

Drinking Water Source Protection Conference

*The Utilization of Coverage Indication
Technology to Reduce Road Salt Use
During Winter Operations*

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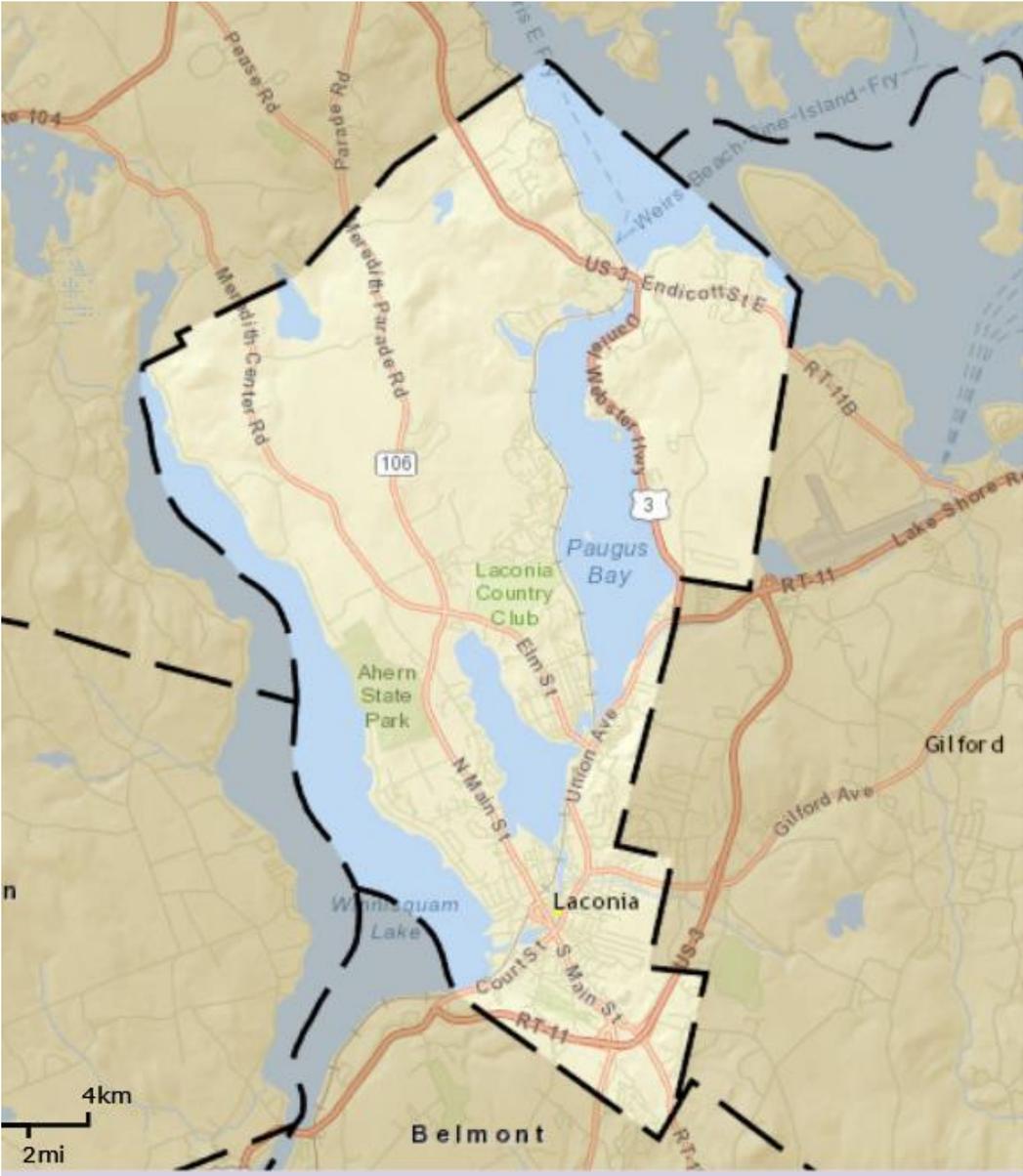
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Laconia, NH

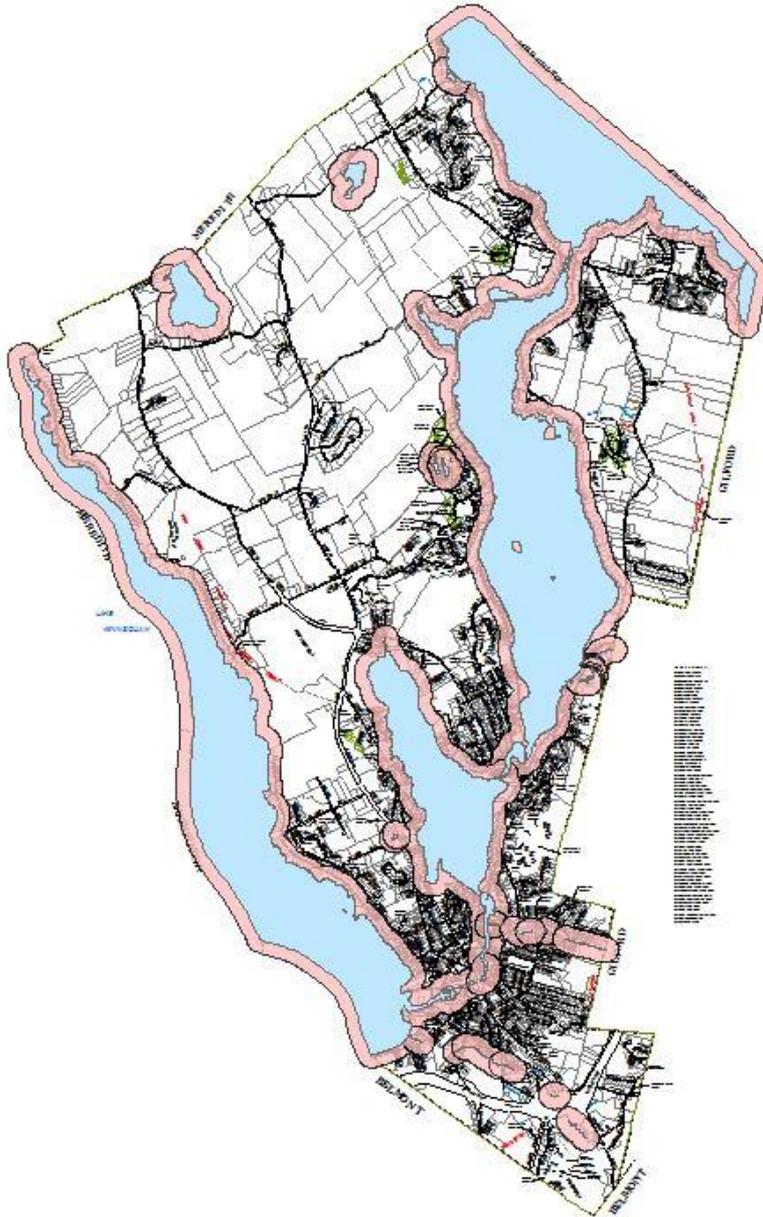


- 27 square miles (21 land, 6 lakes)
- Population – 16,055 (estimated 24,000 in summer)
- 85 miles of City maintained paved roads
- Roughly 180,000' (34 miles) of shoreline

Laconia, NH



Laconia, NH

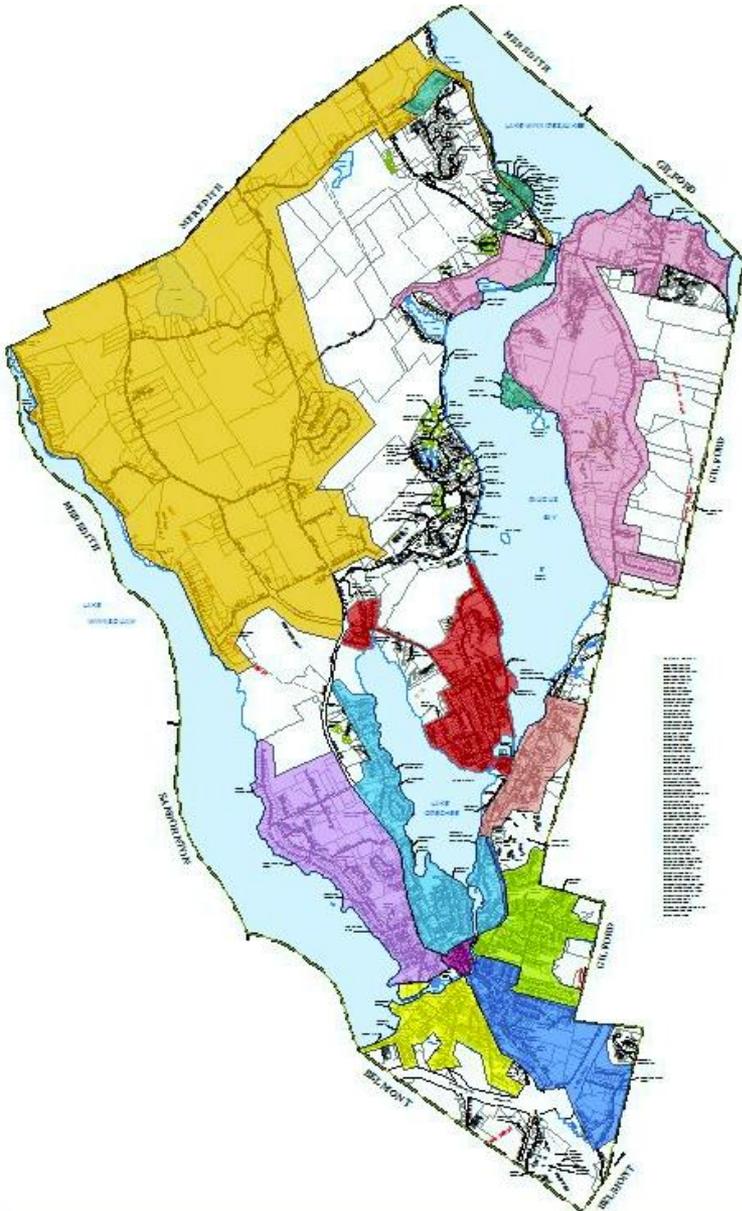


500' Buffer from lake and river edges shows that we have 38 miles of road within that buffer.

