

**APPENDIX A: WEATHER DATA OF FIELD DAYS AND FIELD SEASON (SHAKOPEE)**

Shakopee Mankato Lanesville

Shakopee, MN, USA

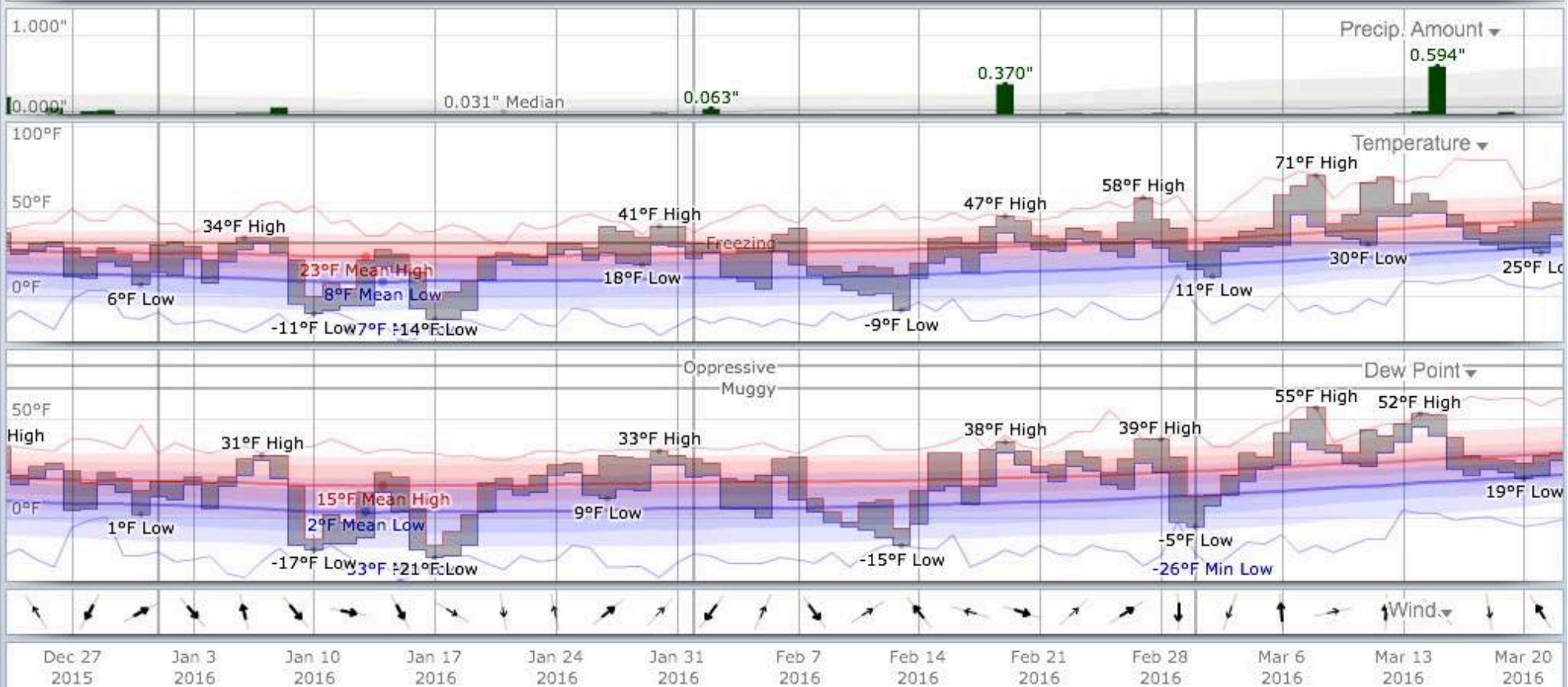
Forecast: NOAA

Download

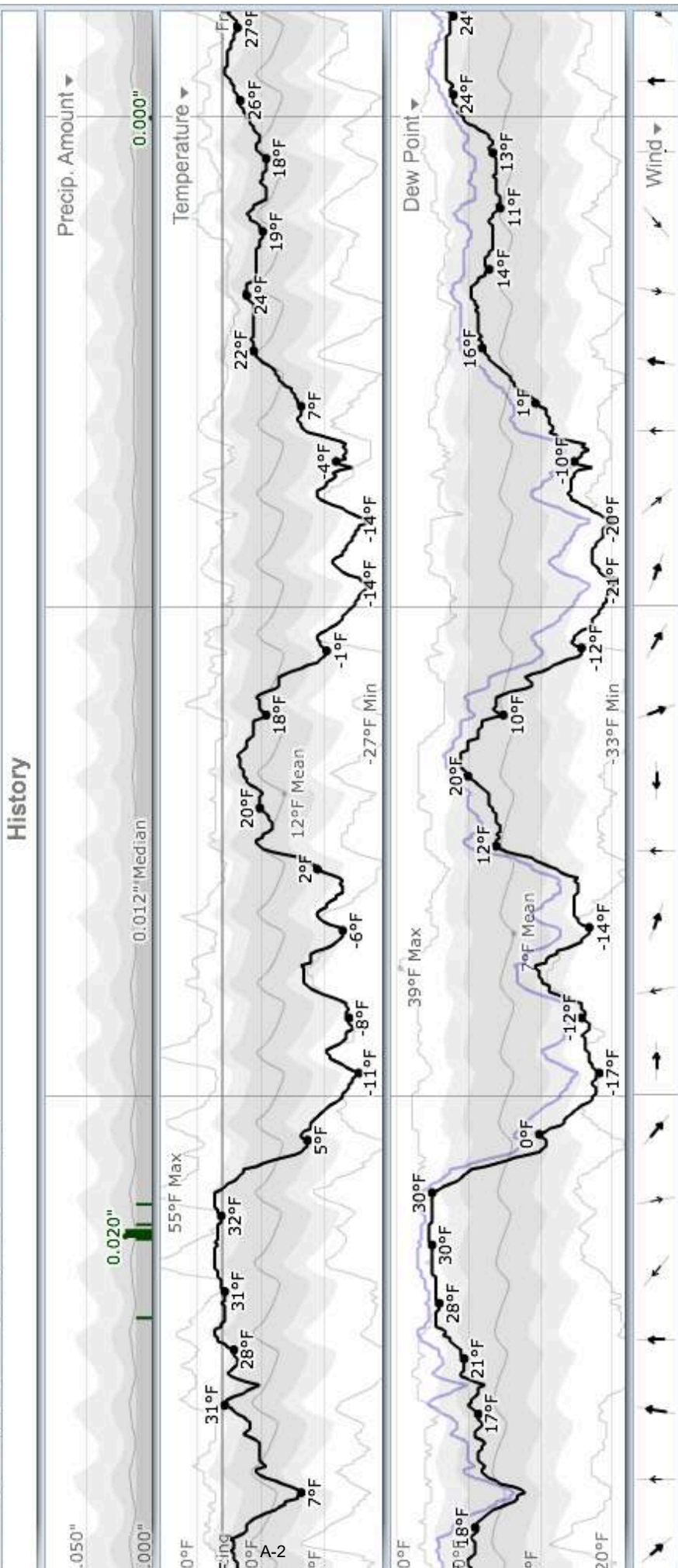
Graphs

Forecast Daily 1 quarter 1 year Averages

History

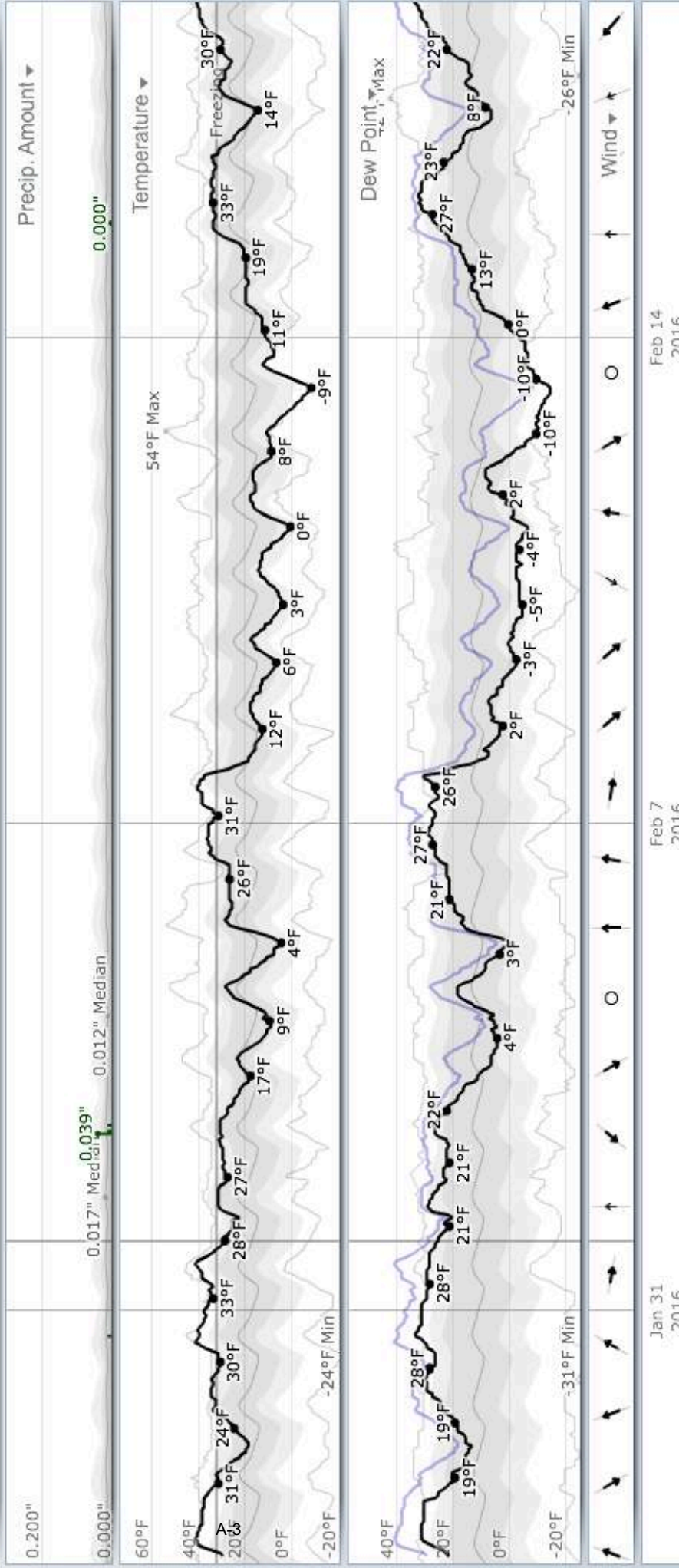


Forecast Daily 1 quarter 1 year Averages



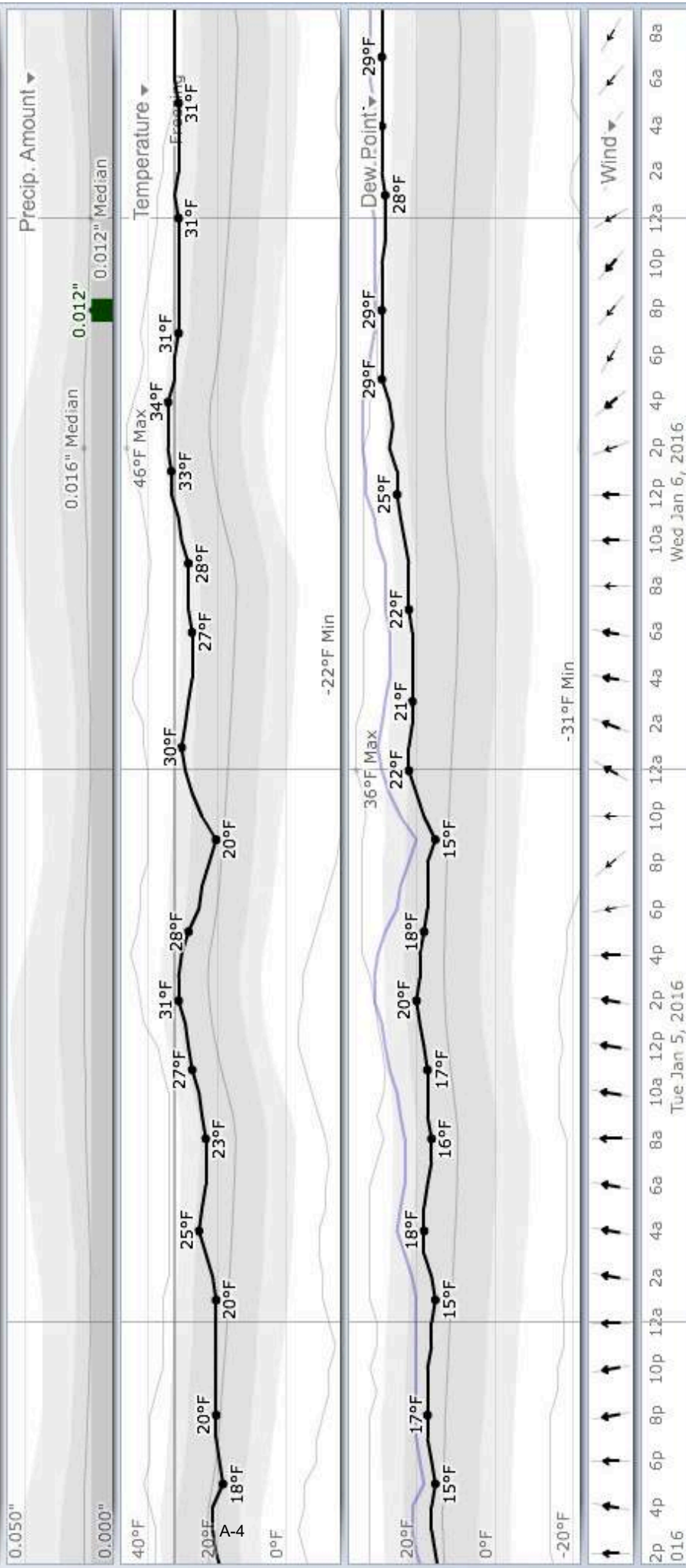
Forecast Daily 1 quarter 1 year Averages

History



Forecast Daily 1 quarter 1 year Averages

History



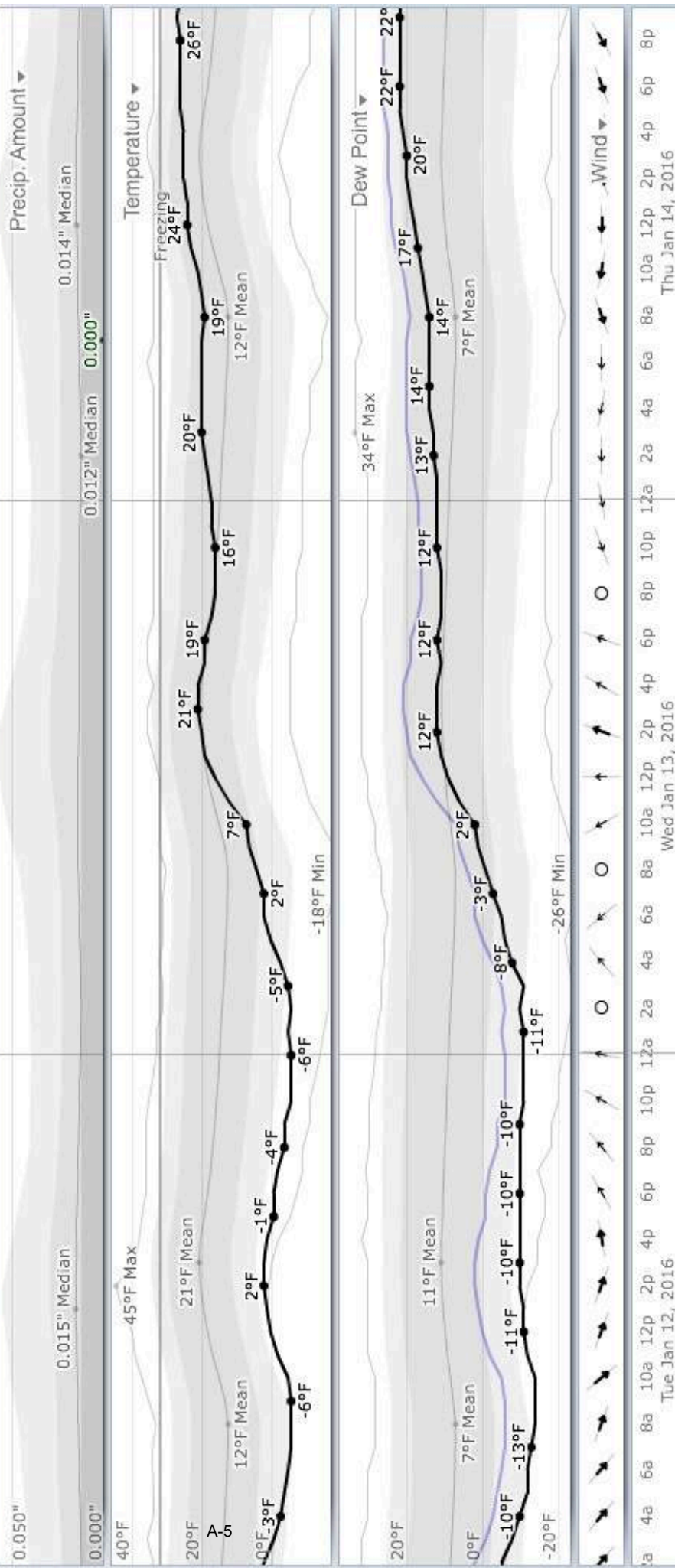
Shakopee, MN, USA

Forecast: NOAA ▼

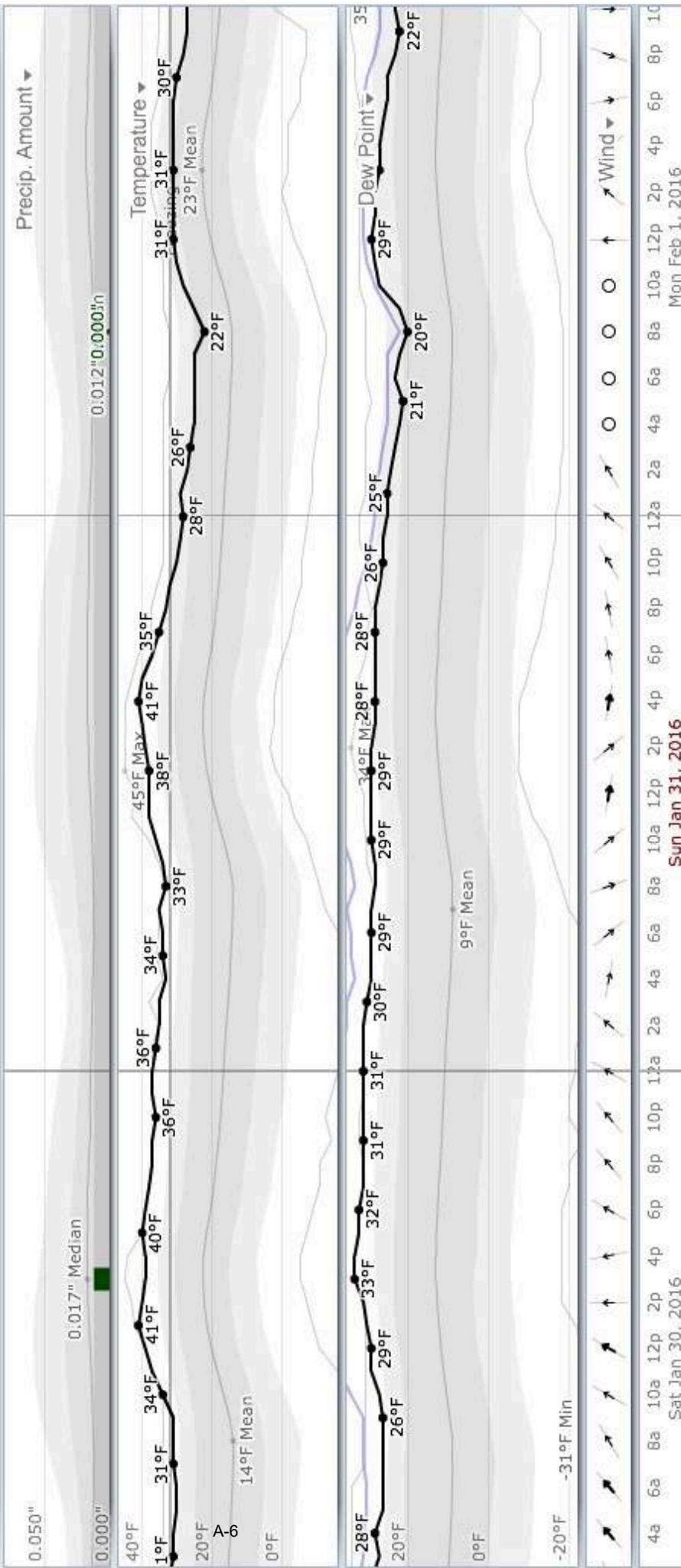
Download ▼ Graphs ▼

Forecast Daily 1 quarter 1 year Averages

History

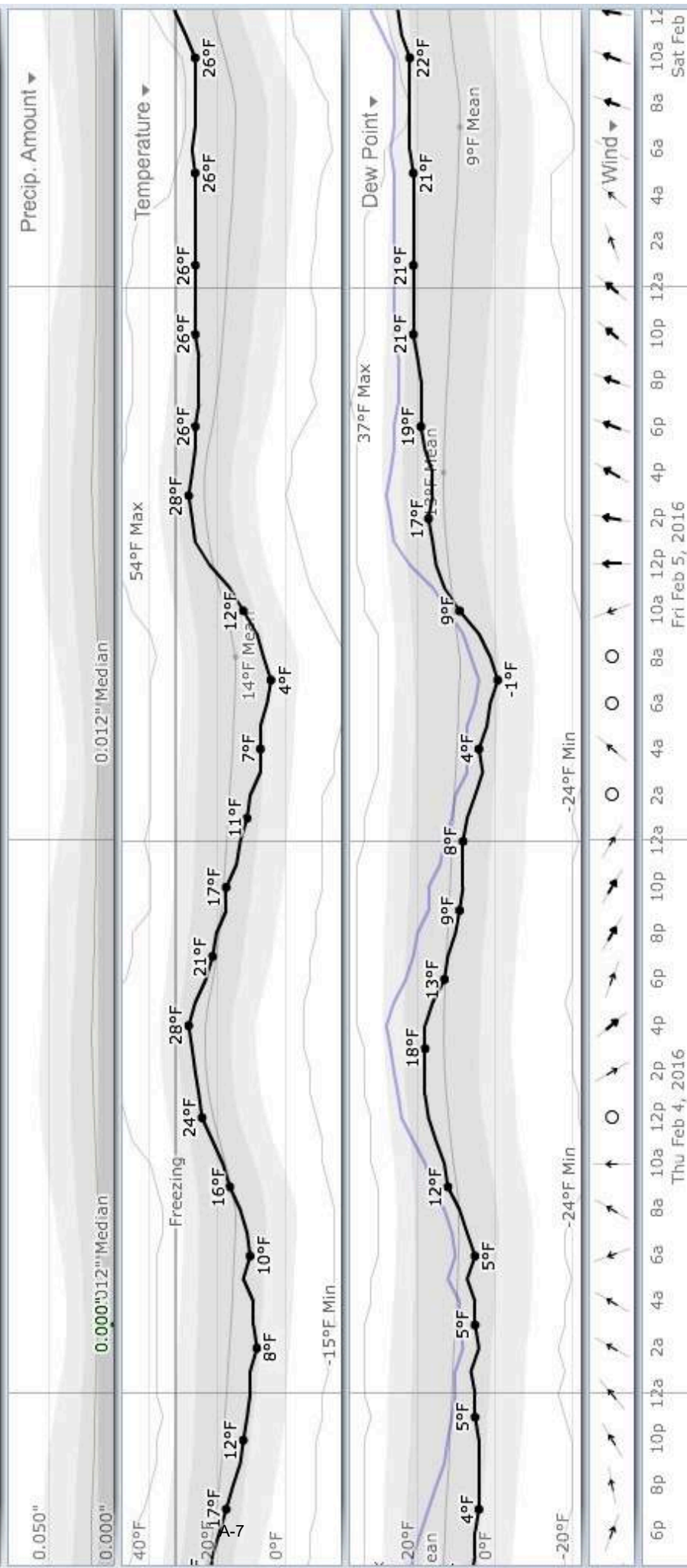


History



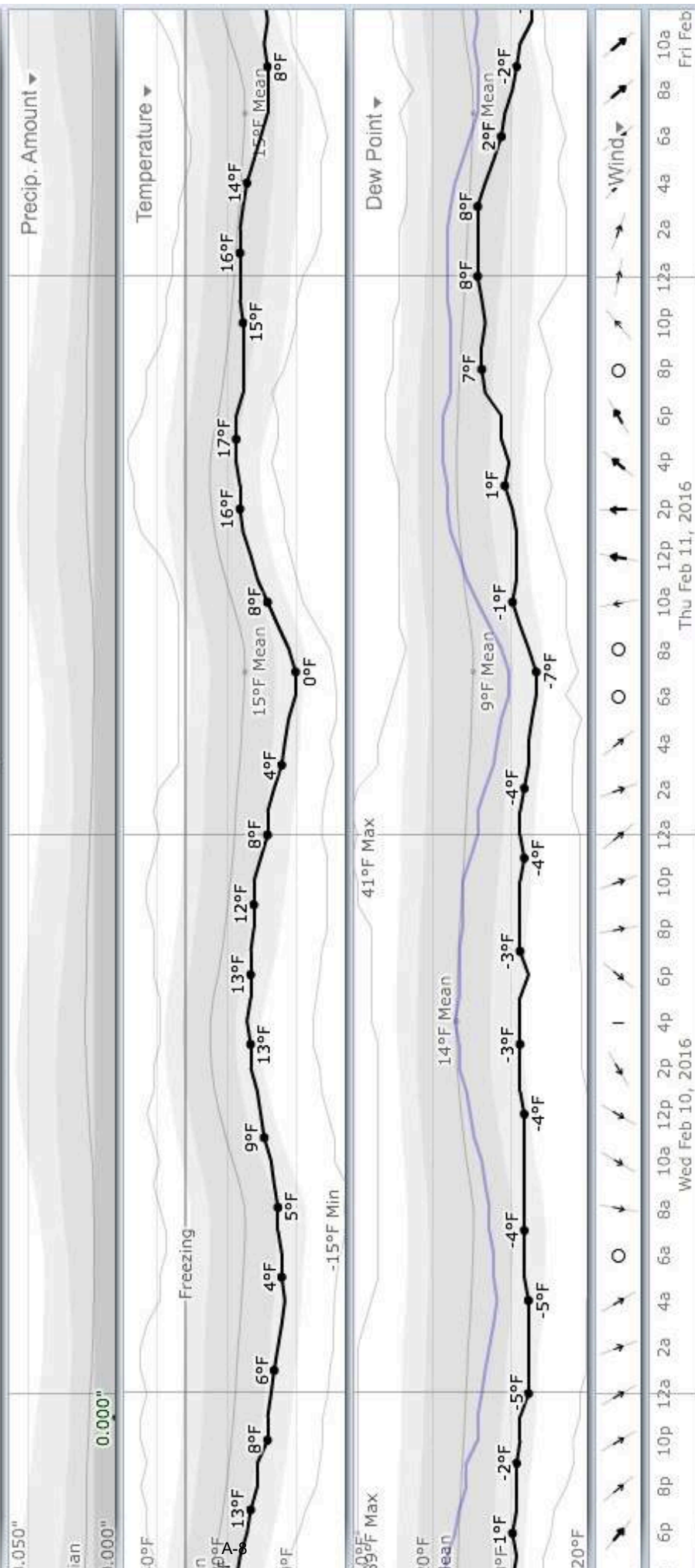
Forecast Daily 1 quarter 1 year Averages

History





History



# Minneapolis Flying Cloud, MN

Flying Cloud

© 11:19 PM CDT on April 07, 2017 [GMT -0500]

## Weather History for KFCM - December, 2016

December

12

2016

### View

Monday, December 12, 2016

Daily	Weekly	Monthly	Custom	
		<b>Actual</b>	<b>Average</b>	<b>Record</b>
Temperature				
Mean Temperature		2 °F	-	
Max Temperature		10 °F	31 °F	46 °F [1999]
Min Temperature		-5 °F	17 °F	-13 °F [2000]
Degree Days				
Heating Degree Days		62		
Moisture				
Dew Point		-4 °F		
Average Humidity		78		
Maximum Humidity		91		
Minimum Humidity		67		
Precipitation				

Precipitation	0.00 in	-	- ( )
Sea Level Pressure			
Sea Level Pressure	30.07 in		
Wind			
Wind Speed	7 mph (WSW)		
Max Wind Speed	12 mph		
Max Gust Speed	-		
Visibility	10 miles		

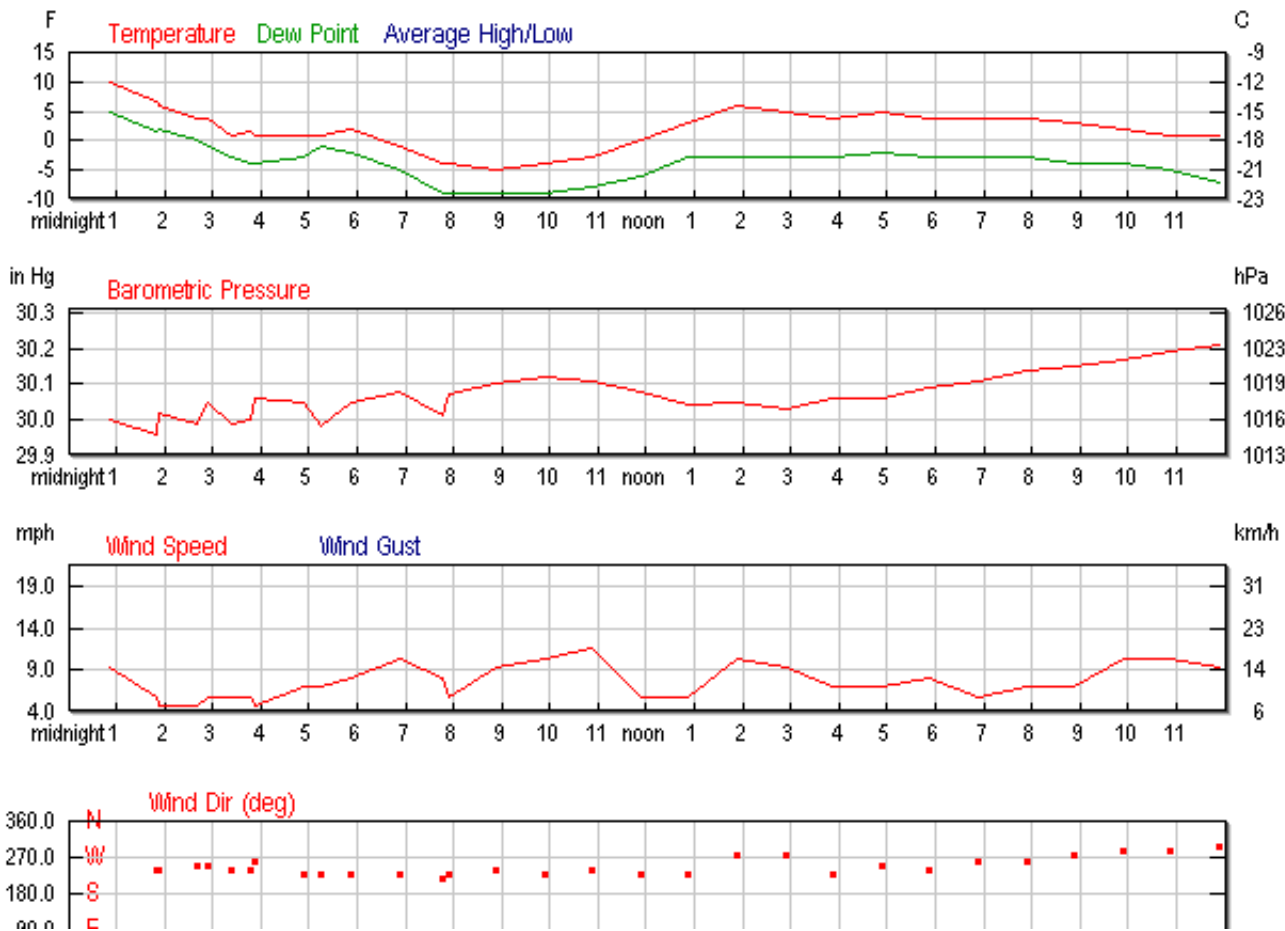
Events

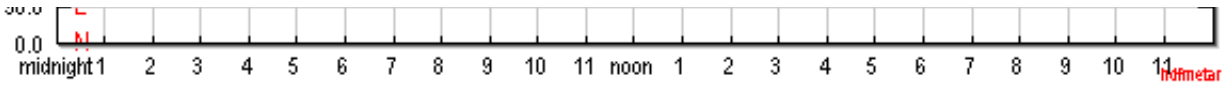
Averages and records for this station are not official NWS values.

T = Trace of Precipitation, MM = Missing Value

Source: NWS Daily Summary

Daily Weather History Graph





## Search for Another Location

Airport or City:

KFCM

**Submit**

## Trip Planner

Search our weather history database for the weather conditions in past years. The results will help you decide how hot, cold, wet, or windy it might be!

Date:

December

12

**Submit**

## Astronomy

Dec. 12, 2016	Rise	Set
Actual Time	7:42 AM CST	4:32 PM CST
<u>Civil Twilight</u>	7:09 AM CST	5:06 PM CST
<u>Nautical Twilight</u>	6:32 AM CST	5:43 PM CST
<u>Astronomical Twilight</u>	5:56 AM CST	6:19 PM CST
Moon	3:58 PM CST [12/12]	5:41 AM CST [12/12]
<u>Length of Visible Light</u>	9h 57m	
<u>Length of Day</u>	8h 50m	

**Waxing Gibbous, 98% of the Moon is Illuminated**

Dec 12	Dec 13	Dec 20	Dec 29	Jan 5
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Waxing Gibbous

Full

Last Quarter

New

First Quarter

### Hourly Weather History & Observations

Time (CST)	Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Ev
12:53 AM	10.0 °F	-2.9 °F	5.0 °F	80%	30.00 in	10.0 mi	West	9.2 mph	-	N/A	
1:50 AM	6.8 °F	-3.5 °F	1.4 °F	79%	29.96 in	10.0 mi	WSW	5.8 mph	-	N/A	
1:53 AM	6.1 °F	-2.8 °F	1.9 °F	83%	30.02 in	10.0 mi	WSW	4.6 mph	-	N/A	
2:42 AM	3.9 °F	-5.3 °F	-0.0 °F	84%	29.99 in	10.0 mi	WSW	4.6 mph	-	N/A	
2:53 AM	3.9 °F	-6.9 °F	-0.9 °F	80%	30.05 in	10.0 mi	WSW	5.8 mph	-	N/A	
3:22 AM	1.0 °F	-10.3 °F	-2.9 °F	83%	29.99 in	10.0 mi	WSW	5.8 mph	-	N/A	
3:48 AM	1.4 °F	-9.9 °F	-4.0 °F	78%	30.00 in	10.0 mi	WSW	5.8 mph	-	N/A	
3:53 AM	1.0 °F	-8.7 °F	-4.0 °F	79%	30.06 in	10.0 mi	West	4.6 mph	-	N/A	
4:53 AM	1.0 °F	-11.7 °F	-2.9 °F	83%	30.05 in	8.0 mi	SW	6.9 mph	-	N/A	
5:15 AM	1.0 °F	-11.7 °F	-0.9 °F	91%	29.98 in	6.0 mi	SW	6.9 mph	-	N/A	
5:53 AM	1.9 °F	-11.8 °F	-2.0 °F	83%	30.05 in	8.0 mi	SW	8.1 mph	-	N/A	
6:53 AM	-0.9 °F	-17.4 °F	-5.1 °F	83%	30.08 in	8.0 mi	SW	10.4 mph	-	N/A	
7:46 AM	-4.0 °F	-19.0 °F	-9.0 °F	79%	30.01 in	9.0 mi	SW	8.1 mph	-	N/A	
7:53 AM	-4.0 °F	-16.3 °F	-9.0 °F	79%	30.07 in	10.0 mi	SW	5.8 mph	-	N/A	

8:53 AM	-5.1 °F	-21.5 °F	-9.0 °F	83%	30.10 in	10.0 mi	WSW	9.2 mph	-	N/A
9:53 AM	-4.0 °F	-21.2 °F	-9.0 °F	79%	30.12 in	10.0 mi	SW	10.4 mph	-	N/A
10:53 AM	-2.9 °F	-20.8 °F	-8.0 °F	79%	30.11 in	10.0 mi	WSW	11.5 mph	-	N/A
11:53 AM	-0.0 °F	-11.6 °F	-6.0 °F	76%	30.08 in	10.0 mi	SW	5.8 mph	-	N/A
12:53 PM	3.0 °F	-8.0 °F	-2.9 °F	76%	30.04 in	10.0 mi	SW	5.8 mph	-	N/A
1:53 PM	6.1 °F	-8.7 °F	-2.9 °F	67%	30.05 in	10.0 mi	West	10.4 mph	-	N/A
2:53 PM	5.0 °F	-9.1 °F	-2.9 °F	70%	30.03 in	10.0 mi	West	9.2 mph	-	N/A
3:53 PM	3.9 °F	-8.2 °F	-2.9 °F	73%	30.06 in	10.0 mi	SW	6.9 mph	-	N/A
4:53 PM	5.0 °F	-6.9 °F	-2.0 °F	73%	30.06 in	10.0 mi	WSW	6.9 mph	-	N/A
5:53 PM	3.9 °F	-9.4 °F	-2.9 °F	73%	30.09 in	10.0 mi	WSW	8.1 mph	-	N/A
6:53 PM	3.9 °F	-6.9 °F	-2.9 °F	73%	30.11 in	10.0 mi	West	5.8 mph	-	N/A
7:53 PM	3.9 °F	-8.2 °F	-2.9 °F	73%	30.14 in	10.0 mi	West	6.9 mph	-	N/A
8:53 PM	3.0 °F	-9.3 °F	-4.0 °F	73%	30.15 in	10.0 mi	West	6.9 mph	-	N/A
9:53 PM	1.9 °F	-13.8 °F	-4.0 °F	76%	30.17 in	10.0 mi	WNW	10.4 mph	-	N/A
10:53 PM	1.0 °F	-14.9 °F	-5.1 °F	75%	30.19 in	10.0 mi	WNW	10.4 mph	-	N/A
11:53 PM	1.0 °F	-14.0 °F	-7.1 °F	69%	30.21 in	10.0 mi	WNW	9.2 mph	-	N/A

# Minneapolis Flying Cloud, MN

Flying Cloud

© 11:14 PM CDT on April 07, 2017 [GMT -0500]

## Weather History for KFCM - January, 2017

January

19

2017

### View

Thursday, January 19, 2017

Daily	Weekly	Monthly	Custom
		<b>Actual</b>	<b>Average</b>
			<b>Record</b>
Temperature			
		37 °F	-
		39 °F	21 °F
		35 °F	39 °F [2013]
			-15 °F [2008]
Degree Days			
		28	
Moisture			
		32 °F	
		82	
		89	
		76	
Precipitation			

Precipitation	0.00 in	-	- ( )
Sea Level Pressure			
Sea Level Pressure	29.76 in		
Wind			
Wind Speed	9 mph [SE]		
Max Wind Speed	13 mph		
Max Gust Speed	-		
Visibility	7 miles		

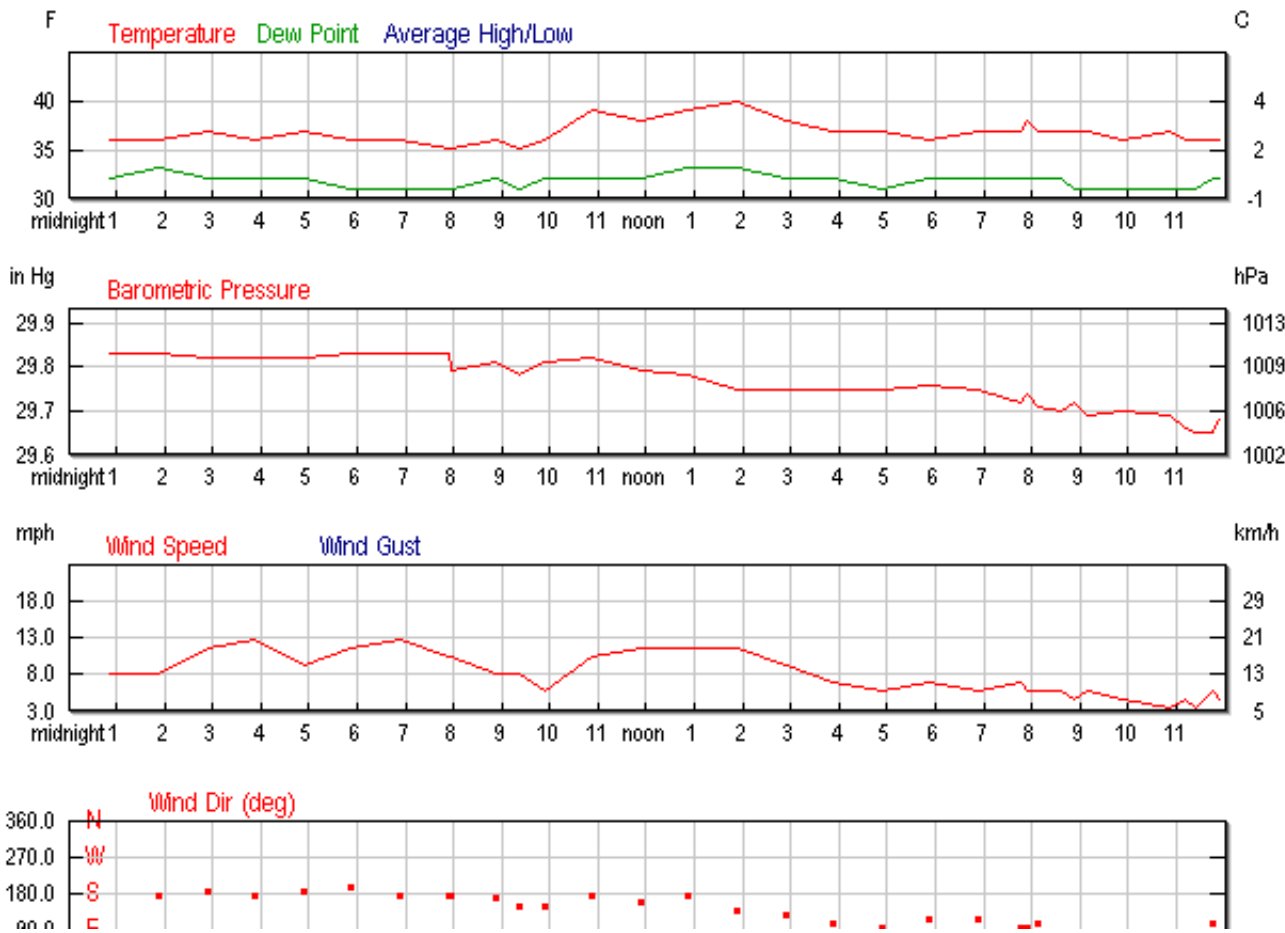
Events

Averages and records for this station are not official NWS values.

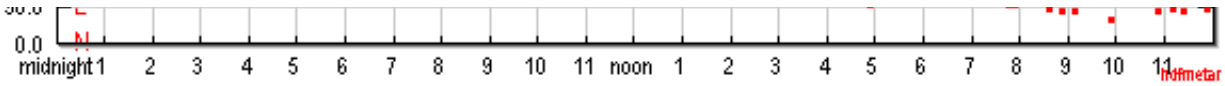
T = Trace of Precipitation, MM = Missing Value

Source: NWS Daily Summary

Daily Weather History Graph







## Search for Another Location

Airport or City:

**Submit**

## Trip Planner

Search our weather history database for the weather conditions in past years. The results will help you decide how hot, cold, wet, or windy it might be!

Date:



**Submit**

## Astronomy

Jan. 19, 2017	Rise	Set
Actual Time	7:45 AM CST	5:04 PM CST
<u>Civil Twilight</u>	7:12 AM CST	5:36 PM CST
<u>Nautical Twilight</u>	6:36 AM CST	6:12 PM CST
<u>Astronomical Twilight</u>	6:02 AM CST	6:47 PM CST
Moon	12:05 AM CST [1/19]	11:37 AM CST [1/19]
<u>Length of Visible Light</u>	10h 23m	
<u>Length of Day</u>	9h 19m	

**Waning Gibbous, 52% of the Moon is Illuminated**

Jan 19	Jan 19	Jan 27	Feb 3	Feb 10
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Waning Gibbous

Last Quarter

New

First Quarter

Full

### Hourly Weather History & Observations

Time (CST)	Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	E
12:53 AM	36.0 °F	29.6 °F	32.0 °F	86%	29.83 in	8.0 mi	SSW	8.1 mph	-	N/A	
1:53 AM	36.0 °F	29.6 °F	33.1 °F	89%	29.83 in	8.0 mi	South	8.1 mph	-	N/A	
2:53 AM	37.0 °F	29.3 °F	32.0 °F	82%	29.82 in	7.0 mi	South	11.5 mph	-	N/A	
3:53 AM	36.0 °F	27.5 °F	32.0 °F	86%	29.82 in	7.0 mi	South	12.7 mph	-	N/A	
4:53 AM	37.0 °F	30.4 °F	32.0 °F	82%	29.82 in	7.0 mi	South	9.2 mph	-	N/A	
5:53 AM	36.0 °F	28.0 °F	30.9 °F	82%	29.83 in	7.0 mi	SSW	11.5 mph	-	N/A	
6:53 AM	36.0 °F	27.5 °F	30.9 °F	82%	29.83 in	6.0 mi	South	12.7 mph	-	N/A	
7:53 AM	35.1 °F	27.4 °F	30.9 °F	85%	29.83 in	3.0 mi	South	10.4 mph	-	N/A	
7:56 AM	35.1 °F	27.4 °F	30.9 °F	85%	29.79 in	6.0 mi	South	10.4 mph	-	N/A	
8:53 AM	36.0 °F	29.6 °F	32.0 °F	86%	29.81 in	6.0 mi	South	8.1 mph	-	N/A	
9:21 AM	35.1 °F	28.6 °F	30.9 °F	85%	29.78 in	5.0 mi	SSE	8.1 mph	-	N/A	
9:53 AM	36.0 °F	31.1 °F	32.0 °F	86%	29.81 in	10.0 mi	SSE	5.8 mph	-	N/A	
10:53 AM	39.0 °F	32.3 °F	32.0 °F	76%	29.82 in	10.0 mi	South	10.4 mph	-	N/A	
11:53 AM	37.9 °F	30.5 °F	32.0 °F	79%	29.79 in	8.0 mi	SSE	11.5 mph	-	N/A	

12:53 PM	39.0 °F	31.8 °F	33.1 °F	79%	29.78 in	6.0 mi	South	11.5 mph	-	N/A
1:53 PM	39.9 °F	32.9 °F	33.1 °F	77%	29.75 in	8.0 mi	SE	11.5 mph	-	N/A
2:53 PM	37.9 °F	31.5 °F	32.0 °F	79%	29.75 in	8.0 mi	SE	9.2 mph	-	N/A
3:53 PM	37.0 °F	31.6 °F	32.0 °F	82%	29.75 in	8.0 mi	ESE	6.9 mph	-	N/A
4:53 PM	37.0 °F	32.4 °F	30.9 °F	79%	29.75 in	9.0 mi	East	5.8 mph	-	N/A
5:53 PM	36.0 °F	30.3 °F	32.0 °F	86%	29.76 in	9.0 mi	ESE	6.9 mph	-	N/A
6:53 PM	37.0 °F	32.4 °F	32.0 °F	82%	29.75 in	10.0 mi	ESE	5.8 mph	-	N/A
7:46 PM	37.0 °F	31.6 °F	32.0 °F	82%	29.72 in	10.0 mi	East	6.9 mph	-	N/A
7:53 PM	37.9 °F	33.5 °F	32.0 °F	79%	29.74 in	10.0 mi	East	5.8 mph	-	N/A
8:07 PM	37.0 °F	32.4 °F	32.0 °F	82%	29.71 in	9.0 mi	ESE	5.8 mph	-	N/A
8:38 PM	37.0 °F	32.4 °F	32.0 °F	82%	29.70 in	8.0 mi	East	5.8 mph	-	N/A
8:53 PM	37.0 °F	33.3 °F	30.9 °F	79%	29.72 in	8.0 mi	East	4.6 mph	-	N/A
9:09 PM	37.0 °F	32.4 °F	30.9 °F	79%	29.69 in	8.0 mi	East	5.8 mph	-	N/A
9:53 PM	36.0 °F	32.1 °F	30.9 °F	82%	29.70 in	8.0 mi	ENE	4.6 mph	-	N/A
10:53 PM	37.0 °F	34.5 °F	30.9 °F	79%	29.69 in	7.0 mi	East	3.5 mph	-	N/A
11:11 PM	36.0 °F	32.1 °F	30.9 °F	82%	29.66 in	7.0 mi	East	4.6 mph	-	N/A
11:25 PM	36.0 °F	33.3 °F	30.9 °F	82%	29.65 in	7.0 mi	East	3.5 mph	-	N/A
11:46 PM	36.0 °F	31.1 °F	32.0 °F	86%	29.65 in	2.0 mi	ESE	5.8 mph	-	N/A

11:53 PM    **36.0 °F**    **32.1 °F**    **32.0 °F**    86%    **29.68 in**    **2.0 mi**    East    **4.6 mph**    -    **0.00 in**

|

# Minneapolis Flying Cloud, MN

Flying Cloud

© 11:19 PM CDT on April 07, 2017 [GMT -0500]

## Weather History for KFCM - January, 2017

January

26

2017

### View

Thursday, January 26, 2017

Daily	Weekly	Monthly	Custom	
		<b>Actual</b>	<b>Average</b>	<b>Record</b>
Temperature				
		26 °F	-	
		28 °F	22 °F	48 °F [2002]
		23 °F	9 °F	-9 °F [2009]
Degree Days				
		40		
Moisture				
		19 °F		
		74		
		78		
		68		
Precipitation				

Precipitation	<b>0.00</b> in	-	- ( )
Sea Level Pressure			
Sea Level Pressure	<b>29.93</b> in		
Wind			
Wind Speed	<b>12</b> mph [WNW]		
Max Wind Speed	<b>16</b> mph		
Max Gust Speed	<b>22</b> mph		
Visibility	<b>10</b> miles		

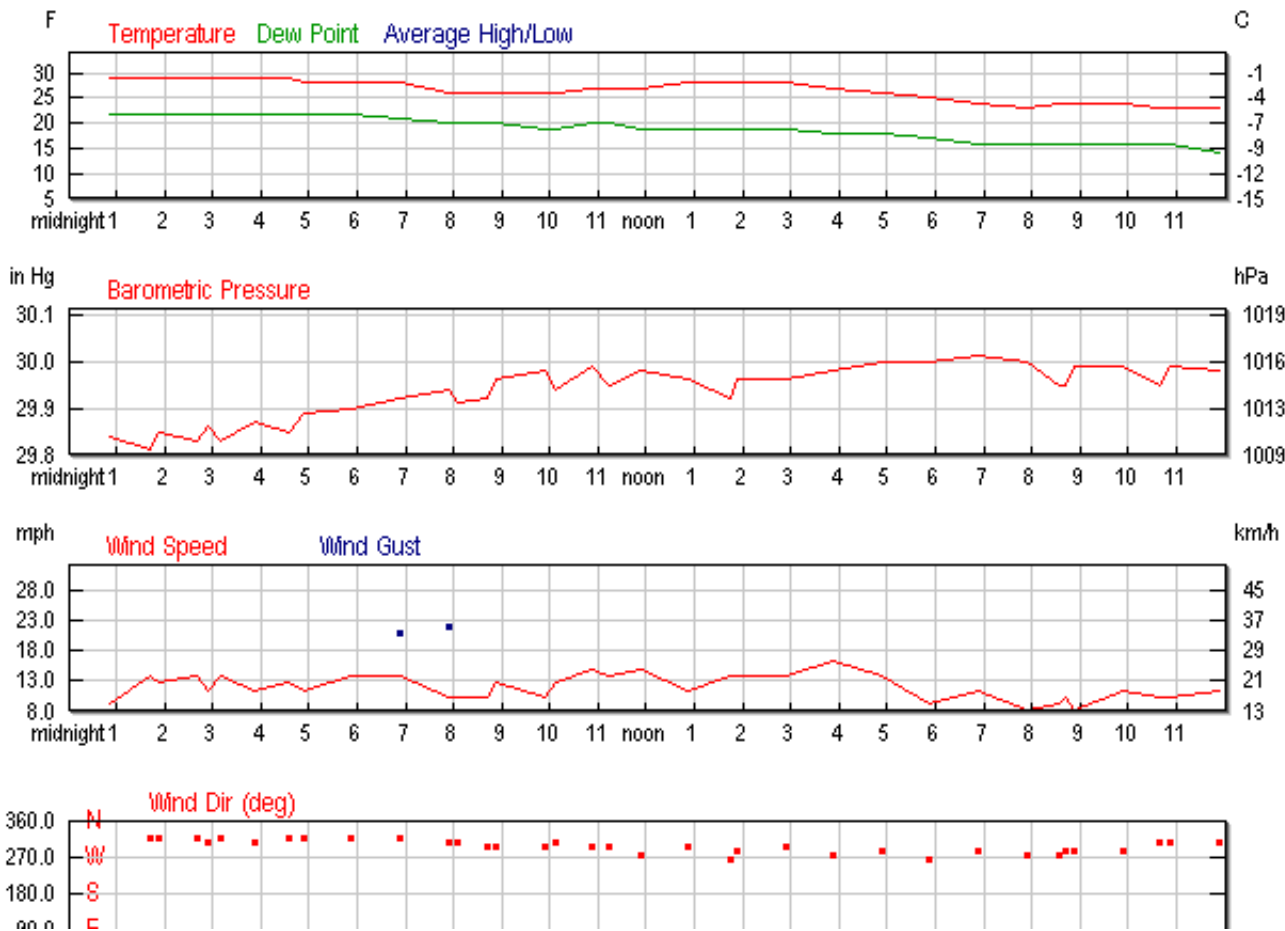
Events

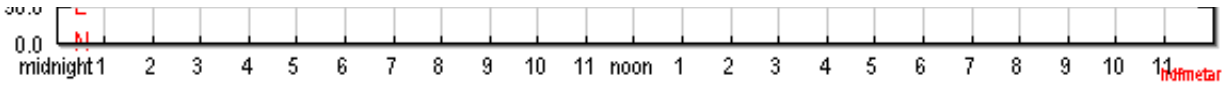
Averages and records for this station are not official NWS values.

T = Trace of Precipitation, MM = Missing Value

Source: NWS Daily Summary

Daily Weather History Graph





## Search for Another Location

Airport or City:

KFCM

**Submit**

## Trip Planner

Search our weather history database for the weather conditions in past years. The results will help you decide how hot, cold, wet, or windy it might be!

Date:

January

26

**Submit**

## Astronomy

Jan. 26, 2017	Rise	Set
Actual Time	7:39 AM CST	5:14 PM CST
<u>Civil Twilight</u>	7:07 AM CST	5:45 PM CST
<u>Nautical Twilight</u>	6:32 AM CST	6:21 PM CST
<u>Astronomical Twilight</u>	5:57 AM CST	6:55 PM CST
Moon	6:29 AM CST [1/26]	4:15 PM CST [1/26]
<u>Length of Visible Light</u>	10h 38m	
<u>Length of Day</u>	9h 34m	

**Waning Crescent, 2% of the Moon is Illuminated**

Jan 26	Jan 27	Feb 3	Feb 10	Feb 18
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Waning Crescent

New

First Quarter

Full

Last Quarter

### Hourly Weather History & Observations

Time (CST)	Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip
12:53 AM	28.9 °F	20.4 °F	21.9 °F	75%	29.84 in	10.0 mi	NW	9.2 mph	-	N/A
1:42 AM	28.9 °F	18.2 °F	21.9 °F	75%	29.81 in	10.0 mi	NW	13.8 mph	20.7 mph	N/A
1:53 AM	28.9 °F	18.6 °F	21.9 °F	75%	29.85 in	10.0 mi	NW	12.7 mph	-	N/A
2:40 AM	28.9 °F	18.2 °F	21.9 °F	75%	29.83 in	10.0 mi	NW	13.8 mph	-	N/A
2:53 AM	28.9 °F	19.2 °F	21.9 °F	75%	29.86 in	10.0 mi	NW	11.5 mph	-	N/A
3:09 AM	28.9 °F	18.2 °F	21.9 °F	75%	29.83 in	10.0 mi	NW	13.8 mph	-	N/A
3:53 AM	28.9 °F	19.2 °F	21.9 °F	75%	29.87 in	10.0 mi	NW	11.5 mph	-	N/A
4:34 AM	28.9 °F	18.6 °F	21.9 °F	75%	29.85 in	10.0 mi	NW	12.7 mph	-	N/A
4:53 AM	28.0 °F	18.1 °F	21.9 °F	78%	29.89 in	10.0 mi	NW	11.5 mph	-	N/A
5:53 AM	28.0 °F	17.0 °F	21.9 °F	78%	29.90 in	10.0 mi	NW	13.8 mph	19.6 mph	N/A
6:53 AM	28.0 °F	17.0 °F	21.0 °F	75%	29.92 in	10.0 mi	NW	13.8 mph	20.7 mph	N/A
7:53 AM	26.1 °F	16.2 °F	19.9 °F	78%	29.94 in	10.0 mi	NW	10.4 mph	21.9 mph	N/A
8:04 AM	26.1 °F	16.2 °F	19.9 °F	78%	29.91 in	10.0 mi	NW	10.4 mph	-	N/A
8:43 AM	26.1 °F	16.2 °F	19.9 °F	78%	29.92 in	10.0 mi	WNW	10.4 mph	-	N/A



8:53 AM	26.1 °F	15.0 °F	19.9 °F	78%	29.96 in	10.0 mi	WNW	12.7 mph	-	N/A
9:53 AM	26.1 °F	16.2 °F	19.0 °F	75%	29.98 in	10.0 mi	WNW	10.4 mph	-	N/A
10:07 AM	26.1 °F	15.0 °F	19.0 °F	75%	29.94 in	10.0 mi	NW	12.7 mph	-	N/A
10:53 AM	27.0 °F	15.2 °F	19.9 °F	75%	29.99 in	10.0 mi	WNW	15.0 mph	-	N/A
11:14 AM	27.0 °F	15.6 °F	19.9 °F	75%	29.95 in	10.0 mi	WNW	13.8 mph	-	N/A
11:53 AM	27.0 °F	15.2 °F	19.0 °F	72%	29.98 in	10.0 mi	West	15.0 mph	-	N/A
12:53 PM	28.0 °F	18.1 °F	19.0 °F	69%	29.96 in	10.0 mi	WNW	11.5 mph	-	N/A
1:44 PM	28.0 °F	17.0 °F	19.0 °F	69%	29.92 in	10.0 mi	West	13.8 mph	-	N/A
1:53 PM	28.0 °F	17.0 °F	19.0 °F	69%	29.96 in	10.0 mi	WNW	13.8 mph	-	N/A
2:53 PM	28.0 °F	17.0 °F	19.0 °F	69%	29.96 in	10.0 mi	WNW	13.8 mph	-	N/A
3:53 PM	27.0 °F	14.7 °F	18.0 °F	69%	29.98 in	10.0 mi	West	16.1 mph	-	N/A
4:53 PM	26.1 °F	14.5 °F	18.0 °F	71%	30.00 in	10.0 mi	WNW	13.8 mph	-	N/A
5:53 PM	25.0 °F	15.5 °F	17.1 °F	72%	30.00 in	10.0 mi	West	9.2 mph	-	N/A
6:53 PM	24.1 °F	13.1 °F	16.0 °F	71%	30.01 in	10.0 mi	WNW	11.5 mph	-	N/A
7:53 PM	23.0 °F	13.9 °F	16.0 °F	74%	30.00 in	10.0 mi	West	8.1 mph	-	N/A
8:33 PM	24.1 °F	14.4 °F	16.0 °F	71%	29.95 in	10.0 mi	West	9.2 mph	-	N/A
8:42 PM	24.1 °F	13.7 °F	16.0 °F	71%	29.95 in	10.0 mi	WNW	10.4 mph	-	N/A
8:53 PM	24.1 °F	15.2 °F	16.0 °F	71%	29.99 in	10.0 mi	WNW	8.1 mph	-	N/A

9:53 PM	24.1 °F	13.1 °F	16.0 °F	71%	29.99 in	10.0 mi	WNW	11.5 mph	-	N/A
10:40 PM	23.0 °F	12.4 °F	16.0 °F	74%	29.95 in	10.0 mi	NW	10.4 mph	-	N/A
10:53 PM	23.0 °F	12.4 °F	16.0 °F	74%	29.99 in	10.0 mi	NW	10.4 mph	-	N/A
11:53 PM	23.0 °F	11.7 °F	14.0 °F	68%	29.98 in	10.0 mi	NW	11.5 mph	-	N/A

|

# Minneapolis Flying Cloud, MN

Flying Cloud

⌚ 8:54 AM CDT on April 11, 2017 [GMT -0500]

## Weather History for KFCM - December, 2016

December

16

2016

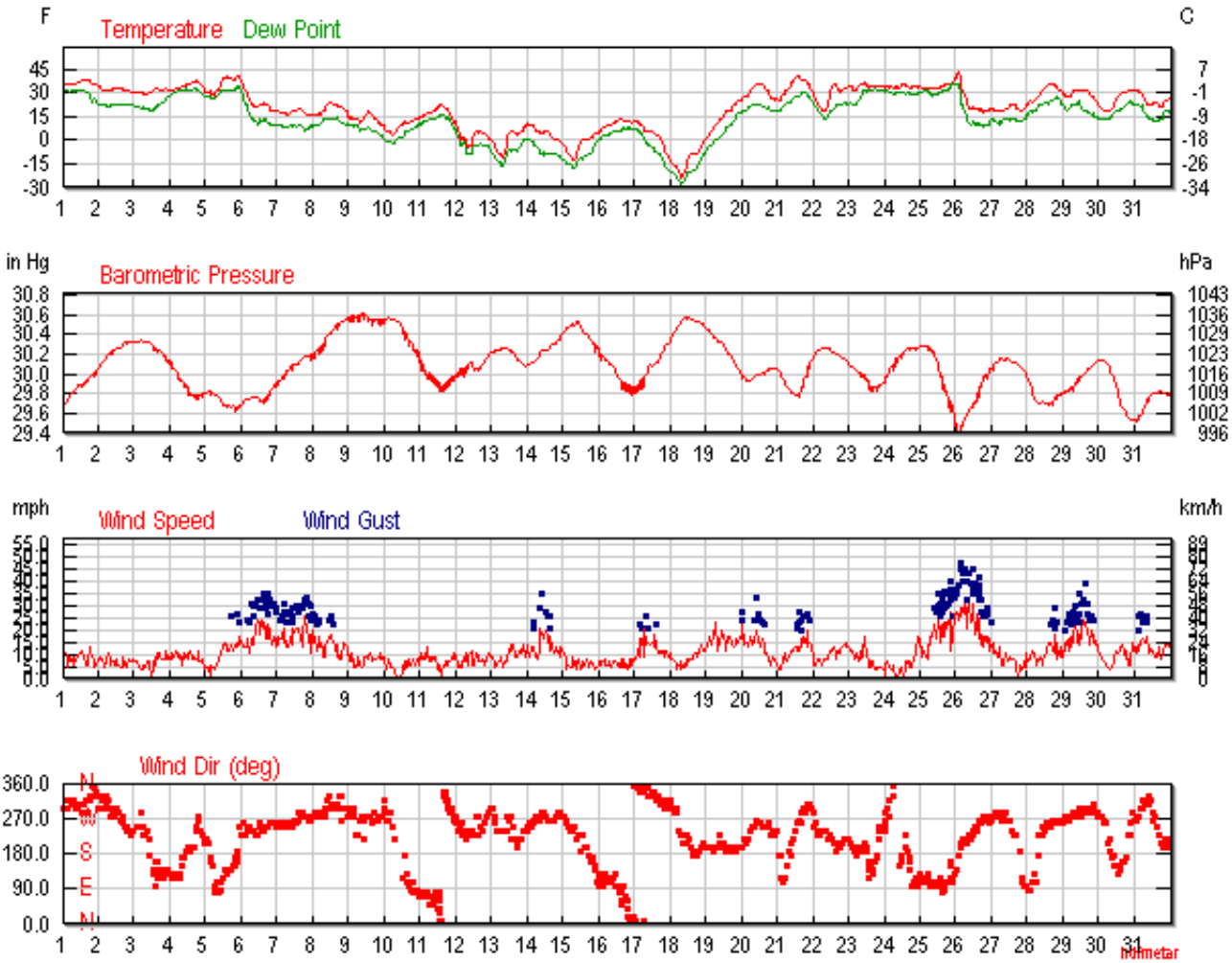
### View

Month of December, 2016

Daily	Weekly	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				43 °F	26 °F	0 °F	
Mean Temperature				36 °F	20 °F	-12 °F	
Min Temperature				34 °F	14 °F	-24 °F	
Degree Days							
Heating Degree Days [base 65]				77	44	29	1378
Cooling Degree Days [base 65]				0	0	0	0
Growing Degree Days [base 50]				0	0	0	0
Dew Point							
Dew Point				36 °F	13 °F	-29 °F	
Precipitation							
Precipitation				1.00 in	0.05 in	0.00 in	1.48 in

Snowdepth	-	-	-
Wind			
Wind	31 mph	11 mph	0 mph
Gust Wind	47 mph	26 mph	17 mph
Sea Level Pressure			
Sea Level Pressure	30.61 in	30.06 in	29.40 in

### Monthly Weather History Graph



### Search for Another Location

Airport or City:

KFCM

**Submit**

## Trip Planner

Search our weather history database for the weather conditions in past years. The results will help you decide how hot, cold, wet, or windy it might be!

Date:

December

16

**Submit**

## Astronomy

Dec. 16, 2016	Rise	Set
Actual Time	7:45 AM CST	4:33 PM CST
<u>Civil Twilight</u>	7:11 AM CST	5:07 PM CST
<u>Nautical Twilight</u>	6:34 AM CST	5:44 PM CST
<u>Astronomical Twilight</u>	5:59 AM CST	6:20 PM CST
Moon	7:59 PM CST [12/16]	9:53 AM CST [12/16]
<u>Length of Visible Light</u>	9h 55m	
<u>Length of Day</u>	8h 48m	

**Waning Gibbous, 90% of the Moon is Illuminated**

Dec 16	Dec 20	Dec 29	Jan 5	Jan 12
Waning Gibbous	Last Quarter	New	First Quarter	Full

## Daily Weather History & Observations

**2016    Temp. [°F]                      Dew Point [°F]                      Humidity [%]                      Sea Level Press. (in)                      Visibility (mi)**

Dec	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low
37	36	34	33	29	23	86	76	62	30.06	29.87	29.65	10	10	10	
34	32	30	23	23	21	75	68	64	30.33	30.24	30.07	10	10	10	
33	30	28	28	22	19	85	70	59	30.34	30.24	30.10	10	9	2	
37	34	30	33	31	28	96	88	79	30.10	29.88	29.74	10	5	1	
41	34	28	34	30	26	92	82	73	29.83	29.72	29.62	10	9	2	
35	26	18	27	13	9	72	66	60	29.91	29.77	29.71	10	9	6	
19	18	16	9	8	6	74	68	62	30.20	30.07	29.88	10	8	3	
24	20	15	15	12	9	81	73	62	30.57	30.34	30.15	10	7	2	
18	14	9	9	7	1	84	74	64	30.61	30.55	30.49	10	10	7	
14	8	3	10	4	-2	86	77	67	30.57	30.39	30.12	10	5	0	
21	16	10	16	13	7	86	81	78	30.14	29.94	29.83	10	3	0	
10	2	-5	5	-4	-9	91	78	67	30.21	30.07	29.96	10	10	6	
10	-2	-11	1	-8	-16	79	69	55	30.27	30.20	30.08	10	10	9	
10	5	-2	0	-7	-12	67	61	52	30.40	30.24	30.09	10	10	9	
5	-5	-13	0	-10	-18	84	70	57	30.52	30.39	30.20	10	8	1	
12	8	5	8	6	0	84	80	71	30.22	29.95	29.79	10	4	0	
12	0	-13	7	-3	-20	80	72	60	30.33	30.02	29.81	10	6	1	
0	-12	-24	-8	-20	-29	82	70	59	30.58	30.51	30.36	10	10	10	
25	13	1	17	6	-6	73	67	61	30.45	30.25	29.99	10	10	10	
36	30	25	23	20	18	75	67	57	30.06	30.00	29.92	10	10	10	
41	33	25	30	26	18	79	70	57	30.15	29.92	29.76	10	10	10	
35	27	19	24	20	14	88	72	54	30.27	30.21	30.10	10	10	8	
37	34	30	33	30	22	96	85	64	30.08	29.92	29.82	10	6	1	
36	34	33	32	30	28	96	86	78	30.28	30.14	29.90	9	6	2	
39	36	33	36	31	28	97	89	82	30.29	29.95	29.48	10	5	2	

43	30	17	36	13	9	86	68	62	30.06	29.76	29.40	10	8	2
23	20	18	16	13	9	78	73	68	30.16	30.10	29.98	10	9	2
36	30	23	27	23	16	79	72	61	29.93	29.75	29.69	10	10	10
32	28	21	25	20	14	79	69	57	30.14	29.95	29.81	10	9	2
32	25	18	25	18	13	85	76	66	30.14	29.83	29.53	10	10	9
30	26	21	23	17	12	75	70	60	29.82	29.71	29.51	10	10	6

# Minneapolis Flying Cloud, MN

Flying Cloud

© 8:53 AM CDT on April 11, 2017 [GMT -0500]

## Weather History for KFCM - January, 2017

January

16

2017

### View

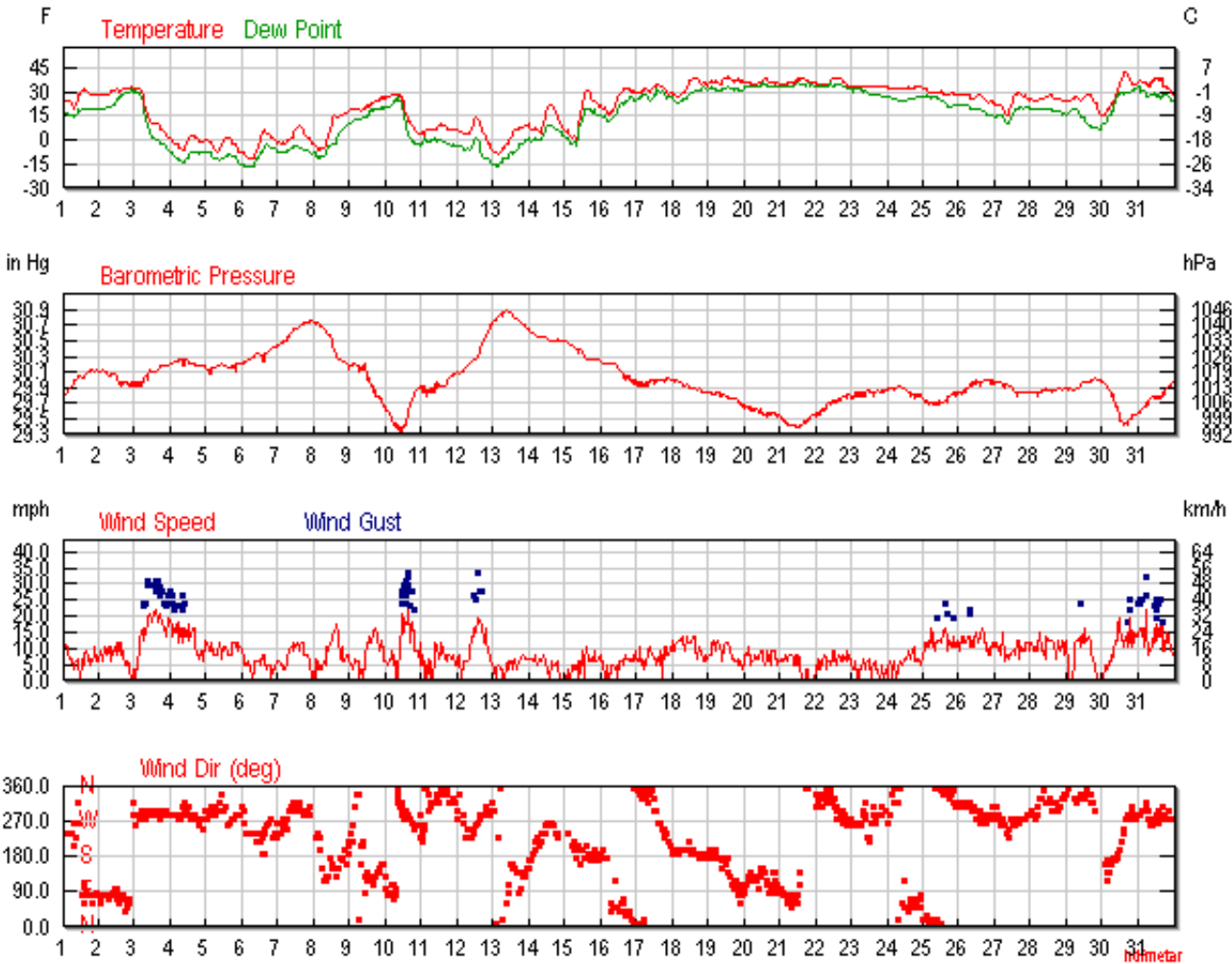
Month of January, 2017

Daily	Weekly	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				42 °F	27 °F	1 °F	
Mean Temperature				37 °F	21 °F	-3 °F	
Min Temperature				35 °F	15 °F	-11 °F	
Degree Days							
Heating Degree Days [base 65]				68	44	28	1375
Cooling Degree Days [base 65]				0	0	0	0
Growing Degree Days [base 50]				0	0	0	0
Dew Point							
Dew Point				36 °F	15 °F	-17 °F	
Precipitation							
Precipitation				0.11 in	0.01 in	0.00 in	0.37 in



Snowdepth	-	-	-	-
Wind				
Wind	24 mph	8 mph	0 mph	
Gust Wind	33 mph	23 mph	16 mph	
Sea Level Pressure				
Sea Level Pressure	30.89 in	30.00 in	29.35 in	

### Monthly Weather History Graph



### Search for Another Location

Airport or City:

KFCM

**Submit**

## Trip Planner

Search our weather history database for the weather conditions in past years. The results will help you decide how hot, cold, wet, or windy it might be!

Date:

January

16

**Submit**

## Astronomy

Jan. 16, 2017	Rise	Set
Actual Time	7:47 AM CST	5:00 PM CST
<u>Civil Twilight</u>	7:14 AM CST	5:33 PM CST
<u>Nautical Twilight</u>	6:38 AM CST	6:09 PM CST
<u>Astronomical Twilight</u>	6:03 AM CST	6:44 PM CST
Moon	10:02 PM CST [1/16]	10:13 AM CST [1/16]
<u>Length of Visible Light</u>	10h 18m	
<u>Length of Day</u>	9h 13m	

**Waning Gibbous, 79% of the Moon is Illuminated**

Jan 16	Jan 19	Jan 27	Feb 3	Feb 10
Waning Gibbous	Last Quarter	New	First Quarter	Full

## Daily Weather History & Observations

2017 Temp. [°F] Dew Point [°F] Humidity [%] Sea Level Press. [in] Visibility [mi]

Jan	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low
	32	26	19	20	18	14	81	69	61	30.12	30.01	29.81	10	10	10
	33	30	28	32	27	20	96	84	67	30.12	29.99	29.92	10	4	1
	32	16	1	31	12	-7	96	77	64	30.20	30.05	29.91	10	7	1
	3	-2	-6	-7	-10	-14	72	67	60	30.26	30.21	30.16	10	10	4
	1	-3	-8	-8	-11	-15	79	69	58	30.22	30.16	30.07	10	9	2
	6	-2	-11	-3	-10	-17	83	72	60	30.44	30.32	30.22	10	10	9
	9	4	-2	-4	-6	-9	79	69	53	30.75	30.63	30.44	10	10	8
	18	6	-6	11	-1	-11	83	69	45	30.74	30.45	30.13	10	10	10
	27	22	18	21	16	11	85	79	71	30.21	29.98	29.66	10	6	0
	28	16	3	27	17	-4	93	81	64	29.92	29.48	29.35	10	4	0
	10	6	3	2	-1	-4	87	73	63	30.09	29.91	29.79	10	6	1
	14	4	-6	2	-7	-15	66	60	44	30.72	30.34	30.08	10	10	10
	10	0	-9	1	-8	-16	72	65	55	30.89	30.79	30.65	10	10	10
	21	12	3	9	4	-1	84	71	58	30.63	30.54	30.49	10	10	8
	30	15	0	20	9	-4	95	77	64	30.49	30.34	30.24	10	8	5
	32	24	16	27	21	12	86	78	69	30.23	30.09	29.94	10	6	4
	35	32	28	32	28	24	93	86	75	30.02	29.97	29.92	10	5	2
	39	33	27	33	28	23	89	82	73	29.99	29.91	29.84	10	7	4
	39	37	35	33	32	31	89	82	76	29.83	29.76	29.65	10	7	2
	37	36	35	36	34	33	97	93	89	29.66	29.59	29.52	9	2	1
	37	36	35	36	35	34	100	94	89	29.55	29.45	29.39	7	2	0
	39	36	33	36	34	32	100	93	86	29.82	29.69	29.55	9	4	0
	34	34	33	32	30	27	96	89	78	29.87	29.82	29.77	10	5	1
	33	32	32	27	26	25	82	78	75	29.92	29.84	29.77	10	8	5

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32	30	28	28	25	21	89	82	69	29.85	29.73	29.67	10	5	0
28	26	23	22	19	14	78	74	68	30.01	29.93	29.81	10	10	10
30	23	16	21	17	11	81	75	66	29.98	29.89	29.80	10	10	8
28	26	24	20	18	16	81	74	69	29.89	29.86	29.79	10	10	9
28	22	15	19	13	7	75	62	43	30.02	29.94	29.86	10	10	10
42	29	16	34	25	10	93	80	62	29.96	29.63	29.42	10	8	2
39	34	28	33	28	24	86	75	62	29.97	29.77	29.57	10	9	0

# Minneapolis Flying Cloud, MN

Flying Cloud

© 8:55 AM CDT on April 11, 2017 [GMT -0500]

## Weather History for KFCM - February, 2017

February

16

2017

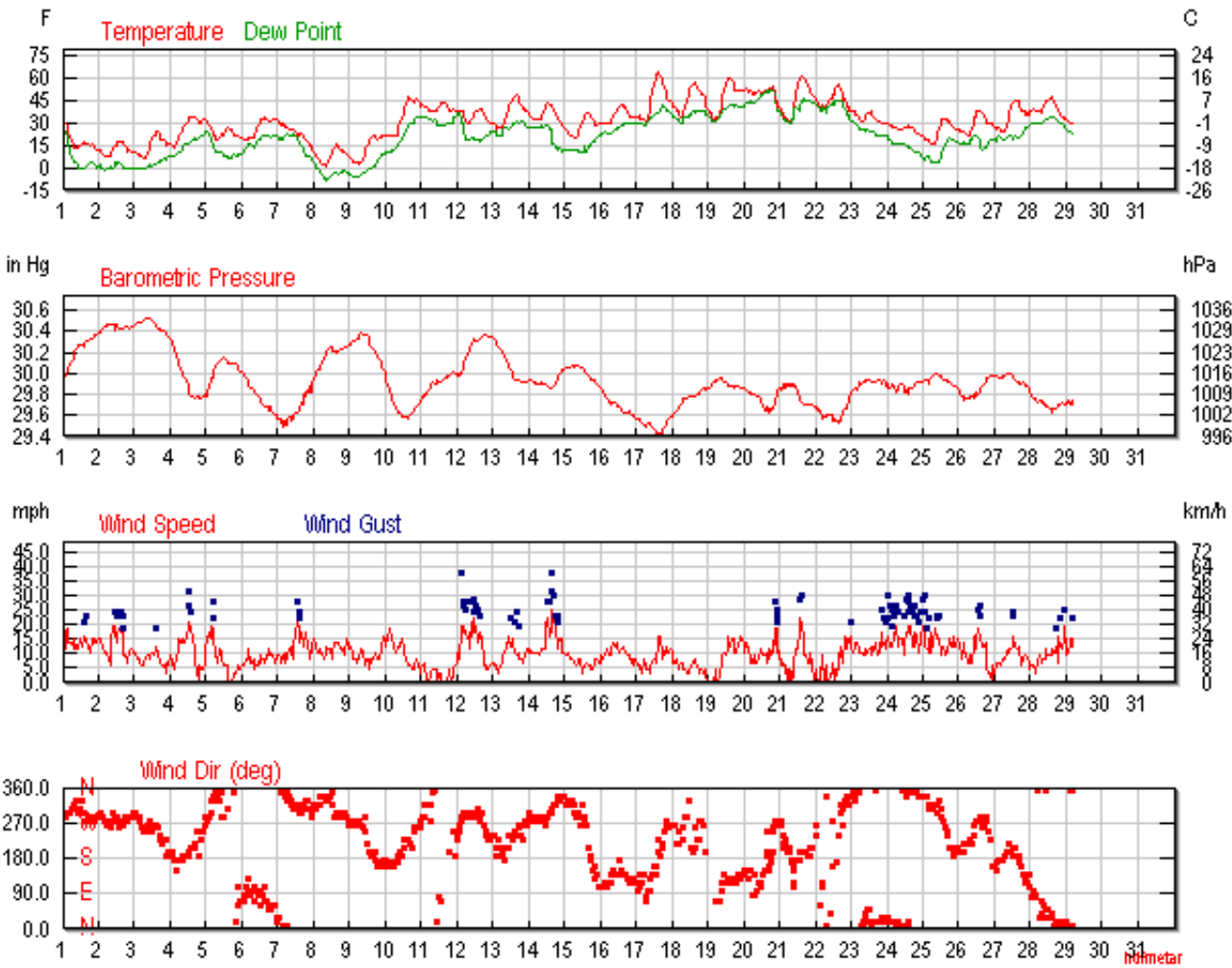
### View

Month of February, 2017

Daily	Weekly	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				63 °F	40 °F	15 °F	
Mean Temperature				48 °F	31 °F	8 °F	
Min Temperature				39 °F	22 °F	1 °F	
Degree Days							
Heating Degree Days [base 65]				57	34	18	958
Cooling Degree Days [base 65]				0	0	0	0
Growing Degree Days [base 50]				0	0	0	0
Dew Point							
Dew Point				52 °F	21 °F	-9 °F	
Precipitation							
Precipitation				0.66 in	0.03 in	0.00 in	0.70 in

Snowdepth	-	-	-
Wind			
Wind	25 mph	10 mph	0 mph
Gust Wind	38 mph	24 mph	17 mph
Sea Level Pressure			
Sea Level Pressure	30.53 in	29.92 in	29.40 in

### Monthly Weather History Graph



### Search for Another Location

Airport or City:

KFCM

**Submit**

## Trip Planner

Search our weather history database for the weather conditions in past years. The results will help you decide how hot, cold, wet, or windy it might be!

Date:

February

16

**Submit**

## Astronomy

Feb. 16, 2017	Rise	Set
Actual Time	7:12 AM CST	5:44 PM CST
<u>Civil Twilight</u>	6:42 AM CST	6:14 PM CST
<u>Nautical Twilight</u>	6:08 AM CST	6:48 PM CST
<u>Astronomical Twilight</u>	5:34 AM CST	7:22 PM CST
Moon	11:50 PM CST [2/16]	10:06 AM CST [2/16]
<u>Length of Visible Light</u>	11h 31m	
<u>Length of Day</u>	10h 31m	

**Waning Gibbous, 69%** of the Moon is Illuminated

Feb 16	Feb 18	Feb 26	Mar 5	Mar 12
Waning Gibbous	Last Quarter	New	First Quarter	Full

## Daily Weather History & Observations

2017 Temp. [°F] Dew Point [°F] Humidity [%] Sea Level Press. [in] Visibility [mi]

Feb	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low
30	21	12	24	7	-1	82	63	45	30.38	30.20	29.98	10	9	1	
17	12	7	3	1	-2	73	60	49	30.46	30.44	30.39	10	10	10	
24	15	6	8	2	-1	76	60	38	30.53	30.45	30.32	10	10	10	
34	23	12	24	15	7	77	63	50	30.31	29.93	29.77	10	10	10	
30	24	19	24	11	6	79	61	43	30.15	30.04	29.79	10	10	9	
33	26	19	22	18	10	81	69	61	29.99	29.76	29.59	10	9	7	
32	22	10	23	17	3	92	77	61	29.94	29.64	29.49	10	7	2	
15	8	1	2	-4	-9	73	59	43	30.27	30.18	29.97	10	10	10	
21	11	1	9	0	-6	69	56	40	30.38	30.25	30.00	10	10	10	
46	34	21	34	22	10	73	61	46	29.94	29.68	29.57	10	10	10	
43	40	37	35	31	28	93	71	56	30.02	29.91	29.77	10	9	4	
39	34	28	36	24	17	96	68	41	30.36	30.20	29.97	10	9	3	
48	36	25	31	27	21	85	68	50	30.33	30.06	29.91	10	10	9	
43	36	26	28	22	11	82	61	36	30.04	29.92	29.85	10	10	10	
36	28	19	21	14	10	72	58	34	30.08	30.00	29.86	10	10	10	
42	35	28	30	26	23	85	72	57	29.85	29.69	29.57	10	10	9	
63	46	30	42	34	28	92	67	37	29.59	29.50	29.40	10	9	6	
57	45	33	38	35	30	92	68	47	29.86	29.77	29.61	10	10	10	
59	46	32	42	38	31	96	73	49	29.96	29.89	29.85	10	9	6	
54	48	39	52	47	38	97	89	69	29.85	29.73	29.62	10	6	1	
61	46	30	46	36	29	100	86	47	29.90	29.83	29.67	10	4	0	
55	46	37	44	39	31	100	83	64	29.80	29.62	29.53	10	7	2	
37	32	28	31	25	21	79	72	57	29.94	29.90	29.80	10	10	10	
28	24	21	19	13	6	69	60	53	29.92	29.87	29.80	10	10	10	
32	24	15	20	10	3	72	58	40	29.99	29.93	29.83	10	10	10	



37	29	21	22	17	12	78	62	37	29.98	29.84	29.74	10	10	10
45	34	24	28	22	17	84	62	37	30.00	29.94	29.82	10	10	10
46	39	32	33	30	25	82	70	59	29.78	29.71	29.63	10	10	9

**APPENDIX B: TIME-LAPSE PHOTOGRAPHS OF LANE  
TREATMENTS (WINTER 2015-16)**

Lane and Date:	VF1 01/05/2016	Time:	11:25 am
Weather:	Sunny, light clouds	Wind: 15-20mph	28°F 18°F DP
Pavement Temp:	Truck: 3153	Snow:	Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Tandem axle, 10-wheeler, dozer plow, Joma cutting edge			

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Truck, 3 passes.



A) Pre plow



B) Post plow



C) 10 minutes post traffic



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic

Lane and Date:	VF2 01/05/2016	Time:	11:25 am
Weather:	Sunny, light clouds	Wind: 15-20mph	28°F 18°F DP
Pavement Temp:	Truck: 3153	Snow:	Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Tandem axle, 10-wheeler, bulldozer plow, Joma cutting edge			

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Car, 3 passes.



A) Post plow



B) Post traffic



C) 10 minutes post traffic



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic

Lane and Date:	VF3 01/05/2016	Time:	11:25 am
Weather:	Sunny, light clouds	Wind: 15-20mph	28°F 18°F DP
Pavement Temp:	Truck: 3153	Snow:	Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Tandem axle, 10-wheeler, bulldozer plow, Joma cutting edge			

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Car, 10 passes.



A) Post plow



B) Post traffic

No photo - camera malfunction



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic

Lane and Date:	VF4 01/05/2016	Time:	11:25 am
Weather:	Sunny, light clouds	Wind: 15-20mph	28°F 18°F DP
Pavement Temp:	Truck: 3153	Snow:	Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Tandem axle, 10-wheeler, bulldozer plow, Joma cutting edge			

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Truck, 10 passes.



A) Post plow



B) Post traffic



C) 10 minutes post traffic



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic

Lane and Date:	VF5 01/05/2016	Time:	11:25 am
Weather:	Sunny, light clouds	Wind: 15-20mph	28°F 18°F DP
Pavement Temp:	Truck: 3153	Snow:	Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Tandem axle, 10-wheeler, bulldozer plow, Joma cutting edge			

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: None.



A) Post plow

No traffic

B) Post traffic



C) 10 minutes post traffic



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic

Lane and Date:	VF6 01/05/2016	Time:	11:25 am
Weather:	Sunny, light clouds	Wind: 15-20mph	28°F 18°F DP
Pavement Temp:	Truck: 3153	Snow:	Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Tandem axle, 10-wheeler, bulldozer plow, Joma cutting edge			

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Car, 5 passes.



A) Post plow



B) Post traffic



C) 10 minutes post traffic



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic



Lane and Date:	VF7 01/05/2016	Time:	11:25 am
Weather:	Sunny, light clouds	Wind: 15-20mph	28°F 18°F DP
Pavement Temp:	Truck: 3153	Snow:	Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Tandem axle, 10-wheeler, bulldozer plow, Joma cutting edge			

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Truck, 5 passes.



A) Post plow



B) Post traffic



C) 10 minutes post traffic



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic

Lane and Date:	VF8 01/05/2016	Time:	11:25 am
Weather:	Sunny, light clouds	Wind: 15-20mph	28°F 18°F DP
Pavement Temp:	Truck: 3153	Snow:	Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Tandem axle, 10-wheeler, bulldozer plow, Joma cutting edge			

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Car, 1 pass.



A) Post plow



B) Post traffic



C) 10 minutes post traffic



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic

Lane and Date:	VF9 01/05/2016	Time:	11:25 am
Weather:	Sunny, light clouds	Wind: 15-20mph	28°F 18°F DP
Pavement Temp:	Truck: 3153	Snow:	Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Tandem axle, 10-wheeler, bulldozer plow, Joma cutting edge			

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Truck, 1 pass.



A) Post plow



B) Post traffic



C) 10 minutes post traffic



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic

Lane and Date:	VF1 02/05/2016	Time: 11:50 pm
Weather:	Sunny, clear	Wind: 12-15mph 28°F 15°F DP
Pavement Temp:	Truck: 0401	Snow: Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Plow not provided. Winter Polarflex cutting edge.		

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Truck, 3 passes.



A) Pre plow



B) Post plow



C) 10 minutes post traffic



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic

Lane and Date:	VF2 02/05/2016	Time:	11:50pm
Weather:	Sunny, clear	Wind: 12-15mph	28°F 15°F DP
Pavement Temp:	Truck: 1313	Snow: Soft, moist, clear white, rounded	
Truck type, Plow type, Cutting Edge: Henderson Two Way. Polarflex cutting edge.			

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Car, 3 passes.

No Photo Available/Malfunction



B) Post plow

A) Pre plow

No Photo Available/Malfunction

No Photo Available/Malfunction

C) 10 minutes post traffic

D) 20 minutes post traffic

No Photo Available/Malfunction

No Photo Available/Malfunction

E) 30 minutes post traffic

F) 60 minutes post traffic

Lane and Date:	VF3 02/05/2016	Time: 11:50 pm
Weather:	Sunny, clear	Wind: 12-15mph 28°F 15°F DP
Pavement Temp:	Truck: 0702	Snow: Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Falls Model 312, Kennametal cutting edge		

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Car, 10 passes.



A) Pre plow



B) Post plow



C) 10 minutes post traffic



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic

Lane and Date:	VF4 02/05/2016	Time: 11:50 pm
Weather:	Sunny, clear	Wind: 12-15mph 28°F 15°F DP
Pavement Temp:	Truck: 1311	Snow: Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Henderson Polyflex, Joma cutting edge.		

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Truck, 10 passes.

No Photo Available/Malfunction



B) Post plow

A) Pre plow



C) 10 minutes post traffic

No Photo Available/Malfunction

D) 20 minutes post traffic

No Photo Available/Malfunction

No Photo Available/Malfunction

E) 30 minutes post traffic

F) 60 minutes post traffic

Lane and Date:	VF5 02/05/2016	Time: 11:50 pm
Weather:	Sunny, clear	Wind: 12-15mph 28°F 15°F DP
Pavement Temp:	Truck: 1501	Snow: Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Falls dozer. Kennametal cutting edge.		

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: None.



A) Pre plow



B) Post plow



C) 10 minutes post traffic



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic



Lane and Date:	VF6 02/05/2016	Time: 11:50 pm
Weather:	Sunny, clear	Wind: 12-15mph 28°F 15°F DP
Pavement Temp:	Truck: 0502	Snow: Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: DOK plow. Kennametal cutting edge.		

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Truck, 5 passes.

No Photo Available/Malfunction

No Photo Available/Malfunction

A) Pre plow

B) Post plow

No Photo Available/Malfunction

No Photo Available/Malfunction

C) 10 minutes post traffic

D) 20 minutes post traffic

No Photo Available/Malfunction

No Photo Available/Malfunction

E) 30 minutes post traffic

F) 60 minutes post traffic

Lane and Date:	VF7 02/05/2016	Time: 11:50 pm
Weather:	Sunny, clear	Wind: 12-15mph 28°F 15°F DP
Pavement Temp:	Truck: 0703	Snow: Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Falls stationary plow, Joma cutting edge.		

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Car, 5 passes.



A) Pre plow



B) Post plow



C) 10 minutes post traffic



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic

Lane and Date:	VF8 02/05/2016	Time: 11:50 pm
Weather:	Sunny, clear	Wind: 12-15mph 28°F 15°F DP
Pavement Temp:	Truck: 1408	Snow: Soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Towmaster reversible plow, Joma cutting edge.		

Deicer 600 lbs/LM with 15 gal/ton RG8 10%. Traffic: Truck, 1 pass.



A) Pre plow



B) Post plow

No Photo Available/Malfunction

No Photo Available/Malfunction

C) 10 minutes post traffic

D) 20 minutes post traffic

No Photo Available/Malfunction

No Photo Available/Malfunction

E) 30 minutes post traffic

F) 60 minutes post traffic

Lane and Date:	VF9 02/05/2016	Time: 11:46 am	-	3:08pm
Weather:	Sunny, clear	Wind: 12-15mph	28°F	15°F DP
Pavement Temp:	Truck: 0901	Snow: Soft, moist, clear white, rounded		
Truck type, Plow type, Cutting Edge: Falls articulating plow, Joma cutting edge.				

Traffic type and number of passes: Car – 1 Pass



A) Pre plow



B) Post plow



C) 10 minutes post traffic



D) 20 minutes post traffic



E) 30 minutes post traffic



F) 60 minutes post traffic

Lane and Date:	CP 1A 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Rock Salt – hand distribution

Prewet: RG8 10%

Traffic: None



A) Post-plow



B) Treatment/Traffic



C) 10 minutes post-treatment/traffic

No Photo

D) 20 minutes post-treatment/traffic

No Photo

E) 30 minutes post-treatment/traffic



F) 60 minutes post-treatment/traffic

Lane and Date:	CP 1B 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Magnesium Chloride – hand distribution

Prewet: RG8 10%

Traffic: None



A) Post-plow



B) Treatment/Traffic



C) 10 minutes post-treatment/traffic

No Photo

D) 20 minutes post-treatment/traffic

No Photo

E) 30 minutes post-treatment/traffic



F) 60 minutes post-treatment/traffic

Lane and Date:	CP 1C 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Calcium Chloride – hand distribution

Prewet: RG8 10%

Traffic: None



A) Post-plow



B) Treatment/Traffic



C) 10 minutes post-treatment/traffic

No Photo

D) 20 minutes post-treatment/traffic

No Photo

No Photo

E) 30 minutes post-treatment/traffic

F) 60 minutes post-treatment/traffic

Lane and Date:	CP 1D 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Ice Slicer – hand distribution

Prewet: RG8 10%

Traffic: None



A) Post-plow



B) Treatment/Traffic

No Photo

No Photo

C) 10 minutes post-treatment/traffic

D) 20 minutes post-treatment/traffic

No Photo

No Photo

E) 30 minutes post-treatment/traffic

F) 60 minutes post-treatment/traffic



Lane and Date:	CP 1D 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Ice Melter – hand distribution

Prewet: RG8 10%

Traffic: None



A) Post-plow



B) Treatment/Traffic

No Photo

No Photo

C) 10 minutes post-treatment/traffic

D) 20 minutes post-treatment/traffic

No Photo

No Photo

E) 30 minutes post-treatment/traffic

F) 60 minutes post-treatment/traffic

Lane and Date:	CP 2A 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Ice Melter – hand distribution

Prewet: None

Traffic: None



A) Post-plow



B) Treatment/Traffic



C) 10 minutes post-treatment/traffic



D) 20 minutes post-treatment/traffic



E) 30 minutes post-treatment/traffic



F) 60 minutes post-treatment/traffic

Lane and Date:	CP 2B 02/11/2016	Time:	11:00 am
Weather:	Sunny, clouds mixed	Wind:	8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow:	soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge			

Treatment: Ice Slicer – hand distribution

Prewet: None

Traffic: None



A) Post-plow



B) Treatment/Traffic



C) 10 minutes post-treatment/traffic



D) 20 minutes post-treatment/traffic



E) 30 minutes post-treatment/traffic



F) 60 minutes post-treatment/traffic

Lane and Date:	CP 2C 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Calcium Chloride – hand distribution

Prewet: None

Traffic: None



A) Post-plow



B) Treatment/Traffic



C) 10 minutes post-treatment/traffic



D) 20 minutes post-treatment/traffic



E) 30 minutes post-treatment/traffic



F) 60 minutes post-treatment/traffic

Lane and Date:	CP 2D 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Magnesium Chloride – hand distribution

Prewet: None

Traffic: None



A) Post-plow



B) Treatment/Traffic



C) 10 minutes post-treatment/traffic



D) 20 minutes post-treatment/traffic



E) 30 minutes post-treatment/traffic



F) 60 minutes post-treatment/traffic

Lane and Date:	CP 2E 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Rock Salt – hand distribution

Prewet: None

Traffic: None



A) Post-plow



B) Treatment/Traffic



C) 10 minutes post-treatment/traffic



D) 20 minutes post-treatment/traffic



E) 30 minutes post-treatment/traffic



F) 60 minutes post-treatment/traffic

Lane and Date:	CP 3A 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Rock Salt – hand distribution

Prewet: RG8 10%

Traffic: Car - 5 passes

No Photo

No Photo

A) Post-plow

B) Treatment/Traffic

No Photo

No Photo

C) 10 minutes post-treatment/traffic

D) 20 minutes post-treatment/traffic

No Photo



E) 30 minutes post-treatment/traffic

F) 60 minutes post-treatment/traffic

Lane and Date:	CP 3B 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Magnesium Chloride – hand distribution

Prewet: RG8 10%

Traffic: Car - 5 passes

No Photo

No Photo

A) Post-plow

B) Treatment/Traffic

No Photo

No Photo

C) 10 minutes post-treatment/traffic

D) 20 minutes post-treatment/traffic

No Photo



E) 30 minutes post-treatment/traffic

F) 60 minutes post-treatment/traffic



Lane and Date:	CP 3C 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Calcium Chloride – hand distribution

Prewet: RG8 10%

Traffic: Car - 5 passes

No Photo

No Photo

A) Post-plow

B) Treatment/Traffic

No Photo

No Photo

C) 10 minutes post-treatment/traffic

D) 20 minutes post-treatment/traffic

No Photo



E) 30 minutes post-treatment/traffic

F) 60 minutes post-treatment/traffic

Lane and Date:	CP 3D 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Ice Slicer – hand distribution

Prewet: RG8 10%

Traffic: Car - 5 passes

No Photo

No Photo

A) Post-plow

B) Treatment/Traffic

No Photo

No Photo

C) 10 minutes post-treatment/traffic

D) 20 minutes post-treatment/traffic

No Photo



E) 30 minutes post-treatment/traffic

F) 60 minutes post-treatment/traffic

Lane and Date:	CP 3E 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Ice Melter – hand distribution

Prewet: RG8 10%

Traffic: Car - 5 passes

No Photo

No Photo

A) Post-plow

B) Treatment/Traffic

No Photo

No Photo

C) 10 minutes post-treatment/traffic

D) 20 minutes post-treatment/traffic

No Photo



E) 30 minutes post-treatment/traffic

F) 60 minutes post-treatment/traffic

Lane and Date:	CP 4A 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Ice Melter – hand distribution

Prewet: None

Traffic: Car – 5 Passes



A) Post-plow



B) Treatment/Traffic



C) 10 minutes post-treatment/traffic



D) 20 minutes post-treatment/traffic



E) 30 minutes post-treatment/traffic



F) 60 minutes post-treatment/traffic

Lane and Date:	CP 4B 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Ice Slicer – hand distribution

Prewet: None

Traffic: Car – 5 Passes



A) Post-plow



B) Treatment/Traffic



C) 10 minutes post-treatment/traffic



D) 20 minutes post-treatment/traffic



E) 30 minutes post-treatment/traffic



F) 60 minutes post-treatment/traffic

Lane and Date:	CP 4C 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Calcium Chloride – hand distribution

Prewet: None

Traffic: Car – 5 Passes



A) Post-plow



B) Treatment/Traffic



C) 10 minutes post-treatment/traffic



D) 20 minutes post-treatment/traffic



E) 30 minutes post-treatment/traffic



F) 60 minutes post-treatment/traffic

Lane and Date:	CP 4D 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Magnesium Chloride – hand distribution

Prewet: None

Traffic: Car – 5 Passes



A) Post-plow



B) Treatment/Traffic



C) 10 minutes post-treatment/traffic



D) 20 minutes post-treatment/traffic



E) 30 minutes post-treatment/traffic



F) 60 minutes post-treatment/traffic

Lane and Date:	CP 4E 02/11/2016	Time: 11:00 am
Weather:	Sunny, clouds mixed	Wind: 8-12 mph 11°F DP -2°F
Pavement Temp:	Truck: 214516	Snow: soft, moist, clear white, rounded
Truck type, Plow type, Cutting Edge: Single axle, dozer plow with wing, Joma cutting edge		

Treatment: Rock Salt – hand distribution

Prewet: None

Traffic: Car – 5 Passes



A) Post-plow



B) Treatment/Traffic



C) 10 minutes post-treatment/traffic



D) 20 minutes post-treatment/traffic



E) 30 minutes post-treatment/traffic



F) 60 minutes post-treatment/traffic



**APPENDIX C: TIME-LAPSE PHOTOGRAPHS OF LANE  
TREATMENTS (WINTER 2016-17)**

Lane & Date: CP1A 01/19/2017

Time: 11:54 AM

Weather: Clear and sunny; 35°F

Wind: little to none.

