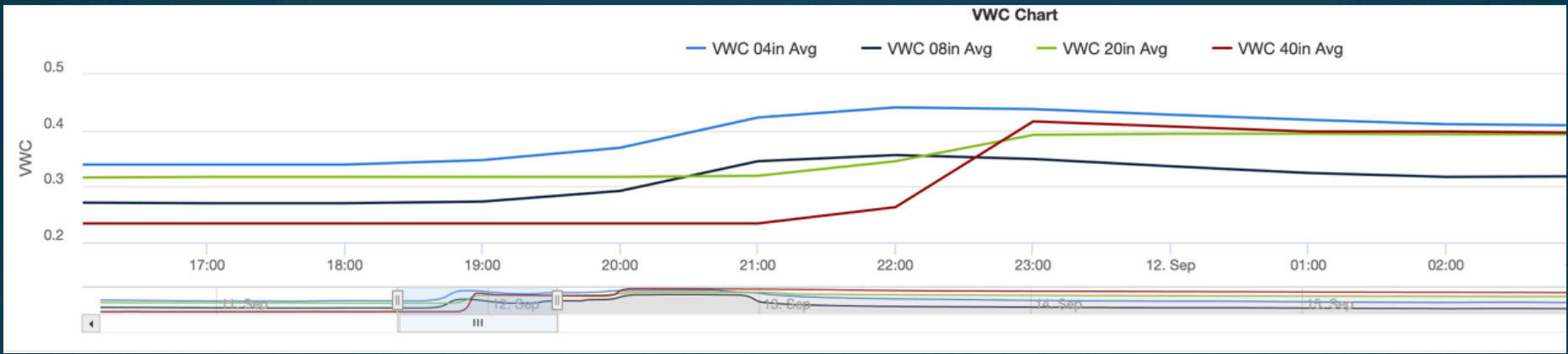


Hourly Avg Temperature	
Time	Temp Hourly (°F)
2019-09-17 13:00:00	80.1
2019-09-17 12:00:00	76
2019-09-17 11:00:00	72.3
2019-09-17 10:00:00	67.1
2019-09-17 09:00:00	64.1
2019-09-17 08:00:00	64
2019-09-17 07:00:00	63.6



Volumetric Water Content				
Time	VWC 0.4in Avg	VWC 0.8in Avg	VWC 20in Avg	VWC 40in Avg
2019-09-17 13:00:00	0.312	0.256	0.378	0.415
2019-09-17 12:00:00	0.312	0.256	0.378	0.415
2019-09-17 11:00:00	0.311	0.257	0.379	0.415
2019-09-17 10:00:00	0.312	0.258	0.379	0.415
2019-09-17 09:00:00	0.312	0.258	0.379	0.415
2019-09-17 08:00:00	0.312	0.258	0.379	0.415
2019-09-17 07:00:00	0.313	0.258	0.378	0.415

Cloud Service



Soil Moisture

Contact information:

geoff@ndenergy.org

(701) 527-1832

daryl.ritchison@ndsu.edu

(701) 231-8209