Laconia, NH

10 Plow Routes

Dedicated plow trucks
without spreaders.
(6 wheel, 2 axle dump
trucks)



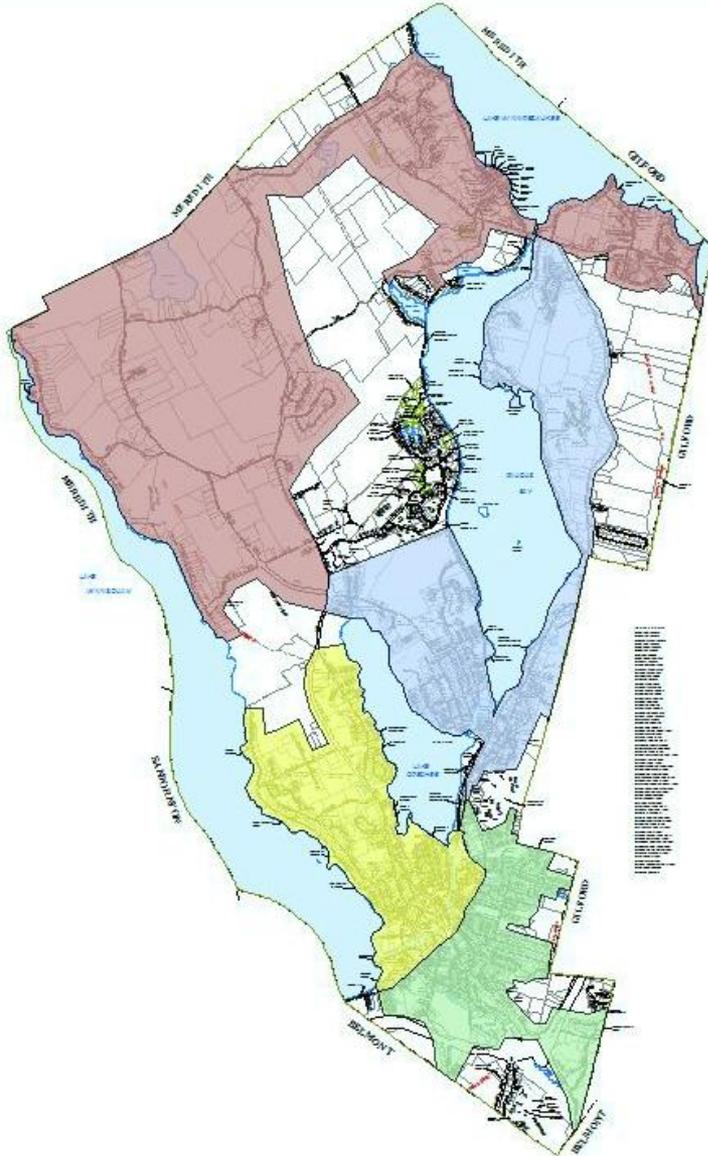
Laconia, NH

Salt Truck Routes

4 dedicated trucks with salt/sand spreaders.

General Procedure:

- Treat roads in very early stage of storm event.
- Allow snow to accumulate to about 2+”. Traffic creates a spreading brine.
- Plow during remainder of storm.
- Salt application at end of storm.



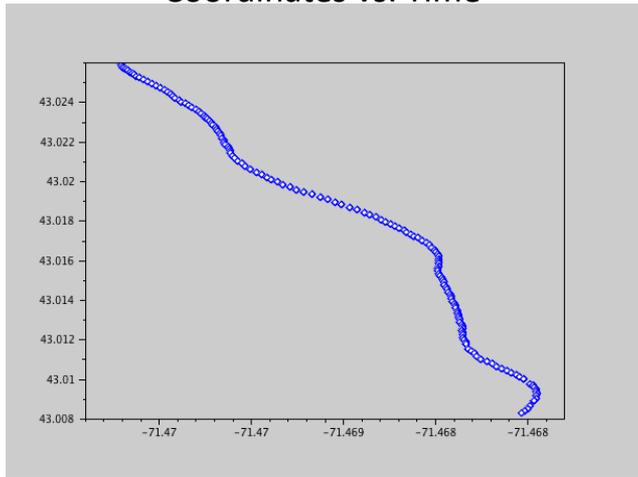


“Focused on the road and on the future”

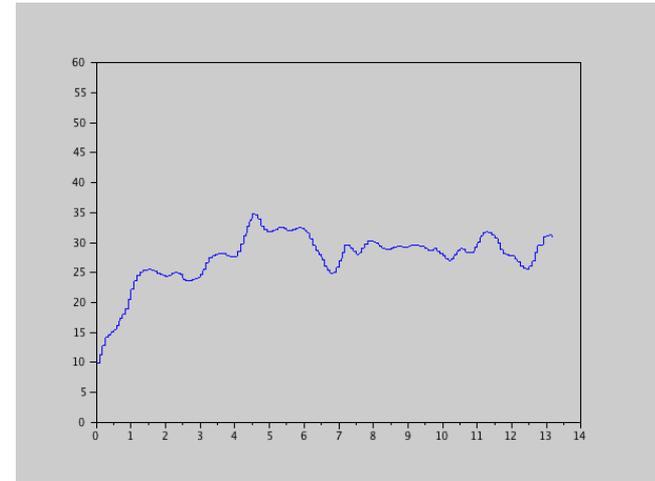
Laconia, NH

SST Prototype Spreader System Data Analysis (2013-2014)

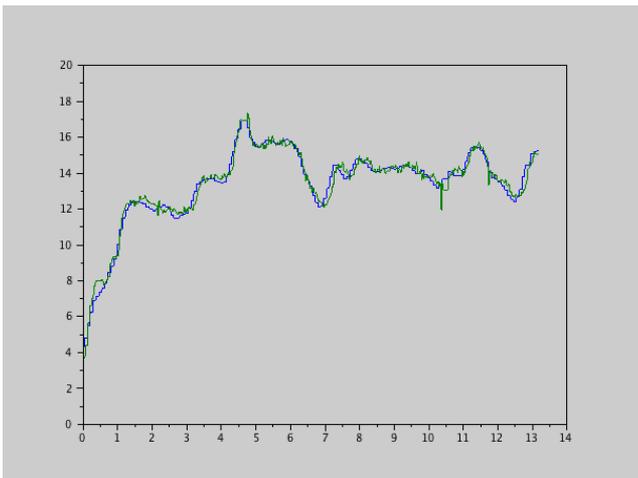
Truck Location in WGS84 (GPS)
Coordinates vs. Time



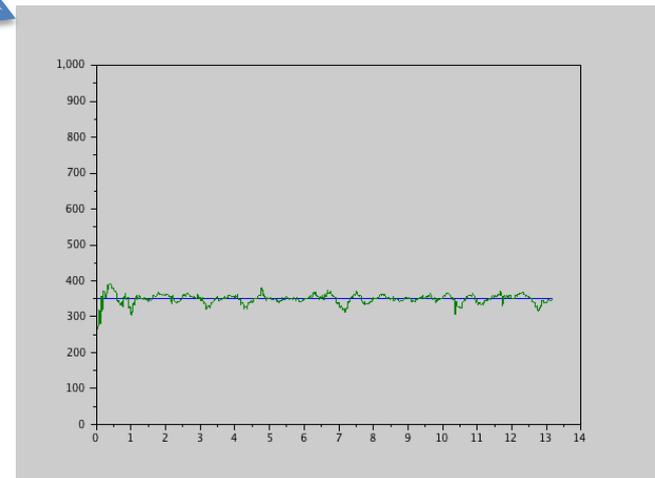
Truck Velocity



Conveyor Rotation Rate as computed from
truck Velocity (Set value and Measured value)

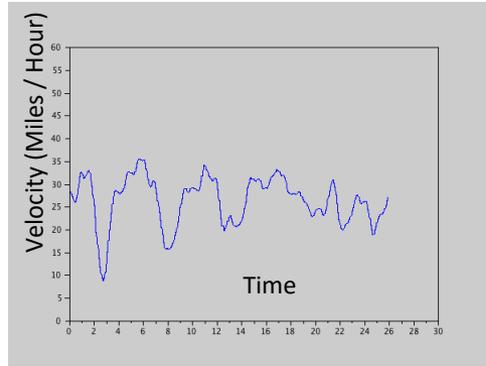
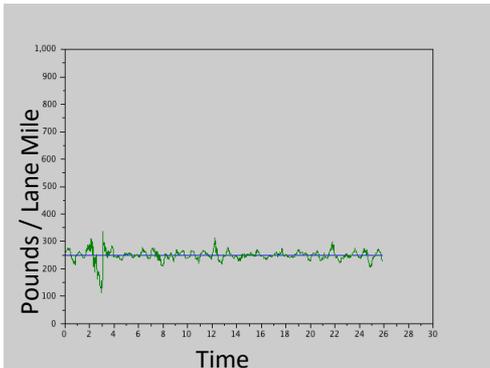


Salt laydown (Set value and Measured value)

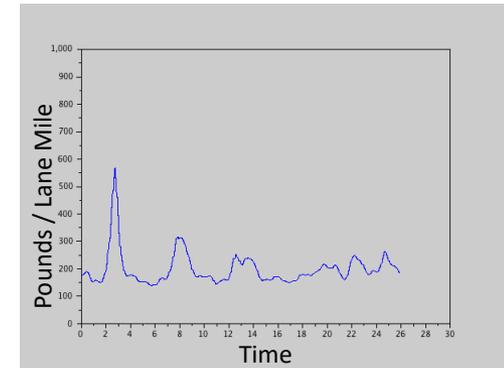


SST Prototype Spreader System Data Analysis (2013-2014)

With Conveyor Velocity Control Feedback



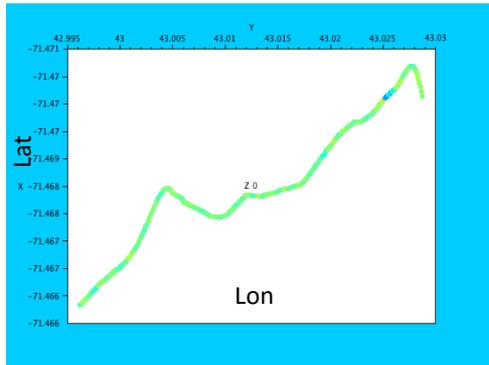
Without Conveyor Velocity Control Feedback



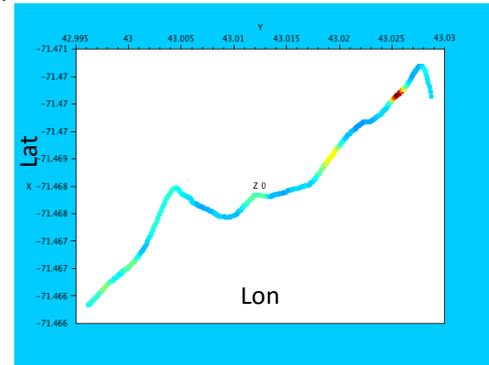
When Municipalities DON'T Use Conveyor Speed Control It leads to geographical "hot" and "cold" spots