Pavement Temp: 32°F

Truck: 214516

Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



Traffic 20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: CP1B 01/19/2017

Time: 11:54 AM

Weather: Clear and sunny; 35°F

Wind: little to none.

Pavement Temp: 32°F

Truck: 214516

Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



Traffic 20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: CP1C 01/19/2017

Time: 11:54 AM

Weather: Clear and sunny; 35°F

Wind: little to none.

Pavement Temp: 32°F

Truck: 214516

Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



Traffic 20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: CP1D 01/19/2017

Time:

Weather: Clear and sunny; 35°F

Wind: little to none.

Pavement Temp: 32°F

Truck: 214516

Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



Traffic 20 minutes after plowing



30 minutes after plowing



1 hour after traffic

Lane & Date: CP2A 01/19/2017

Time: 11:55 AM

Weather: Clear and sunny; 35°F

Wind: little to none.

Pavement Temp: 32°F

Truck: 214516

Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: CP2B 01/19/2017

Time: 11:55 AM

Weather: Clear and sunny; 35°F

Wind: little to none.

Pavement Temp: 32°F

Truck: 214516

Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: CP2C 01/19/2017		Time: 11:54 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.





Lane & Date: CP3A 01/19/2017

Time: 11:57 AM

Weather: Clear and sunny; 35°F

Wind: little to none.

Pavement Temp: 32°F

Truck: 214516

Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



30 minutes after plowing



Traffic 40 minutes after plowing



1 hour after plowing

Lane & Date: CP3B 01/19/2017		Time: 11:57 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Lane & Date: CP3C 01/19/2017

Time: 11:57 AM

Weather: Clear and sunny; 35°F

Wind: little to none.

Pavement Temp: 32°F

Truck: 214516

Snow: Very dry, crusty, hard. 4 inches.



Lane & Date: CP4B 01/19/2017

Time: 11:58 AM

Weather: Clear and sunny; 35°F

Wind: little to none.

Pavement Temp: 32°F

Truck: 214516

Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



Traffic Immediately after plowing



10 minutes after plowing



30 minutes after traffic



60 minutes after traffic

Lane & Date: CP4C 01/19/2017		Time: 11:58 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



Traffic immediately after plowing



10 minutes after traffic

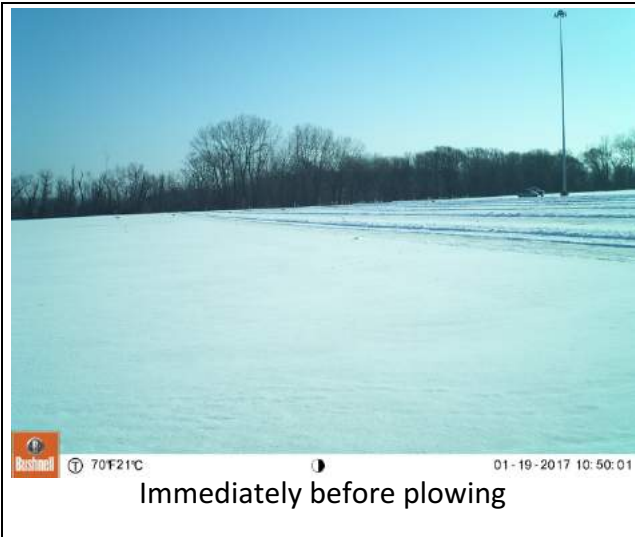


30 minutes after traffic



60 minutes after traffic

Lane & Date: VF1A	01/19/2017	Time: 10:49 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Lane & Date: VF1B	01/19/2017	Time: 10:49 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



30 minutes after plowing



1 hour after plowing



2 hours after plowing



3 hours after plowing

Lane & Date: VF2A	01/19/2017	Time: 10:47 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



Traffic immediately after plowing



30 minutes after plowing



1 hour after plowing



2 hours after plowing



Lane & Date: VF2B	01/19/2017	Time: 10:47 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Traffic 5 minutes after plowing



10 minutes after plowing



20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: VF3A	01/19/2017	Time: 10:45 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



Traffic 20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: VF3B	01/19/2017	Time: 10:45 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



50°F 10°C 01-19-2017 10:47:15

Immediately before plowing



50°F 10°C 01-19-2017 10:48:00

Immediately after plowing



51°F 10°C 01-19-2017 10:58:00

10 minutes after plowing



51°F 10°C 01-19-2017 11:06:22

Traffic 20 minutes after plowing



50°F 10°C 01-19-2017 11:18:00

30 minutes after plowing



50°F 10°C 01-19-2017 11:48:00

1 hour after plowing

Lane & Date: VF4A	01/19/2017	Time: 10:44 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



30 minutes after plowing

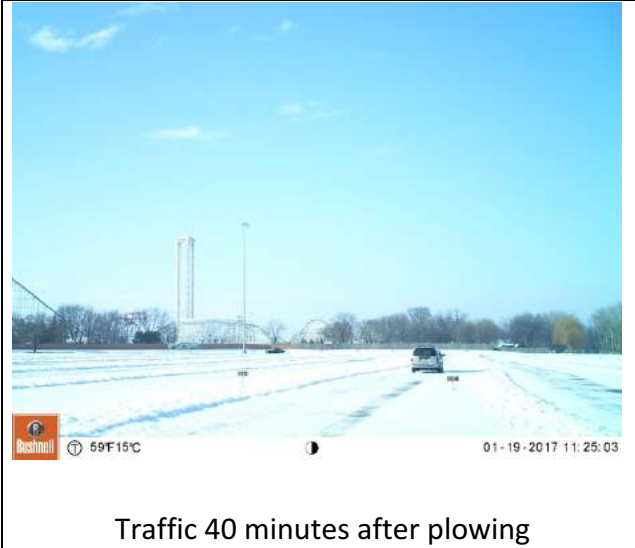
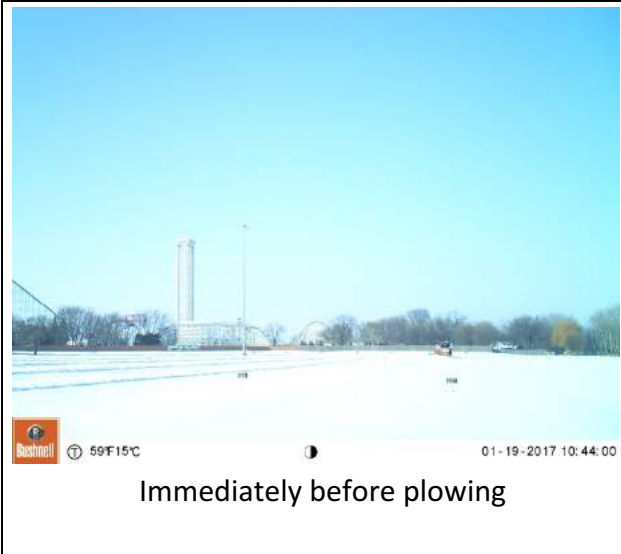


Traffic 40 minutes after plowing



1 hour after plowing

Lane & Date: VF4B	01/19/2017	Time: 10:44 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Lane & Date: VF5A	01/19/2017	Time: 10:42 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing

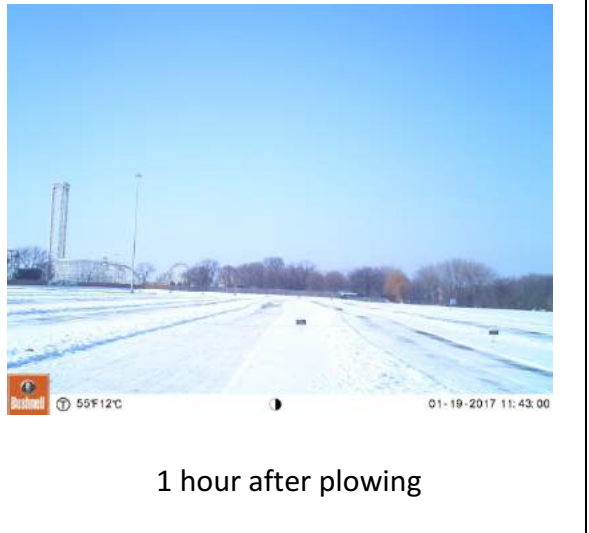
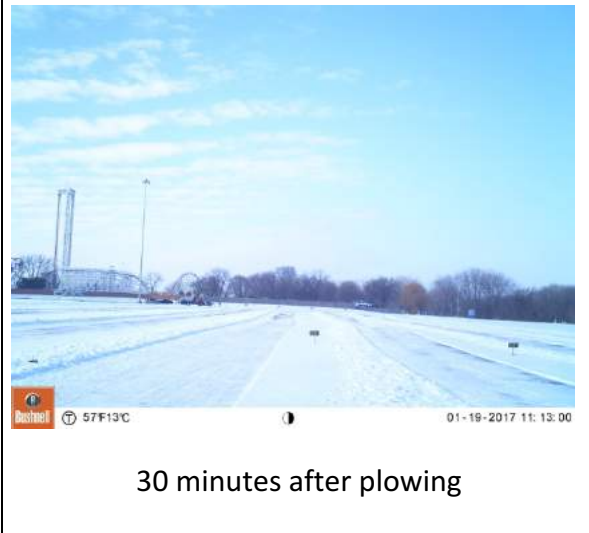
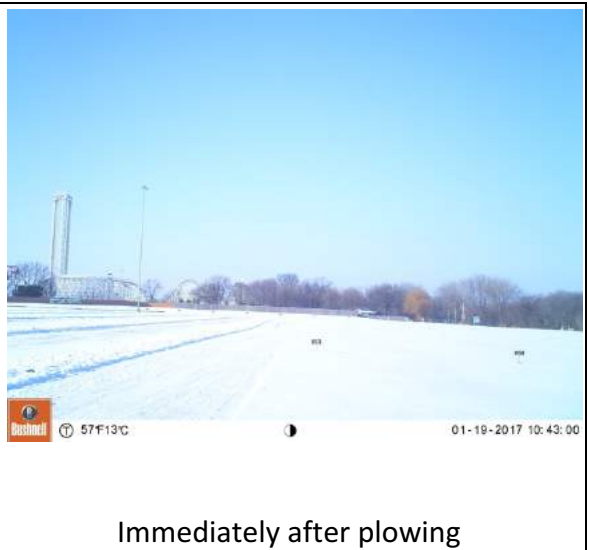
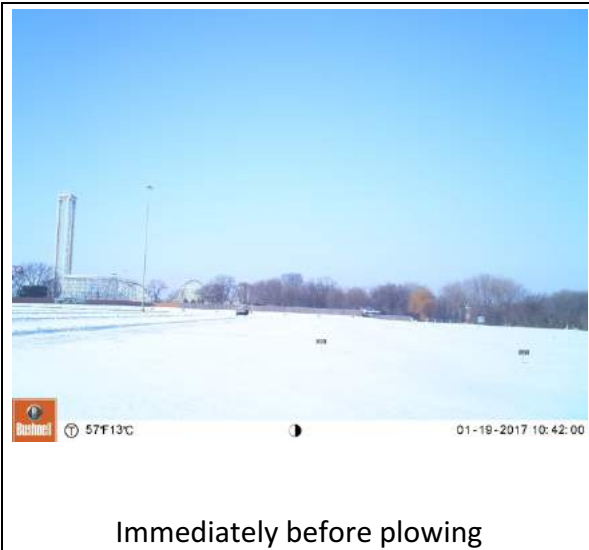


30 minutes after plowing



1 hour after plowing

Lane & Date: VF5B	01/19/2017	Time: 10:42 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Lane & Date: VF6A	01/19/2017	Time: 10:34 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Bushnell 62°F16°C 01-19-2017 10:34:45

Immediately before plowing



Bushnell 62°F18°C 01-19-2017 10:35:27

Immediately after plowing



Bushnell 62°F18°C 01-19-2017 10:36:31

Traffic 10 minutes after plowing



Bushnell 60°F15°C 01-19-2017 10:44:27

10 minutes after plowing



Bushnell 59°F15°C 01-19-2017 11:04:27

30 minutes after plowing



Bushnell 53°F11°C 01-19-2017 11:34:27

1 hour after plowing



Lane & Date: VF6B	01/19/2017	Time: 10:34 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



Traffic immediately after plowing



10 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: VF7A	01/19/2017	Time: 10:37 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



Traffic 20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: VF7B	01/19/2017	Time: 10:37 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: VF8A	01/19/2017	Time: 10:39 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



30 minutes after plowing



Traffic 40 minutes after plowing



1 hour after plowing

Lane & Date: VF8B	01/19/2017	Time: 10:39 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



30 minutes after plowing



Traffic 40 minutes after plowing



1 hour after plowing

Lane & Date: VF9A	01/19/2017	Time: 10:40 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing

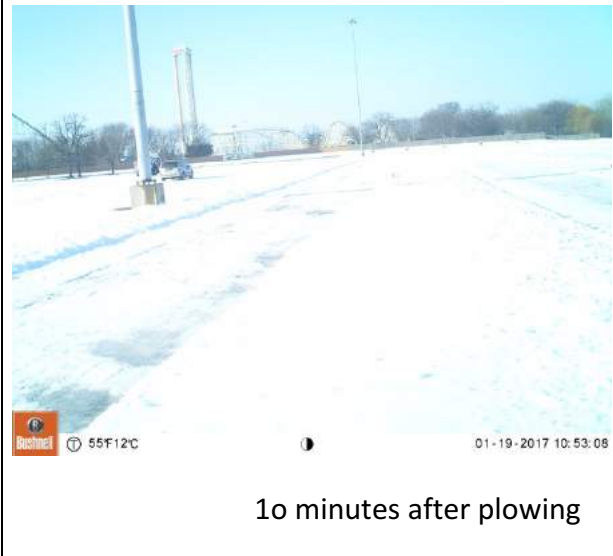


30 minutes after plowing



1 hour after plowing

Lane & Date: VF9B	01/19/2017	Time: 10:40 AM
Weather: Clear and sunny; 35°F		Wind: little to none.
Pavement Temp: 32°F	Truck: 214516	Snow: Very dry, crusty, hard. 4 inches.



Lane & Date: CP1A 01/26/2017

Time: 11:19 AM

Weather: Clear and sunny; 25°F

Wind: little to none.

Pavement Temp: 26°F

Truck: 214516

Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing



30 minutes after plowing



1 hour after plowing



Lane & Date: CP1B 01/26/2017

Time: 11:19 AM

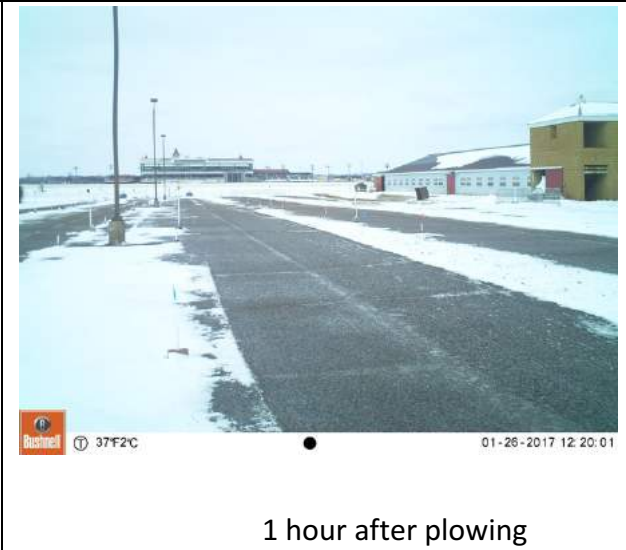
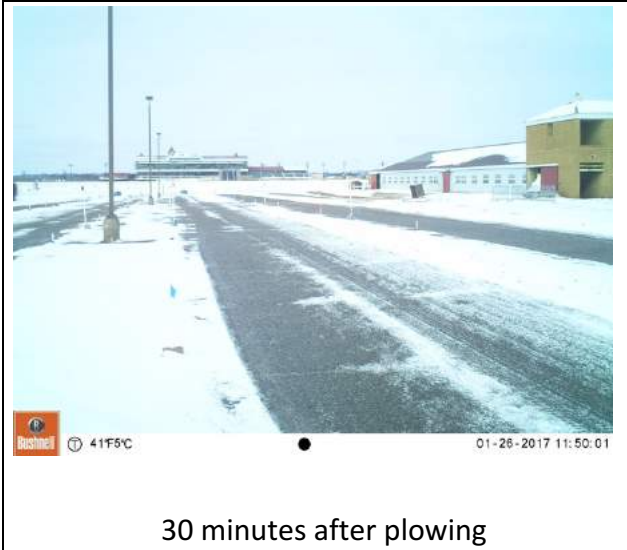
Weather: Clear and sunny; 25°F

Wind: little to none.

Pavement Temp: 26°F

Truck: 214516

Snow: Thin, moist, soft. 1 inch.



Lane & Date: CP1C 01/26/2017	Time: 11:19 AM
Weather: Clear and sunny; 25°F	Wind: little to none.
Pavement Temp: 26°F	Truck: 214516      Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: CP1D 01/26/2017

Time: 11:19 AM

Weather: Clear and sunny; 25°F

Wind: little to none.

Pavement Temp: 26°F

Truck: 214516

Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: CP2A 01/26/2017

Time: 11:20 AM

Weather: Clear and sunny; 25°F

Wind: little to none.

Pavement Temp: 26°F

Truck: 214516

Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing



30 minutes after plowing



1 hour after plowing'

Lane & Date: CP2C	01/26/2017	Time: 11:20 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: CP2E	01/26/2017	Time: 11:20 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: CP3A	01/26/2017	Time: 11:21 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



Traffic immediately after plowing



10 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: CP3C	01/26/2017	Time: 11:21 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



Traffic immediately before plowing



10 minutes after plowing



30 minutes after plowing



1 hour after plowing



Lane & Date: CP4A	01/26/2017	Time: 11:23 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



Traffic immediately after plowing



10 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: CP4C	01/26/2017	Time: 11:23 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



Traffic immediately after plowing



10 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: CP4E	01/26/2017	Time: 11:23 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



53°F11°C 01-26-2017 11:22:58

Immediately before plowing



53°F11°C 01-26-2017 11:23:58

Immediately after plowing



53°F11°C 01-26-2017 11:25:36

Traffic immediately after plowing



48°F8°C 01-26-2017 11:34:58

10 minutes after plowing



44°F8°C 01-26-2017 11:54:58

30 minutes after plowing



41°F5°C 01-26-2017 12:24:57

1 hours after plowing

Lane & Date: VF1A	01/26/2017	Time: 12:02 PM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Bushnell 44°F/6°C 01-26-2017 12:02:40

Immediately before plowing



Bushnell 44°F/6°C 01-26-2017 12:03:01

Immediately after plowing



Bushnell 46°F/7°C 01-26-2017 12:04:34

Traffic immediately after plowing



Bushnell 44°F/6°C 01-26-2017 12:13:01

10 minutes after plowing



Bushnell 44°F/6°C 01-26-2017 12:23:01

20 minutes after plowing



Bushnell 42°F/5°C 01-26-2017 13:03:01

1 hour after plowing

Lane & Date: VF1B	01/26/2017	Time: 12:02 PM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



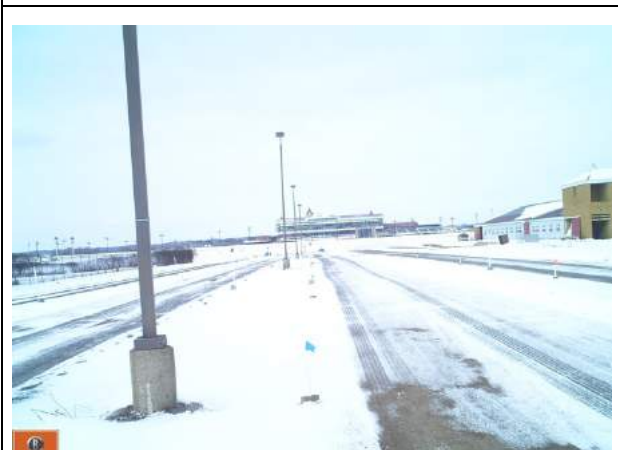
Bushnell 55°F/12°C 01-26-2017 11:19:03

Immediately before plowing



Bushnell 53°F/11°C 01-26-2017 11:21:03

Immediately after plowing



Bushnell 48°F/8°C 01-26-2017 11:32:03

10 minutes after plowing



Bushnell 44°F/6°C 01-26-2017 11:41:03

20 minutes after plowing



Bushnell 42°F/5°C 01-26-2017 11:51:03

30 minutes after plowing



Bushnell 41°F/5°C 01-26-2017 12:21:01

1 hour after plowing

Lane & Date: VF2A	01/26/2017	Time: 12:00 PM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



44°F/8°C 01-26-2017 12:01:29

Immediately before plowing



44°F/8°C 01-26-2017 12:02:15

Immediately after plowing



44°F/8°C 01-26-2017 12:12:15

10 minutes after plowing



42°F/5°C 01-26-2017 12:22:30

20 minutes after plowing



42°F/5°C 01-26-2017 12:34:15

30 minutes after plowing



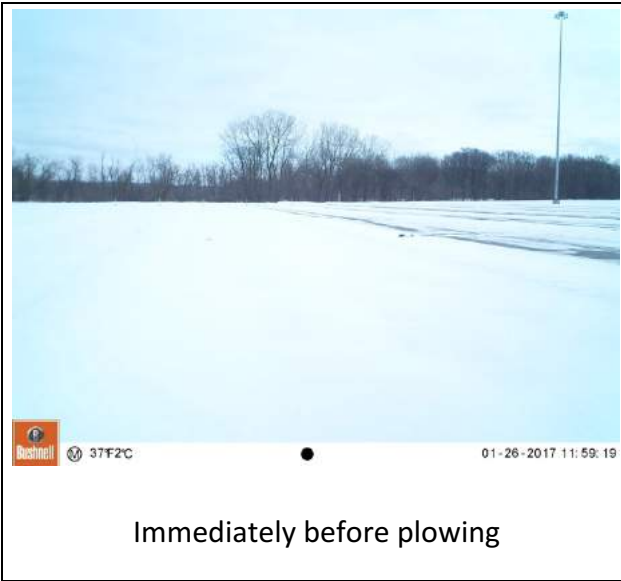
41°F/5°C 01-26-2017 13:04:15

1 hour after plowing

Lane & Date: VF2B	01/26/2017	Time: 12:00 PM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Lane & Date: VF3A	01/26/2017	Time: 11:58 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.





Lane & Date: VF3B	01/26/2017	Time: 11:58 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



Traffic 20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: VF4A	01/26/2017	Time: 11:55 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



Traffic immediately after plowing



10 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: VF4B	01/26/2017	Time: 11:55 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Bushnell 41°F5°C 01-26-2017 11:55:00

Immediately before plowing



Bushnell 42°F5°C 01-26-2017 11:56:00

Immediately after plowing



Bushnell 42°F5°C 01-26-2017 11:57:37

Traffic immediately after plowing



Bushnell 41°F5°C 01-26-2017 12:06:00

10 minutes after plowing



Bushnell 41°F5°C 01-26-2017 12:28:00

30 minutes after plowing



Bushnell 41°F5°C 01-26-2017 12:56:00

1 hour after plowing

Lane & Date: VF5A	01/26/2017	Time: 11:53 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: VF5B	01/26/2017	Time: 11:53 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: VF6A	01/26/2017	Time: 11:46 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



Traffic immediately after plowing



10 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: VF6B	01/26/2017	Time: 11:46 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



Traffic immediately after plowing



10 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: VF7A	01/26/2017	Time: 11:48 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing



30 minutes after plowing



1 hour after plowing



Lane & Date: VF8A	01/26/2017	Time: 11:50 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



Traffic 20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: VF8B	01/26/2017	Time: 11:50 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



Traffic 20 minutes after plowing



30 minutes after plowing



1 hour after plowing

Lane & Date: VF9A	01/26/2017	Time: 11:51 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



Immediately before plowing



Immediately after plowing



10 minutes after plowing



20 minutes after plowing

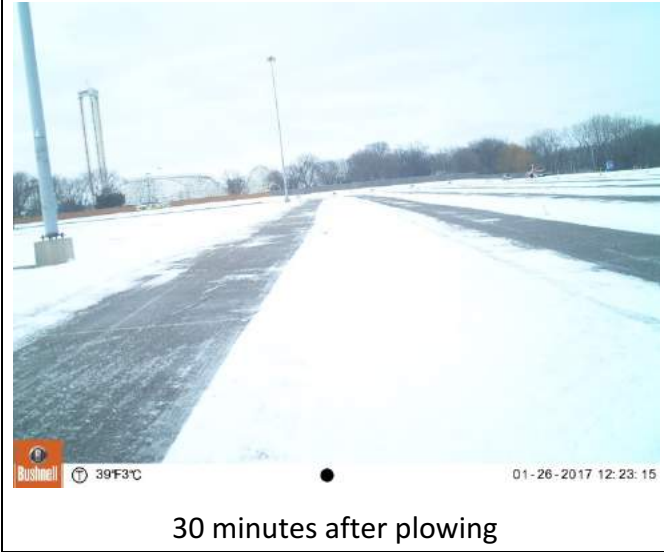
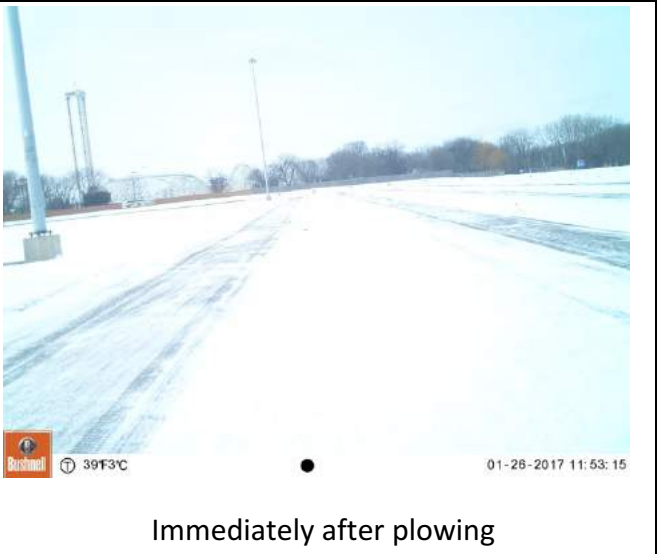
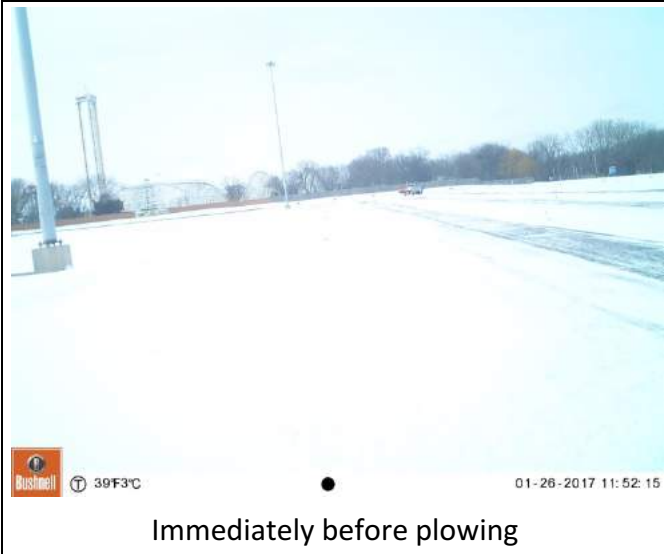


30 minutes after plowing



1 hour after plowing

Lane & Date: VF9B	01/26/2017	Time: 11:51 AM
Weather: Clear and sunny; 25°F		Wind: little to none.
Pavement Temp: 26°F	Truck: 214516	Snow: Thin, moist, soft. 1 inch.



**APPENDIX D: THERMOGRAPHIC EVALUATIONS**

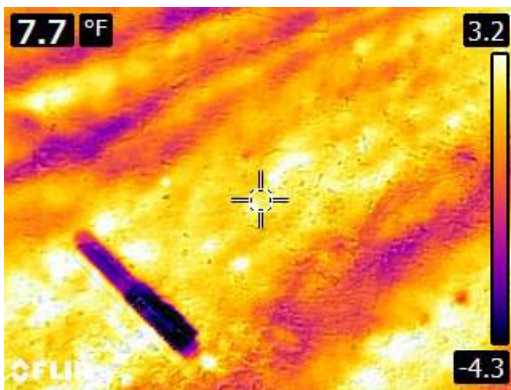
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Rock salt with salt brine	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



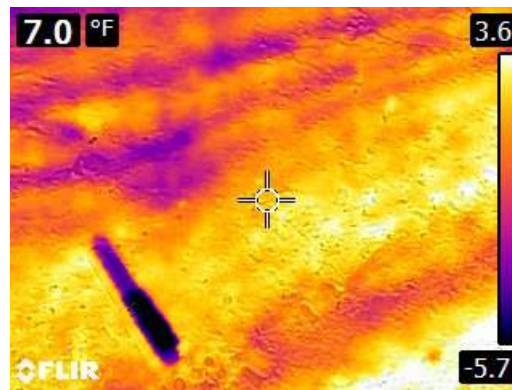
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

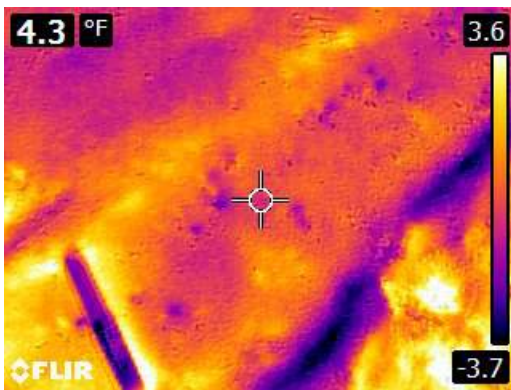
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Rock salt with Apex	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



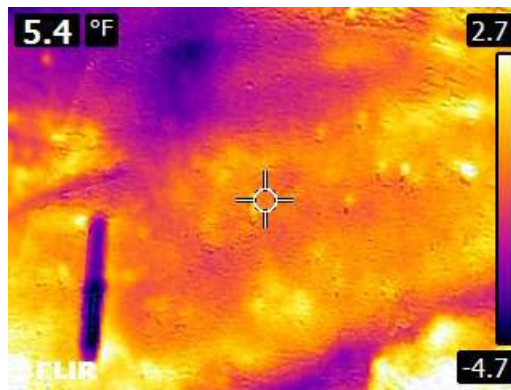
A) Nikon photograph at ~20 minutes after treatment



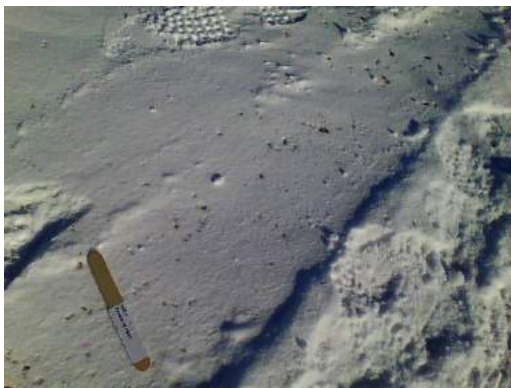
B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

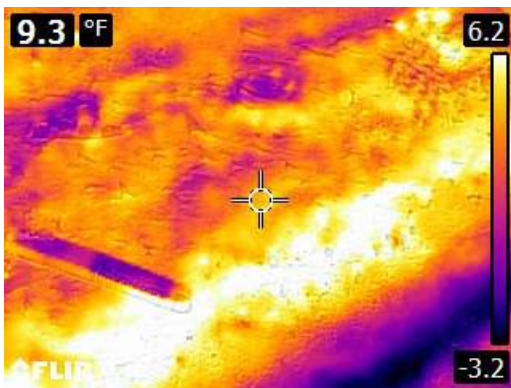
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Rock salt with Freezeguard	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



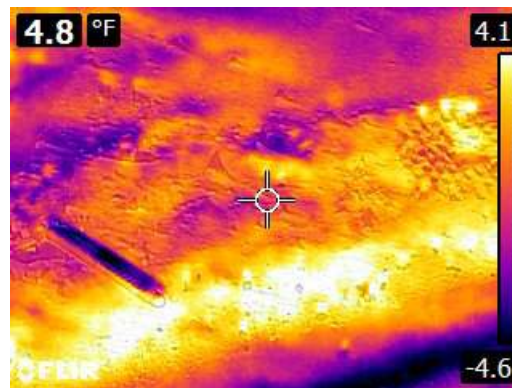
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment



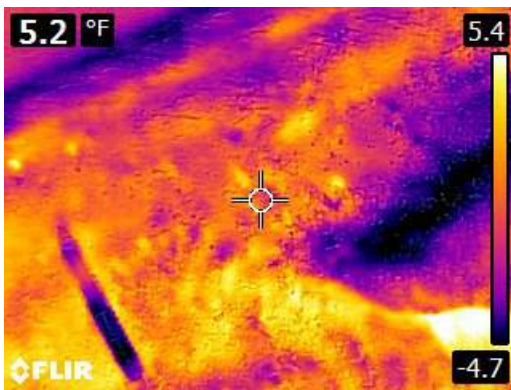
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Rock salt with RG8 10%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



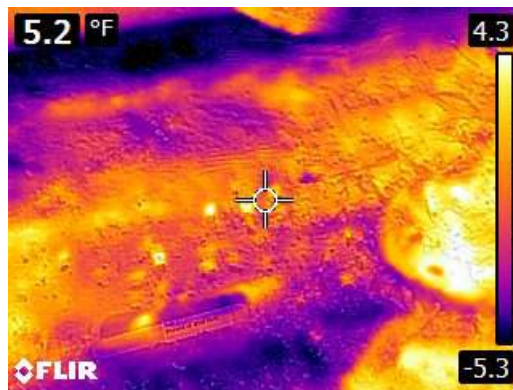
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



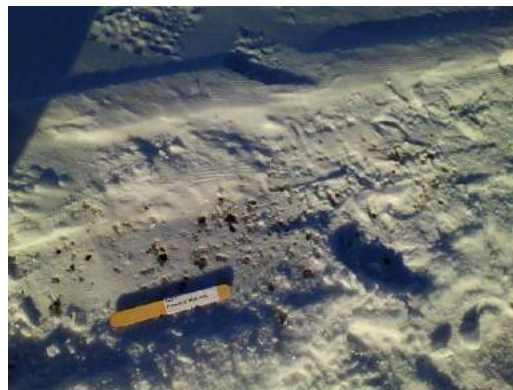
C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

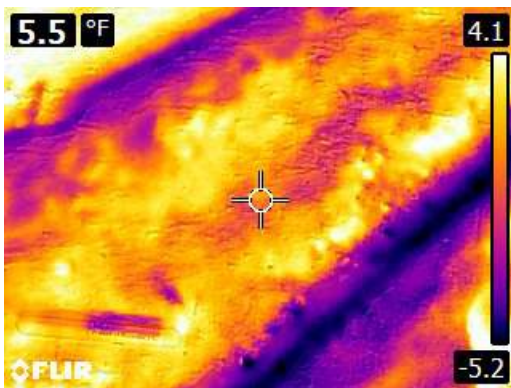
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Rock salt with molasses 1%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



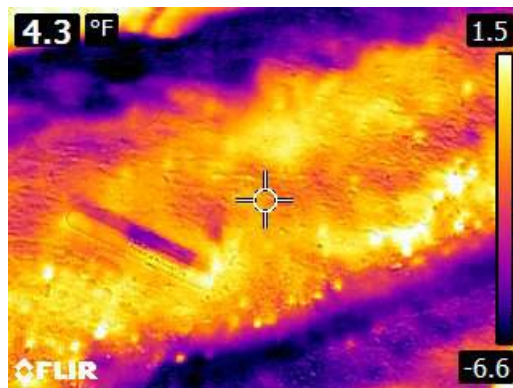
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

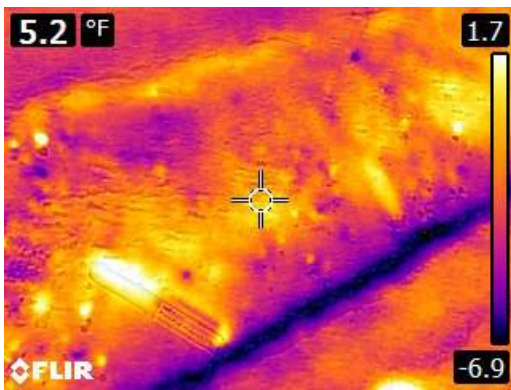
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Rock salt with molasses 3%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



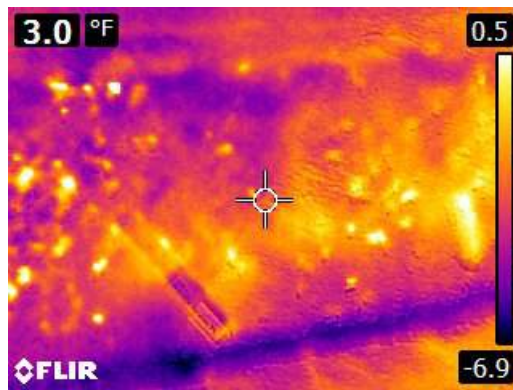
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

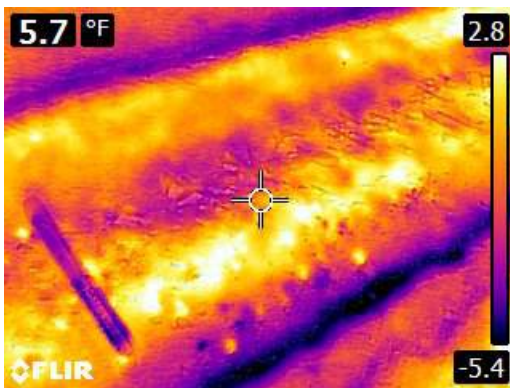
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Rock salt with molasses 5%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



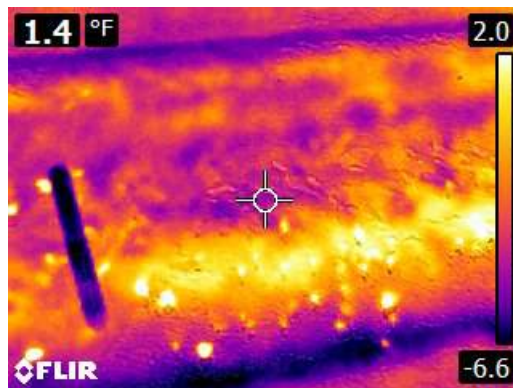
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

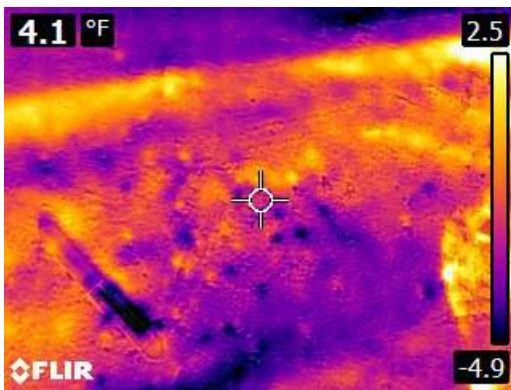
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Rock salt with molasses 10%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



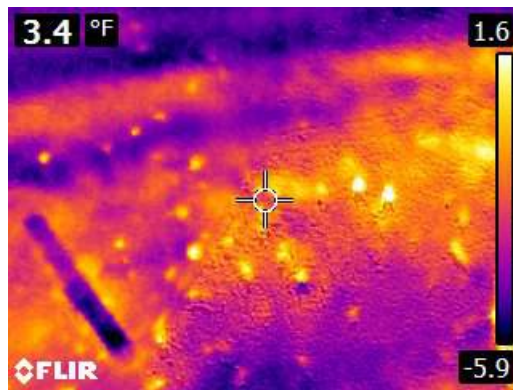
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment

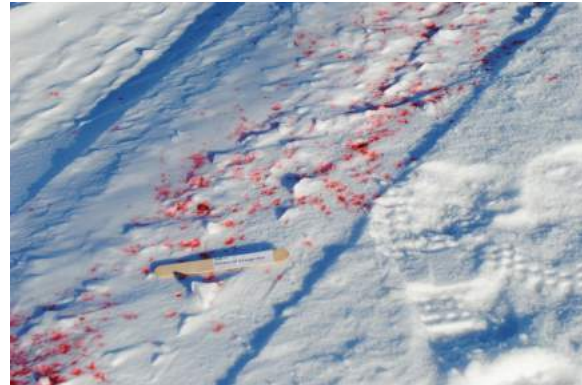


F) FLIR concurrent photograph at ~20 minutes after treatment

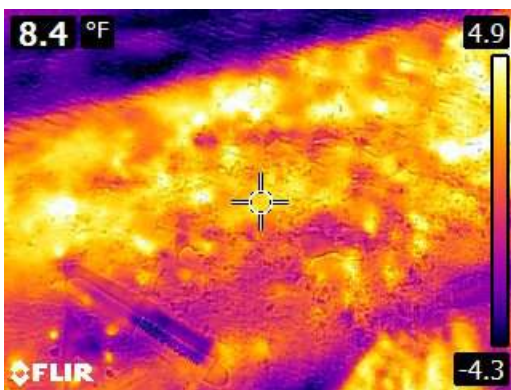
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Rock salt with orange dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



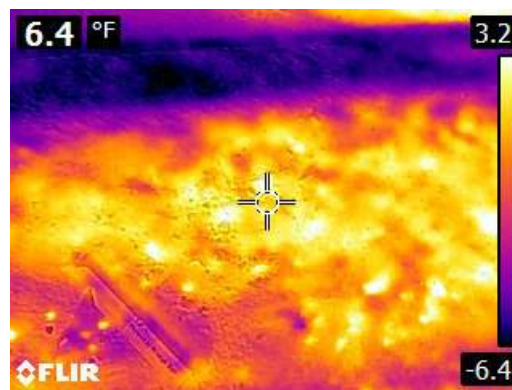
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment

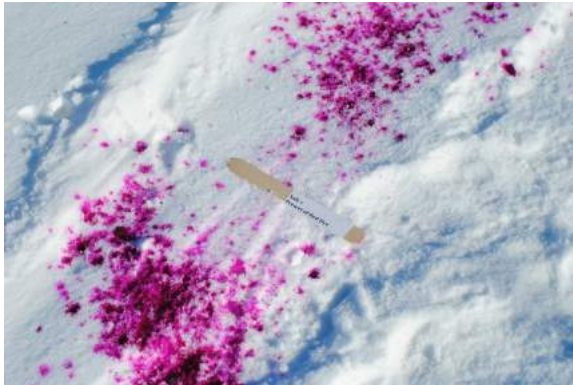


E) FLIR concurrent photograph at ~20 minutes after treatment

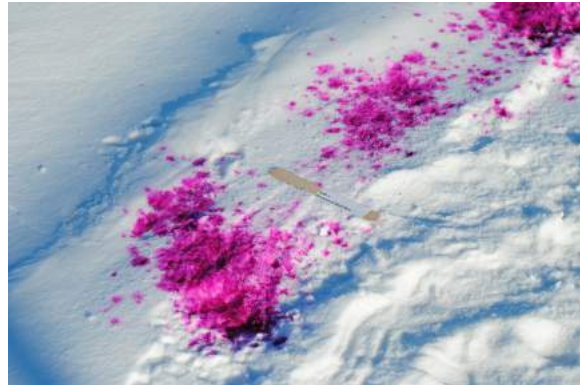


F) FLIR concurrent photograph at ~20 minutes after treatment

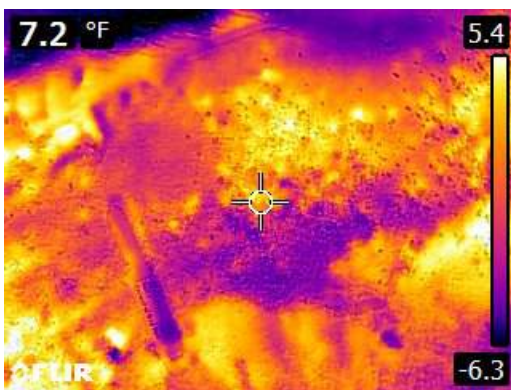
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Rock salt with red dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



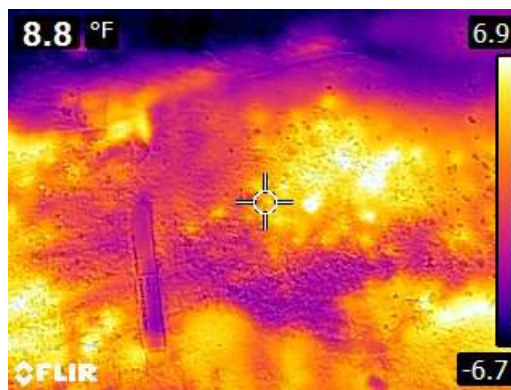
A) Nikon photograph at ~20 minutes after treatment



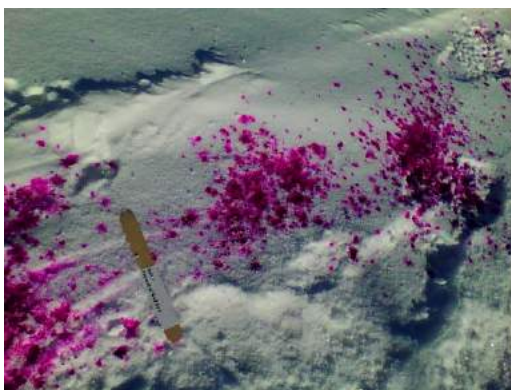
B) Nikon photograph at 120 minutes after treatment



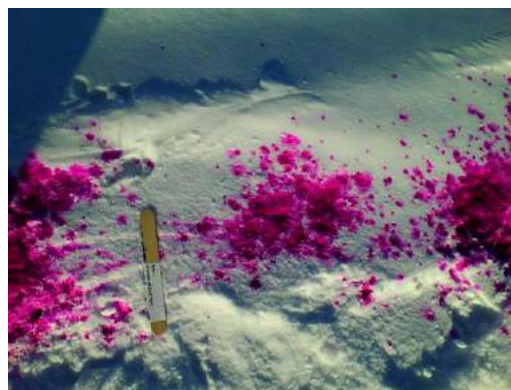
C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

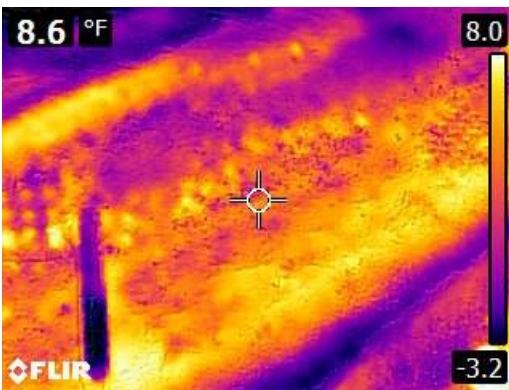
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Rock salt with blue dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



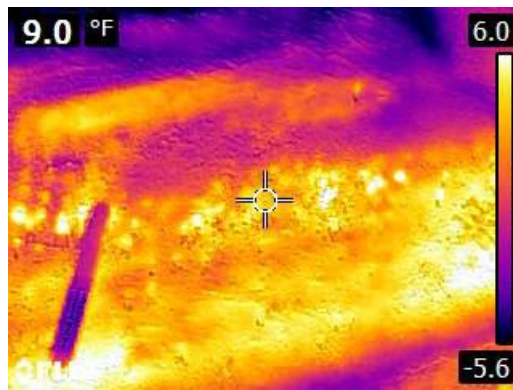
A) Nikon photograph at ~20 minutes after treatment



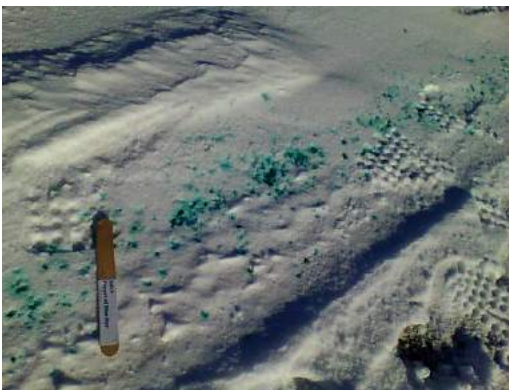
B) Nikon photograph at 120 minutes after treatment



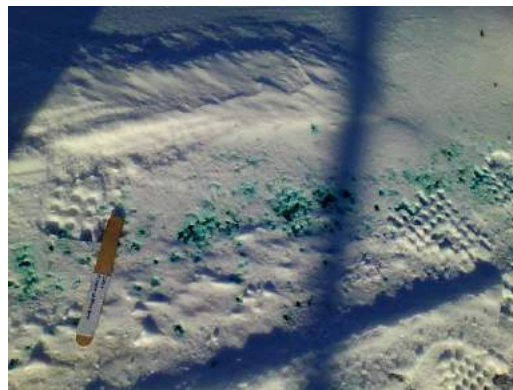
C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



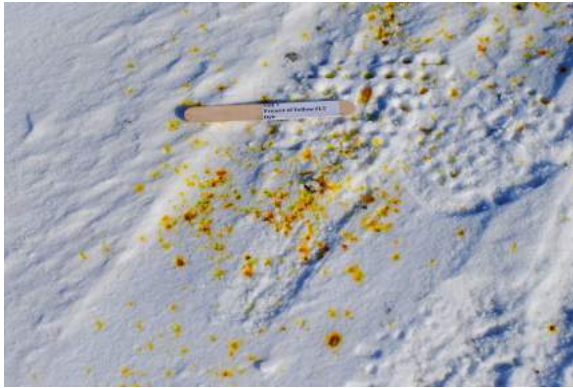
E) FLIR concurrent photograph at ~20 minutes after treatment



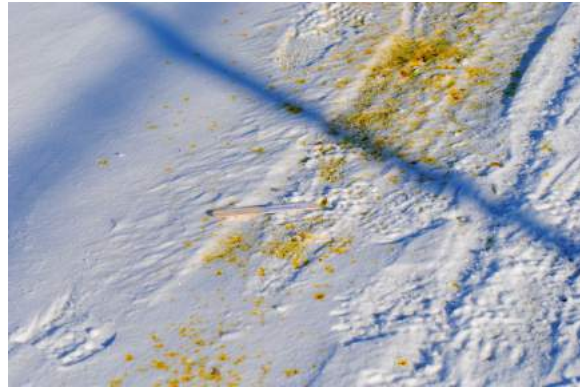
F) FLIR concurrent photograph at ~20 minutes after treatment



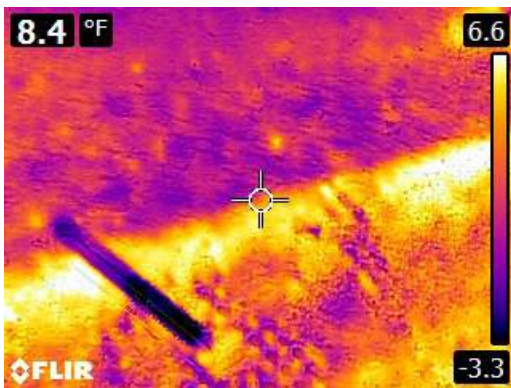
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Rock salt with yellow dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



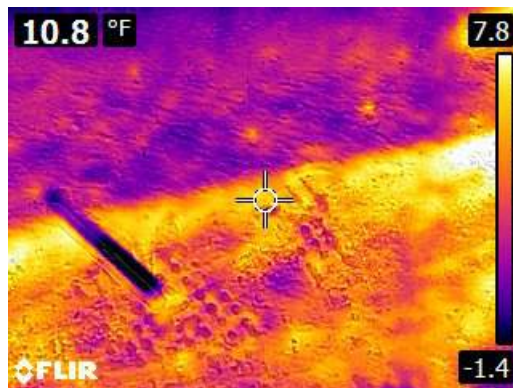
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

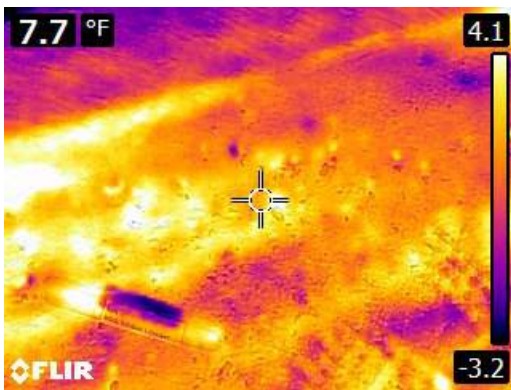
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Salt with no prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



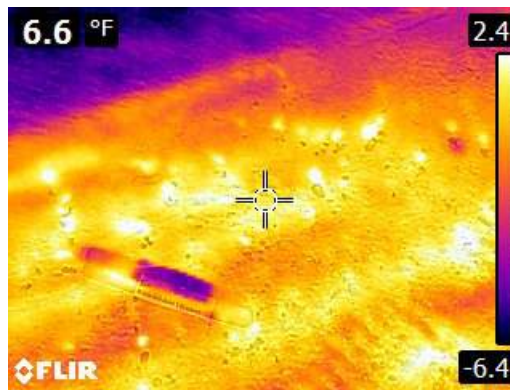
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

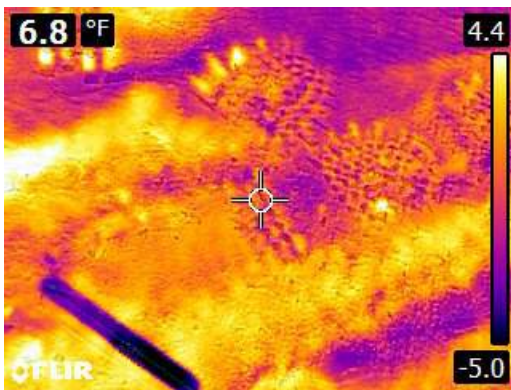
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Rock salt with no prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



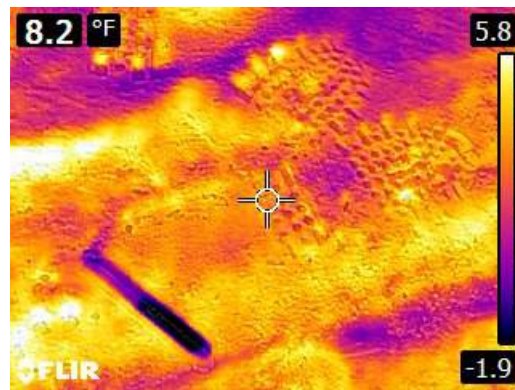
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment

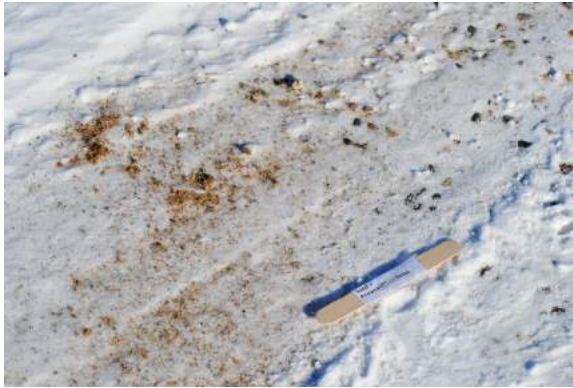


E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

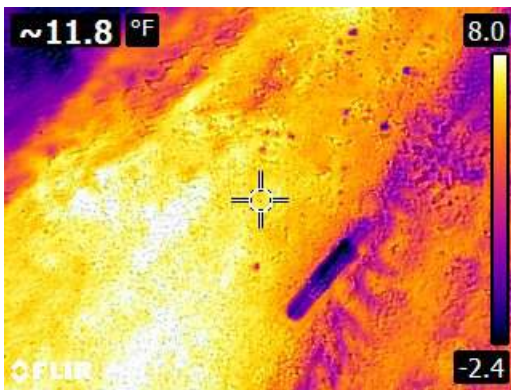
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with salt brine prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



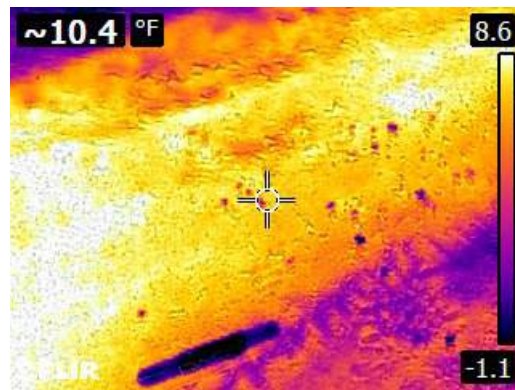
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

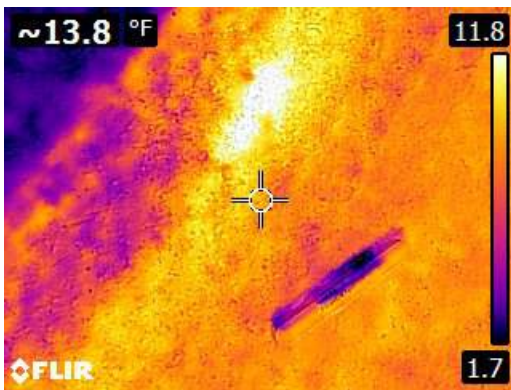
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with Apex prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



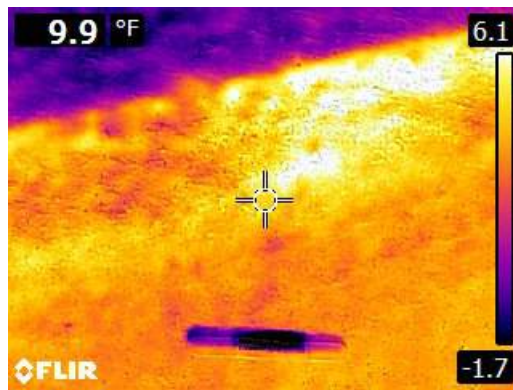
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

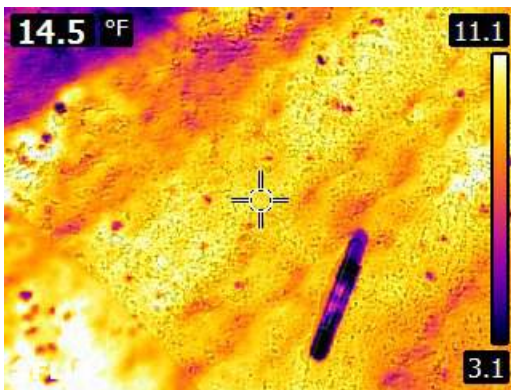
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with Freezeguard prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



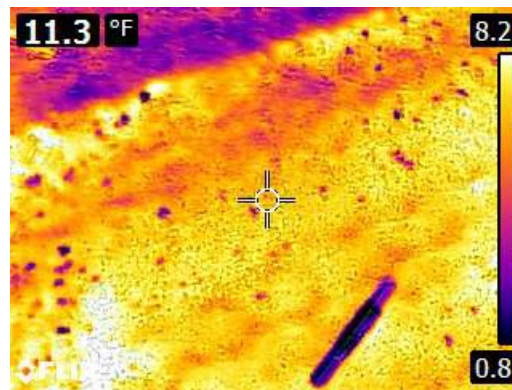
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

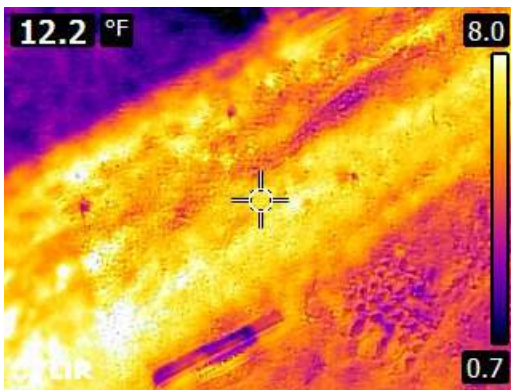
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with RG8 10% prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



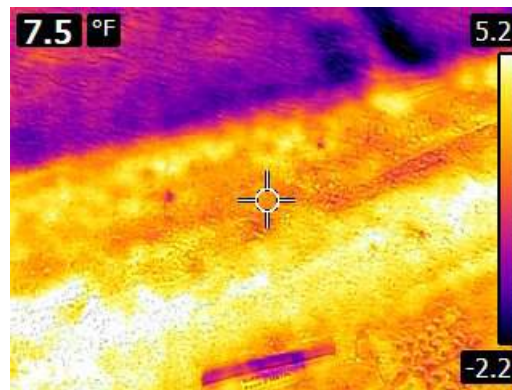
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

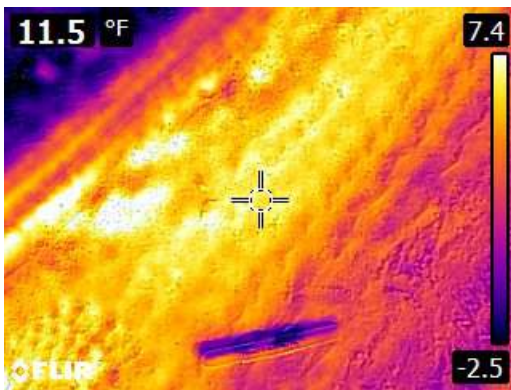
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with molasses 1% prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



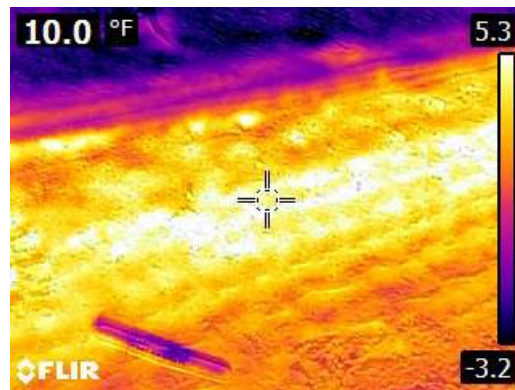
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment



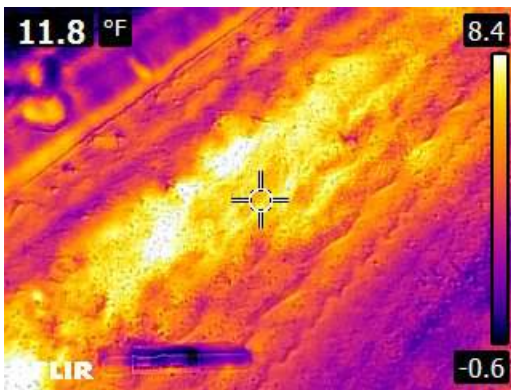
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with molasses 3% prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



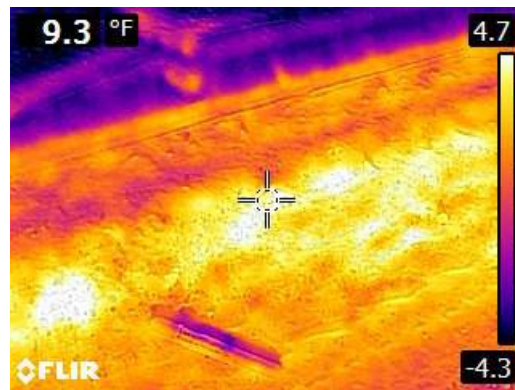
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

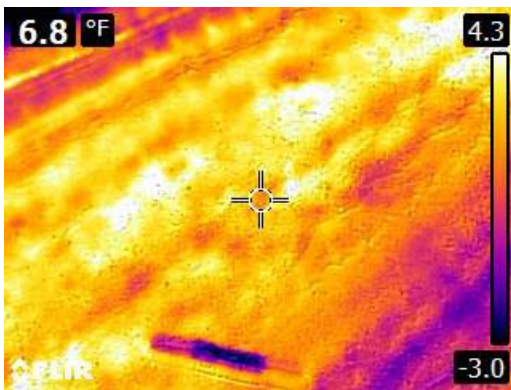
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with molasses 5% prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



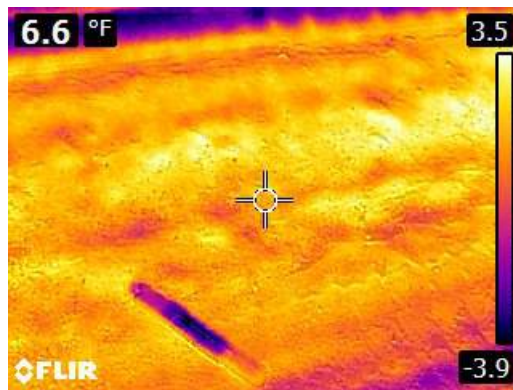
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

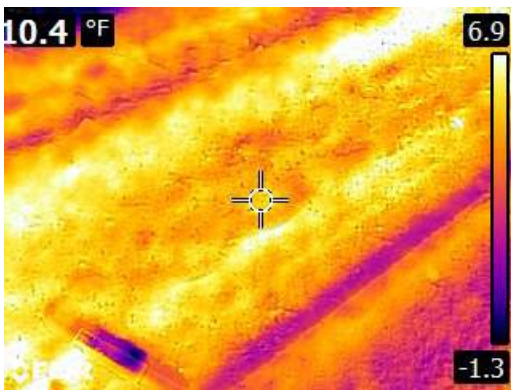
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with molasses 10% prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



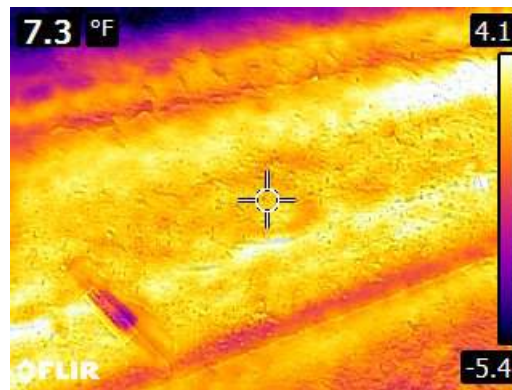
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment

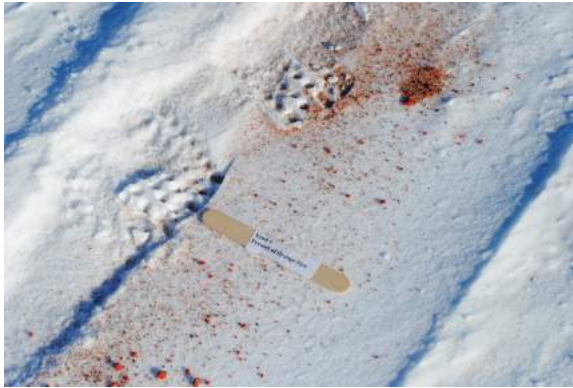


E) FLIR concurrent photograph at ~20 minutes after treatment

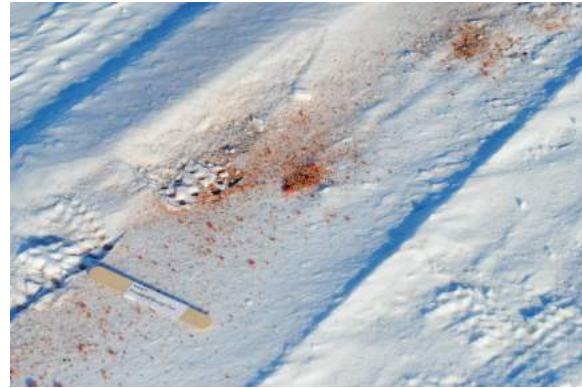


F) FLIR concurrent photograph at ~20 minutes after treatment

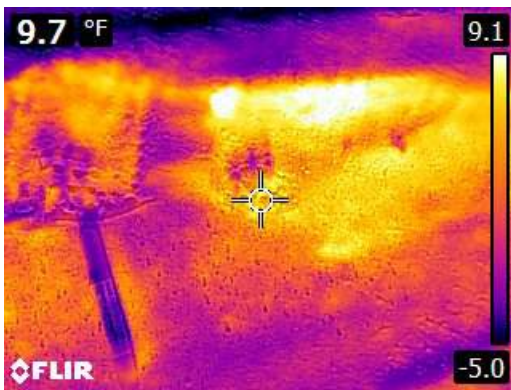
Lane and Date:	5°F. Sunny, very clear	Wind: 8-12 mph
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with orange dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



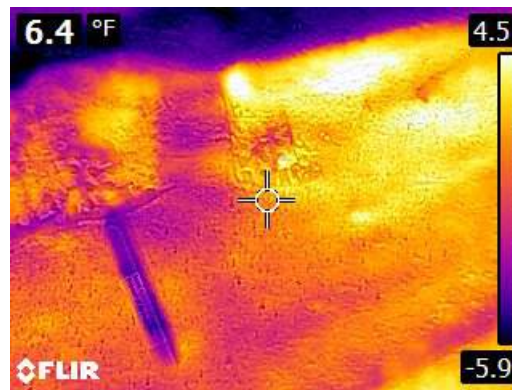
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment

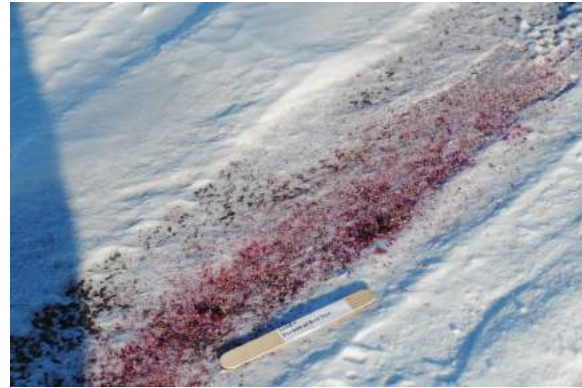


F) FLIR concurrent photograph at ~20 minutes after treatment

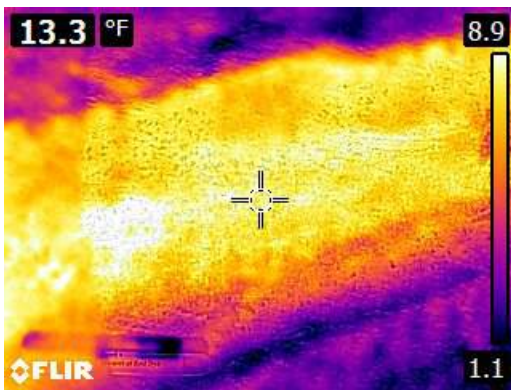
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with red dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



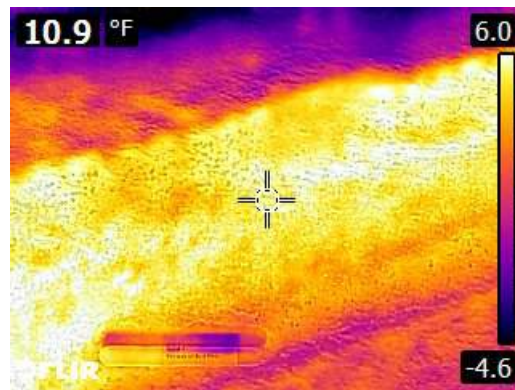
A) Nikon photograph at ~20 minutes after treatment



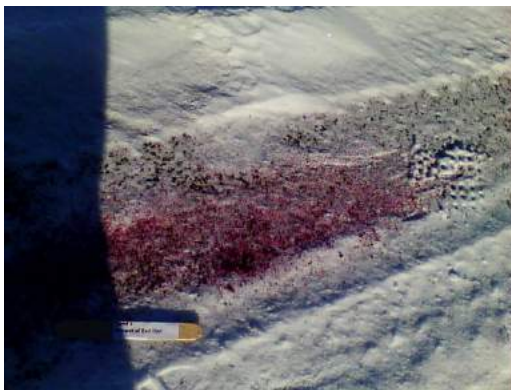
B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

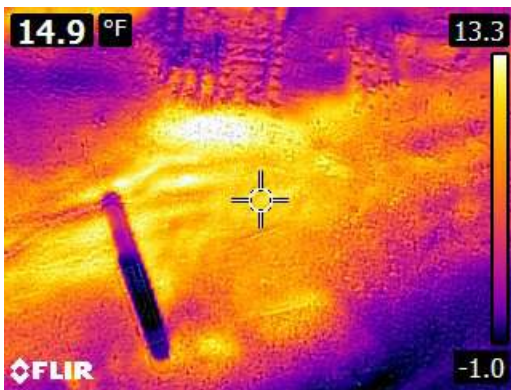
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with blue dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



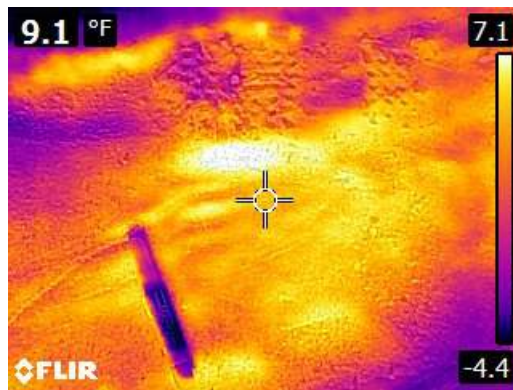
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

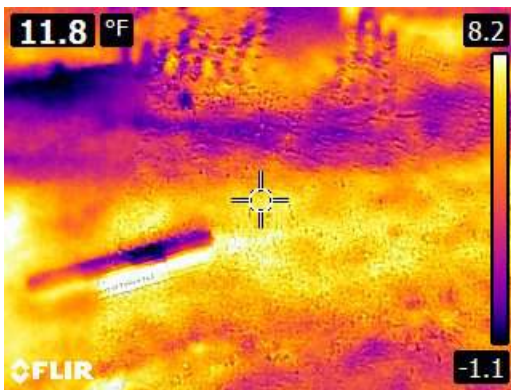
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with yellow dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



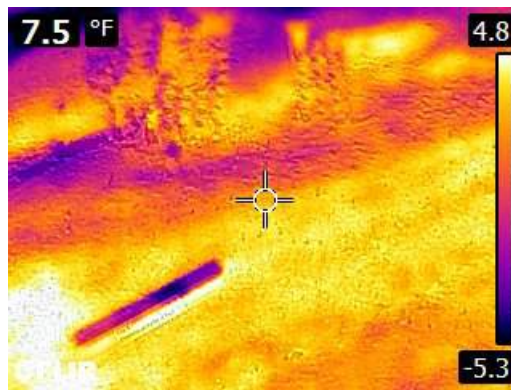
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

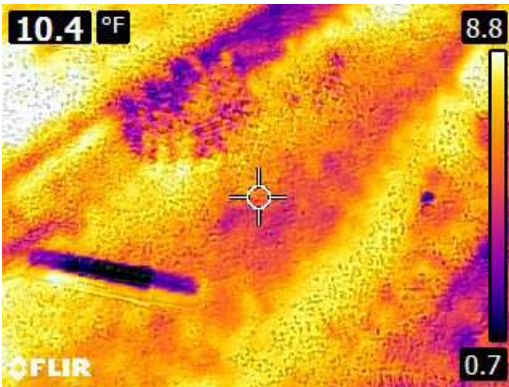
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with no prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



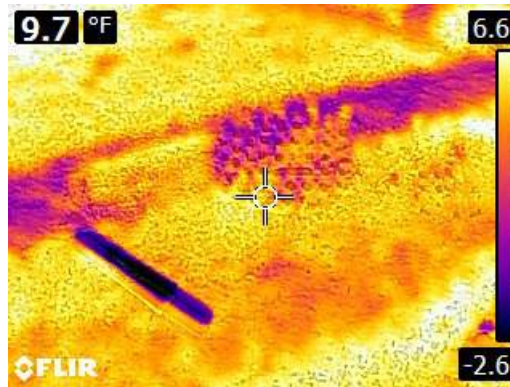
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment



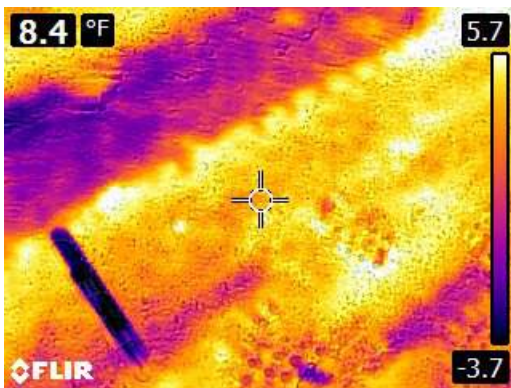
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Sand with no prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



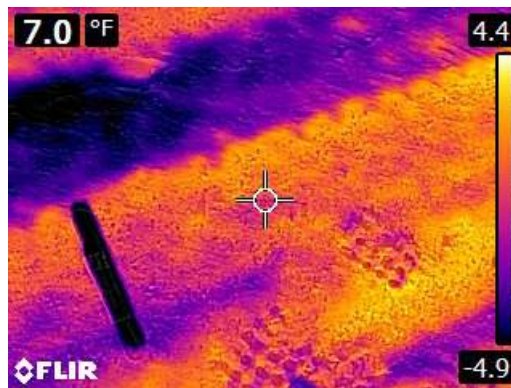
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

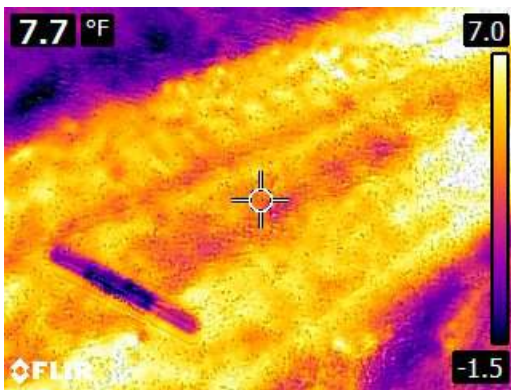
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Walnut hull sand	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



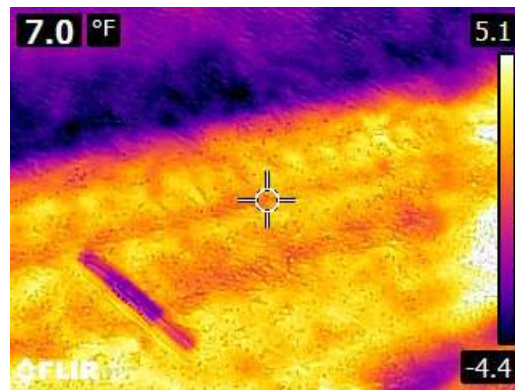
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

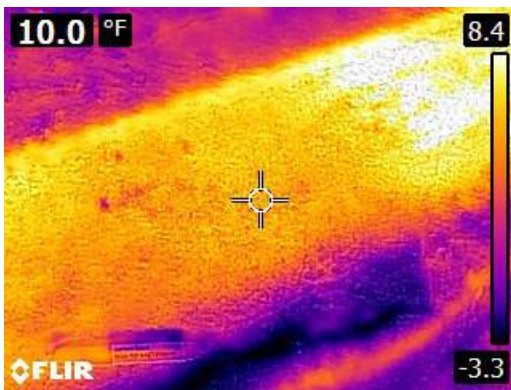
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Garnet sand	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



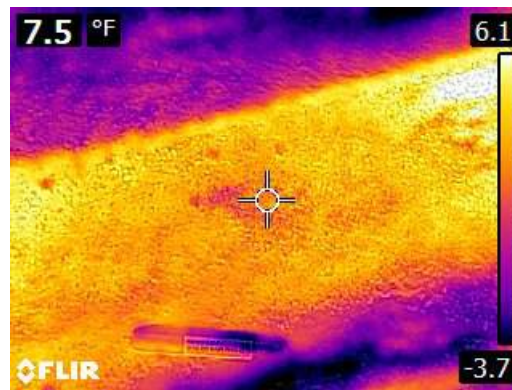
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment

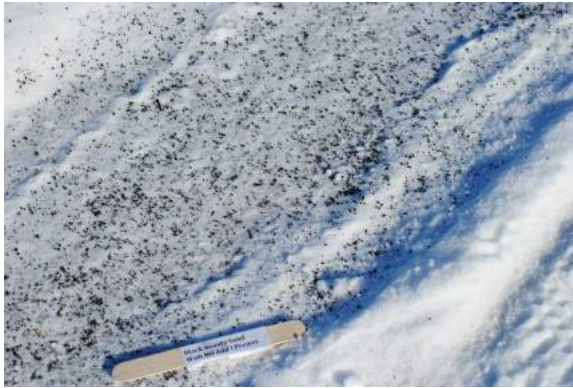


E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

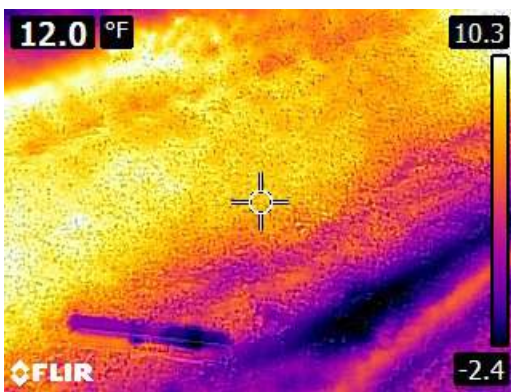
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Black Beauty Sand	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



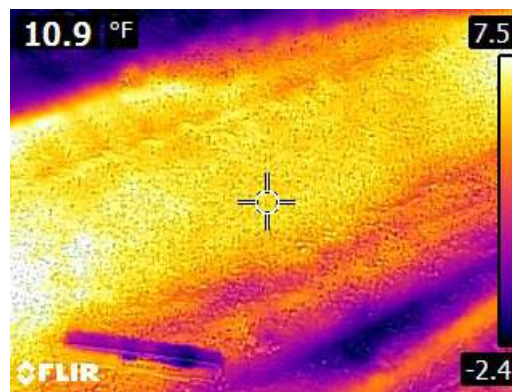
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

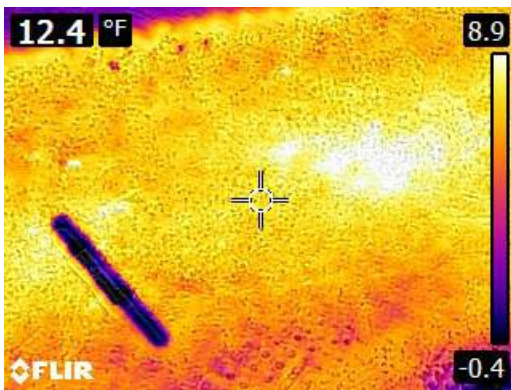
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Silt	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



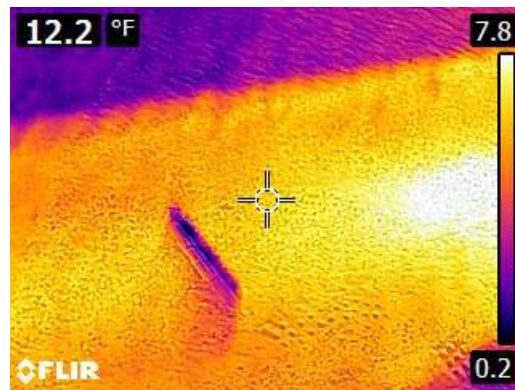
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

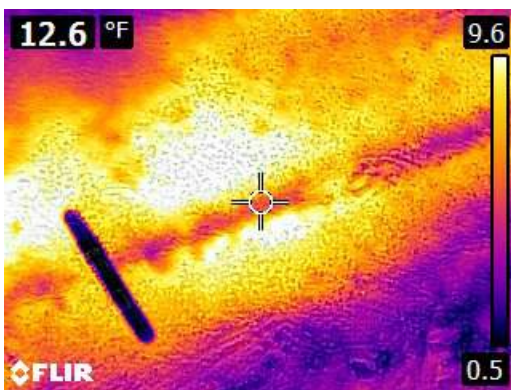
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Ice Melter	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



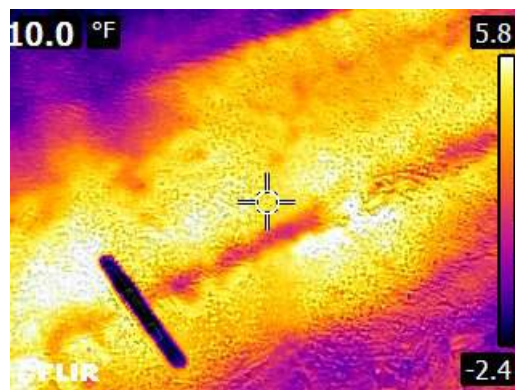
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

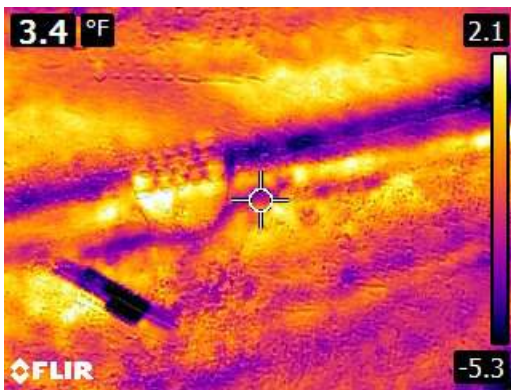
Lane and Date:	January 12, 2016	Time: 12:20 pm to 2:40 pm
Weather:	5°F. Sunny, very clear	Wind: 8-12 mph Dew Point -10°F
Treatment Material:	Ice Slicer	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



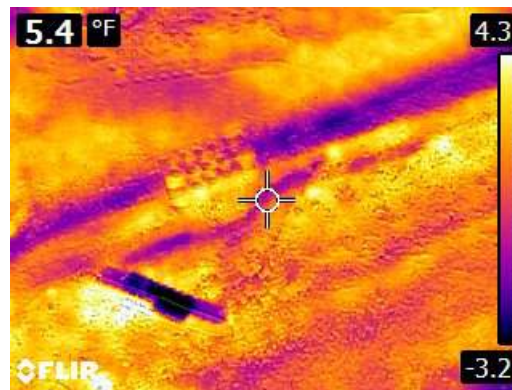
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 120 minutes after treatment



C) FLIR infrared thermograph at ~20 minutes after treatment



D) FLIR infrared thermograph at 120 minutes after treatment



E) FLIR concurrent photograph at ~20 minutes after treatment



F) FLIR concurrent photograph at ~20 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with salt brine	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



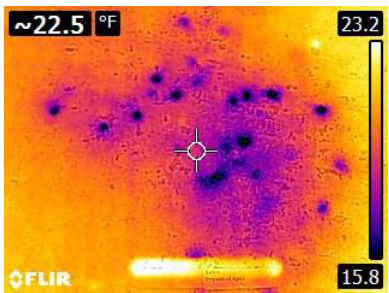
A) Nikon photograph at ~20 minutes after treatment



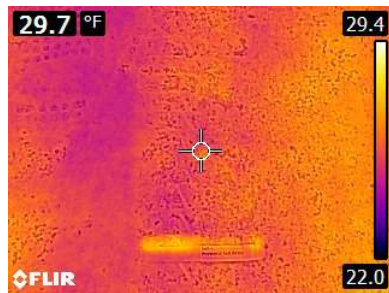
B) Nikon photograph at 50 minutes after treatment



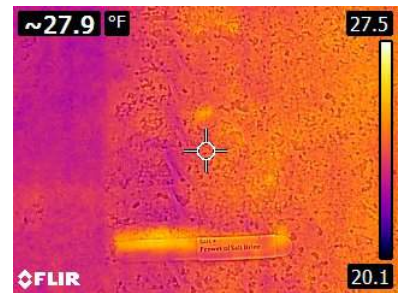
C) Nikon photograph at 80 minutes after treatment



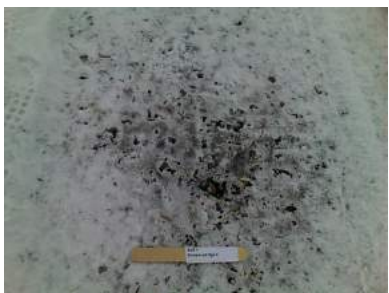
D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment



Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with Apex	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



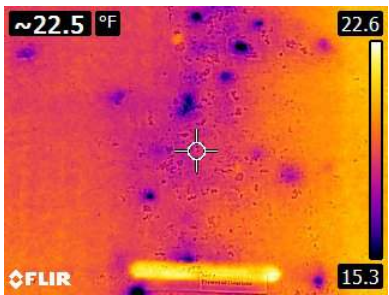
A) Nikon photograph at ~20 minutes after treatment



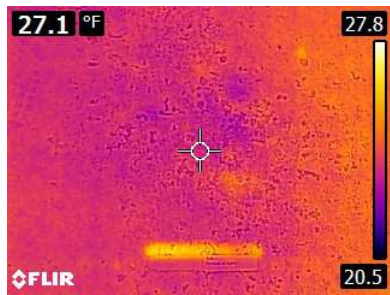
B) Nikon photograph at 50 minutes after treatment



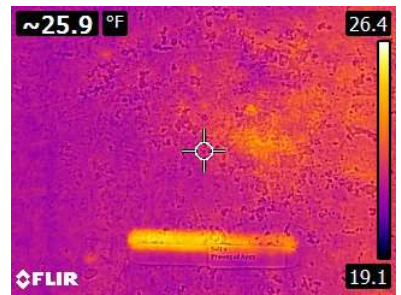
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



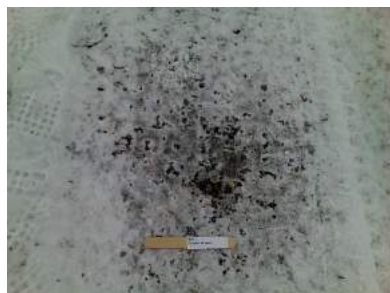
E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with Freezeguard	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



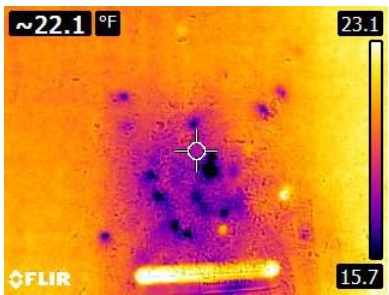
A) Nikon photograph at ~20 minutes after treatment



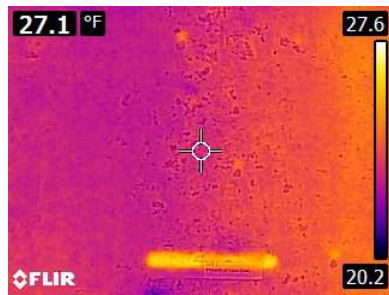
B) Nikon photograph at 50 minutes after treatment



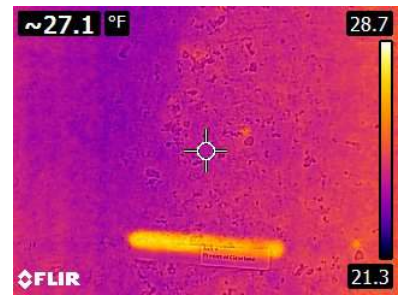
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with RG8 10%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



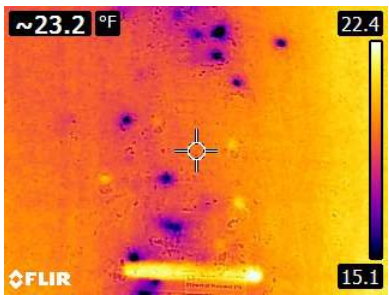
A) Nikon photograph at ~20 minutes after treatment



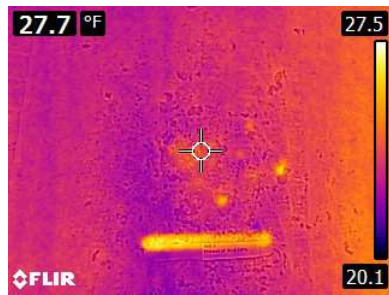
B) Nikon photograph at 50 minutes after treatment



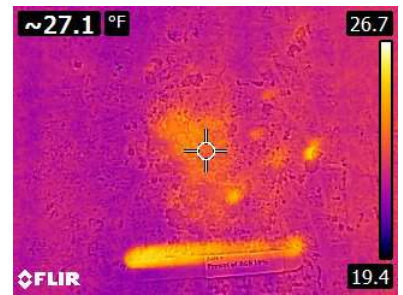
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with molasses 1%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



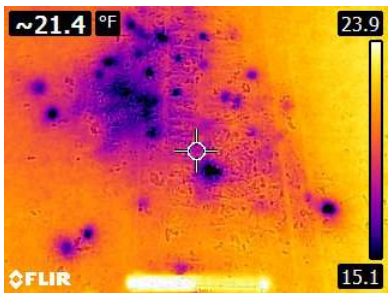
A) Nikon photograph at ~20 minutes after treatment



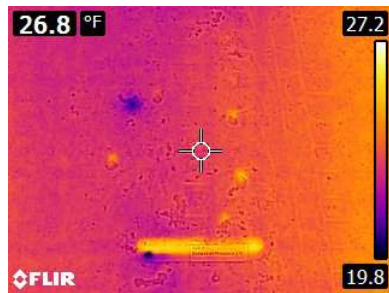
B) Nikon photograph at 50 minutes after treatment



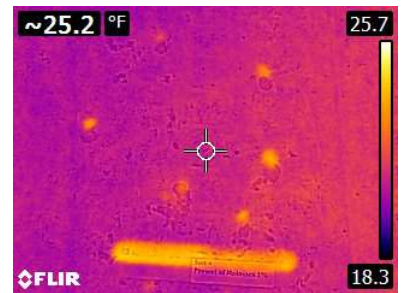
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with molasses 3%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



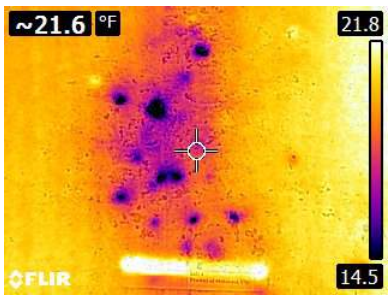
A) Nikon photograph at ~20 minutes after treatment



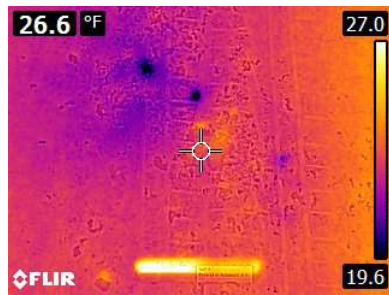
B) Nikon photograph at 50 minutes after treatment



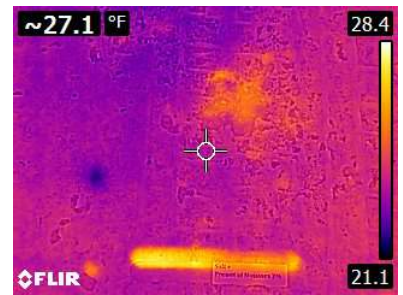
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with molasses 5%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



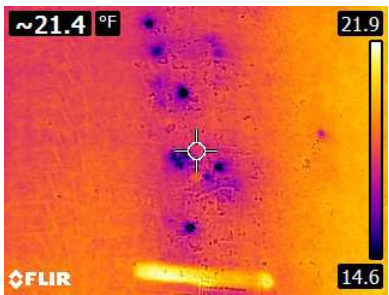
A) Nikon photograph at ~20 minutes after treatment



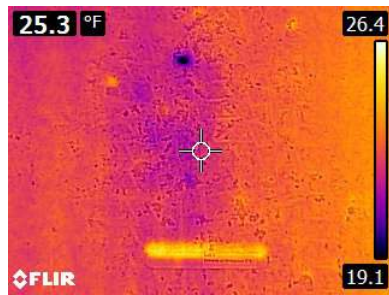
B) Nikon photograph at 50 minutes after treatment



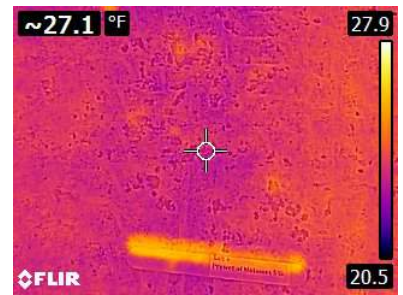
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with molasses 10%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



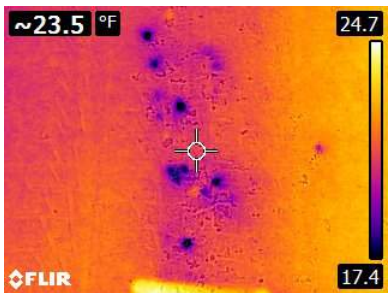
A) Nikon photograph at ~20 minutes after treatment



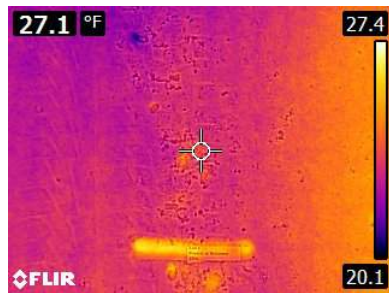
B) Nikon photograph at 50 minutes after treatment



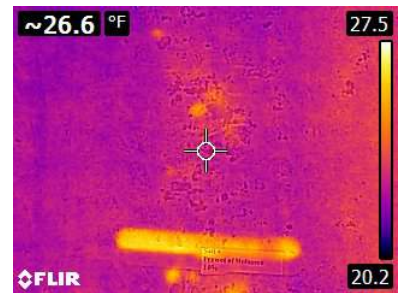
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with orange dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