Truck Location in WGS84 (GPS) Coordinates vs. Time

SST System



Time



Open Loop System

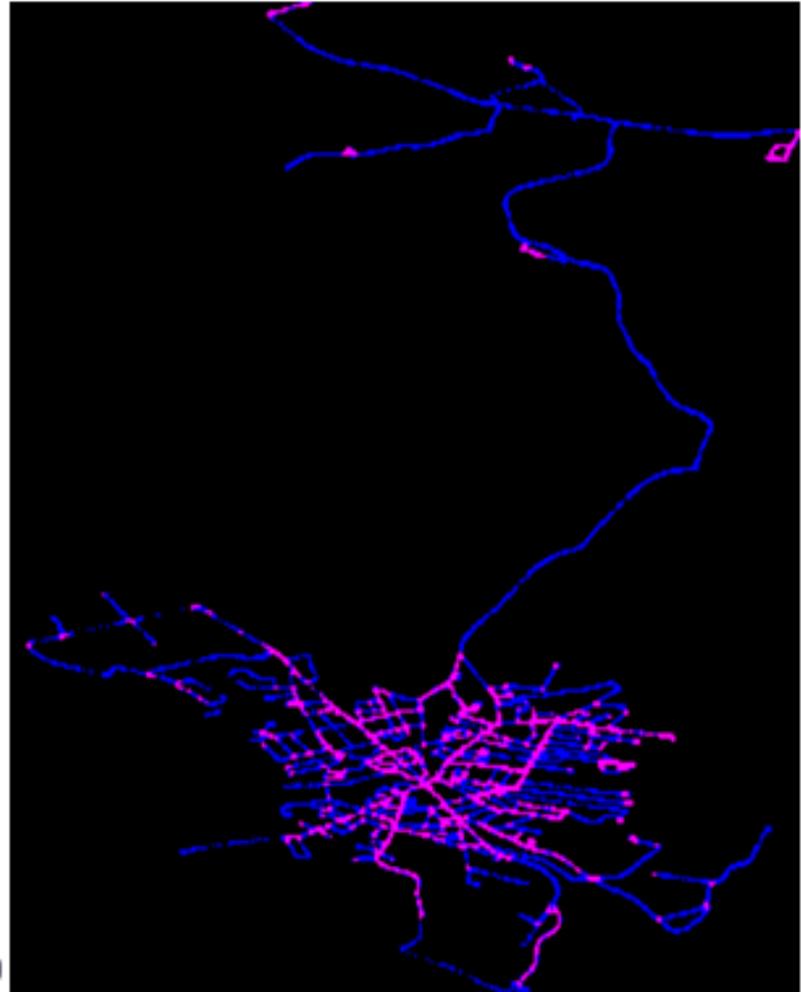
Data Analysis

(2013-2014)



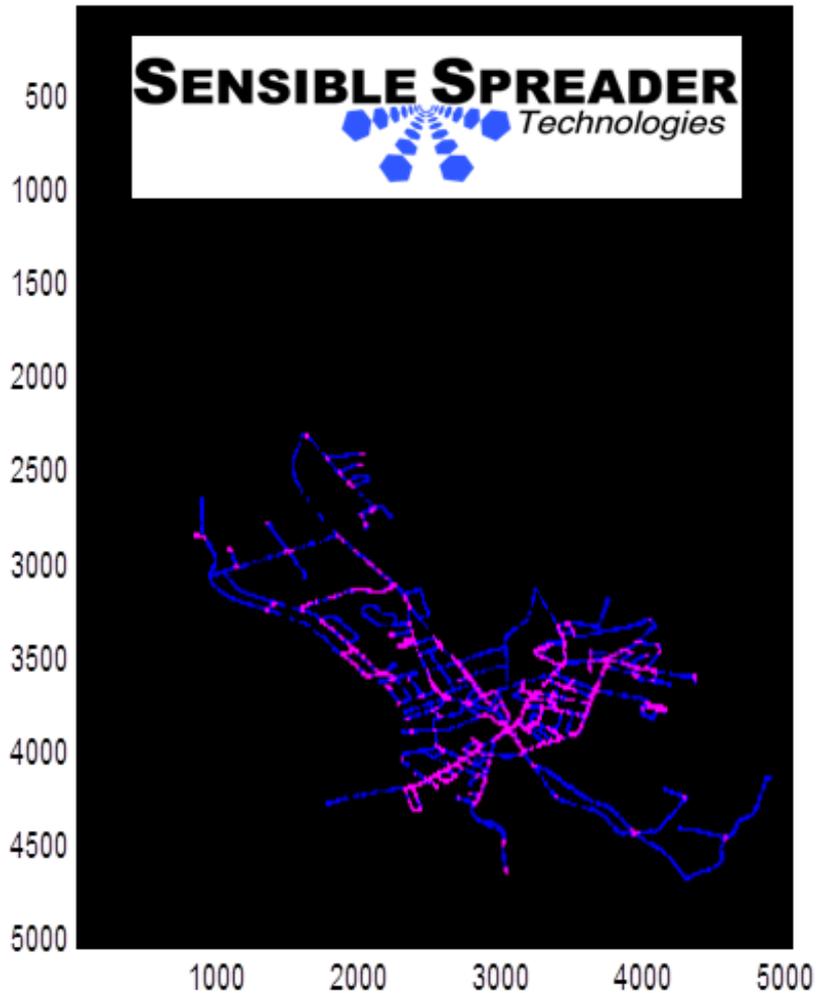
Data Analysis

(2013-2014)



Winter Event 12-09-13

09-Dec-2013 13:23:13 UTC



Location Overlap

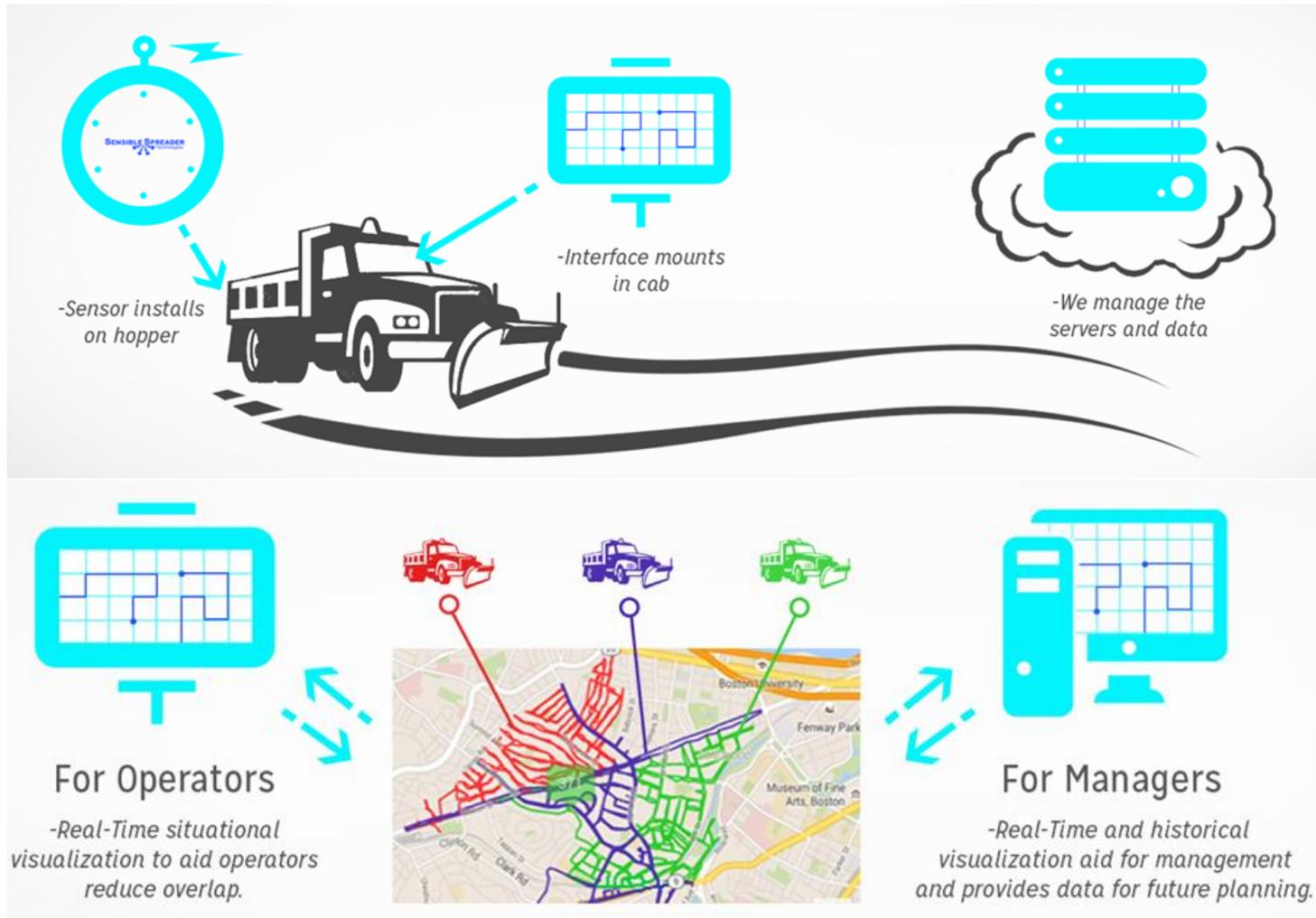
- 1hr=0.35
- 2hr=0.44
- 3hr=0.49
- 4hr=0.52
- 5hr=0.53
- 6hr=0.55
- 7hr=0.59
- 8hr=0.63
- 9hr=0.65
- 10hr=0.71
- 11hr=0.73
- 12hr=0.74
- 13hr=0.74

Material Overlap

- 1hr=0.27
- 2hr=0.38
- 3hr=0.42
- 4hr=0.45
- 5hr=0.47
- 6hr=0.48
- 7hr=0.51
- 8hr=0.55
- 9hr=0.58
- 10hr=0.65
- 11hr=0.67
- 12hr=0.69
- 13hr=0.69

Coverage Indication

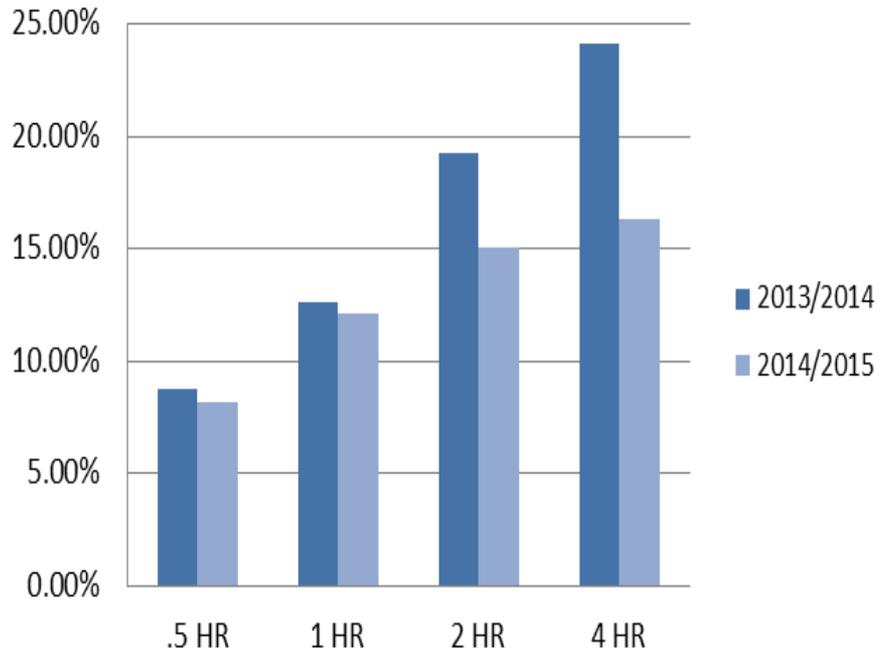
Show operators what's been done and what hasn't



Coverage Indication

A Material Based Overlap Solution!

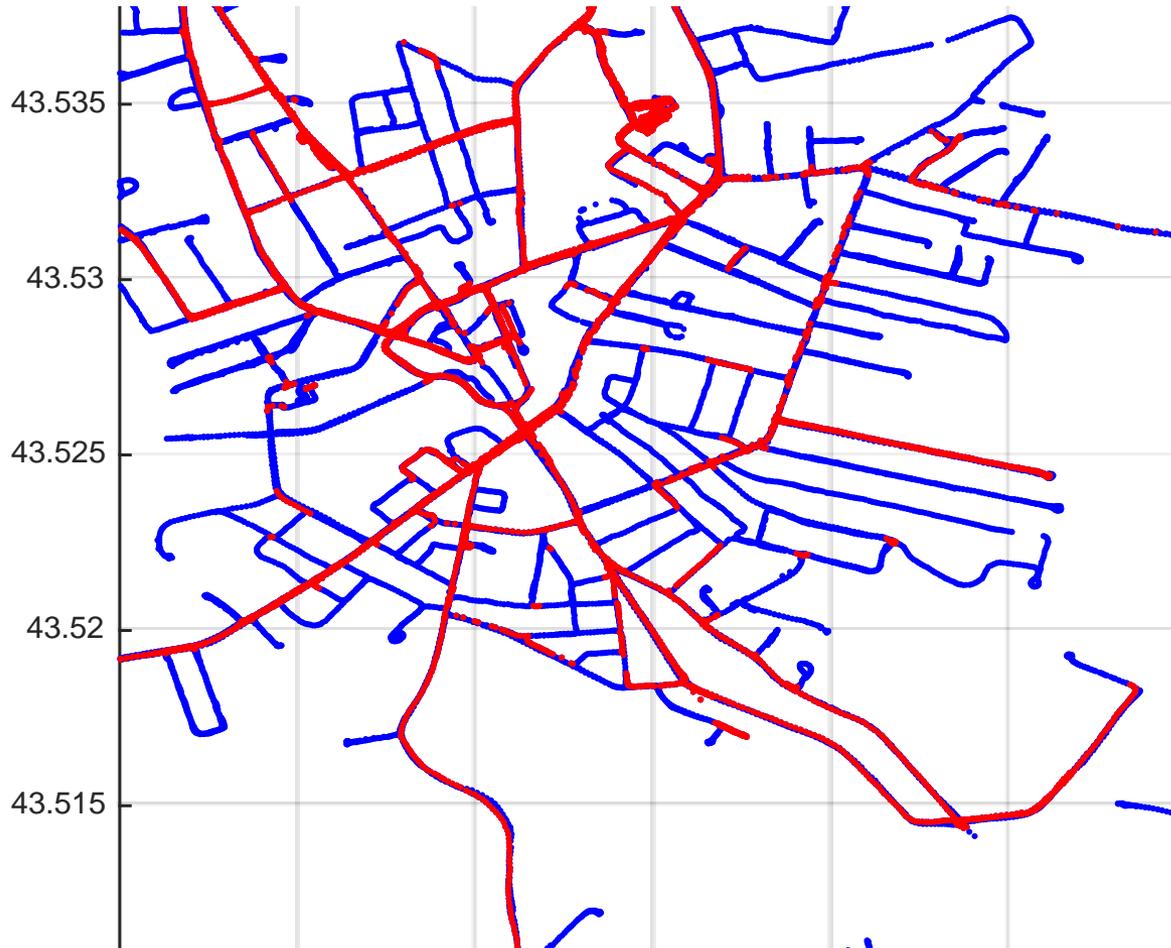
Material Based Overlap



Reductions In Material Based Overlap			
	2013/2014	2014/2015	% Change
.5 HR	8.73%	8.17%	-6.4
1 HR	12.60%	12.16%	-3.5
2 HR	19.23%	15.10%	-21.5
4 HR	24.16%	16.32%	-32.5

4 Combined Trucks 2/5/16

(Typical Event)



14.4% Material Based Overlap

4 Combined Trucks 2/8/16

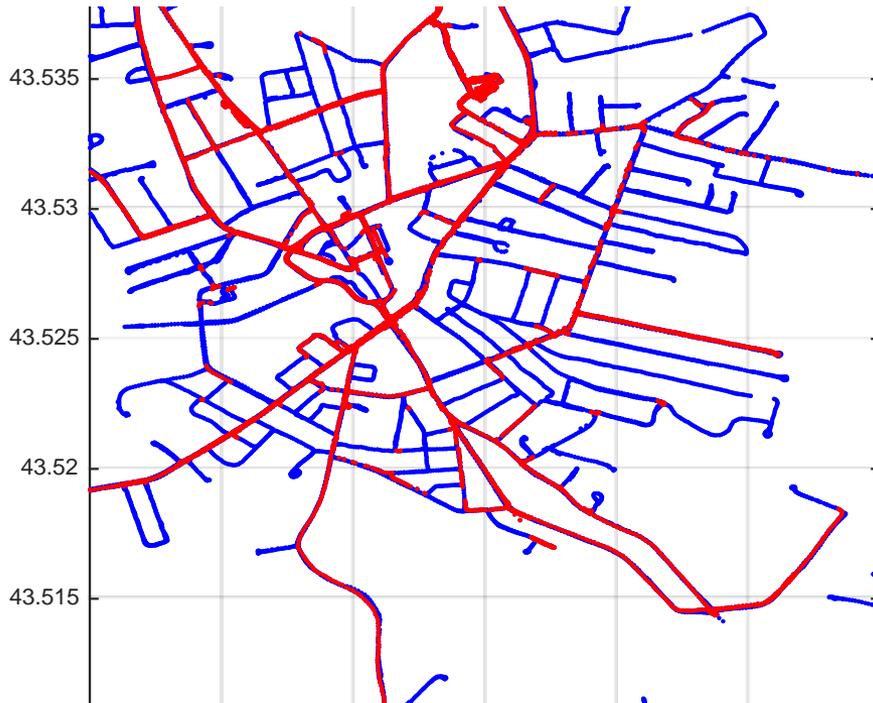
(Heavy Salt Event)