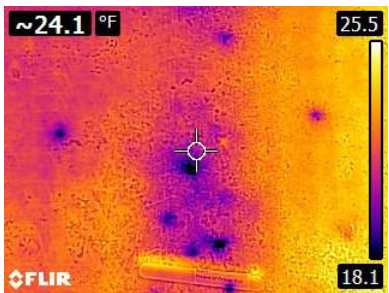
A) Nikon photograph at ~20 minutes after treatment



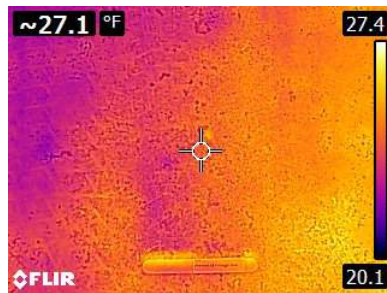
B) Nikon photograph at 50 minutes after treatment



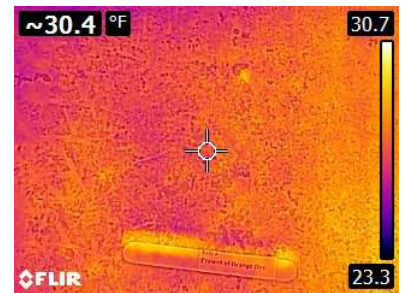
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



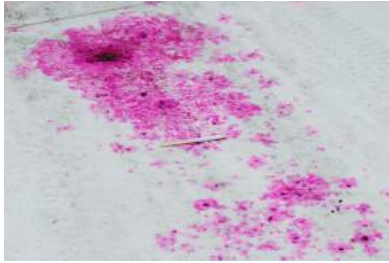
H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment



Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with red dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



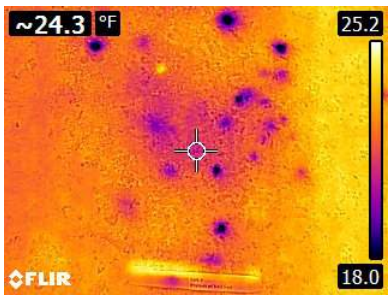
A) Nikon photograph at ~20 minutes after treatment



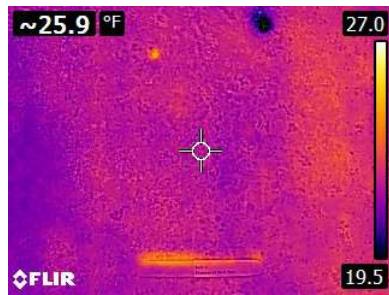
B) Nikon photograph at 50 minutes after treatment



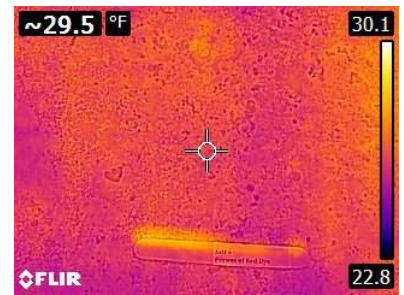
C) Nikon photograph at 80 minutes after treatment



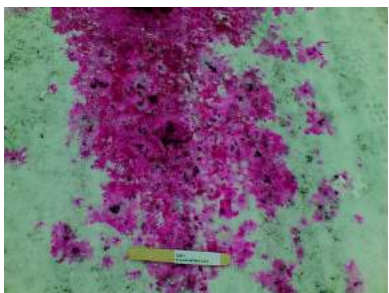
D) FLIR infrared thermograph at ~20 minutes after treatment



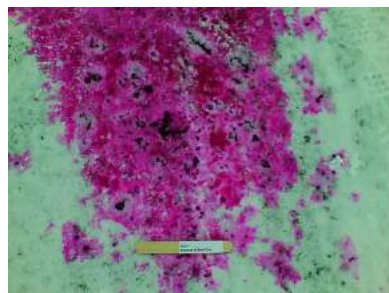
E) FLIR infrared thermograph at 50 minutes after treatment



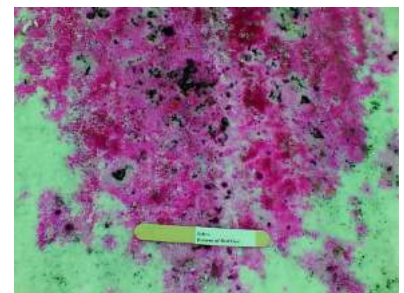
F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Rock salt with blue dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



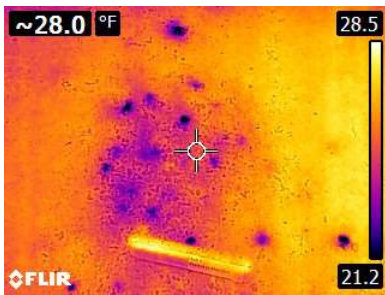
A) Nikon photograph at ~20 minutes after treatment



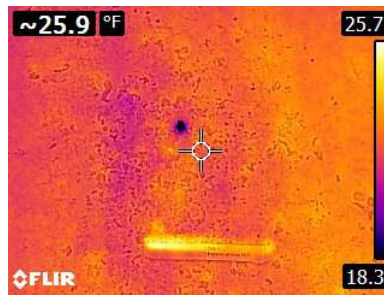
B) Nikon photograph at 50 minutes after treatment



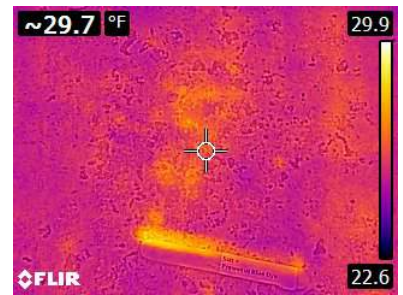
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



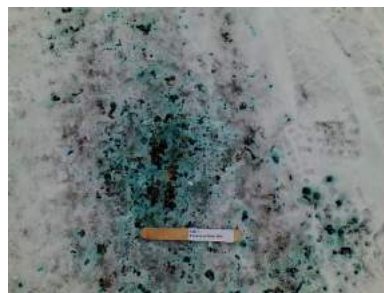
E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with yellow dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



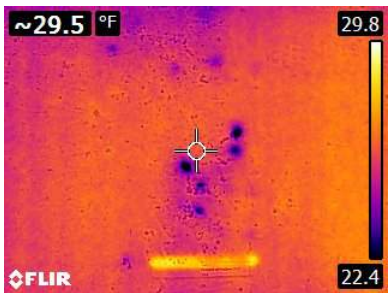
A) Nikon photograph at ~20 minutes after treatment



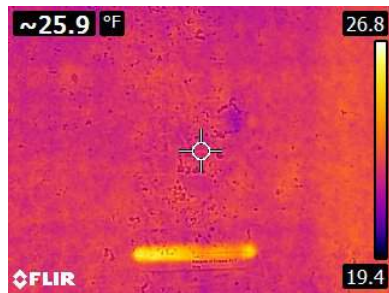
B) Nikon photograph at 50 minutes after treatment



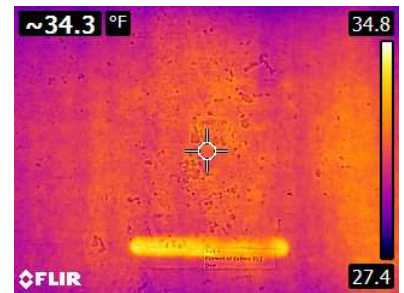
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	salt with no prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



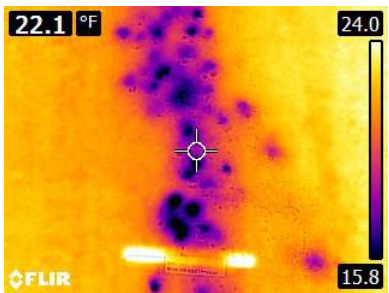
A) Nikon photograph at ~20 minutes after treatment



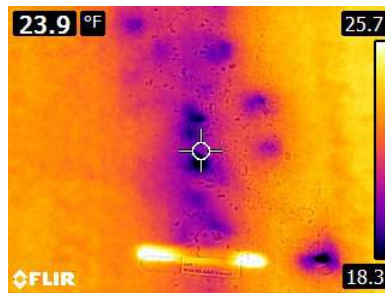
B) Nikon photograph at 50 minutes after treatment



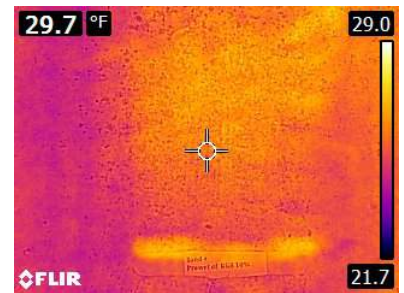
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with no prewet - replicate	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



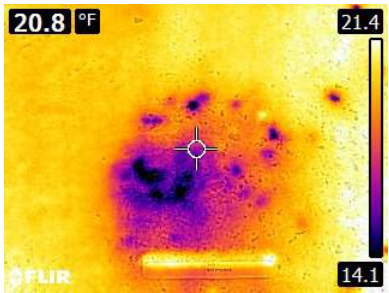
A) Nikon photograph at ~20 minutes after treatment



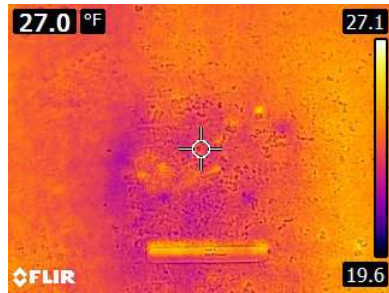
B) Nikon photograph at 50 minutes after treatment



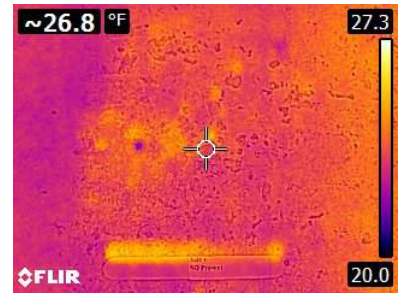
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	sand with salt brine	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



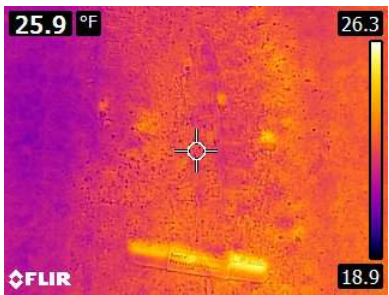
A) Nikon photograph at ~20 minutes after treatment



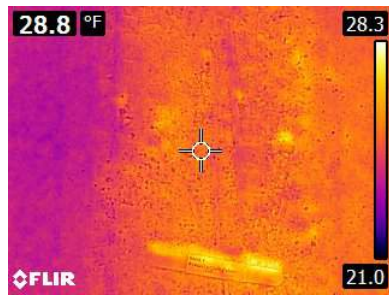
B) Nikon photograph at 50 minutes after treatment



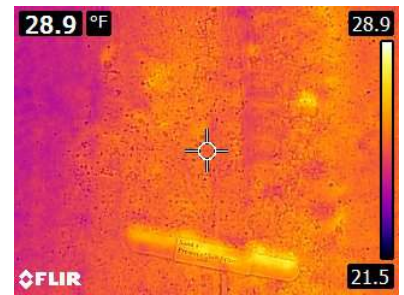
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	sand with Apex	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



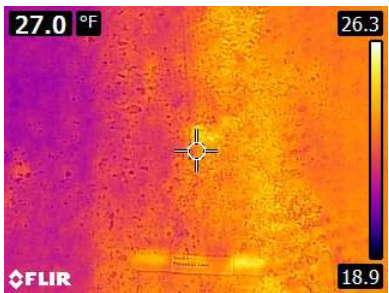
A) Nikon photograph at ~20 minutes after treatment



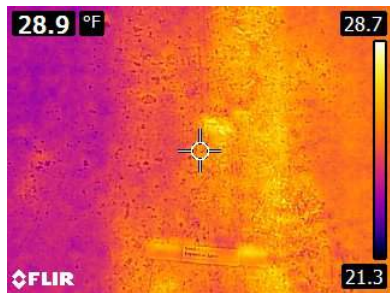
B) Nikon photograph at 50 minutes after treatment



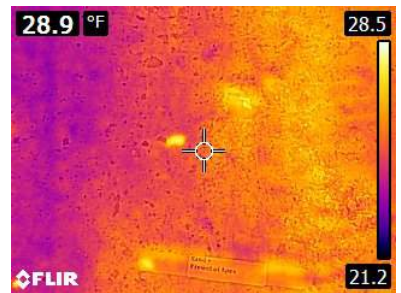
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	sand with Freezeguard	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



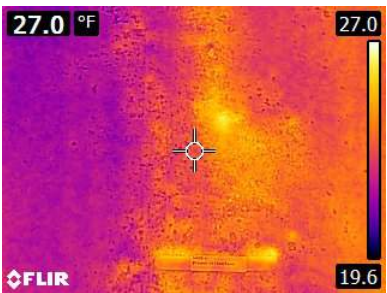
A) Nikon photograph at ~20 minutes after treatment



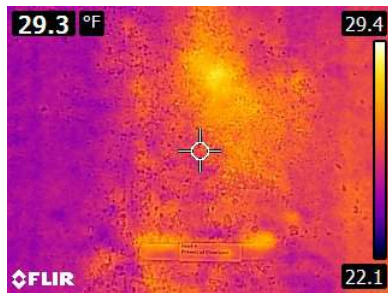
B) Nikon photograph at 50 minutes after treatment



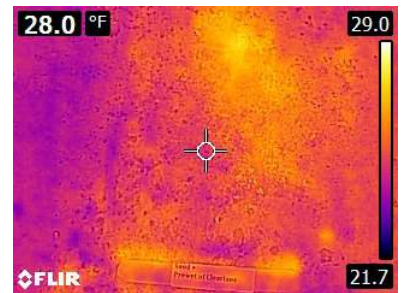
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment



Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	sand with RG8 10%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



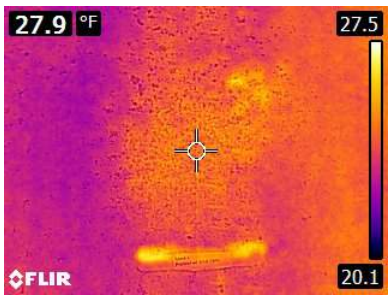
A) Nikon photograph at ~20 minutes after treatment



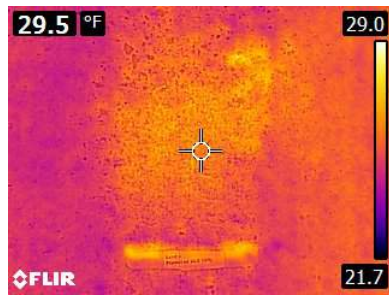
B) Nikon photograph at 50 minutes after treatment



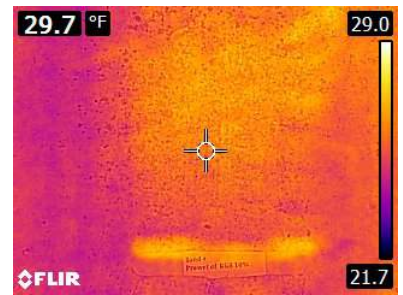
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	sand with molasses 1%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



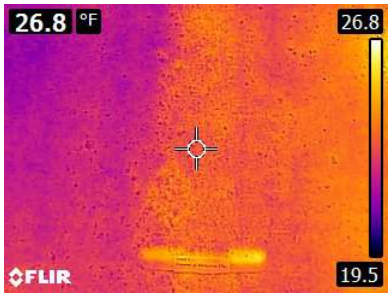
A) Nikon photograph at ~20 minutes after treatment



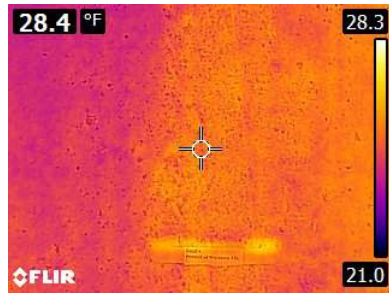
B) Nikon photograph at 50 minutes after treatment



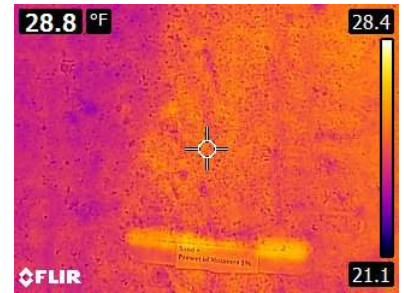
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	sand with molasses 3%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



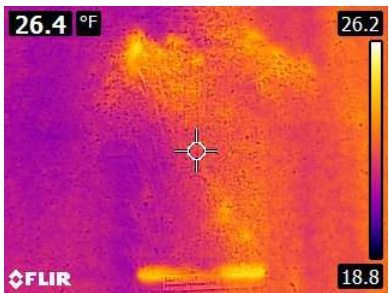
A) Nikon photograph at ~20 minutes after treatment



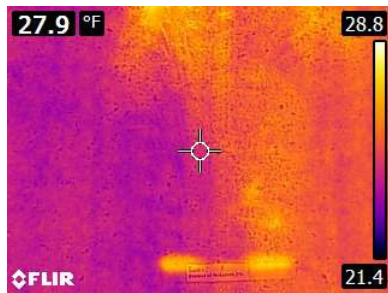
B) Nikon photograph at 50 minutes after treatment



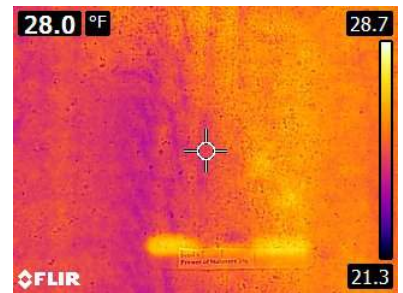
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	sand with molasses 5%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



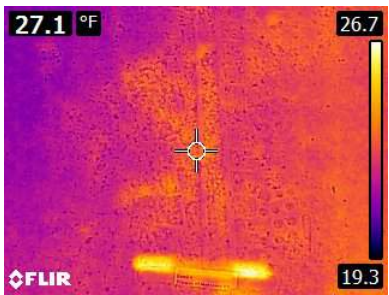
A) Nikon photograph at ~20 minutes after treatment



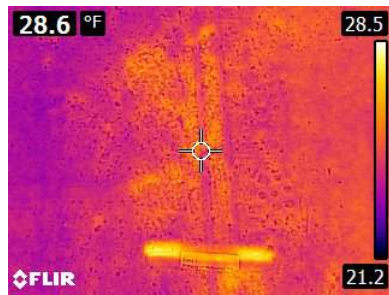
B) Nikon photograph at 50 minutes after treatment



C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	sand with molasses 10%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



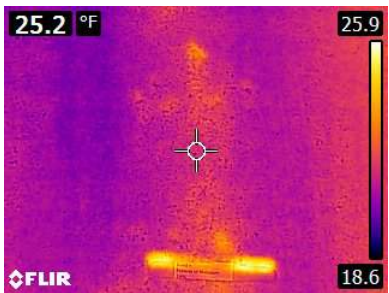
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 50 minutes after treatment



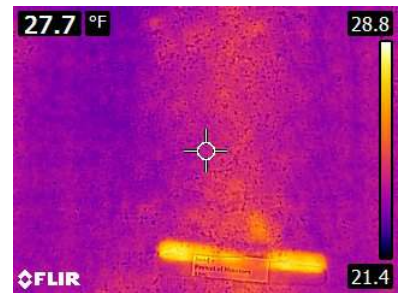
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	sand with orange dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



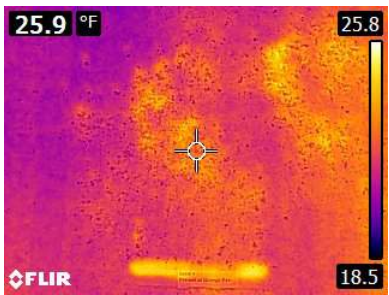
A) Nikon photograph at ~20 minutes after treatment



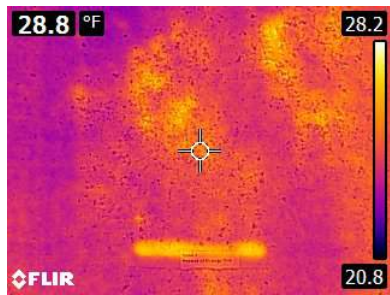
B) Nikon photograph at 50 minutes after treatment



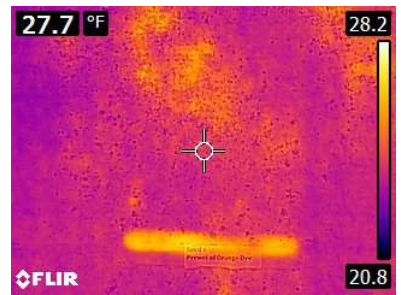
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	sand with red dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



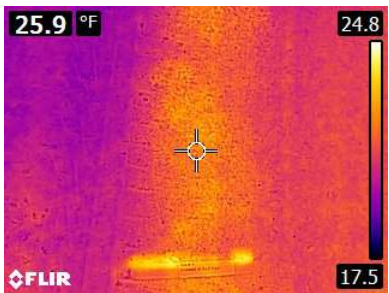
A) Nikon photograph at ~20 minutes after treatment



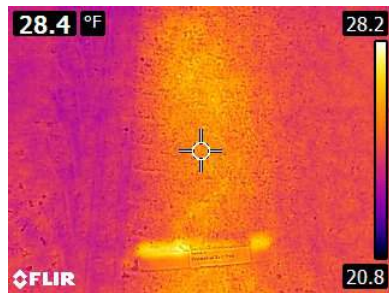
B) Nikon photograph at 50 minutes after treatment



C) Nikon photograph at 80 minutes after treatment



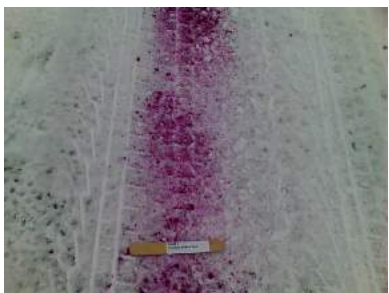
D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



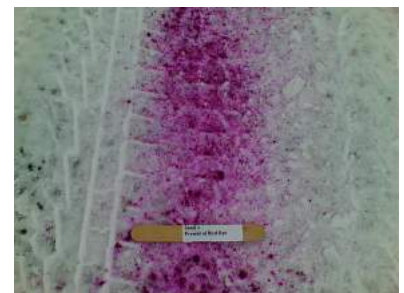
F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with blue dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



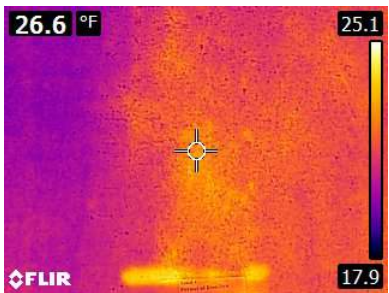
A) Nikon photograph at ~20 minutes after treatment



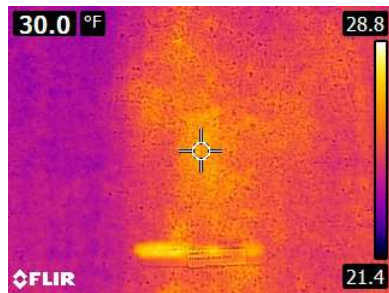
B) Nikon photograph at 50 minutes after treatment



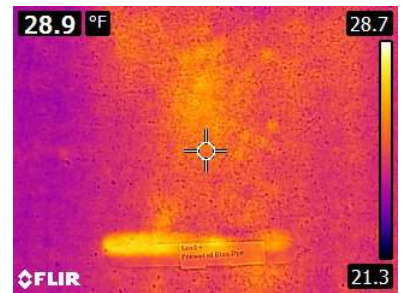
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment



Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Salt with yellow dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



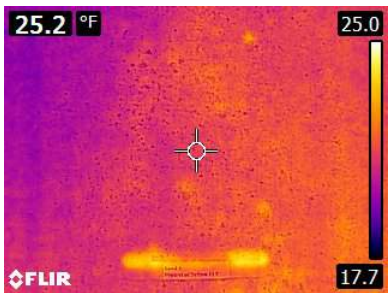
A) Nikon photograph at ~20 minutes after treatment



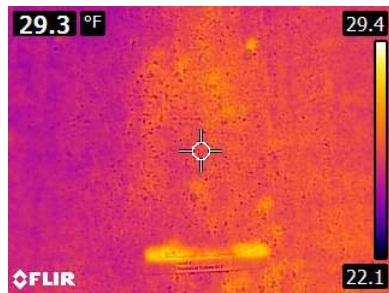
B) Nikon photograph at 50 minutes after treatment



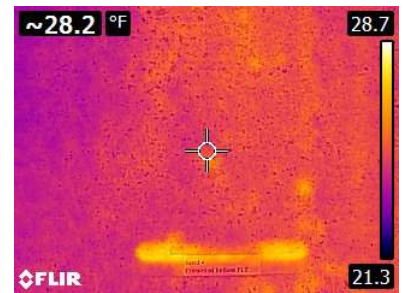
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	sand with no prewet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



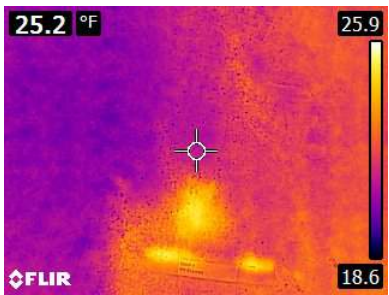
A) Nikon photograph at ~20 minutes after treatment



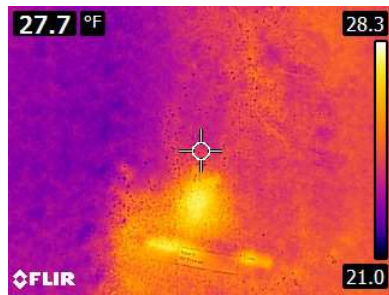
B) Nikon photograph at 50 minutes after treatment



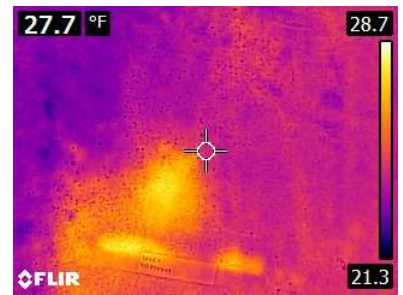
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	sand with no prewet - replicate	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



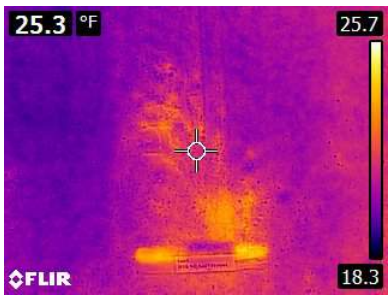
A) Nikon photograph at ~20 minutes after treatment



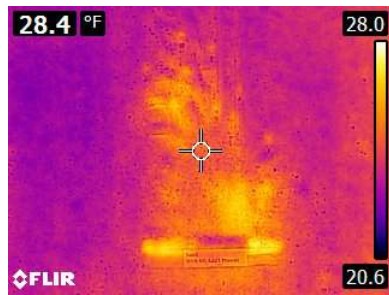
B) Nikon photograph at 50 minutes after treatment



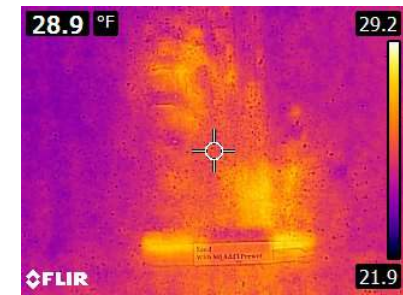
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Walnut hull sand	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



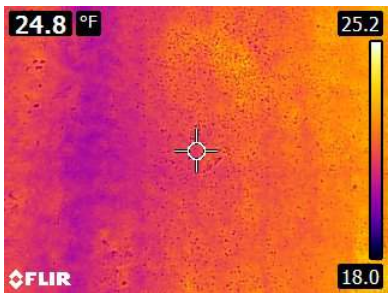
A) Nikon photograph at ~20 minutes after treatment



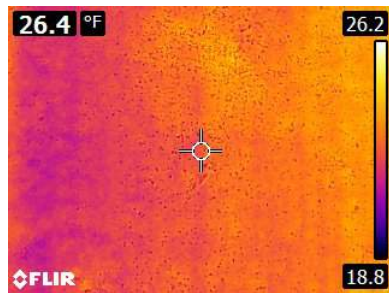
B) Nikon photograph at 50 minutes after treatment



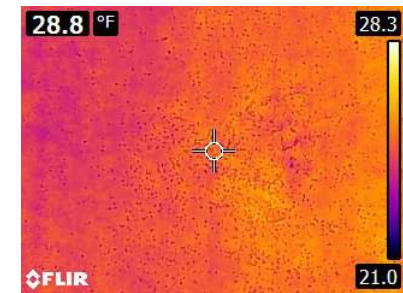
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Garnet sand	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



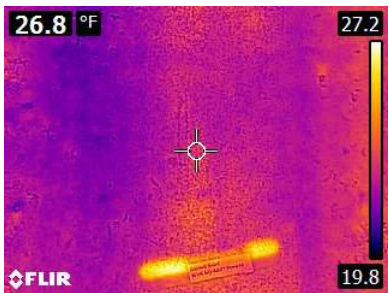
A) Nikon photograph at ~20 minutes after treatment



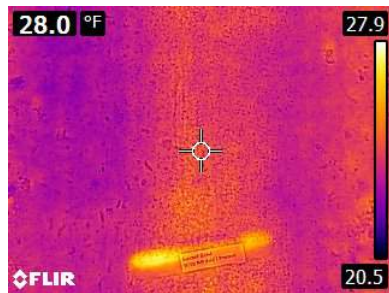
B) Nikon photograph at 50 minutes after treatment



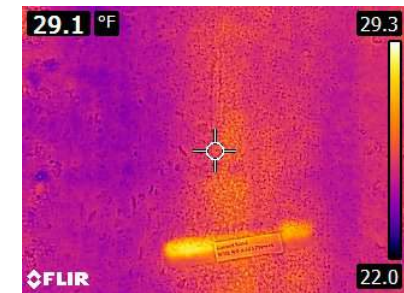
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Black Beauty	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



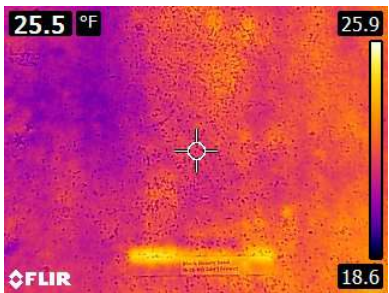
A) Nikon photograph at ~20 minutes after treatment



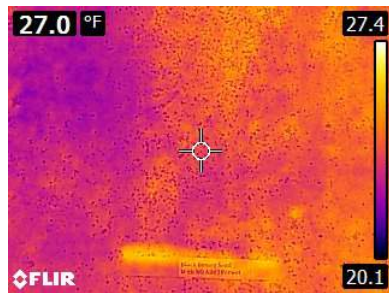
B) Nikon photograph at 50 minutes after treatment



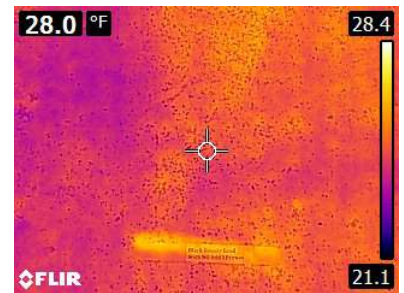
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	silt	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



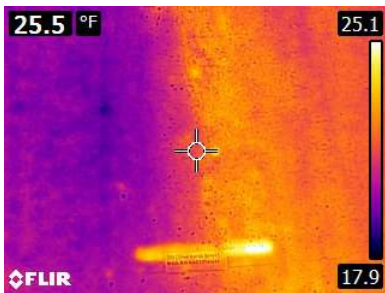
A) Nikon photograph at ~20 minutes after treatment



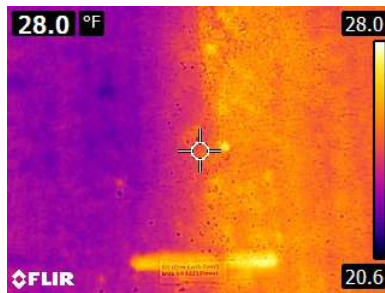
B) Nikon photograph at 50 minutes after treatment



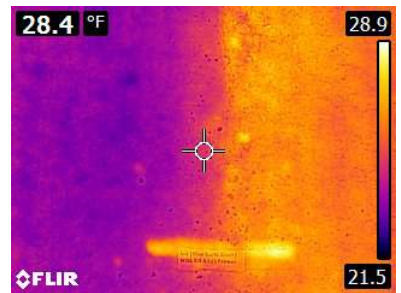
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Ice melter	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



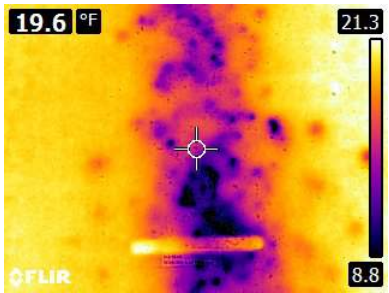
A) Nikon photograph at ~20 minutes after treatment



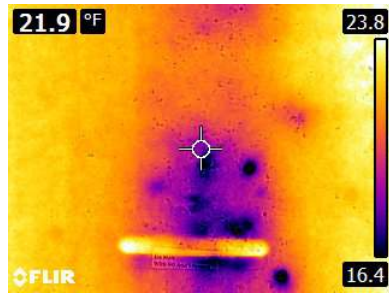
B) Nikon photograph at 50 minutes after treatment



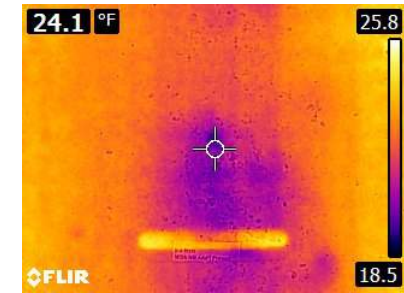
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment



Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Ice Slicer	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



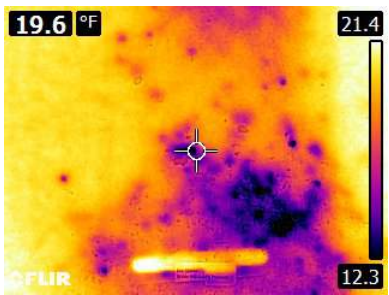
A) Nikon photograph at ~20 minutes after treatment



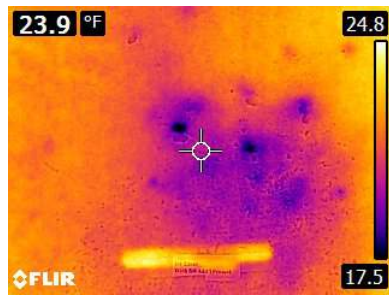
B) Nikon photograph at 50 minutes after treatment



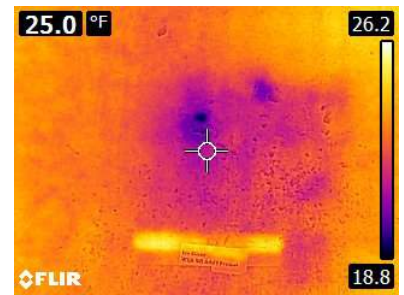
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Magnesium Chloride	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



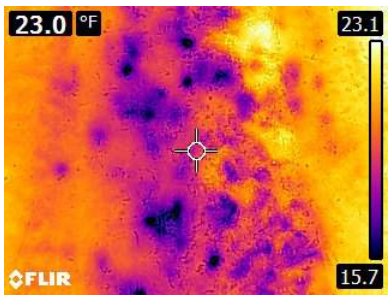
A) Nikon photograph at ~20 minutes after treatment



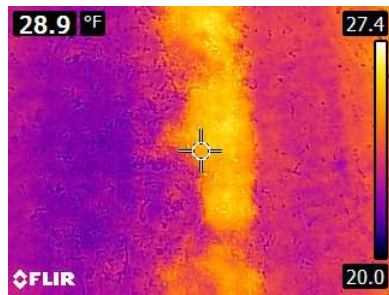
B) Nikon photograph at 50 minutes after treatment



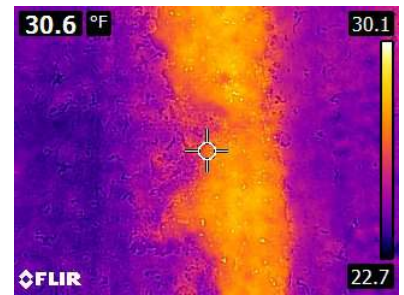
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 14, 2016	Time: 1:00pm to 2:40pm
Weather:	30°F Overcast	Wind: 9 mph Dew Point 17°F
Treatment Material:	Pellets of fire / Calcium Chloride	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



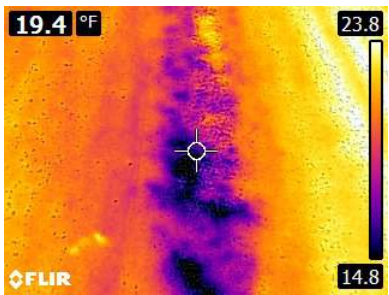
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 50 minutes after treatment



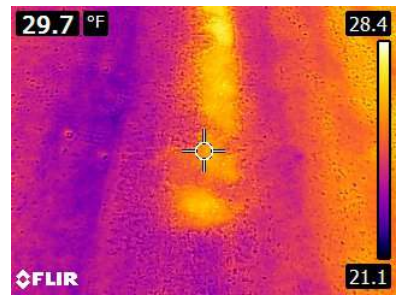
C) Nikon photograph at 80 minutes after treatment



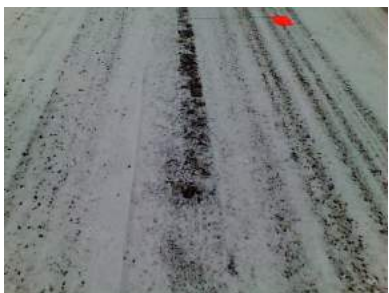
D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Rock salt w/ salt brine		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



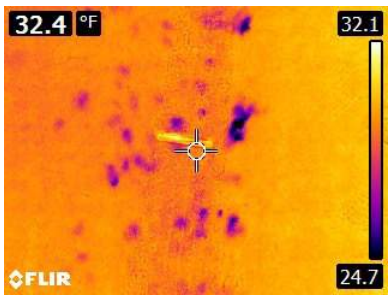
A) Nikon photograph at ~20 minutes after treatment



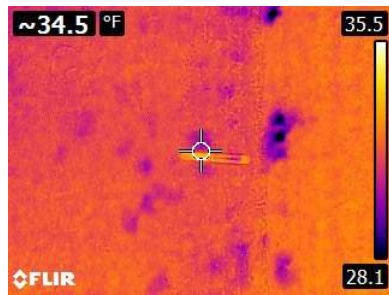
B) Nikon photograph at 50 minutes after treatment



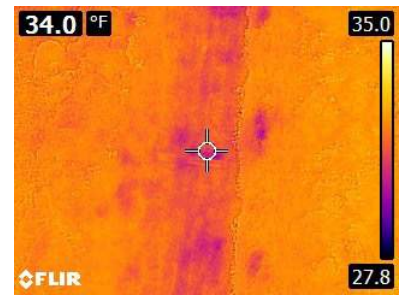
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Salt w/ Apex	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



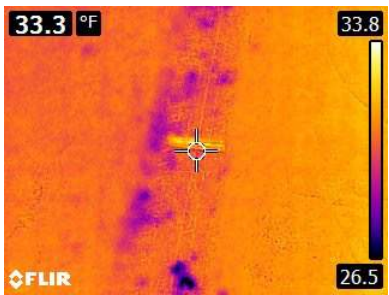
A) Nikon photograph at ~20 minutes after treatment



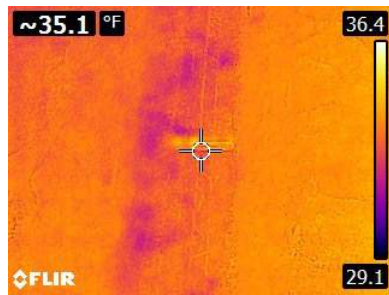
B) Nikon photograph at 50 minutes after treatment



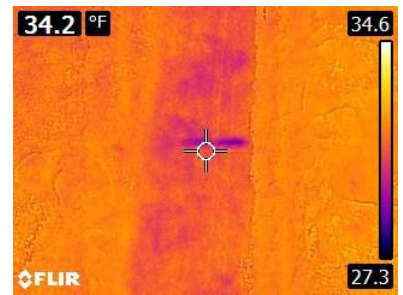
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Rock Salt w/ Freezeguard	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



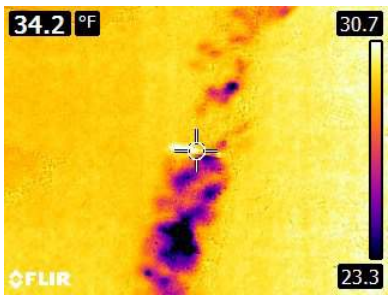
A) Nikon photograph at ~20 minutes after treatment



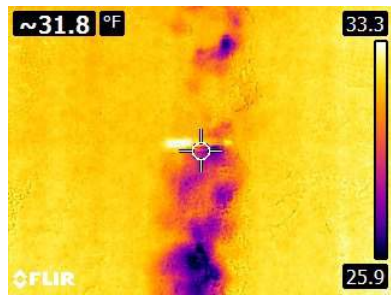
B) Nikon photograph at 50 minutes after treatment



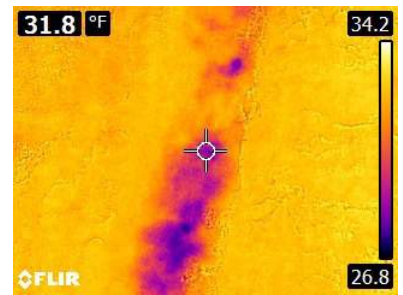
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Rock salt w/ RG8 10%		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



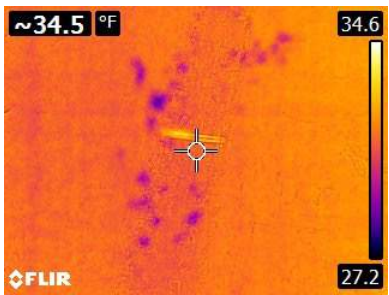
A) Nikon photograph at ~20 minutes after treatment



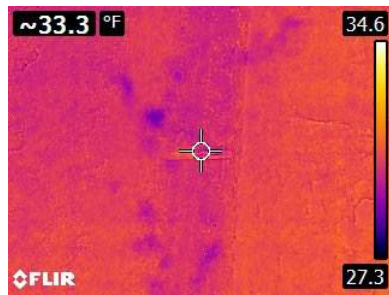
B) Nikon photograph at 50 minutes after treatment



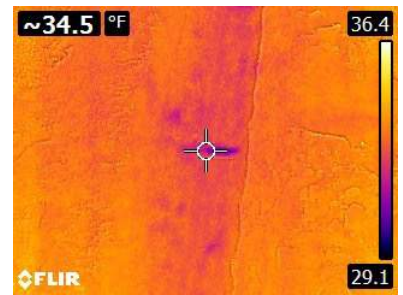
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Rock salt w/ molasses 1%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



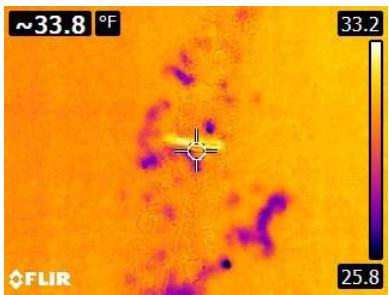
A) Nikon photograph at ~20 minutes after treatment



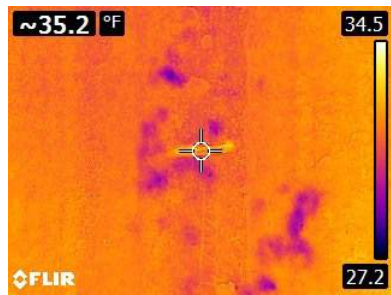
B) Nikon photograph at 50 minutes after treatment



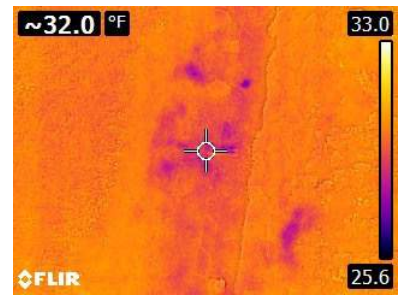
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment



Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Rock salt w/ molasses 3%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



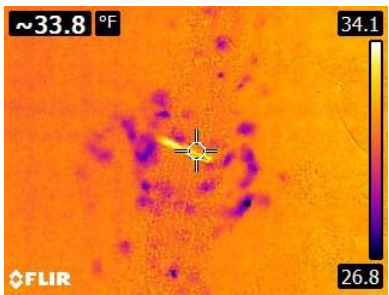
A) Nikon photograph at ~20 minutes after treatment



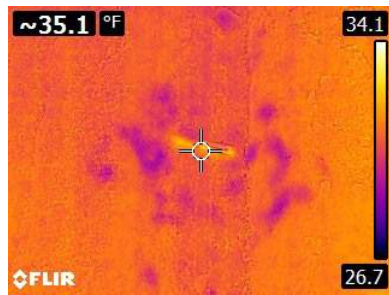
B) Nikon photograph at 50 minutes after treatment



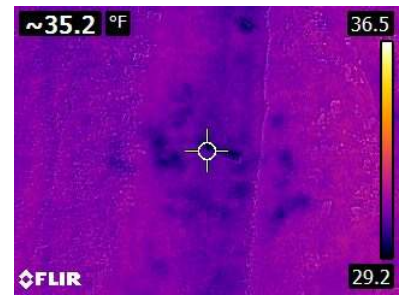
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Rock salt w/ molasses 5%		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



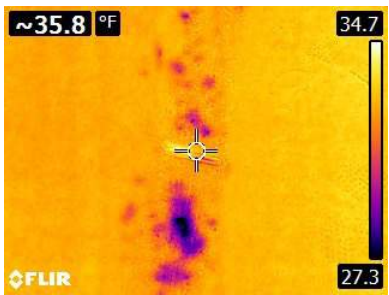
A) Nikon photograph at ~20 minutes after treatment



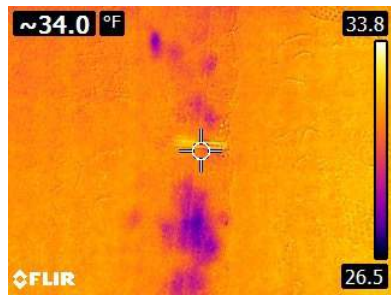
B) Nikon photograph at 50 minutes after treatment



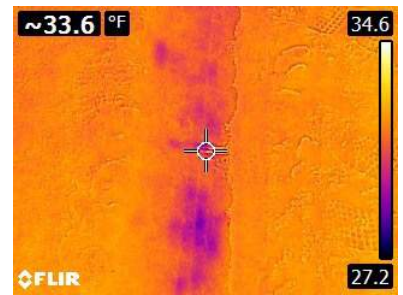
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Rock salt w/ molasses 10%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



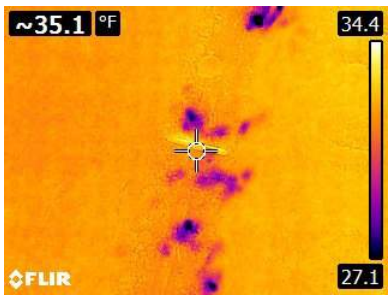
A) Nikon photograph at ~20 minutes after treatment



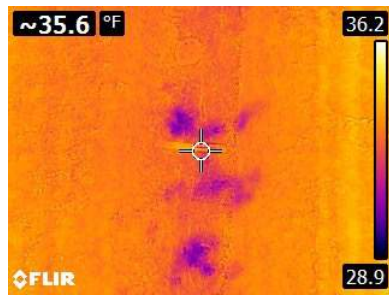
B) Nikon photograph at 50 minutes after treatment



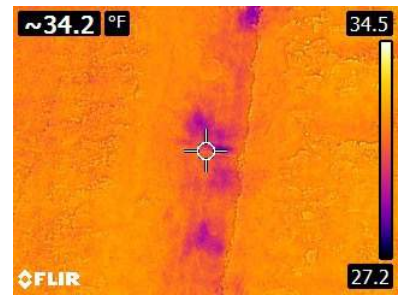
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Rock salt w/ orange dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



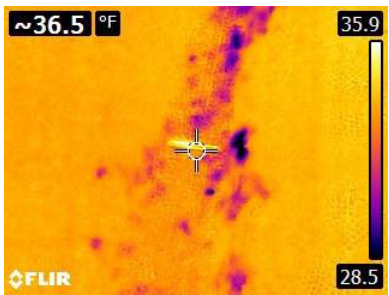
A) Nikon photograph at ~20 minutes after treatment



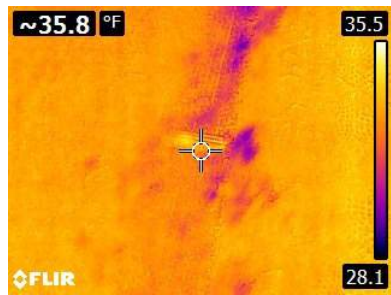
B) Nikon photograph at 50 minutes after treatment



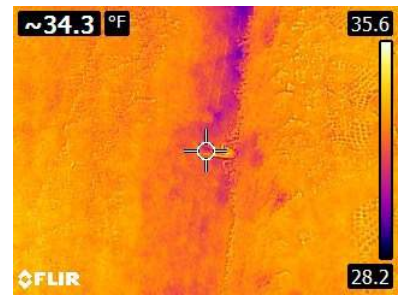
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Rock salt w/ red dye		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



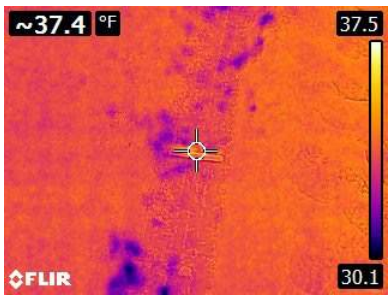
A) Nikon photograph at ~20 minutes after treatment



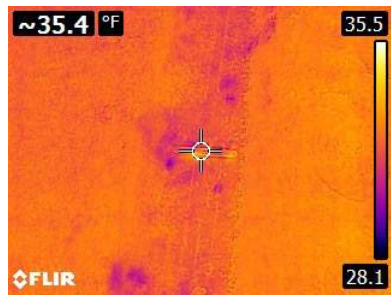
B) Nikon photograph at 50 minutes after treatment



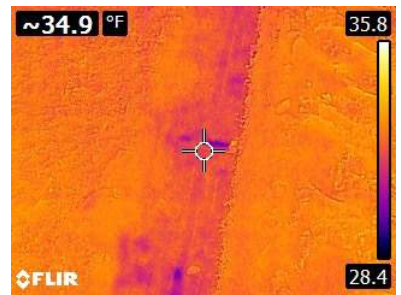
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Salt w/ Blue Dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



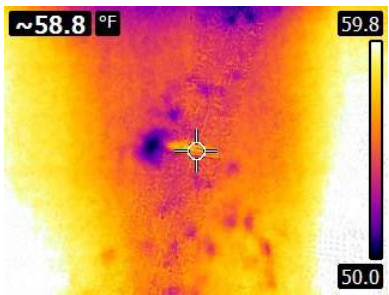
A) Nikon photograph at ~20 minutes after treatment



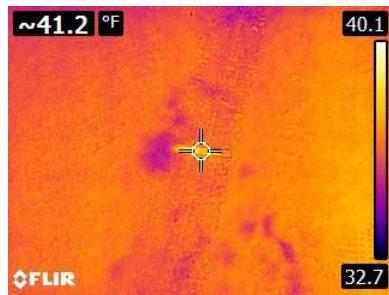
B) Nikon photograph at 50 minutes after treatment



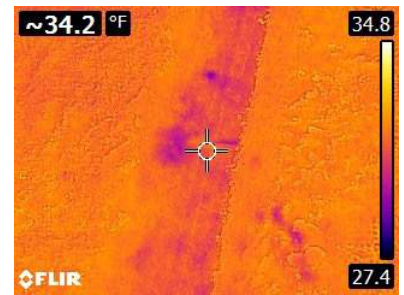
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Rock salt w/ yellow dye	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



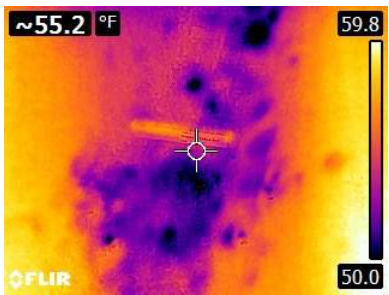
A) Nikon photograph at ~20 minutes after treatment



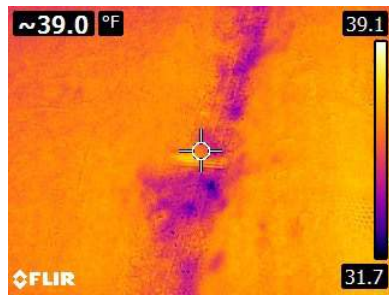
B) Nikon photograph at 50 minutes after treatment



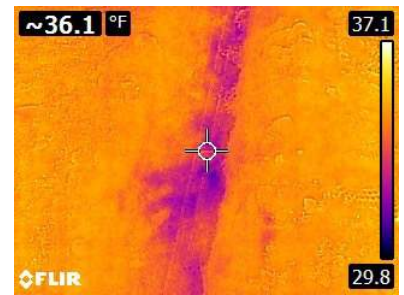
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Rock salt w/ salt brine	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



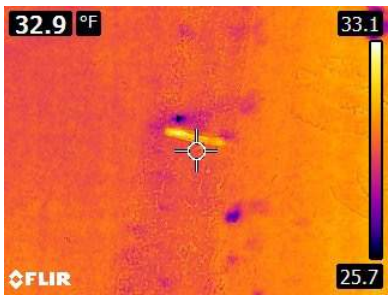
A) Nikon photograph at ~20 minutes after treatment



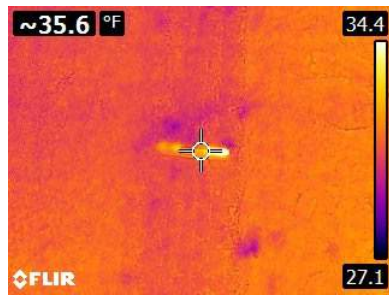
B) Nikon photograph at 50 minutes after treatment



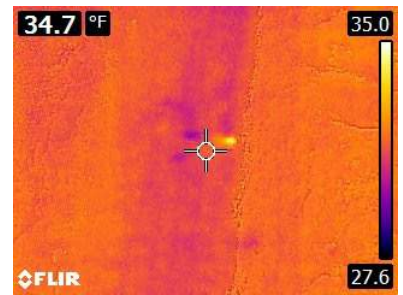
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment



Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Sand w salt brine		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



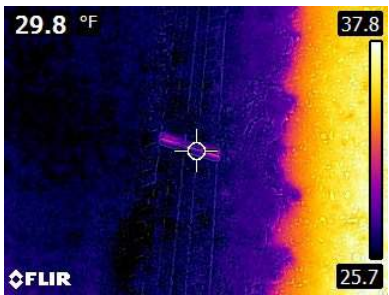
A) Nikon photograph at ~20 minutes after treatment



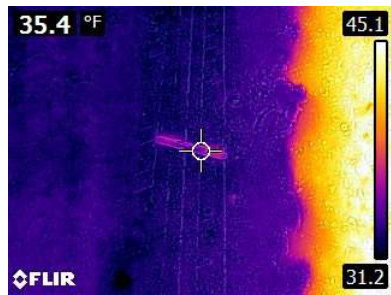
B) Nikon photograph at 50 minutes after treatment



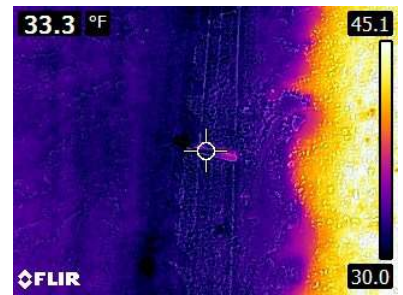
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Sand with Apex	
Snow: dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



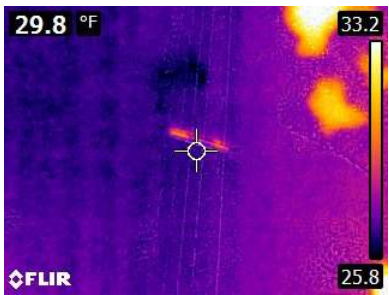
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 50 minutes after treatment



C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Sand with Freezeguard	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



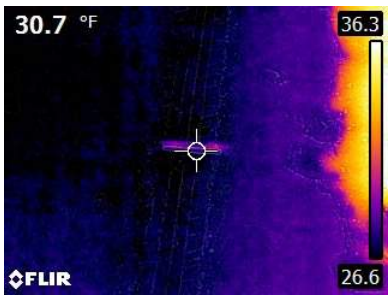
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 50 minutes after treatment



C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Sand with RG8 10%		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



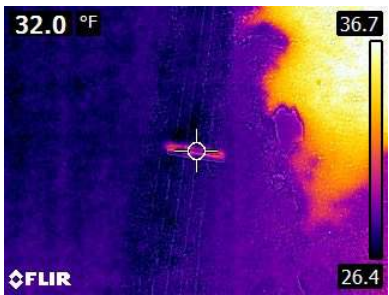
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 50 minutes after treatment



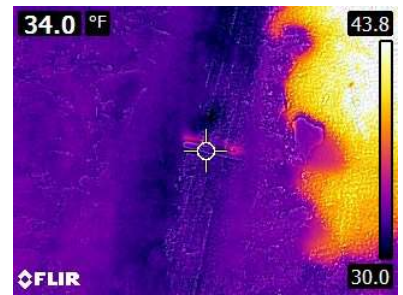
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Sand with molasses 1%		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



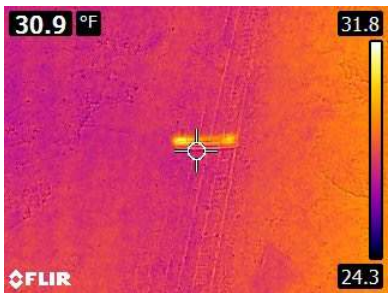
A) Nikon photograph at ~20 minutes after treatment



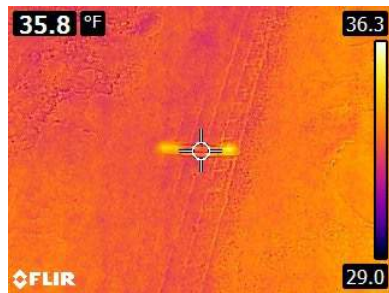
B) Nikon photograph at 50 minutes after treatment



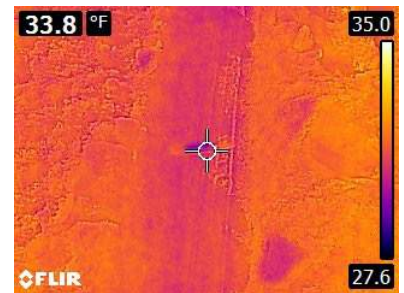
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Sand with molasses 3%		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



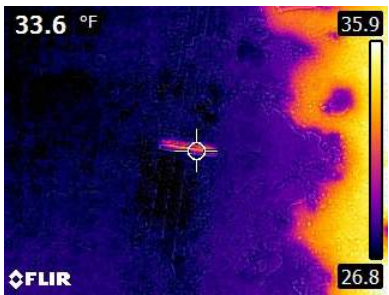
A) Nikon photograph at ~20 minutes after treatment



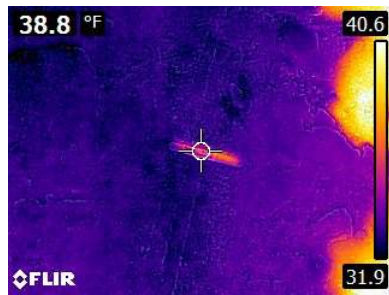
B) Nikon photograph at 50 minutes after treatment



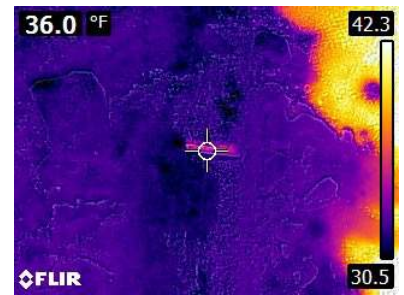
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Sand with molasses 5%	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



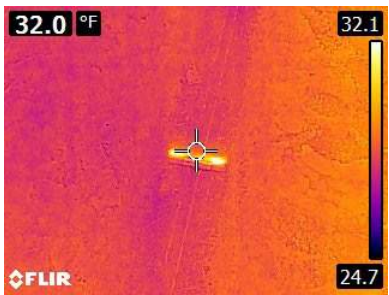
A) Nikon photograph at ~20 minutes after treatment



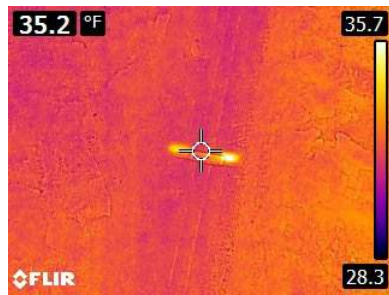
B) Nikon photograph at 50 minutes after treatment



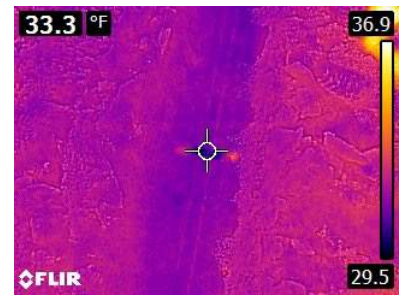
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Sand with molasses 10%		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



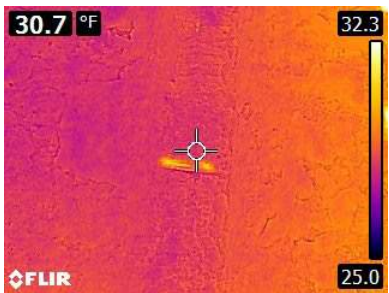
A) Nikon photograph at ~20 minutes after treatment



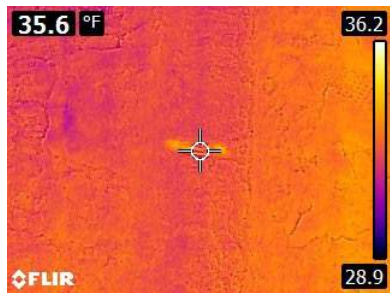
B) Nikon photograph at 50 minutes after treatment



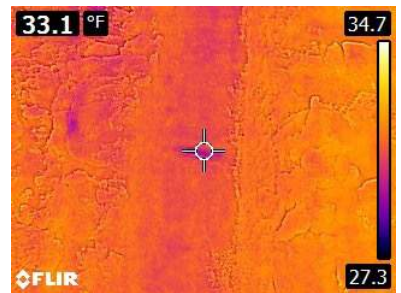
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment



Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Sand with orange dye		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



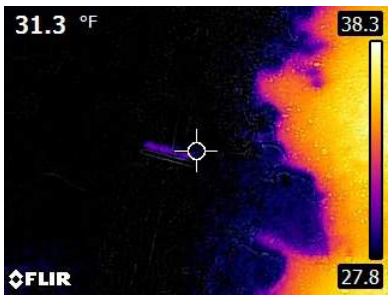
A) Nikon photograph at ~20 minutes after treatment



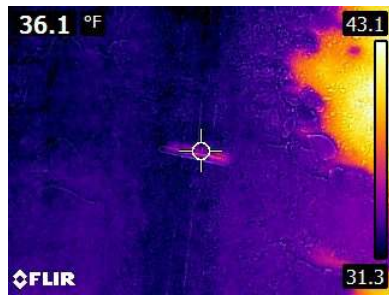
B) Nikon photograph at 50 minutes after treatment



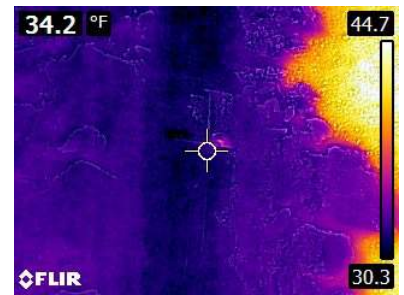
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Sand with red dye		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



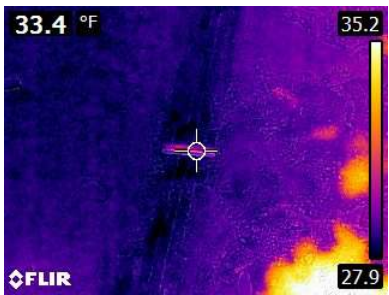
A) Nikon photograph at ~20 minutes after treatment



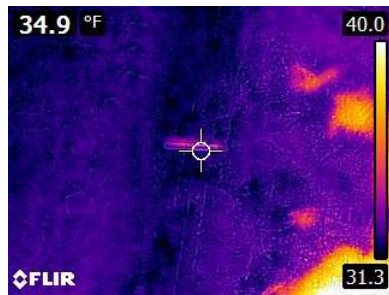
B) Nikon photograph at 50 minutes after treatment



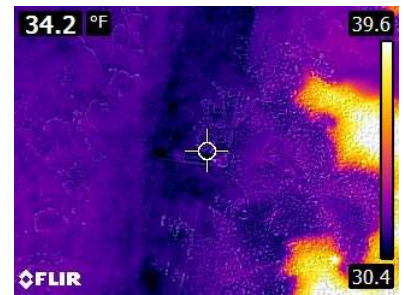
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Sand with blue dye		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



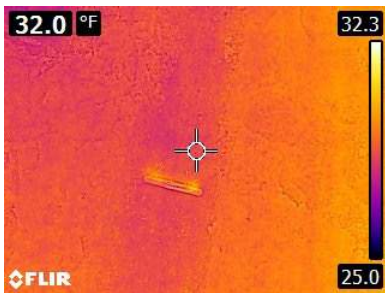
A) Nikon photograph at ~20 minutes after treatment



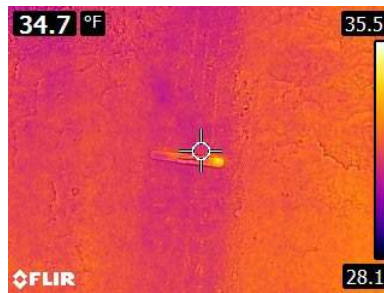
B) Nikon photograph at 50 minutes after treatment



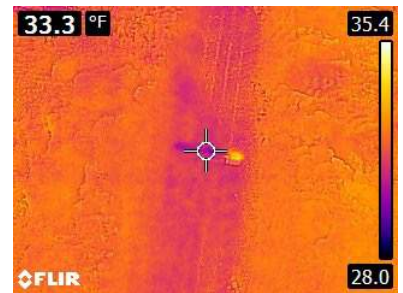
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Sand with yellow dye		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



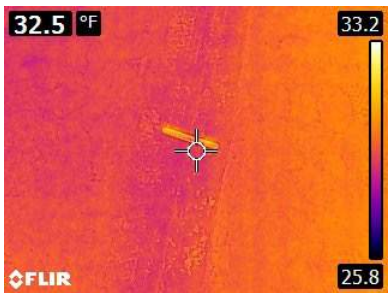
A) Nikon photograph at ~20 minutes after treatment



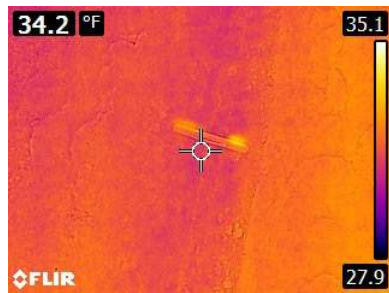
B) Nikon photograph at 50 minutes after treatment



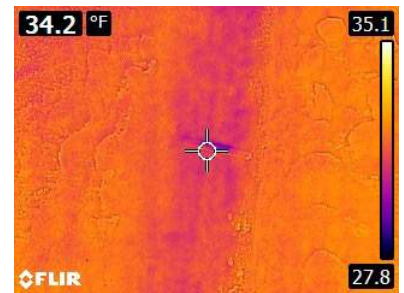
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Sand with no prewet		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



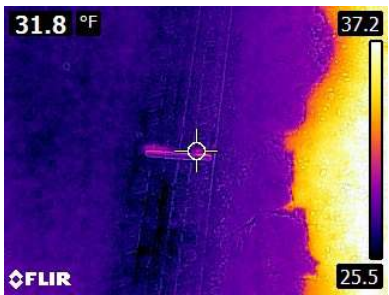
A) Nikon photograph at ~20 minutes after treatment



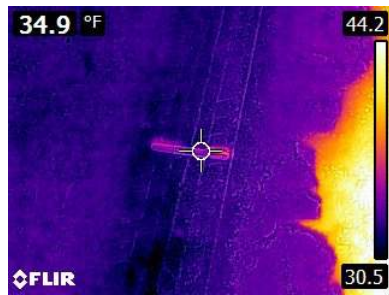
B) Nikon photograph at 50 minutes after treatment



C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Walnut hull sand		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



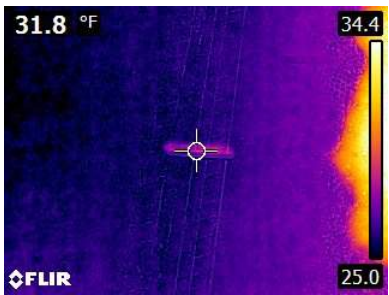
A) Nikon photograph at ~20 minutes after treatment



B) Nikon photograph at 50 minutes after treatment



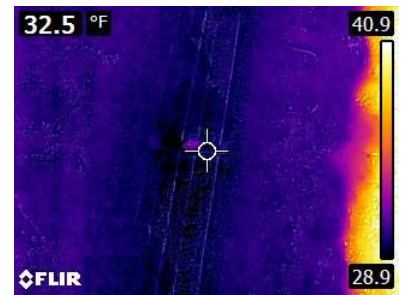
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Garnet	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



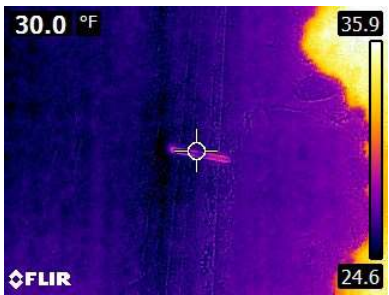
A) Nikon photograph at ~20 minutes after treatment



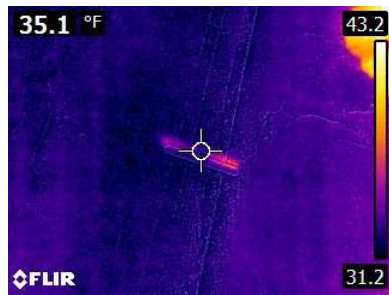
B) Nikon photograph at 50 minutes after treatment



C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Black Beauty	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



A) Nikon photograph at ~20 minutes after treatment



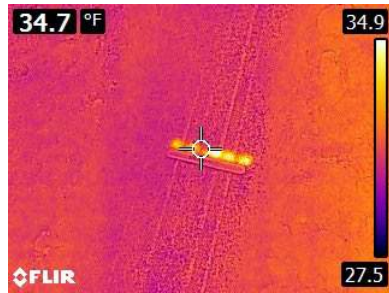
B) Nikon photograph at 50 minutes after treatment



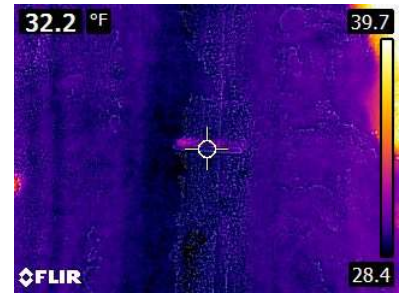
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment



Lane and Date:	January 31, 2016	Time:	1 pm
Weather:	39° F Overcast	Wind:	5-8 mph Dew Point 29° F
Treatment Material:	Silt		
Snow: dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track			



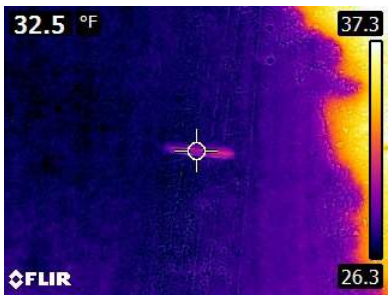
A) Nikon photograph at ~20 minutes after treatment



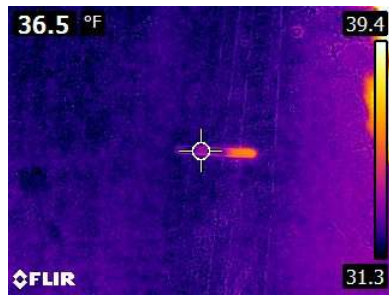
B) Nikon photograph at 50 minutes after treatment



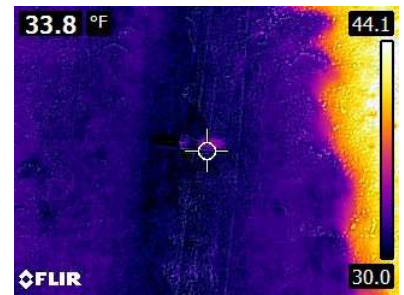
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Ice Melter	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



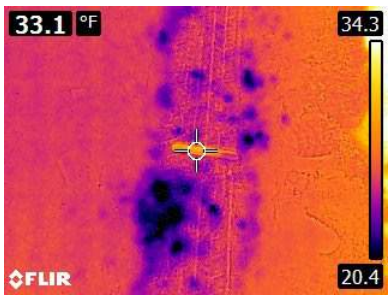
A) Nikon photograph at ~20 minutes after treatment



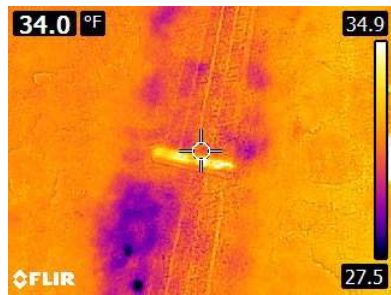
B) Nikon photograph at 50 minutes after treatment



C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material:	Ice Slicer	
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track	



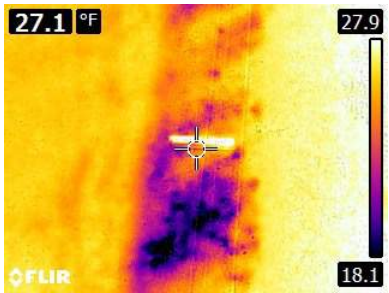
A) Nikon photograph at ~20 minutes after treatment



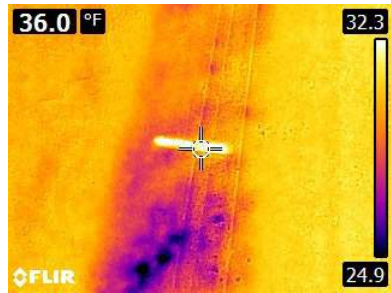
B) Nikon photograph at 50 minutes after treatment



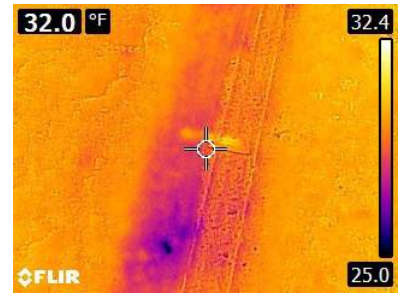
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time: 1 pm
Weather:	39° F Overcast	Wind: 5-8 mph Dew Point 29° F
Treatment Material: Magnesium Chloride		
Snow: dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



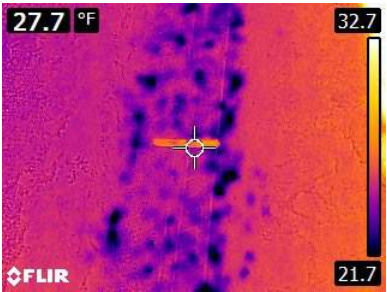
A) Nikon photograph at ~20 minutes after treatment



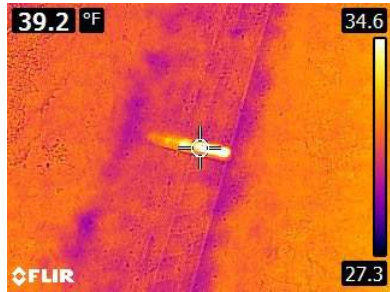
B) Nikon photograph at 50 minutes after treatment



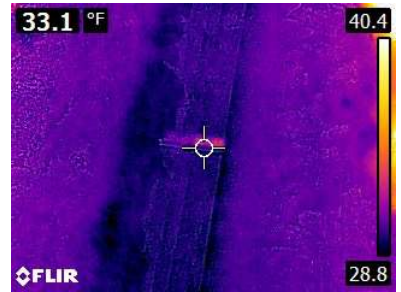
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

Lane and Date:	January 31, 2016	Time:	
Weather:	39° F Overcast	Wind: 5-8 mph	Dew Point 29° F
Treatment Material:	Pellets of Fire Calcium Chloride		
Snow:	dry, compacted; some drift fingers. Note: no truck; used pre-existing tire track		



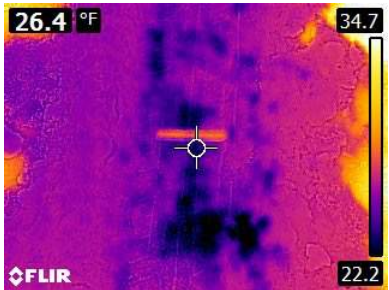
A) Nikon photograph at ~20 minutes after treatment



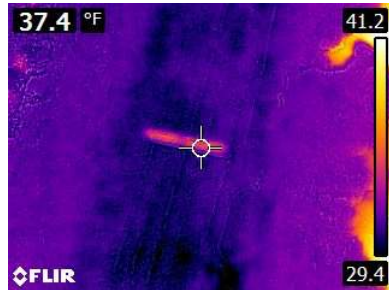
B) Nikon photograph at 50 minutes after treatment



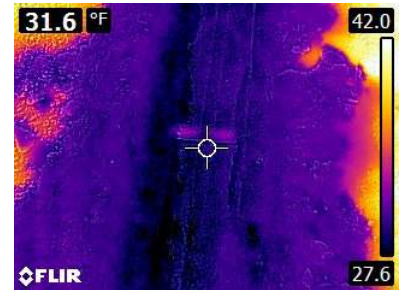
C) Nikon photograph at 80 minutes after treatment



D) FLIR infrared thermograph at ~20 minutes after treatment



E) FLIR infrared thermograph at 50 minutes after treatment



F) FLIR infrared thermograph at 80 minutes after treatment



G) FLIR concurrent photograph at ~20 minutes after treatment



H) FLIR concurrent photograph at ~50 minutes after treatment



H) FLIR concurrent photograph at ~80 minutes after treatment

**APPENDIX E: PLOW EVALUATIONS**

Date: February 5, 2016

Lane: VF 1

Truck: Carver County 401

Plow: unnamed

Cutting Edge: Winter Polarflex

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F



Cast

- Low to medium height. Relatively uniform and concentrated. Landing close.

Clouding

- Passenger side: Medium to high, moderately opaque, verging on thick. Constrained distribution, not widespread. Medium sized particles, few fines.
- Driver side: Low to medium high, intermittently opaque, medium grained.

Date: February 5, 2016

Lane: VF 1

Truck: Carver County 401

Plow:

Cutting Edge: Winter Polarflex

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F



### Cut

- Thicker residual, changing to medium to thin about 100 feet in after passing low gutter perpendicular to direction of lane.
- Uniform both across and longitudinally (looking beyond first section). No bare spots.

### Compaction

- Little compaction noted; snow moisture may be too low for snow to compact much.



Date: February 5, 2016

Lane: VF 2

Truck: Carver County 1313

Plow: Henderson Two Way

Cutting Edge: Polarflex

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F

**Cast**

- Medium to high cast, moderately broad, landing mid distance.

**Clouding**

- Passenger side: High, broad and floating, distributing away and wrapping around truck. Opaque and moderately thick. Fines mobilized.
- Driver side: Coarse, not rising, low. Thin and mostly transparent.

Date: February 5, 2016

Lane: VF 2

Truck: Carver County 1313

Plow: Henderson Two Way

Cutting Edge: Polarflex

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F



32°F/0°C



07-15-2014 21:28:56

Cut

- Medium residual, not thin. Some variation across, with slightly thicker strips. Little variation longitudinally, though some apparent response to underlying pavement variations.

Compaction

- Little compaction noted; snow moisture may be too low for snow to compact much.

Date: February 5, 2016

Lane: VF 3

Truck: Carver County 0702

Plow: Falls Model 312

Cutting Edge: Kennametal

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F

**Cast**

- Low, compact and concentrated. Medium distance. Focused.

**Clouding**

- Passenger side: Widespread on medium and high levels; fine and floating. Medium opaque and uniform. Wrapping around behind truck.
- Driver side: Little cloud formation. Contained and controlled, low if at all.

Date: February 5, 2016

Lane: VF 3

Truck: Carver County 0702

Plow: Falls Model 312

Cutting Edge: Kennametal

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F

**Cut**

- Thicker. No bare or near bare spots, a few medium thickness patches. Not a close cut. Uniform both across and longitudinally.

**Compaction**

- Little compaction noted; snow moisture may be too low for snow to compact much.

Date: February 5, 2016

Lane: VF 4

Truck: Carver County 1311

Plow: Henderson

Cutting Edge: Joma

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F

**Cast**

- Low and concentrated cast, not much rise. Medium distance, appears farther than most other plows.

**Clouding**

- Passenger side: Medium to high cloud, uniform and opaque, thick. Broadly distributed, wrapping behind truck.
- Driver side: Low but thick. Leakage over front corner of plow. Opaque. Appears coarse as little fine material floating away. Widely spread from edge of plow.

Date: February 5, 2016

Lane: VF 4

Truck: Carver County 1311

Plow: Henderson

Cutting Edge: Joma

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F



### Cut

- Thinner residual; cut is close to roadway surface. Some small strips of medium thickness; variation is across lane not longitudinal. Few small bare spots located along drivers edge and inside of passenger wheel line.

### Compaction

- Little compaction noted; snow moisture may be too low for snow to compact much.

Date: February 5, 2016

Lane: VF 5

Truck: Carver County 1501

Plow: Falls Dozer

Cutting Edge: Kennametal

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F



#### Cast

- Medium distance. Not focused, turbulent, broadly distributed. Cast and cloud blending, boundary not distinct.

#### Clouding

- Passenger side: Big and broad, thick and opaque. Appears to be both coarse and fine particles. High. Fines wrapping around truck, staying airborne.
- Driver side: Streaming mid height. Thin but broad; transparent.

Date: February 5, 2016

Lane: VF 5

Truck: Carver County 1501

Plow: Falls Dozer

Cutting Edge: Kennametal

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F



M 48°F/8°C



02-05-2016 12:18:34

### Cut

- Medium thick residual. Not uniform; zones of thicker and thinner residual. Longitudinally uniform.

### Compaction

- Little compaction noted; snow moisture may be too low for snow to compact much.



Date: February 5, 2016

Lane: VF 6

Truck: Carver County 1408

Plow: DOK

Cutting Edge: Kennametal

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F

**Cast**

- Distributed and turbulent; not focused. Rolling. Medium distance.

**Clouding**

- Passenger side: High and far; widespread. Coarse at distance but fine throughout. Opaque and thick. Substantial.
- Driver side: Moderate leakage from end of plow. Medium to low height, coarse and fine both. Opaque and thick. Wide. Staying airborne at least until truck is past.

Date: February 5, 2016

Lane: VF 6

Truck: Carver County 1408

Plow: DOK

Cutting Edge: Kennametal

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F



Cut

- Relatively uniform residual; thin to medium. Uniform longitudinally, but several small variation across.

Compaction

- Little compaction noted; snow moisture may be too low for snow to compact much.

Date: February 5, 2016

Lane: VF 7

Truck: Carver County 0502

Plow: Falls Stationary

Cutting Edge: Joma

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F



#### Cast

- Uniform and focused; directed. Medium distance. Low.

#### Clouding

- Passenger side: Medium to low in majority, wispy high. Coarse fraction appears to be not mobilized. Fines wrapping around truck.
- Driver side: Low to medium height. Thick. Appears coarse. Widely spread from edge of plow.

Date: February 5, 2016

Lane: VF 7

Truck: Carver County 0502

Plow: Falls Stationary

Cutting Edge: Joma

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F

**Cut**

- Thinner under centerline of truck. Somewhat variable, not uniform, either across or longitudinal. Some bare spots.

**Compaction**

- Little compaction noted; snow moisture may be too low for snow to compact much.

Date: February 5, 2016

Lane: VF 8

Truck: Carver County 0702  
Plow: Towmaster Reversible  
Cutting Edge: Joma

Speed: 30 mph  
Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.  
Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F



#### Cast

- Tight and focused. Low. Medium distance.

#### Clouding

- Passenger side: Low, some medium height. Opaque and thick. Little fines. Constrained; moderate to low amount wrapping around truck.
- Driver side: Low to medium height. Thick. Opaque. Appears coarse as little fine material floating away. Widely spread from edge of plow.

Date: February 5, 2016

Lane: VF 8

Truck: Carver County 0702  
Plow: Towmaster Reversible  
Cutting Edge: Joma

Speed: 30 mph  
Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.  
Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F



#### Cut

- Uniform but with a few small bare spots. Generally medium thick residual, not close. Some longitudinal variation; not much variation across.

#### Compaction

- Little compaction noted; snow moisture may be too low for snow to compact much.

Date: February 5, 2016

Lane: VF 9

Truck: Carver County 0901

Plow: Falls Articulating

Cutting Edge: Joma

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F

**Cast**

- Low and focused. Close. Appears concentrated. Medium distance, perhaps closer.

**Clouding**

- Passenger side: Low. Little clouding. Fine and generally transparent. Close.
- Driver side: Fine and wispy. Thin and transparent. Medium height.

Date: February 5, 2016

Lane: VF 9

Truck: Carver County 0901

Plow: Falls Articulating

Cutting Edge: Joma

Speed: 30 mph

Load: Empty

Snow: 5 inches soft, moist, clear white, rounded grains, generally uniform some fingers.

Weather: Overcast, 28°F, wind 6 mph from south, dew point 21°F



Cut

- Thin. Some bare spots. Mostly uniform in longitudinal direction, some variation across with nearly bare narrow stripe under passenger side.

Compaction

- Little compaction noted; snow moisture may be too low for snow to compact much.





Figure 1. Valley Fair Lane 1, truck speed 30 mph, December 12, 2016; very dry fine snow with uniform structure, approximately 5 inches thick. Photos at approximately 100-foot increments through the zone of constant speed.



Figure 2. Valley Fair Lane 2, truck speed 30 mph, December 12, 2016; very dry fine snow with uniform structure, approximately 5 inches thick. Photos at approximately 100-foot increments through the zone of constant speed.



Figure 3. Valley Fair Lane 3, truck speed 30 mph, December 12, 2016; very dry fine snow with uniform structure, approximately 5 inches thick. Photos at approximately 100-foot increments through the zone of constant speed.



Figure 4. Valley Fair Lane 4, truck speed 35 mph, December 12, 2016; very dry fine snow with uniform structure, approximately 5 inches thick. Photos at approximately 100-foot increments through the zone of constant speed.



Figure 5. Valley Fair Lane 5, truck speed 35 mph, December 12, 2016; very dry fine snow with uniform structure, approximately 5 inches thick. Photos at approximately 100-foot increments through the zone of constant speed.



Figure 6. Valley Fair Lane 6, truck speed 35 mph, December 12, 2016; very dry fine snow with uniform structure, approximately 5 inches thick. Photos at approximately 100-foot increments through the zone of constant speed.



Figure 7. Valley Fair Lane 7, truck speed 25 mph, December 12, 2016; very dry fine snow with uniform structure, approximately 5 inches thick. Photos at approximately 100-foot increments through the zone of constant speed.



Figure 8. Valley Fair Lane 8, truck speed 25 mph, December 12, 2016; very dry fine snow with uniform structure, approximately 5 inches thick. Photos at approximately 100-foot increments through the zone of constant speed.





Figure 9. Valley Fair Lane 9, truck speed 25 mph, December 12, 2016; very dry fine snow with uniform structure, approximately 5 inches thick. Photos at approximately 100-foot increments through the zone of constant speed.



Figure 10. Evaluation of replication: two photos each of three lanes plowed at the same speed. Lanes shown are Valley Fair 7 (top), 8 (middle) and 9 (bottom), all plowed at 25 mph.



Figure 11. Evaluation of replication: two photos each of three lanes plowed at the same speed. Lanes shown are Valley Fair 1 (top), 2 (middle) and 3 (bottom), all plowed at 30 mph.



Figure 12. Evaluation of replication: two photos each of three lanes plowed at the same speed. Lanes shown are Valley Fair 4 (top), 5 (middle) and 6 (bottom), all plowed at 35 mph.

Table 1. Comparison of plowing at different speeds of the same truck and plow; December 12, 2016

<p>VF Lane 8, 25 mph speed</p>	 A plow truck is shown from a front-left perspective, moving across a snow-covered field. The truck is orange and white, with a large black plow blade. It is moving from left to right, leaving a trail of snow behind it. The background shows a line of trees and a fence.	 A plow truck is shown from a front-right perspective, moving across a snow-covered field. The truck is orange and white, with a large black plow blade. It is moving from right to left, leaving a trail of snow behind it. The background shows a line of trees and a fence.
<p>VF Lane 3, 30 mph speed</p>	 A plow truck is shown from a front-left perspective, moving across a snow-covered field. The truck is orange and white, with a large black plow blade. It is moving from left to right, leaving a trail of snow behind it. The background shows a line of trees and a fence.	 A plow truck is shown from a front-right perspective, moving across a snow-covered field. The truck is orange and white, with a large black plow blade. It is moving from right to left, leaving a trail of snow behind it. The background shows a line of trees and a fence.
<p>VF Lane 5, 35 mph speed</p>	 A plow truck is shown from a front-left perspective, moving across a snow-covered field. The truck is orange and white, with a large black plow blade. It is moving from left to right, leaving a trail of snow behind it. The background shows a line of trees and a fence.	 A plow truck is shown from a front-right perspective, moving across a snow-covered field. The truck is orange and white, with a large black plow blade. It is moving from right to left, leaving a trail of snow behind it. The background shows a line of trees and a fence.




<p>VF Lane 8, 25 mph speed</p>	 A snowplow is shown from a front-quarter perspective, moving away from the camera on a snow-covered road. The plow blade is lowered and pushing snow to the right. The road is marked with several yellow and red flags. The background shows a line of trees and a fence.
<p>VF Lane 3, 30 mph speed</p>	 A snowplow is shown from a front-quarter perspective, moving away from the camera. The plow blade is pushing snow to the right. The road is marked with several yellow and red flags. The background shows a line of trees and a fence.
<p>VF Lane 5, 35 mph speed</p>	 A snowplow is shown from a front-quarter perspective, moving away from the camera. The plow blade is pushing snow to the right. The road is marked with several yellow and red flags. The background shows a line of trees and a fence.

Figure 13. Selected photos from three lanes at different plow speeds.



Figure 14. Valley Fair Lane 1, 30 mph.



Figure 15. Valley Fair Lane 2, 30 mph.





Figure 16. Valley Fair Lane 3, 30 mph.



Figure 17. Valley Fair Lane 4, 35 mph.



Figure 18. Valley Fair Lane 5, 35 mph.



Figure 19. Valley Fair Lane 6, 35 mph.



Figure 20. Valley Fair Lane 7, 25 mph.



Figure 21. Valley Fair Lane 8, 25 mph.



Figure 22. Valley Fair Lane 9, 25 mph.



Figure 23. Evaluation of replication: two photos each of three lanes plowed at the same speed. Lanes shown are Valley Fair 7 (top), 8 (middle) and 9 (bottom), all plowed at 25 mph.



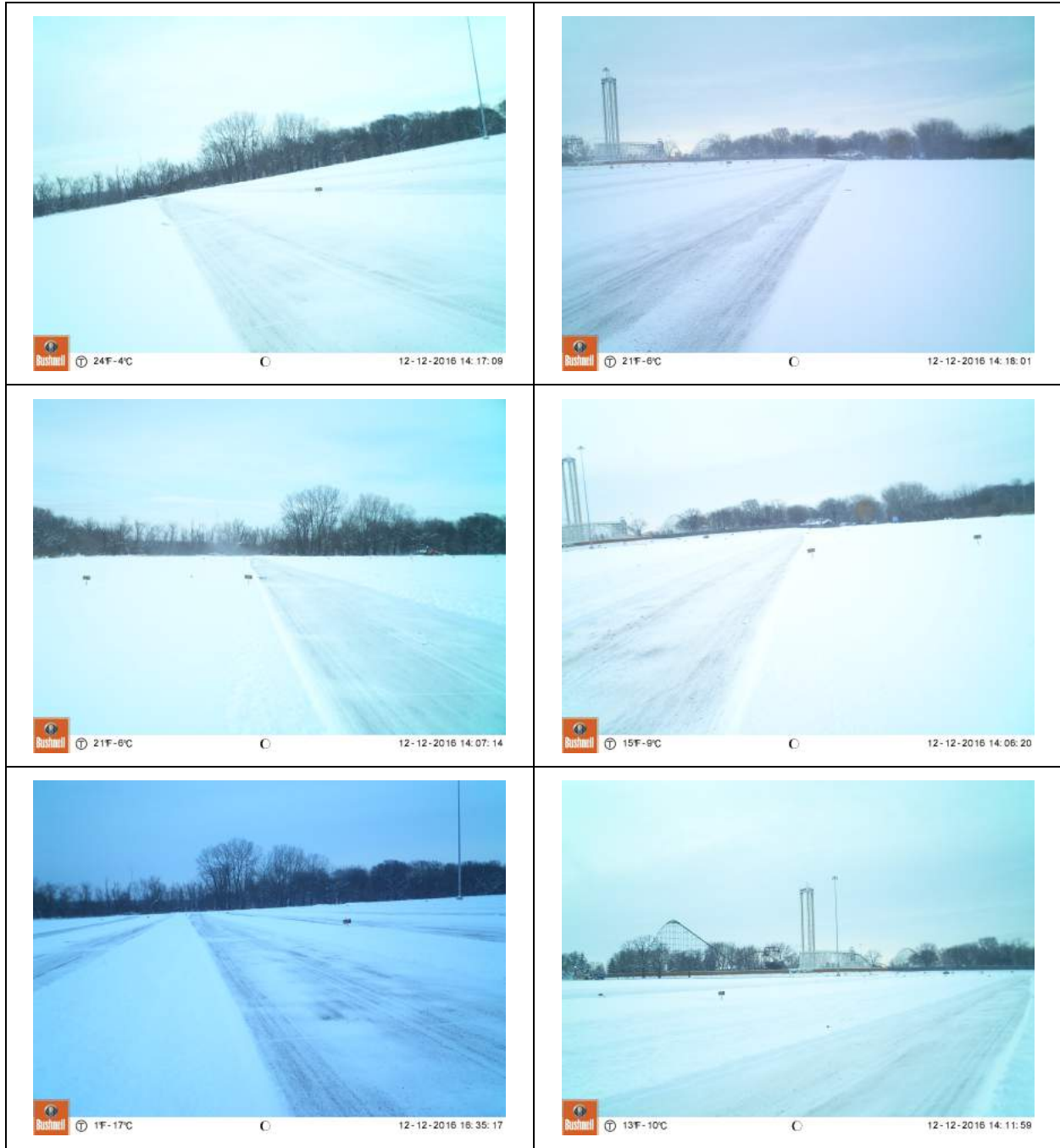


Figure 24. Evaluation of replication: two photos each of three lanes plowed at the same speed. Lanes shown are Valley Fair 1 (top), 2 (middle) and 3 (bottom), all plowed at 30 mph.



Figure 25. Evaluation of replication: two photos each of three lanes plowed at the same speed. Lanes shown are Valley Fair 4 (top), 5 (middle) and 6 (bottom), all plowed at 35 mph.