40.1% Material Based Overlap

Significant Change in Material Based Overlap

4 combined trucks 2/5/16



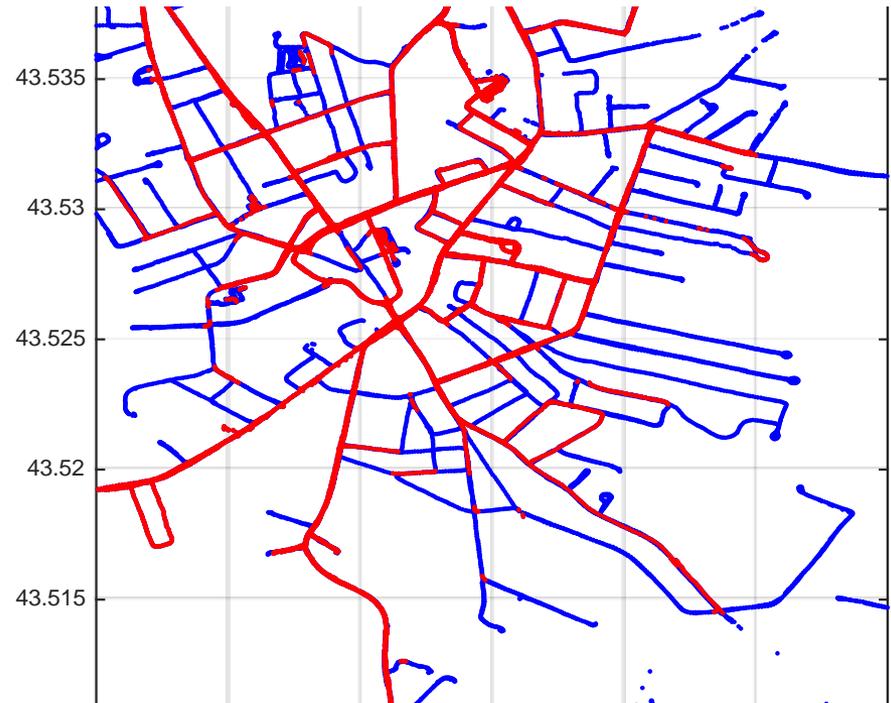
14.4% Material Based Overlap

5" Snow

.31 Precipitation

36F-21F

4 combined trucks 2/8/16



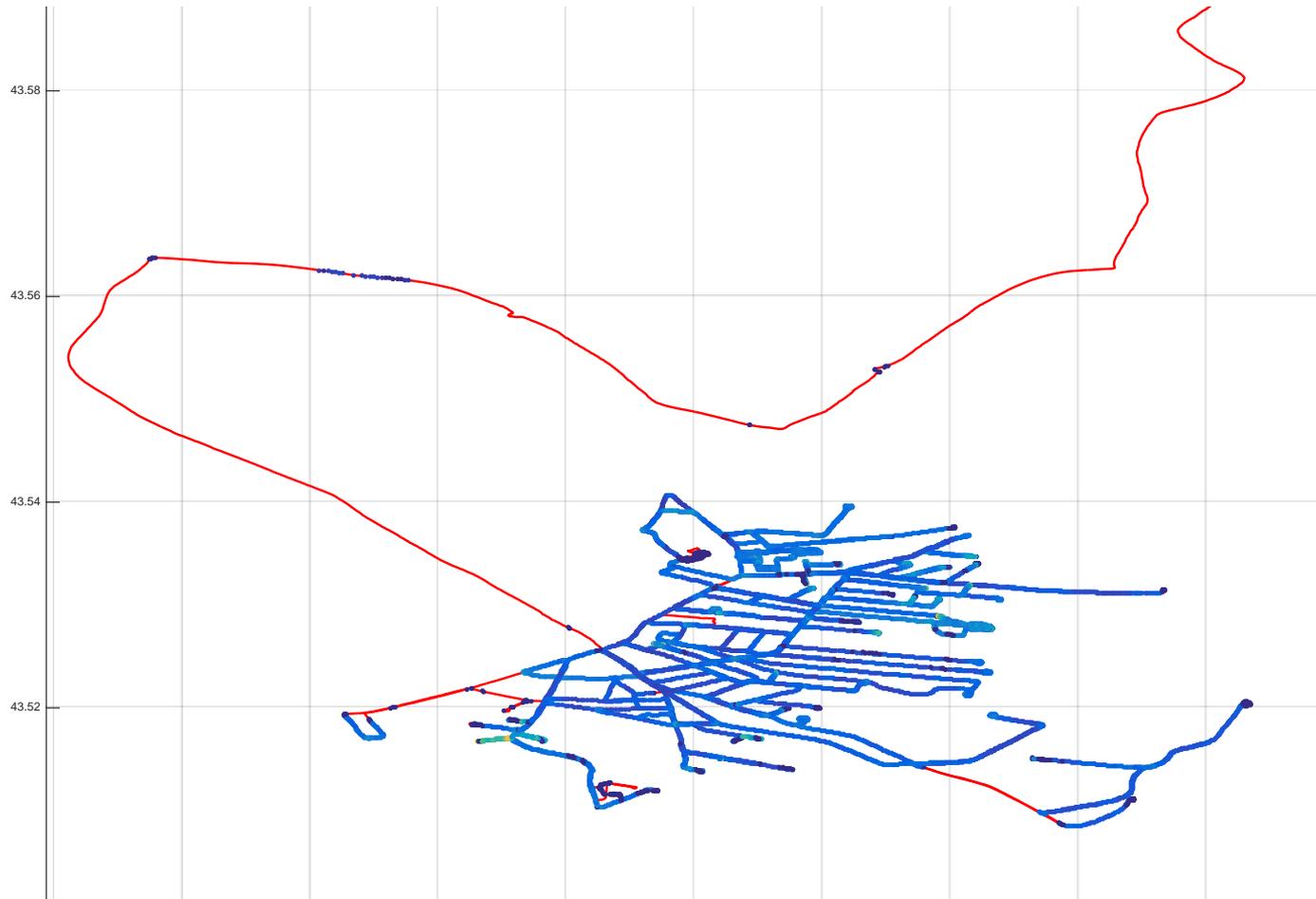
40.1% Material Based Overlap

3.5" Snow

.34 Precipitation

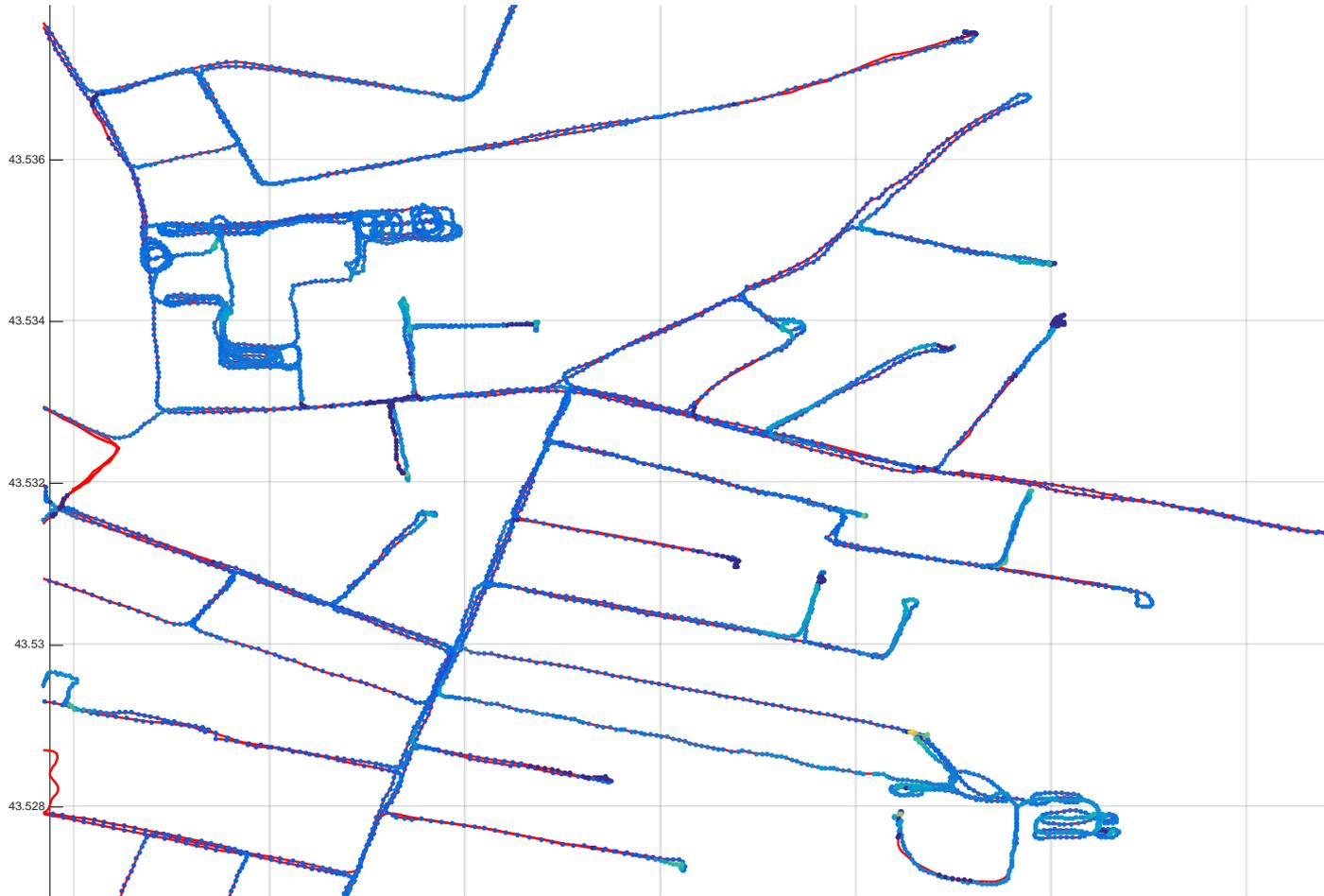
30F-18F

Salt by Location Mapping



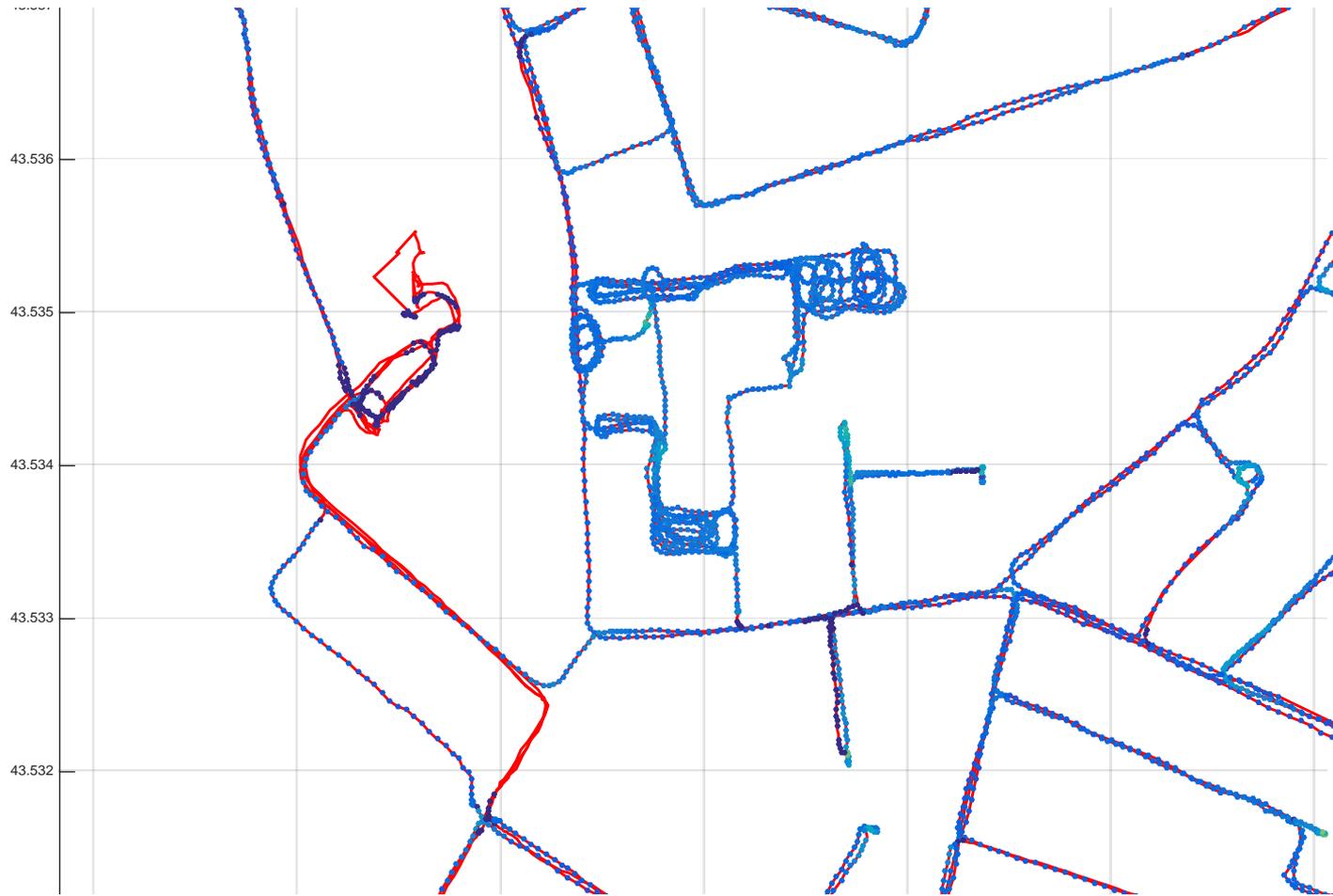
This data was collected between 02-Mar-2016 01:15:14 and 02-Mar-2016 11:58:14 Local Time

Salt by Location Mapping



02-Mar-2016 01:15:14 and 02-Mar-2016 11:58:14 LT

Salt by Location Mapping

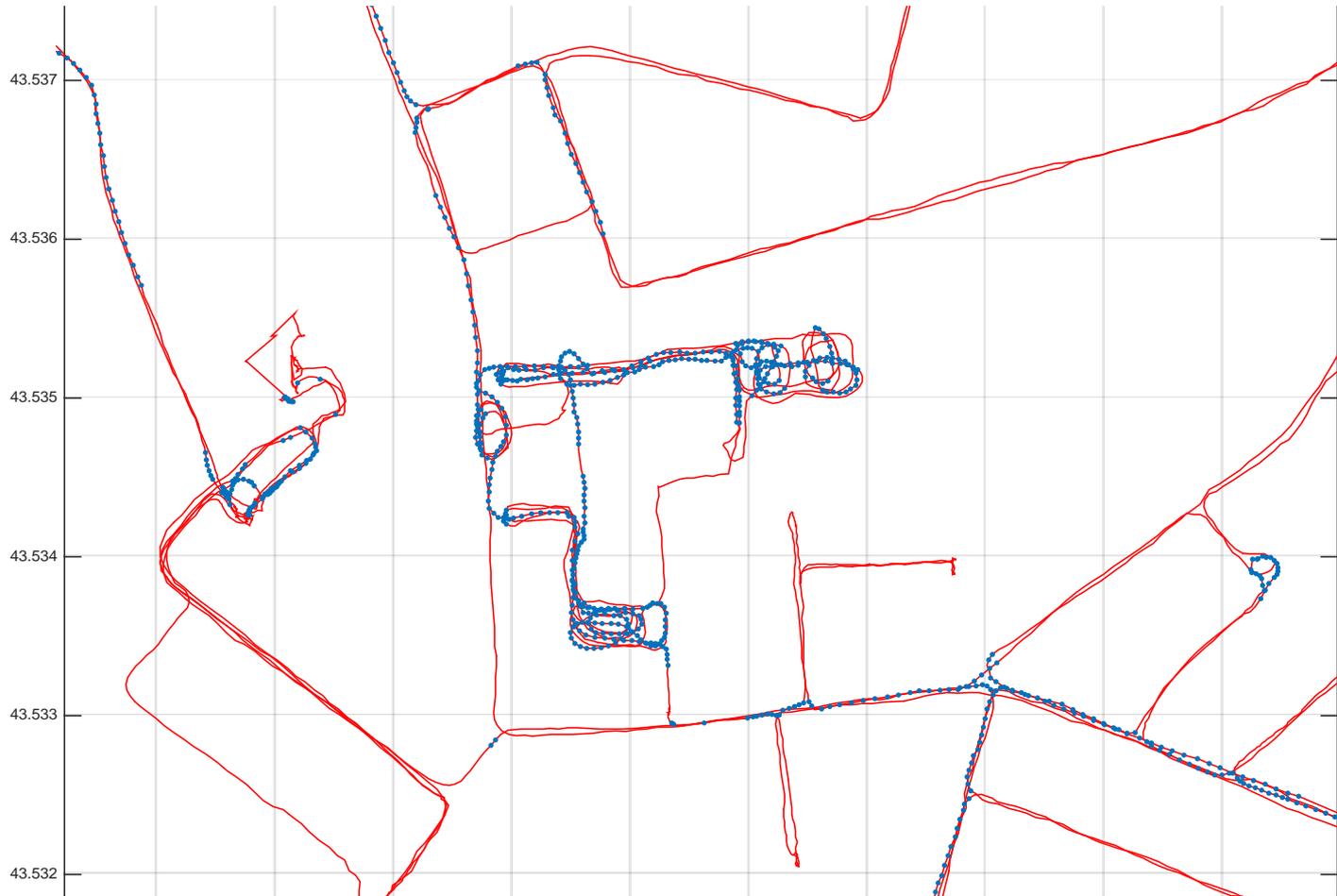


02-Mar-2016 01:15:14 and 02-Mar-2016 11:58:14 LT

Laconia High School



Overlap Areas (Indicated in Blue)

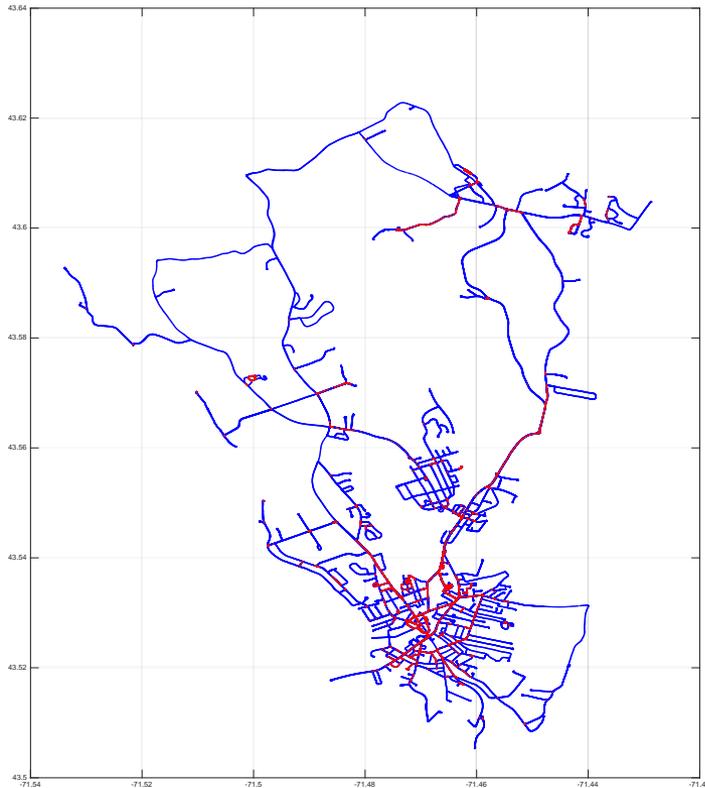


02-Mar-2016 01:15:14 and 02-Mar-2016 11:58:14 LT

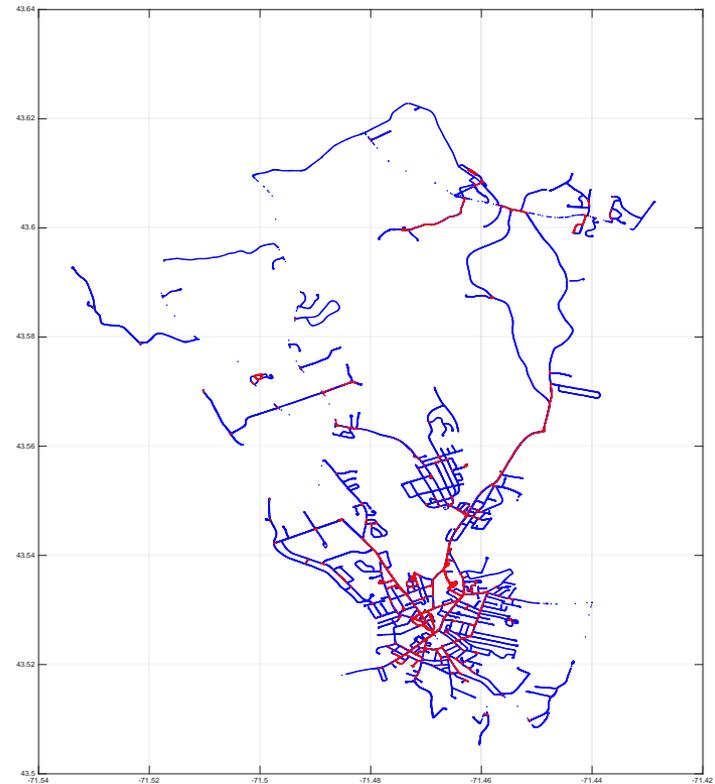
Typical Spring Storm

4 combined trucks 4/4/16 (1.9")