**APPENDIX F: CALIBRATION OF FLOW MEASUREMENT WEIRS**

Height Vs. Flow Table for US169 Drum Flow Through Cells - V notch Weir Calibration  
Mn DOT Salt III Project  
November 16, 2015

Flow Condition				Determination of C by Flow Level			Evaluation of Individual Drum Average C			
Alfa (Right Weir)				Flow (L/min)	Flow (gpm)	$C=Q/H^{2.5}$	$Q=C_{avg}H^{2.5}$ (gpm)	Flow <sub>predicted</sub> /Flow <sub>actual</sub>	$Q_{calc}-Q_{actual}$	
Speed	height (feet)	Q (L/min)	Q(GPM)							
30, 2 tubes	0.11	7.35	1.94	7.35	1.94	484	1.68	87%	-0.26	
50, 2 tubes	0.14	13.33	3.52	13.33	3.52	480	3.08	87%	-0.45	
60, 2 tubes	0.16	17.47	4.62	17.47	4.62	451	4.29	93%	-0.32	
70, 2 tubes	0.18	20.13	5.32	20.13	5.32	387	5.76	108%	0.45	
80, 2 tubes	0.19	21	5.55	21	5.55	353	6.60	119%	1.05	
100, 2 tubes	0.2	24.49	6.47	24.49	6.47	362	7.50	116%	1.03	
Avg =						419				
Bravo (Left Weir)				Flow (L/min)	Flow (gpm)	$C=Q/H^{2.5}$	$Q=C_{avg}H^{2.5}$ (gpm)	Flow <sub>predicted</sub> /Flow <sub>actual</sub>	$Q_{calc}-Q_{actual}$	
Speed	height (feet)	Q (L/min)	Flow (gpm)							
30, 2 tubes	0.11	7.22	1.91	7.22	1.91	475	1.91	100%	0.01	
50, 2 tubes	0.13	12.28	3.24	12.28	3.24	532	2.91	90%	-0.34	
60, 2 tubes	0.15	17.39	4.59	17.39	4.59	527	4.15	90%	-0.44	
70, 2 tubes	0.16	18.87	4.99	18.87	4.99	487	4.88	98%	-0.10	
80, 2 tubes	0.17	19.17	5.06	19.17	5.06	425	5.68	112%	0.62	
100, 2 tubes	0.18	21.53	5.69	21.53	5.69	414	6.55	115%	0.87	
Avg =						477				
Charlie (Left Weir)				Flow (gpm)	Flow (L/min)	Flow (gpm)	$C=Q/H^{2.5}$	$Q=C_{avg}H^{2.5}$ (gpm)	Flow <sub>predicted</sub> /Flow <sub>actual</sub>	$Q_{calc}-Q_{actual}$
Speed	height (feet)									
30, 2 tubes	0.11	7.05	1.86	7.05	1.86	464	1.74	93%	-0.12	
50, 2 tubes	0.14	11.98	3.17	11.98	3.17	432	3.18	100%	0.01	
60, 2 tubes	0.15	17.08	4.51	17.08	4.51	518	3.78	84%	-0.73	
70, 2 tubes	0.17	18.52	4.89	18.52	4.89	411	5.17	106%	0.27	
80, 2 tubes	0.18	20.13	5.32	20.13	5.32	387	5.96	112%	0.64	
100, 2 tubes	0.19	23.25	6.14	23.25	6.14	390	6.82	111%	0.68	
Avg =						434				
Delta (Left Weir)				Flow (gpm)	Flow (L/min)	Flow (gpm)	$C=Q/H^{2.5}$	$Q=C_{avg}H^{2.5}$ (gpm)	Flow <sub>predicted</sub> /Flow <sub>actual</sub>	$Q_{calc}-Q_{actual}$
Speed	height (feet)									
30, 2 tubes	0.11	7.25	1.92	7.25	1.92	477	1.66	87%	-0.25	
50, 2 tubes	0.14	12.68	3.35	12.68	3.35	457	3.04	91%	-0.31	
60, 2 tubes	0.16	12.98	3.43	12.98	3.43	335	4.24	124%	0.81	
70, 2 tubes	0.15	15	3.96	15	3.96	455	3.61	91%	-0.36	
80, 2 tubes	0.16	15.6	4.12	15.6	4.12	402	4.24	103%	0.12	
100, 2 tubes	0.18	18.5758514	4.91	18.57585139	4.91	357	5.69	116%	0.78	
Avg =						414				
Echo (Right Weir)				Flow (gpm)	Flow (L/min)	Flow (gpm)	$C=Q/H^{2.5}$	$Q=C_{avg}H^{2.5}$ (gpm)	Flow <sub>predicted</sub> /Flow <sub>actual</sub>	$Q_{calc}-Q_{actual}$
Speed	height (feet)									
30, 2 tubes	0.12	7.45	1.97	7.45	1.97	395	1.94	98%	-0.03	
50, 2 tubes	0.14	12.17	3.22	12.17	3.22	438	2.85	89%	-0.37	
60, 2 tubes	0.16	16.57	4.38	16.57	4.38	428	3.98	91%	-0.40	
70, 2 tubes	0.18	19.23	5.08	19.23	5.08	370	5.34	105%	0.26	
80, 2 tubes	0.15	11.27	2.98	11.27	2.98	342	3.38	114%	0.41	
100, 2 tubes	0.15	11.8110236	3.12	11.81102362	3.12	358	3.38	108%	0.26	
Avg =						388				
Foxtrot (Left Weir)				Flow (gpm)	Flow (L/min)	Flow (gpm)	$C=Q/H^{2.5}$	$Q=C_{avg}H^{2.5}$ (gpm)	Flow <sub>predicted</sub> /Flow <sub>actual</sub>	$Q_{calc}-Q_{actual}$
Speed	height (feet)									
30, 2 tubes	0.12	8.1	2.14	8.1	2.14	429	2.25	105%	0.11	
50, 2 tubes	0.14	13.57	3.59	13.57	3.59	489	3.32	92%	-0.27	
60, 2 tubes	0.16	17.65	4.66	17.65	4.66	455	4.63	99%	-0.03	
70, 2 tubes	0.17	19.74	5.22	19.74	5.22	438	5.39	103%	0.17	
80, 2 tubes	0.175	23.35	6.17	23.35	6.17	482	5.79	94%	-0.38	
100, 2 tubes	0.19	25	6.61	25	6.61	420	7.11	108%	0.51	
Avg =						452				
Golf (Left Weir)				Flow (gpm)	Flow (L/min)	Flow (gpm)	$C=Q/H^{2.5}$	$Q=C_{avg}H^{2.5}$ (gpm)	Flow <sub>predicted</sub> /Flow <sub>actual</sub>	$Q_{calc}-Q_{actual}$
Speed	height (feet)									
30, 2 tubes	0.11	7.64	2.02	7.64	2.02	503	2.19	108%	0.17	
50, 2 tubes	0.13	12.73	3.36	12.73	3.36	552	3.32	99%	-0.04	
60, 2 tubes	0.16	19.8	5.23	19.8	5.23	511	5.58	107%	0.35	
70, 2 tubes	0.16	22	5.81	22	5.81	568	5.58	96%	-0.24	
80, 2 tubes	0.16	22.2	5.87	22.2	5.87	573	5.58	95%	-0.29	
100, 2 tubes	0.17	25.32	6.69	25.32	6.69	561	6.49	97%	-0.20	
Avg =						545				
Hotel (Left Weir)				Flow (gpm)	Flow (L/min)	Flow (gpm)	$C=Q/H^{2.5}$	$Q=C_{avg}H^{2.5}$ (gpm)	Flow <sub>predicted</sub> /Flow <sub>actual</sub>	$Q_{calc}-Q_{actual}$
Speed	height (feet)									
30, 2 tubes	0.11	7.13	1.88	7.13	1.88	469	1.72	91%	-0.17	
50, 2 tubes	0.13	12.45	3.29	12.45	3.29	540	2.61	79%	-0.68	
60, 2 tubes	0.16	16.8	4.44	16.8	4.44	433	4.38	99%	-0.06	
70, 2 tubes	0.17	18.46	4.88	18.46	4.88	409	5.10	104%	0.22	
80, 2 tubes	0.18	18.75	4.95	18.75	4.95	360	5.88	119%	0.92	
100, 2 tubes	0.19	21.05	5.56	21.05	5.56	353	6.73	121%	1.17	
Avg =						428				

## **APPENDIX G: CALIBRATION OF LEVELLOGGERS FOR CONDUCTIVITY AND SALT BRINE CONCENTRATION**

Calibration of Levelloggers for Conductivity and Salt Concentration  
 S. Druschel  
 November 15, 2015

Initial Conc 1,330 mg/L

Position	Reading Order	Solution	Conc mg/L	Alfa Reading	Bravo Reading	Charlie Reading	Delta Reading	Echo Reading	Foxtrot Reading	Golf Reading	Hotel Reading
1	1	0%	-	0	0	0	0	0	0	0	0
1	2	0%	-	0	0	0	0	0	0	0	0
1	3	0%	-	0	0	0	0	0	0	0	0
1	4	0%	-	0	626	0	0	0	0	261	0
2	1	0%	-	0	0	0	0	0	0	0	0
2	2	0%	-	0	0	0	0	0	0	0	0
2	3	0%	-	0	0	0	0	0	0	0	0
2	4	0%	-	704	602	265	0	0	38993	654	0
3	1	20%	266.0	26002	27659	29660	34.935	40272	39857	111	34128
3	2	20%	266.0	26118	27998	29828	35.387	40356	40010	35387	34359
3	3	20%	266.0	26195	28091	29879	35.516	40356	40152	35515	34374
3	4	20%	266.0	2	1063	597	35.575	40424	0	44	1827
4	1	50%	665.0	78213	69521	65829	75.699	79896	85766	77634	75726
4	2	50%	665.0	78254	69719	65825	76.47	80071	86147	79289	78017
4	3	50%	665.0	78265	69723	65871	76.632	80119	86190	80131	78107
4	4	50%	665.0	2110	1610	56275	76.649	80150	1465	244	81994
5	1	95%	1,263.5	86479	75928	73792	81.427	89677	96358	94222	82048
5	2	95%	1,263.5	86532	75871	73861	81.803	90258	96371	94694	82101
5	3	95%	1,263.5	86549	75906	73916	81.854	89818	96421	94679	82128
5	4	95%	1,263.5	983	2477	5421	81.826	90381	3105	4003	60654
6	1	40%	532.0	29706	40253	53862	3.797	73464	72592	55852	61303
6	2	40%	532.0	30925	40472	53843	3.84	73481	72629	55472	61387
6	3	40%	532.0	31768	40518	53866	64.417	73511	72653	55630	61387
6	4	40%	532.0	0	2594	5586	64.577	73553	3861	4505	11280
7	1	5%	66.5	10986	10655	11203	4.499	11451	11700	11503	11294
7	2	5%	66.5	10991	10750	11208	10.892	11422	11697	11531	11308
7	3	5%	66.5	11007	10800	11208	10.883	11444	11721	11546	11310
7	4	5%	66.5	1188	3088	5996	10.884	11455	118	5215	80148
8	1	75%	997.5	82310	72403	71931	5.591	88479	190	89102	80286
8	2	75%	997.5	82252	72434	71816	80.058	89005	92531	90375	80329
8	3	75%	997.5	82228	72469	71807	80.187	88620	92500	90871	80371
8	4	75%	997.5	8814	7736	7560	80.226	89090	2599	6160	84697
9	1	100%	1,330.0	86841	76058	75303	7.354	0	96402	95861	84788
9	2	100%	1,330.0	86905	76197	75004	82.298	91116	96414	95743	84793
9	3	100%	1,330.0	86964	76119	75362	82.607	91447	96389	95683	84863
9	4	100%	1,330.0	0	8493	8794	82.573	91956	3887	7829	213
10	1	0%	-	386	544	152	6.749	189	98	348	200
10	2	0%	-	387	357	139	0.117	17	67	325	191
10	3	0%	-	384	347	128	0.12	12	42	285	180
10	4	0%	-	8897	7736	7342	0.118	9	2826	4051	20740
11	1	10%	133.0	20214	19129	19256	6.669	21579	21894	21463	20892
11	2	10%	133.0	20412	19237	19307	20.993	21601	21917	21554	20948
11	3	10%	133.0	20456	19275	19335	21.009	21617	21940	21641	20963
11	4	10%	133.0	9410	8686	7896	21.004	21622	3393	4448	20816

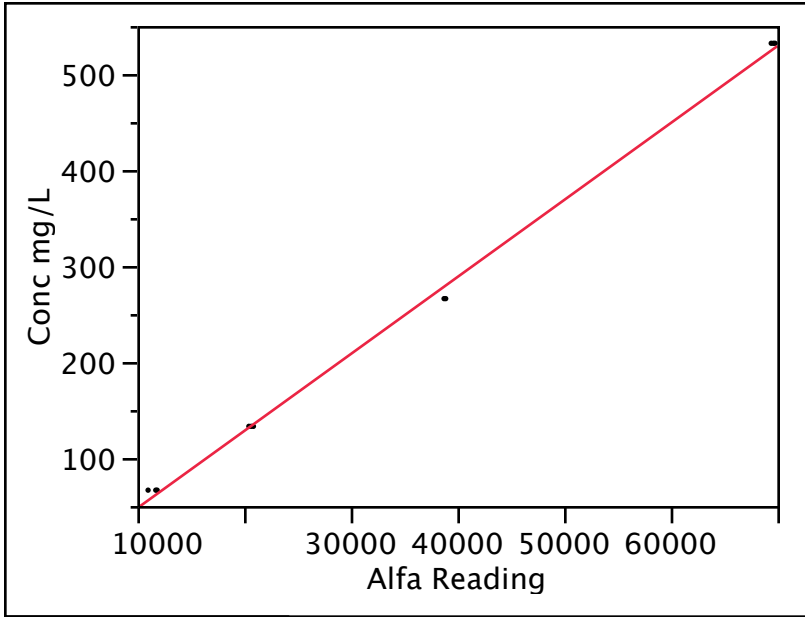
Position	Reading Order	Solution	Conc mg/L	Alfa Reading	Bravo Reading	Charlie Reading	Delta Reading	Echo Reading	Foxtrot Reading	Golf Reading	Hotel Reading
12	1	10%	133.0	20758	18733	19298	7.565	21432	21599	21463	20872
12	2	10%	133.0	20840	18894	19335	20.983	21437	21744	21560	20923
12	3	10%	133.0	20884	18936	19340	21.014	21470	21819	21606	20938
12	4	10%	133.0	9606	8852	8218	21.041	21475	3334	4533	20710
13	1	10%	133.0	20532	19025	19199	7.774	21127	21836	21474	20882
13	2	10%	133.0	20626	19228	19241	20.861	21268	21854	21554	20948
13	3	10%	133.0	20681	19285	19284	20.967	21323	21888	21606	20948
13	4	10%	133.0	9808	9130	8032	20.999	21355	3747	4781	135
14	1	0%	-	303	312	7864	7.767	4	27	149	135
14	2	0%	-	292	277	120	0.082	0	26	152	128
14	3	0%	-	293	249	136	0.074	0	24	152	124
14	4	0%	-	9508	8776	8892	0.066	0	2244	3158	82287
15	1	100%	1,330.0	86841	75989	75188	7.621	91821	96483	94797	82996
15	2	100%	1,330.0	86952	76088	75294	81.697	92442	96539	95558	84527
15	3	100%	1,330.0	86993	76123	75326	82.129	93087	96551	95580	84649
15	4	100%	1,330.0	11987	18101	16054	82.146	93124	96588	95558	81946
16	1	80%	1,064.0	86106	75628	74095	9.901	90350	93467	94613	81984
16	2	80%	1,064.0	86124	75663	74178	81.326	90338	93473	94686	82064
16	3	80%	1,064.0	86141	75646	74191	81.27	90418	93460	94709	82085
16	4	80%	1,064.0	13117	15914	74164	81.287	90412	93374	94709	29
17	1	50%	665.0	78207	69771	68569	12.189	81501	86079	80279	78383
17	2	50%	665.0	78341	69942	68753	77.689	81701	86615	80712	78405
17	3	50%	665.0	78393	69960	68822	78.159	81731	86689	80598	78452
17	4	50%	665.0	13979	69973	68854	78.271	81761	86695	80570	46
18	1	0%	-	540	440	12543	78.377	6641	146	314	344
18	2	0%	-	512	384	184	0.234	82	140	330	292
18	3	0%	-	496	369	198	0.201	51	110	316	270
18	4	0%	-	9524	355	198	0.177	32	91	299	274
19	1	80%	1,064.0	85570	74098	12338	0.157	90136	93590	91127	81861
19	2	80%	1,064.0	86089	75611	74164	0.42	90295	93566	94450	81925
19	3	80%	1,064.0	86129	75620	74164	81.326	90356	93559	94613	82021
19	4	80%	1,064.0	86112	75624	74582	81.287	90387	93535	94576	2301
20	1	100%	1,330.0	87407	11774	13435	81.264	94053	96576	95639	84660
20	2	100%	1,330.0	87092	76214	11488	2.656	94114	96619	95617	84735
20	3	100%	1,330.0	87121	76192	11488	82.275	94207	96626	95580	84809
20	4	100%	1,330.0	87594	76184	11484	82.545	94244	96644	95499	330
21	1	5%	66.5	11880	15498	229	82.539	11388	11829	11472	11612
21	2	5%	66.5	11851	11051	11452	14.539	11504	11807	11542	11605
21	3	5%	66.5	11858	11034	11449	82.286	11546	11799	11558	11591
21	4	5%	66.5	11862	11019	11439	82.534	11555	11792	11551	10894
22	1	0%	-	927	15607	300	82.551	1023	14	379	255
22	2	0%	-	528	481	192	0.113	79	59	423	230
22	3	0%	-	462	377	172	0.142	48	56	336	189
22	4	0%	-	404	335	149	0.142	17	42	288	178
23	1	75%	997.5	334	15526	1366	0.129	8628	90304	690	79994
23	2	75%	997.5	81537	72381	72216	79.862	86066	90898	83253	80116
23	3	75%	997.5	81421	72416	72322	80.187	86054	90762	88456	80174
23	4	75%	997.5	81392	72425	72170	80.204	86102	90712	89167	80212
24	1	40%	532.0	18077	16553	3438	80.187	9077	75319	8349	70712
24	2	40%	532.0	69426	61549	62617	1.761	74652	75611	73749	70775
24	3	40%	532.0	69633	61749	62728	69.699	74753	75751	72633	70807

Position	Reading Order	Solution	Conc mg/L	Alfa Reading	Bravo Reading	Charlie Reading	Delta Reading	Echo Reading	Foxtrot Reading	Golf Reading	Hotel Reading
24	4	40%	532.0	69524	61762	62797	69.855	74825	75782	72163	70764
25	1	80%	1,064.0	18444	16600	3716	69.932	1416	93429	827	82064
25	2	80%	1,064.0	86252	75724	74628	3.446	90522	93479	94355	82128
25	3	80%	1,064.0	86194	75702	74256	81.365	90632	93448	94701	82543
25	4	80%	1,064.0	86223	75767	74628	81.365	90558	93411	94723	82548
26	1	0%	-	741	17672	6381	81.399	292	22	11965	280
26	2	0%	-	476	349	114	3.819	41	54	315	230
26	3	0%	-	426	340	113	0.065	41	40	244	186
26	4	0%	-	395	314	116	0.058	20	30	205	161
27	1	95%	1,263.5	13930	16501	5120	0.044	224	512	12324	82522
27	2	95%	1,263.5	86876	76101	75225	3.845	92485	96427	94768	83396
27	3	95%	1,263.5	86952	76093	75294	82.039	92485	96470	95432	84180
27	4	95%	1,263.5	87010	76145	75298	82.073	92988	96483	95388	84660
28	1	20%	266.0	19945	14114	8359	82.073	93025	2334	15121	39015
28	2	20%	266.0	38866	35270	35068	5.794	40543	41347	41174	39031
28	3	20%	266.0	38911	35265	35198	39.404	40729	41477	41199	39077
28	4	20%	266.0	38967	35265	35259	39.469	40785	41524	41167	39098
29	1	95%	1,263.5	20181	17781	7142	39.507	40819	3263	14243	84612
29	2	95%	1,263.5	86876	76028	75298	6.382	94127	96501	95144	84719
29	3	95%	1,263.5	86917	76153	75353	82.095	94059	96495	95425	84660
29	4	95%	1,263.5	86981	76049	75340	82.011	94145	96483	95402	84767
30	1	20%	266.0	21114	20235	9789	82.011	94145	4752	10593	38830
30	2	20%	266.0	38649	34938	35459	8.437	40887	41518	41192	38835
30	3	20%	266.0	38755	35063	35431	39.453	40898	41589	41311	38913
30	4	20%	266.0	38805	35109	35450	39.48	40915	41642	41217	38943
31	1	75%	997.5	20549	19082	9781	39.555	41056	4841	15361	80158
31	2	75%	997.5	80863	72264	72147	8.152	85379	90242	81606	80212
31	3	75%	997.5	80852	72281	71848	79.374	85506	90181	83982	80238
31	4	75%	997.5	80794	72303	71669	79.694	85513	90020	85834	80281
32	1	0%	-	21318	25835	9207	79.8	85476	10717	74925	133
32	2	0%	-	592	399	102	10.795	11	93	245	265
32	3	0%	-	562	421	92	0.1	21	84	217	220
32	4	0%	-	480	367	91	0.098	26	58	199	194
33	1	5%	66.5	20318	331	87	0.095	25	32	187	11377
33	2	5%	66.5	11751	19365	11311	6.149	11476	11733	11700	11359
33	3	5%	66.5	11728	10947	11317	11.253	11474	11736	11675	11353
33	4	5%	66.5	11709	10900	11314	11.23	11475	11745	11670	11355
34	1	40%	532.0	21521	10890	11305	11.233	11484	11751	11671	136
34	2	40%	532.0	69622	61531	53806	2.178	71760	72210	71072	70479
34	3	40%	532.0	69783	61509	62802	63.234	72617	72757	70859	70543
34	4	40%	532.0	69668	61567	62815	63.975	72730	72896	70721	70558
35	1	50%	665.0	22461	1856	62774	63.742	72760	72915	70529	1194
35	2	50%	665.0	78596	68846	69448	63.715	81821	86935	16501	78484
35	3	50%	665.0	78567	69368	69250	76.665	82069	86978	78070	78463
35	4	50%	665.0	78543	69535	69434	77.946	82087	86972	78972	78474
36	1	85%	1,130.5	22477	69530	69254	78.293	82087	86935	79226	381
36	2	85%	1,130.5	86596	75967	74761	78.517	91404	94080	94148	82564
36	3	85%	1,130.5	86590	75976	74802	81.955	91361	94086	94945	83012
36	4	85%	1,130.5	86654	75897	74834	81.86	91907	94086	94922	83039
37	1	85%	1,130.5	450	75893	74834	81.848	91441	94043	94908	17119
37	2	85%	1,130.5	86596	75889	0	81.904	0	94012	94930	83023



Position	Reading Order	Solution	Conc mg/L	Alfa Reading	Bravo Reading	Charlie Reading	Delta Reading	Echo Reading	Foxtrot Reading	Golf Reading	Hotel Reading
37	3	85%	1,130.5	86602	75897	74784	81.882	91895	94062	94908	83044
37	4	85%	1,130.5	86643	75945	74798	81.882	91821	94000	94908	83060
38	1	85%	1,130.5	3102	75919	74802	81.837	91417	94018	94849	18301
38	2	85%	1,130.5	86608	75893	74802	81.865	91331	94037	94930	83092
38	3	85%	1,130.5	86654	75897	74802	81.933	91895	94043	94878	83449
38	4	85%	1,130.5	86649	75967	74839	81.815	91864	94018	94819	83497
39	1	0%	-	829	75910	74844	81.893	91858	94006	94827	5697
39	2	0%	-	882	788	395	81.86	158	265	465	453
39	3	0%	-	701	638	323	0.259	100	227	470	415
39	4	0%	-	636	571	284	0.239	79	173	415	361
40	1	0%	-	472	519	259	0.245	67	148	382	5287
40	2	0%	-	462	366	206	0.221	228	163	298	298
40	3	0%	-	397	359	208	0.246	40	135	279	282
40	4	0%	-	360	346	213	0.249	47	90	259	254

**Bivariate Fit of Conc mg/L By Alfa Reading Range=Low**



— Linear Fit

**Linear Fit**

$$\text{Conc mg/L} = -32.44772 + 0.0080213 * \text{Alfa Reading}$$

**Summary of Fit**

RSquare	0.998209
RSquare Adj	0.998103
Root Mean Square Error	7.681964
Mean of Response	227.5
Observations (or Sum Wgts)	19

**Analysis of Variance**

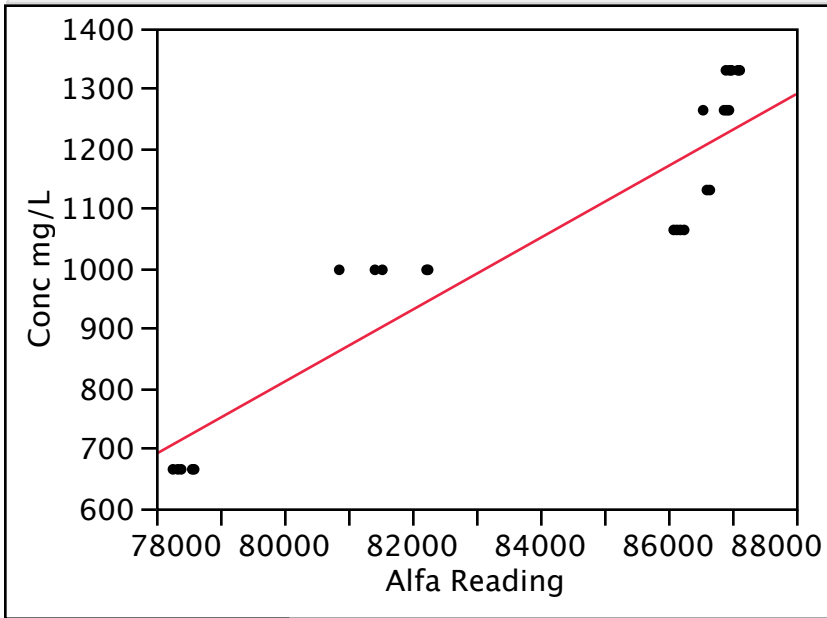
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	558993.29	558993	9472.444
Error	17	1003.21	59	<b>Prob &gt; F</b>
C. Total	18	559996.50		<.0001*

**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-32.44772	3.199929	-10.14	<.0001*
Alfa Reading	0.0080213	8.242e-5	97.33	<.0001*

**Bivariate Fit of Conc mg/L By Alfa Reading Range=High**

**Bivariate Fit of Conc mg/L By Alfa Reading Range=High**



— Linear Fit

**Linear Fit**

Conc mg/L = -3985.496 + 0.0599501\*Alfa Reading

**Summary of Fit**

RSquare	0.841084
RSquare Adj	0.83641
Root Mean Square Error	88.27486
Mean of Response	1075.083
Observations (or Sum Wgts)	36

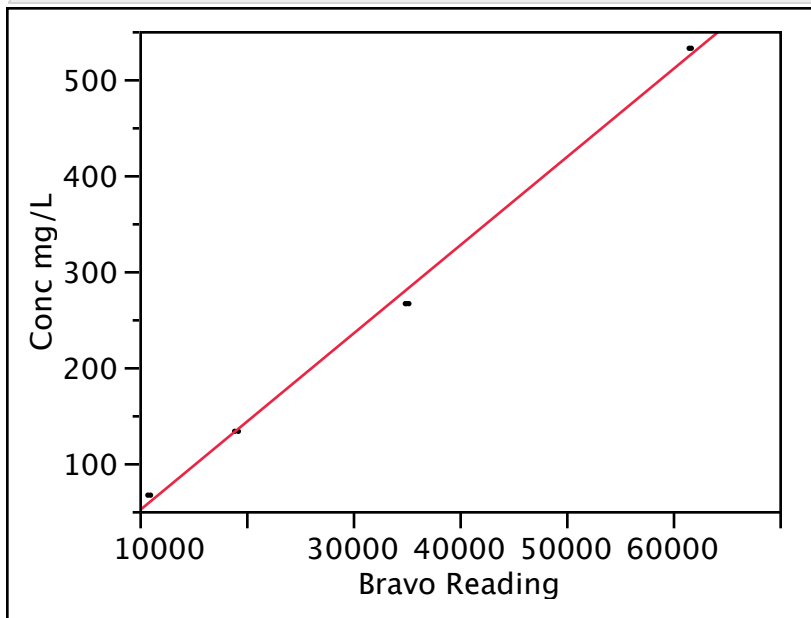
**Analysis of Variance**

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	1402244.9	1402245	179.9492
Error	34	264943.3	7792	<b>Prob &gt; F</b>
C. Total	35	1667188.3		<.0001*

**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-3985.496	377.5333	-10.56	<.0001*
Alfa Reading	0.0599501	0.004469	13.41	<.0001*

**Bivariate Fit of Conc mg/L By Bravo Reading Range=Low**



— Linear Fit

**Linear Fit**

Conc mg/L = -41.54373 + 0.0091888\*Bravo Reading

**Summary of Fit**

RSquare	0.997304
RSquare Adj	0.997145
Root Mean Square Error	9.424175
Mean of Response	227.5
Observations (or Sum Wgts)	19

**Analysis of Variance**

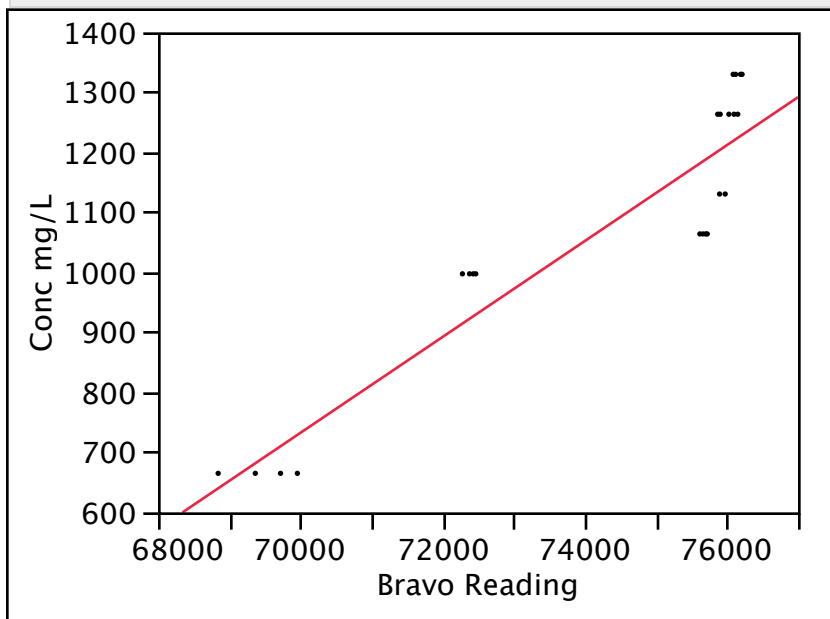
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	558486.64	558487	6288.196
Error	17	1509.86	89	<b>Prob &gt; F</b>
C. Total	18	559996.50		<.0001*

**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-41.54373	4.02314	-10.33	<.0001*
Bravo Reading	0.0091888	0.000116	79.30	<.0001*

**Bivariate Fit of Conc mg/L By Bravo Reading Range=High**

**Bivariate Fit of Conc mg/L By Bravo Reading Range=High**



— Linear Fit

**Linear Fit**

Conc mg/L = -4863.818 + 0.0799441\*Bravo Reading

**Summary of Fit**

RSquare	0.849442
RSquare Adj	0.845014
Root Mean Square Error	85.9221
Mean of Response	1075.083
Observations (or Sum Wgts)	36

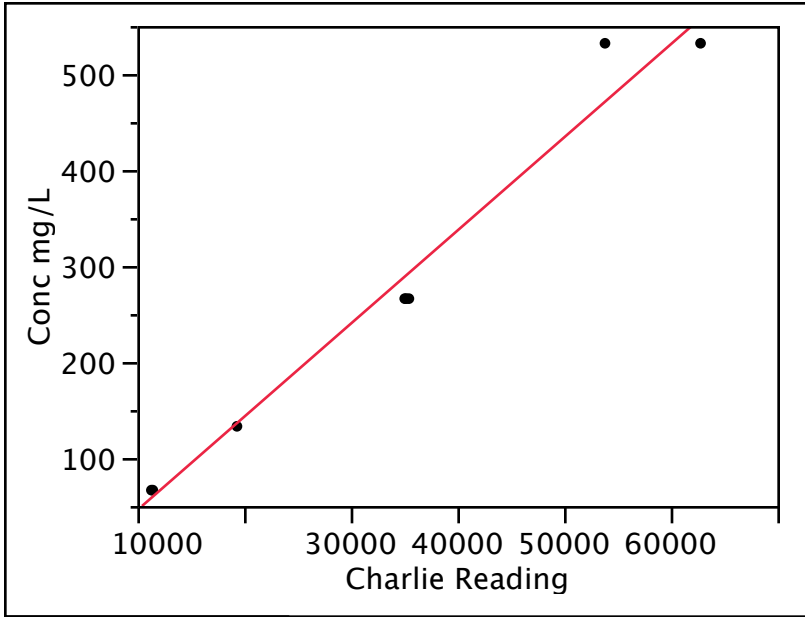
**Analysis of Variance**

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	1416179.6	1416180	191.8265
Error	34	251008.6	7383	<b>Prob &gt; F</b>
C. Total	35	1667188.3		<.0001*

**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-4863.818	429.0362	-11.34	<.0001*
Bravo Reading	0.0799441	0.005772	13.85	<.0001*

**Bivariate Fit of Conc mg/L By Charlie Reading Range=Low**



— Linear Fit

**Linear Fit**

Conc mg/L = -51.30948 + 0.0097025\*Charlie Reading

**Summary of Fit**

RSquare	0.979912
RSquare Adj	0.978796
Root Mean Square Error	25.54314
Mean of Response	219.45
Observations (or Sum Wgts)	20

**Analysis of Variance**

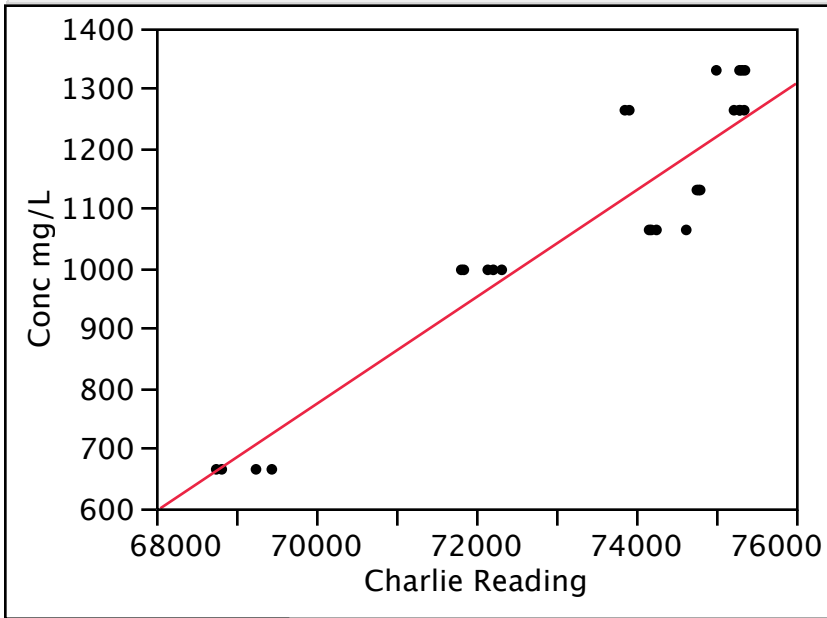
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	572877.31	572877	878.0374
Error	18	11744.14	652	<b>Prob &gt; F</b>
C. Total	19	584621.45		<.0001*

**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-51.30948	10.77573	-4.76	0.0002*
Charlie Reading	0.0097025	0.000327	29.63	<.0001*

**Bivariate Fit of Conc mg/L By Charlie Reading Range=High**

**Bivariate Fit of Conc mg/L By Charlie Reading Range=High**



— Linear Fit

**Linear Fit**

Conc mg/L = -5461.886 + 0.0890739\*Charlie Reading

**Summary of Fit**

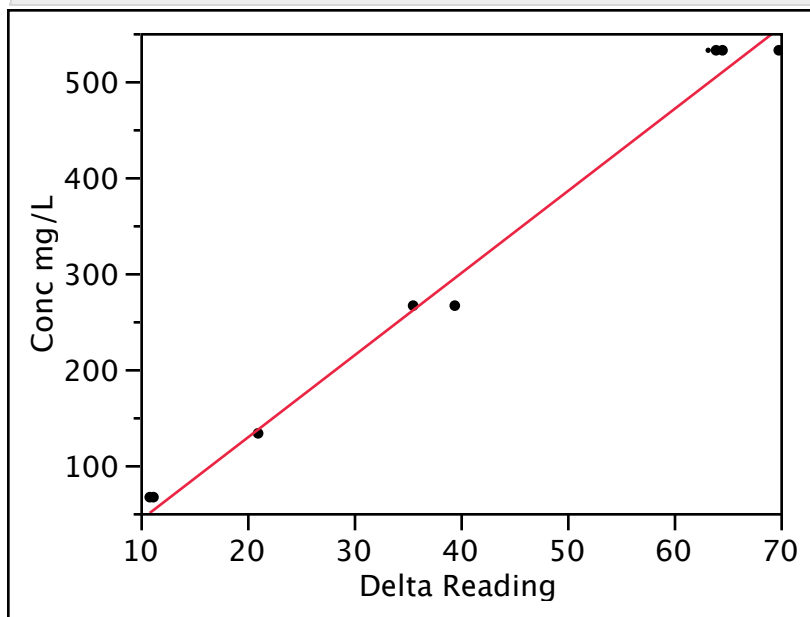
RSquare	0.860077
RSquare Adj	0.855253
Root Mean Square Error	75.95554
Mean of Response	1083.306
Observations (or Sum Wgts)	31

**Analysis of Variance**

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	1028411.3	1028411	178.2575
Error	29	167308.1	5769	<b>Prob &gt; F</b>
C. Total	30	1195719.3		<.0001*

**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-5461.886	490.4182	-11.14	<.0001*
Charlie Reading	0.0890739	0.006672	13.35	<.0001*

**Bivariate Fit of Conc mg/L By Delta Reading Range=Low**

— Linear Fit

**Linear Fit**

$$\text{Conc mg/L} = -43.10304 + 8.5544619 * \text{Delta Reading}$$

**Summary of Fit**

RSquare	0.988051
RSquare Adj	0.987454
Root Mean Square Error	20.30175
Mean of Response	266
Observations (or Sum Wgts)	22

**Analysis of Variance**

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	681627.78	681628	1653.789
Error	20	8243.22	412	<b>Prob &gt; F</b>
C. Total	21	689871.00		<.0001*

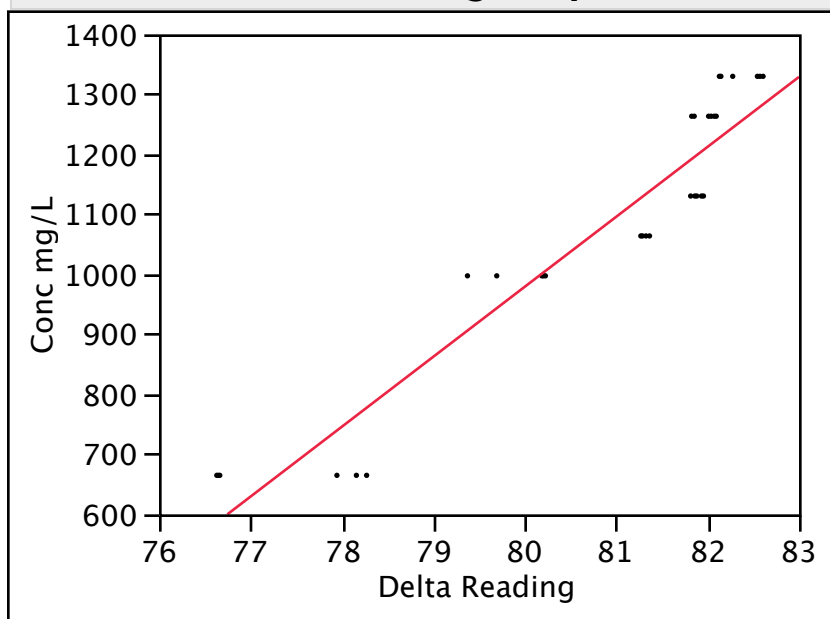
**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-43.10304	8.746873	-4.93	<.0001*
Delta Reading	8.5544619	0.210355	40.67	<.0001*

**Bivariate Fit of Conc mg/L By Delta Reading Range=High**



## Bivariate Fit of Conc mg/L By Delta Reading Range=High



— Linear Fit

## Linear Fit

$$\text{Conc mg/L} = -8349.285 + 116.60639 * \text{Delta Reading}$$

## Summary of Fit

RSquare	0.899459
RSquare Adj	0.896502
Root Mean Square Error	70.21411
Mean of Response	1075.083
Observations (or Sum Wgts)	36

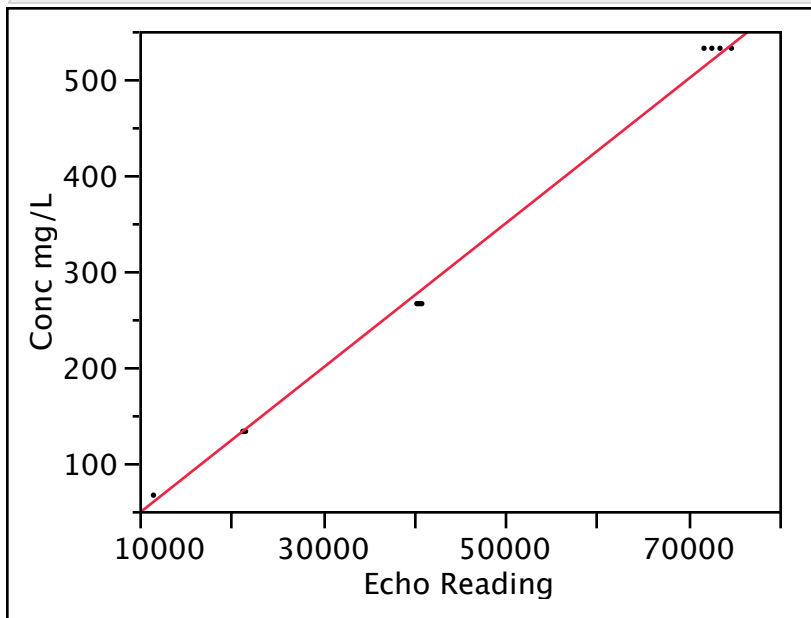
## Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	1499567.5	1499568	304.1706
Error	34	167620.7	4930	<b>Prob &gt; F</b>
C. Total	35	1667188.3		<.0001*

## Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-8349.285	540.4997	-15.45	<.0001*
Delta Reading	116.60639	6.685959	17.44	<.0001*

**Bivariate Fit of Conc mg/L By Echo Reading Range=Low**



— Linear Fit

**Linear Fit**

$$\text{Conc mg/L} = -27.38681 + 0.0075299 \cdot \text{Echo Reading}$$

**Summary of Fit**

RSquare	0.997482
RSquare Adj	0.997367
Root Mean Square Error	9.344195
Mean of Response	249.375
Observations (or Sum Wgts)	24

**Analysis of Variance**

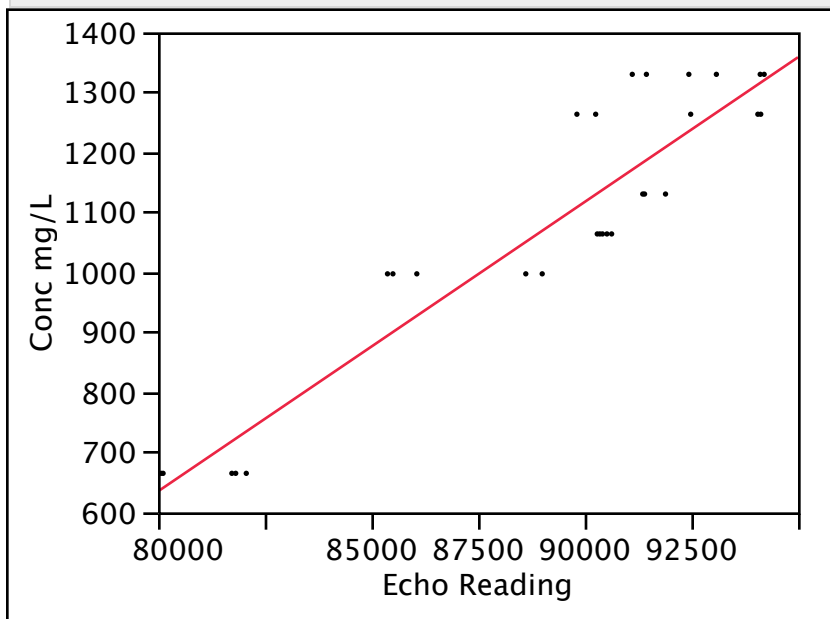
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	760917.22	760917	8714.724
Error	22	1920.91	87	<b>Prob &gt; F</b>
C. Total	23	762838.13		<.0001*

**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-27.38681	3.525262	-7.77	<.0001*
Echo Reading	0.0075299	8.066e-5	93.35	<.0001*

**Bivariate Fit of Conc mg/L By Echo Reading Range=High**

**Bivariate Fit of Conc mg/L By Echo Reading Range=High**



— Linear Fit

**Linear Fit**

Conc mg/L = -3223.61 + 0.0482321\*Echo Reading

**Summary of Fit**

RSquare	0.871369
RSquare Adj	0.867471
Root Mean Square Error	80.53713
Mean of Response	1073.5
Observations (or Sum Wgts)	35

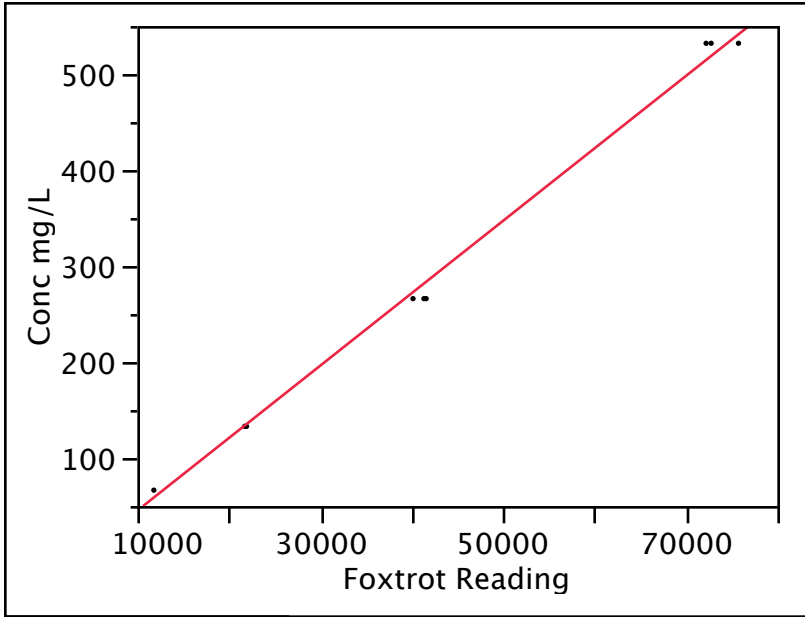
**Analysis of Variance**

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	1449983.9	1449984	223.5480
Error	33	214045.6	6486	<b>Prob &gt; F</b>
C. Total	34	1664029.5		<.0001*

**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-3223.61	287.7251	-11.20	<.0001*
Echo Reading	0.0482321	0.003226	14.95	<.0001*

**Bivariate Fit of Conc mg/L By Foxtrot Reading Range=Low**



— Linear Fit

**Linear Fit**

$$\text{Conc mg/L} = -30.2391 + 0.0075456 * \text{Foxtrot Reading}$$

**Summary of Fit**

RSquare	0.996528
RSquare Adj	0.99637
Root Mean Square Error	10.97197
Mean of Response	249.375
Observations (or Sum Wgts)	24

**Analysis of Variance**

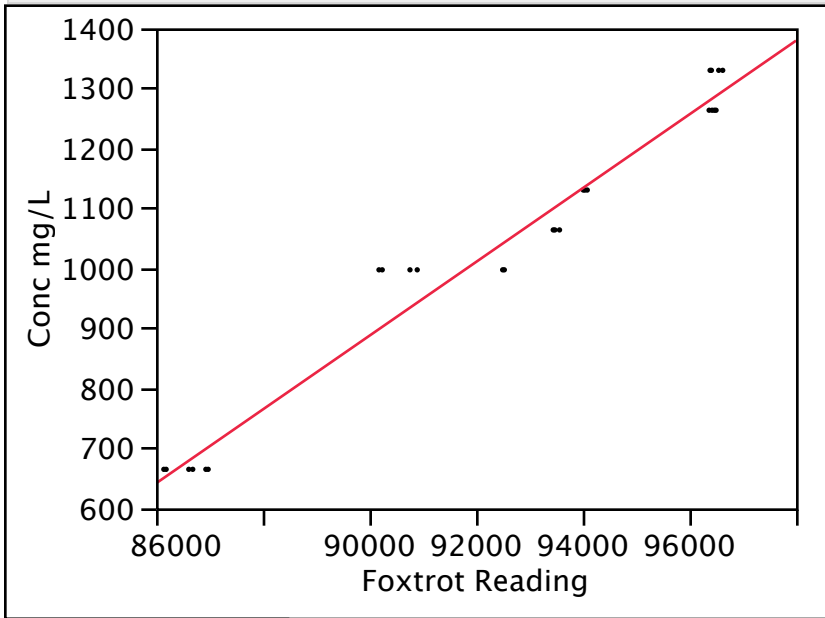
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	760189.67	760190	6314.700
Error	22	2648.45	120	<b>Prob &gt; F</b>
C. Total	23	762838.13		<.0001*

**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-30.2391	4.171005	-7.25	<.0001*
Foxtrot Reading	0.0075456	0.000095	79.47	<.0001*

**Bivariate Fit of Conc mg/L By Foxtrot Reading Range=High**

**Bivariate Fit of Conc mg/L By Foxtrot Reading Range=High**



— Linear Fit

**Linear Fit**

$$\text{Conc mg/L} = -4645.984 + 0.0614839 * \text{Foxtrot Reading}$$

**Summary of Fit**

RSquare	0.966726
RSquare Adj	0.965747
Root Mean Square Error	40.39287
Mean of Response	1075.083
Observations (or Sum Wgts)	36

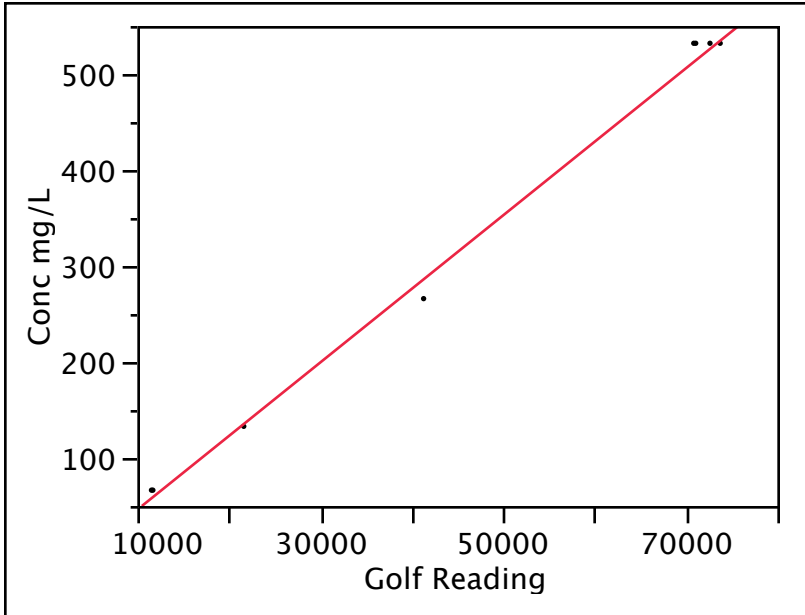
**Analysis of Variance**

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	1611714.4	1611714	987.8217
Error	34	55473.9	1632	<b>Prob &gt; F</b>
C. Total	35	1667188.3		<.0001*

**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-4645.984	182.1523	-25.51	<.0001*
Foxtrot Reading	0.0614839	0.001956	31.43	<.0001*

**Bivariate Fit of Conc mg/L By Golf Reading Range=Low**



**Linear Fit**

$$\text{Conc mg/L} = -30.43562 + 0.0076621 * \text{Golf Reading}$$

**Summary of Fit**

RSquare	0.995438
RSquare Adj	0.995185
Root Mean Square Error	12.17182
Mean of Response	219.45
Observations (or Sum Wgts)	20

**Analysis of Variance**

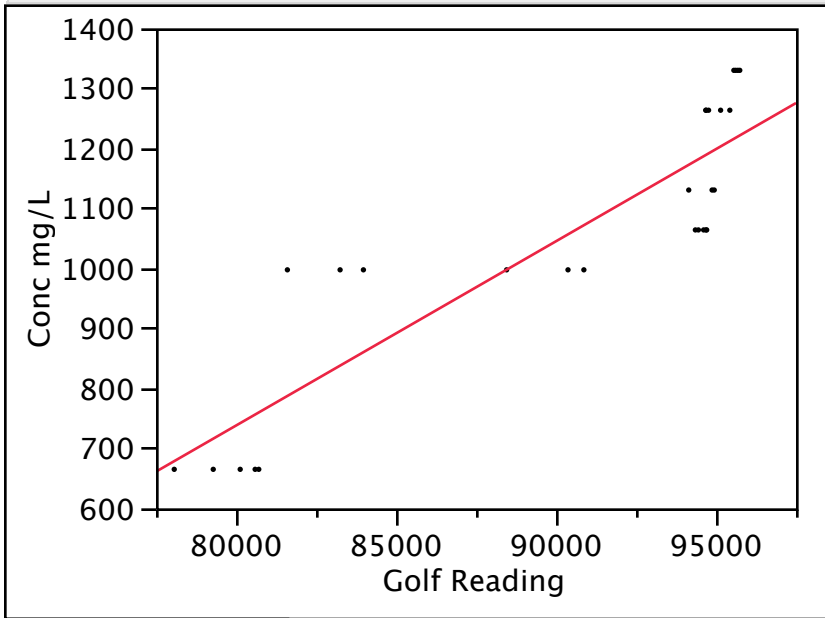
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	581954.69	581955	3928.057
Error	18	2666.76	148	<b>Prob &gt; F</b>
C. Total	19	584621.45		<.0001*

**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-30.43562	4.827451	-6.30	<.0001*
Golf Reading	0.0076621	0.000122	62.67	<.0001*

**Bivariate Fit of Conc mg/L By Golf Reading Range=High**

**Bivariate Fit of Conc mg/L By Golf Reading Range=High**



— Linear Fit

**Linear Fit**

Conc mg/L = -1719.39 + 0.0307167\*Golf Reading

**Summary of Fit**

RSquare	0.774542
RSquare Adj	0.76771
Root Mean Square Error	101.0375
Mean of Response	1086.8
Observations (or Sum Wgts)	35

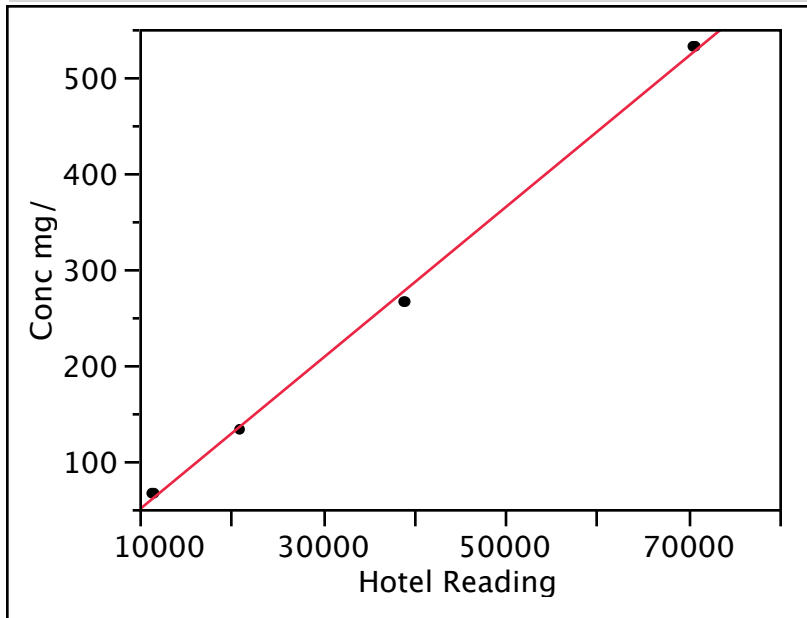
**Analysis of Variance**

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	1157332.2	1157332	113.3686
Error	33	336882.9	10209	<b>Prob &gt; F</b>
C. Total	34	1494215.1		<.0001*

**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-1719.39	264.1073	-6.51	<.0001*
Golf Reading	0.0307167	0.002885	10.65	<.0001*

**Bivariate Fit of Conc mg/ By Hotel Reading Range=Low**



— Linear Fit

**Linear Fit**

Conc mg/ = -29.27862 + 0.007863\*Hotel Reading

**Summary of Fit**

RSquare	0.998483
RSquare Adj	0.998399
Root Mean Square Error	7.019772
Mean of Response	219.45
Observations (or Sum Wgts)	20

**Analysis of Variance**

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	583734.46	583734	11845.93
Error	18	886.99	49	<b>Prob &gt; F</b>
C. Total	19	584621.45		<.0001*

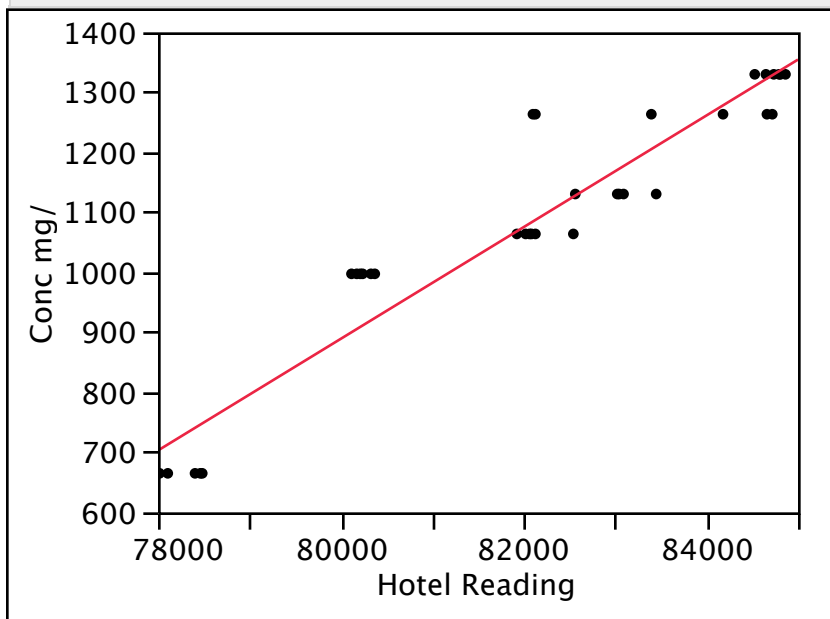
**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-29.27862	2.772437	-10.56	<.0001*
Hotel Reading	0.007863	7.224e-5	108.84	<.0001*

**Bivariate Fit of Conc mg/ By Hotel Reading Range=High**



**Bivariate Fit of Conc mg/ By Hotel Reading Range=High**



— Linear Fit

**Linear Fit**

Conc mg/ = -6555.93 + 0.093065\*Hotel Reading

**Summary of Fit**

RSquare	0.899272
RSquare Adj	0.89631
Root Mean Square Error	70.27924
Mean of Response	1075.083
Observations (or Sum Wgts)	36

**Analysis of Variance**

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	1499256.4	1499256	303.5441
Error	34	167931.8	4939	<b>Prob &gt; F</b>
C. Total	35	1667188.3		<.0001*

**Parameter Estimates**

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-6555.93	438.1537	-14.96	<.0001*
Hotel Reading	0.093065	0.005342	17.42	<.0001*

**APPENDIX H: WEATHER DATA OF FIELD DAYS AND FIELD SEASON (MANKATO)**

# Kasota, MN

Mankato Regional

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## Weather History for KMKT - November, 2015

November

13

2015

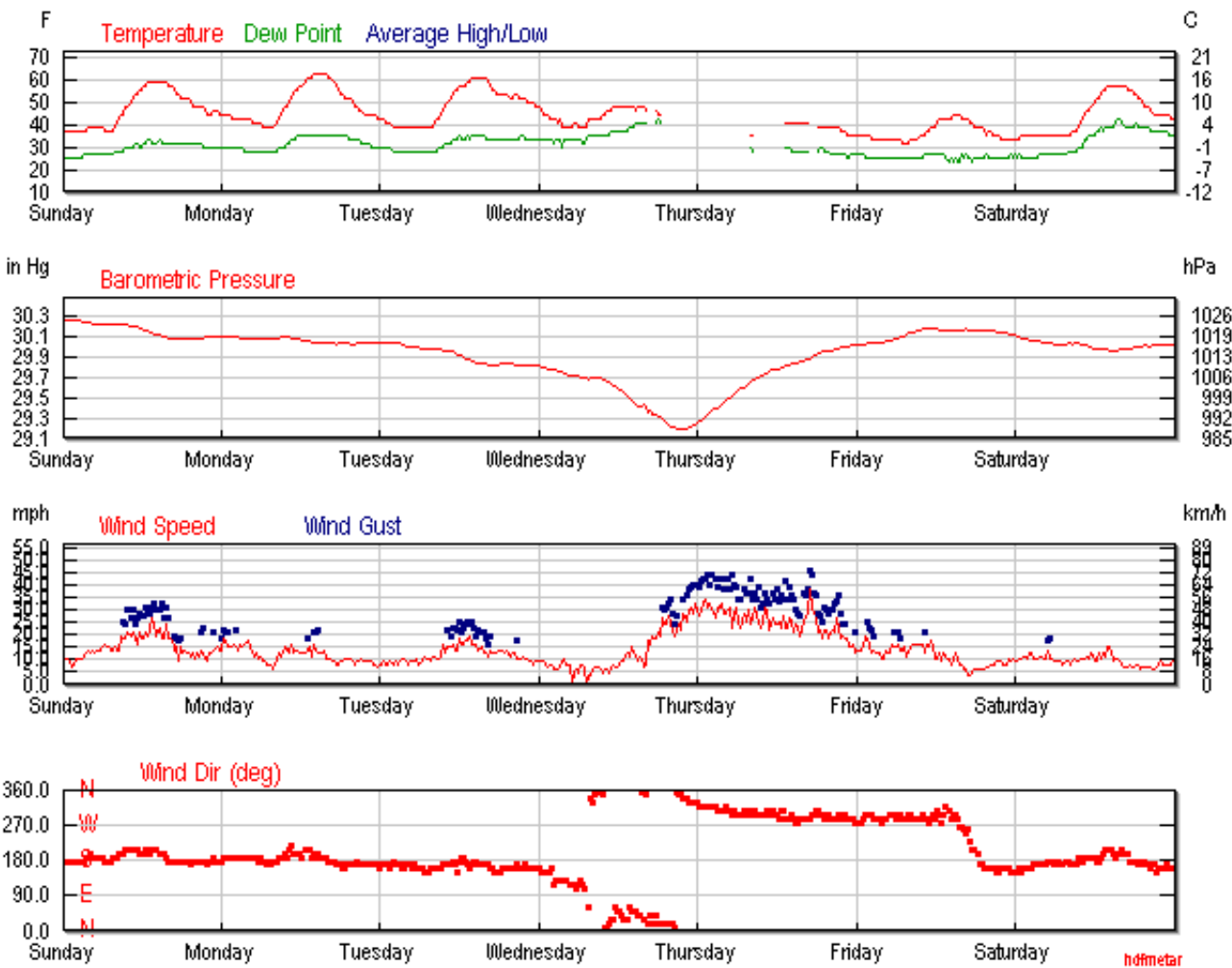
### View

Week of November 8, 2015 through November 14, 2015

Daily	<b>Weekly</b>	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				62 °F	53 °F	41 °F	
Mean Temperature				50 °F	45 °F	38 °F	
Min Temperature				39 °F	36 °F	32 °F	
Degree Days							
Heating Degree Days [base 65]				27	20	14	143
Cooling Degree Days [base 65]				0	0	0	0
Growing Degree Days [base 50]				0	0	0	0
Dew Point							
Dew Point				43 °F	31 °F	23 °F	
Precipitation							

Precipitation	1.21 in	0.18 in	0.00 in	1.23 in
Snowdepth	-	-	-	-
Wind				
Wind	38 mph	14 mph	0 mph	
Gust Wind	46 mph	25 mph	16 mph	
Sea Level Pressure				
Sea Level Pressure	30.27 in	29.93 in	29.19 in	

### Weekly Weather History Graph



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Airport or City:

KMKT

# Kasota, MN

Mankato Regional

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## Weather History for KMKT - November, 2015

November

20

2015

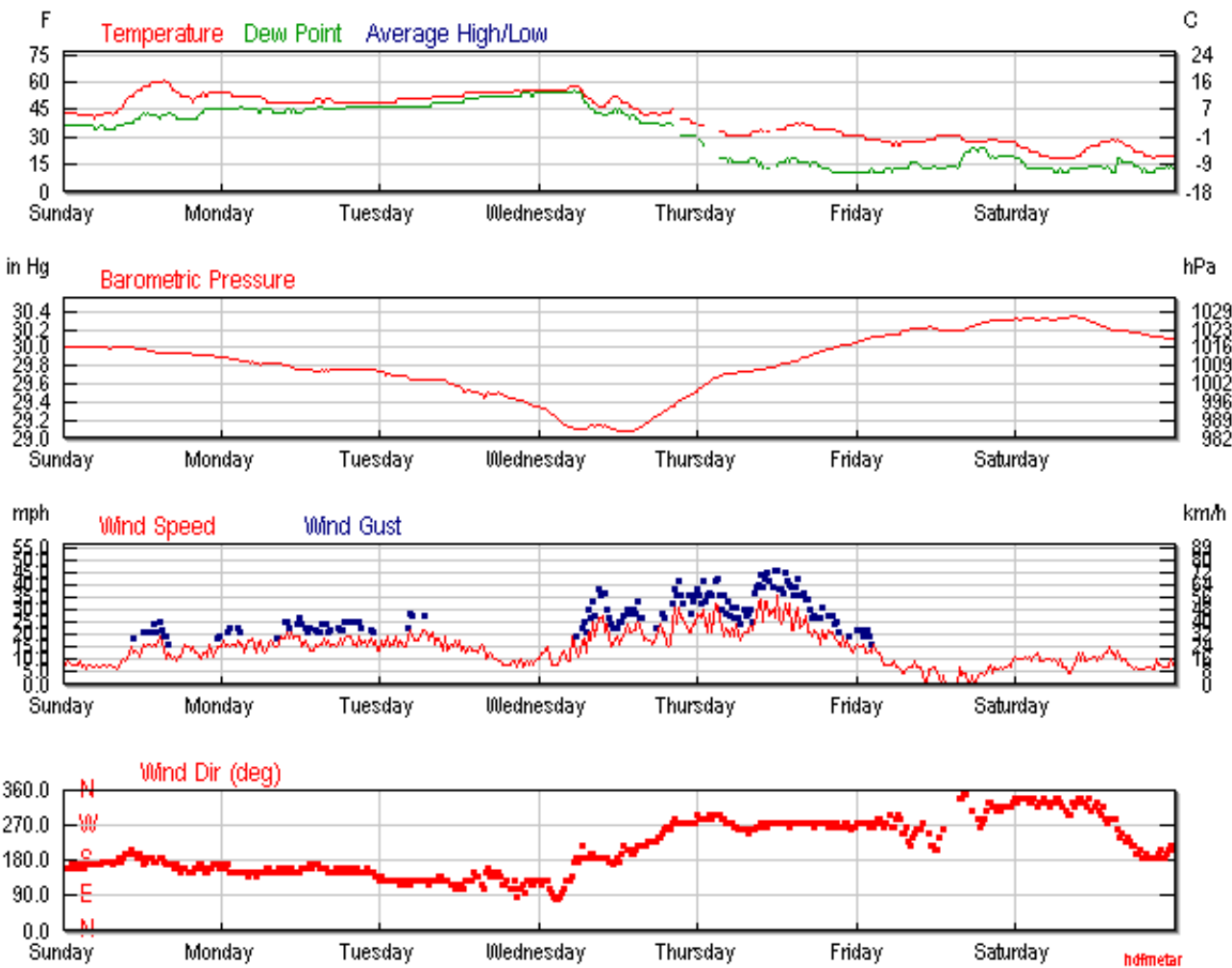
### View

Week of November 15, 2015 through November 21, 2015

Daily	<b>Weekly</b>	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				60 °F	46 °F	28 °F	
Mean Temperature				52 °F	40 °F	22 °F	
Min Temperature				48 °F	35 °F	17 °F	
Degree Days							
Heating Degree Days [base 65]				42	25	14	174
Cooling Degree Days [base 65]				0	0	0	0
Growing Degree Days [base 50]				2	0	0	2
Dew Point							
Dew Point				55 °F	31 °F	10 °F	
Precipitation							

Precipitation	<b>0.48 in</b>	<b>0.10 in</b>	<b>0.00 in</b>	<b>0.68 in</b>
Snowdepth	-	-	-	-
Wind				
Wind	<b>36 mph</b>	<b>14 mph</b>	<b>0 mph</b>	
Gust Wind	<b>46 mph</b>	<b>24 mph</b>	<b>16 mph</b>	
Sea Level Pressure				
Sea Level Pressure	<b>30.34 in</b>	<b>29.83 in</b>	<b>29.08 in</b>	

### Weekly Weather History Graph



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Airport or City:

KMKT

# Kasota, MN

Mankato Regional

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## Weather History for KMKT - November, 2015

November

27

2015

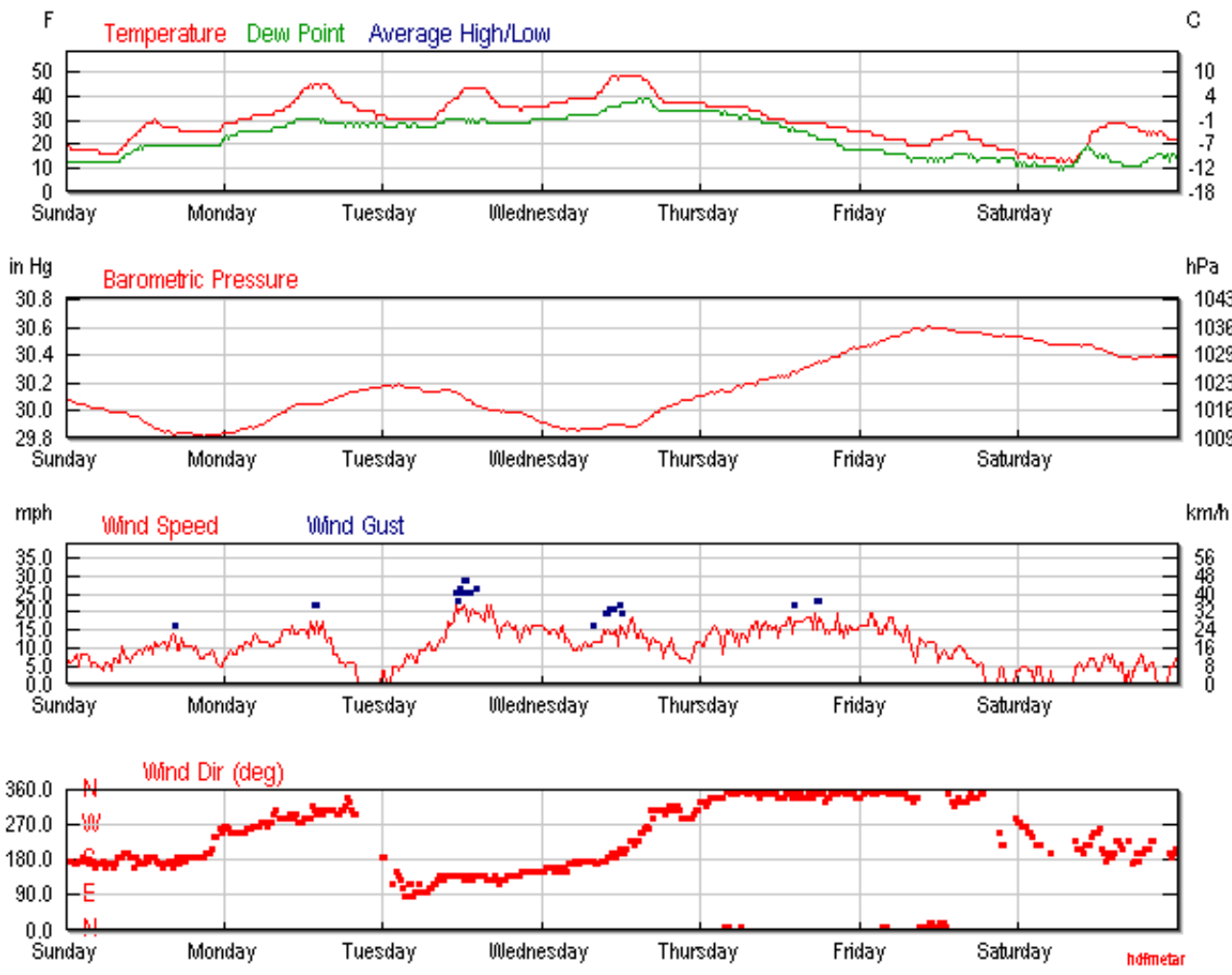
### View

Week of November 22, 2015 through November 28, 2015

Daily	<b>Weekly</b>	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				48 °F	36 °F	24 °F	
Mean Temperature				42 °F	29 °F	20 °F	
Min Temperature				35 °F	23 °F	12 °F	
Degree Days							
Heating Degree Days (base 65)				46	36	24	249
Cooling Degree Days (base 65)				0	0	0	0
Growing Degree Days (base 50)				0	0	0	0
Dew Point							
Dew Point				39 °F	23 °F	9 °F	
Precipitation							

Precipitation	0.00 in	0.00 in	0.00 in	0.00 in
Snowdepth	-	-	-	-
Wind				
Wind	22 mph	10 mph	0 mph	
Gust Wind	29 mph	21 mph	16 mph	
Sea Level Pressure				
Sea Level Pressure	30.61 in	30.17 in	29.81 in	

### Weekly Weather History Graph



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### Search for Another Location

Airport or City:



# Kasota, MN

Mankato Regional

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## Weather History for KMKT - February, 2016

February

19

2016

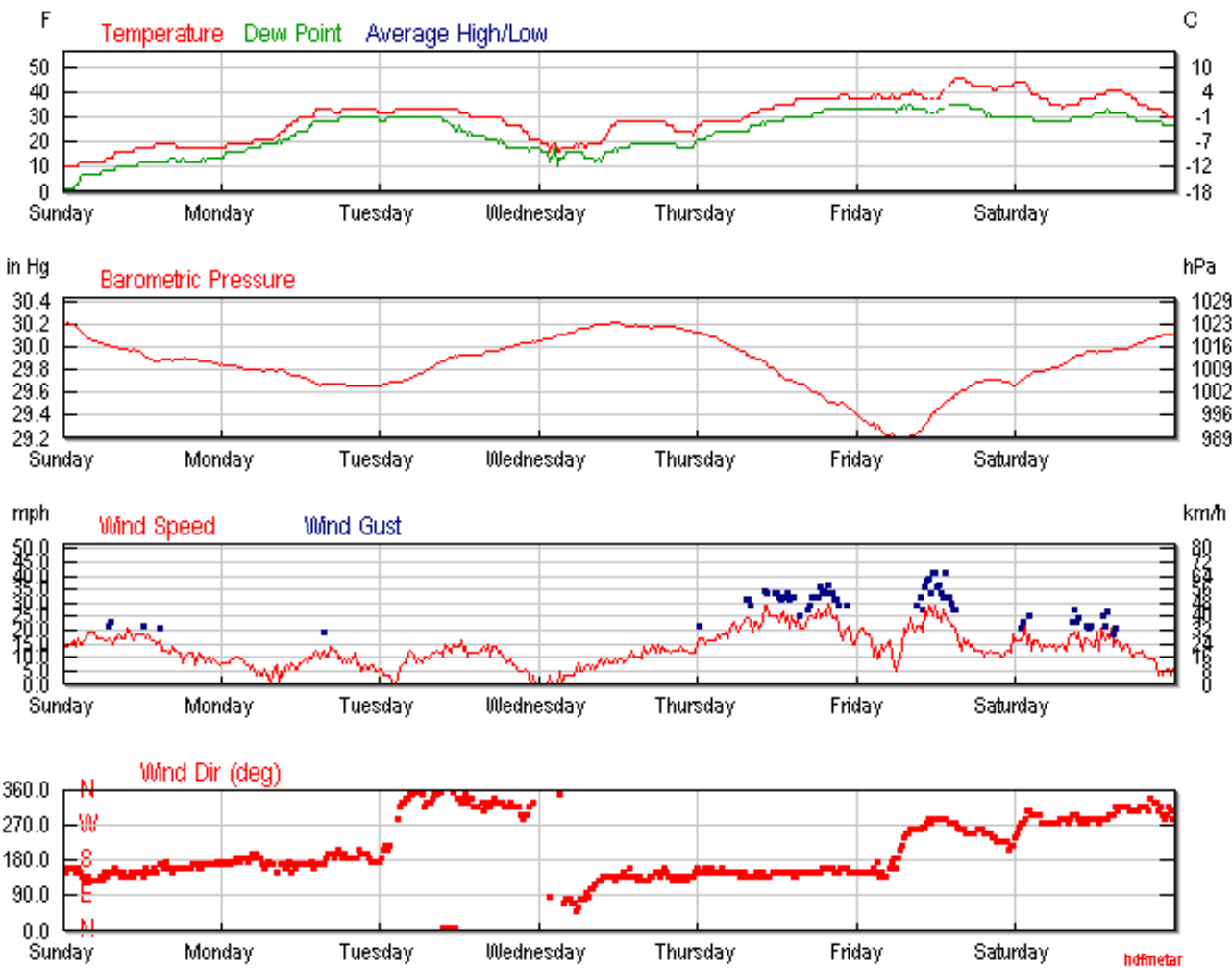
### View

Week of February 14, 2016 through February 20, 2016

Daily	<b>Weekly</b>	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				46 °F	35 °F	19 °F	
Mean Temperature				42 °F	28 °F	14 °F	
Min Temperature				37 °F	22 °F	10 °F	
Degree Days							
Heating Degree Days (base 65)				50	37	24	256
Cooling Degree Days (base 65)				0	0	0	0
Growing Degree Days (base 50)				0	0	0	0
Dew Point							
Dew Point				36 °F	24 °F	0 °F	
Precipitation							

Precipitation	0.00 in	0.00 in	0.00 in	0.00 in
Snowdepth	-	-	-	-
Wind				
Wind	30 mph	13 mph	0 mph	
Gust Wind	41 mph	23 mph	16 mph	
Sea Level Pressure				
Sea Level Pressure	30.23 in	29.85 in	29.20 in	

### Weekly Weather History Graph



report this ad | why ads?

### Search for Another Location

Airport or City:

KMKT

# Kasota, MN

Mankato Regional

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## Weather History for KMKT - February, 2016

February

26

2016

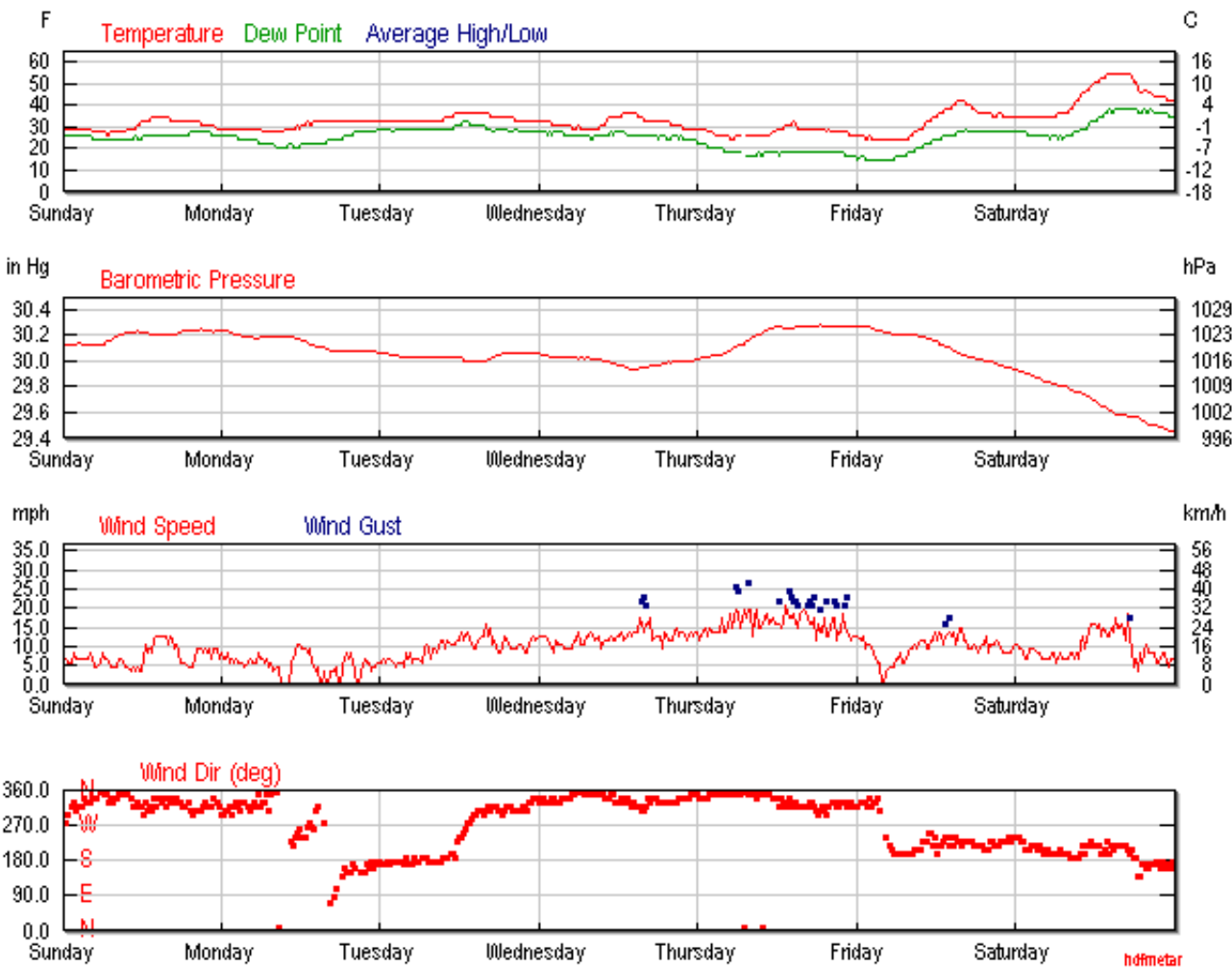
### View

Week of February 21, 2016 through February 27, 2016

Daily	<b>Weekly</b>	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				55 °F	39 °F	33 °F	
Mean Temperature				45 °F	34 °F	28 °F	
Min Temperature				35 °F	29 °F	24 °F	
Degree Days							
Heating Degree Days [base 65]				36	31	20	218
Cooling Degree Days [base 65]				0	0	0	0
Growing Degree Days [base 50]				0	0	0	0
Dew Point							
Dew Point				39 °F	26 °F	16 °F	
Precipitation							

Precipitation	0.00 in	0.00 in	0.00 in	0.00 in
Snowdepth	-	-	-	-
Wind				
Wind	21 mph	10 mph	0 mph	
Gust Wind	26 mph	20 mph	16 mph	
Sea Level Pressure				
Sea Level Pressure	30.28 in	30.05 in	29.45 in	

### Weekly Weather History Graph



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### Search for Another Location

Airport or City:

KMKT

# Kasota, MN

Mankato Regional

© 7:53 AM CDT on May 27, 2016 [GMT -0500]

## Weather History for KMKT - March, 2016

March

4

2016

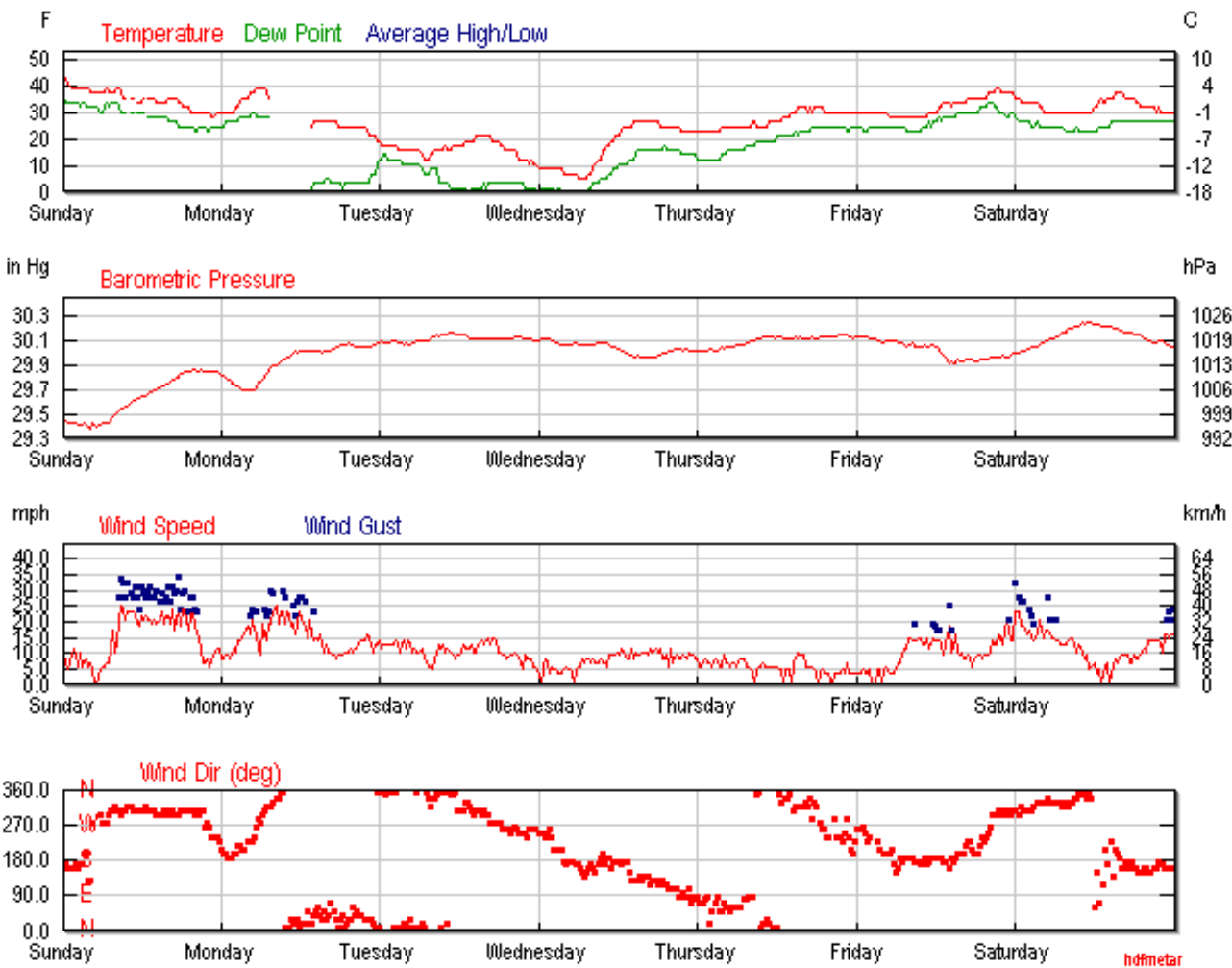
### View

Week of February 28, 2016 through March 5, 2016

Daily	<b>Weekly</b>	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				42 °F	34 °F	21 °F	
Mean Temperature				35 °F	27 °F	16 °F	
Min Temperature				30 °F	20 °F	5 °F	
Degree Days							
Heating Degree Days (base 65)				50	38	30	268
Cooling Degree Days (base 65)				0	0	0	0
Growing Degree Days (base 50)				0	0	0	0
Dew Point							
Dew Point				36 °F	18 °F	0 °F	
Precipitation							

Precipitation	0.00 in	0.00 in	0.00 in	0.00 in
Snowdepth	-	-	-	-
Wind				
Wind	25 mph	10 mph	0 mph	
Gust Wind	34 mph	23 mph	16 mph	
Sea Level Pressure				
Sea Level Pressure	30.24 in	30.00 in	29.37 in	

### Weekly Weather History Graph



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### Search for Another Location

Airport or City:

KMKT

# Kasota, MN

Mankato Regional

© 8:03 AM CDT on May 27, 2016 [GMT -0500]

## Weather History for KMKT - March, 2016

March

11

2016

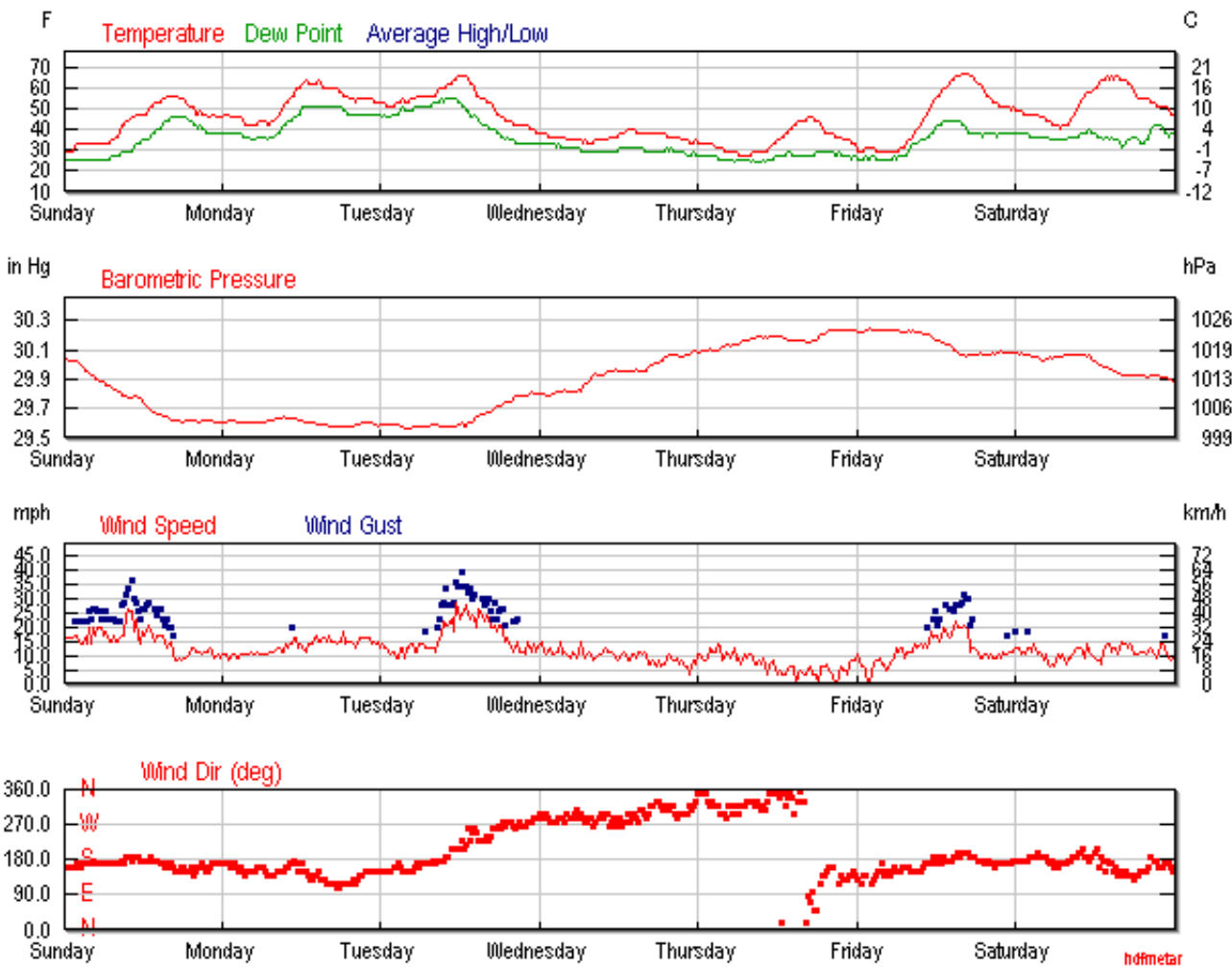
### View

Week of March 6, 2016 through March 12, 2016

Daily	<b>Weekly</b>	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				68 °F	58 °F	41 °F	
Mean Temperature				54 °F	47 °F	37 °F	
Min Temperature				42 °F	35 °F	28 °F	
Degree Days							
Heating Degree Days (base 65)				28	19	12	130
Cooling Degree Days (base 65)				0	0	0	0
Growing Degree Days (base 50)				4	1	0	9
Dew Point							
Dew Point				55 °F	37 °F	25 °F	
Precipitation							

Precipitation	0.00 in	0.00 in	0.00 in	0.00 in
Snowdepth	-	-	-	-
Wind				
Wind	29 mph	12 mph	0 mph	
Gust Wind	39 mph	22 mph	16 mph	
Sea Level Pressure				
Sea Level Pressure	30.25 in	29.89 in	29.56 in	

### Weekly Weather History Graph



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### Search for Another Location

Airport or City:

KMKT



# Kasota, MN

Mankato Regional

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## Weather History for KMKT - March, 2016

March

18

2016

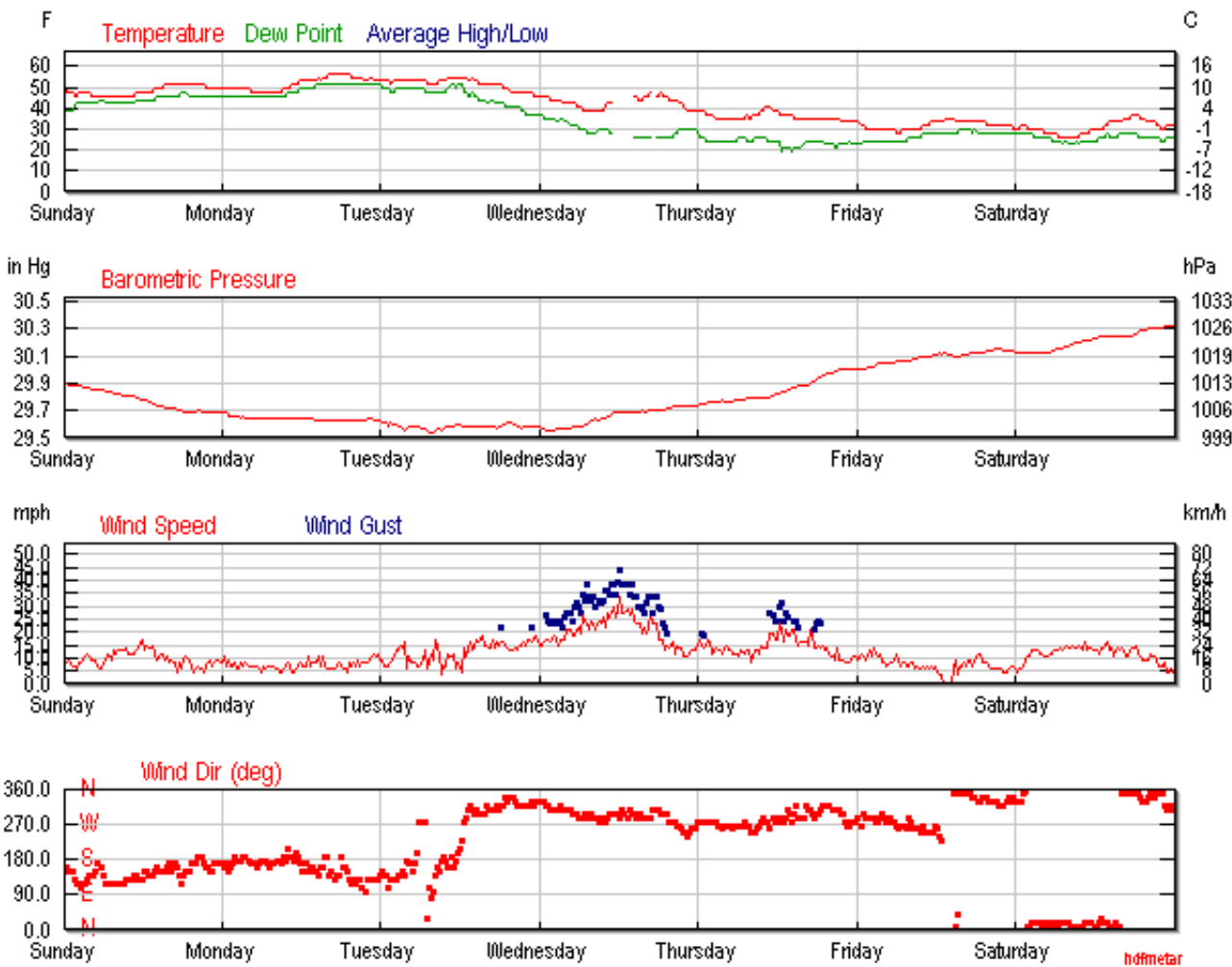
### View

Week of March 13, 2016 through March 19, 2016

Daily	<b>Weekly</b>	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				57 °F	46 °F	35 °F	
Mean Temperature				52 °F	42 °F	32 °F	
Min Temperature				48 °F	38 °F	26 °F	
Degree Days							
Heating Degree Days (base 65)				34	23	12	160
Cooling Degree Days (base 65)				0	0	0	0
Growing Degree Days (base 50)				2	0	0	2
Dew Point							
Dew Point				52 °F	35 °F	19 °F	
Precipitation							

Precipitation	0.07 in	0.02 in	0.00 in	0.14 in
Snowdepth	-	-	-	-
Wind				
Wind	33 mph	11 mph	0 mph	
Gust Wind	44 mph	22 mph	16 mph	
Sea Level Pressure				
Sea Level Pressure	30.32 in	29.83 in	29.53 in	

### Weekly Weather History Graph



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### Search for Another Location

Airport or City:

KMKT

# Kasota, MN

Mankato Regional

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## Weather History for KMKT - March, 2016

March

25

2016

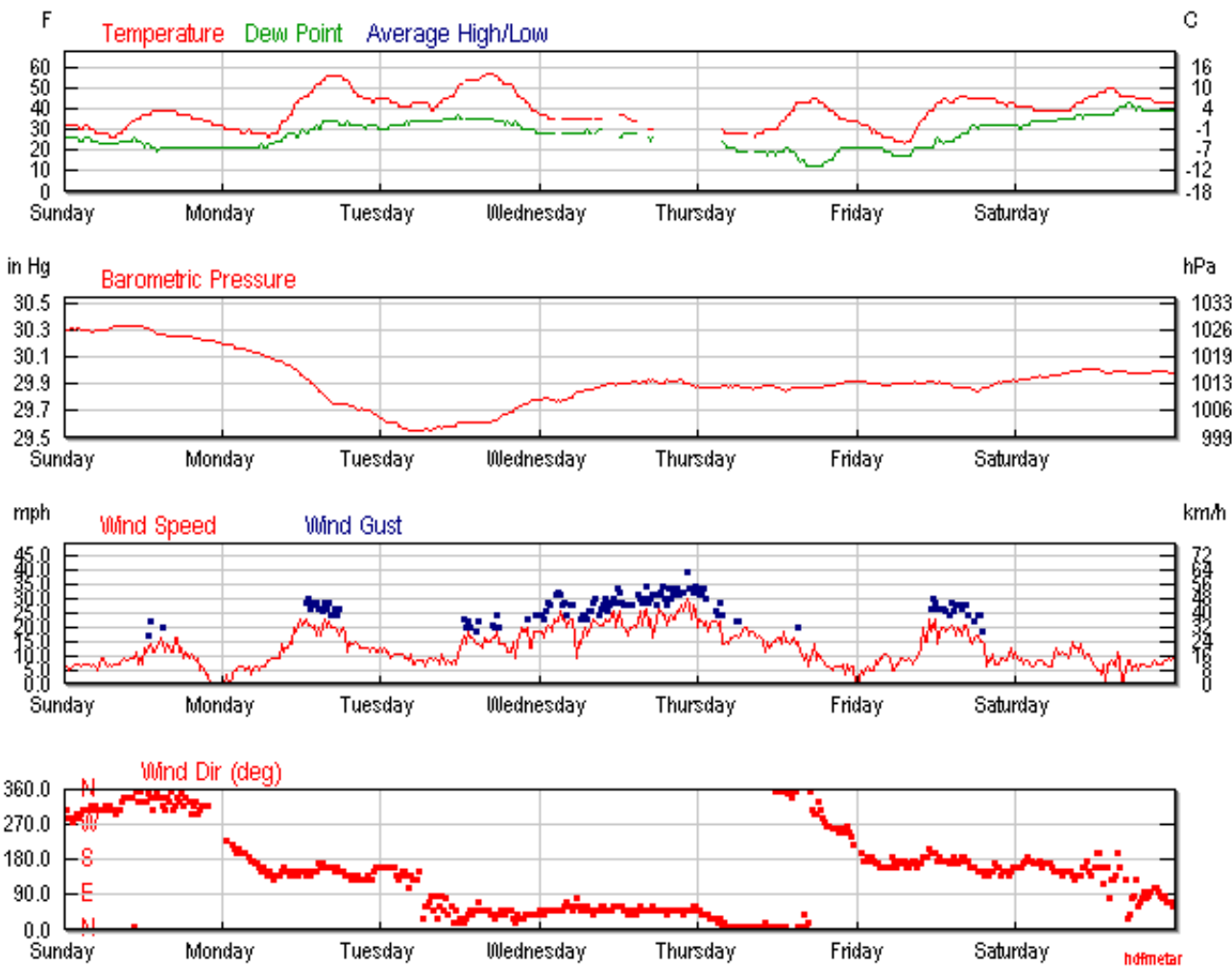
### View

Week of March 20, 2016 through March 26, 2016

Daily	<b>Weekly</b>	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				57 °F	47 °F	37 °F	
Mean Temperature				48 °F	38 °F	32 °F	
Min Temperature				39 °F	30 °F	23 °F	
Degree Days							
Heating Degree Days (base 65)				32	26	17	185
Cooling Degree Days (base 65)				0	0	0	0
Growing Degree Days (base 50)				0	0	0	0
Dew Point							
Dew Point				43 °F	28 °F	12 °F	
Precipitation							

Precipitation	0.08 in	0.01 in	0.00 in	0.08 in
Snowdepth	-	-	-	-
Wind				
Wind	30 mph	12 mph	0 mph	
Gust Wind	39 mph	24 mph	17 mph	
Sea Level Pressure				
Sea Level Pressure	30.34 in	29.93 in	29.55 in	

### Weekly Weather History Graph



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### Search for Another Location

Airport or City:

KMKT

# Kasota, MN

Mankato Regional

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## Weather History for KMKT - April, 2016