4 truck Location + overlap



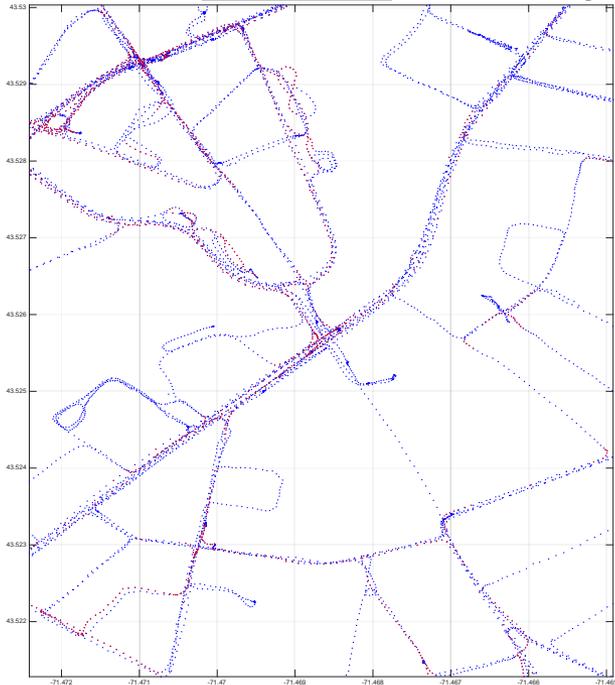
4 truck Salt + overlap



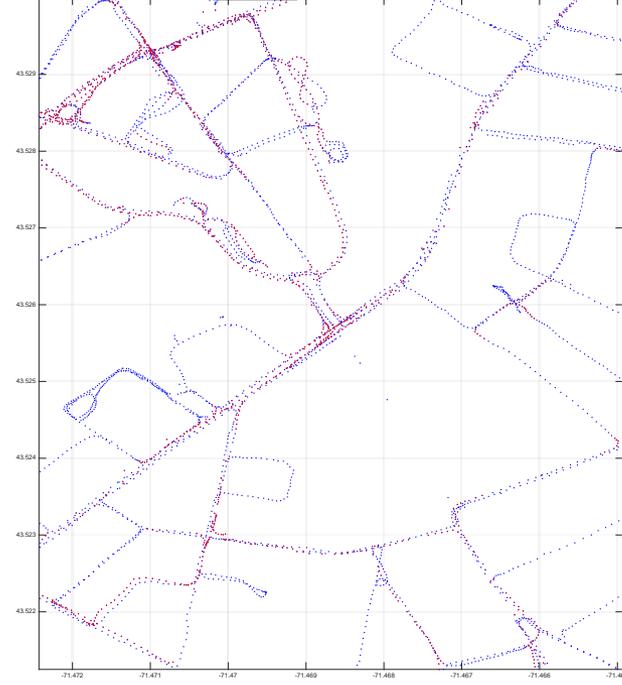
Typical Spring Storm

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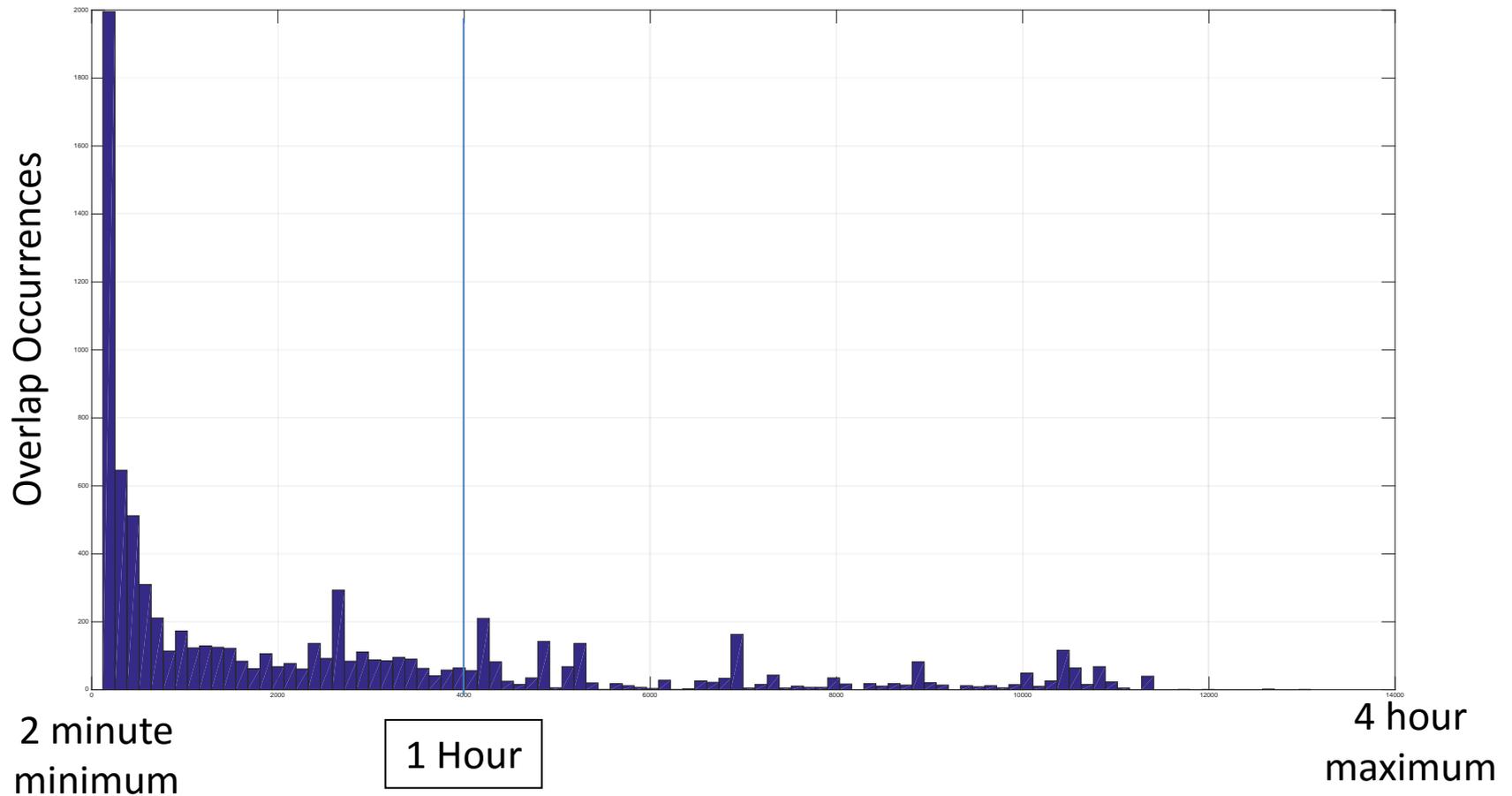


4 truck Salt + overlap



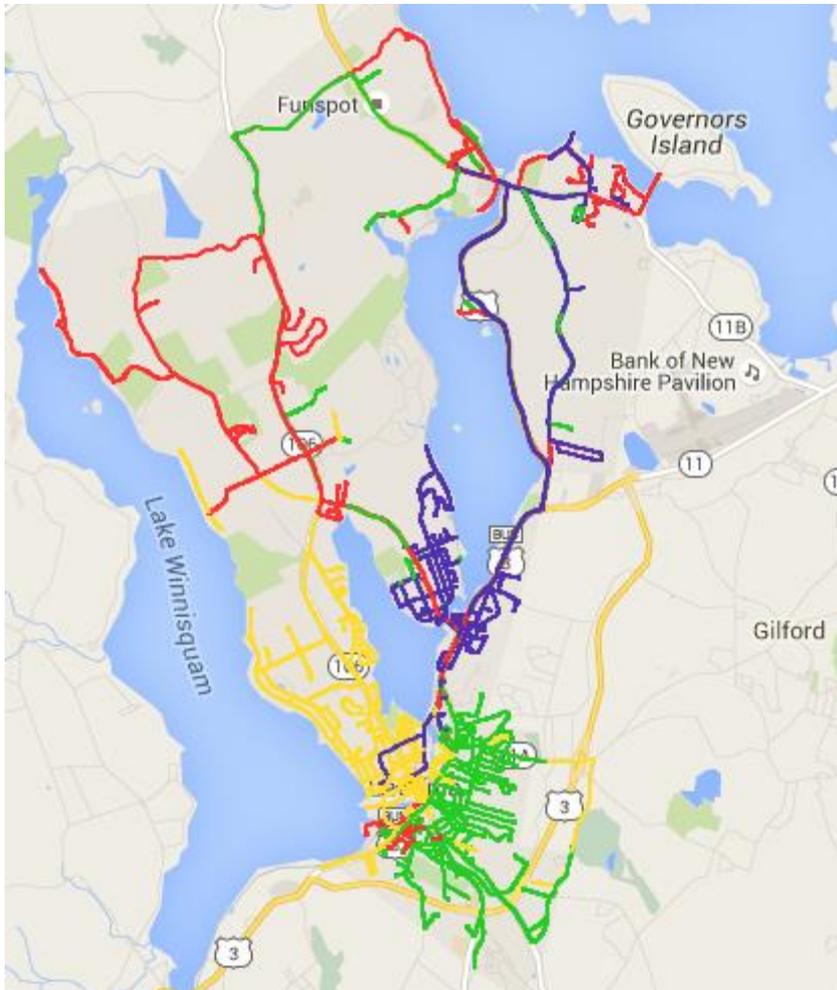
Typical Spring Storm

4 combined trucks 4/4/16 (1.9")