April

1

2016

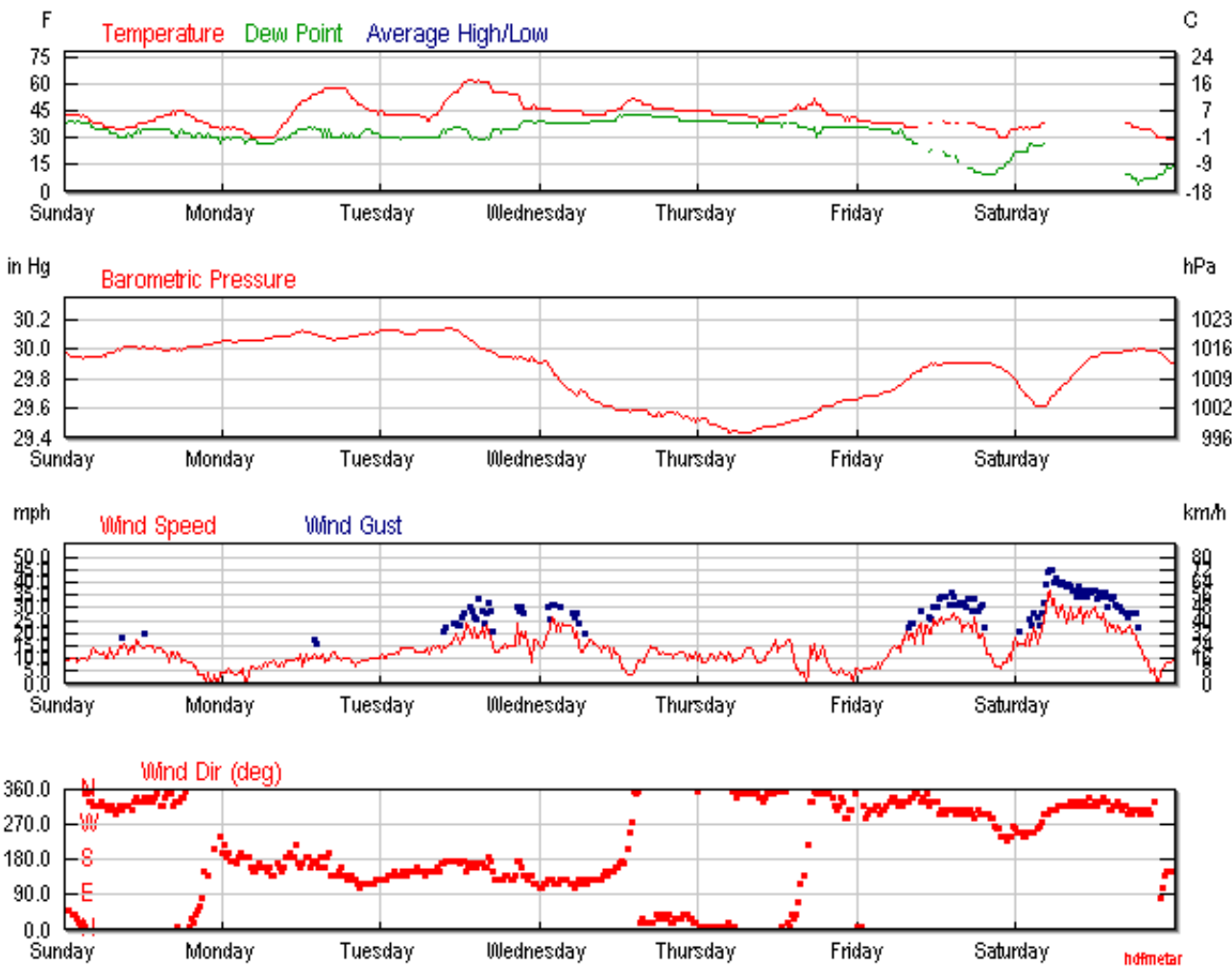
### View

Week of March 27, 2016 through April 2, 2016

Daily	<b>Weekly</b>	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				64 °F	49 °F	37 °F	
Mean Temperature				50 °F	41 °F	32 °F	
Min Temperature				42 °F	34 °F	28 °F	
Degree Days							
Heating Degree Days (base 65)				32	23	14	162
Cooling Degree Days (base 65)				0	0	0	0
Growing Degree Days (base 50)				0	0	0	0
Dew Point							
Dew Point				43 °F	30 °F	3 °F	
Precipitation							

Precipitation	0.18 in	0.03 in	0.00 in	0.24 in
Snowdepth	-	-	-	-
Wind				
Wind	37 mph	13 mph	0 mph	
Gust Wind	45 mph	25 mph	16 mph	
Sea Level Pressure				
Sea Level Pressure	30.14 in	29.85 in	29.44 in	

### Weekly Weather History Graph



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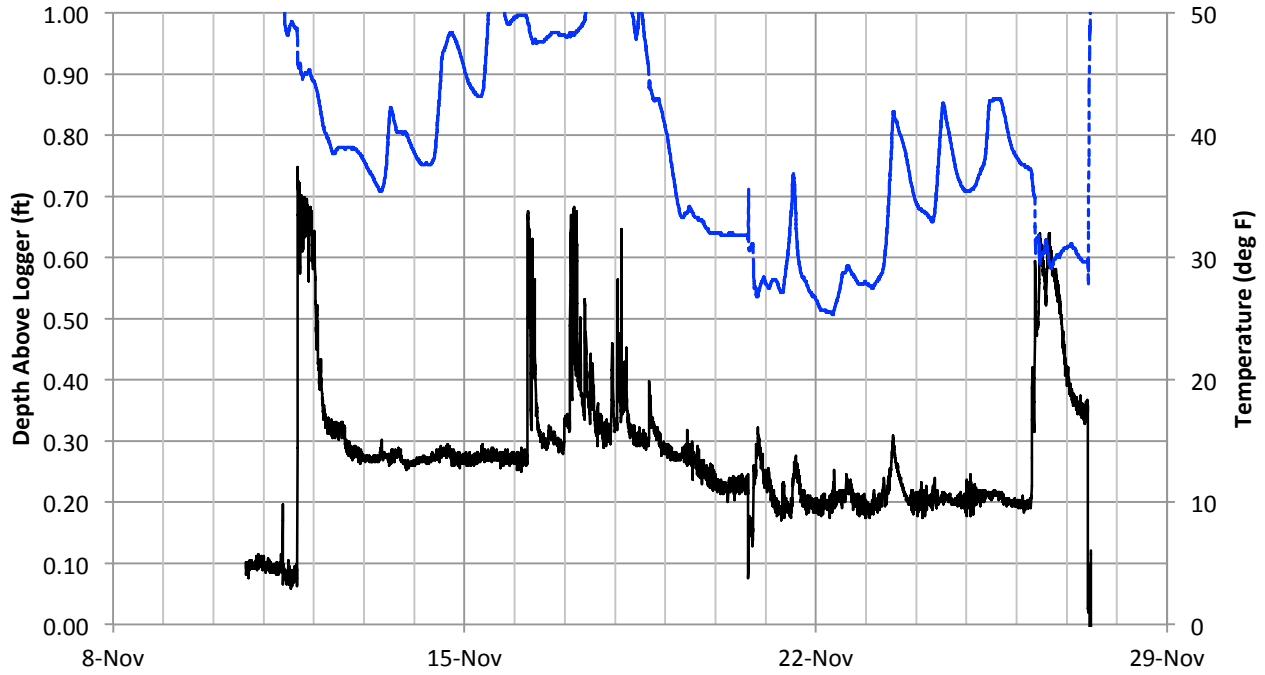
### Search for Another Location

Airport or City:

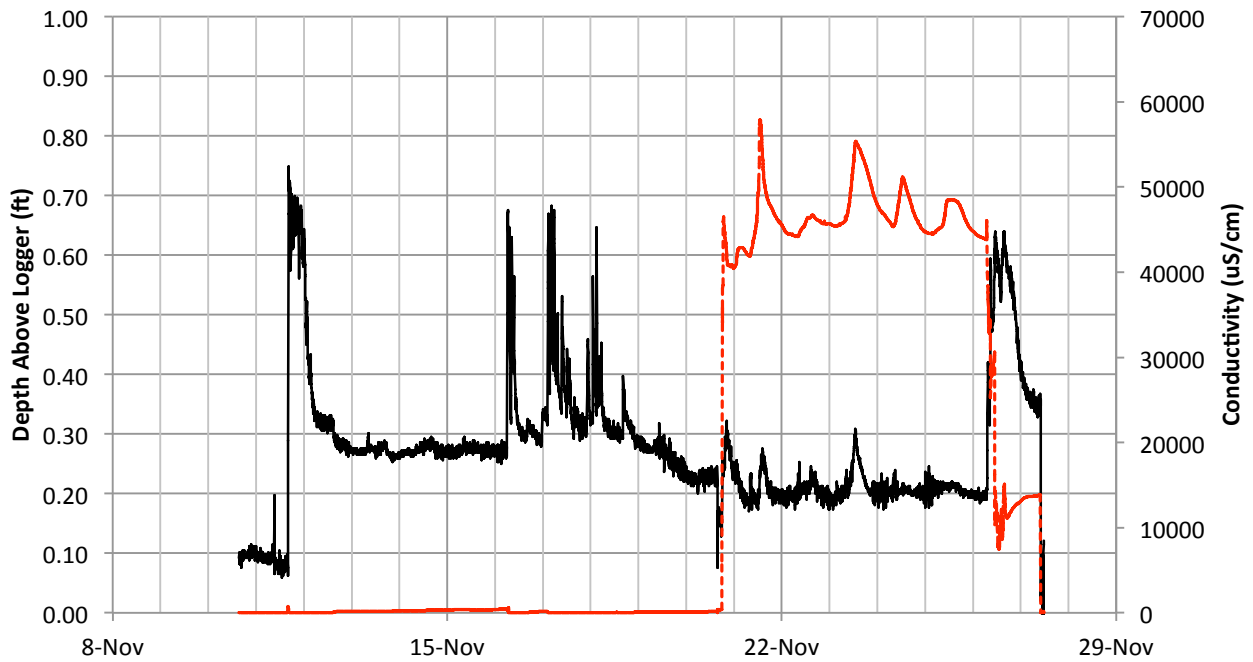
KMKT

## **APPENDIX I: TEMPERATURE, CONDUCTIVITY AND WATER DEPTH RESULTS**

### Location A Water Level & Temperature Measurements

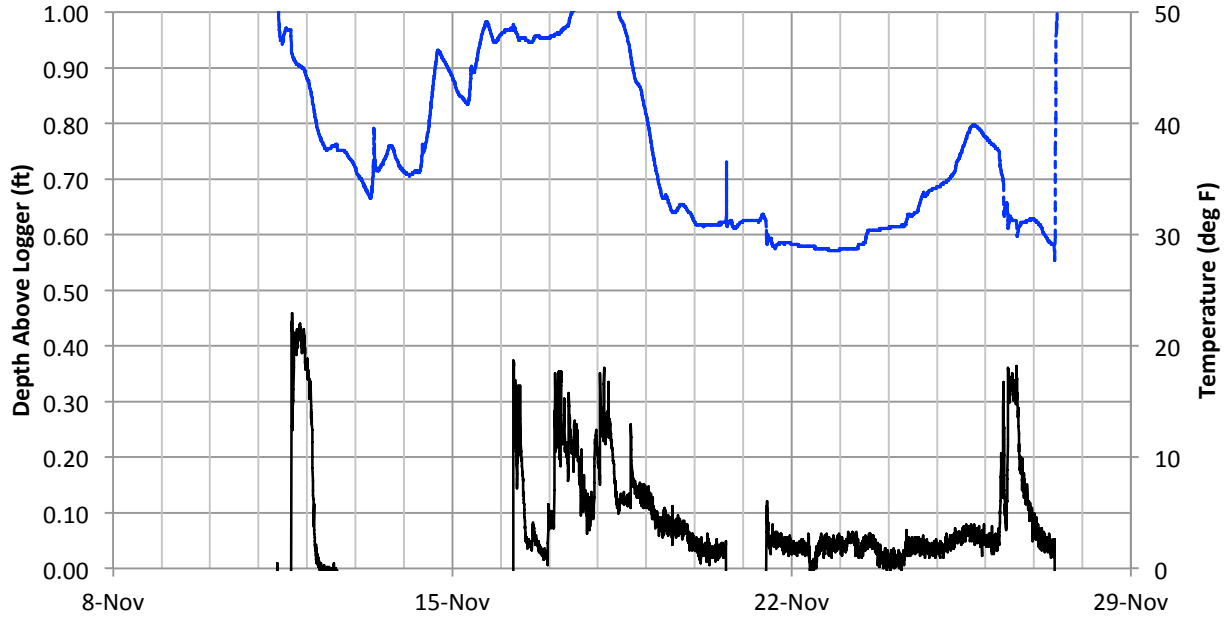


### Location A Water Level & Conductivity Measurements

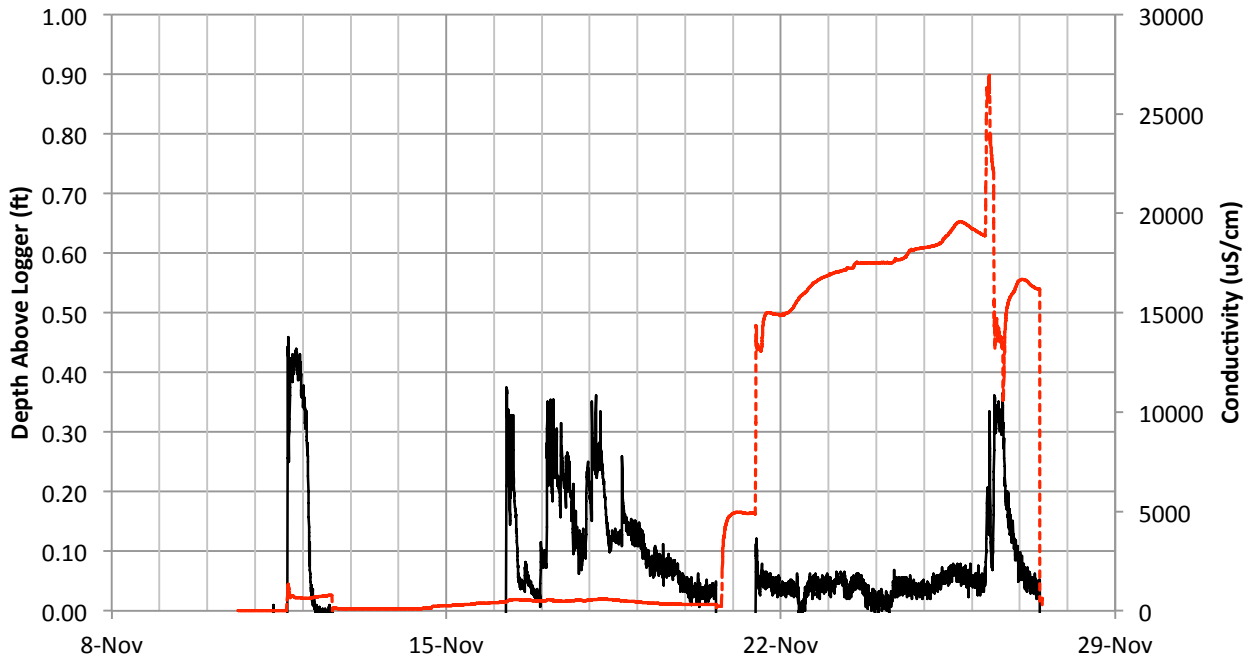




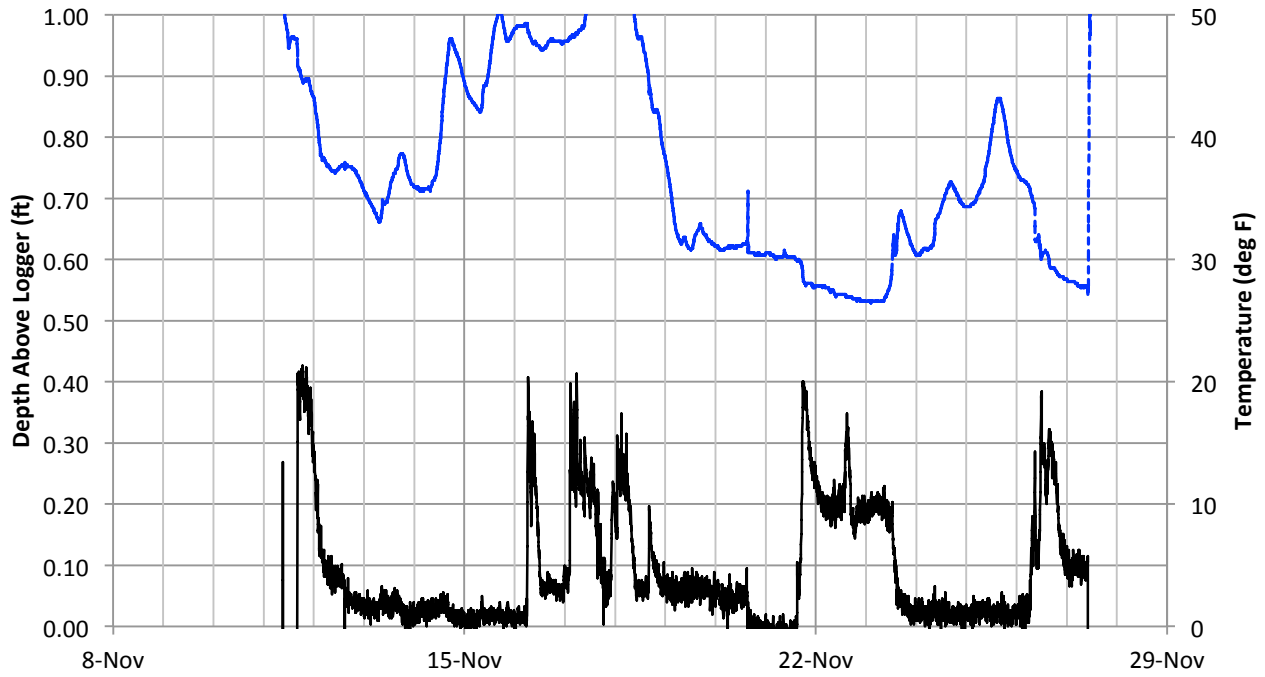
### Location B Water Level & Temperature Measurements



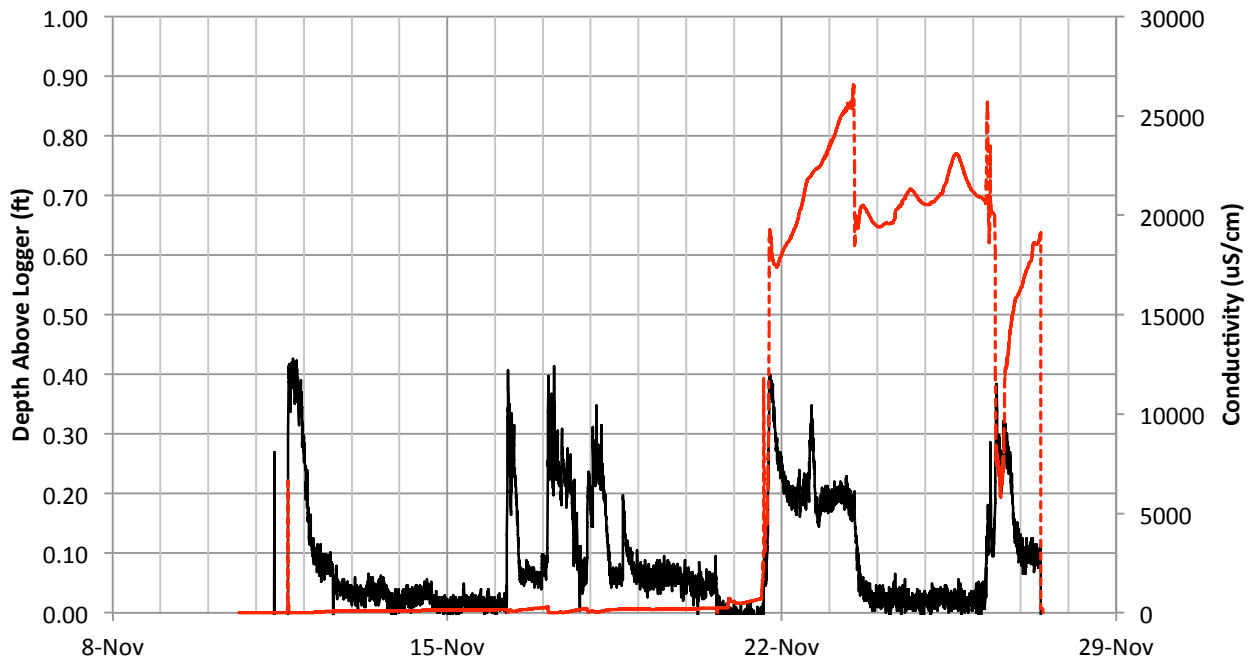
### Location B Water Level & Conductivity Measurements



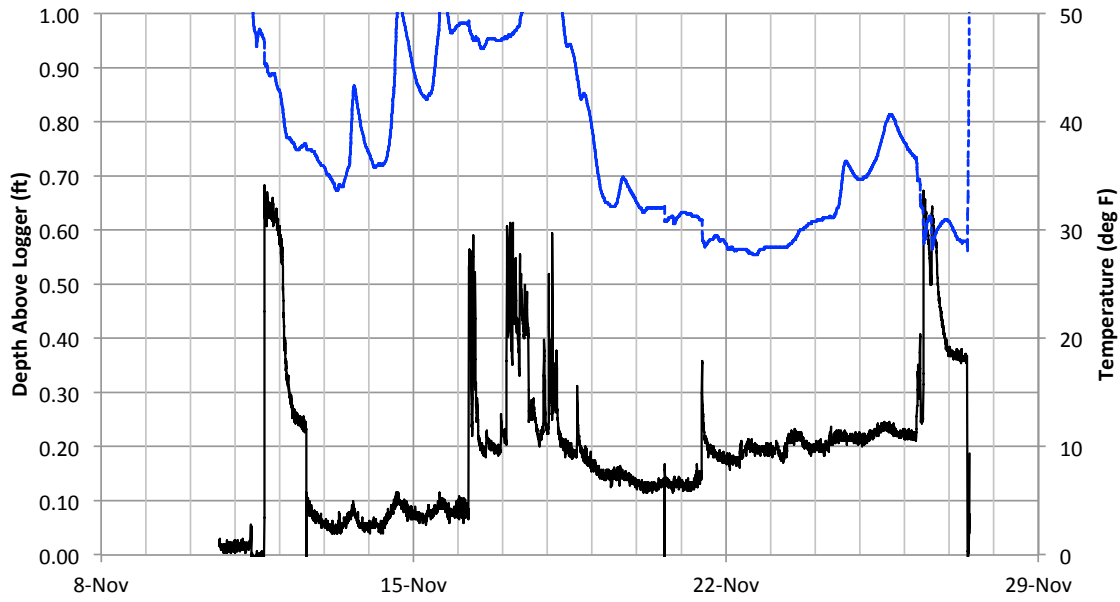
### Location C Water Level & Temperature Measurements



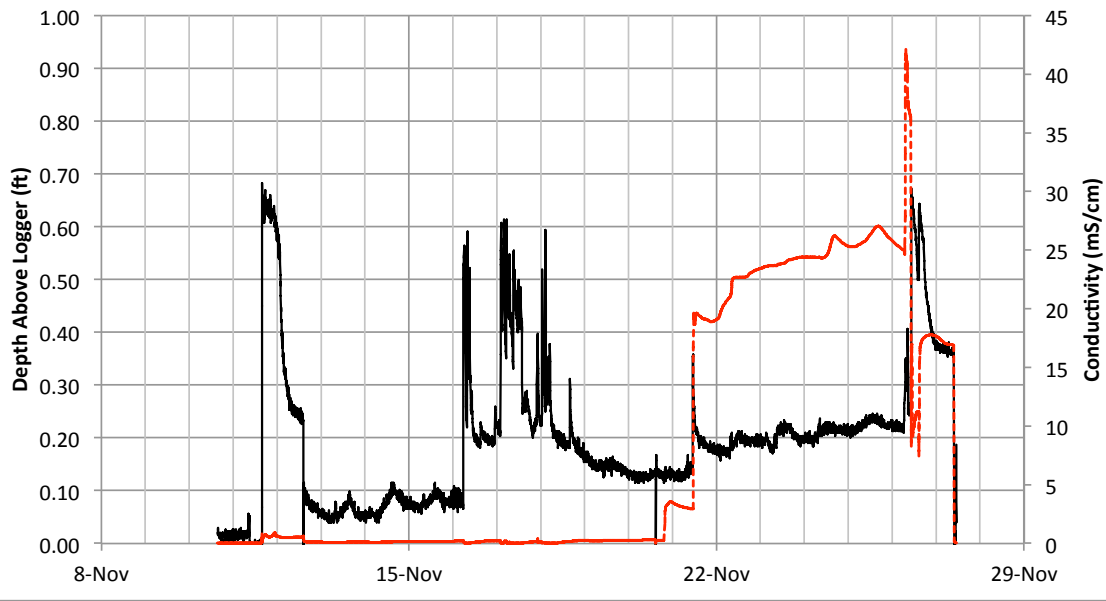
### Location C Water Level & Conductivity Measurements



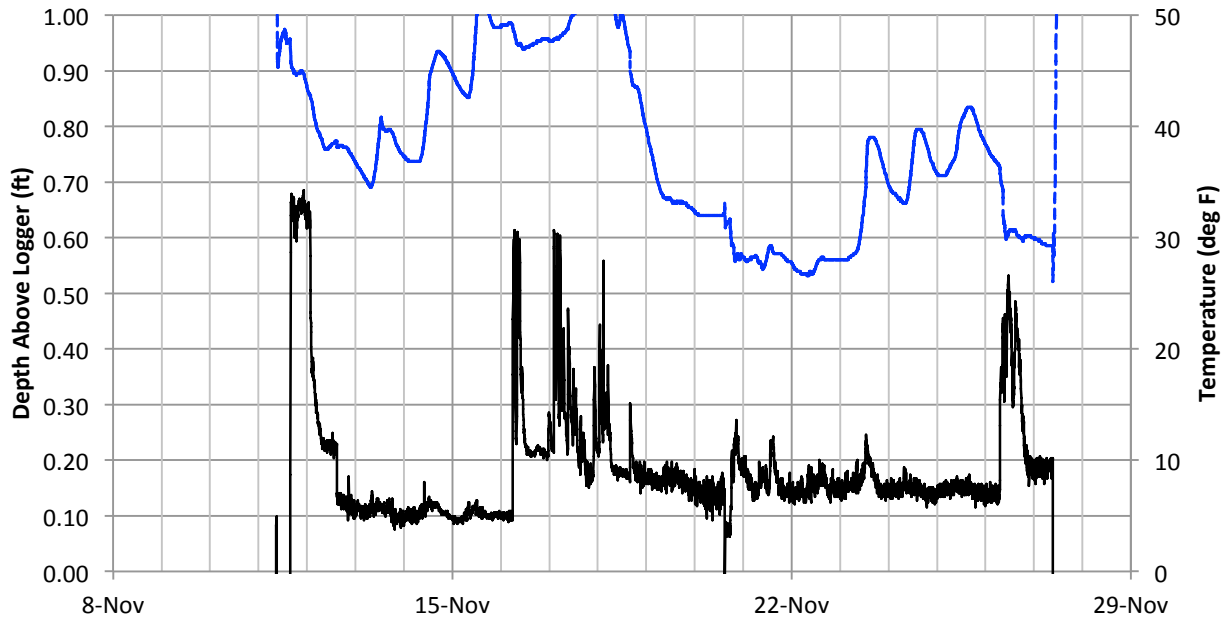
### Location D Water Level & Temperature Measurements



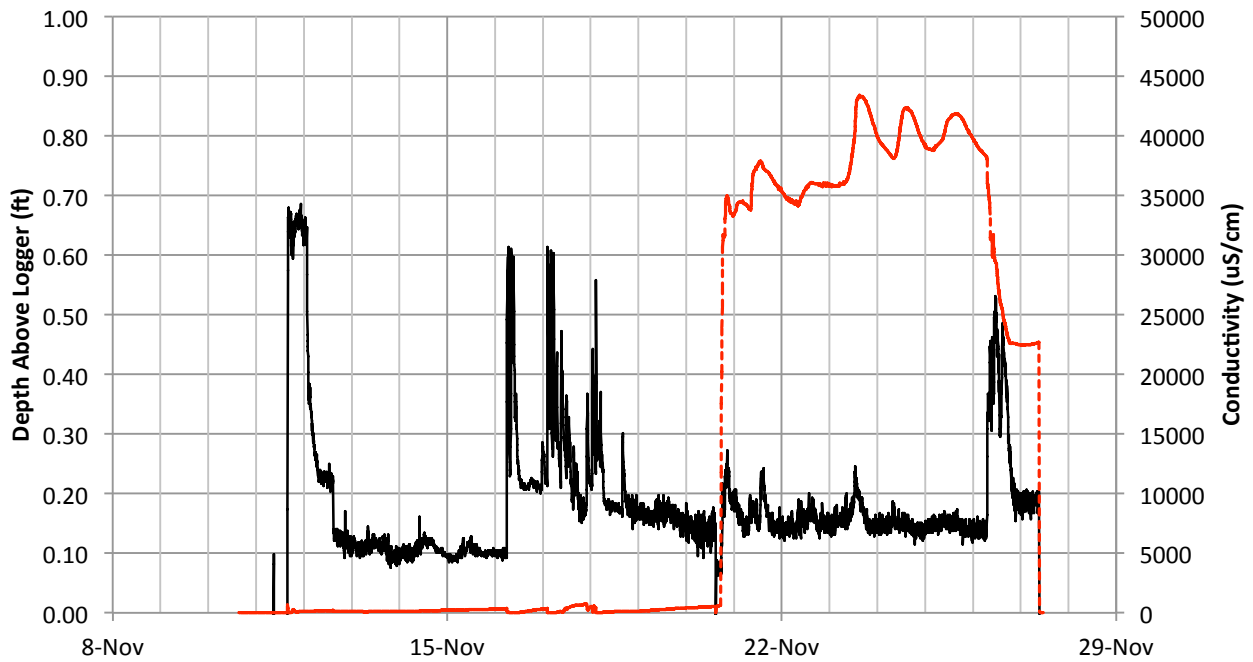
### Location D Water Level & Conductivity Measurements



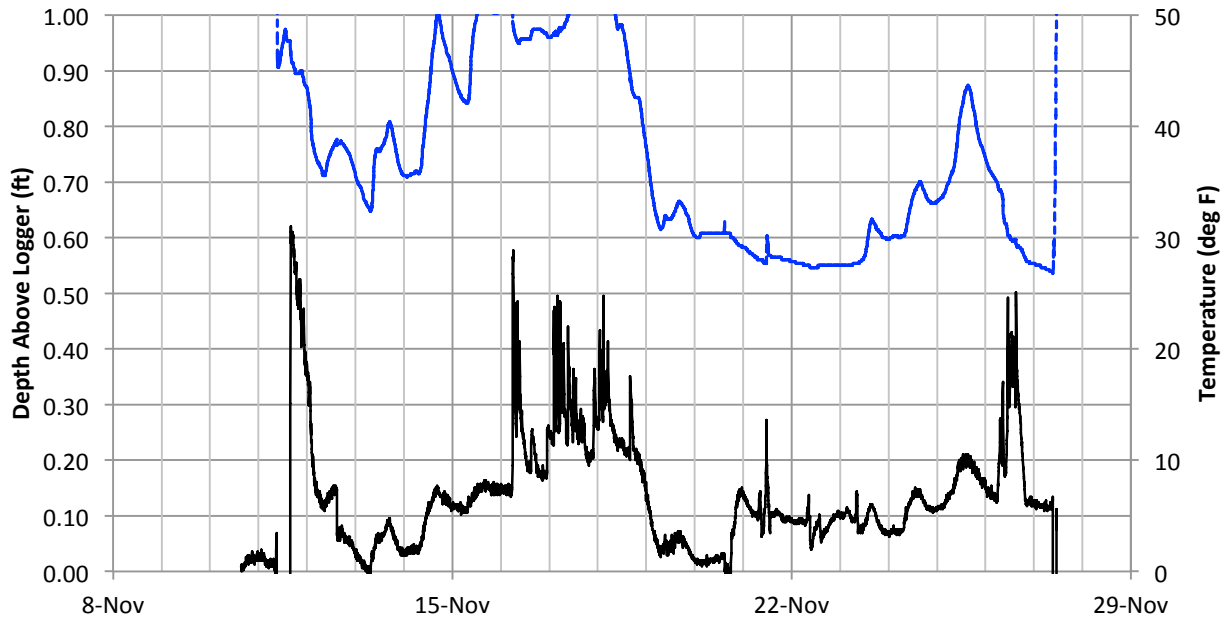
### Location E Water Level & Temperature Measurements



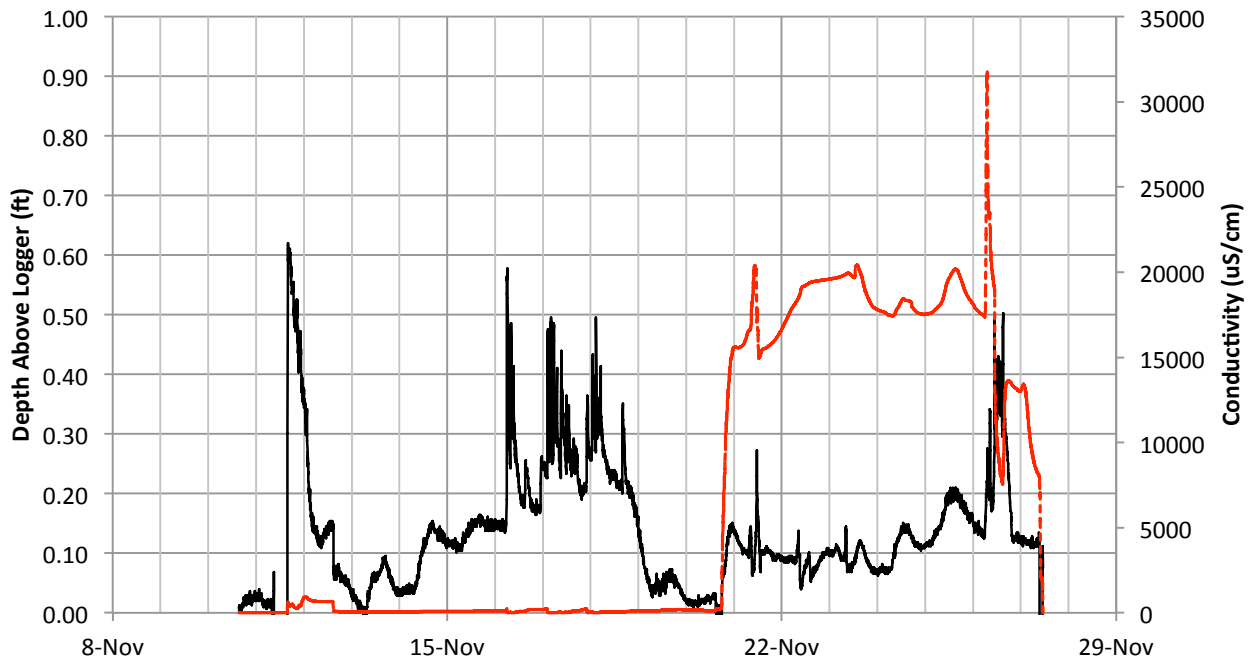
### Location E Water Level & Conductivity Measurements



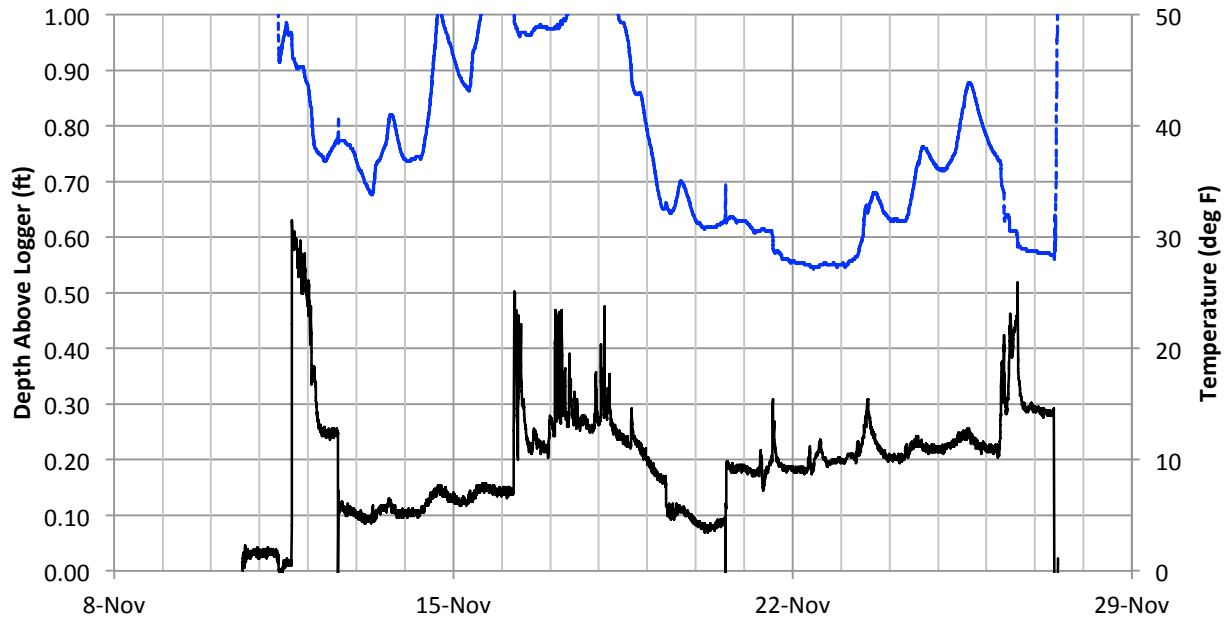
### Location F Water Level & Temperature Measurements



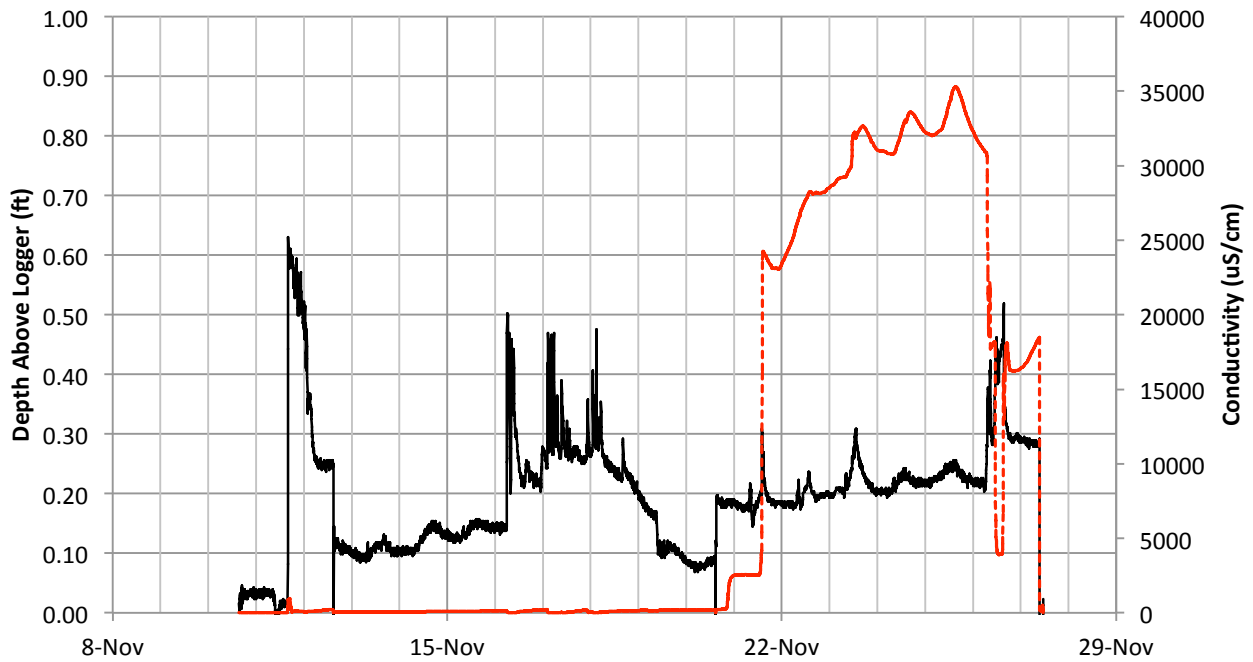
### Location F Water Level & Conductivity Measurements



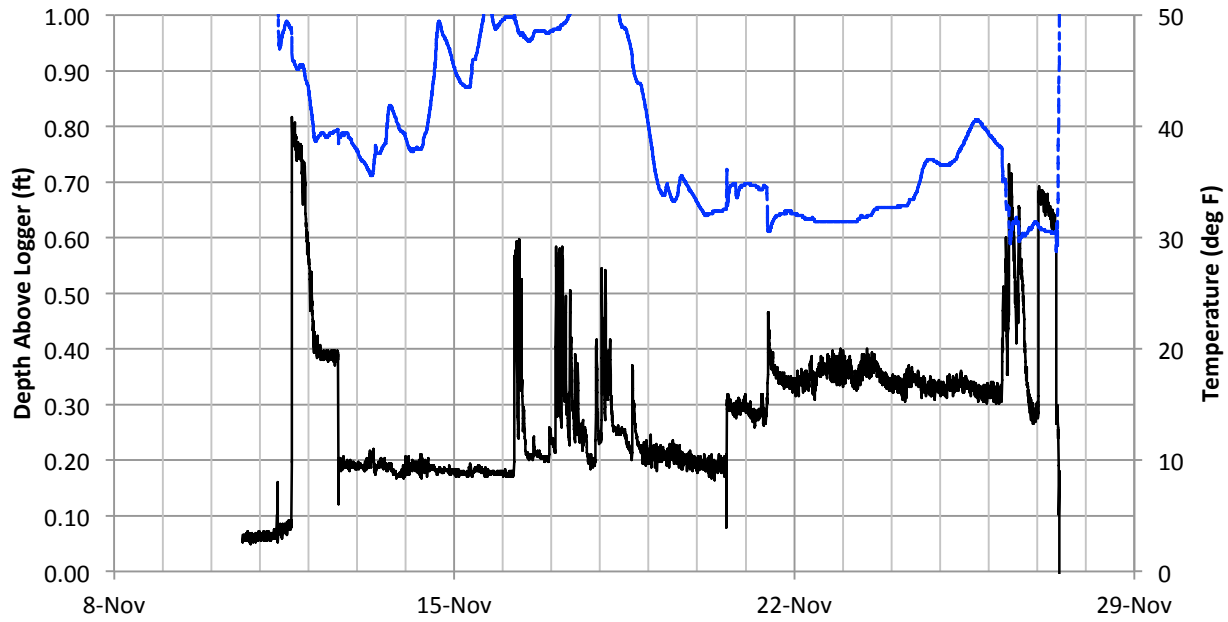
### Location G Water Level & Temperature Measurements



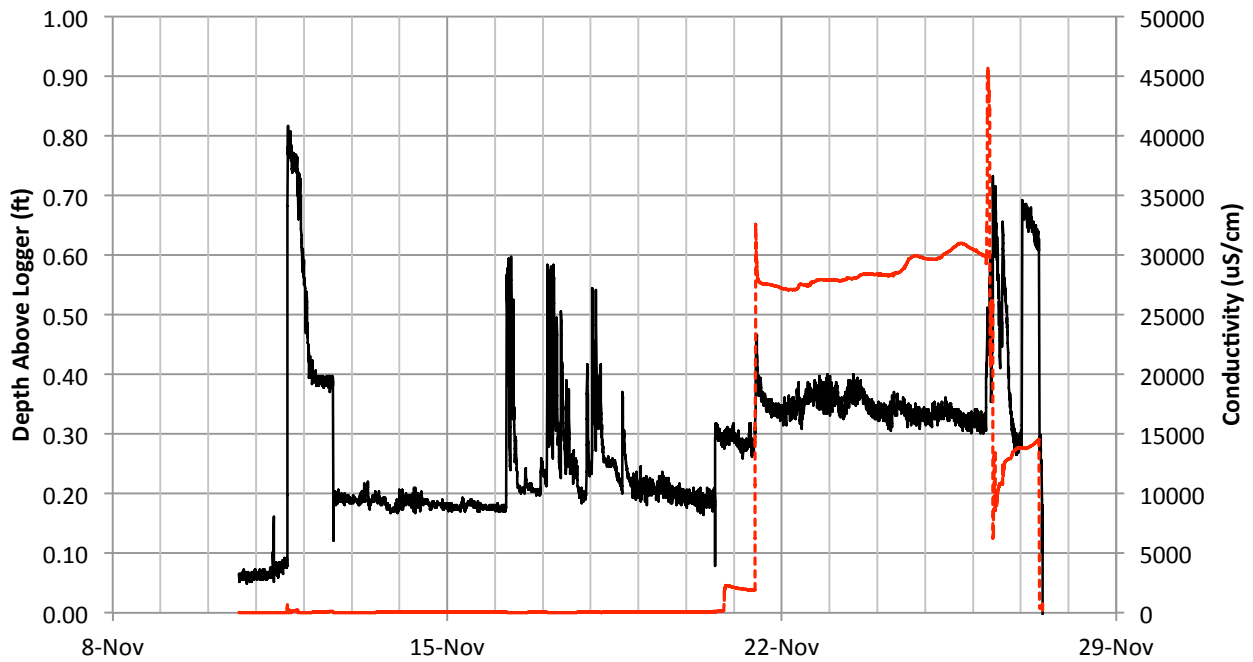
### Location G Water Level & Conductivity Measurements



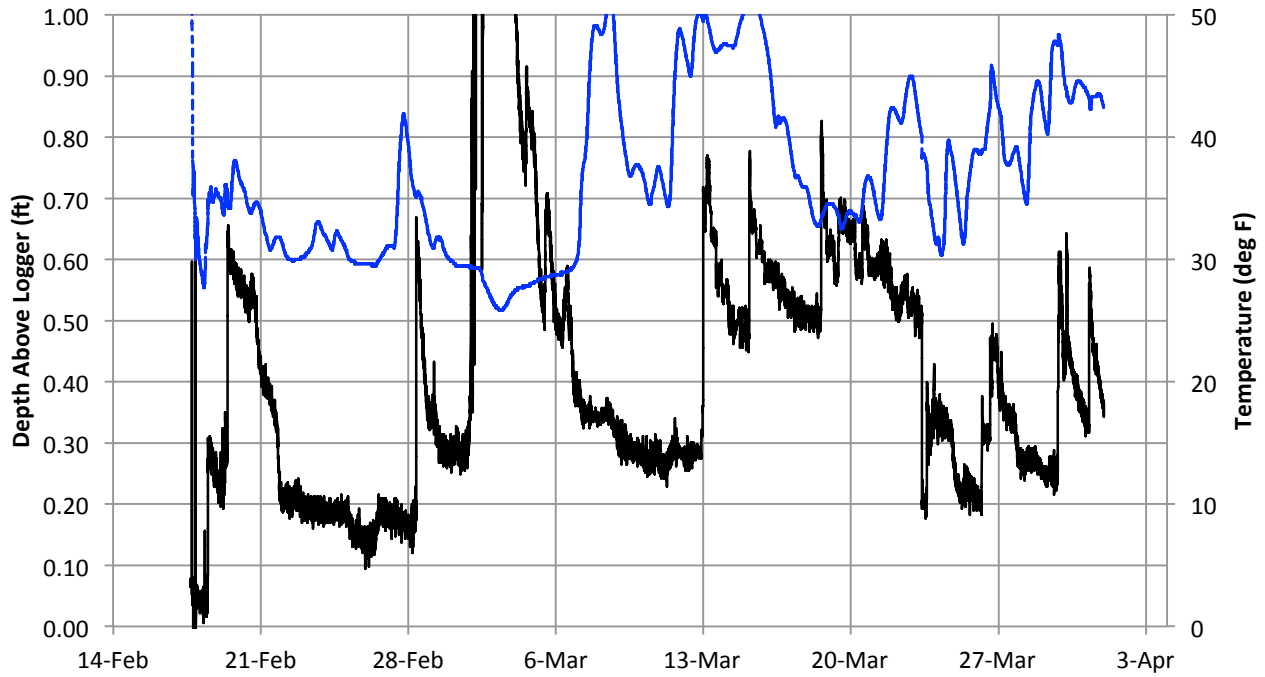
### Location H Water Level & Temperature Measurements



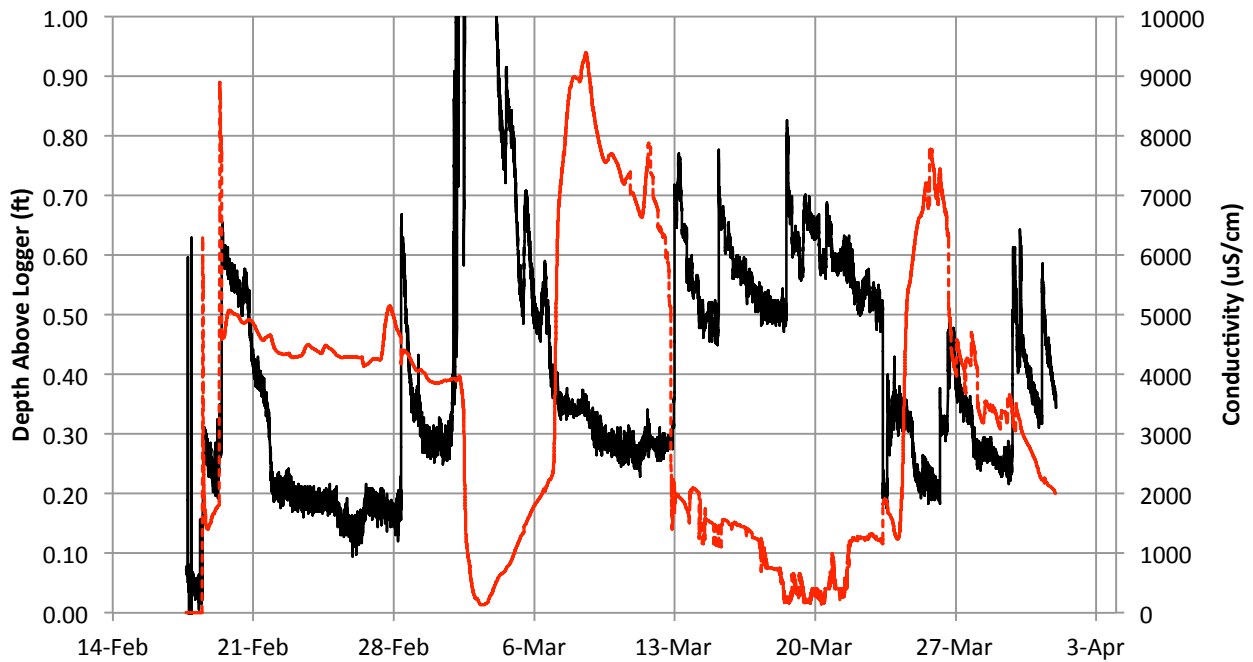
### Location H Water Level & Conductivity Measurements



### Location A Water Level & Temperature Measurements

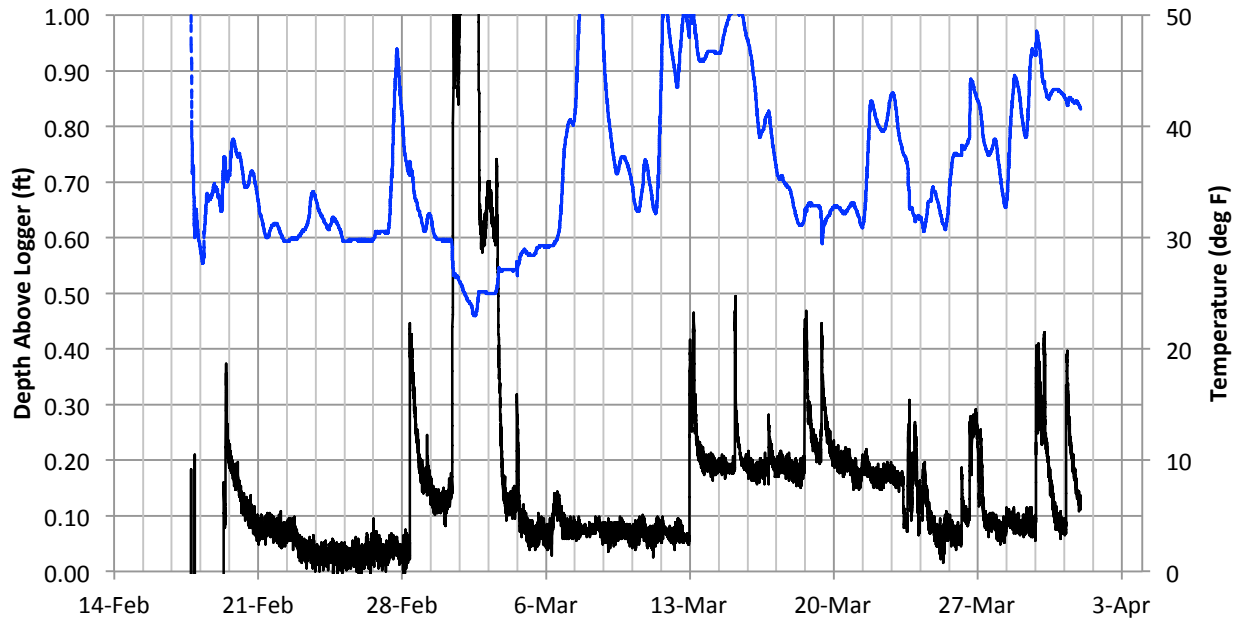


### Location A Water Level & Conductivity Measurements

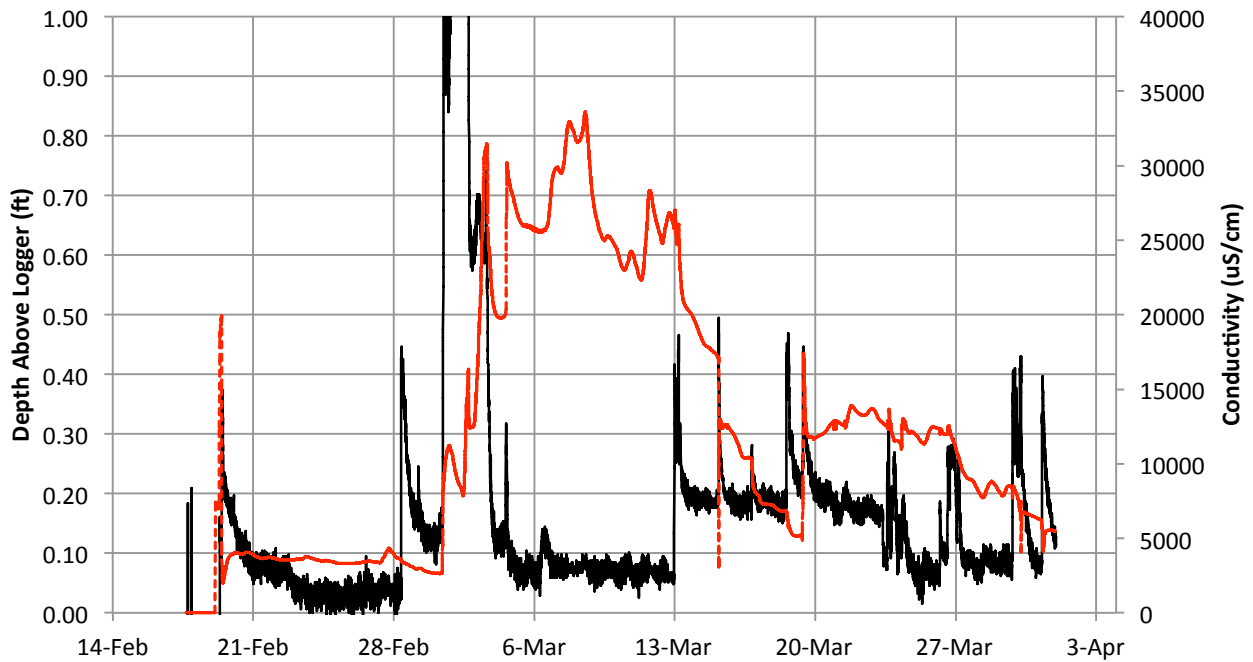




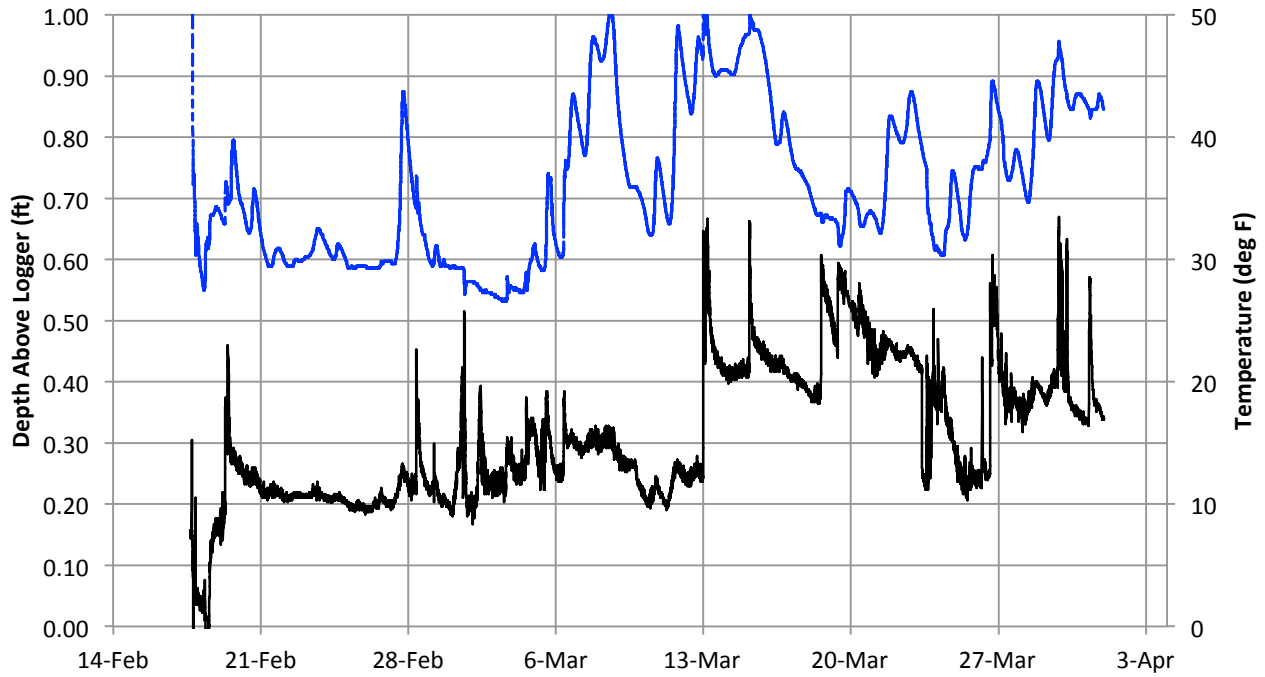
### Location C Water Level & Temperature Measurements



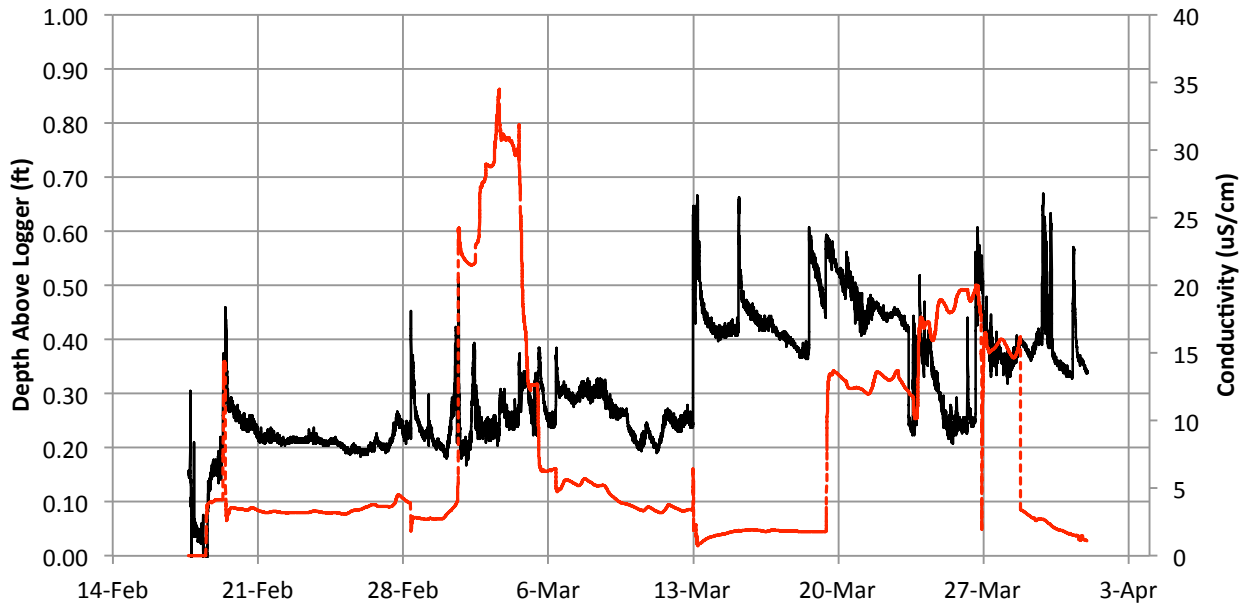
### Location C Water Level & Conductivity Measurements



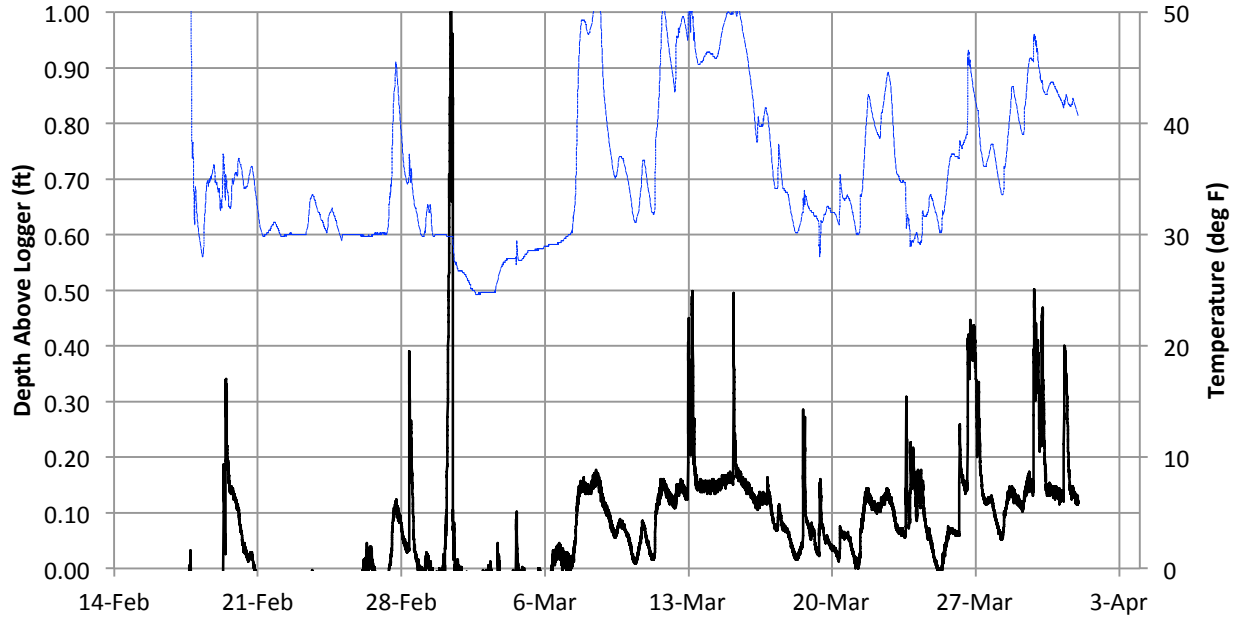
### Location D Water Level & Temperature Measurements



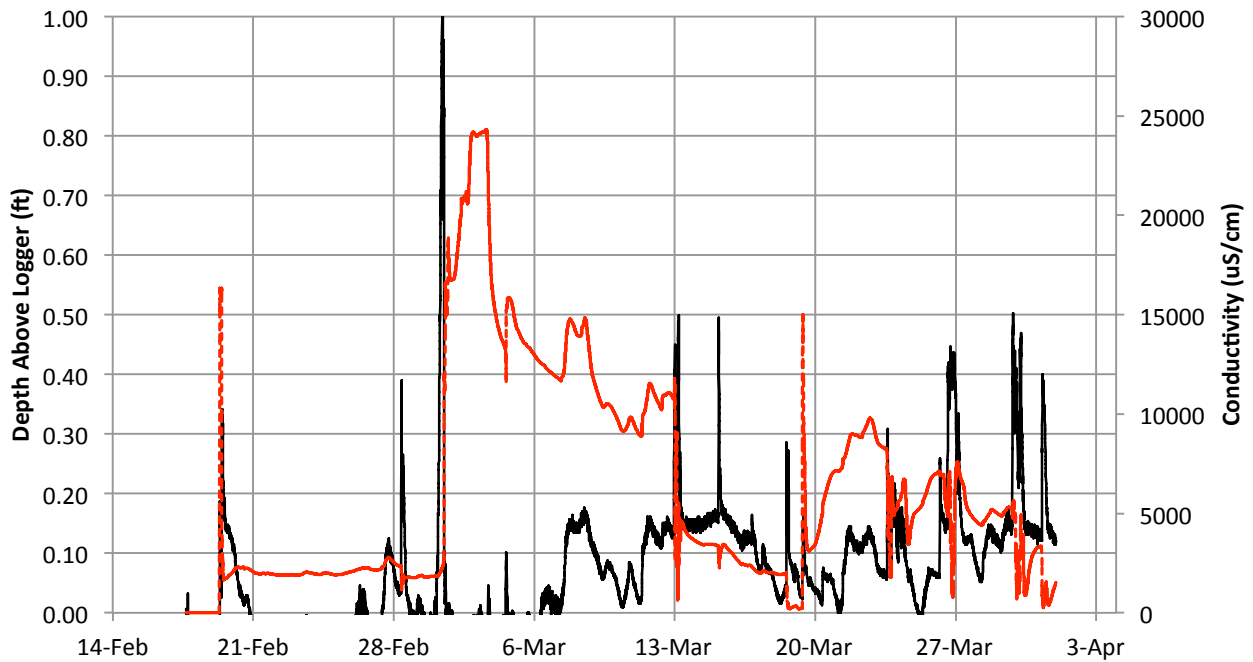
### Location D Water Level & Conductivity Measurements



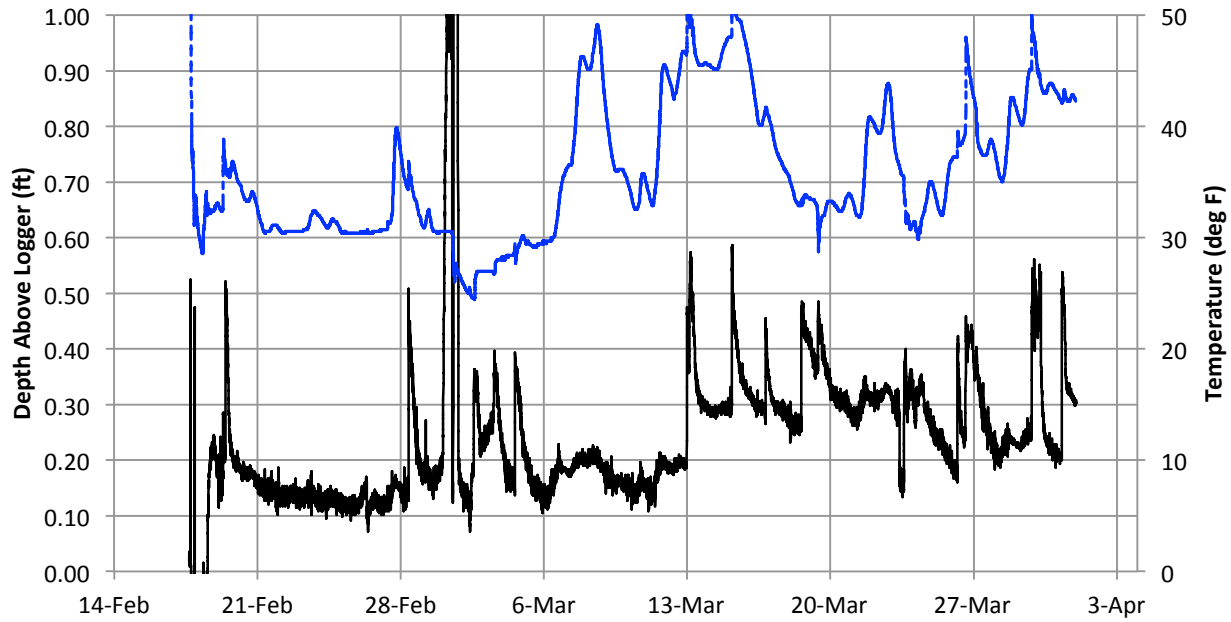
### Location F Water Level & Temperature Measurements



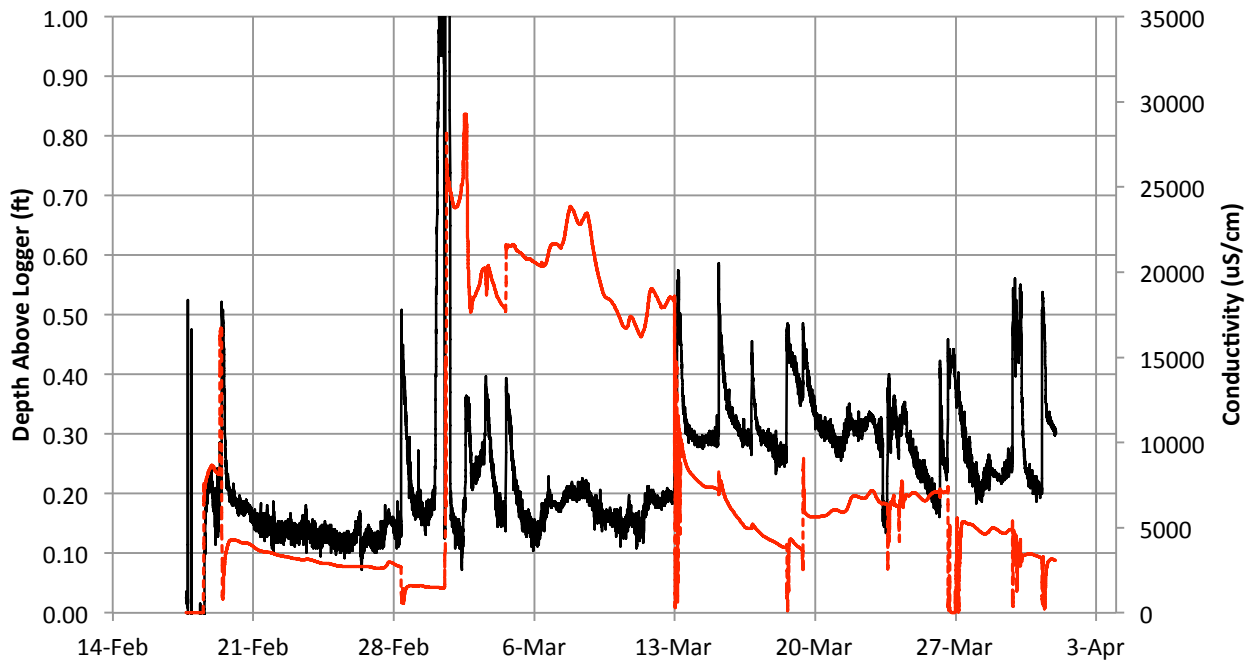
### Location F Water Level & Conductivity Measurements



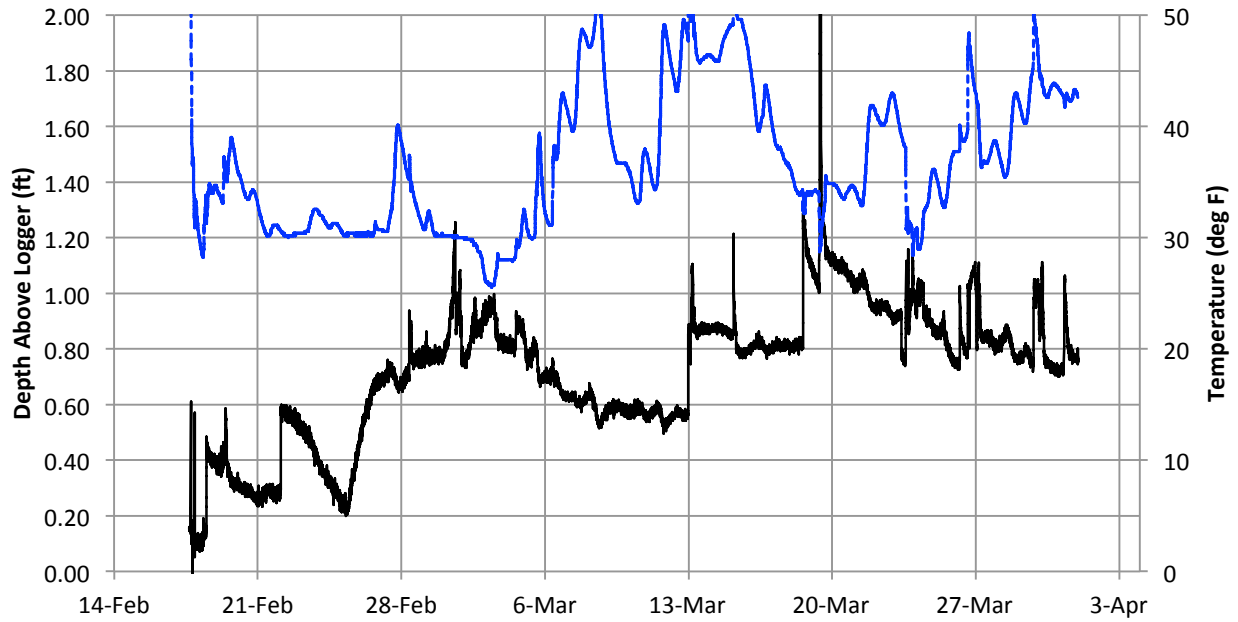
### Location G Water Level & Temperature Measurements



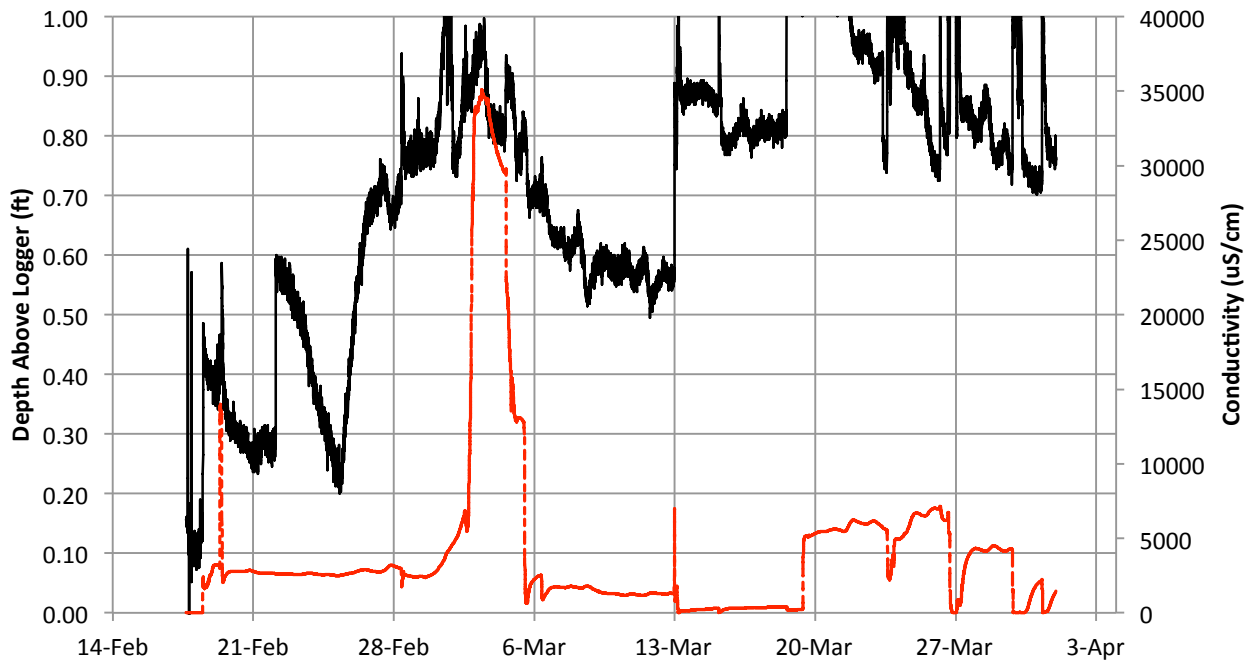
### Location G Water Level & Conductivity Measurements



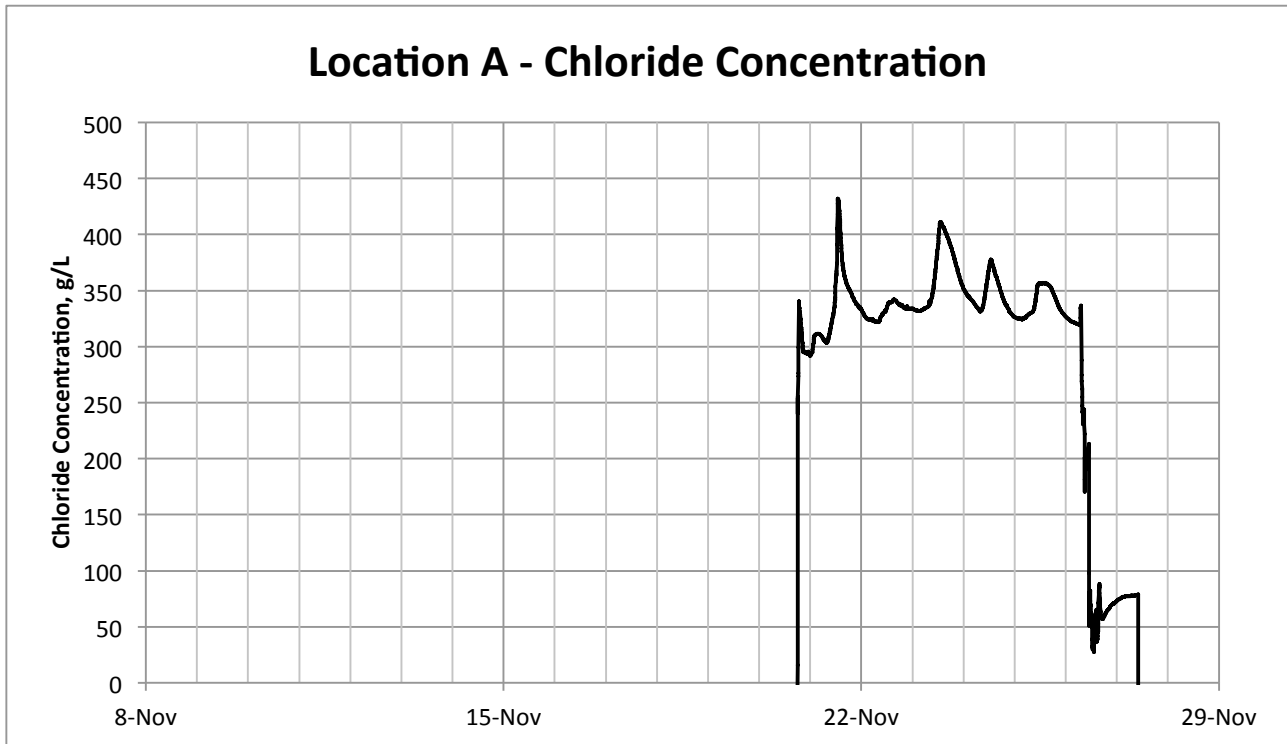
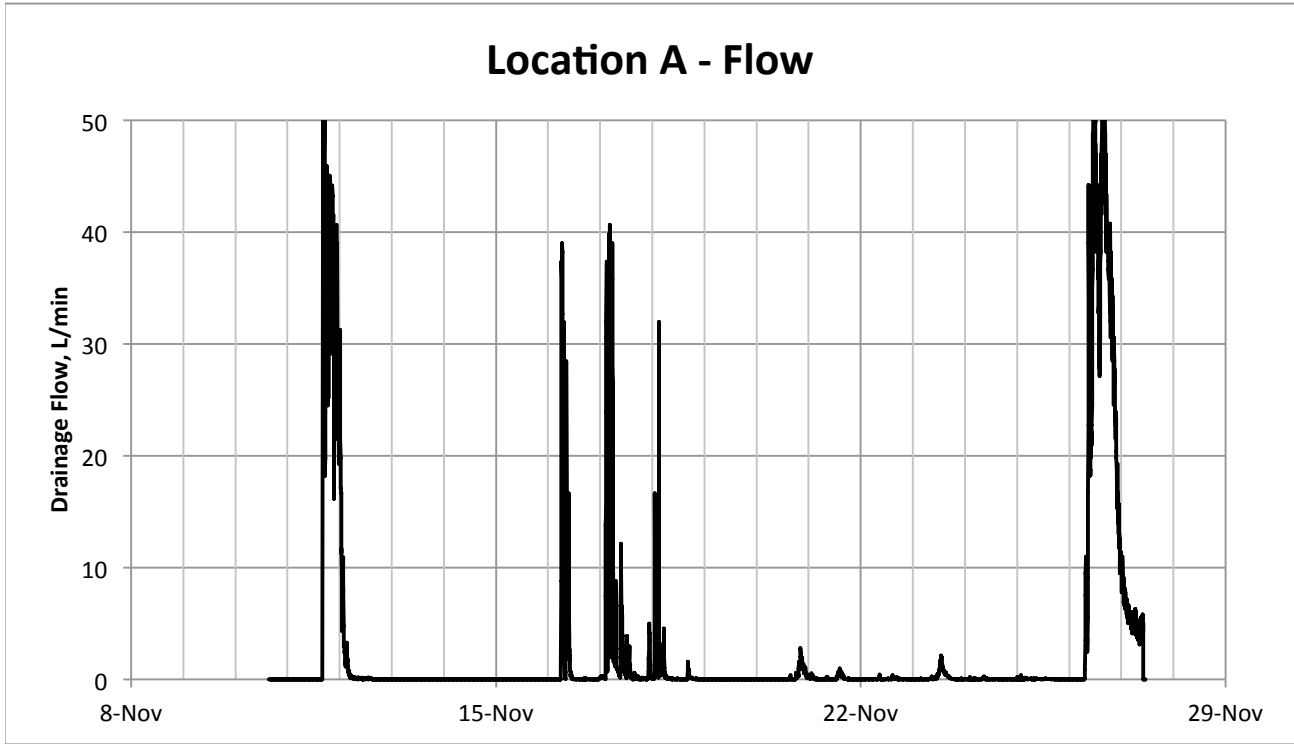
### Location H Water Level & Temperature Measurements

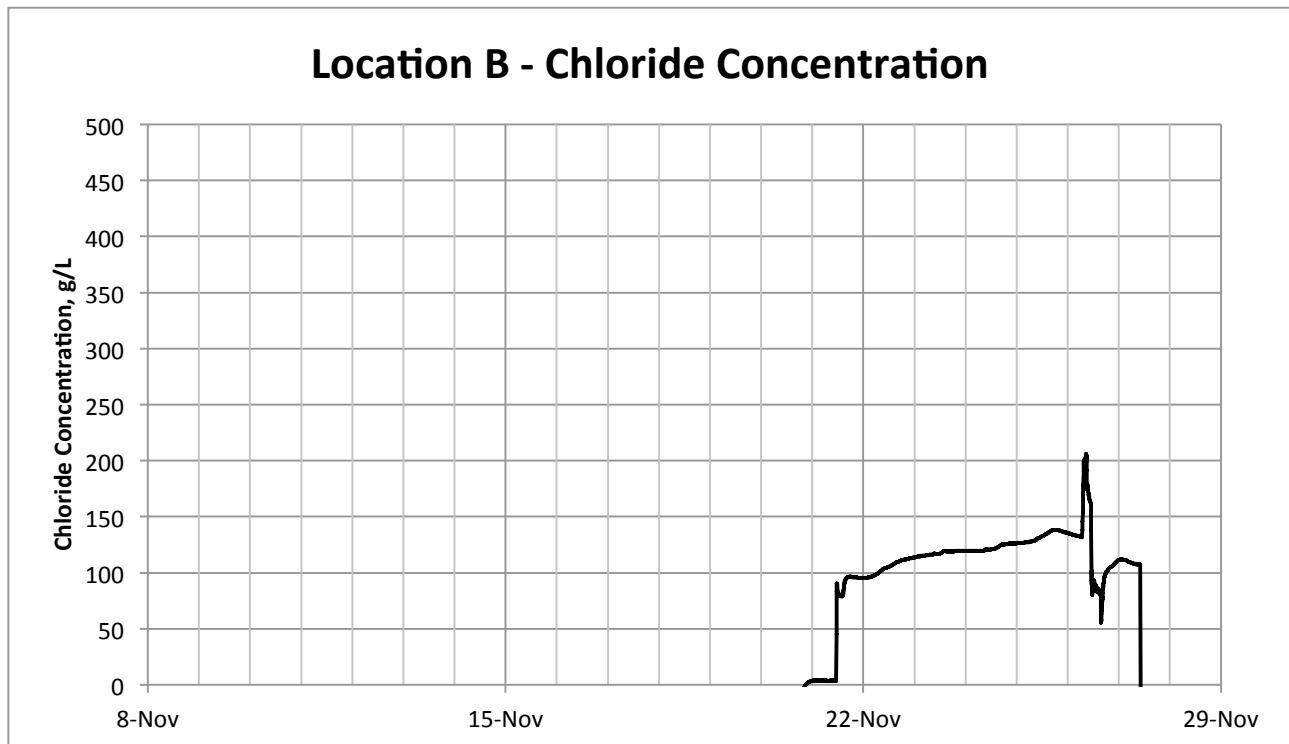
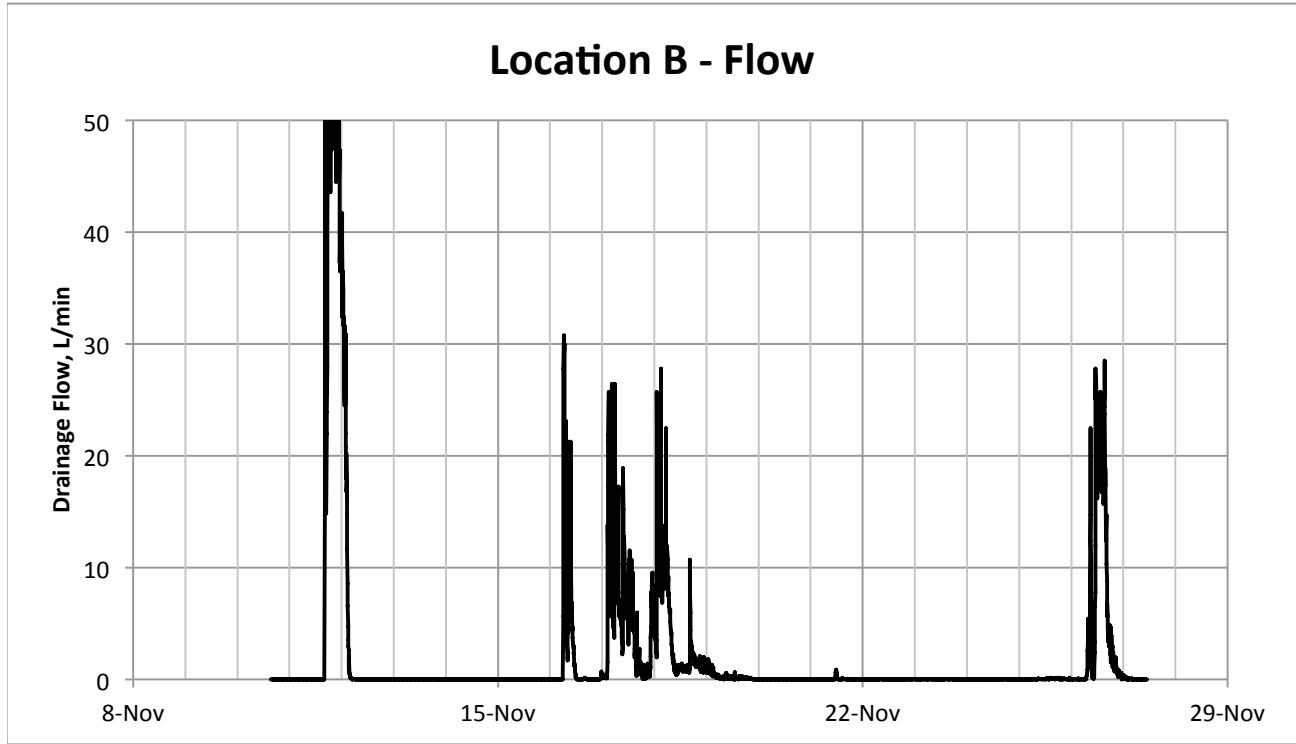


### Location H Water Level & Conductivity Measurements

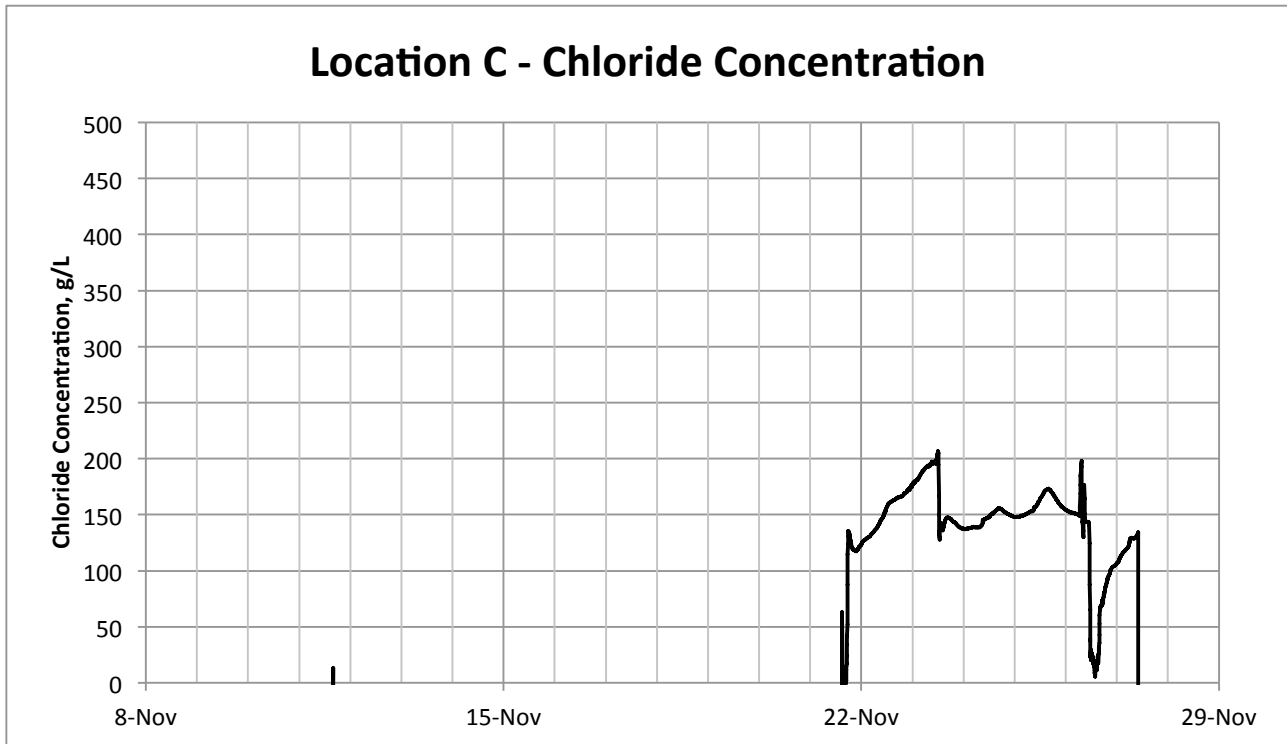
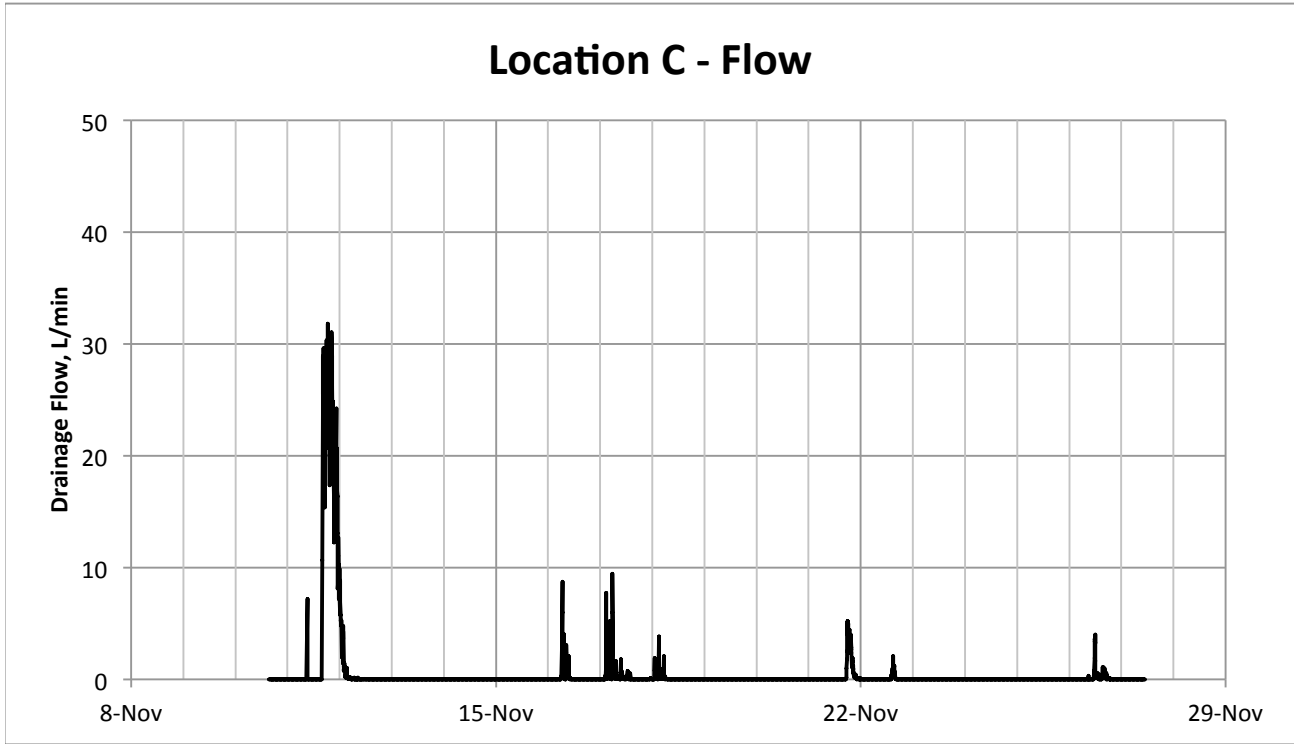


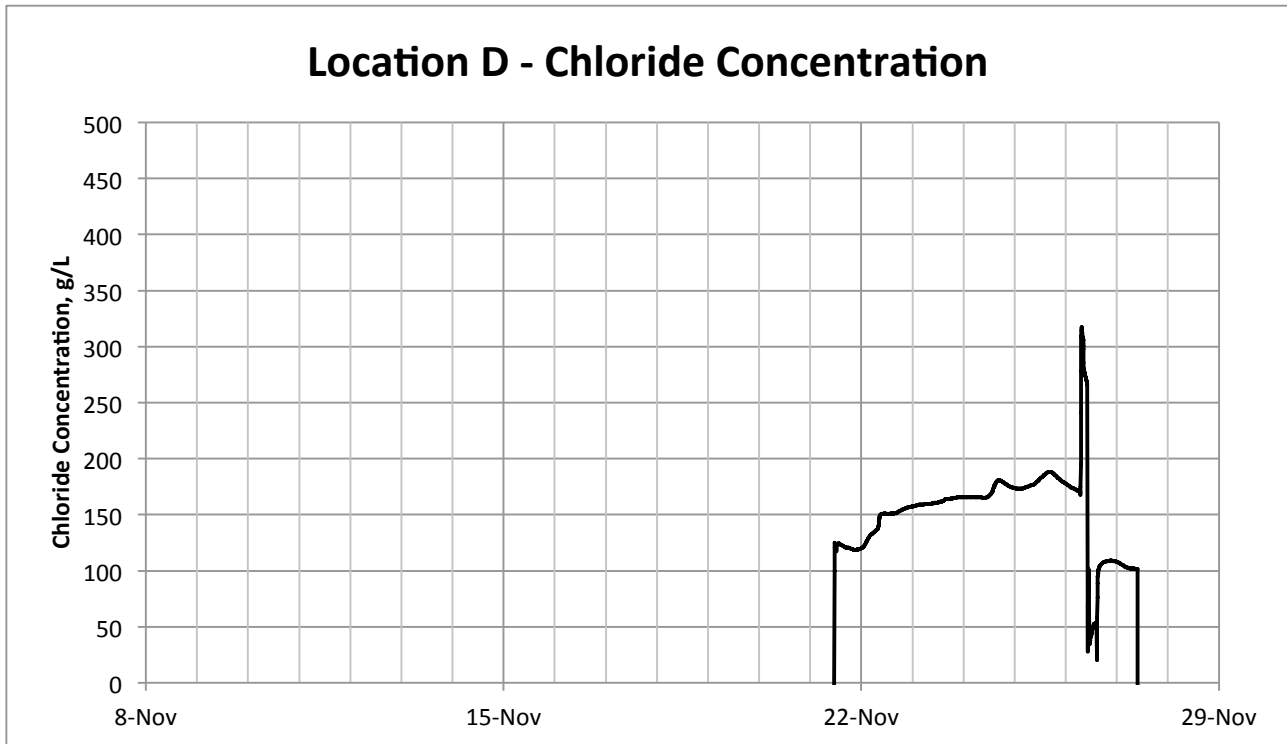
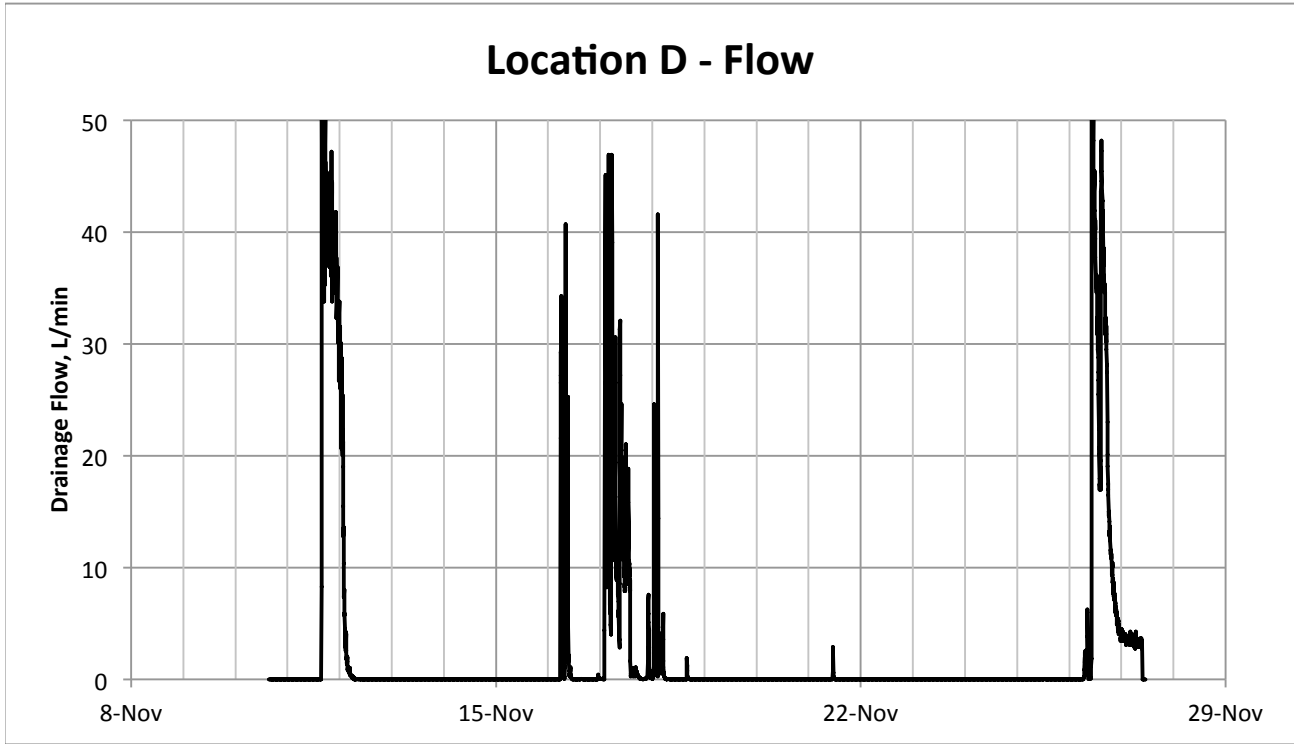
## **APPENDIX J: CHLORIDE CONCENTRATION AND FLOW CALCULATION RESULTS**

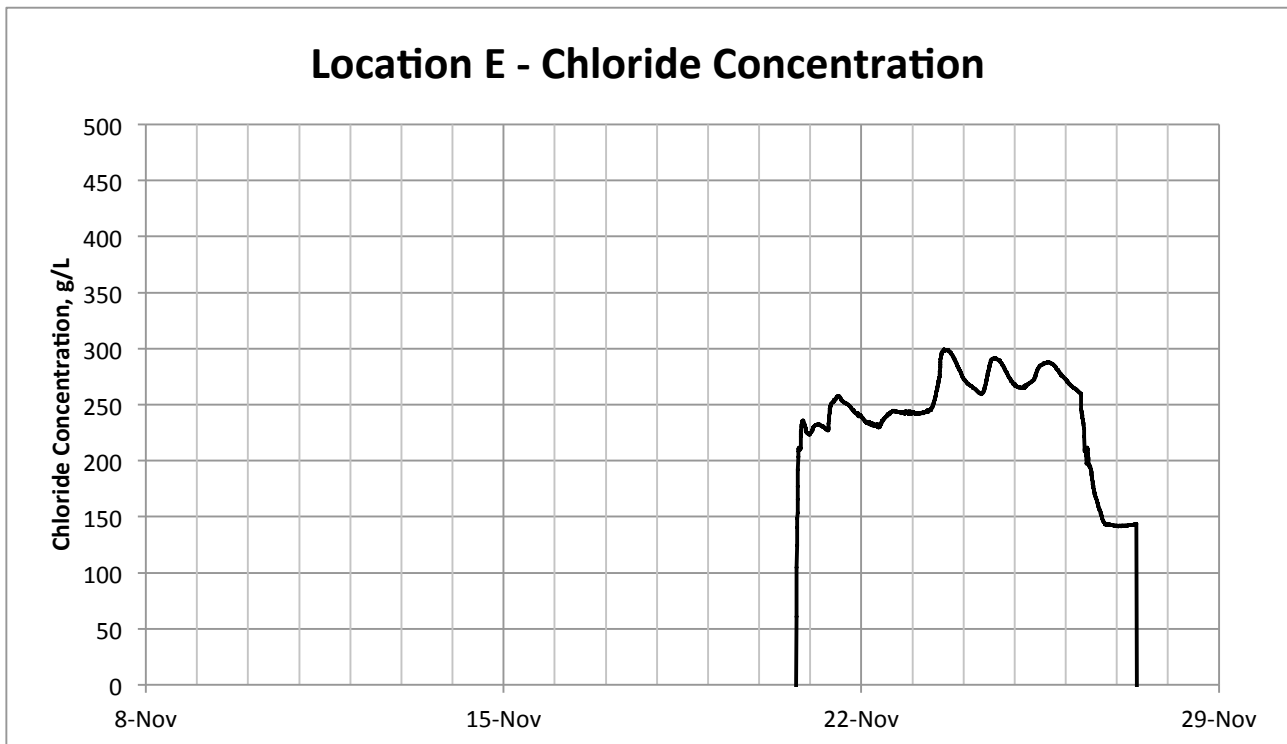
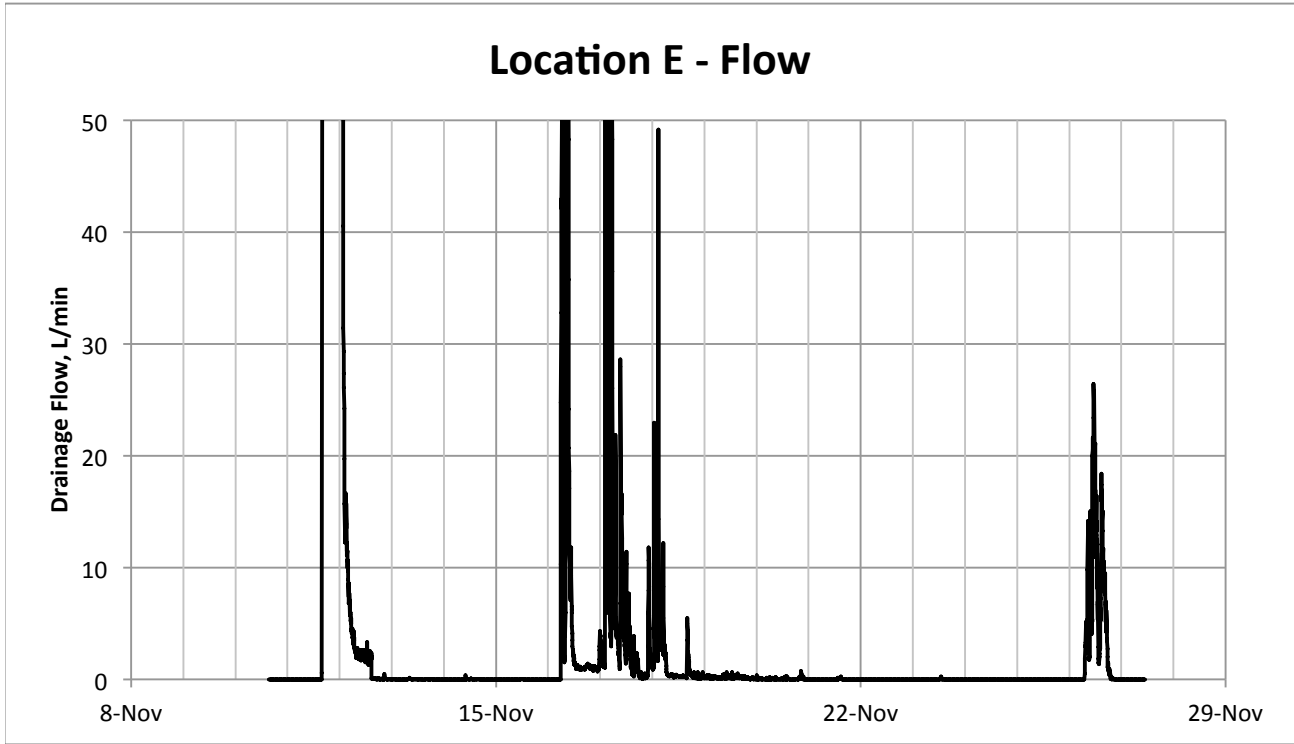


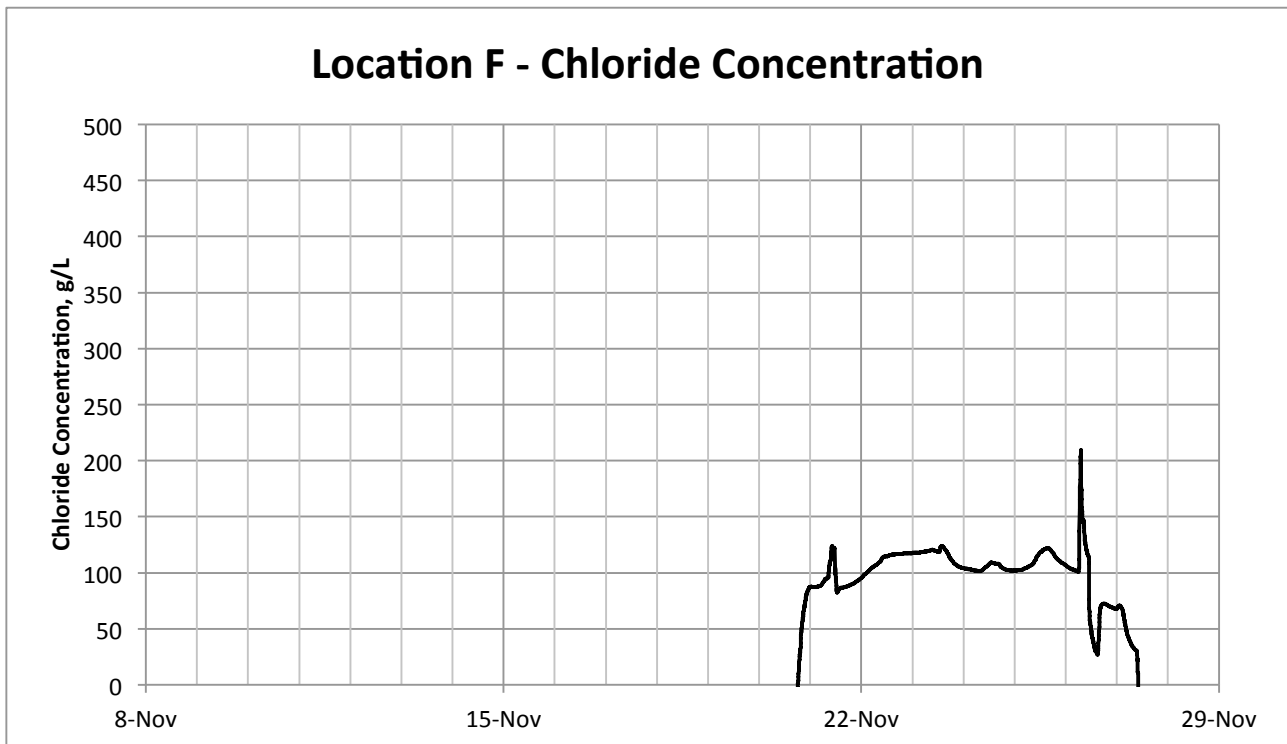
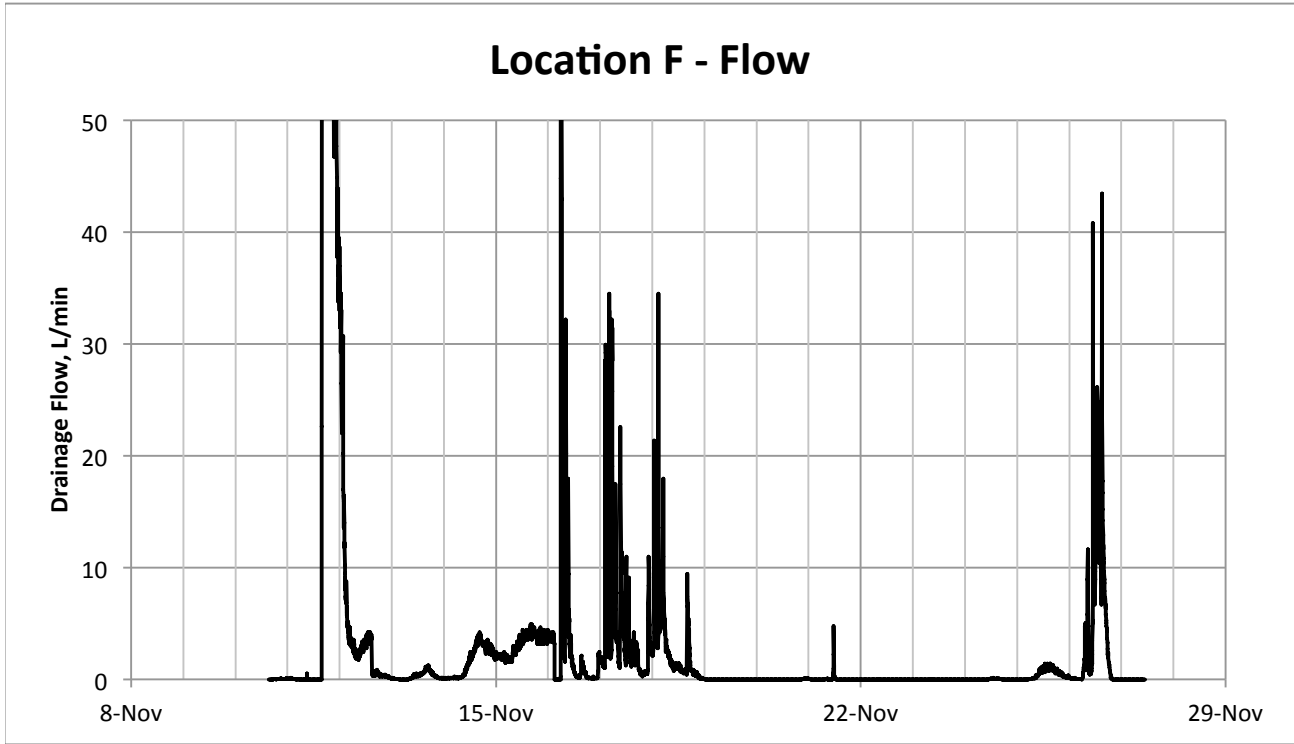


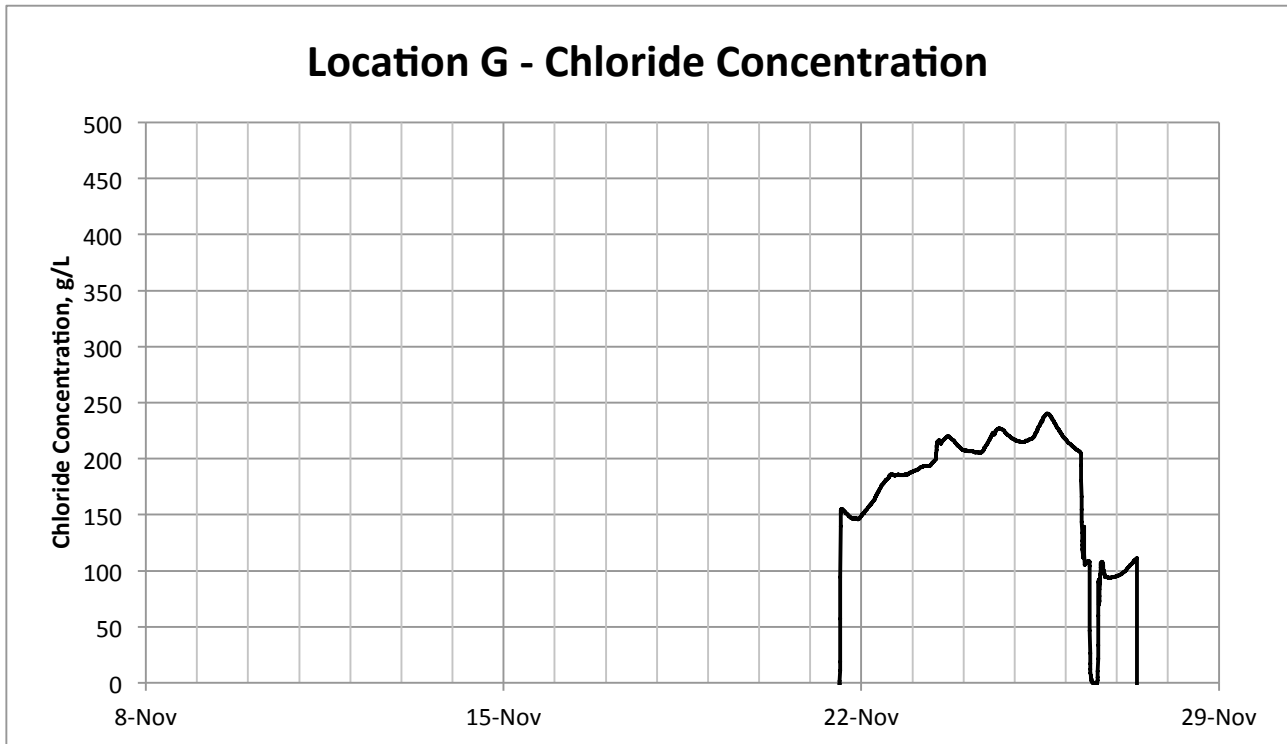
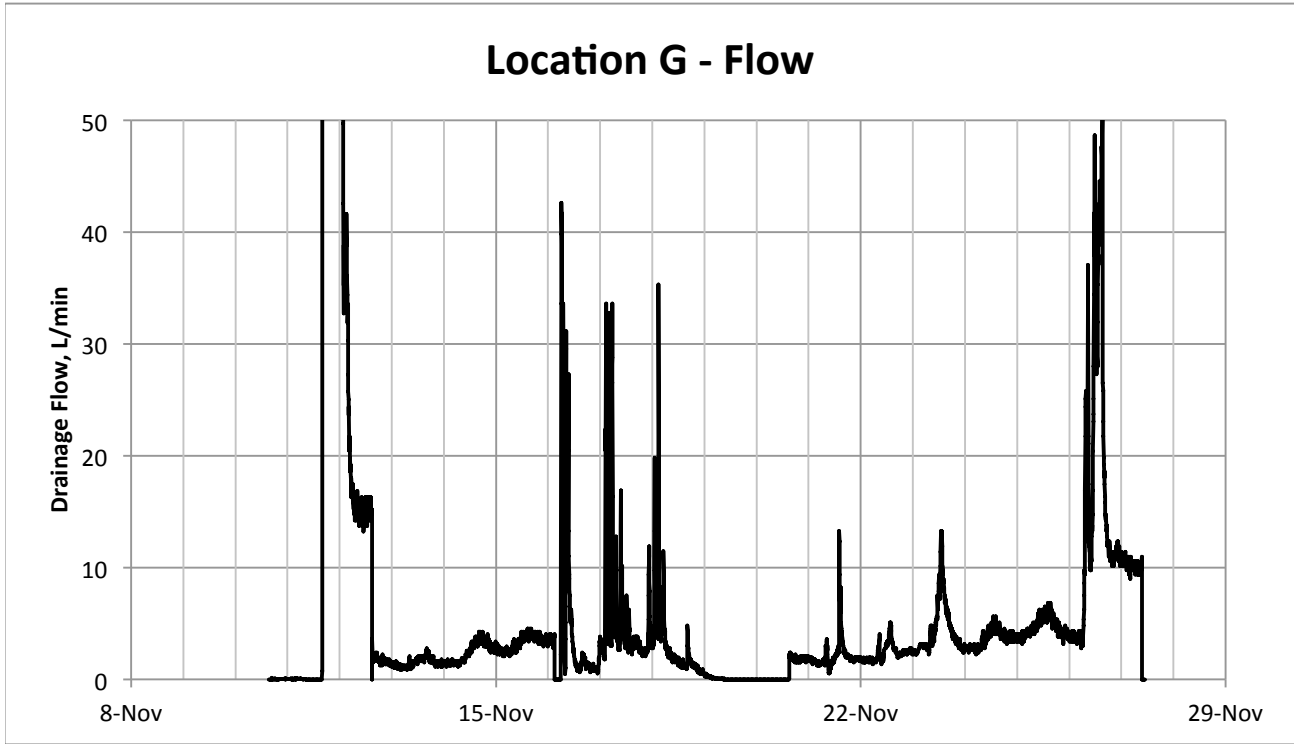


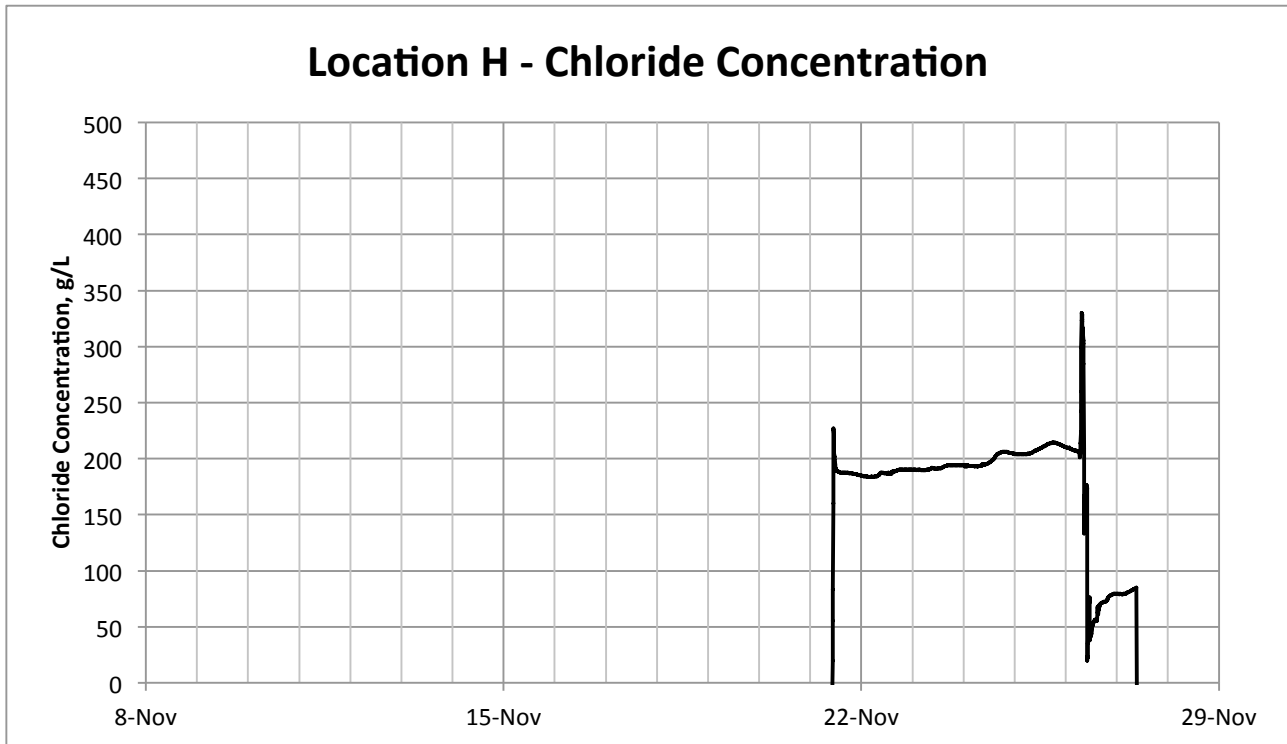
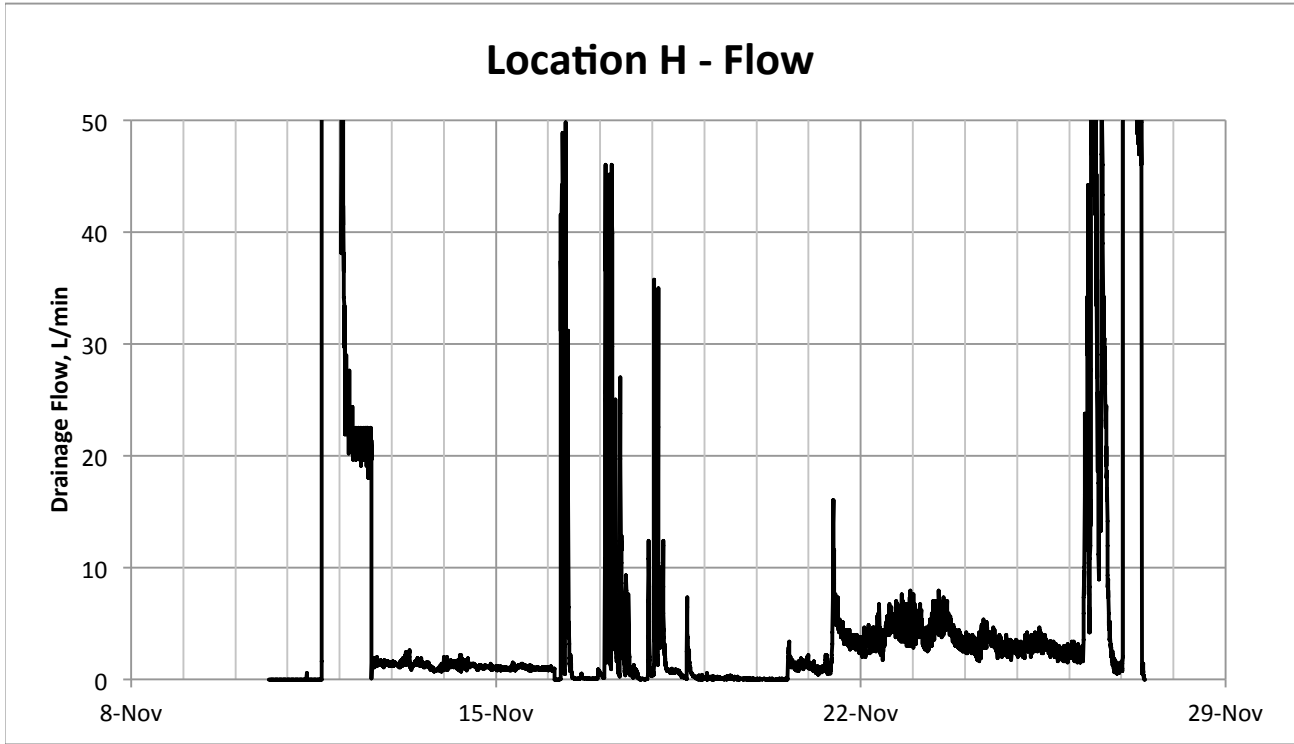


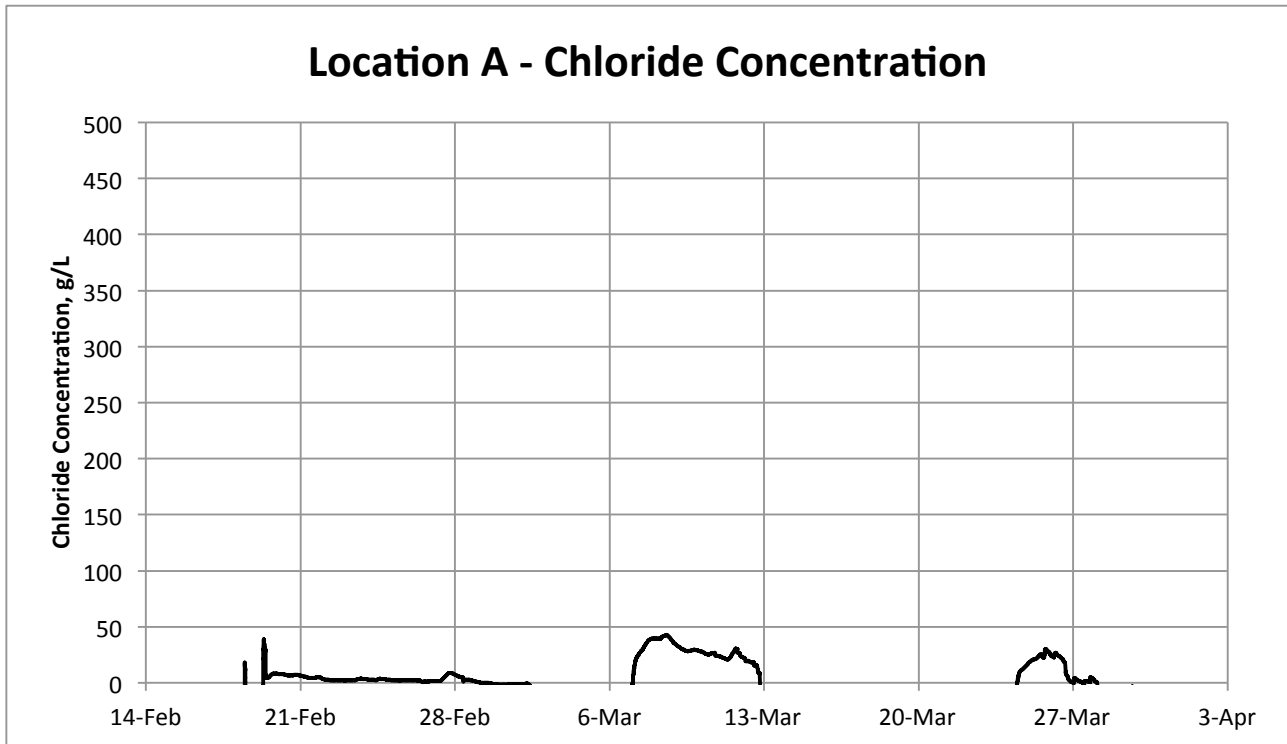
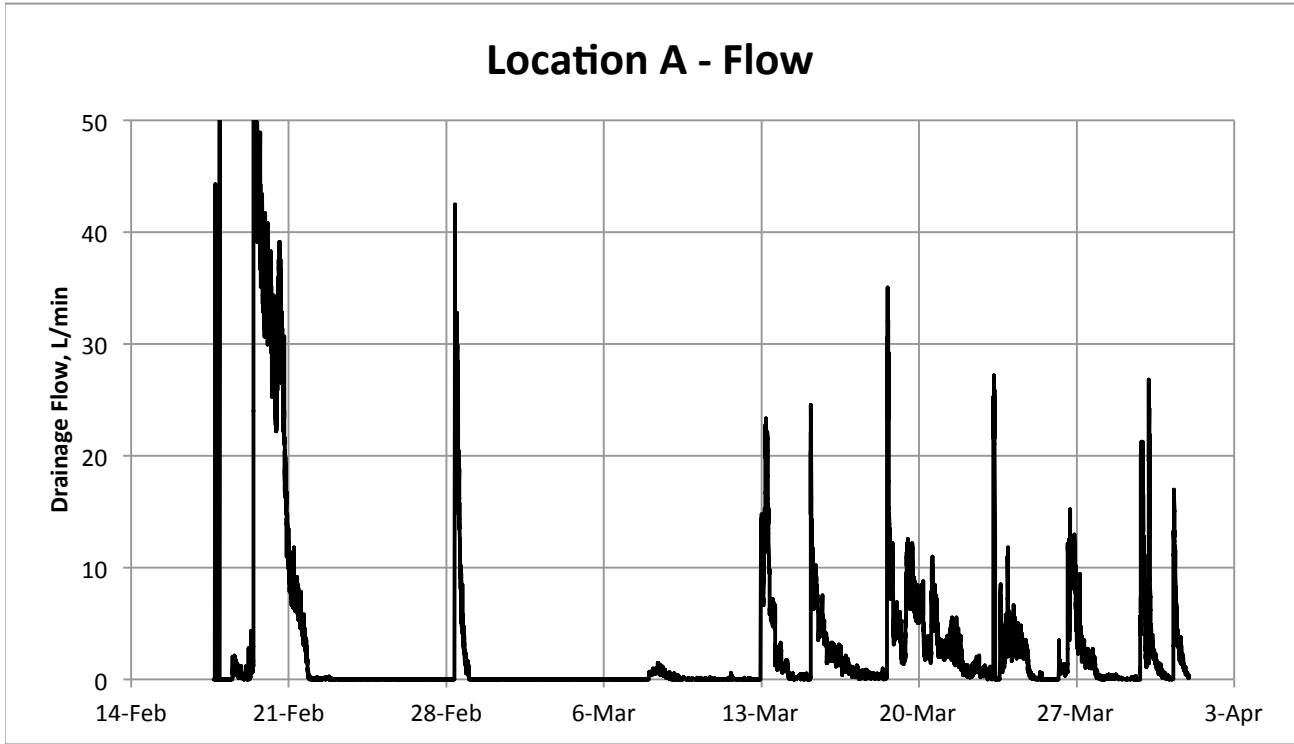


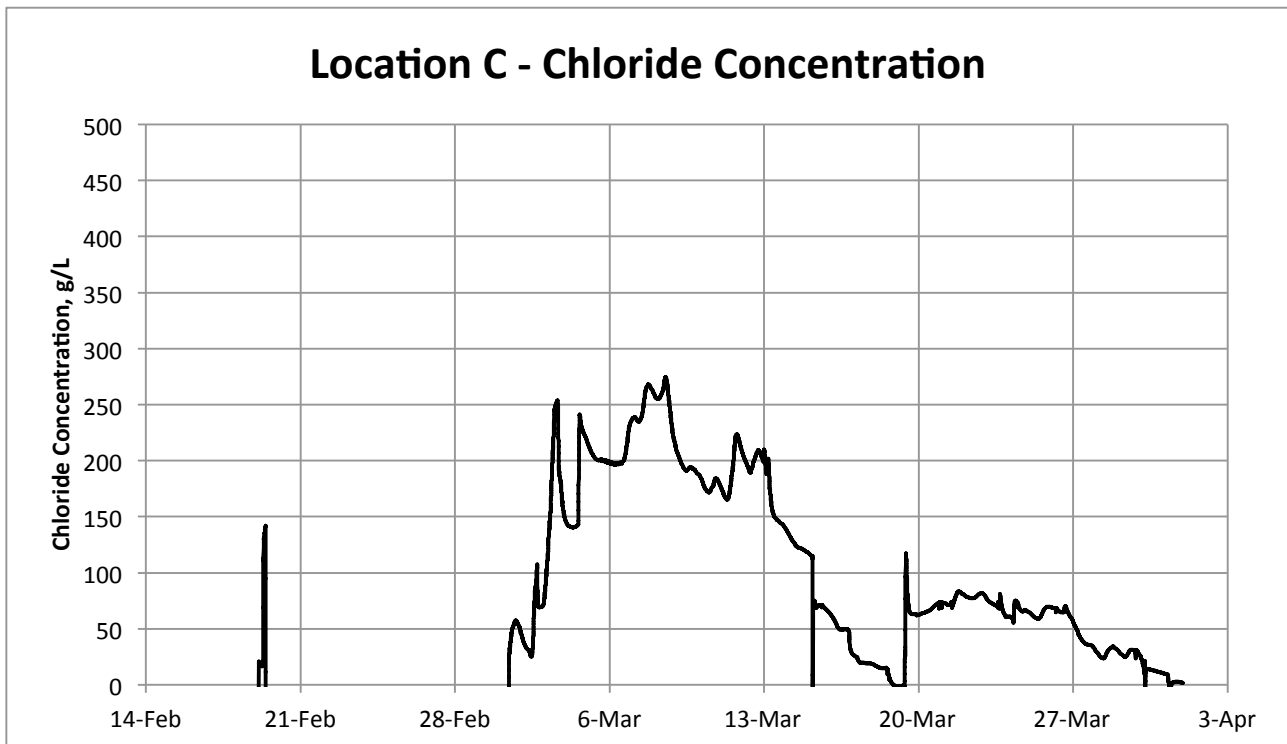
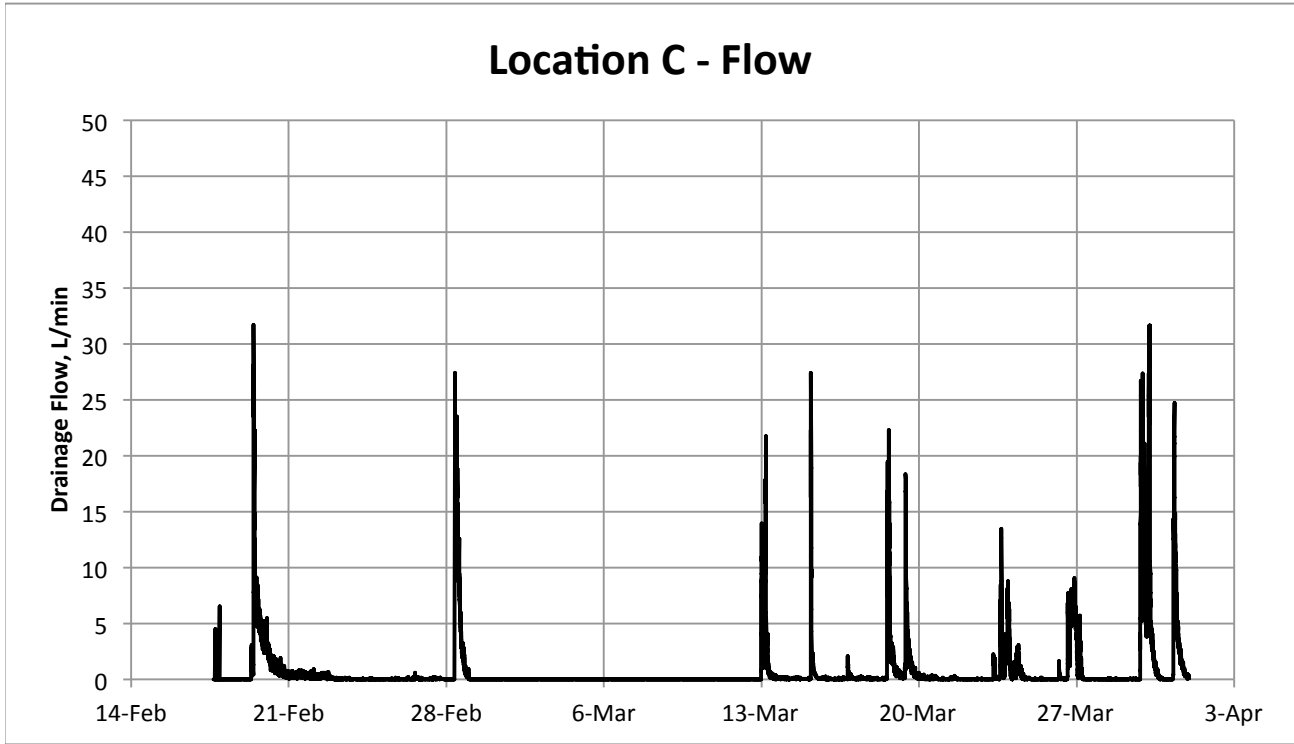




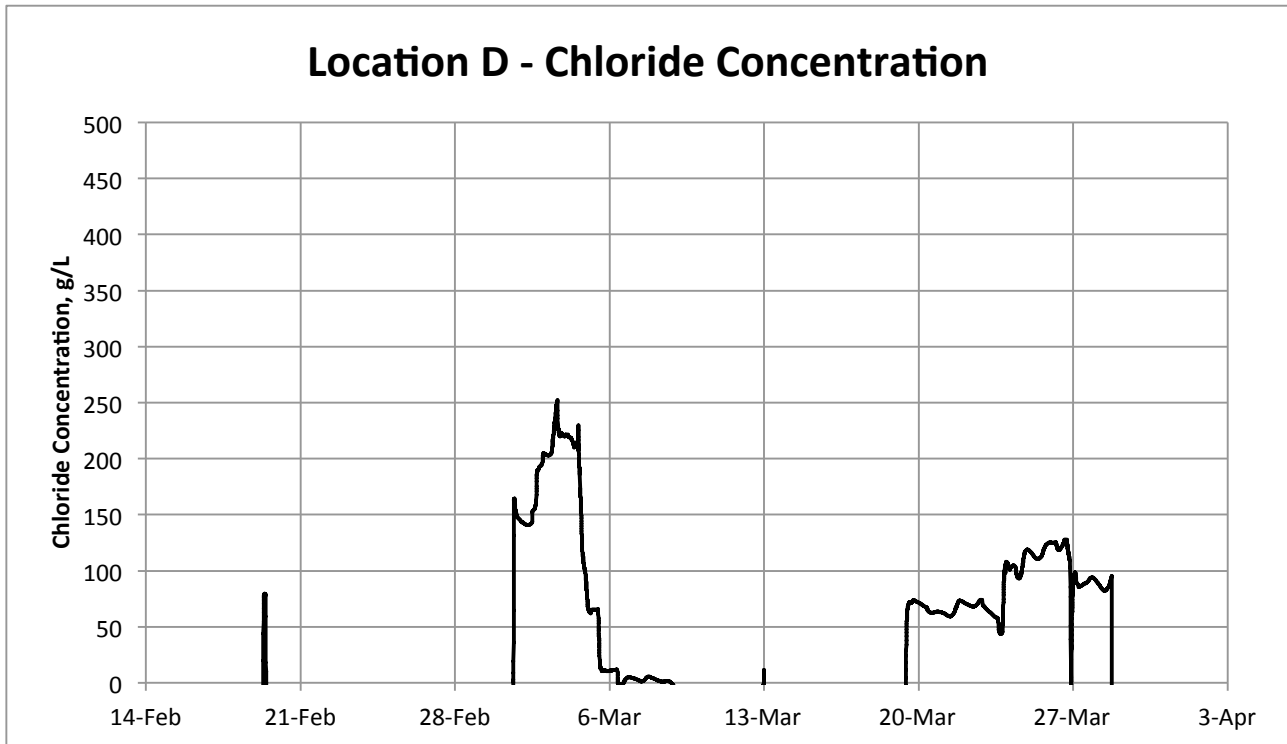
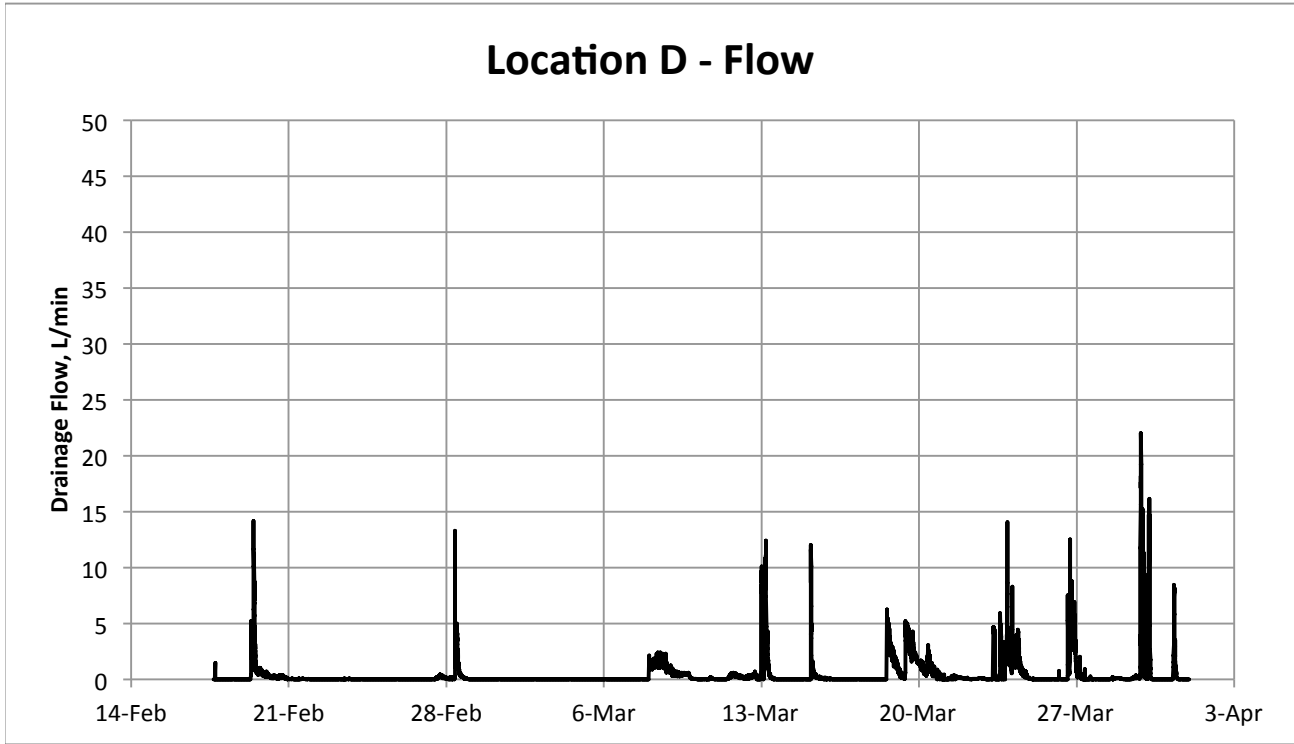


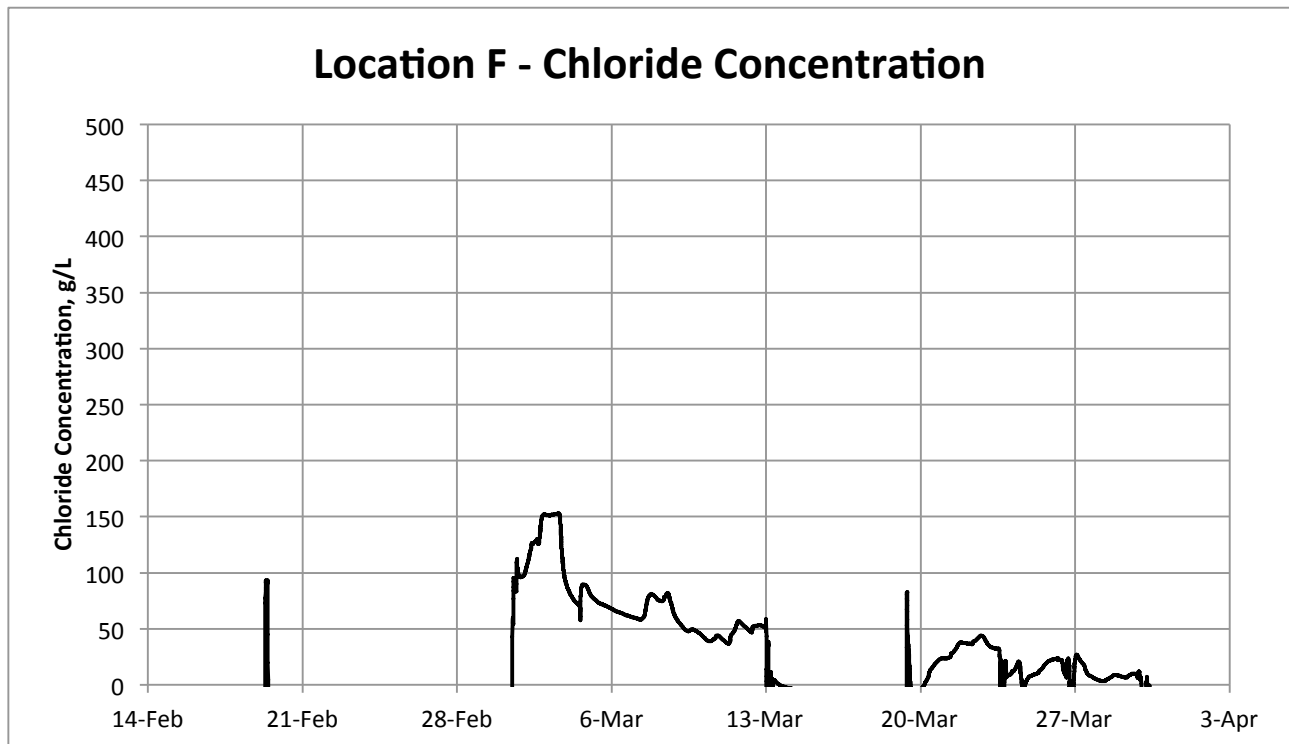
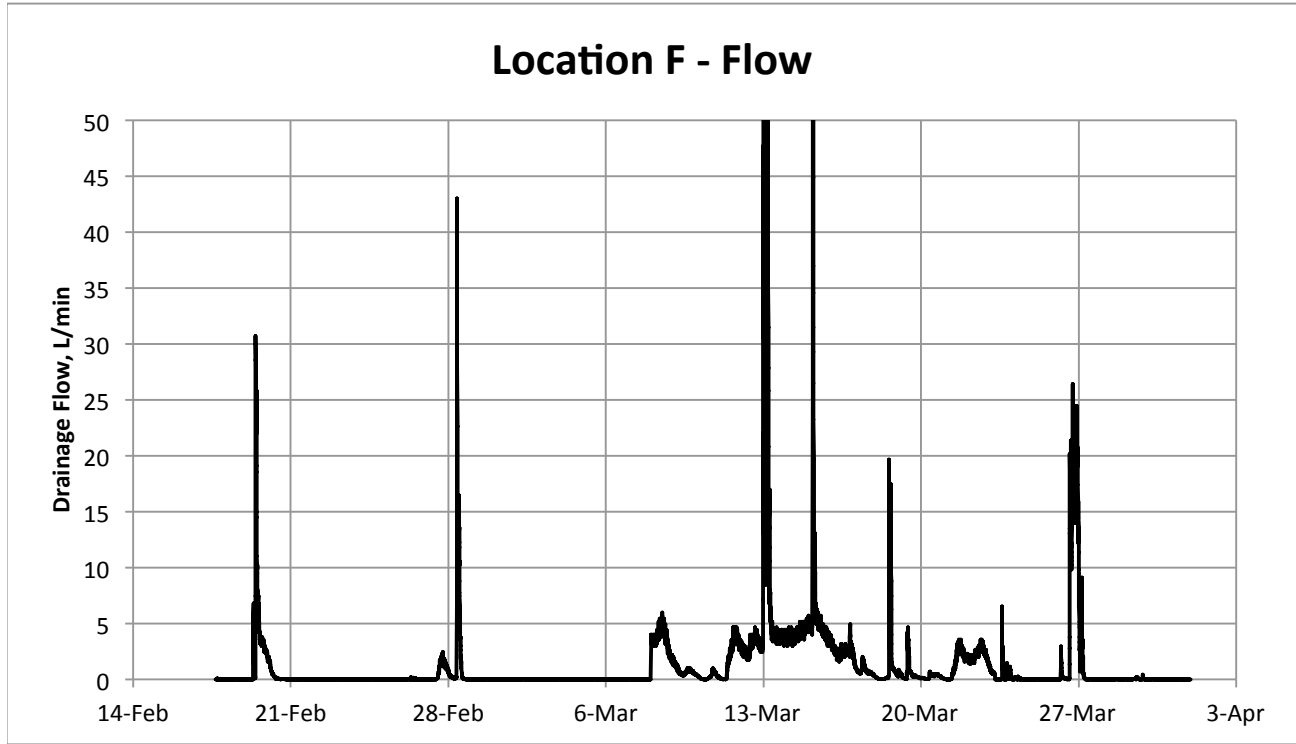


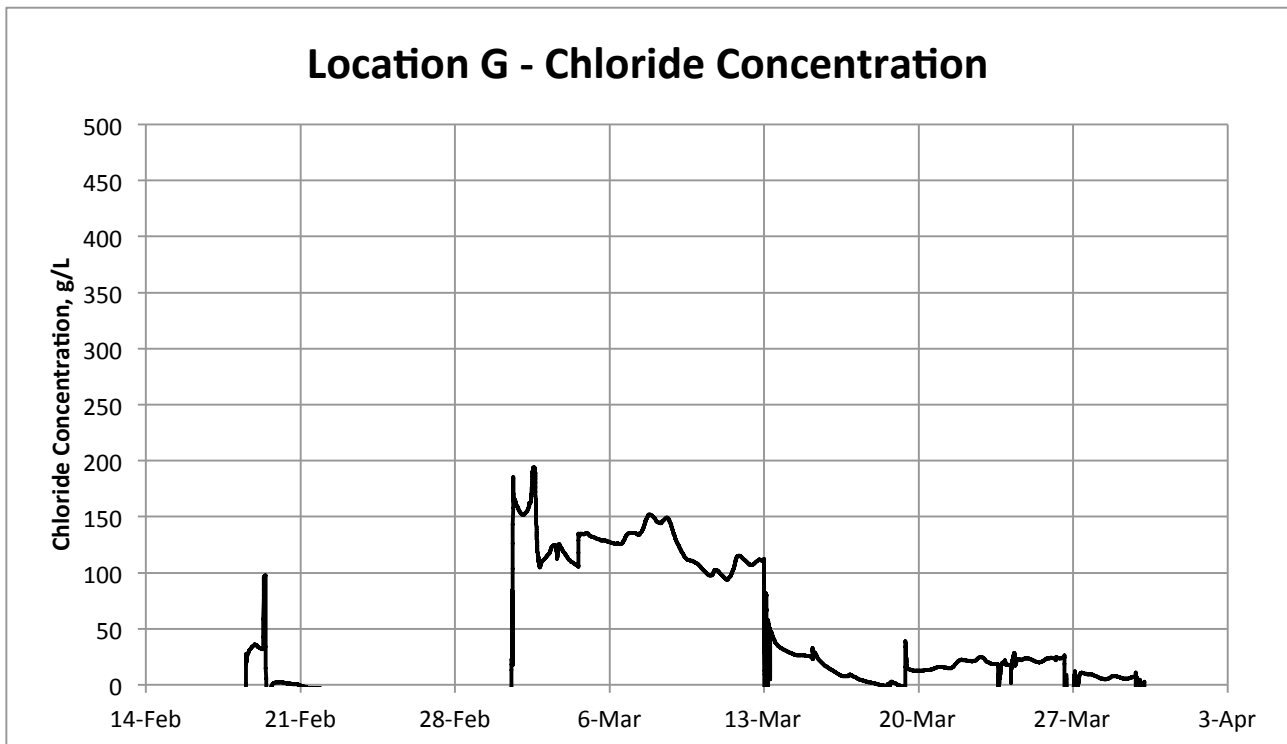
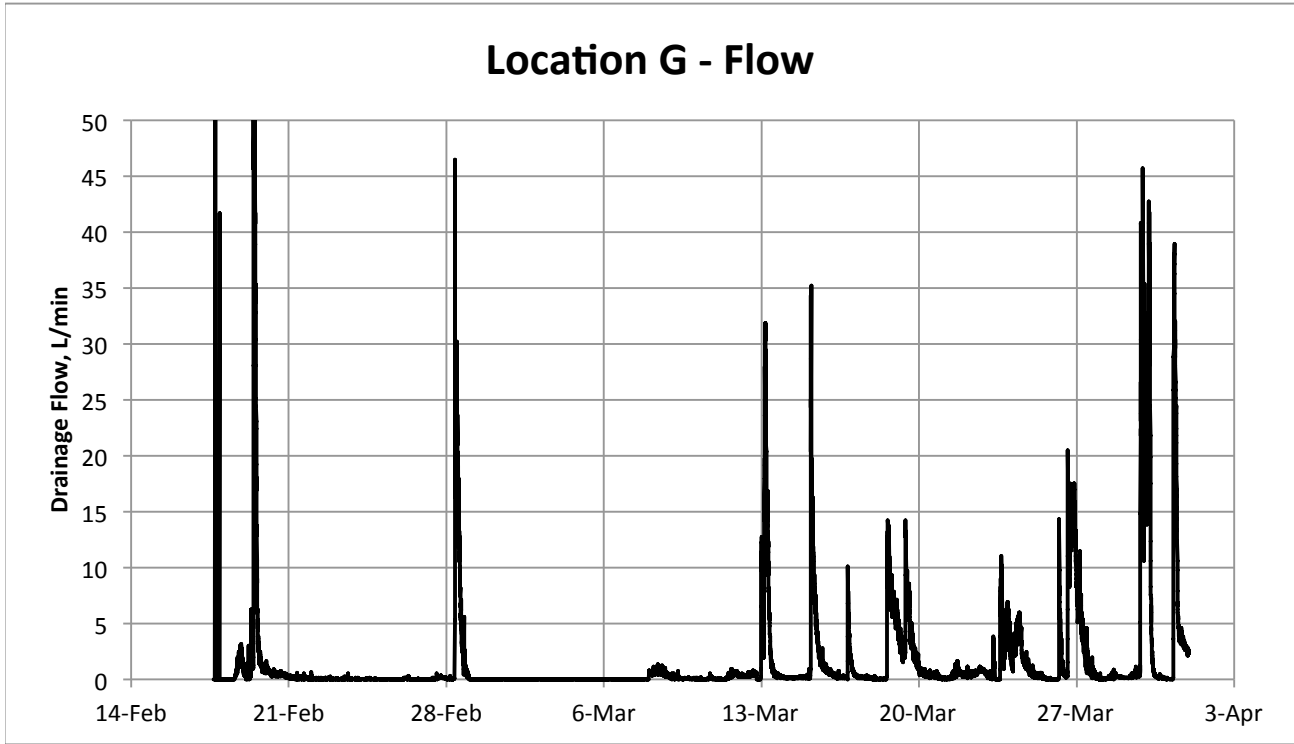


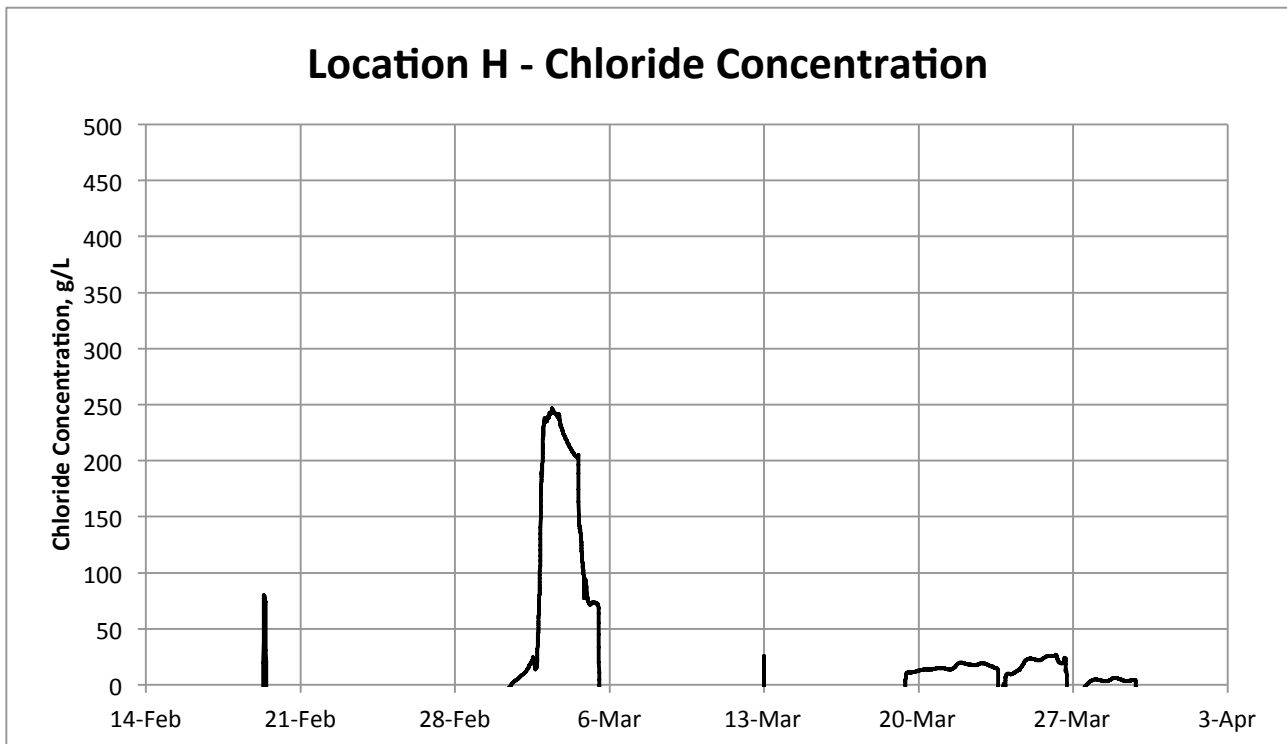
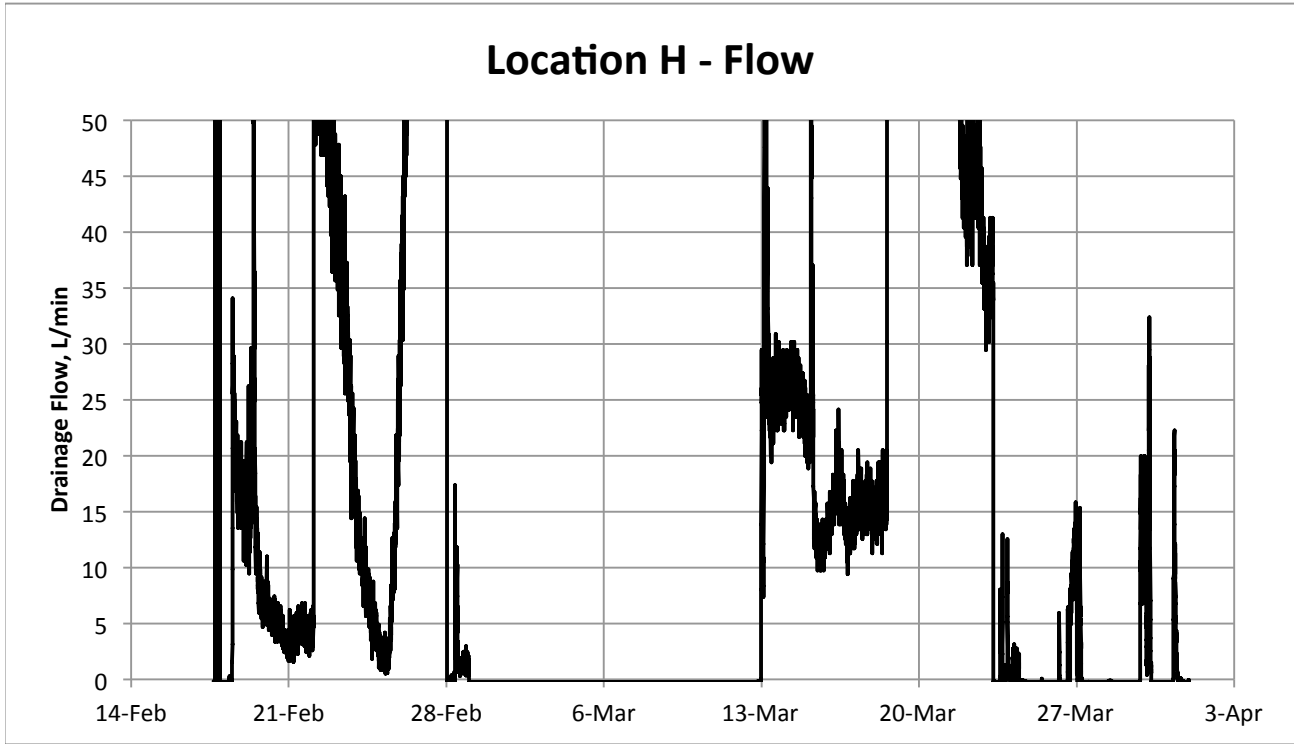




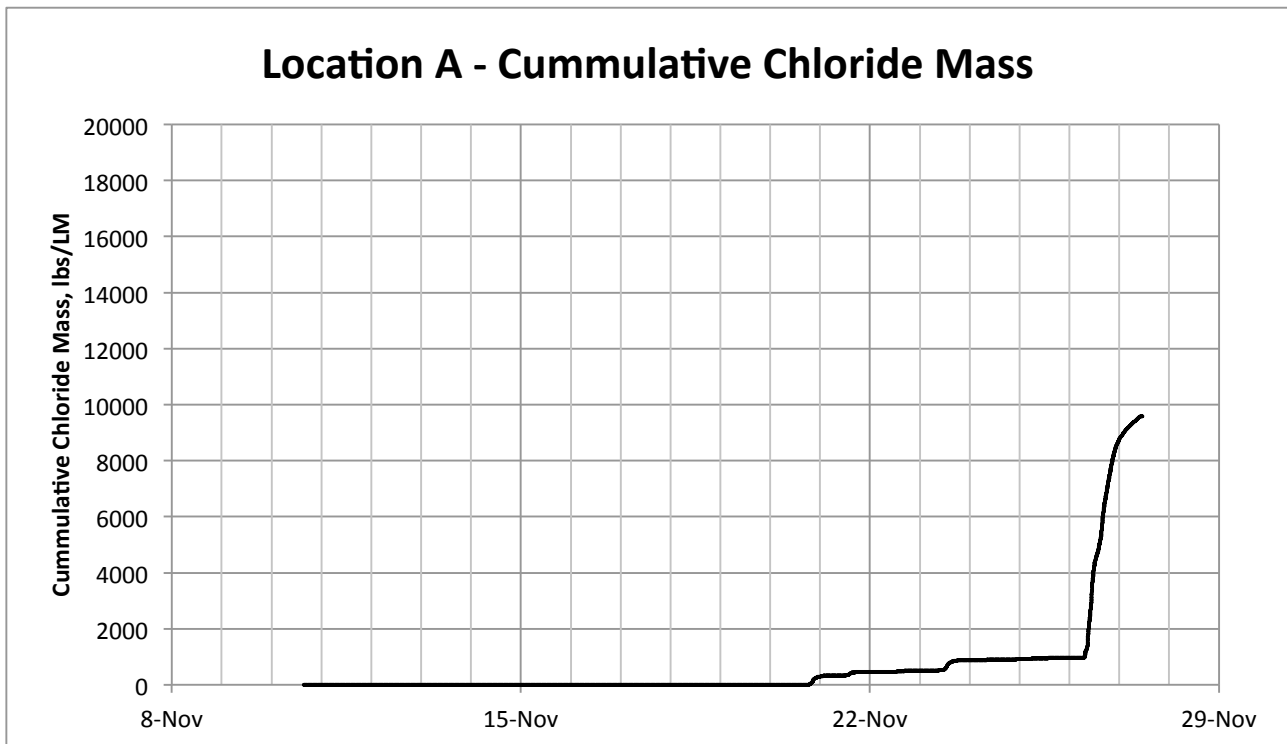
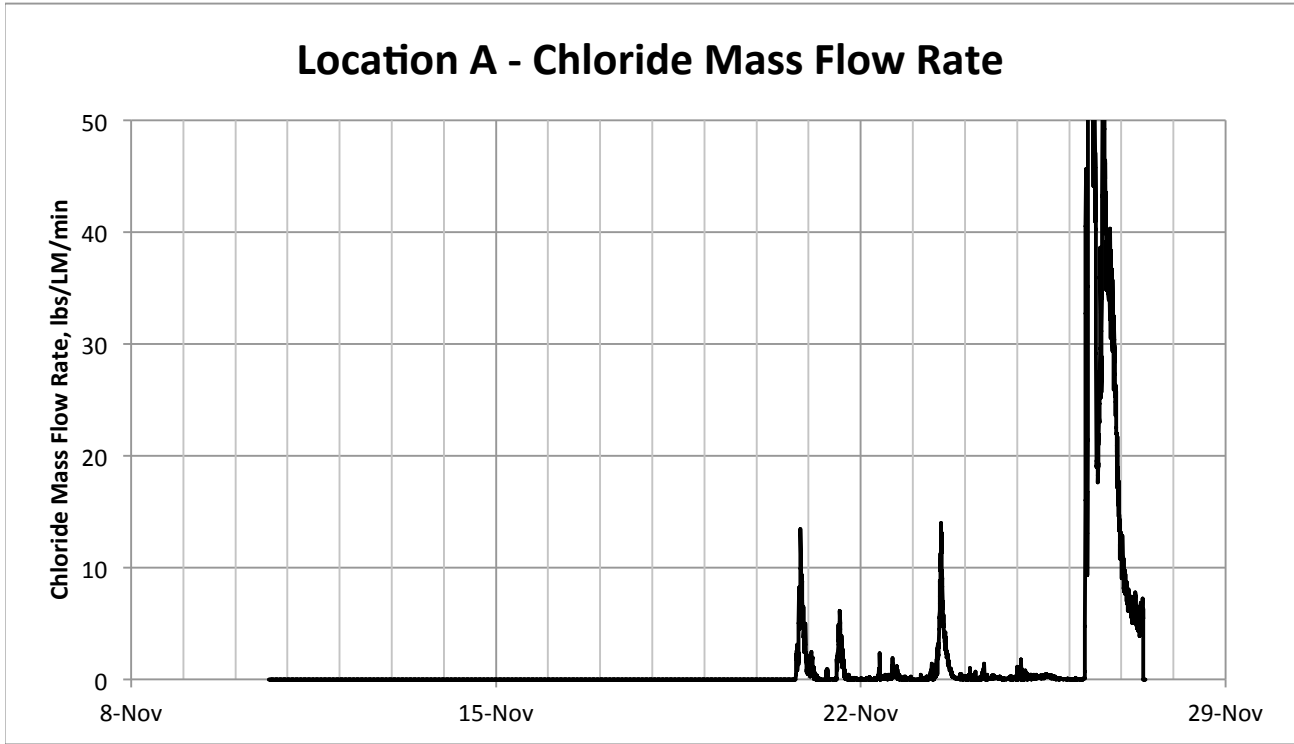


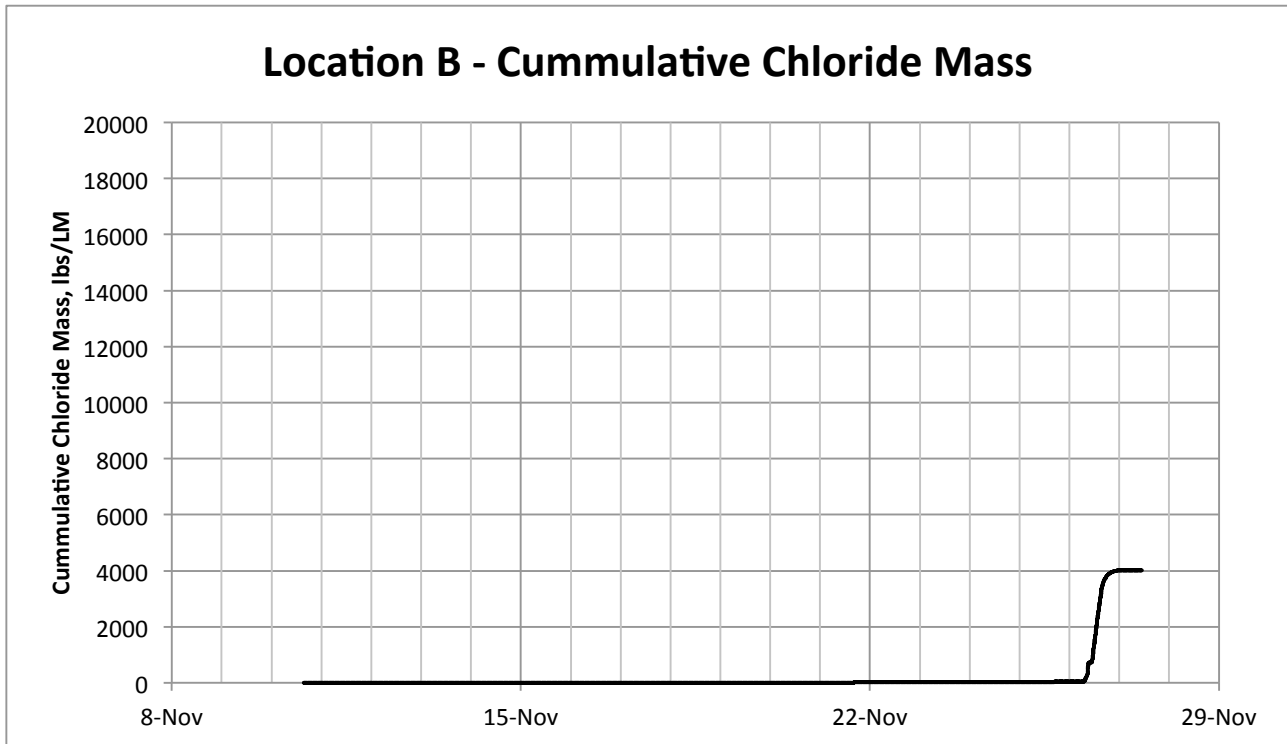
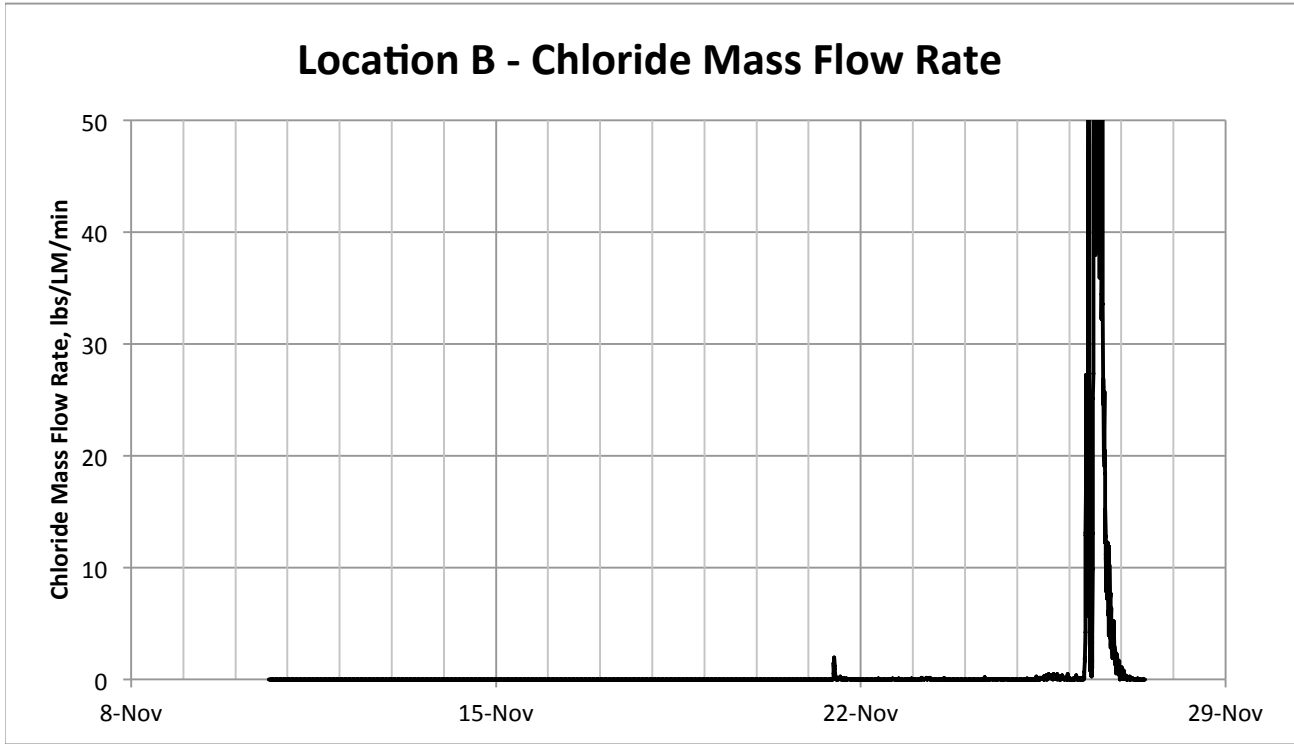


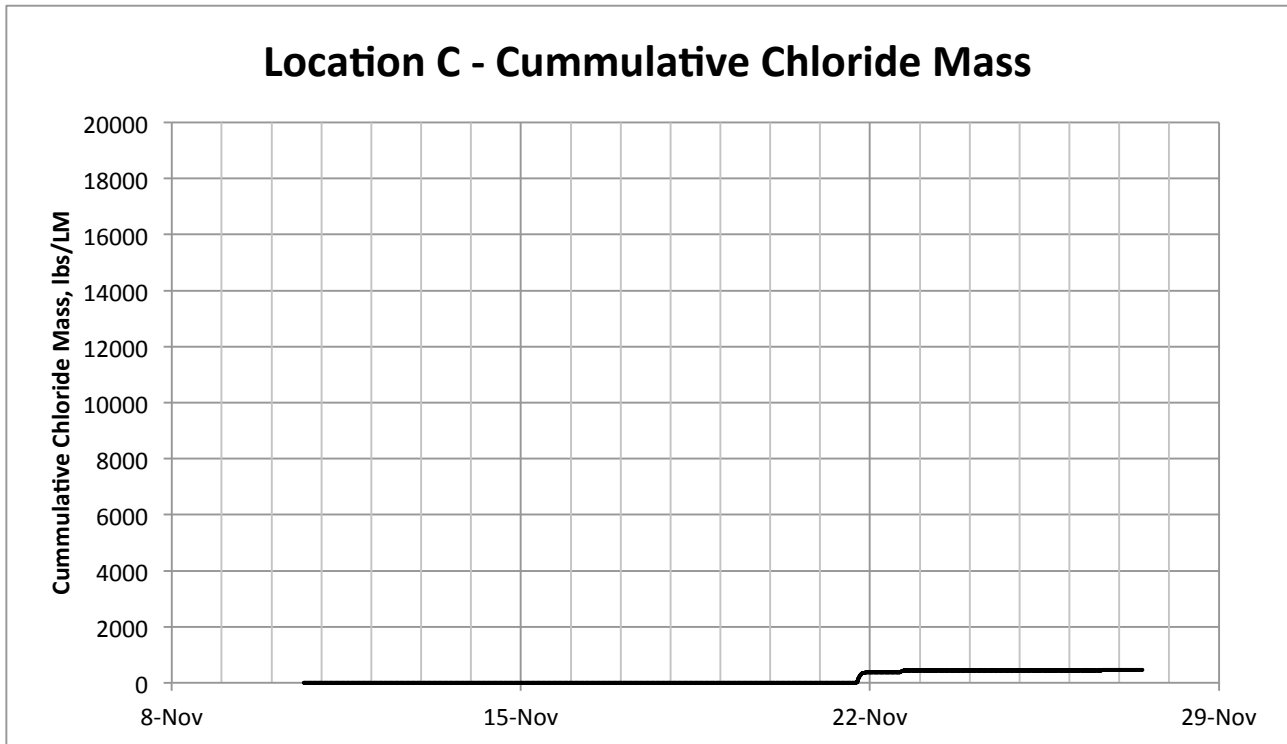
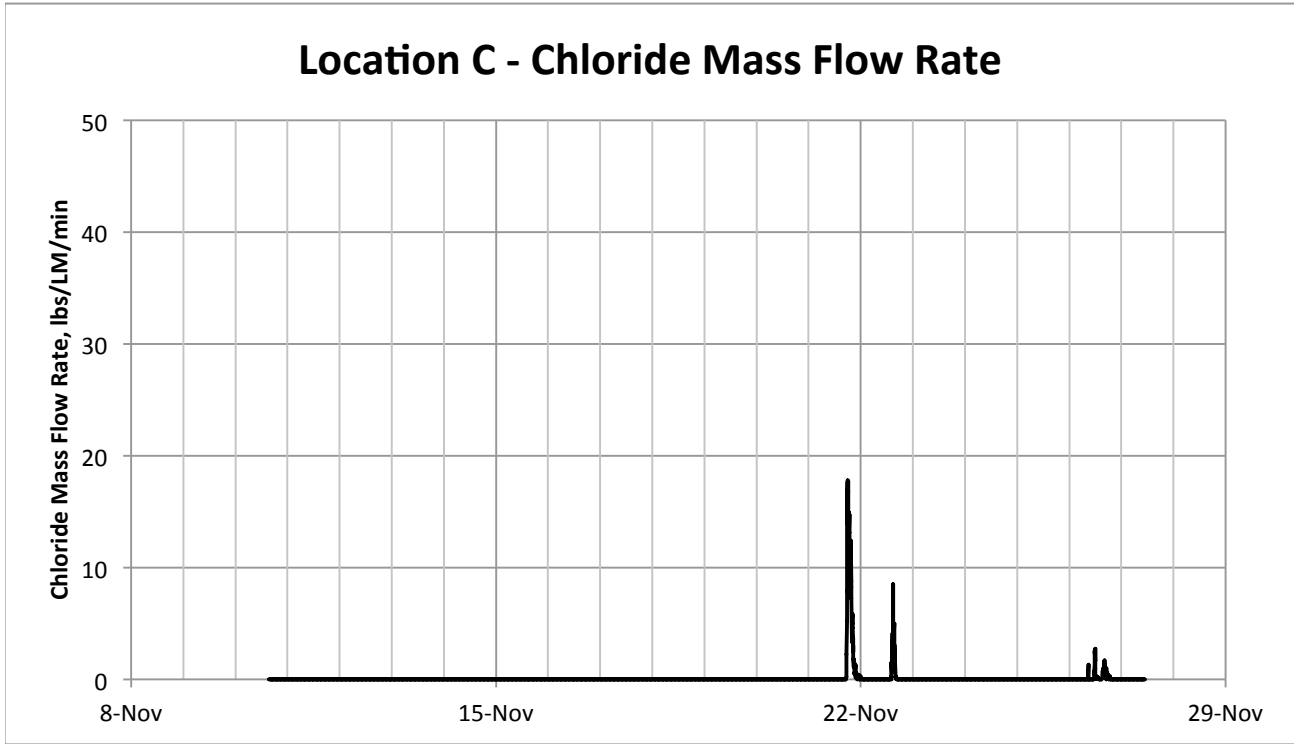




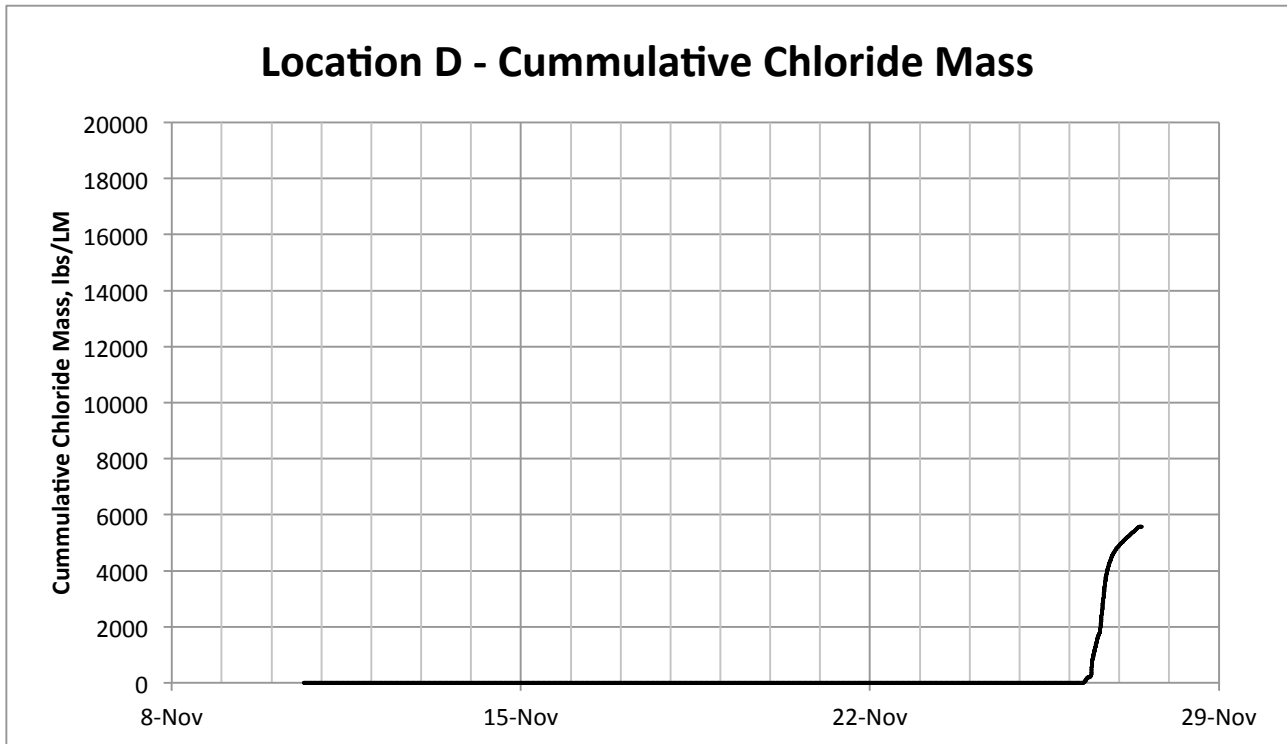
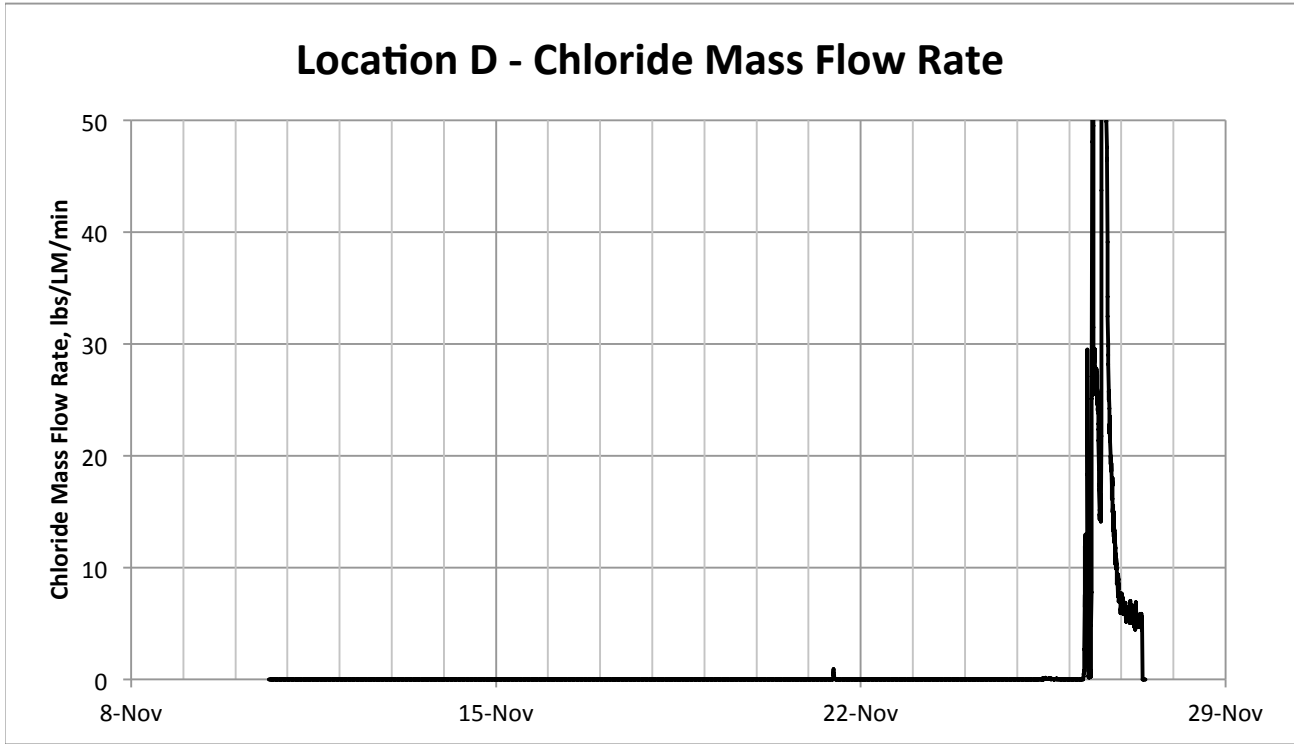
## **APPENDIX K: MASS FLOW AND CUMULATIVE MASS FLOW CALCULATION RESULTS**

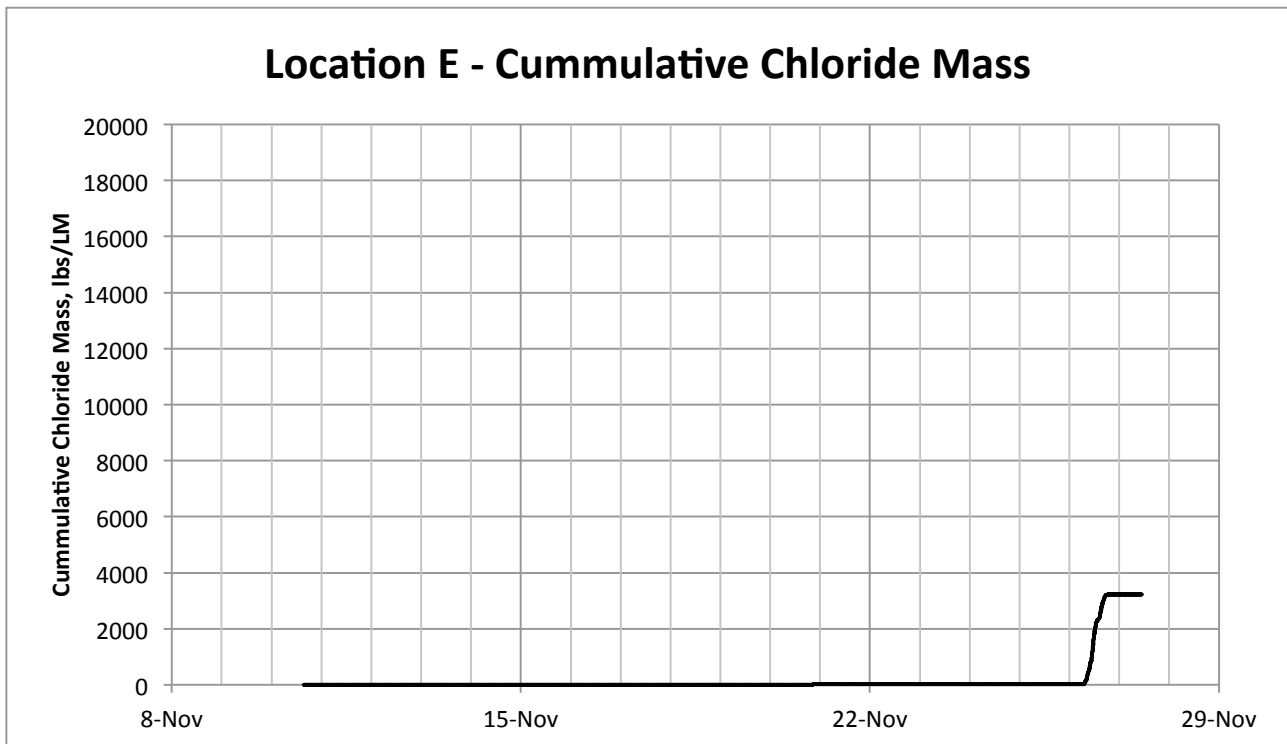
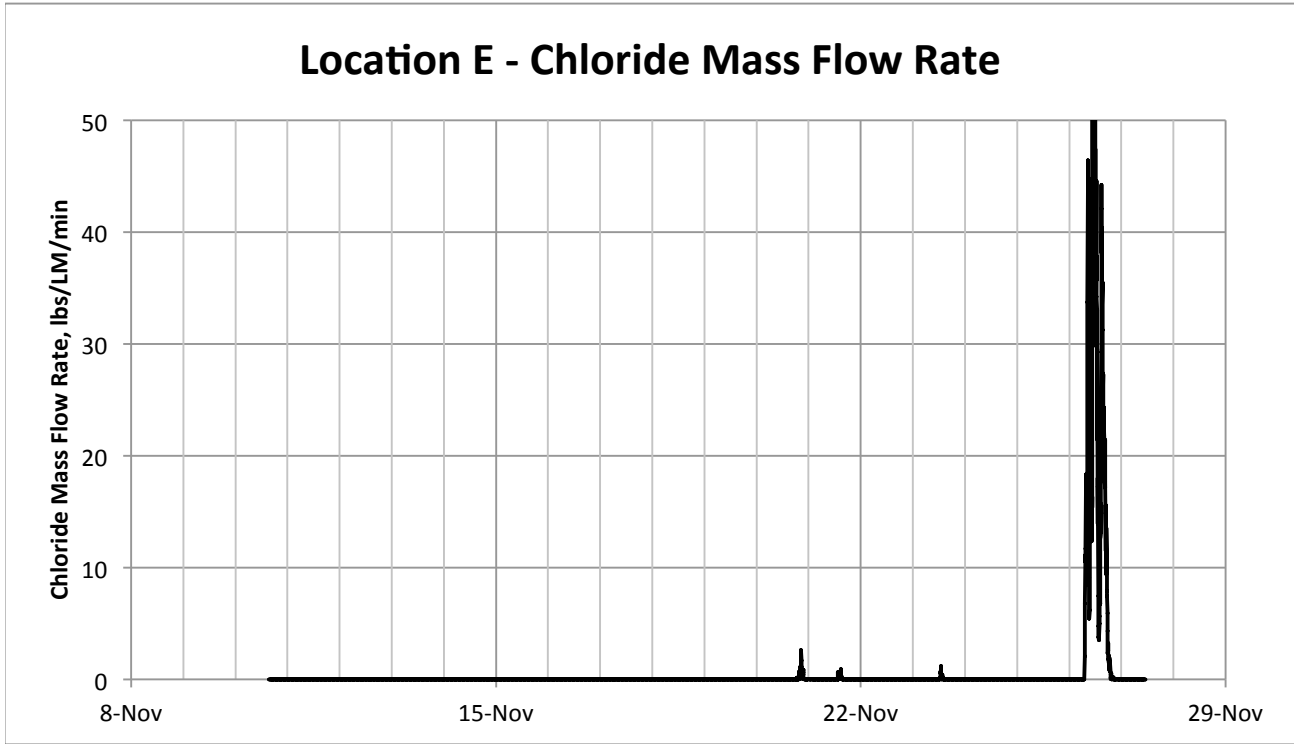


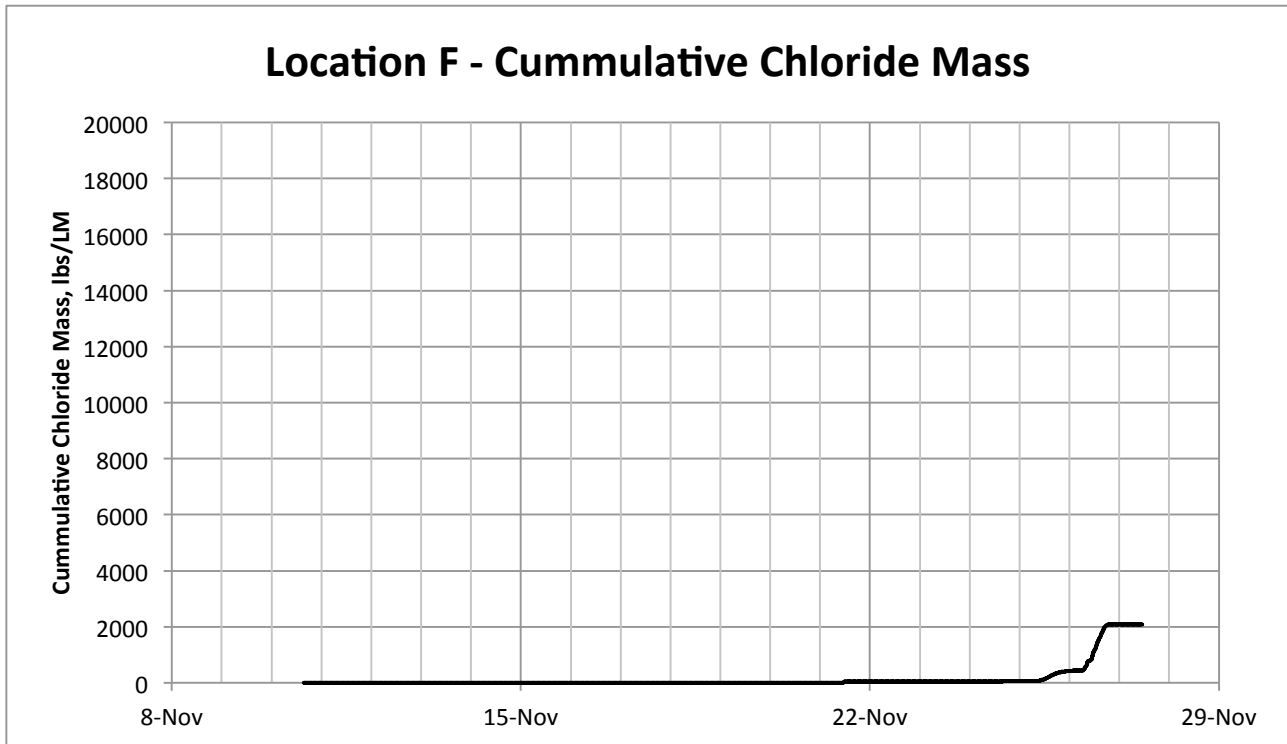
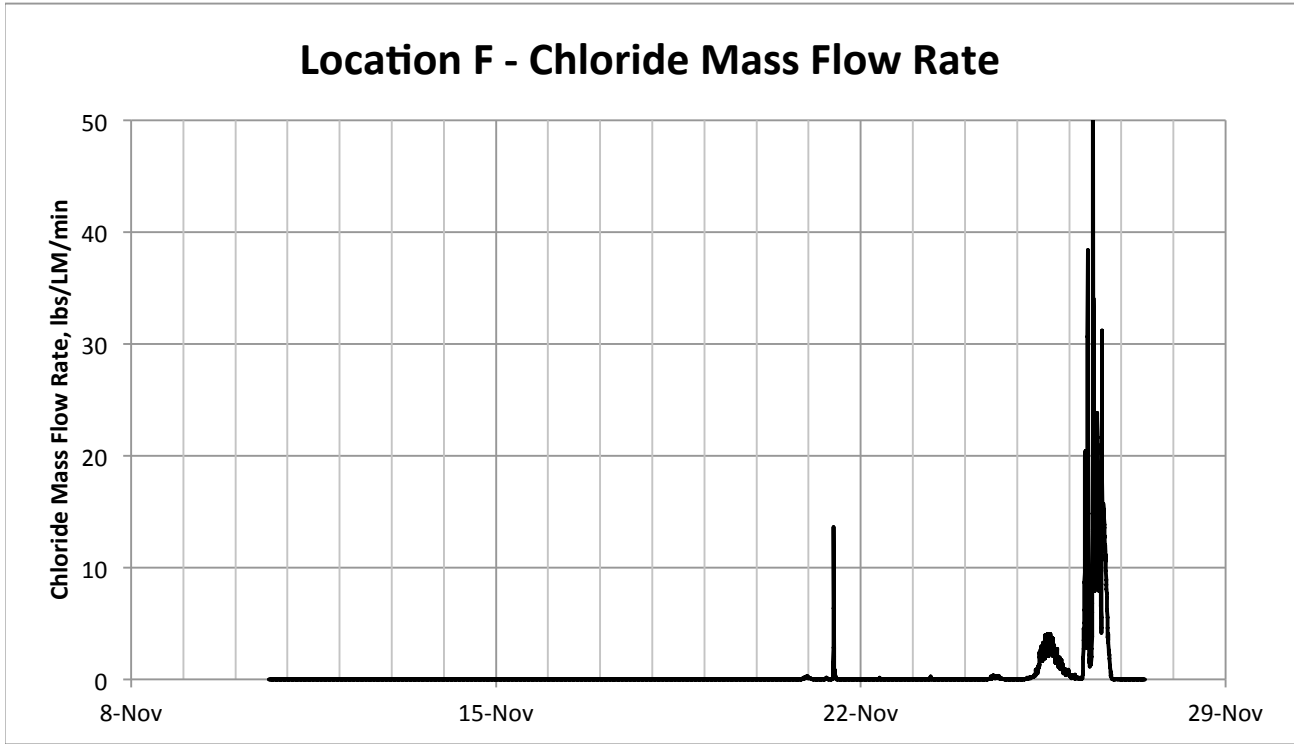