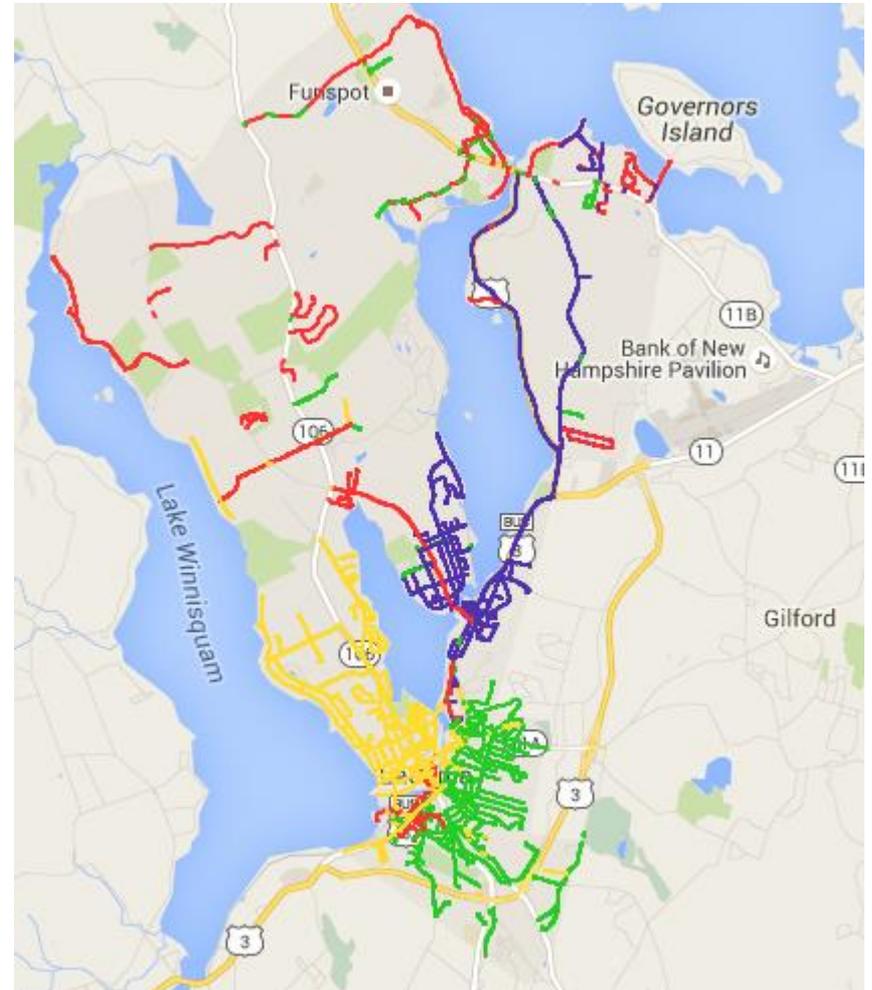


Web Interface 4/4 Storm

Truck Location

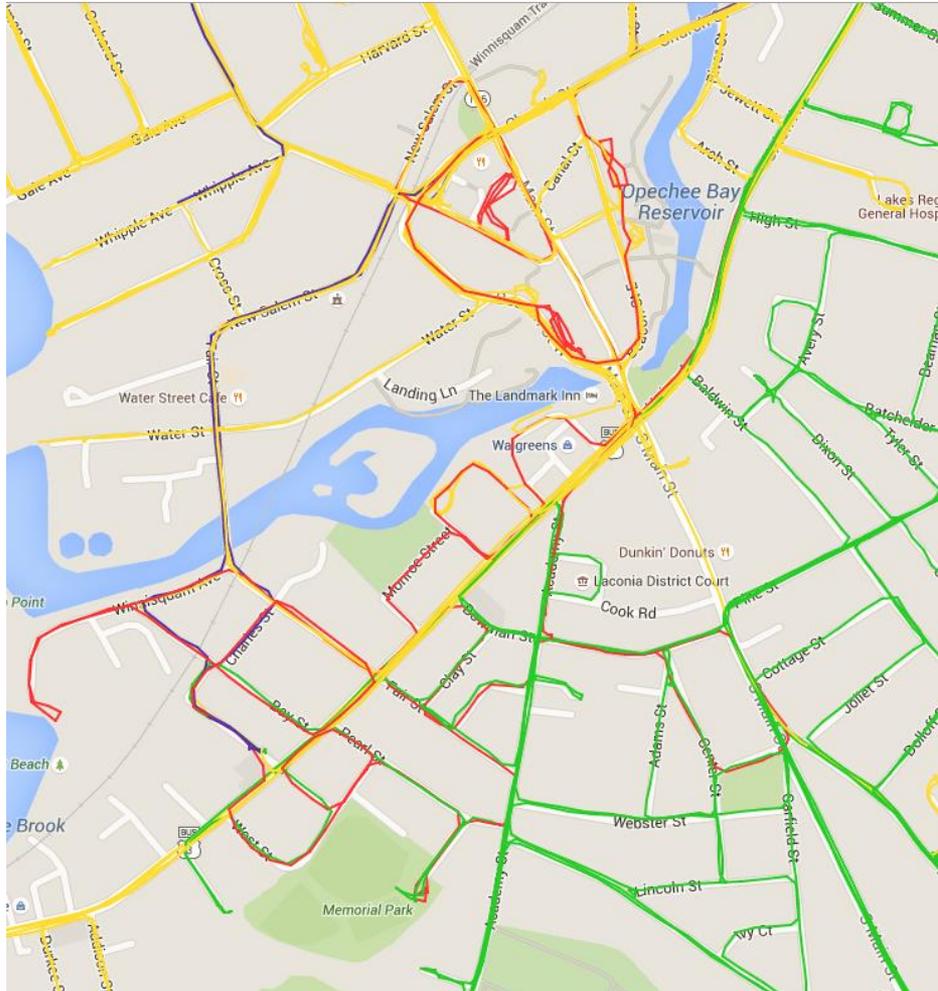


Salt Location

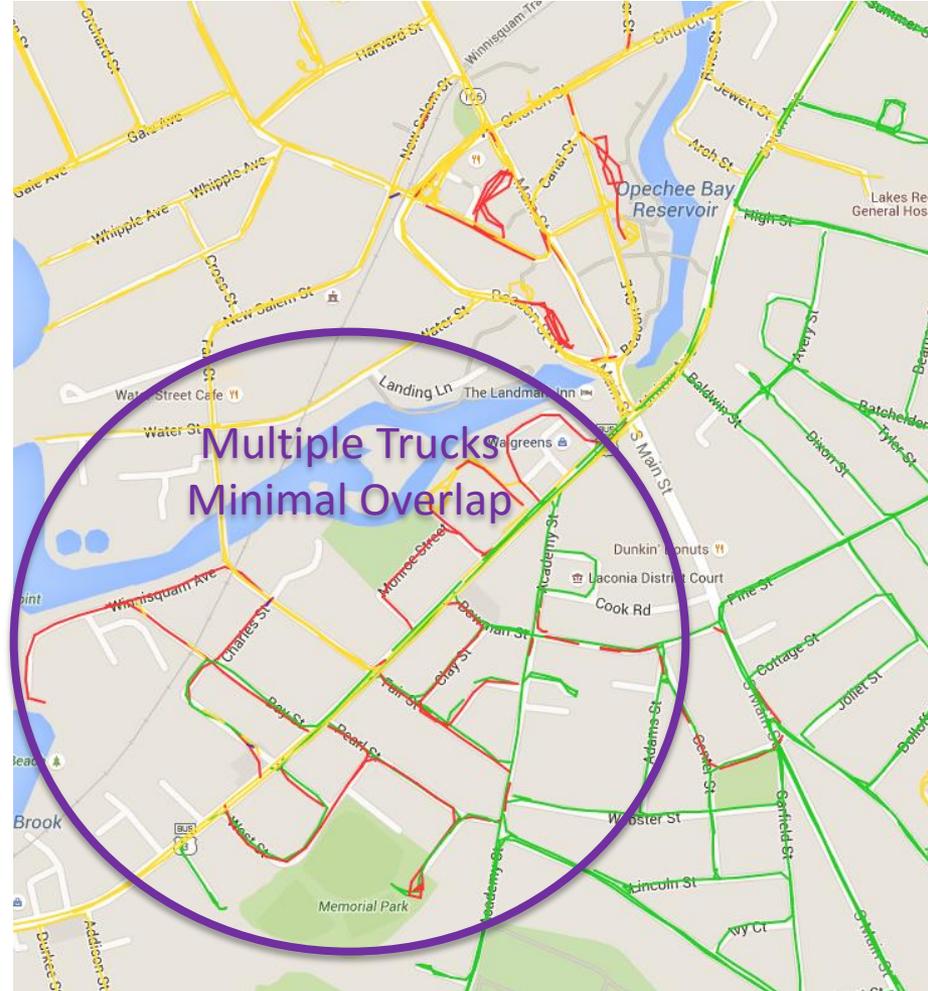


Fleet Cooperation 4/4/16 Storm

Truck Location (24 hours)

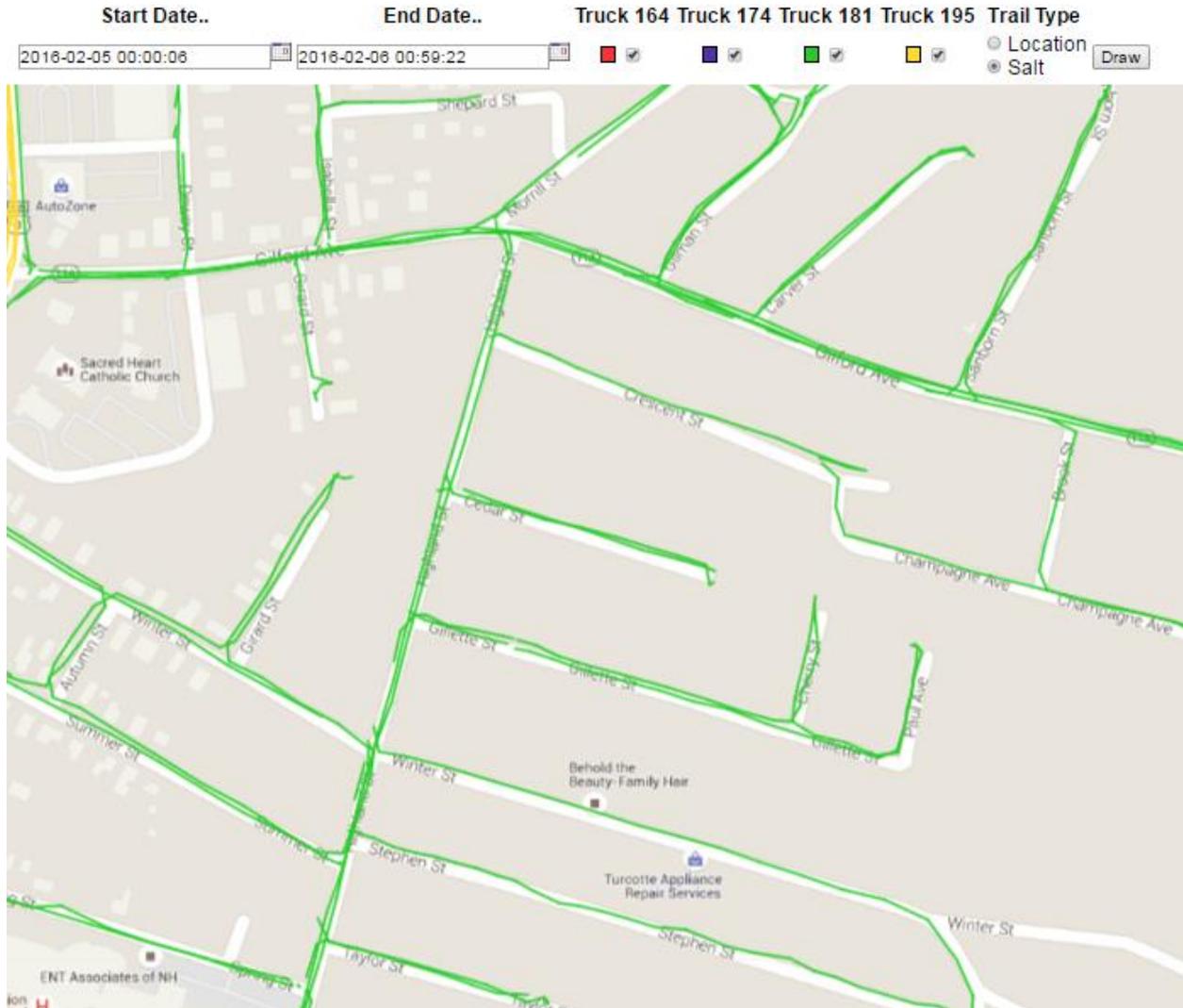


Salt Location (24 hours)



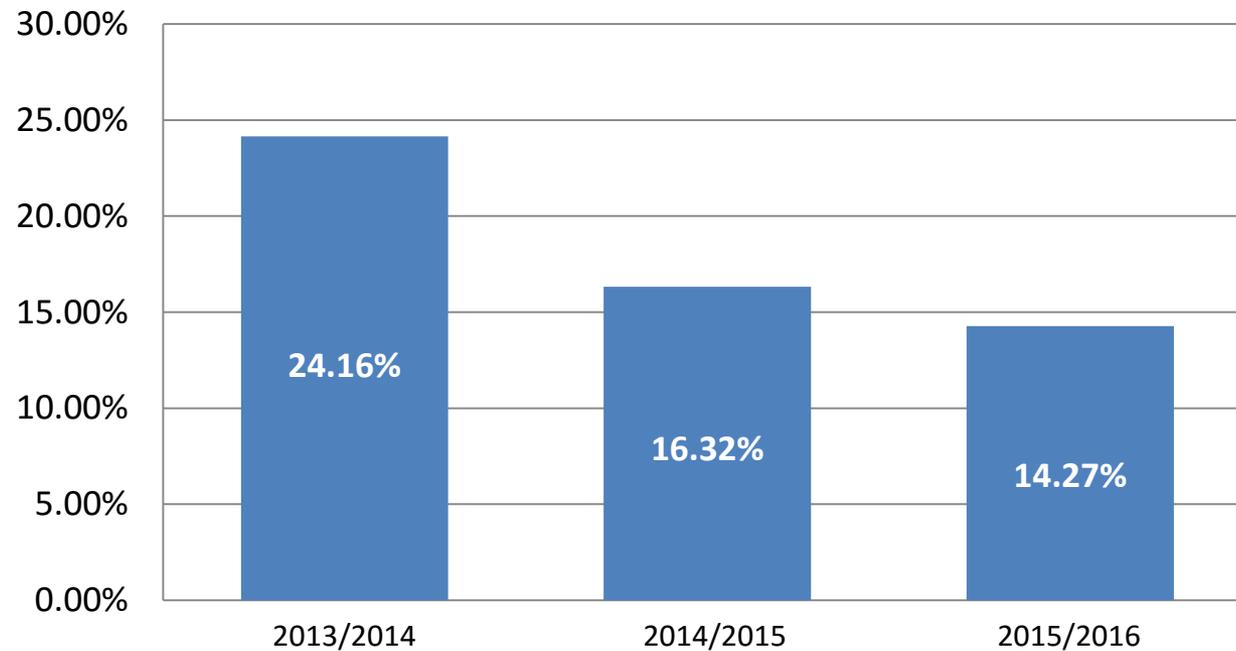
4/4/16 Storm

Single Truck Minimal Overlap



Annual Reductions in Material Based Overlap

Annual Measured Material Based Overlap
(Measured at 4 Hours)





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