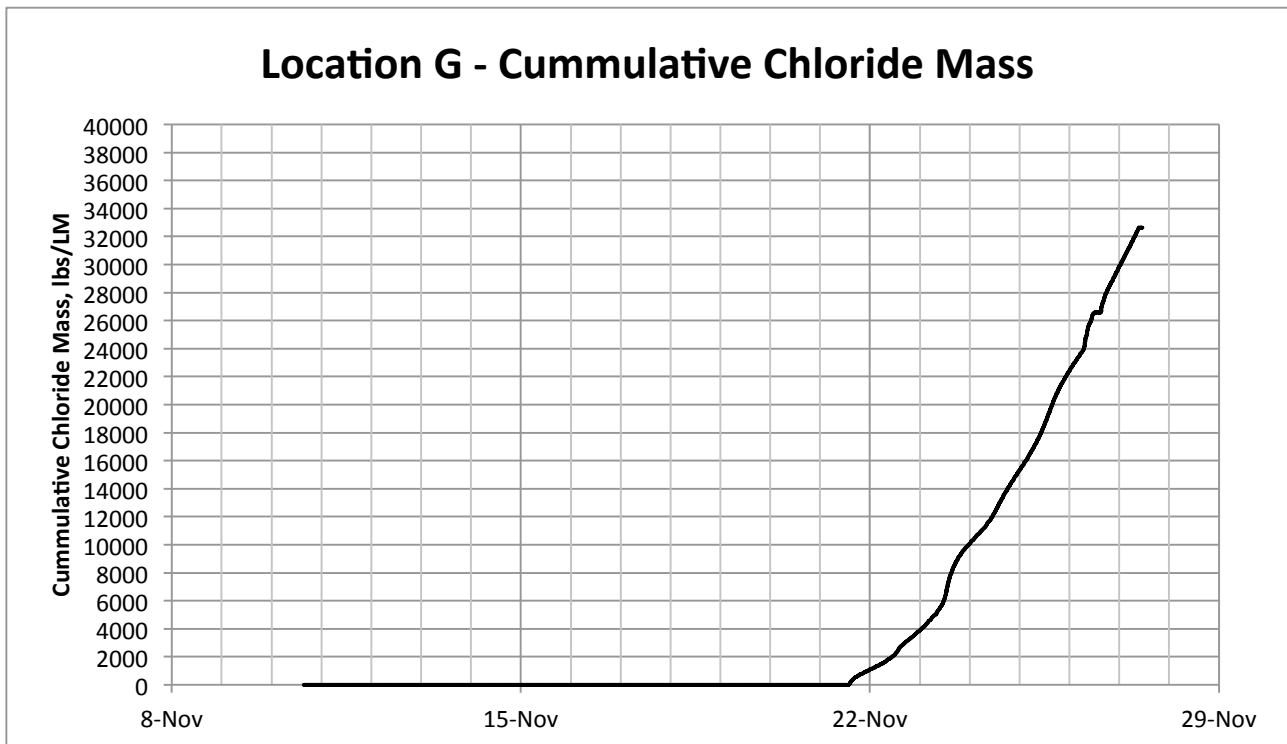
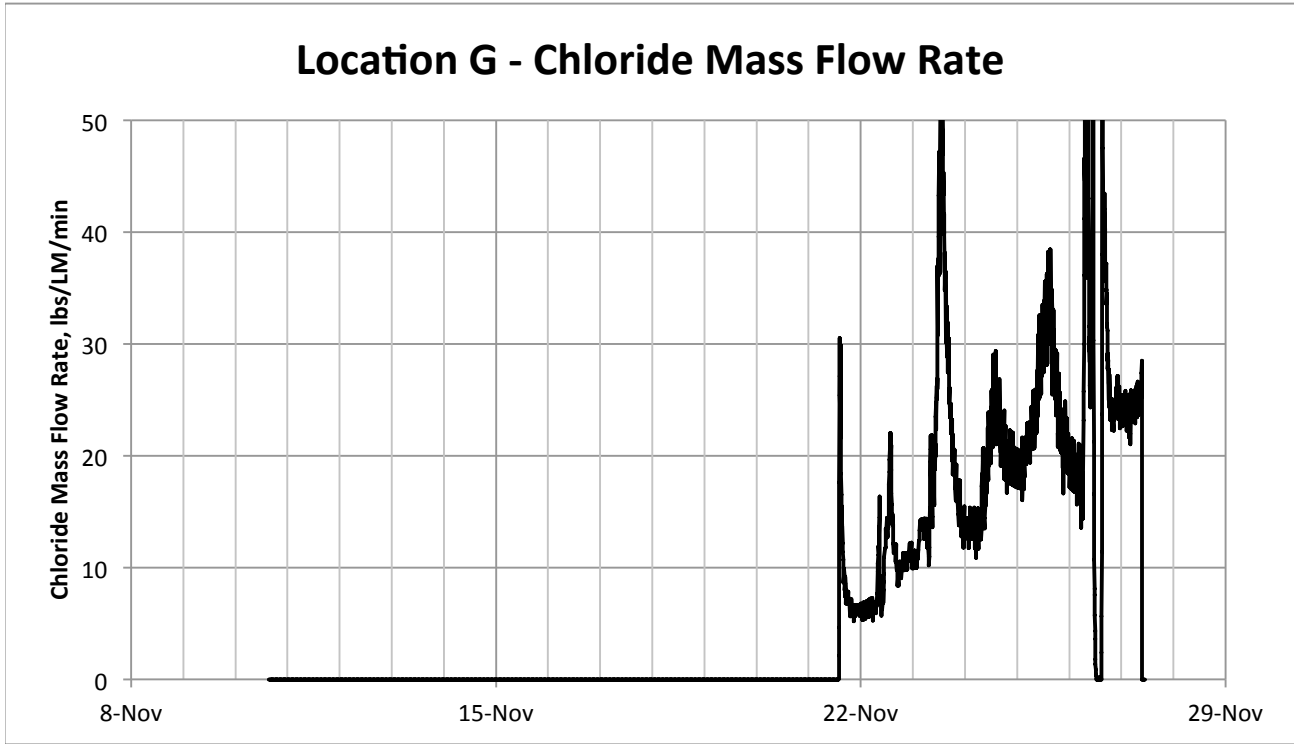


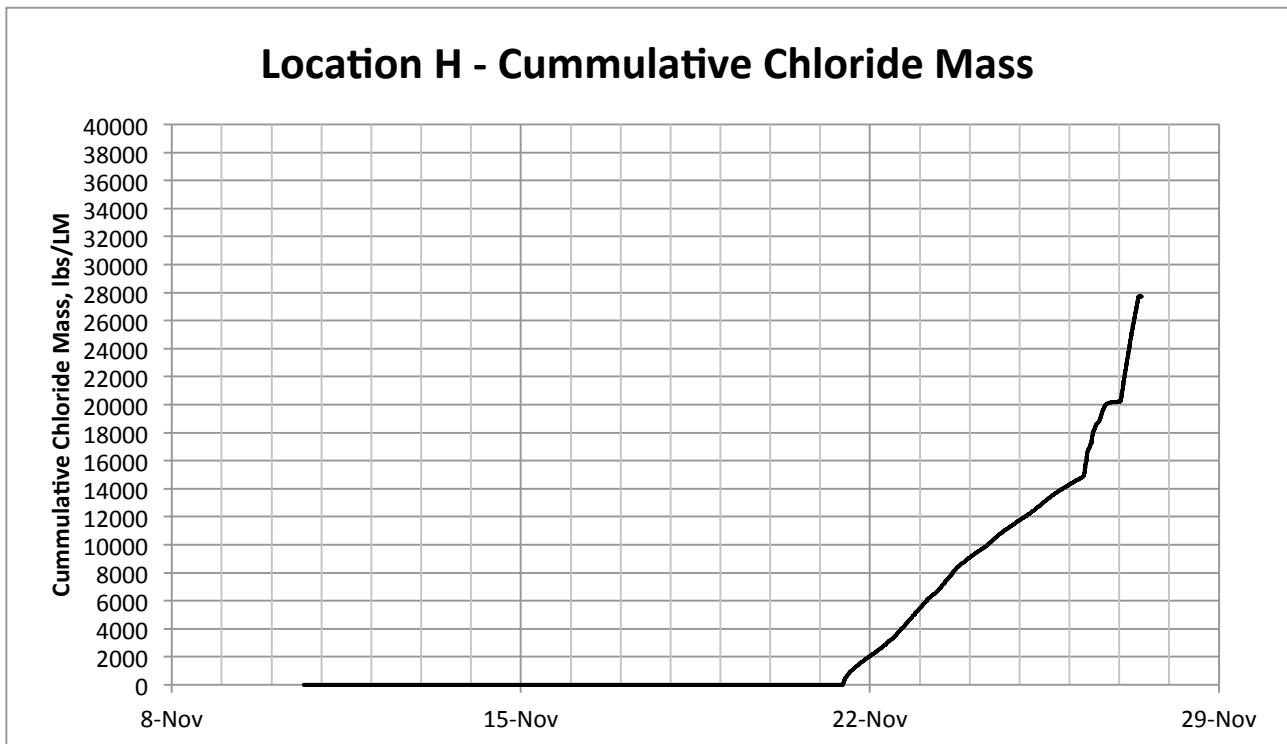
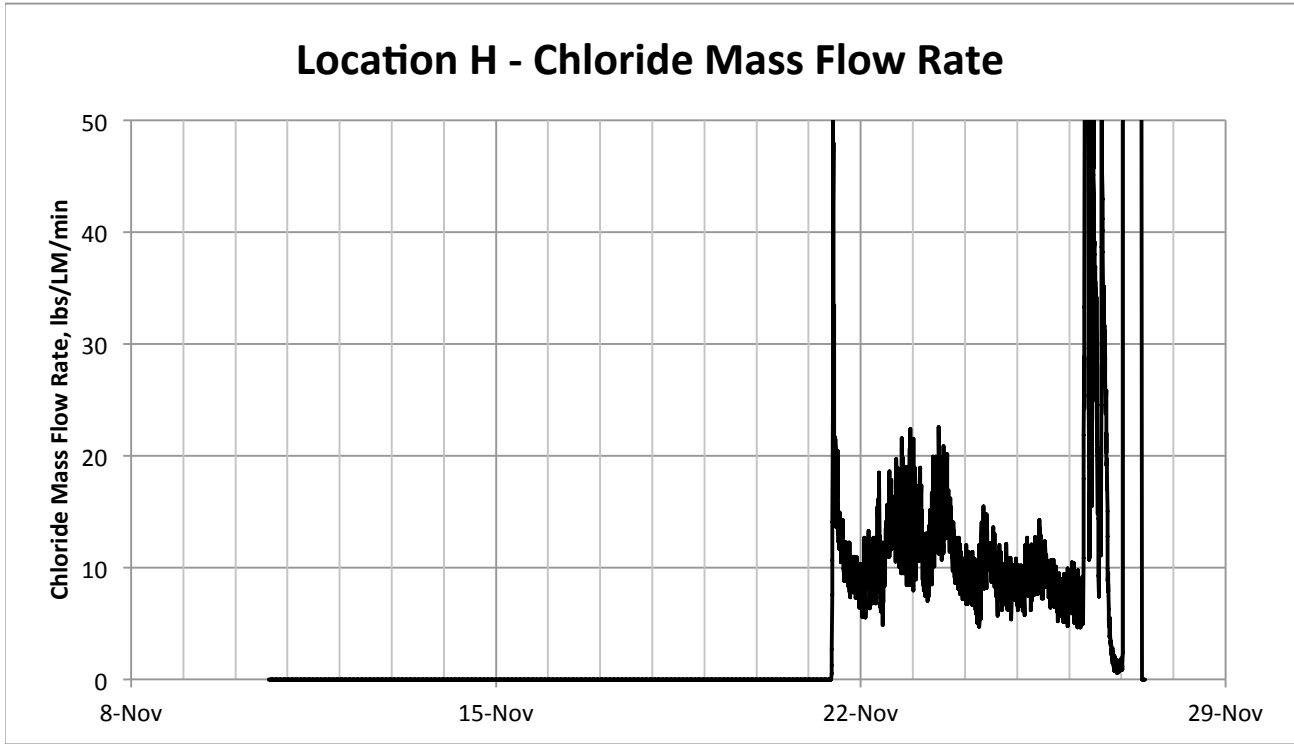


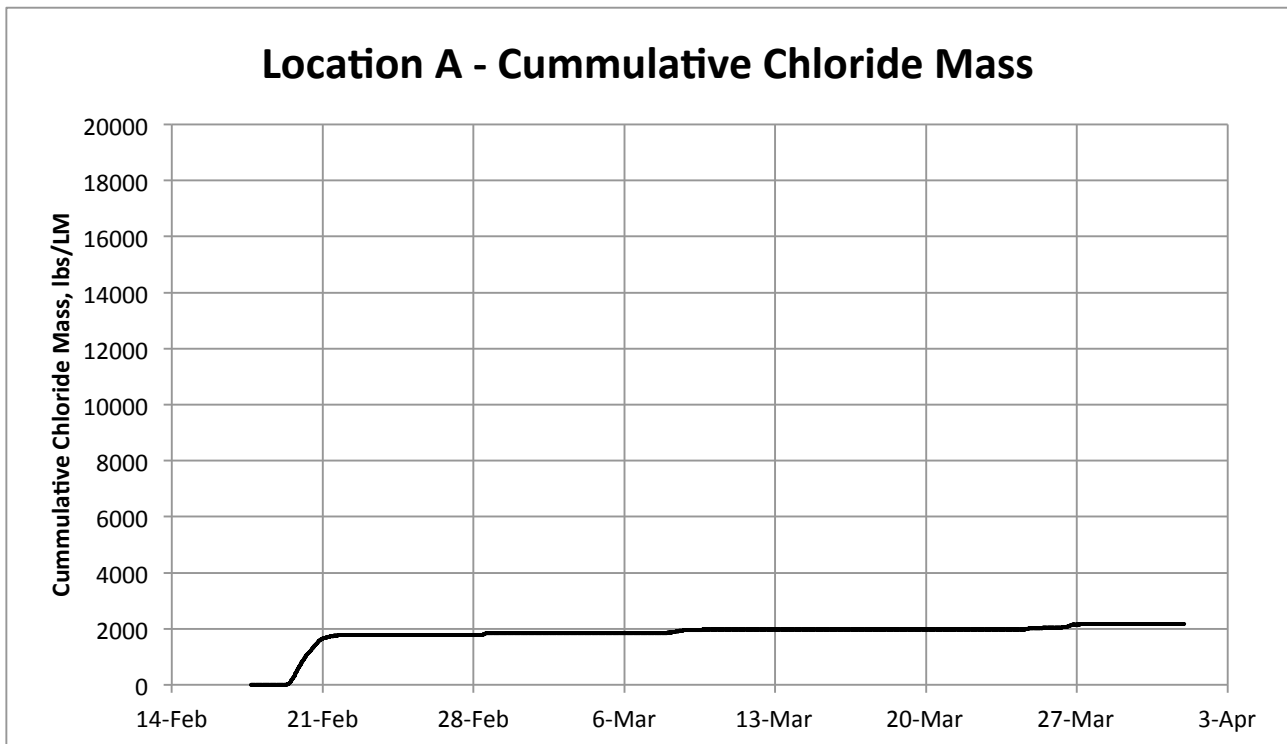
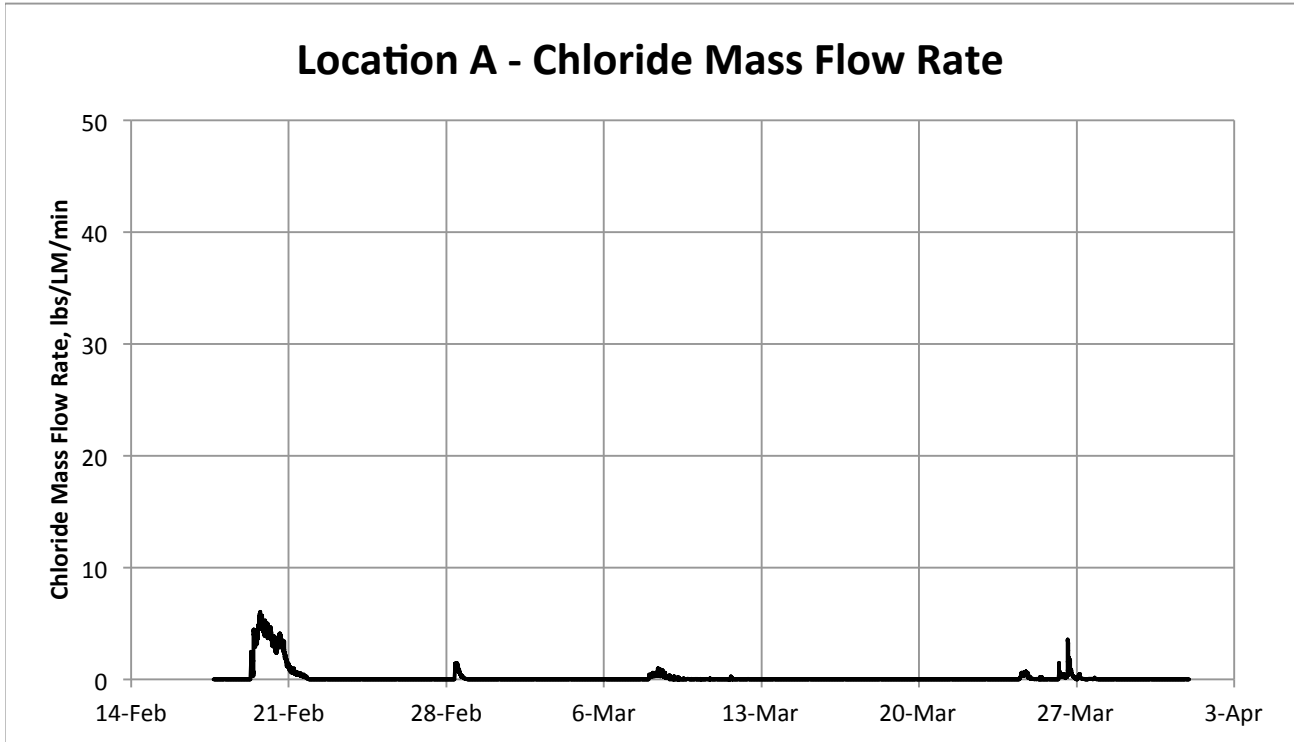


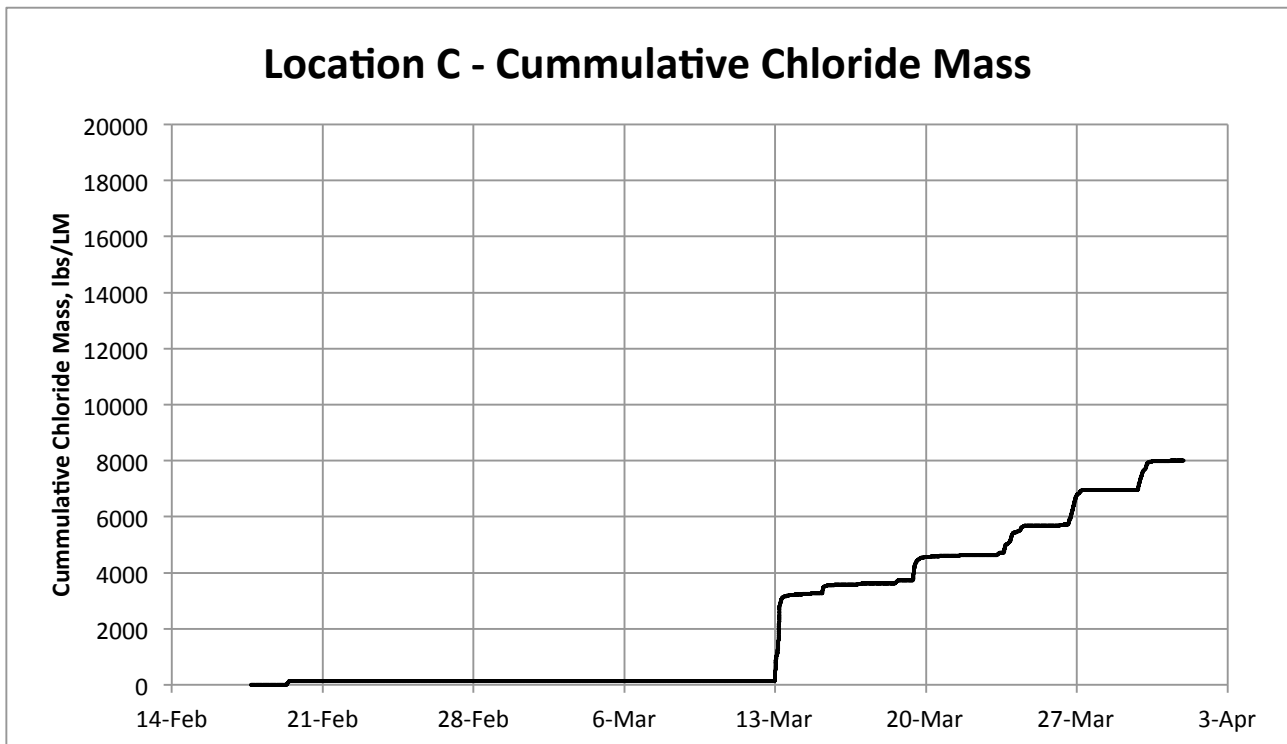
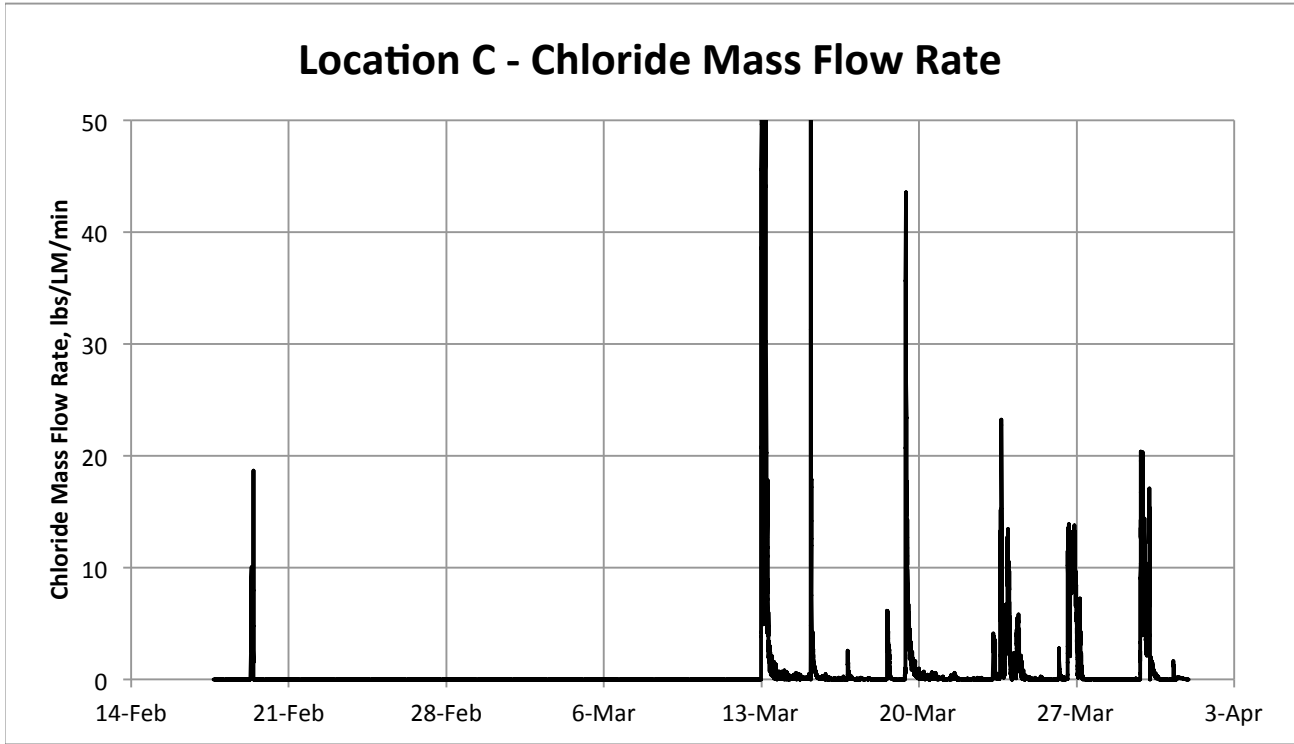


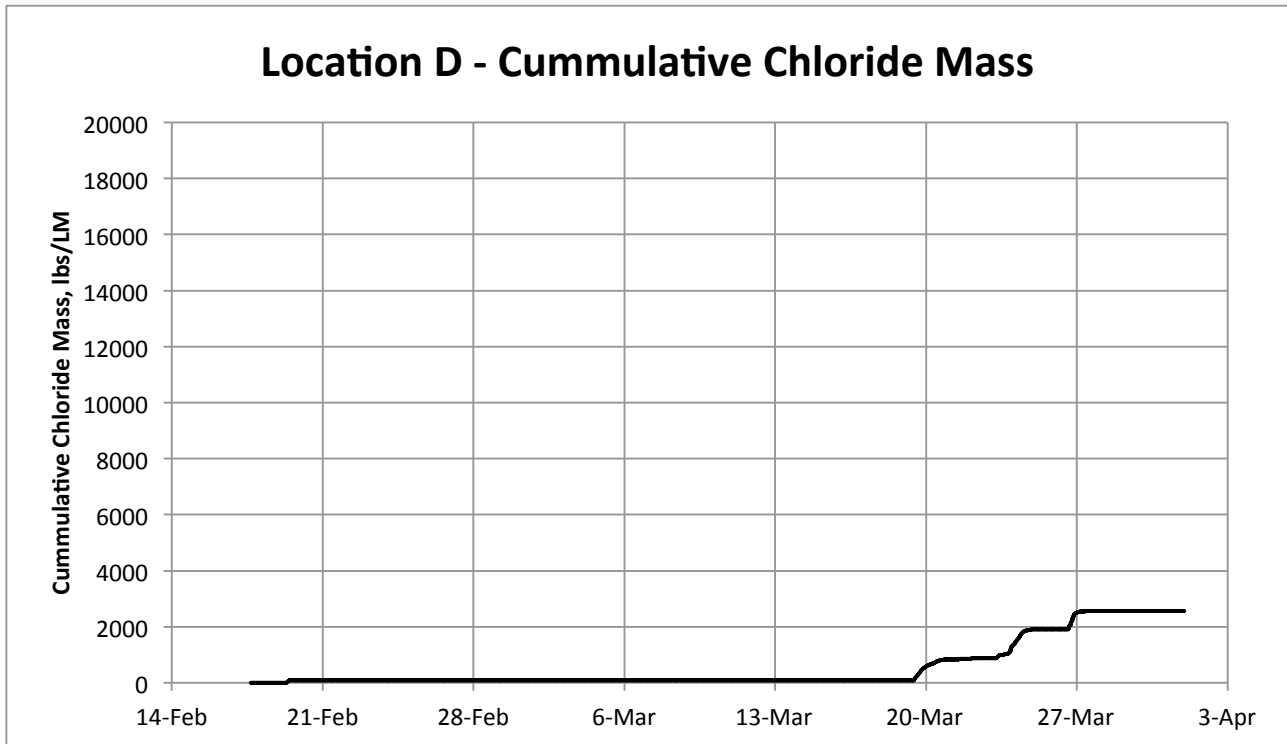
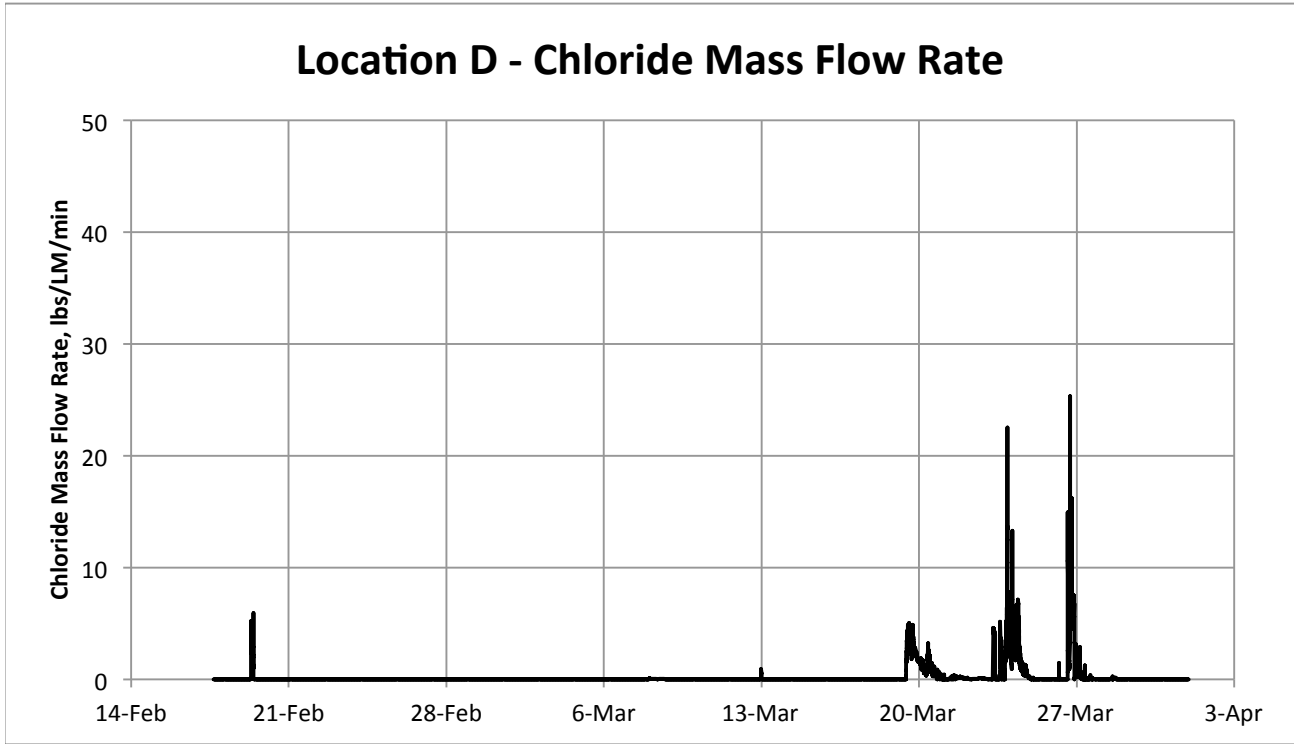




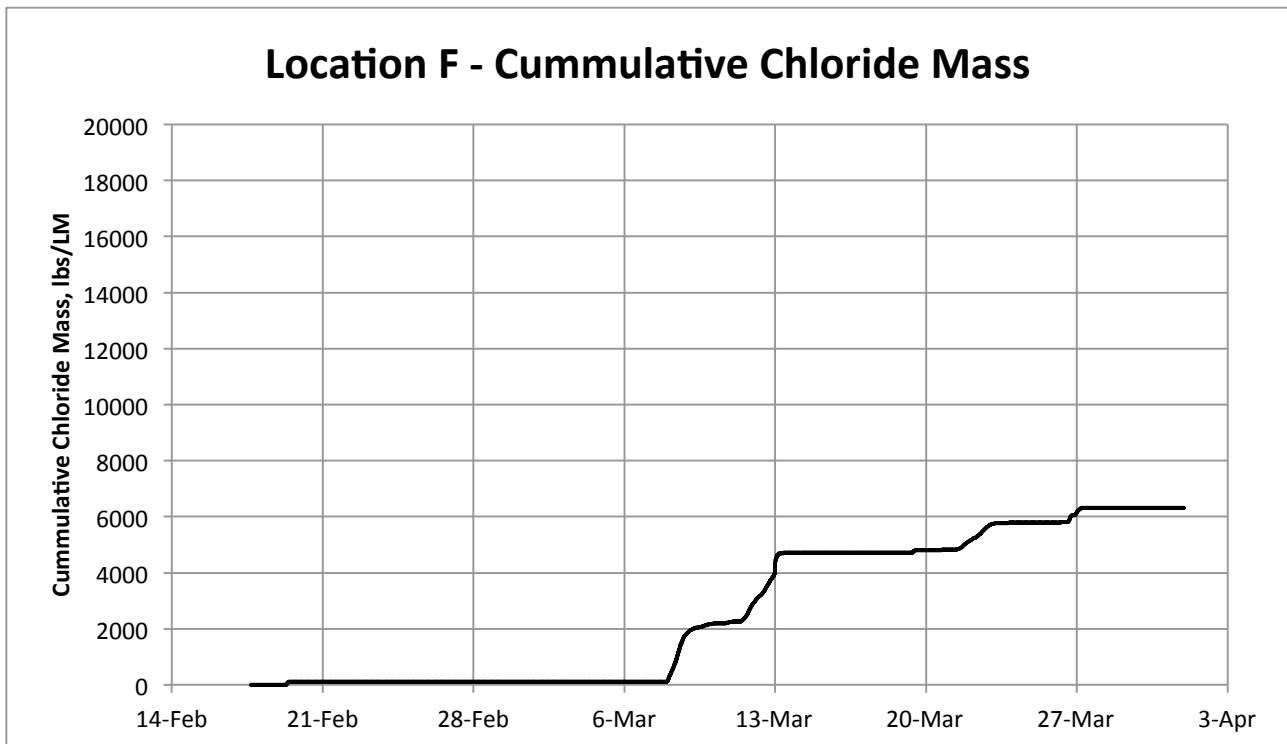
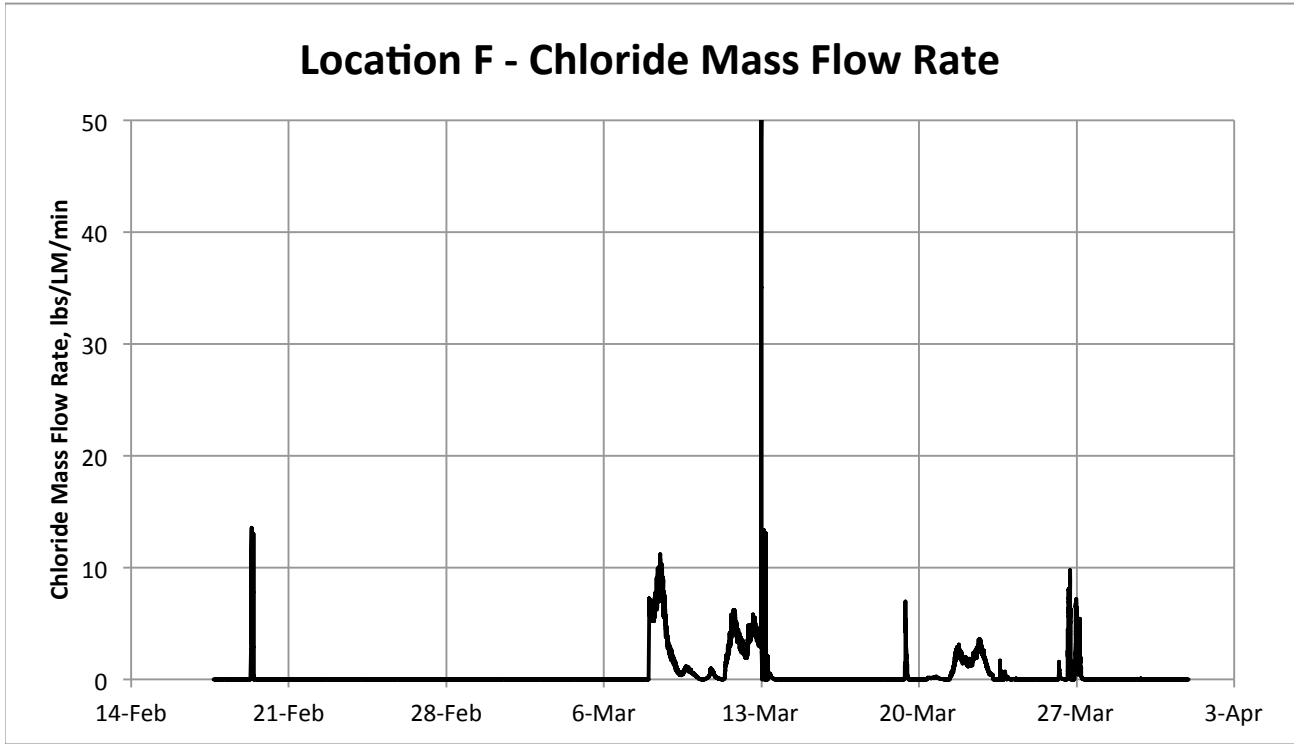


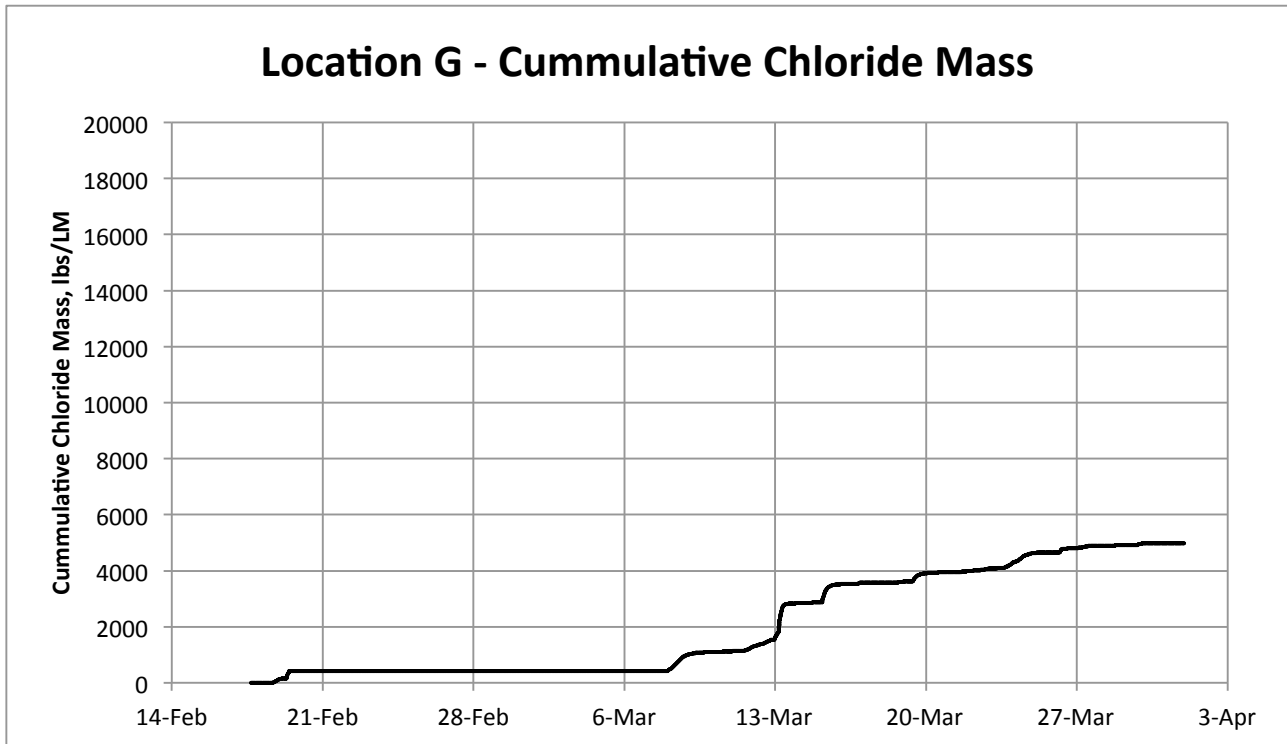
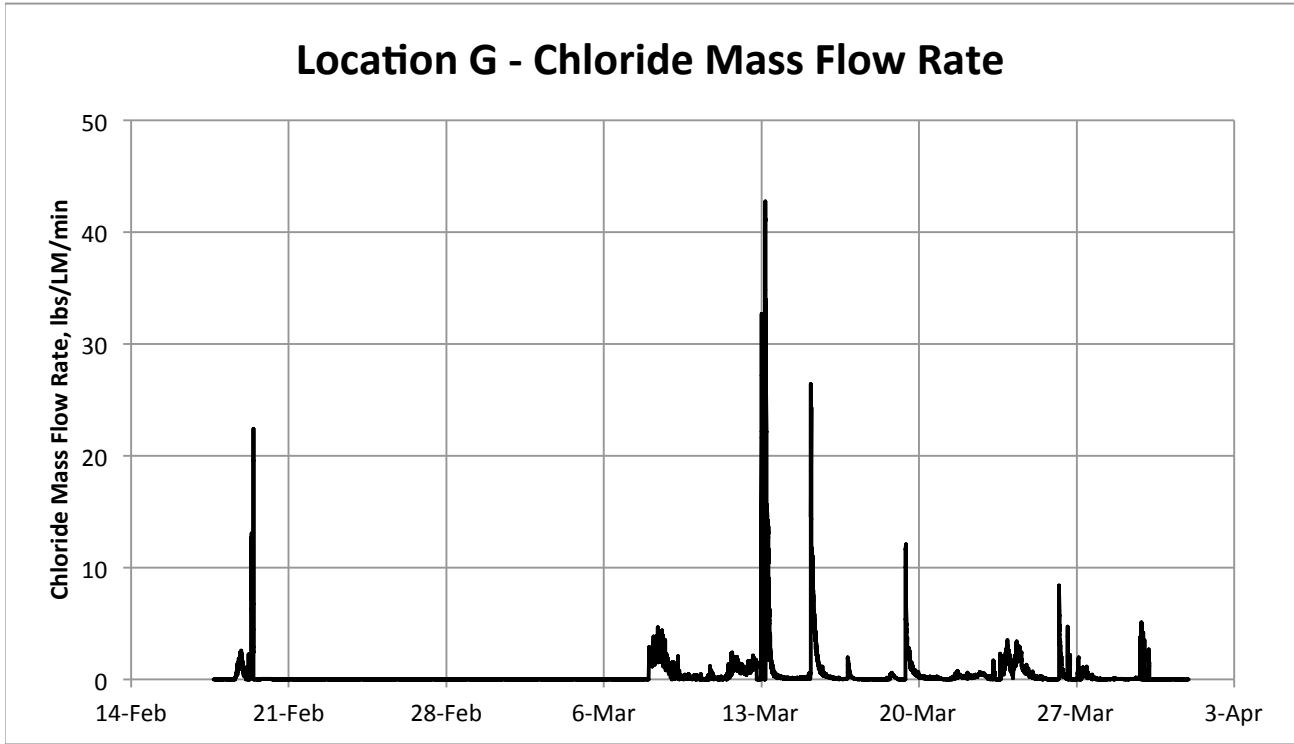


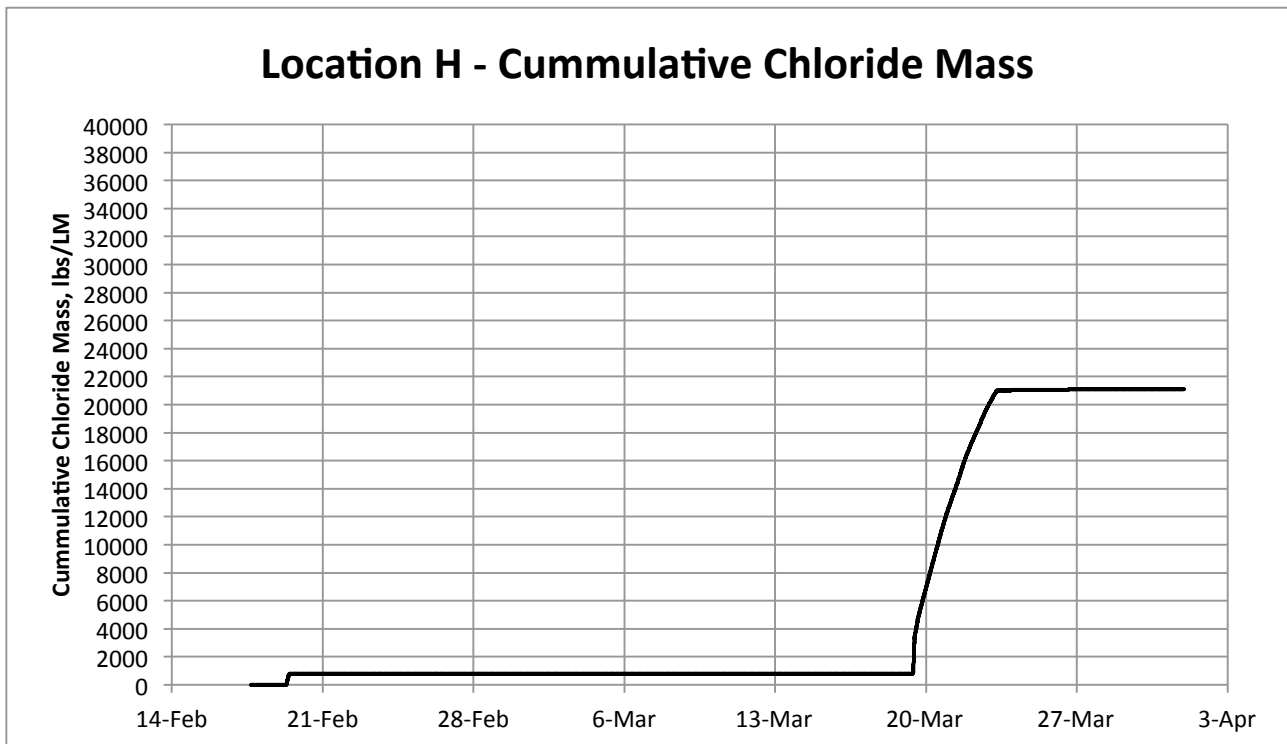
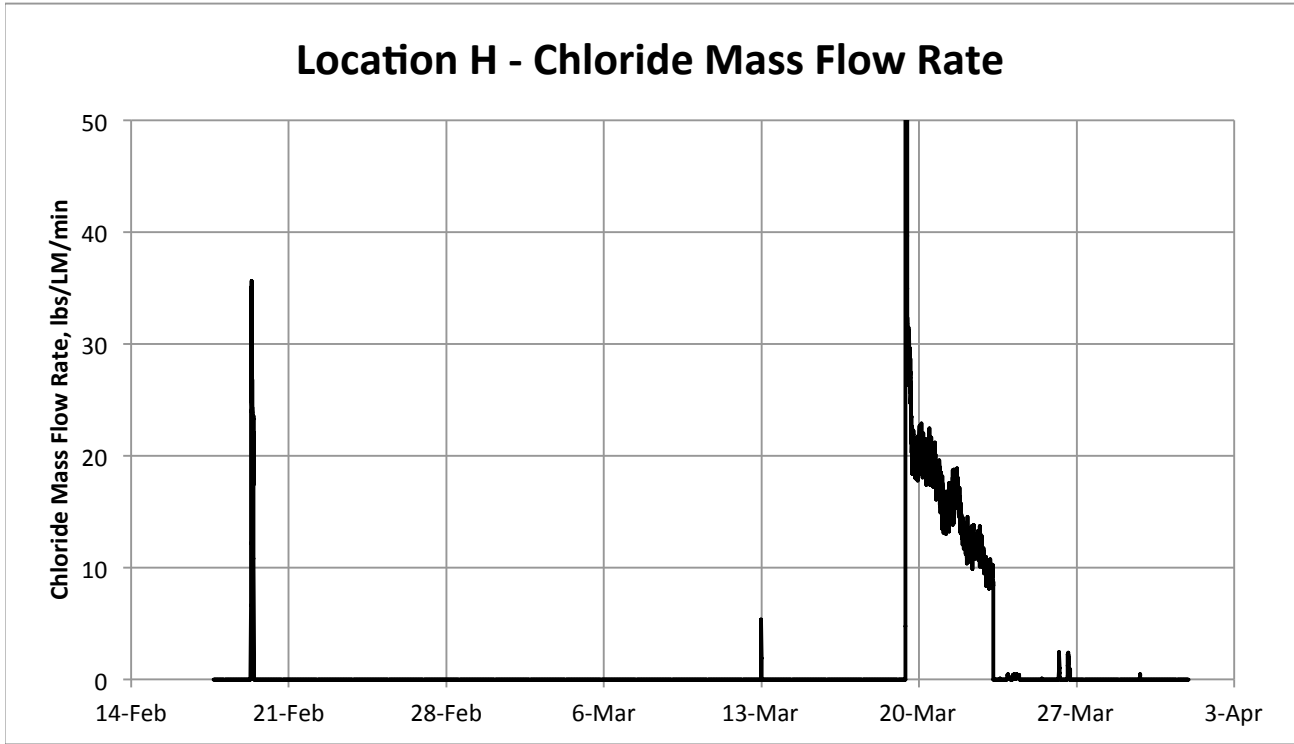








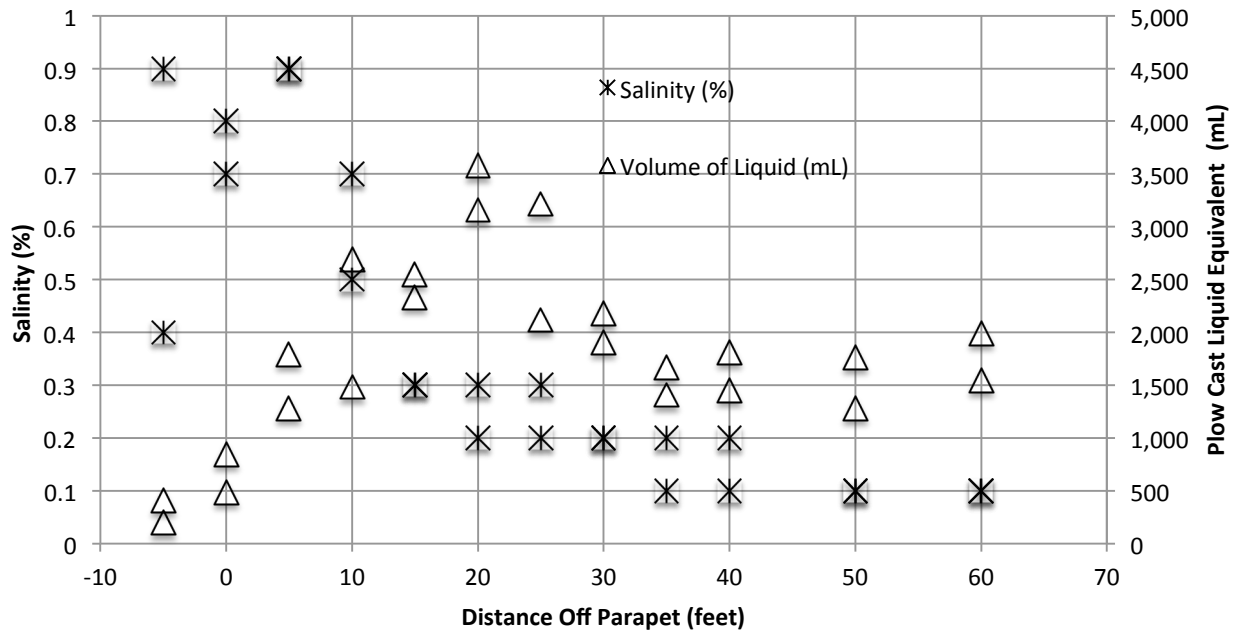




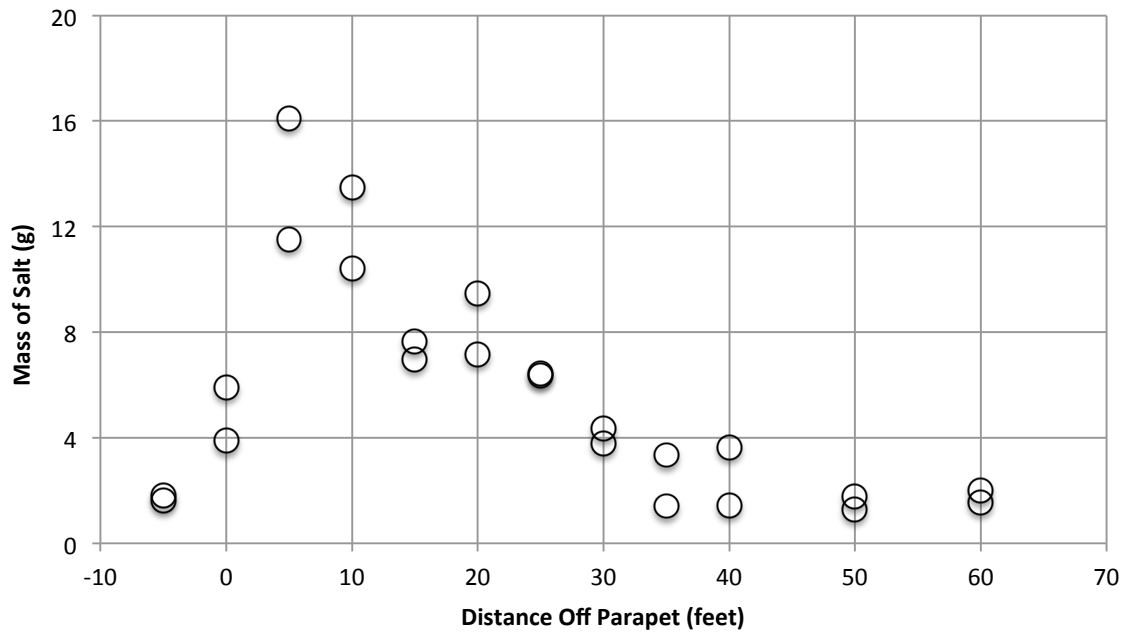
**APPENDIX L: PLOW CAST RESULTS**

Plow Cast Experiment					
Northstar Bridge February 2nd 2016 Storm					
MnDOT Salt III					
S. Druschel					
Mass = (Salinity % / 100) * Vol * 1.00 Salt Spec Grav					
Line	Distance Off Parapet (ft)	Bin #	Salinity (%)	Volume of Liquid (mL)	Mass of Salt (g)
South	-5	1	0.4	405	1.62
South	0	2	0.7	845	5.915
South	5	3	0.9	1790	16.11
South	10	4	0.5	2695	13.475
South	15	5	0.3	2330	6.99
South	20	6	0.3	3160	9.48
South	25	7	0.3	2115	6.345
South	30	8	0.2	1900	3.8
South	35	9	0.2	1670	3.34
South	40	10	0.2	1810	3.62
South	50	11	0.1	1280	1.28
South	60	12	0.1	1550	1.55
North	-5	13	0.9	200	1.8
North	0	14	0.8	485	3.88
North	5	15	0.9	1280	11.52
North	10	16	0.7	1485	10.395
North	15	17	0.3	2550	7.65
North	20	18	0.2	3580	7.16
North	25	19	0.2	3215	6.43
North	30	20	0.2	2180	4.36
North	35	21	0.1	1410	1.41
North	40	22	0.1	1450	1.45
North	50	23	0.1	1760	1.76
North	60	24	0.1	1990	1.99

### Plow Cast - North Star Bridge, February 3, 2016



### Plow Cast - North Star Bridge, February 3, 2016



## **APPENDIX M: EVALUATION OF ANTI-ICER TOTAL DISSOLVED SOLIDS**

Anti Icers  
 May 18, 2016  
 S. Druschel

Test Date	Compound	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)
051316	Salt Brine 90%, RG8 10%	2.13390	32.90850	10.43200	8.29810	30.77460	269,641
051616	Apex 100%	2.0788	7.8759	5.4199	3.34110	5.79710	576,340
051616	Freezegard 100%	2.0117	9.0272	6.1444	4.13270	7.01550	589,081
051616	RG8 100%	2.0179	9.1445	4.4715	2.45360	7.12660	344,288
051616	Salt Brine 90%, RG8 10%	2.0063	8.8633	4.0278	2.02150	6.85700	294,808
051716	Salt Brine 50%, DI Water 50%	2.1141	6.4809	2.5355	0.42140	4.36680	96,501
051716	Salt Brine 50%, Molasses 12.5%, DI Water 37.5%	2.1425	9.8771	3.5713	1.42880	7.73460	184,728
051716	Salt Brine 50%, Molasses 25%, DI Water 25%	2.1895	8.2012	3.8413	1.65180	6.01170	274,764
051716	Salt Brine 50%, Molasses 50%	2.13	3.9783	3.0128	0.88280	1.84830	477,628
051916	Salt Brine 50%, DI Water 50%	2.1111	6.4589	2.5352	0.42410	4.34780	97,544
051916	Salt Brine 50%, Molasses 25%, DI Water 25%	2.108	8.2903	3.893	1.78500	6.18230	288,727
051916	Salt Brine 50%, Ethanol 25%, DI Water 25%	2.1366	7.6879	2.6845	0.54790	5.55130	98,698
051916	Salt Brine 50%, Corn Syrup 25%, DI Water 25%	2.13	9.5467	4.3167	2.18670	7.41670	294,835

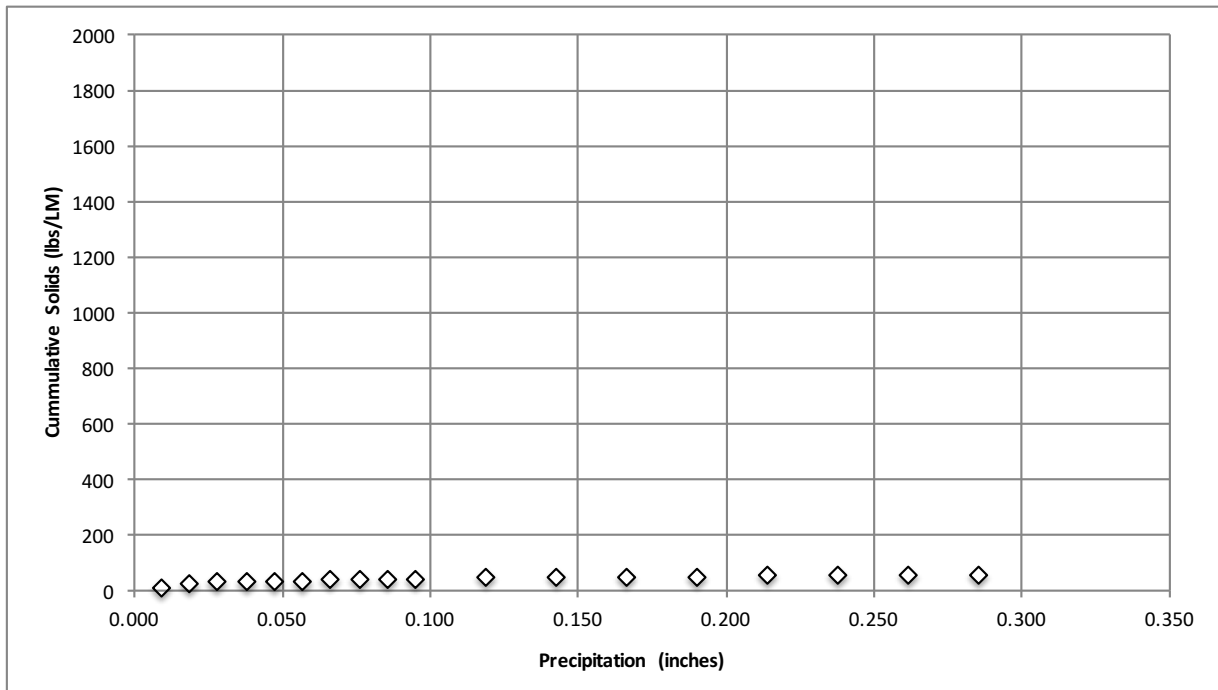
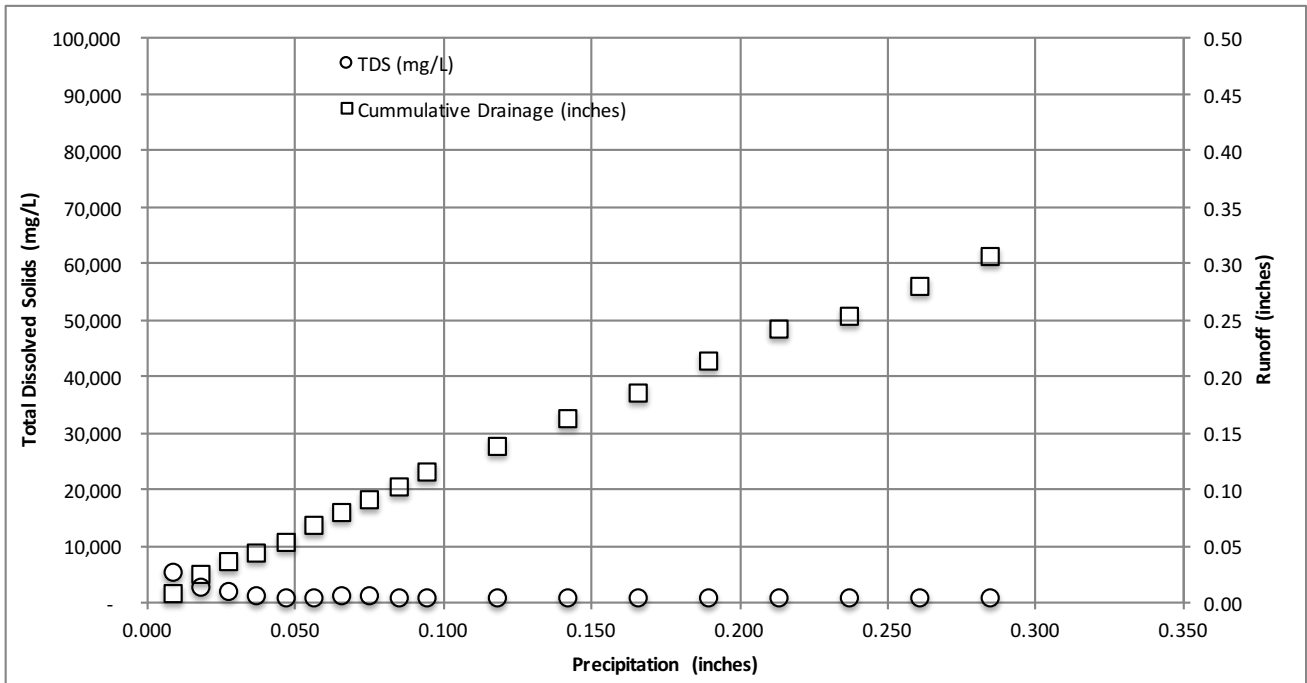


**APPENDIX N: ANTI-ICER PERSISTANCE IN PAVEMENT DRAINAGE**

Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 10, 2016  
Pavement: Concrete #1  
Anti Icer: RG8 10% Salt Brine 90%  
Pavement  
Temperature: 28° F

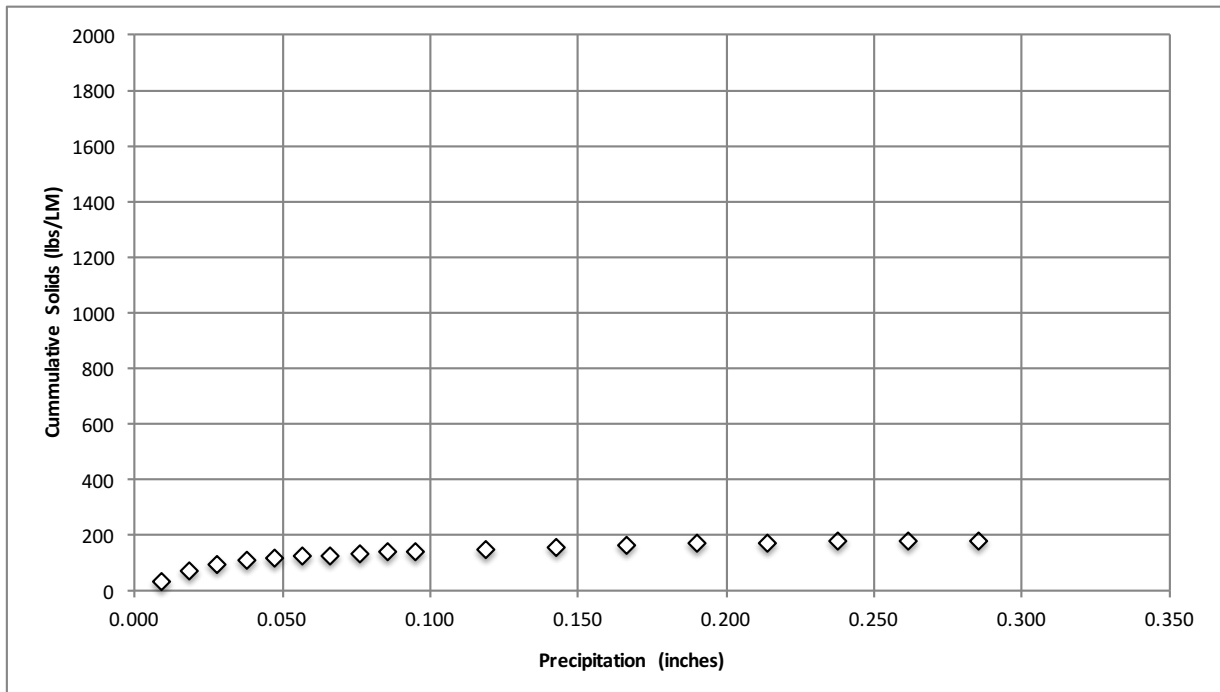
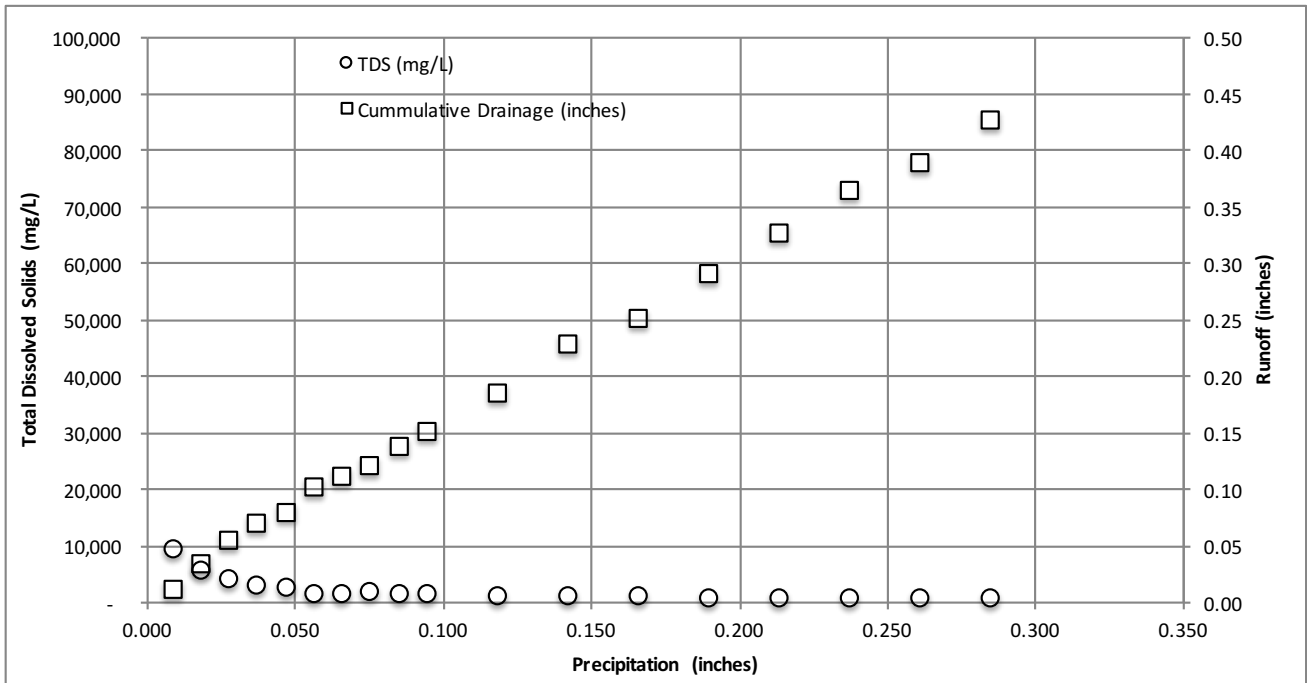
Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.13630	7.16530	2.16140	0.02510	5.02900	4,991	0.03	0.010	8	0.005
20	10	2.14450	20.65170	2.18350	0.03900	18.50720	2,107	0.06	0.019	20	0.022
30	10	2.13100	13.41820	2.14850	0.01750	11.28720	1,550	0.08	0.029	26	0.033
40	10	2.12750	10.59660	2.13410	0.00660	8.46910	779	0.09	0.038	28	0.041
50	10	2.13390	12.52570	2.13730	0.00340	10.39180	327	0.09	0.048	29	0.051
60	10	2.12480	17.47520	2.13180	0.00700	15.35040	456	0.10	0.057	31	0.066
70	10	2.13770	13.95430	2.14560	0.00790	11.81660	669	0.11	0.067	33	0.077
80	10	2.11980	14.63220	2.12860	0.00880	12.51240	703	0.12	0.076	36	0.089
90	10	2.14590	13.19260	2.15000	0.00410	11.04670	371	0.12	0.086	38	0.100
100	10	2.13600	15.69280	2.13910	0.00310	13.55680	229	0.12	0.095	39	0.112
125	25	2.12110	26.41610	2.12760	0.00650	24.29500	268	0.13	0.119	41	0.136
150	25	2.12570	27.03230	2.13210	0.00640	24.90660	257	0.14	0.143	43	0.159
175	25	2.12990	27.35880	2.13490	0.00500	25.22890	198	0.14	0.167	44	0.183
200	25	2.13880	30.54040	2.15030	0.01150	28.40160	405	0.15	0.191	48	0.211
225	25	2.13080	33.02650	2.13590	0.00510	30.89570	165	0.16	0.215	49	0.240
250	25	2.13380	13.13810	2.13520	0.00140	11.00430	127	0.16	0.238	50	0.250
275	25	2.12050	29.94280	2.12560	0.00510	27.82230	183	0.16	0.262	51	0.277
300	25	2.14520	28.98640	2.14920	0.00400	26.84120	149	0.17	0.286	53	0.303



Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 10, 2016  
Pavement: Asphalt #2  
Anti Icer: RG8 10% Salt Brine 90%  
Pavement  
Temperature: 28° F

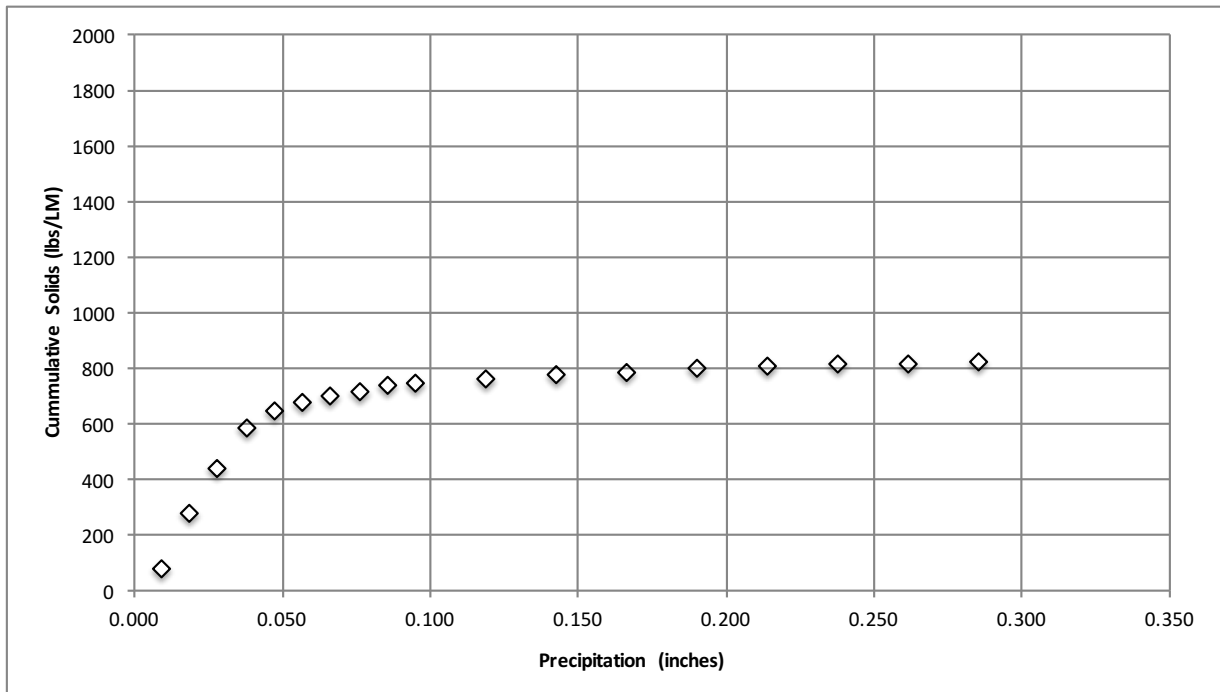
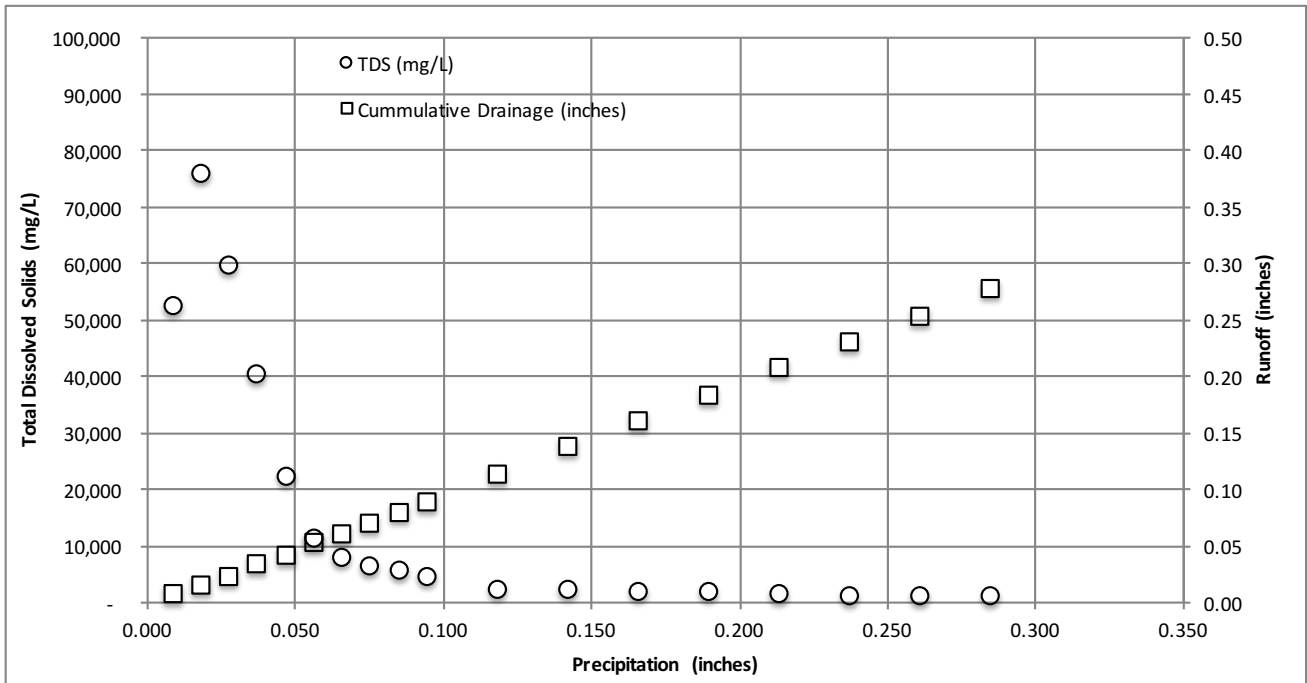
Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.12800	12.35000	2.22040	0.09240	10.22200	9,039	0.09	0.010	29	0.010
20	10	2.13510	24.30050	2.25270	0.11760	22.16540	5,306	0.21	0.019	66	0.031
30	10	2.14410	24.45970	2.22890	0.08480	22.31560	3,800	0.29	0.029	93	0.052
40	10	2.12740	17.83590	2.16770	0.04030	15.70850	2,565	0.34	0.038	105	0.067
50	10	2.12440	12.40320	2.14620	0.02180	10.27880	2,121	0.36	0.048	112	0.077
60	10	2.11130	25.17020	2.13650	0.02520	23.05890	1,093	0.38	0.057	120	0.099
70	10	2.14270	13.40470	2.15570	0.01300	11.26200	1,154	0.40	0.067	124	0.110
80	10	2.11550	11.81690	2.12870	0.01320	9.70140	1,361	0.41	0.076	128	0.119
90	10	2.13870	18.90510	2.15700	0.01830	16.76640	1,091	0.43	0.086	134	0.135
100	10	2.14750	16.97660	2.16470	0.01720	14.82910	1,160	0.44	0.095	140	0.149
125	25	2.17760	37.62190	2.20080	0.02320	35.44430	655	0.47	0.119	147	0.183
150	25	2.14290	46.55050	2.16380	0.02090	44.40760	471	0.49	0.143	153	0.225
175	25	2.13870	26.08690	2.15100	0.01230	23.94820	514	0.50	0.167	157	0.248
200	25	2.14020	45.38000	2.15900	0.01880	43.23980	435	0.52	0.191	163	0.289
225	25	2.11040	38.57520	2.12360	0.01320	36.46480	362	0.53	0.215	167	0.324
250	25	2.13670	41.12080	2.15190	0.01520	38.98410	390	0.55	0.238	172	0.361
275	25	2.14680	28.39540	2.15540	0.00860	26.24860	328	0.56	0.262	175	0.386
300	25	2.14410	42.78820	2.15510	0.01100	40.64410	271	0.57	0.286	178	0.425



Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 13, 2016  
Pavement: Concrete #1  
Anti Icer: RG8 10% Salt Brine 90%  
Pavement  
Temperature: 34° F

Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.06470	6.55420	2.29850	0.23380	4.48950	52,077	0.23	0.010	73	0.004
20	10	2.07080	10.53800	2.71060	0.63980	8.46720	75,562	0.87	0.019	275	0.012
30	10	2.16530	10.78950	2.67510	0.50980	8.62420	59,113	1.38	0.029	435	0.021
40	10	2.18170	13.78380	2.64410	0.46240	11.60210	39,855	1.85	0.038	580	0.032
50	10	2.11370	10.82740	2.30320	0.18950	8.71370	21,747	2.04	0.048	640	0.040
60	10	2.14290	12.45250	2.25590	0.11300	10.30960	10,961	2.15	0.057	675	0.050
70	10	2.10760	10.92200	2.17230	0.06470	8.81440	7,340	2.21	0.067	696	0.058
80	10	2.10300	11.53530	2.16040	0.05740	9.43230	6,085	2.27	0.076	714	0.067
90	10	2.11420	12.57970	2.16970	0.05550	10.46550	5,303	2.33	0.086	731	0.077
100	10	2.12020	11.92590	2.15880	0.03860	9.80570	3,936	2.36	0.095	743	0.087
125	25	2.11630	27.42610	2.16400	0.04770	25.30980	1,885	2.41	0.119	758	0.111
150	25	2.10660	27.21130	2.14830	0.04170	25.10470	1,661	2.45	0.143	771	0.135
175	25	2.10260	26.44130	2.13590	0.03330	24.33870	1,368	2.49	0.167	782	0.158
200	25	2.10280	26.76750	2.13950	0.03670	24.66470	1,488	2.52	0.191	793	0.181
225	25	2.11890	26.88380	2.14860	0.02970	24.76490	1,199	2.55	0.215	803	0.205
250	25	2.17960	26.80330	2.19760	0.01800	24.62370	731	2.57	0.238	808	0.228
275	25	2.17250	26.12730	2.18550	0.01300	23.95480	543	2.58	0.262	812	0.251
300	25	2.13520	26.70750	2.14750	0.01230	24.57230	501	2.60	0.286	816	0.275

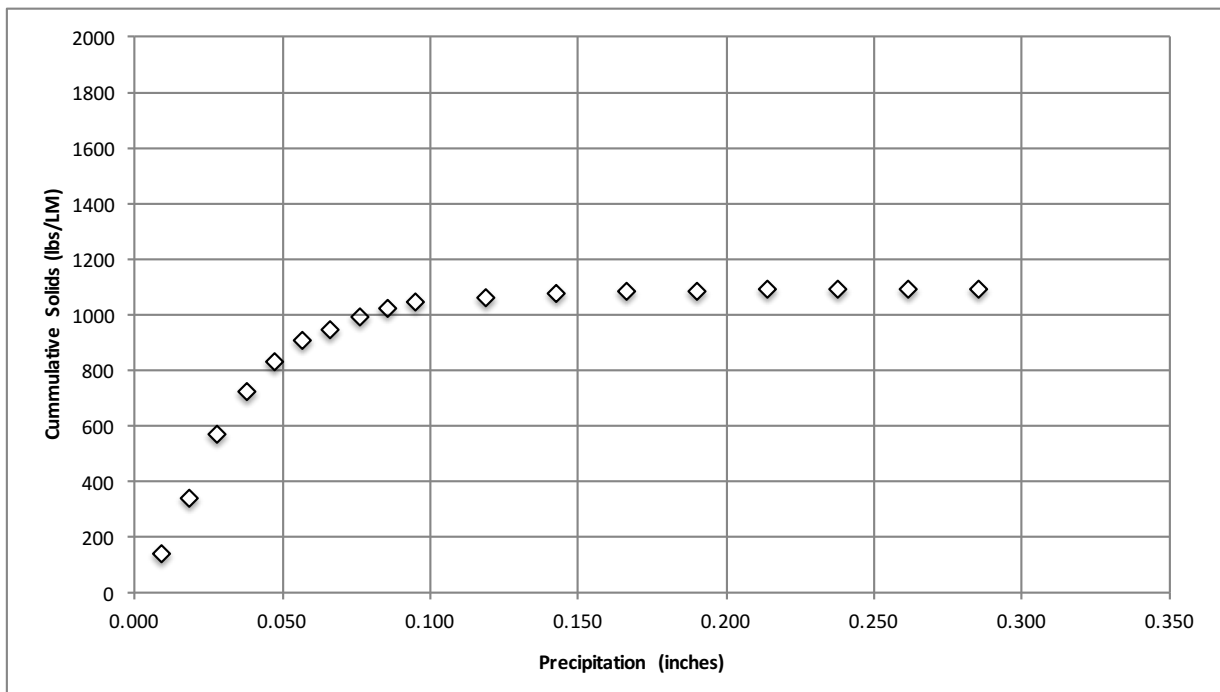
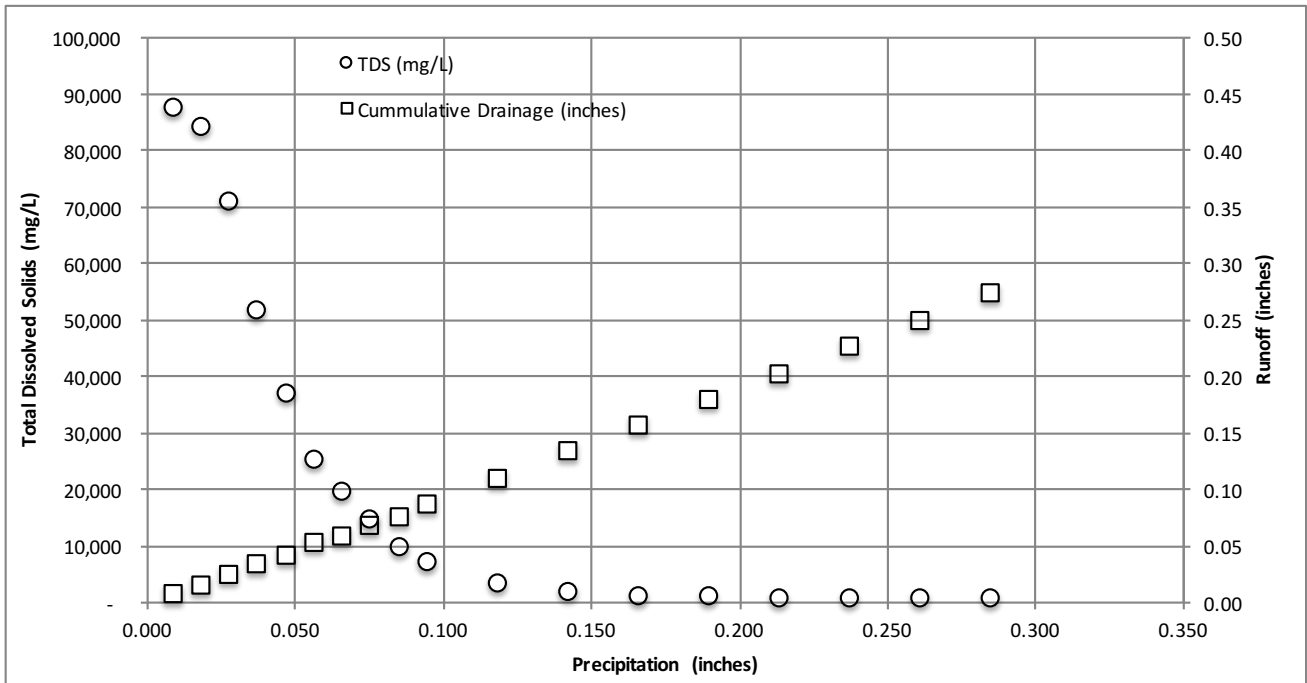


Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 13, 2016  
Pavement: Asphalt #2  
Anti Icer: RG8 10% Salt Brine 90%  
Pavement  
Temperature: 34° F

Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.14670	7.06670	2.57610	0.42940	4.92000	87,276	0.43	0.010	135	0.005
20	10	2.16490	9.79360	2.80360	0.63870	7.62870	83,723	1.07	0.019	336	0.012
30	10	2.10790	12.45350	2.83850	0.73060	10.34560	70,619	1.80	0.029	565	0.022
40	10	2.12740	11.89030	2.62720	0.49980	9.76290	51,194	2.30	0.038	723	0.031
50	10	2.17640	11.22790	2.50580	0.32940	9.05150	36,392	2.63	0.048	826	0.040
60	10	2.14440	12.37070	2.39730	0.25290	10.22630	24,730	2.88	0.057	906	0.050
70	10	2.08630	8.30990	2.20650	0.12020	6.22360	19,314	3.00	0.067	943	0.055
80	10	2.08220	11.76070	2.21900	0.13680	9.67850	14,134	3.14	0.076	986	0.065
90	10	2.14000	11.93140	2.23240	0.09240	9.79140	9,437	3.23	0.086	1015	0.074
100	10	2.03320	12.79260	2.10480	0.07160	10.75940	6,655	3.30	0.095	1038	0.084
125	25	2.06680	25.78980	2.13680	0.07000	23.72300	2,951	3.37	0.119	1060	0.107
150	25	2.12210	28.61140	2.16130	0.03920	26.48930	1,480	3.41	0.143	1072	0.132
175	25	2.04610	24.65510	2.06230	0.01620	22.60900	717	3.43	0.167	1077	0.154
200	25	2.05810	26.05430	2.06920	0.01110	23.99620	463	3.44	0.191	1081	0.177
225	25	2.03520	26.14540	2.04380	0.00860	24.11020	357	3.45	0.215	1084	0.200
250	25	2.11180	27.01220	2.11940	0.00760	24.90040	305	3.45	0.238	1086	0.223
275	25	2.07330	26.76390	2.07930	0.00600	24.69060	243	3.46	0.262	1088	0.247
300	25	2.09930	27.46750	2.10810	0.00880	25.36820	347	3.47	0.286	1091	0.271

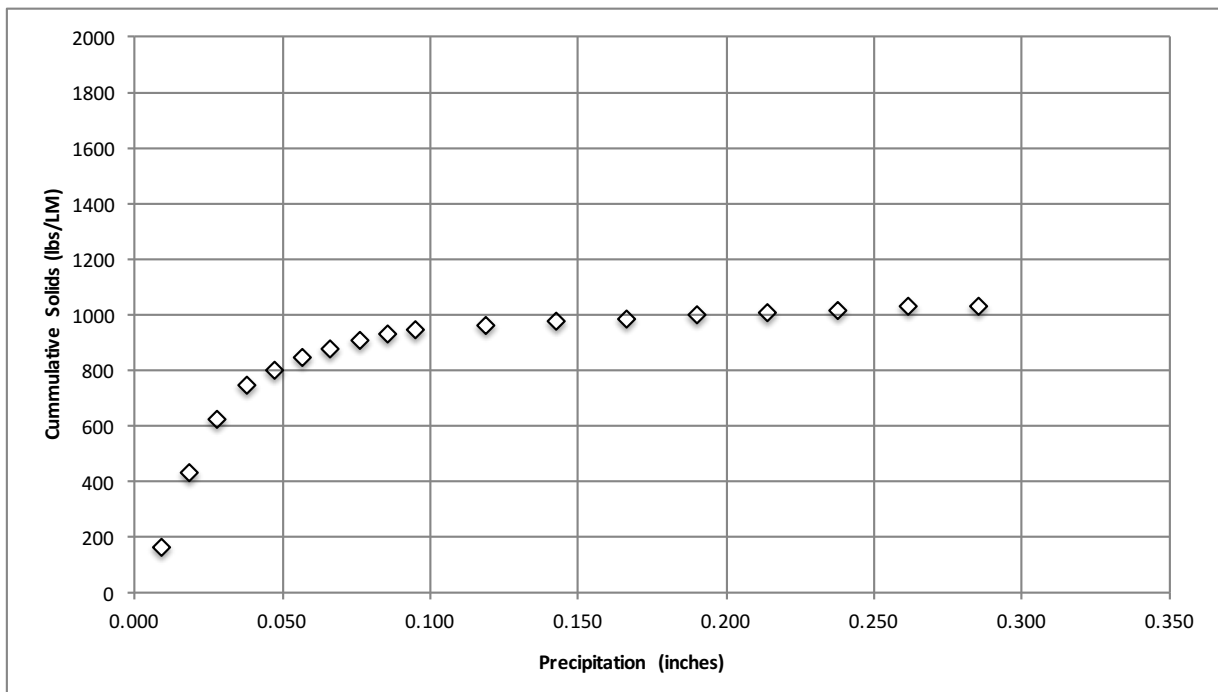
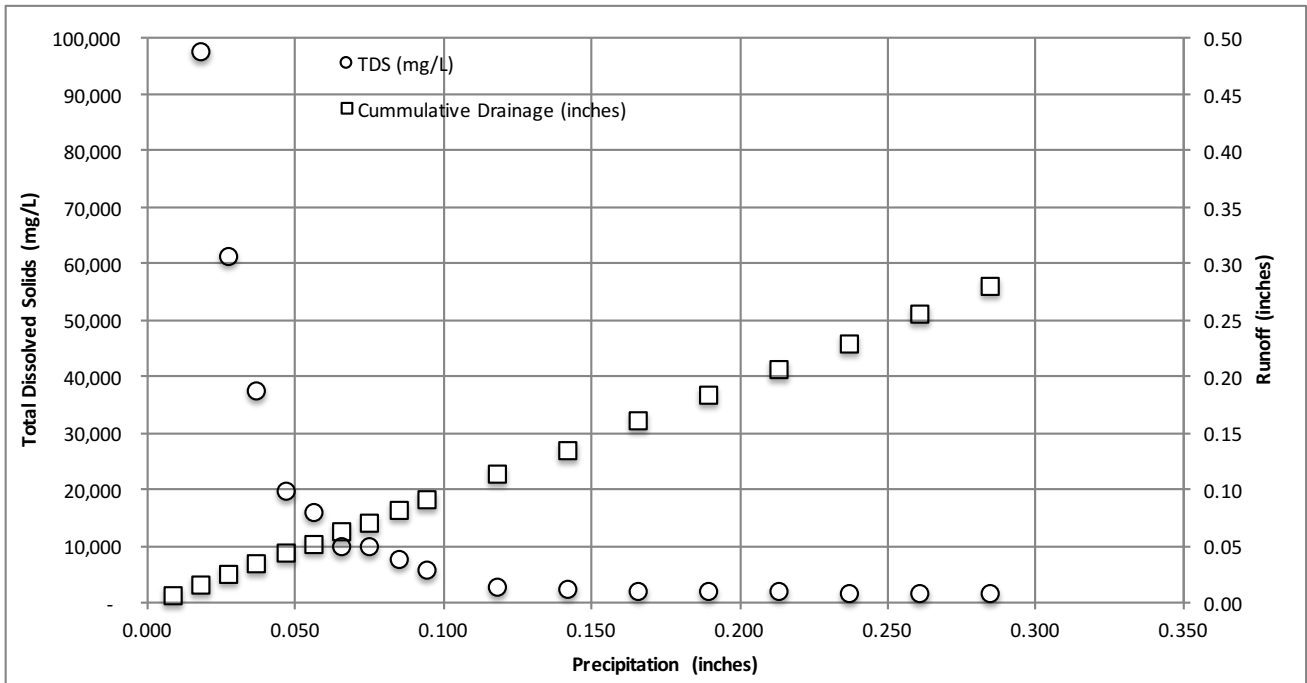




Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 13, 2016  
Pavement: Concrete #3  
Anti Icer: RG8 10% Salt Brine 90%  
Pavement  
Temperature: 34° F

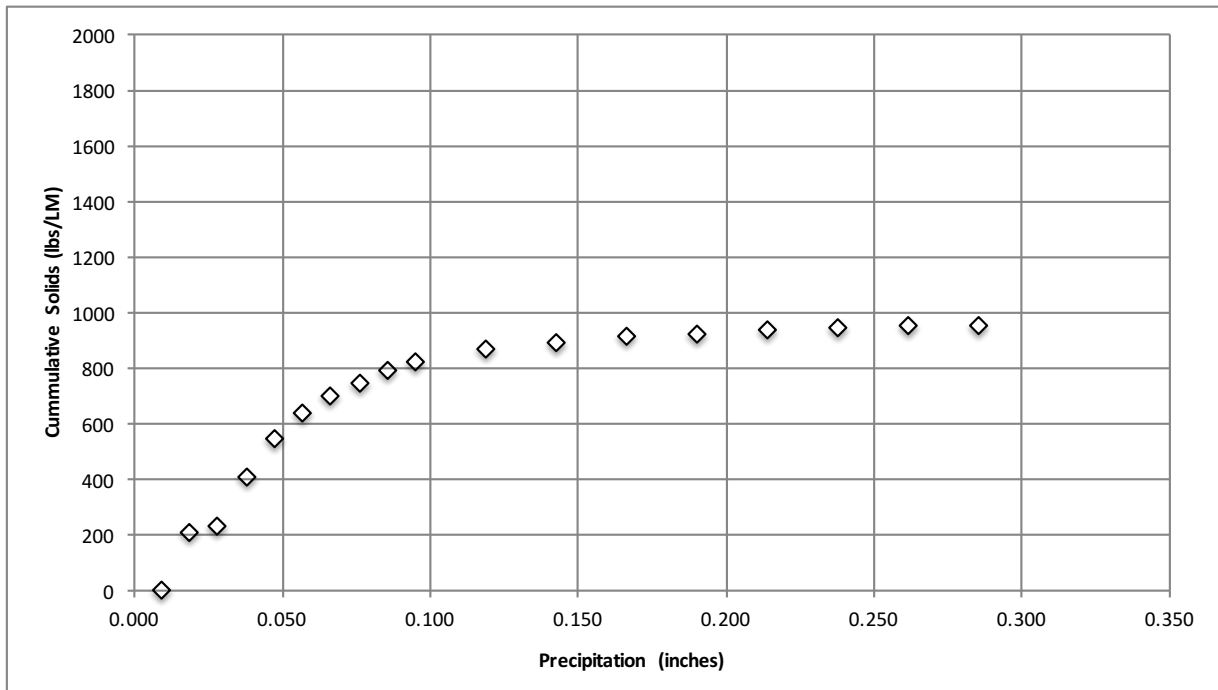
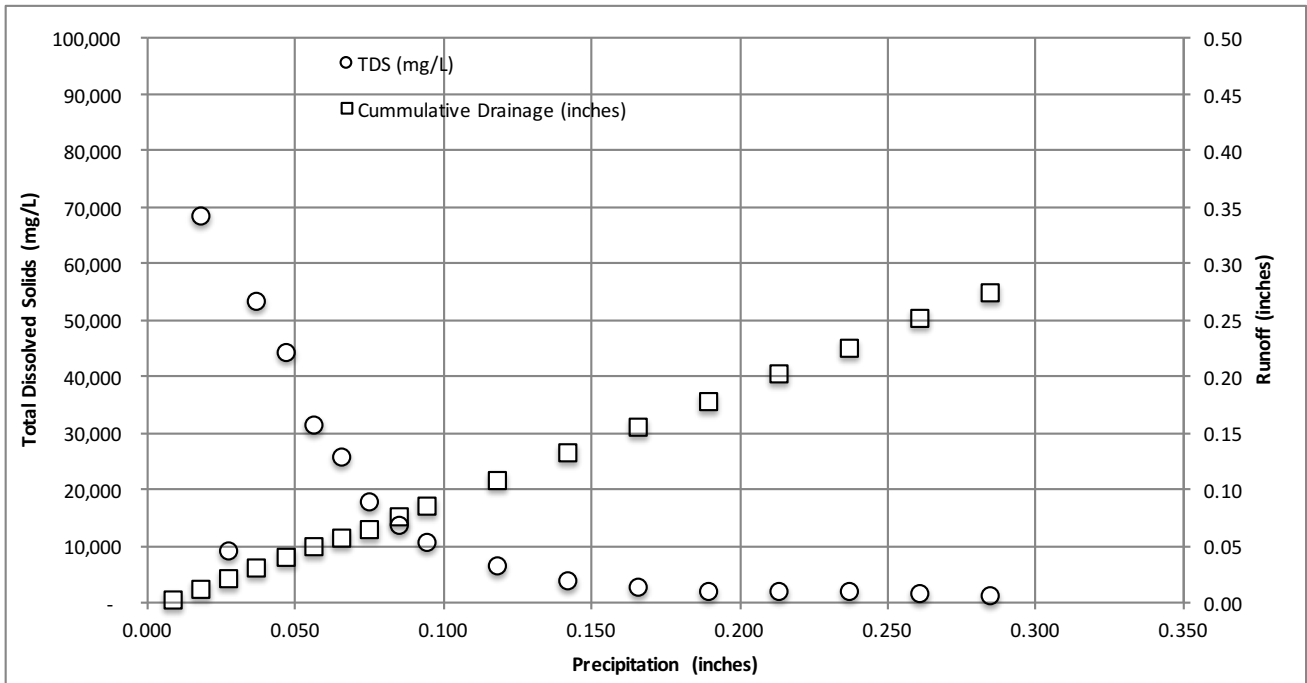
Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.12390	6.00390	2.64080	0.51690	3.88000	133,222	0.52	0.010	162	0.004
20	10	2.13630	10.84690	2.98240	0.84610	8.71060	97,135	1.36	0.019	428	0.012
30	10	2.14500	12.28070	2.76000	0.61500	10.13570	60,677	1.98	0.029	622	0.022
40	10	2.13210	12.73760	2.52330	0.39120	10.60550	36,887	2.37	0.038	745	0.032
50	10	2.14000	10.94280	2.30890	0.16890	8.80280	19,187	2.54	0.048	798	0.040
60	10	2.14560	11.89530	2.29370	0.14810	9.74970	15,190	2.69	0.057	844	0.049
70	10	2.15860	12.31530	2.25460	0.09600	10.15670	9,452	2.78	0.067	875	0.059
80	10	2.11410	11.74310	2.20270	0.08860	9.62900	9,201	2.87	0.076	902	0.068
90	10	2.10100	12.24920	2.17420	0.07320	10.14820	7,213	2.94	0.086	925	0.078
100	10	2.13540	11.98520	2.18520	0.04980	9.84980	5,056	2.99	0.095	941	0.087
125	25	2.13190	27.41800	2.18980	0.05790	25.28610	2,290	3.05	0.119	959	0.112
150	25	2.11150	24.19290	2.14960	0.03810	22.08140	1,725	3.09	0.143	971	0.133
175	25	2.14500	28.84940	2.18430	0.03930	26.70440	1,472	3.13	0.167	984	0.158
200	25	2.17230	26.75990	2.20790	0.03560	24.58760	1,448	3.16	0.191	995	0.181
225	25	2.13820	25.89970	2.17250	0.03430	23.76150	1,444	3.20	0.215	1006	0.204
250	25	2.12180	25.91140	2.14940	0.02760	23.78960	1,160	3.23	0.238	1014	0.227
275	25	2.10090	29.39360	2.12760	0.02670	27.29270	978	3.25	0.262	1023	0.253
300	25	2.10690	26.83360	2.12810	0.02120	24.72670	857	3.27	0.286	1029	0.276



Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 13, 2016  
Pavement: Asphalt #4  
Anti Icer: RG8 10% Salt Brine 90%  
Pavement  
Temperature: 34° F

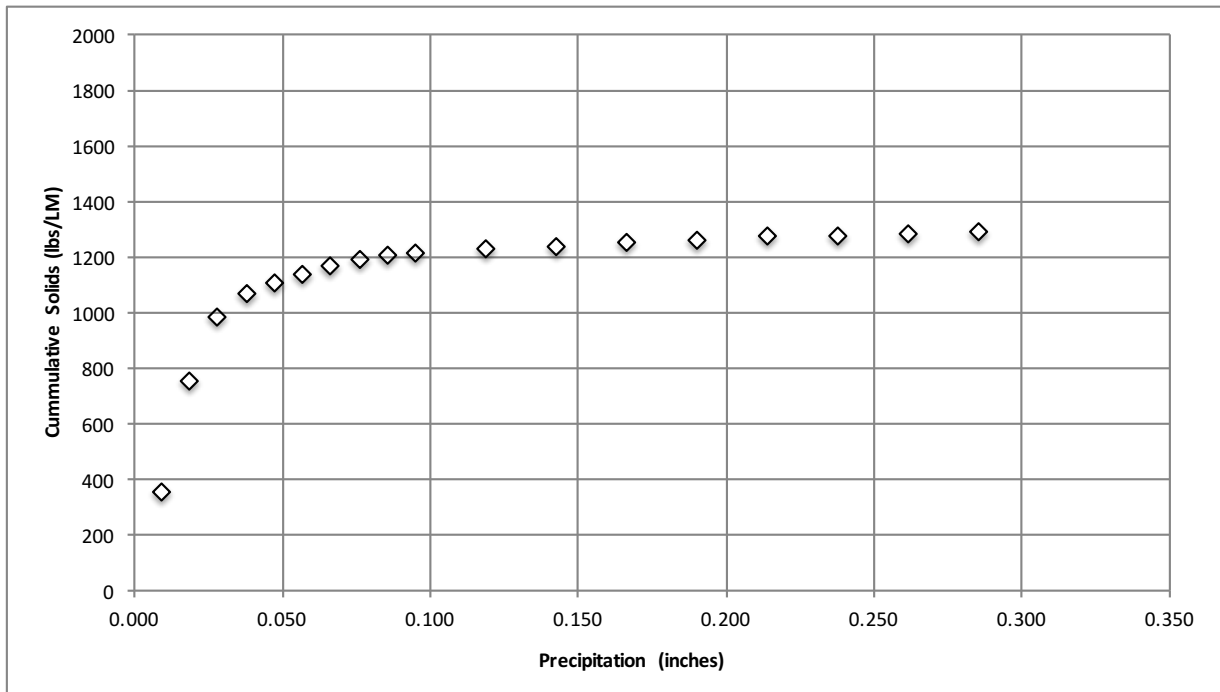
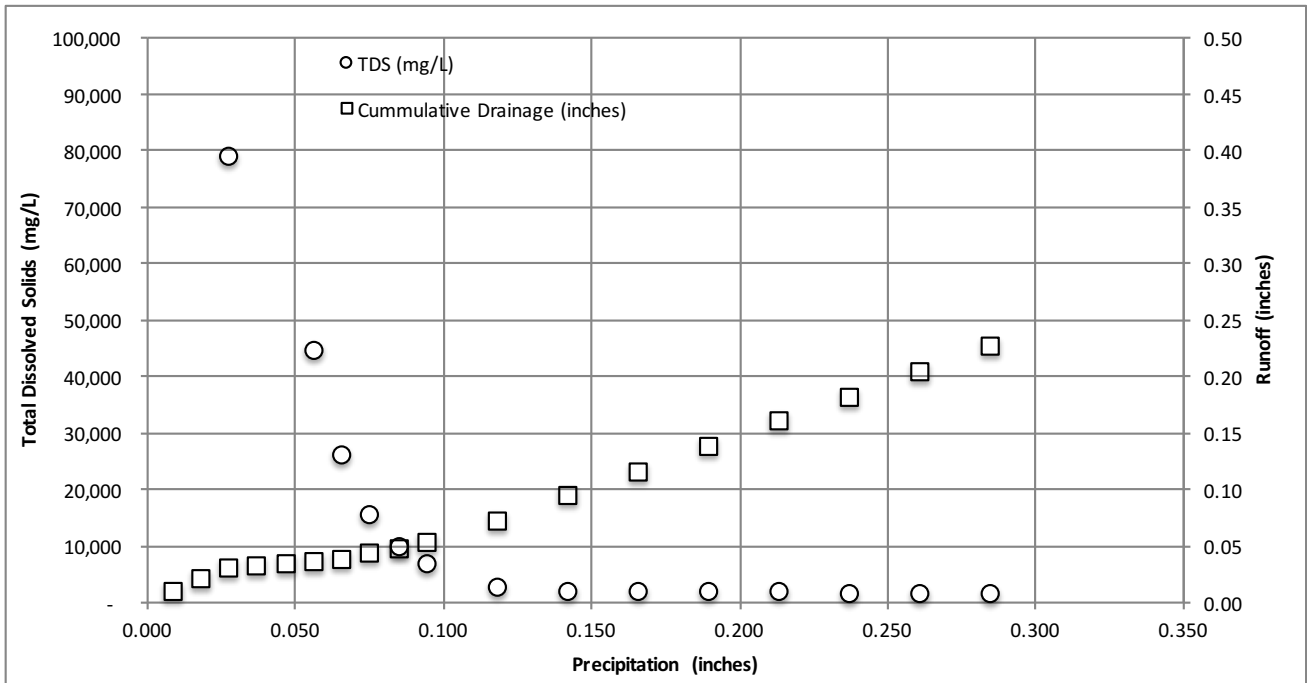
Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.13390	2.13390	2.13390	0.00000	0.00000		0.00	0.010	0	0.000
20	10	2.13930	11.67500	2.78760	0.64830	9.53570	67,987	0.65	0.019	204	0.009
30	10	2.13360	11.67900	2.21620	0.08260	9.54540	8,653	0.73	0.029	230	0.018
40	10	2.12830	12.57770	2.67890	0.55060	10.44940	52,692	1.28	0.038	403	0.028
50	10	2.08420	11.96530	2.51780	0.43360	9.88110	43,882	1.72	0.048	539	0.038
60	10	2.09670	12.18890	2.40930	0.31260	10.09220	30,974	2.03	0.057	637	0.047
70	10	2.11880	9.44790	2.30250	0.18370	7.32910	25,064	2.21	0.067	695	0.054
80	10	2.10990	10.98230	2.26450	0.15460	8.87240	17,425	2.37	0.076	744	0.063
90	10	2.11250	12.22590	2.24570	0.13320	10.11340	13,171	2.50	0.086	786	0.072
100	10	2.13670	12.62850	2.24180	0.10510	10.49180	10,017	2.60	0.095	819	0.082
125	25	2.13640	26.70090	2.27860	0.14220	24.56450	5,789	2.75	0.119	863	0.106
150	25	2.13680	27.00780	2.22150	0.08470	24.87100	3,406	2.83	0.143	890	0.129
175	25	2.12080	26.62760	2.17750	0.05670	24.50680	2,314	2.89	0.167	908	0.153
200	25	2.10740	25.41890	2.14280	0.03540	23.31150	1,519	2.92	0.191	919	0.175
225	25	2.13080	28.62050	2.16710	0.03630	26.48970	1,370	2.96	0.215	930	0.200
250	25	2.09790	25.88530	2.12690	0.02900	23.78740	1,219	2.99	0.238	939	0.223
275	25	2.11550	28.25470	2.13820	0.02270	26.13920	868	3.01	0.262	947	0.248
300	25	2.12830	27.58200	2.14530	0.01700	25.45370	668	3.03	0.286	952	0.272



Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 16, 2016  
Pavement: Concrete #1  
Anti Icer: Apex 100%  
Pavement  
Temperature: 18° F

Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.01520	9.58310	3.12790	1.11270	7.56790	147,029	1.11	0.010	350	0.007
20	10	2.02760	13.39930	3.29780	1.27020	11.37170	111,698	2.38	0.019	749	0.018
30	10	2.03280	11.34190	2.76170	0.72890	9.30910	78,300	3.11	0.029	978	0.027
40	10	2.05100	4.68050	2.31580	0.26480	2.62950	100,704	3.38	0.038	1061	0.029
50	10	2.07240	3.42270	2.21280	0.14040	1.35030	103,977	3.52	0.048	1106	0.031
60	10	2.06980	4.20110	2.16400	0.09420	2.13130	44,198	3.61	0.057	1135	0.033
70	10	2.03550	5.42210	2.12270	0.08720	3.38660	25,749	3.70	0.067	1163	0.036
80	10	2.02200	6.70390	2.09180	0.06980	4.68190	14,908	3.77	0.076	1185	0.040
90	10	2.02790	7.17080	2.07680	0.04890	5.14290	9,508	3.82	0.086	1200	0.045
100	10	2.03220	8.16780	2.07090	0.03870	6.13560	6,307	3.86	0.095	1212	0.051
125	25	2.04400	22.01200	2.08890	0.04490	19.96800	2,249	3.90	0.119	1226	0.070
150	25	2.04610	24.06190	2.07690	0.03080	22.01580	1,399	3.93	0.143	1236	0.091
175	25	2.04800	24.70610	2.08310	0.03510	22.65810	1,549	3.97	0.167	1247	0.113
200	25	2.03030	25.85280	2.06220	0.03190	23.82250	1,339	4.00	0.191	1257	0.136
225	25	2.01900	25.57030	2.05390	0.03490	23.55130	1,482	4.03	0.215	1268	0.158
250	25	2.03990	24.25170	2.06190	0.02200	22.21180	990	4.06	0.238	1275	0.179
275	25	2.06750	24.86410	2.08780	0.02030	22.79660	890	4.08	0.262	1281	0.201
300	25	2.00790	26.57300	2.03060	0.02270	24.56510	924	4.10	0.286	1288	0.224

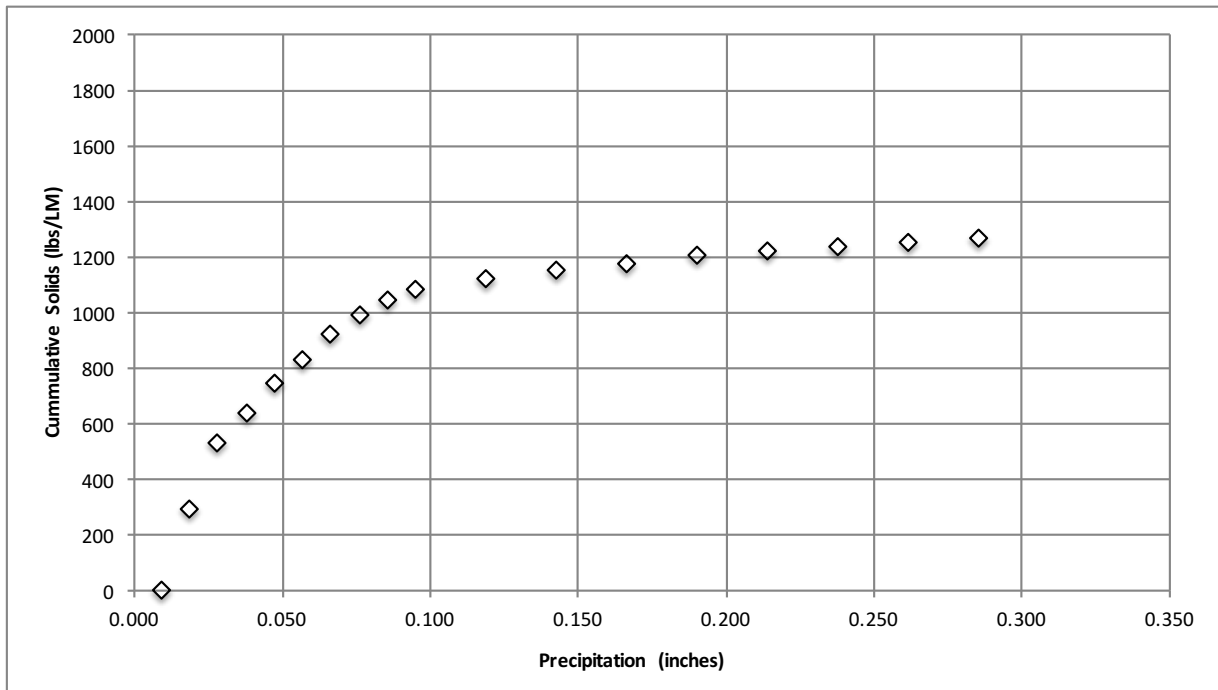
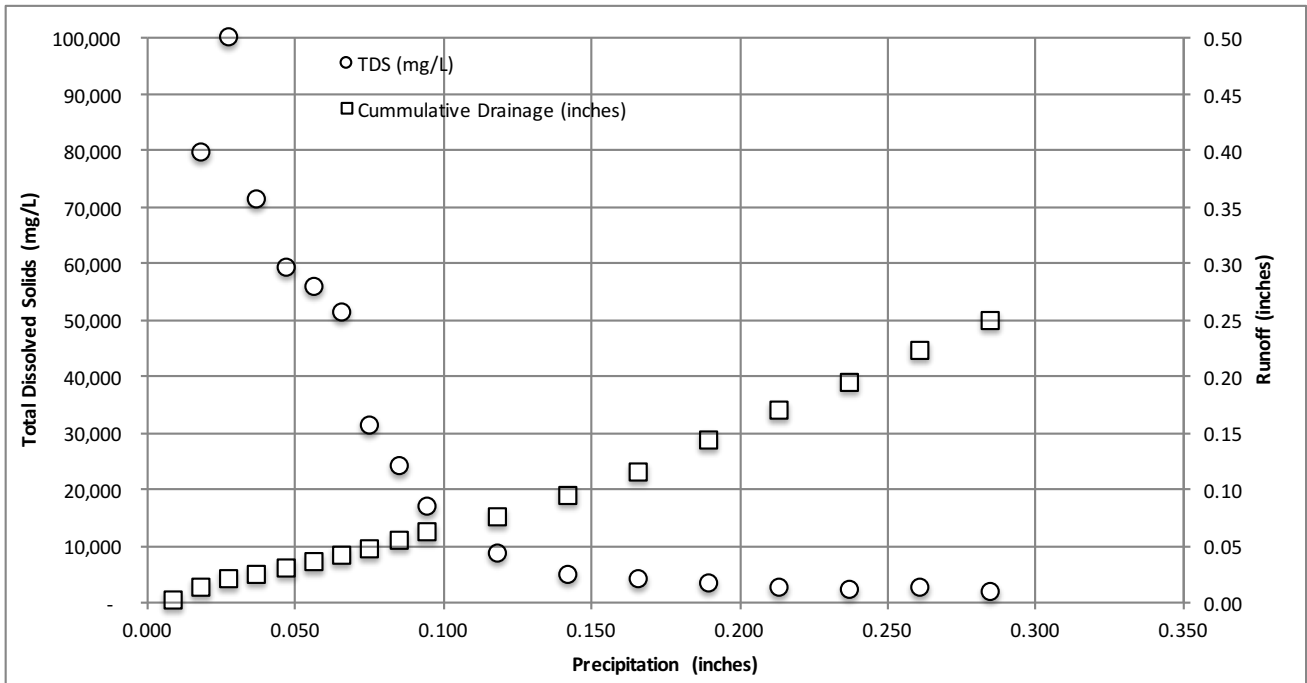


Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 16, 2016  
Pavement: Asphalt #2  
Anti Icer: RG8 100%  
Pavement  
Temperature: 18° F

Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.07670						0.00	0.010	0	0.000
20	10	2.05620	13.65530	2.97470	0.91850	11.59910	79,187	0.92	0.019	289	0.011
30	10	2.07220	9.71380	2.83240	0.76020	7.64160	99,482	1.68	0.029	528	0.018
40	10	2.03280	6.93090	2.37960	0.34680	4.89810	70,803	2.03	0.038	637	0.023
50	10	2.04330	7.85410	2.38440	0.34110	5.81080	58,701	2.37	0.048	744	0.029
60	10	2.07600	6.85280	2.34090	0.26490	4.77680	55,456	2.63	0.057	827	0.033
70	10	2.11060	7.84850	2.40260	0.29200	5.73790	50,890	2.92	0.067	919	0.039
80	10	2.09240	9.32080	2.31490	0.22250	7.22840	30,781	3.15	0.076	989	0.045
90	10	2.07720	9.32520	2.25020	0.17300	7.24800	23,869	3.32	0.086	1043	0.052
100	10	2.12130	9.41140	2.24160	0.12030	7.29010	16,502	3.44	0.095	1081	0.059
125	25	2.02160	16.93580	2.14130	0.11970	14.91420	8,026	3.56	0.119	1119	0.074
150	25	2.01330	22.02530	2.10140	0.08810	20.01200	4,402	3.65	0.143	1146	0.093
175	25	2.04530	24.14240	2.12600	0.08070	22.09710	3,652	3.73	0.167	1172	0.114
200	25	2.02950	30.75440	2.11420	0.08470	28.72490	2,949	3.81	0.191	1198	0.141
225	25	2.05040	29.68330	2.11330	0.06290	27.63290	2,276	3.88	0.215	1218	0.167
250	25	2.01990	27.94250	2.06360	0.04370	25.92260	1,686	3.92	0.238	1232	0.192
275	25	2.02180	32.04590	2.08470	0.06290	30.02410	2,095	3.98	0.262	1252	0.221
300	25	2.02100	29.02520	2.05980	0.03880	27.00420	1,437	4.02	0.286	1264	0.247

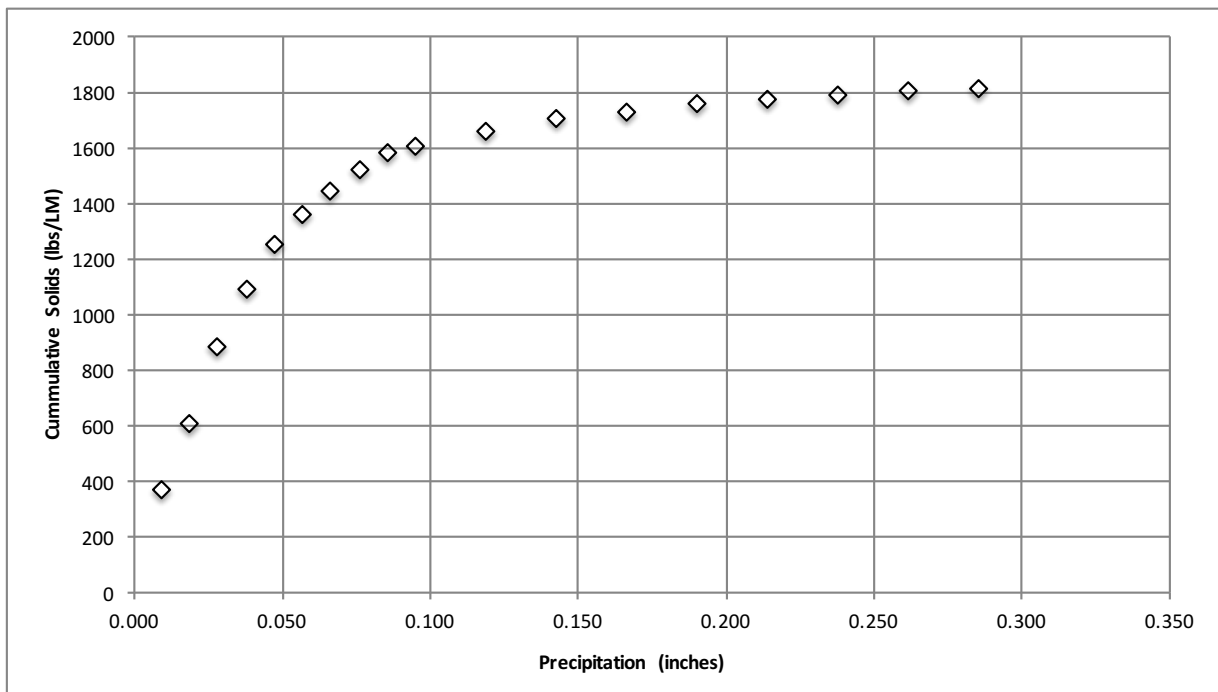
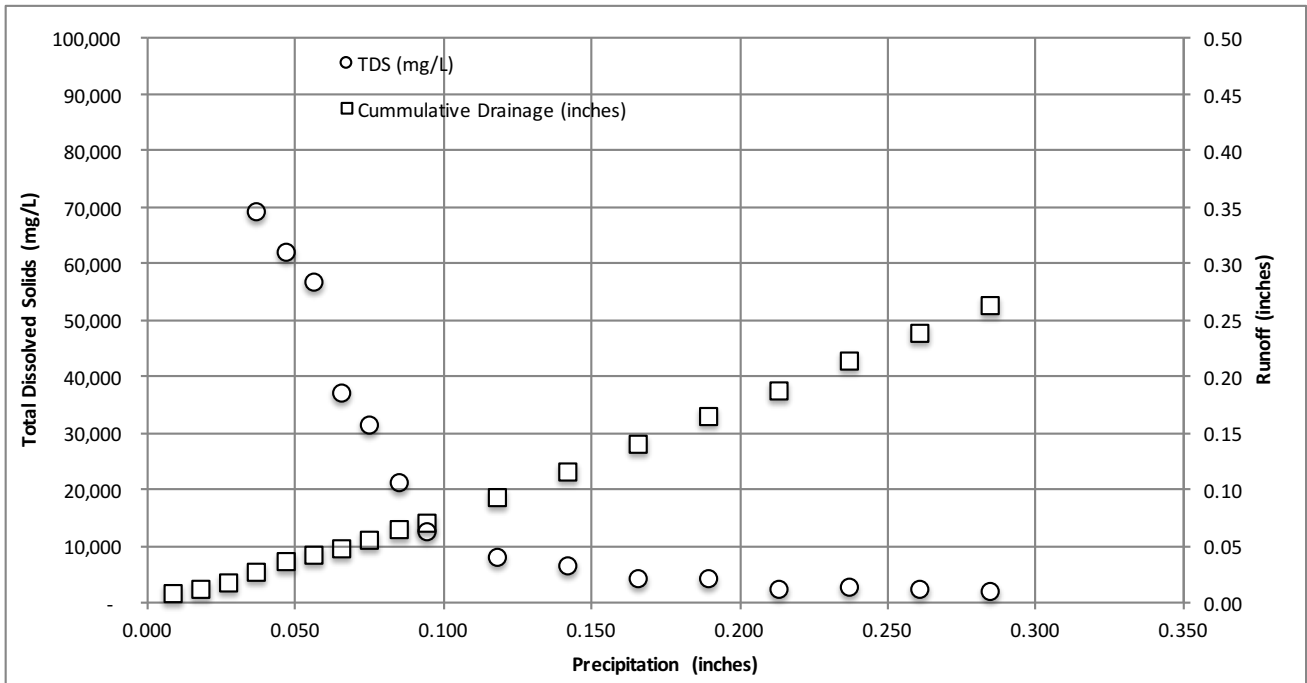




Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 16, 2016  
Pavement: Concrete #3  
Anti Icer: Freezgard 100%  
Pavement  
Temperature: 18° F

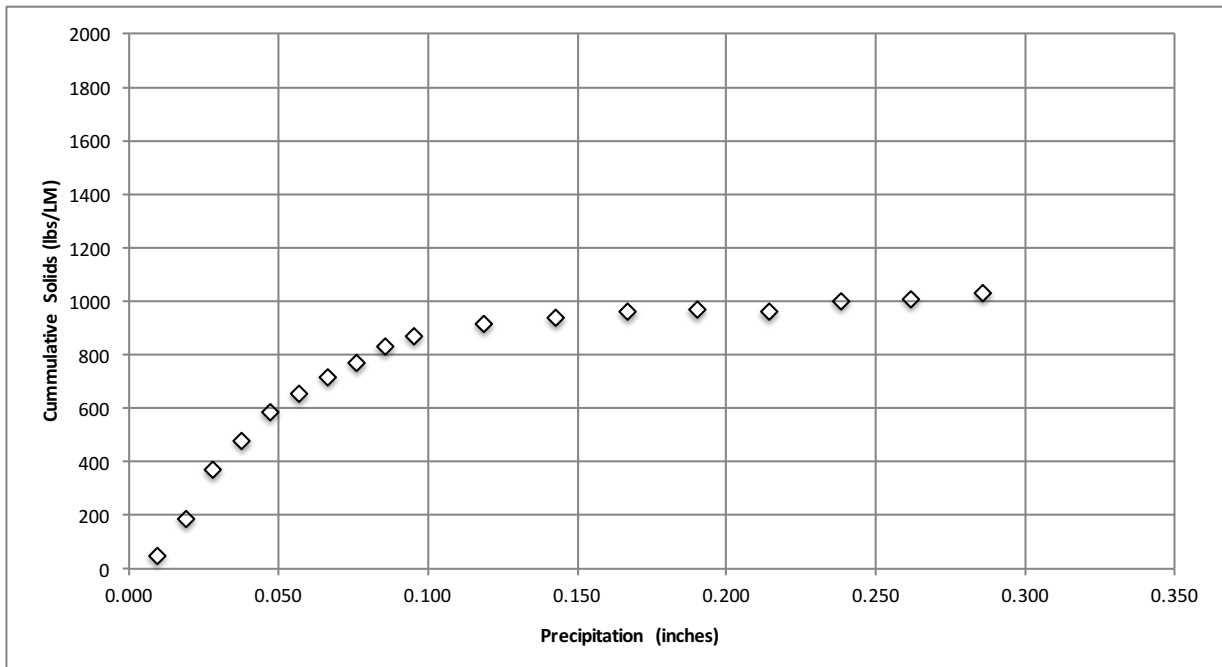
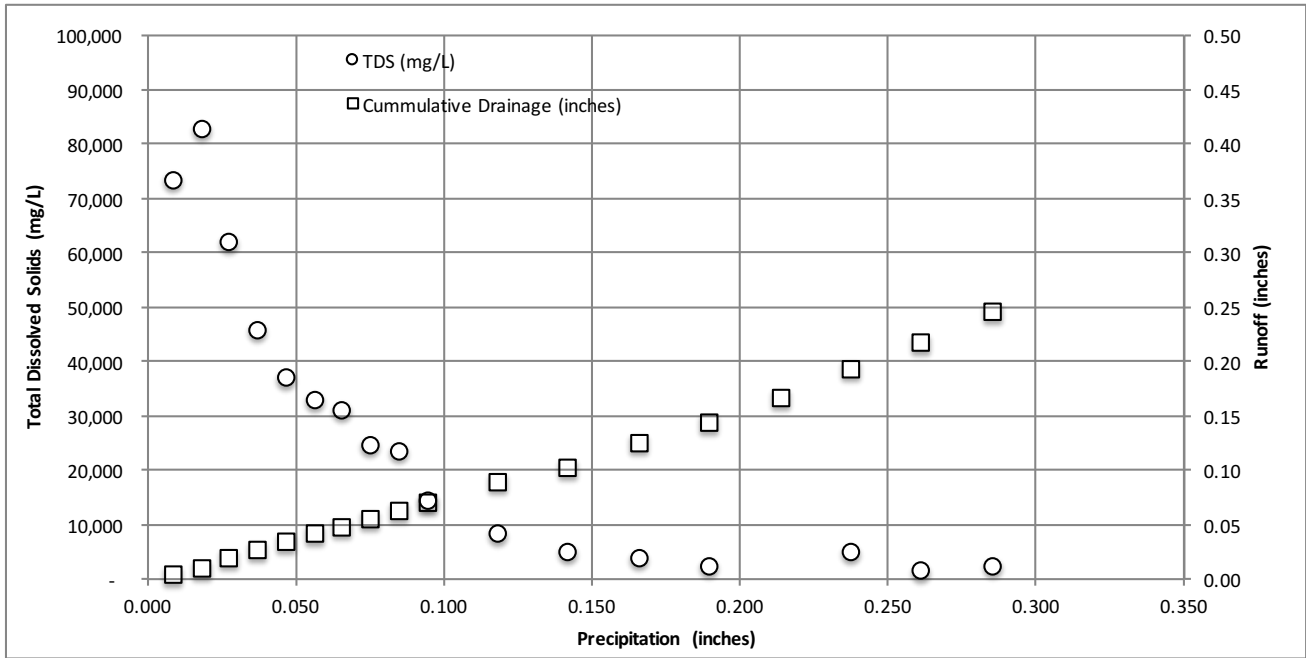
Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.03690	8.16120	3.20900	1.17210	6.12430	191,385	1.17	0.010	368	0.006
20	10	2.02350	4.54340	2.77810	0.75460	2.51990	299,456	1.93	0.019	606	0.008
30	10	2.02410	9.62880	2.89400	0.86990	7.60470	114,390	2.80	0.029	879	0.015
40	10	2.04210	11.54080	2.69270	0.65060	9.49870	68,494	3.45	0.038	1084	0.025
50	10	2.01920	10.56430	2.54510	0.52590	8.54510	61,544	3.97	0.048	1249	0.033
60	10	1.9945	7.88520	2.32570	0.33120	5.89070	56,224	4.30	0.057	1353	0.038
70	10	2.00690	9.38060	2.27640	0.26950	7.37370	36,549	4.57	0.067	1438	0.045
80	10	1.99400	10.06840	2.24230	0.24830	8.07440	30,752	4.82	0.076	1516	0.053
90	10	1.99640	11.17760	2.18530	0.18890	9.18120	20,575	5.01	0.086	1575	0.062
100	10	2.05350	8.27850	2.12890	0.07540	6.22500	12,112	5.09	0.095	1599	0.068
125	25	2.00520	25.33630	2.17830	0.17310	23.33110	7,419	5.26	0.119	1653	0.090
150	25	2.00570	26.75850	2.14810	0.14240	24.75280	5,753	5.40	0.143	1698	0.114
175	25	2.00640	26.96670	2.09660	0.09020	24.96030	3,614	5.49	0.167	1726	0.137
200	25	1.99490	28.06840	2.09500	0.10010	26.07350	3,839	5.59	0.191	1758	0.162
225	25	2.00600	26.22670	2.04460	0.03860	24.22070	1,594	5.63	0.215	1770	0.185
250	25	1.99720	29.09030	2.05100	0.05380	27.09310	1,986	5.68	0.238	1787	0.211
275	25	2.01300	27.29000	2.05450	0.04150	25.27700	1,642	5.73	0.262	1800	0.235
300	25	1.99780	28.34660	2.03280	0.03500	26.34880	1,328	5.76	0.286	1811	0.260



Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 16, 2016  
Pavement: Asphalt #4  
Anti Icer: RG8 10% Salt Brine 90%  
Pavement  
Temperature: 18° F

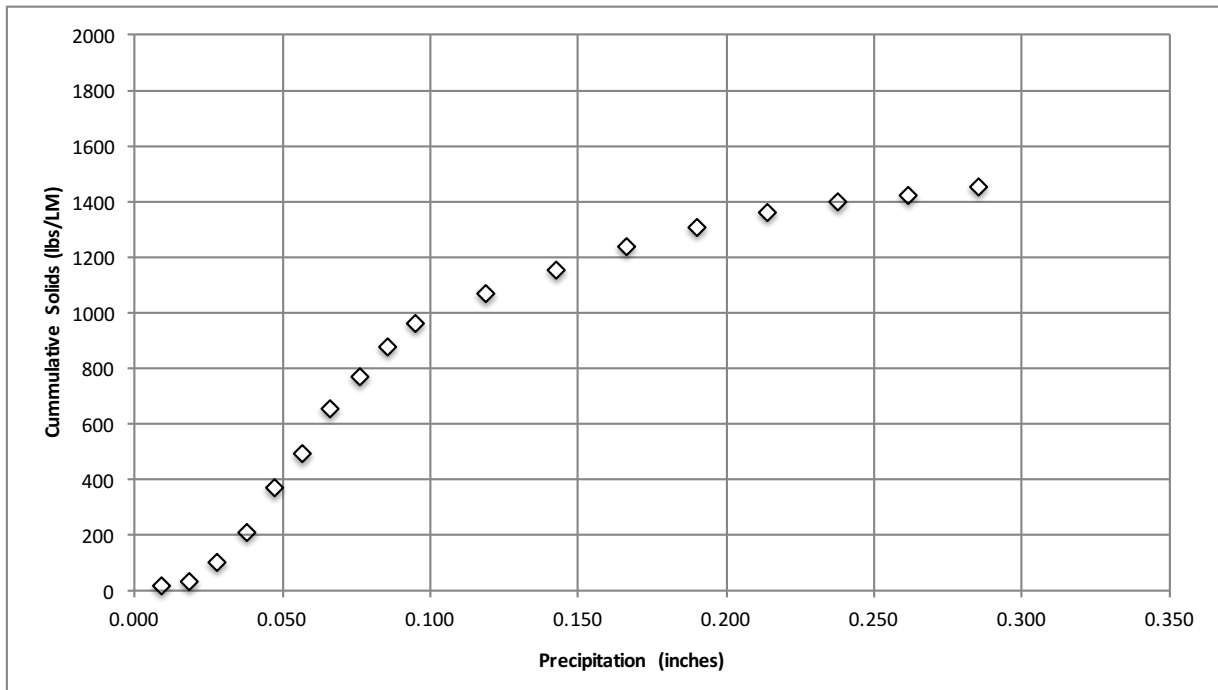
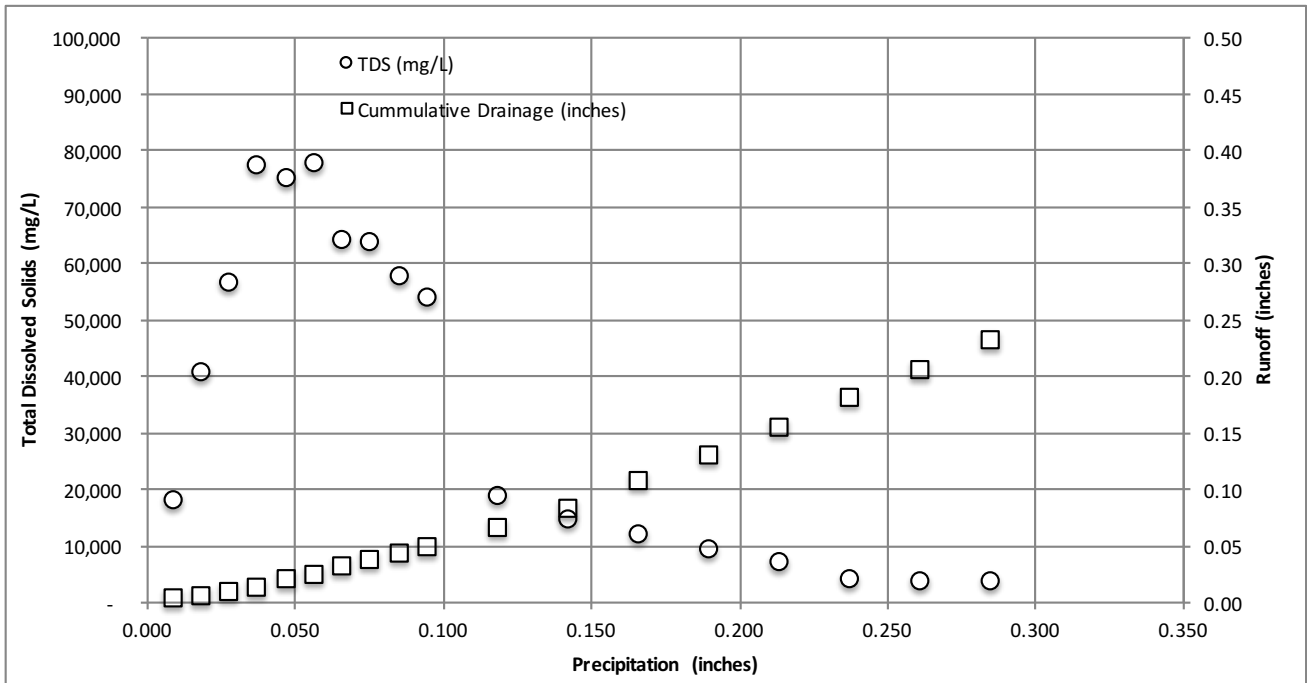
Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.02440	3.83260	2.15600	0.13160	1.80820	72,780	0.13	0.010	41	0.002
20	10	2.04510	7.60660	2.50180	0.45670	5.56150	82,118	0.59	0.019	185	0.007
30	10	2.06560	11.41040	2.63830	0.57270	9.34480	61,285	1.16	0.029	365	0.016
40	10	2.04040	9.83510	2.39360	0.35320	7.79470	45,313	1.51	0.038	476	0.023
50	10	2.02250	11.39430	2.36430	0.34180	9.37180	36,471	1.86	0.048	583	0.032
60	10	2.01330	8.90240	2.23520	0.22190	6.88910	32,210	2.08	0.057	653	0.039
70	10	2.02410	8.08500	2.20870	0.18460	6.06090	30,458	2.26	0.067	711	0.045
80	10	2.02530	9.29070	2.19980	0.17450	7.26540	24,018	2.44	0.076	766	0.052
90	10	2.00740	10.83910	2.21040	0.20300	8.83170	22,985	2.64	0.086	830	0.060
100	10	2.03320	9.24220	2.13280	0.09960	7.20900	13,816	2.74	0.095	861	0.067
125	25	2.00020	22.53840	2.15910	0.15890	20.53820	7,737	2.90	0.119	911	0.086
150	25	2.01380	16.01300	2.07760	0.06380	13.99920	4,557	2.96	0.143	931	0.100
175	25	2.03500	25.14270	2.11360	0.07860	23.10770	3,401	3.04	0.167	956	0.122
200	25	2.02200	22.66840	2.0611	0.03910	20.64640	1,894	3.08	0.191	968	0.142
225	25	2.05850	24.79310	2.01770	-0.04080	22.73460	(1,795)	3.04	0.215	955	0.163
250	25	1.98610	30.07190	2.11440	0.12830	28.08580	4,568	3.17	0.238	996	0.190
275	25	2.00980	28.03180	2.04020	0.03040	26.02200	1,168	3.20	0.262	1005	0.215
300	25	1.99900	31.34040	2.05340	0.05440	29.34140	1,854	3.25	0.286	1022	0.243



Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 17, 2016  
Pavement: Concrete #1  
Anti Icer: Molasses 50% Salt Brine 50%  
Pavement  
Temperature: 24° F

Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.09200	4.34020	2.13170	0.03970	2.24820	17,659	0.04	0.010	12	0.002
20	10	2.07660	3.58880	2.13730	0.06070	1.51220	40,140	0.10	0.019	32	0.004
30	10	2.07050	5.76980	2.27810	0.20760	3.69930	56,119	0.31	0.029	97	0.007
40	10	2.09530	6.43550	2.42940	0.33410	4.34020	76,978	0.64	0.038	202	0.011
50	10	2.06570	9.12560	2.59360	0.52790	7.05990	74,774	1.17	0.048	368	0.018
60	10	2.07740	7.00470	2.45830	0.38090	4.92730	77,304	1.55	0.057	488	0.023
70	10	2.09040	10.03160	2.59550	0.50510	7.94120	63,605	2.06	0.067	646	0.030
80	10	2.06660	7.92980	2.43780	0.37120	5.86320	63,310	2.43	0.076	763	0.036
90	10	2.07070	8.27480	2.42720	0.35650	6.20410	57,462	2.78	0.086	875	0.042
100	10	2.08650	6.94490	2.34570	0.25920	4.85840	53,351	3.04	0.095	957	0.046
125	25	2.0741	20.17940	2.40860	0.33450	18.10530	18,475	3.38	0.119	1062	0.064
150	25	2.10270	20.65540	2.36720	0.26450	18.55270	14,257	3.64	0.143	1145	0.081
175	25	2.09590	26.29850	2.37970	0.28380	24.20260	11,726	3.93	0.167	1234	0.104
200	25	2.09510	26.89360	2.31940	0.22430	24.79850	9,045	4.15	0.191	1305	0.128
225	25	2.08860	28.15000	2.26320	0.17460	26.06140	6,700	4.32	0.215	1359	0.153
250	25	2.09690	29.28210	2.19900	0.10210	27.18520	3,756	4.43	0.238	1392	0.179
275	25	2.08470	26.86720	2.16540	0.08070	24.78250	3,256	4.51	0.262	1417	0.202
300	25	2.08920	31.44180	2.18440	0.09520	29.35260	3,243	4.60	0.286	1447	0.230

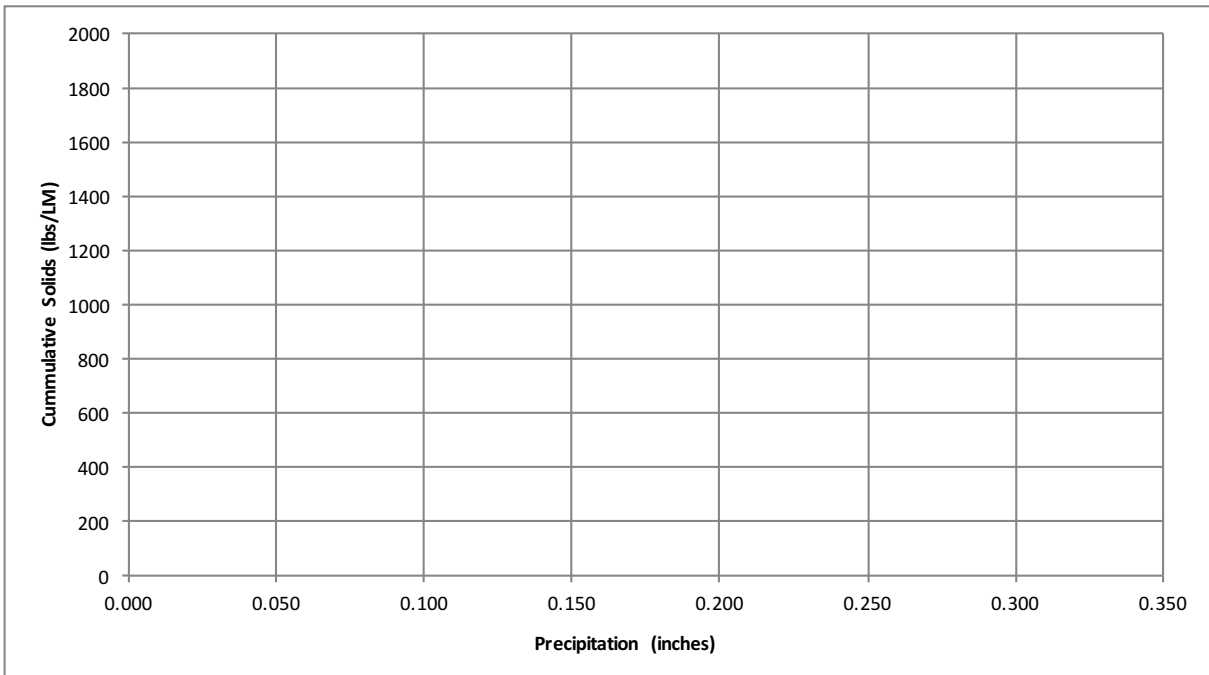
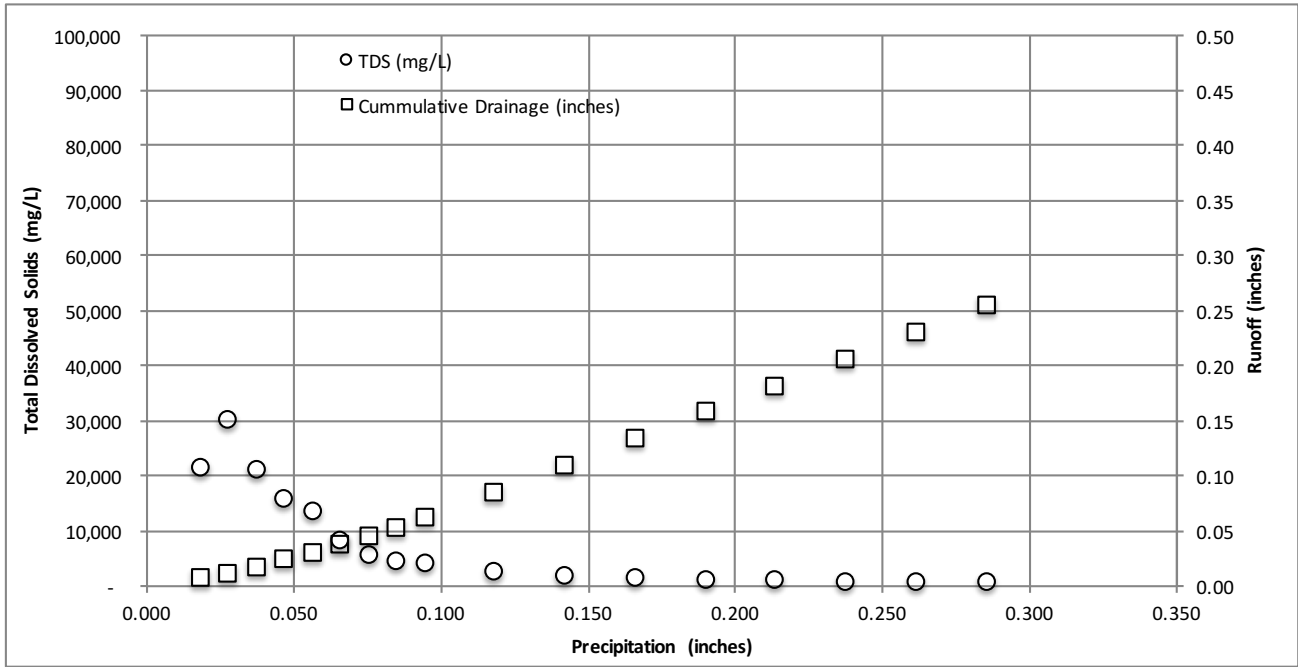


Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 17, 2016  
Pavement: Asphalt #2  
Anti Icer: Molasses 0% Salt Brine 50%  
Pavement  
Temperature: 24° F

Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cumulative Solids (g)	Precip Total (inches)	Cumulative Solids (lbs/LM)	Cumulative Drainage (inches)
10	10	2.10280			-2.10280	-2.10280	1,000,000	-2.10	0.010	-661	-0.002
20	10	2.07260	8.85800	2.21560	0.14300	6.78540	21,075	-1.96	0.019	-616	0.004
30	10	2.08740	7.17600	2.23910	0.15170	5.08860	29,812	-1.81	0.029	-568	0.009
40	10	2.10150	7.82320	2.21930	0.11780	5.72170	20,588	-1.69	0.038	-531	0.015
50	10	2.07750	9.34310	2.18800	0.11050	7.26560	15,209	-1.58	0.048	-497	0.022
60	10	2.10460	7.79670	2.17870	0.07410	5.69210	13,018	-1.51	0.057	-473	0.027
70	10	2.09070	9.95120	2.15200	0.06130	7.86050	7,798	-1.44	0.067	-454	0.035
80	10	2.10090	9.95510	2.14270	0.04180	7.85420	5,322	-1.40	0.076	-441	0.042
90	10	2.09740	11.74050	2.13510	0.03770	9.64310	3,910	-1.36	0.086	-429	0.051
100	10	2.08200	10.63910	2.11190	0.02990	8.55710	3,494	-1.34	0.095	-420	0.059
125	25	2.07660	26.40610	2.12810	0.05150	24.32950	2,117	-1.28	0.119	-403	0.083
150	25	2.07430	27.86110	2.11130	0.03700	25.78680	1,435	-1.25	0.143	-392	0.107
175	25	2.10060	27.27870	2.12380	0.02320	25.17810	921	-1.22	0.167	-385	0.131
200	25	2.07900	28.41060	2.09920	0.02020	26.33160	767	-1.20	0.191	-378	0.156
225	25	2.06570	25.90130	2.07850	0.01280	23.83560	537	-1.19	0.215	-374	0.179
250	25	2.08820	27.27880	2.09720	0.00900	25.19060	357	-1.18	0.238	-371	0.203
275	25	2.07570	28.20100	2.08400	0.00830	26.12530	318	-1.17	0.262	-369	0.228
300	25	2.07710	27.05390	2.08480	0.00770	24.97680	308	-1.17	0.286	-366	0.252

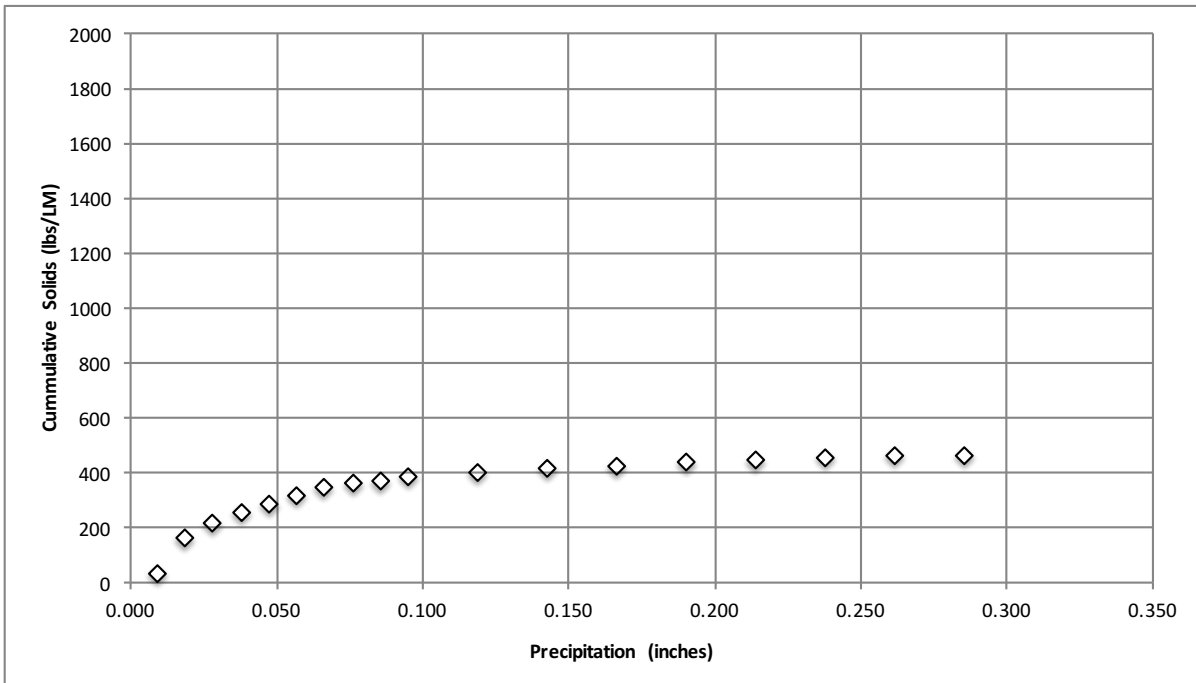
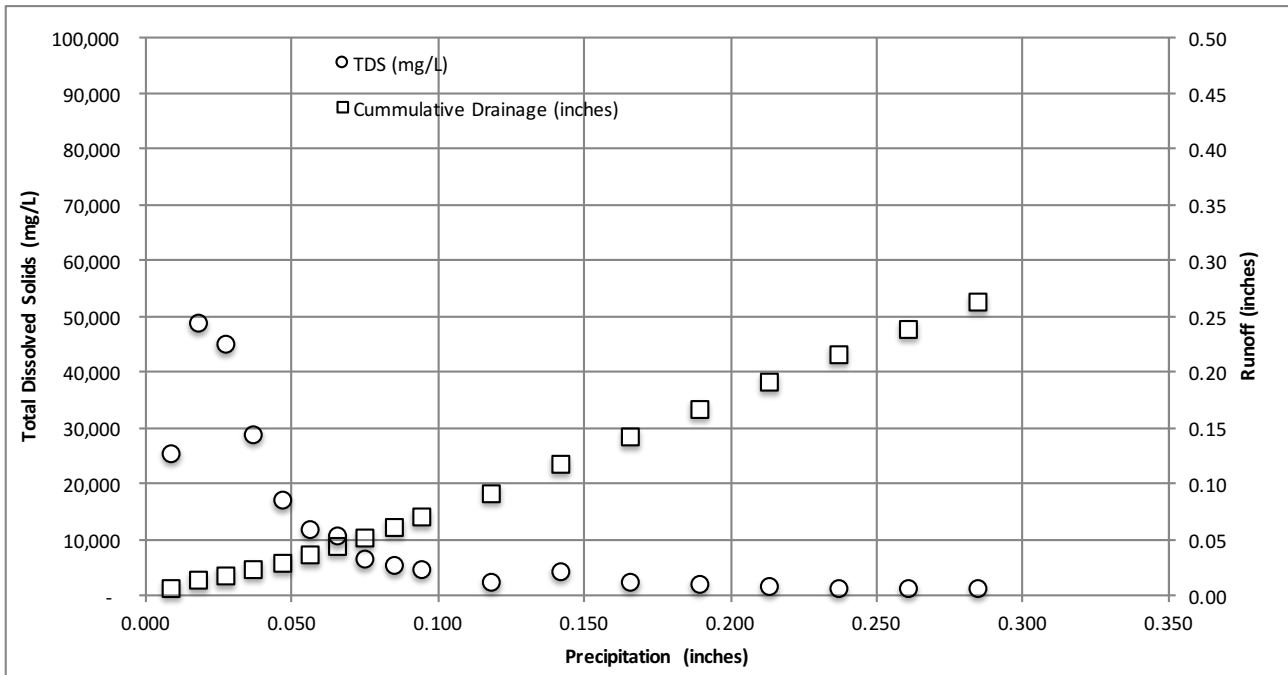




Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 17, 2016  
Pavement: Concrete #3  
Anti Icer: Molasses 12.5% Salt Brine 50%  
Pavement  
Temperature: 24° F

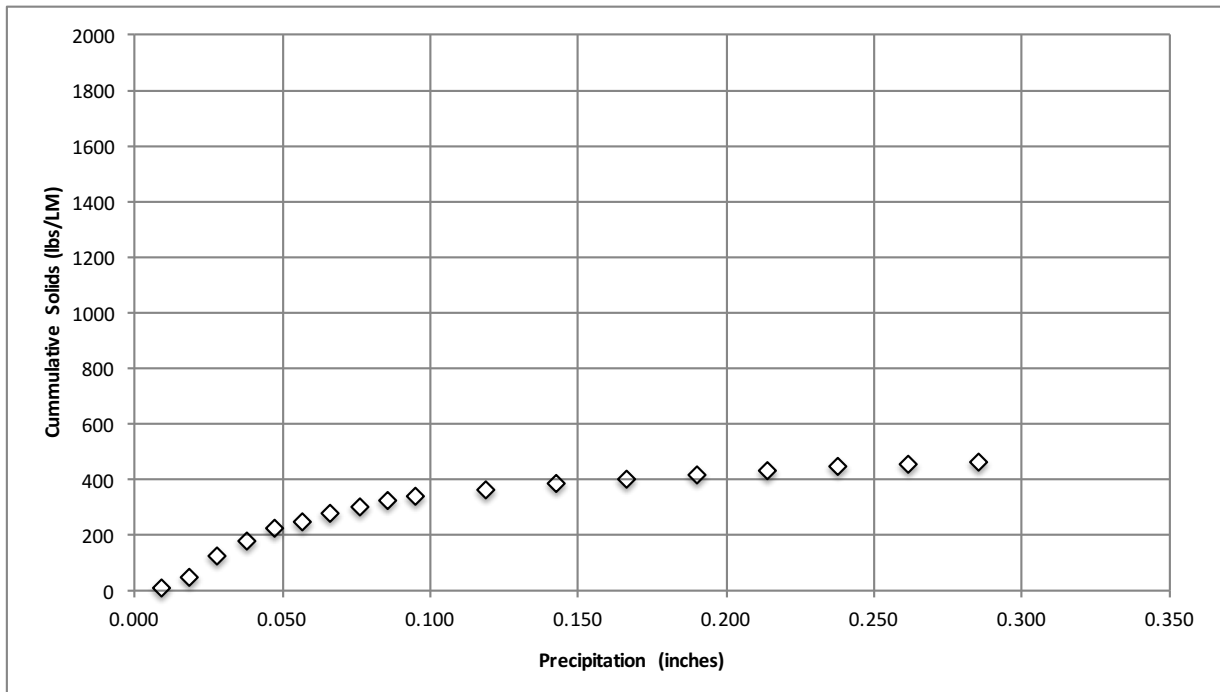
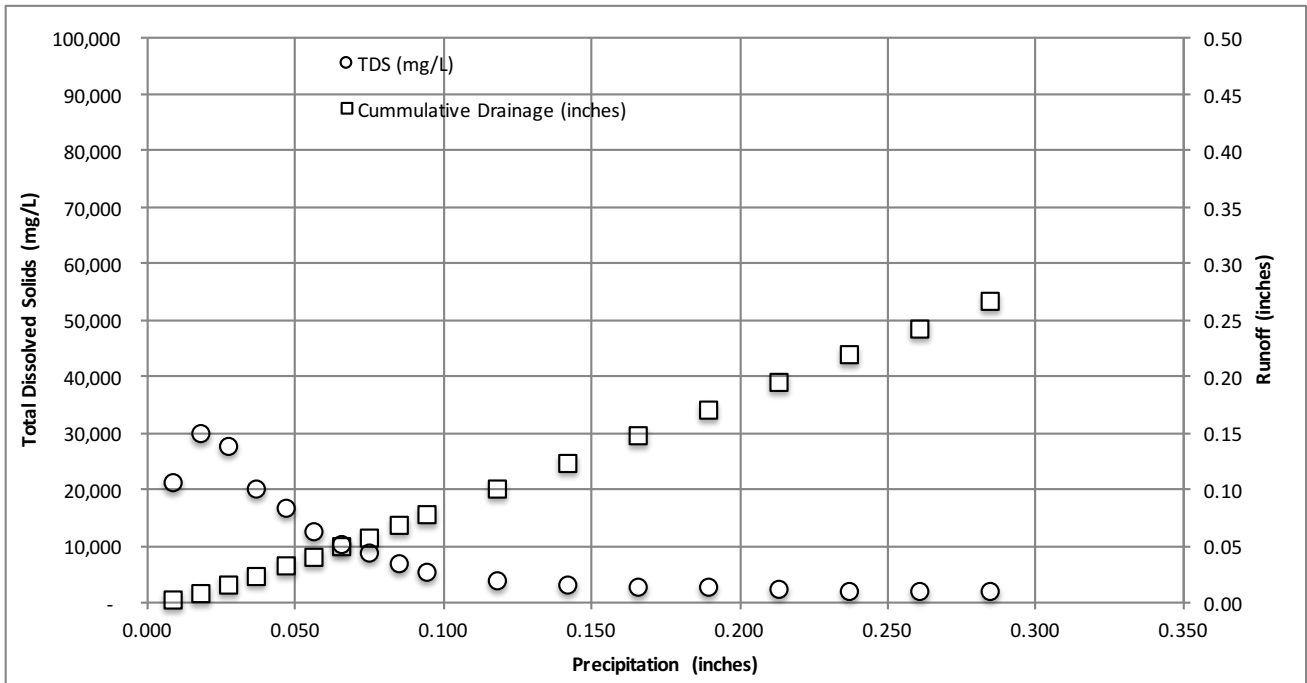
Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.09640	5.84930	2.18920	0.09280	3.75290	24,728	0.09	0.010	29	0.004
20	10	2.08030	10.61780	2.49050	0.41020	8.53750	48,047	0.50	0.019	158	0.012
30	10	2.07880	5.99530	2.25270	0.17390	3.91650	44,402	0.68	0.029	213	0.015
40	10	2.07500	6.52570	2.20090	0.12590	4.45070	28,288	0.80	0.038	252	0.020
50	10	2.05380	8.06880	2.15280	0.09900	6.01500	16,459	0.90	0.048	283	0.025
60	10	2.07700	10.91660	2.17690	0.09990	8.83960	11,301	1.00	0.057	315	0.034
70	10	2.06880	10.15850	2.15010	0.08130	8.08970	10,050	1.08	0.067	340	0.042
80	10	2.06240	10.04940	2.11060	0.04820	7.98700	6,035	1.13	0.076	356	0.049
90	10	2.09540	10.97080	2.13690	0.04150	8.87540	4,676	1.17	0.086	369	0.058
100	10	2.07170	11.38630	2.10910	0.03740	9.31460	4,015	1.21	0.095	380	0.067
125	25	2.09880	25.41240	2.14090	0.04210	23.31360	1,806	1.25	0.119	394	0.089
150	25	2.07340	28.30200	2.12100	0.04760	26.22860	3,592	1.30	0.143	409	0.114
175	25	2.07940	28.10600	2.12590	0.04650	26.02660	1,787	1.35	0.167	423	0.139
200	25	2.07280	28.65680	2.10710	0.03430	26.58400	1,290	1.38	0.191	434	0.164
225	25	2.04990	27.20410	2.07800	0.02810	25.15420	1,117	1.41	0.215	443	0.188
250	25	2.02980	27.23100	2.05000	0.02020	25.20120	802	1.43	0.238	449	0.212
275	25	2.04490	26.85340	2.06390	0.01900	24.80850	766	1.45	0.262	455	0.236
300	25	2.06310	27.34270	2.07990	0.01680	25.27960	665	1.46	0.286	460	0.260



Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 17, 2016  
Pavement: Asphalt #4  
Anti Icer: Molasses 25% Salt Brine 50%  
Pavement  
Temperature: 24° F

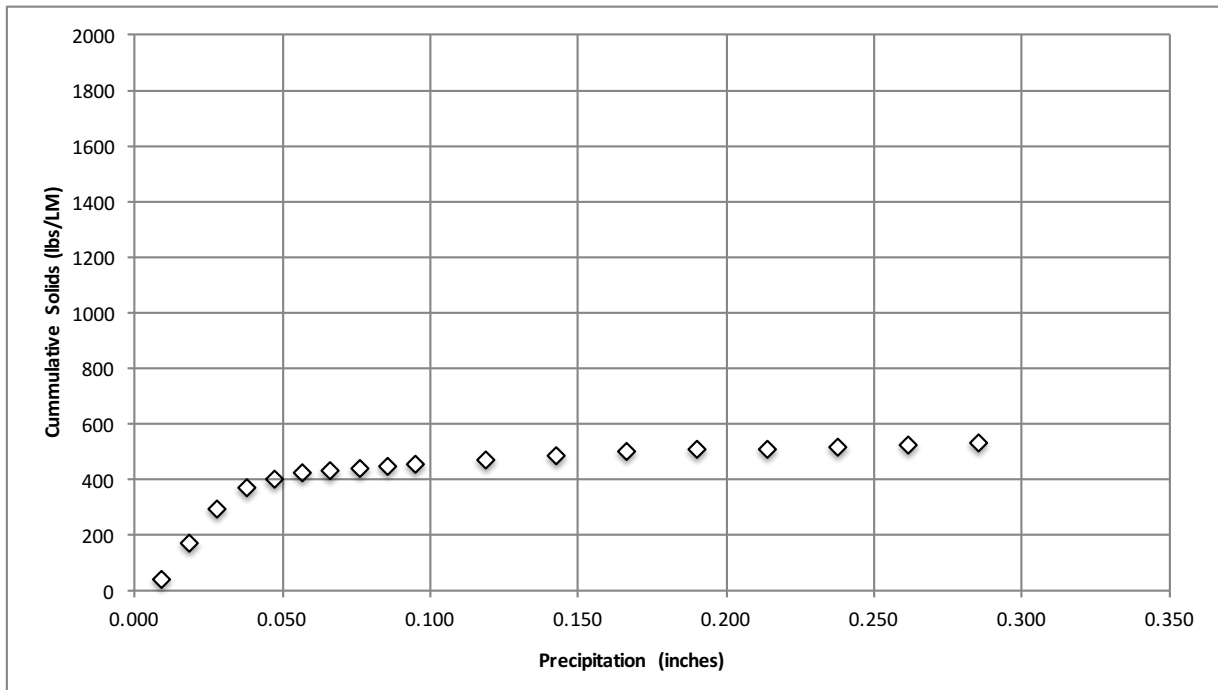
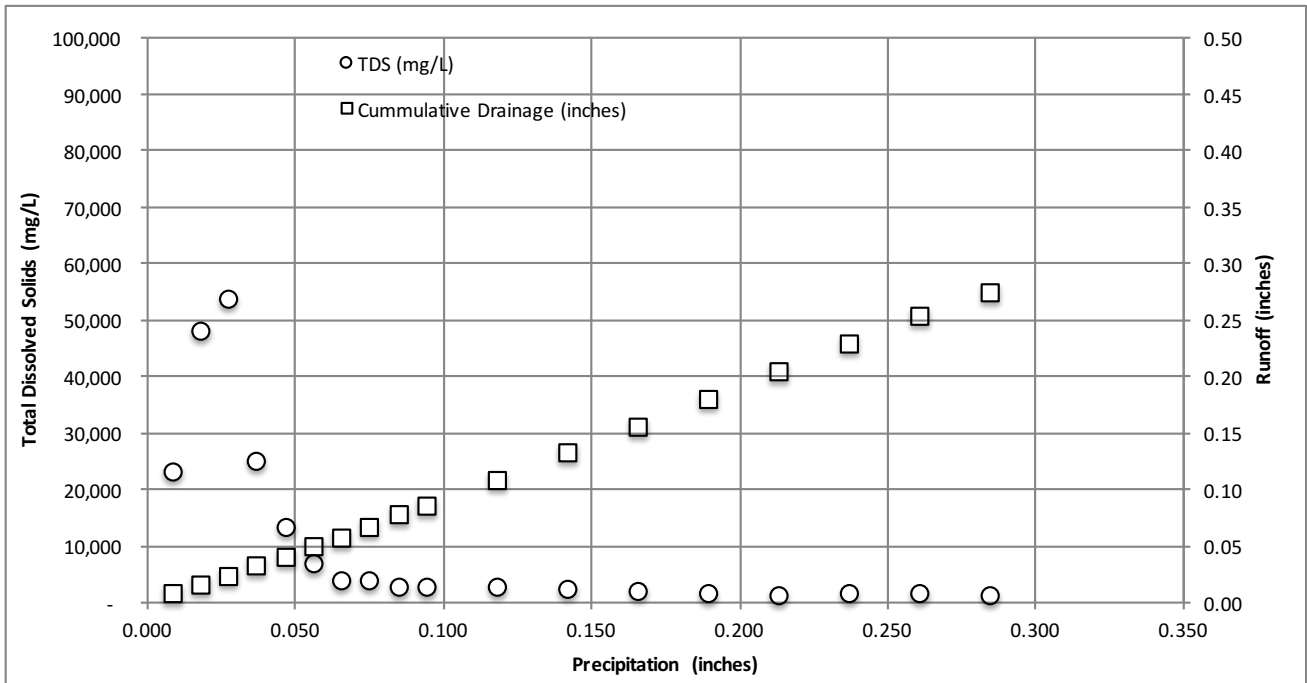
Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.02980	2.41230	2.03770	0.00790	0.38250	20,654	0.01	0.010	2	0.000
20	10	2.01970	6.82050	2.16090	0.14120	4.80080	29,412	0.15	0.019	47	0.005
30	10	2.02720	11.10620	2.27260	0.24540	9.07900	27,029	0.39	0.029	124	0.014
40	10	2.03020	9.69790	2.17970	0.14950	7.66770	19,497	0.54	0.038	171	0.021
50	10	2.02950	11.32540	2.17850	0.14900	9.29590	16,029	0.69	0.048	218	0.030
60	10	2.02090	9.23800	2.10710	0.08620	7.21710	11,944	0.78	0.057	245	0.037
70	10	2.02310	12.90420	2.12760	0.10450	10.88110	9,604	0.88	0.067	278	0.047
80	10	2.04900	9.62120	2.11240	0.06340	7.57220	8,373	0.95	0.076	298	0.054
90	10	2.04700	13.46860	2.11820	0.07120	11.42160	6,234	1.02	0.086	320	0.065
100	10	2.03840	11.52760	2.08510	0.04670	9.48920	4,921	1.07	0.095	335	0.074
125	25	2.03500	27.49250	2.11500	0.08000	25.45750	3,142	1.15	0.119	360	0.098
150	25	2.04350	25.56310	2.10670	0.06320	23.51960	2,687	1.21	0.143	380	0.121
175	25	2.05810	27.78360	2.11250	0.05440	25.72550	2,115	1.26	0.167	397	0.145
200	25	2.08960	25.93350	2.14240	0.05280	23.84390	2,214	1.32	0.191	414	0.168
225	25	2.04510	27.93110	2.08980	0.04470	25.88600	1,727	1.36	0.215	428	0.193
250	25	2.02130	27.37520	2.06010	0.03880	25.35390	1,530	1.40	0.238	440	0.217
275	25	2.05890	24.78060	2.09080	0.03190	22.72170	1,404	1.43	0.262	450	0.239
300	25	2.04870	28.05860	2.08740	0.03870	26.00990	1,488	1.47	0.286	462	0.263



Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 19, 2016  
Pavement: Concrete #1  
Anti Icer: Molasses 25% Salt Brine 50%  
Pavement  
Temperature: 24° F

Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.08500	6.88180	2.19260	0.10760	4.79680	22,432	0.11	0.010	34	0.005
20	10	2.07790	10.77100	2.48970	0.41180	8.69310	47,371	0.52	0.019	163	0.013
30	10	2.07570	9.59820	2.47430	0.39860	7.52250	52,988	0.92	0.029	289	0.020
40	10	2.07760	12.46570	2.33160	0.25400	10.38810	24,451	1.17	0.038	368	0.030
50	10	2.08500	9.74830	2.18300	0.09800	7.66330	12,788	1.27	0.048	399	0.037
60	10	2.08470	12.03690	2.14760	0.06290	9.95220	6,320	1.33	0.057	419	0.047
70	10	2.09140	10.83720	2.12060	0.02920	8.74580	3,339	1.36	0.067	428	0.055
80	10	2.06020	11.43080	2.09130	0.03110	9.37060	3,319	1.39	0.076	438	0.064
90	10	2.08910	13.06740	2.11330	0.02420	10.97830	2,204	1.42	0.086	446	0.074
100	10	2.07120	10.83730	2.09150	0.02030	8.76610	2,316	1.44	0.095	452	0.083
125	25	2.0742	26.15630	2.12560	0.05140	24.08210	2,134	1.49	0.119	468	0.106
150	25	2.08400	26.34030	2.13070	0.04670	24.25630	1,925	1.54	0.143	483	0.129
175	25	2.08420	27.68150	2.11800	0.03380	25.59730	1,320	1.57	0.167	493	0.153
200	25	2.09450	27.24970	2.12060	0.02610	25.15520	1,038	1.60	0.191	502	0.177
225	25	2.07210	27.36060	2.08820	0.01610	25.28850	637	1.61	0.215	507	0.201
250	25	2.12510	27.51630	2.14880	0.02370	25.39120	933	1.64	0.238	514	0.226
275	25	2.11120	27.35240	2.13430	0.02310	25.24120	915	1.66	0.262	521	0.250
300	25	2.09910	24.99380	2.11160	0.01250	22.89470	546	1.67	0.286	525	0.272

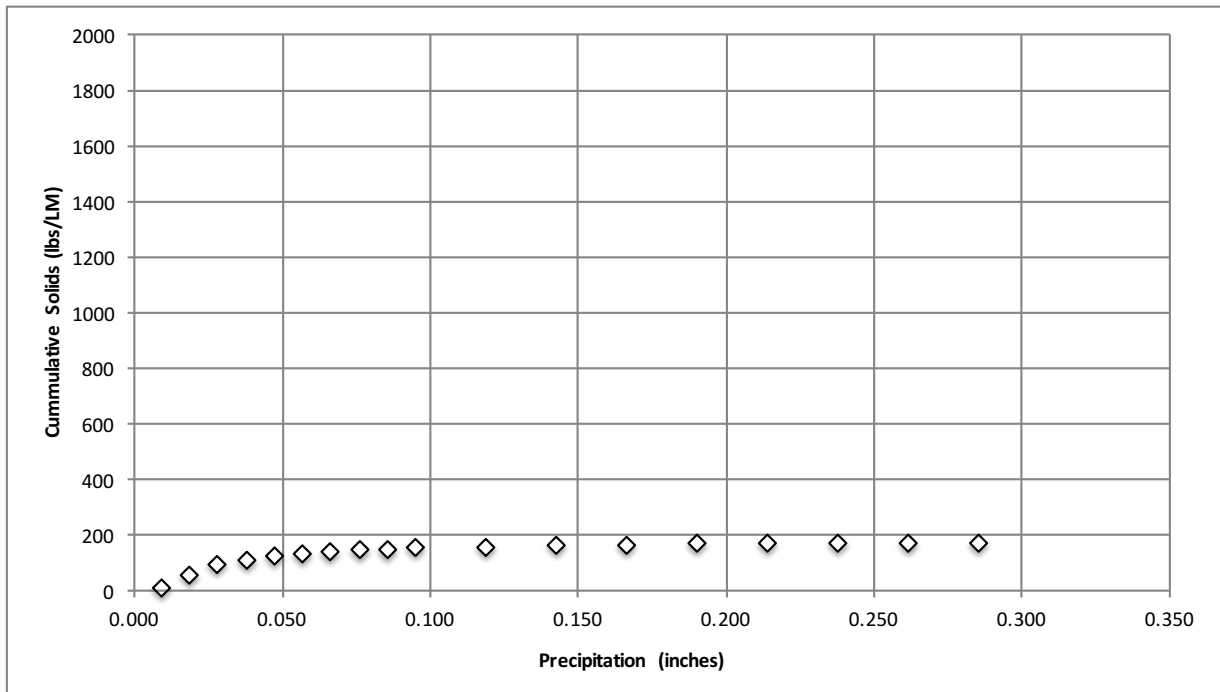
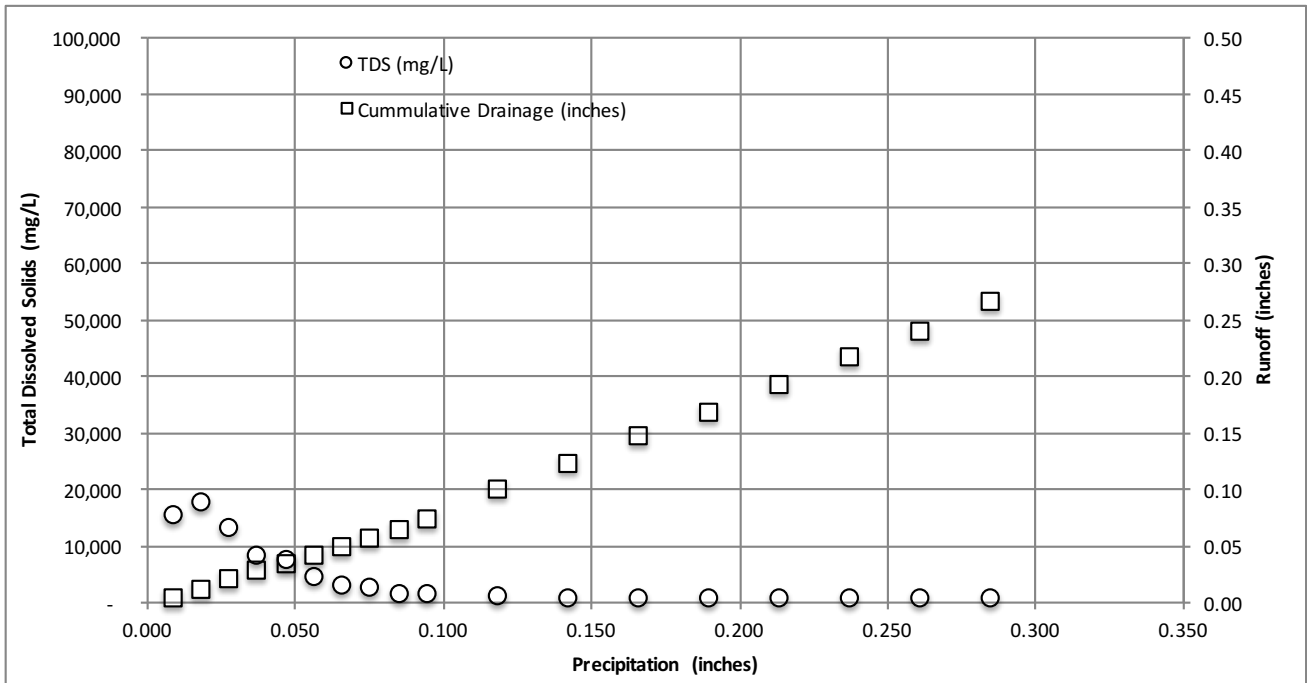


Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 19, 2016  
Pavement: Asphalt #2  
Anti Icer: Ethanol 25% Salt Brine 50%  
Pavement  
Temperature: 24° F

Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.20180	4.18900	2.23180	0.03000	1.98720	15,097	0.03	0.010	9	0.002
20	10	2.14390	9.92900	2.27910	0.13520	7.78510	17,367	0.17	0.019	52	0.009
30	10	2.17690	11.12310	2.29180	0.11490	8.94620	12,843	0.28	0.029	88	0.018
40	10	2.13780	9.75960	2.19800	0.06020	7.62180	7,898	0.34	0.038	107	0.025
50	10	2.09360	9.16540	2.14270	0.04910	7.07180	6,943	0.39	0.048	122	0.032
60	10	2.18970	9.70370	2.21880	0.02910	7.51400	3,873	0.42	0.057	132	0.039
70	10	2.19030	10.39570	2.20970	0.01940	8.20540	2,364	0.44	0.067	138	0.047
80	10	2.13320	9.20880	2.14980	0.01660	7.07560	2,346	0.45	0.076	143	0.054
90	10	2.19970	10.08930	2.20820	0.00850	7.88960	1,077	0.46	0.086	146	0.061
100	10	2.16400	12.73320	2.17380	0.00980	10.56920	927	0.47	0.095	149	0.071
125	25	2.09440	28.95420	2.11430	0.01990	26.85980	741	0.49	0.119	155	0.097
150	25	2.17150	27.10850	2.18230	0.01080	24.93700	433	0.50	0.143	158	0.121
175	25	2.15850	26.92870	2.16920	0.01070	24.77020	432	0.51	0.167	162	0.144
200	25	2.10020	25.20830	2.10770	0.00750	23.10810	325	0.52	0.191	164	0.166
225	25	2.16890	27.81620	2.17340	0.00450	25.64730	175	0.53	0.215	165	0.191
250	25	2.20170	26.91340	2.20710	0.00540	24.71170	219	0.53	0.238	167	0.214
275	25	2.10860	27.25930	2.11350	0.00490	25.15070	195	0.54	0.262	169	0.238
300	25	2.10970	28.19450	2.11420	0.00450	26.08480	173	0.54	0.286	170	0.263

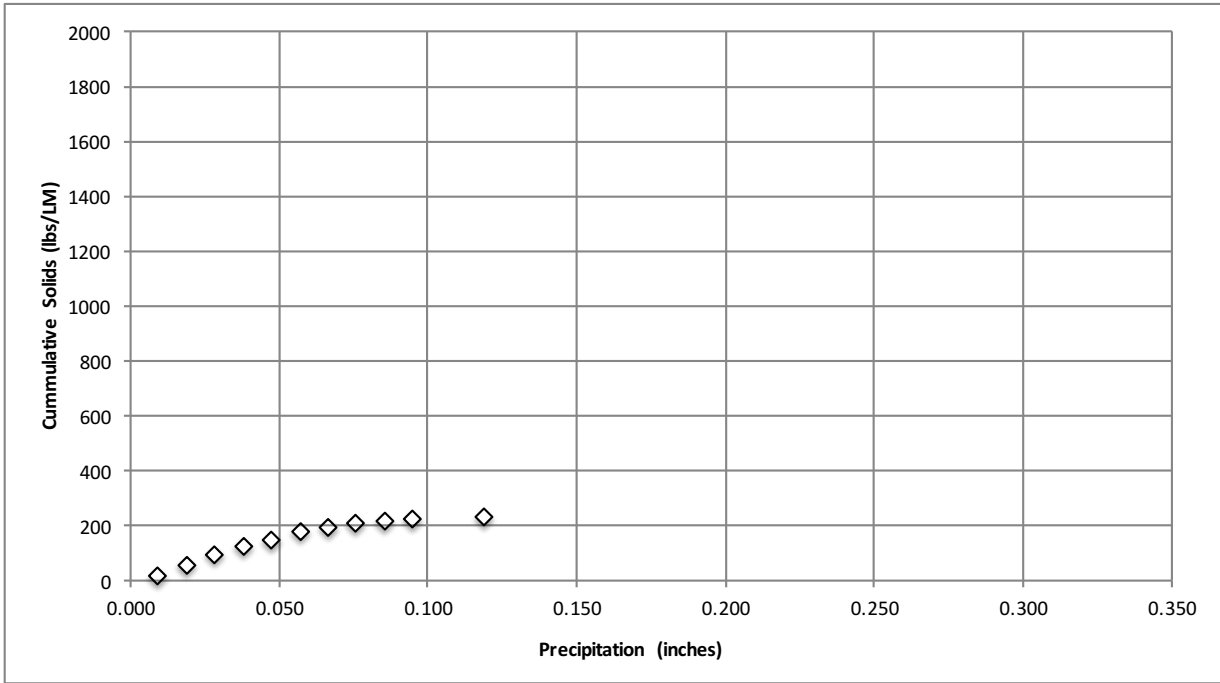
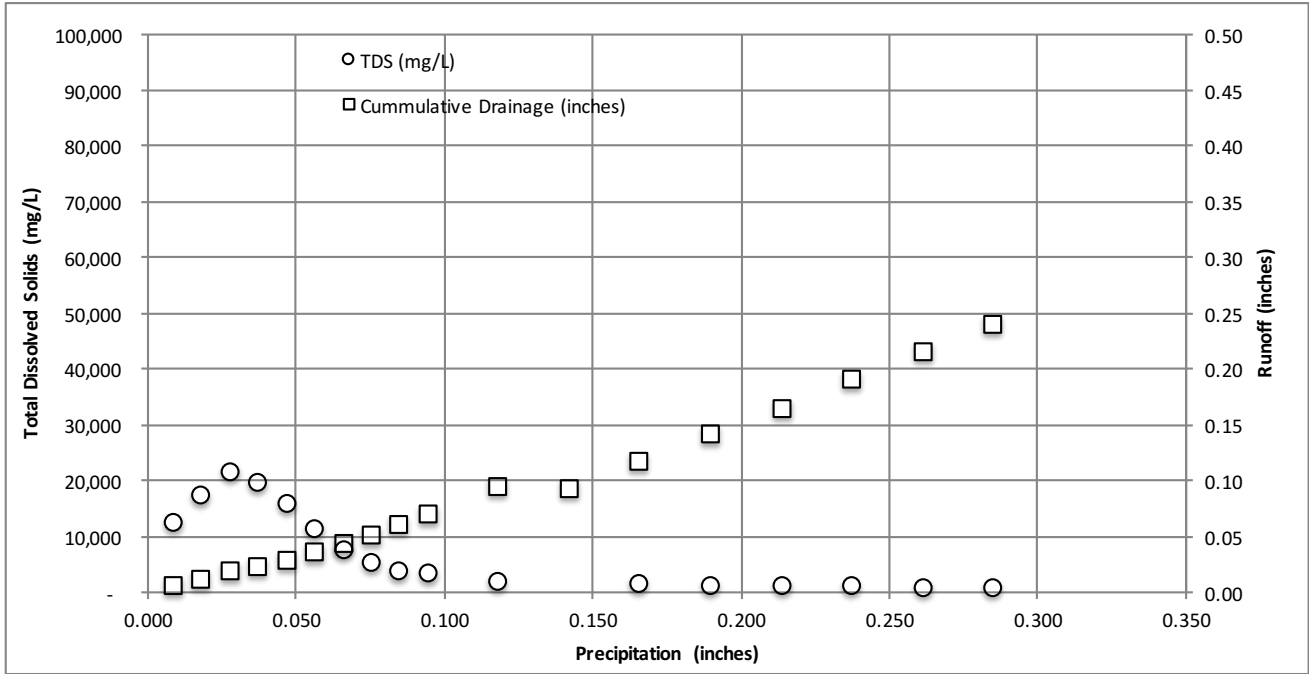




Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

Test Date: May 19, 2016  
Pavement: Concrete #3  
Anti Icer: Salt Brine 50%  
Pavement  
Temperature: 24° F

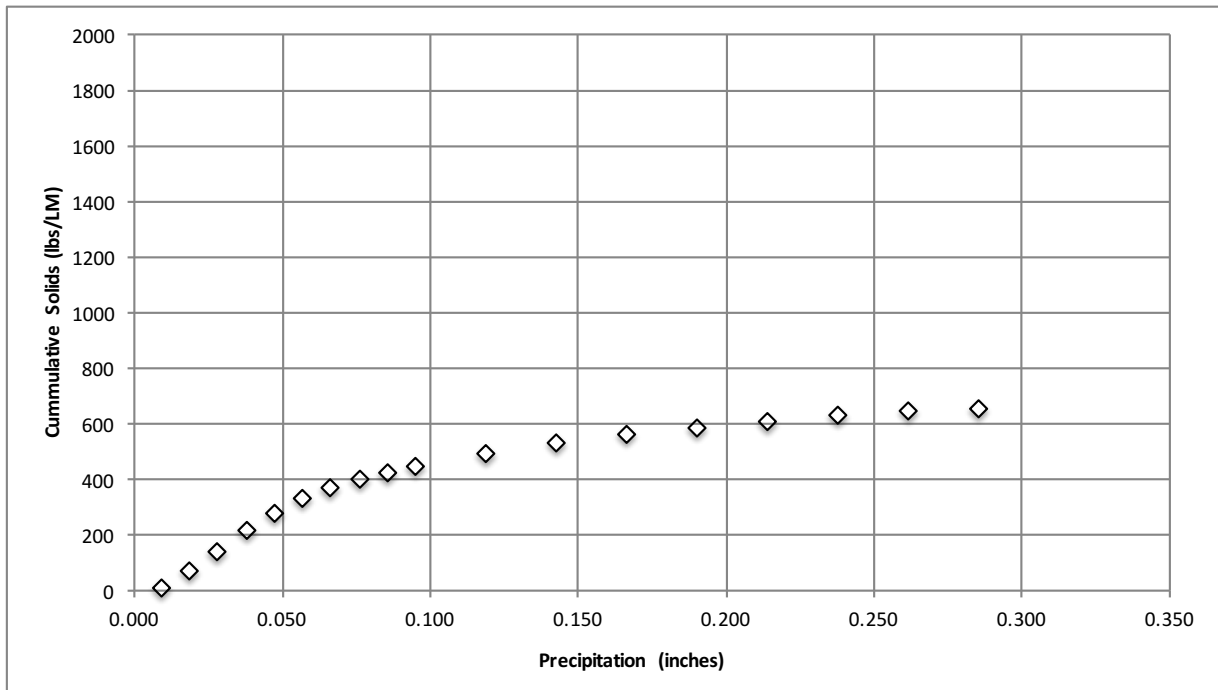
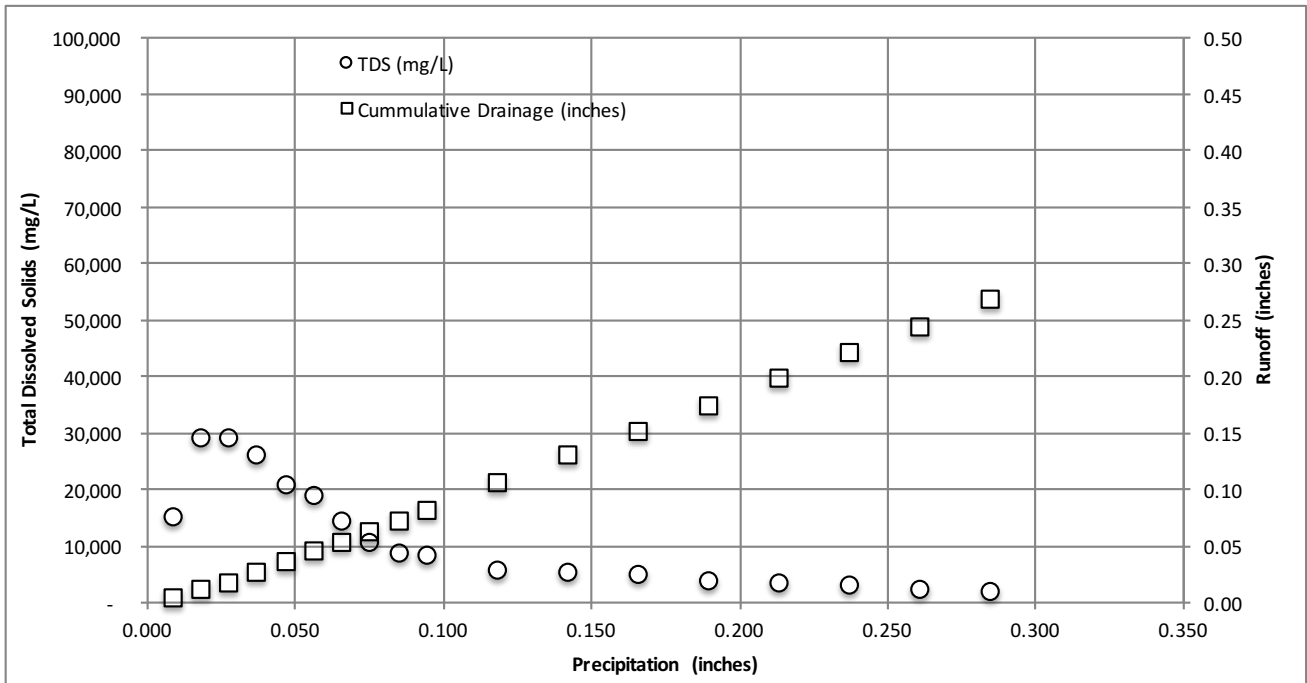
Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.06780	5.99960	2.11440	0.04660	3.93180	11,852	0.05	0.010	15	0.004
20	10	2.07620	8.45080	2.18420	0.10800	6.37460	16,942	0.15	0.019	49	0.010
30	10	2.08520	8.35700	2.21640	0.13120	6.27180	20,919	0.29	0.029	90	0.016
40	10	2.08150	7.23150	2.18080	0.09930	5.15000	19,282	0.39	0.038	121	0.021
50	10	2.06150	7.31010	2.14300	0.08150	5.24860	15,528	0.47	0.048	147	0.026
60	10	2.07800	9.23130	2.15600	0.07800	7.15330	10,904	0.54	0.057	171	0.033
70	10	2.08620	10.66070	2.14620	0.06000	8.57450	6,997	0.60	0.067	190	0.041
80	10	2.07220	11.25580	2.11520	0.04300	9.18360	4,682	0.65	0.076	204	0.049
90	10	2.06510	10.78390	2.09360	0.02850	8.71880	3,269	0.68	0.086	213	0.058
100	10	2.07550	12.51130	2.10430	0.02880	10.43580	2,760	0.70	0.095	222	0.068
125	25	2.08500	27.45280	2.11680	0.03180	25.36780	1,254	0.74	0.119	232	0.092
150	25	2.07560			-2.07560	-2.07560	1,000,000	-1.34	0.143	-421	0.090
175	25	2.07580	27.86650	2.10010	0.02430	25.79070	942	-1.31	0.167	-413	0.115
200	25	2.07420	27.74200	2.09130	0.01710	25.66780	666	-1.30	0.191	-408	0.139
225	25	2.09020	27.00760	2.10410	0.01390	24.91740	558	-1.28	0.215	-404	0.163
250	25	2.08750	28.45910	2.10020	0.01270	26.37160	482	-1.27	0.238	-400	0.188
275	25	2.07700	27.41260	2.08780	0.01080	25.33560	426	-1.26	0.262	-396	0.212
300	25	2.05890	27.63300	2.06930	0.01040	25.57410	407	-1.25	0.286	-393	0.236



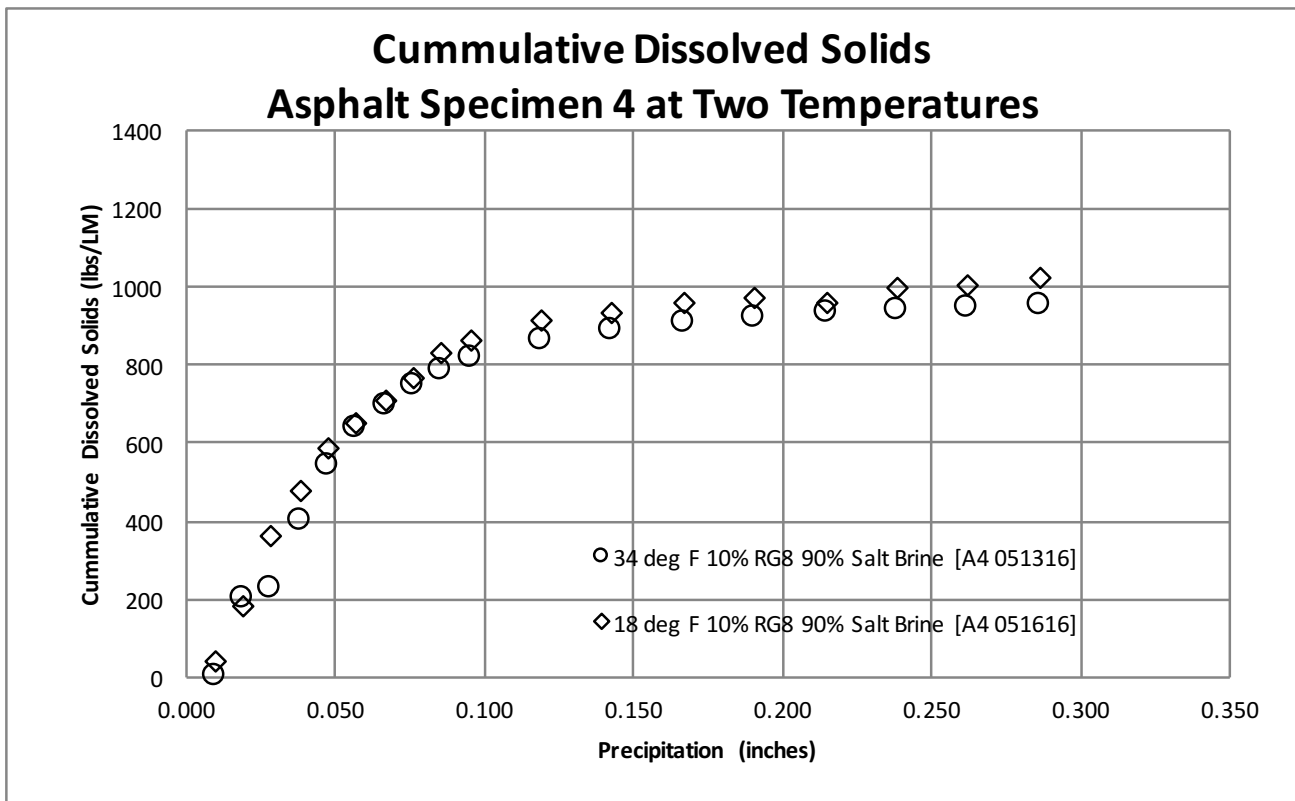
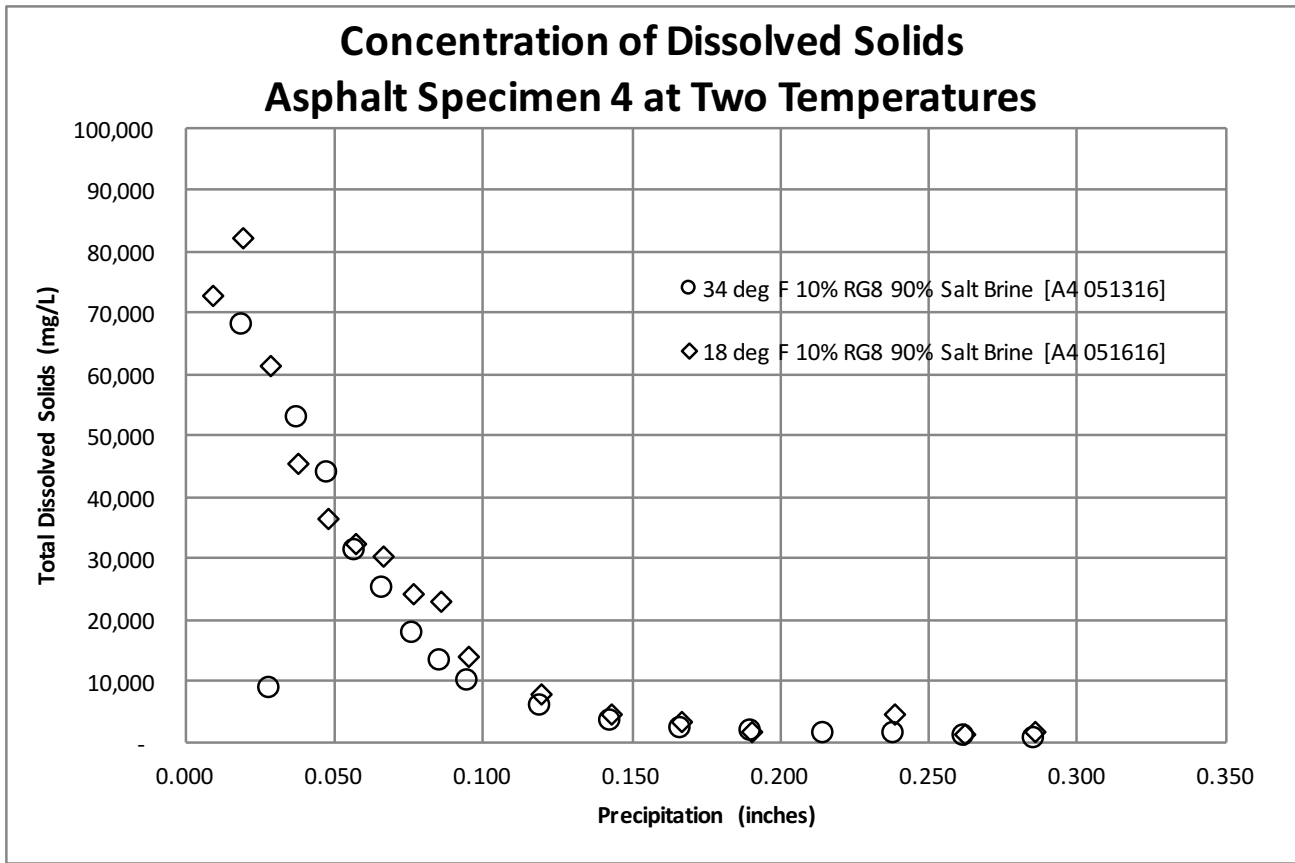
Anti Ice Evaluation  
MnDOT Salt III  
Task 4: Pavement Antilcing Persistence  
May 23, 2016  
S. Druschel

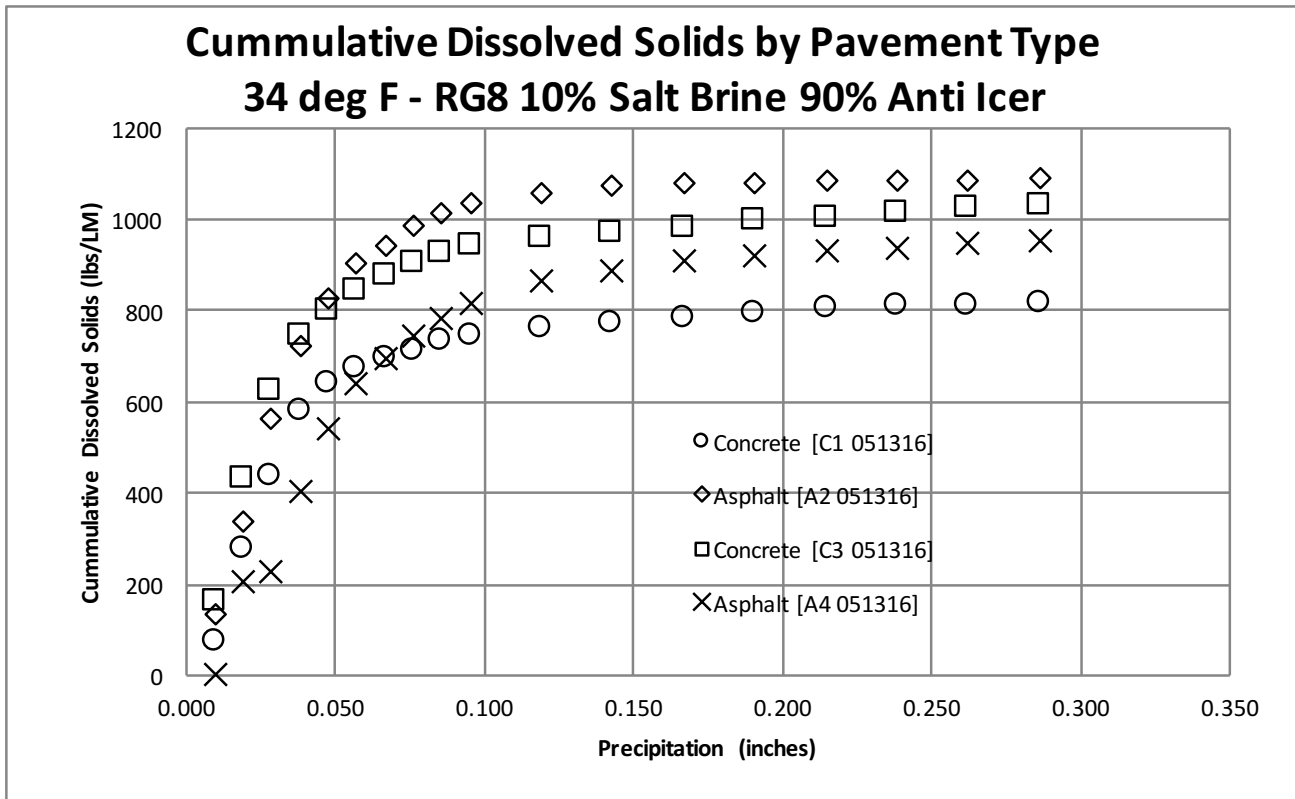
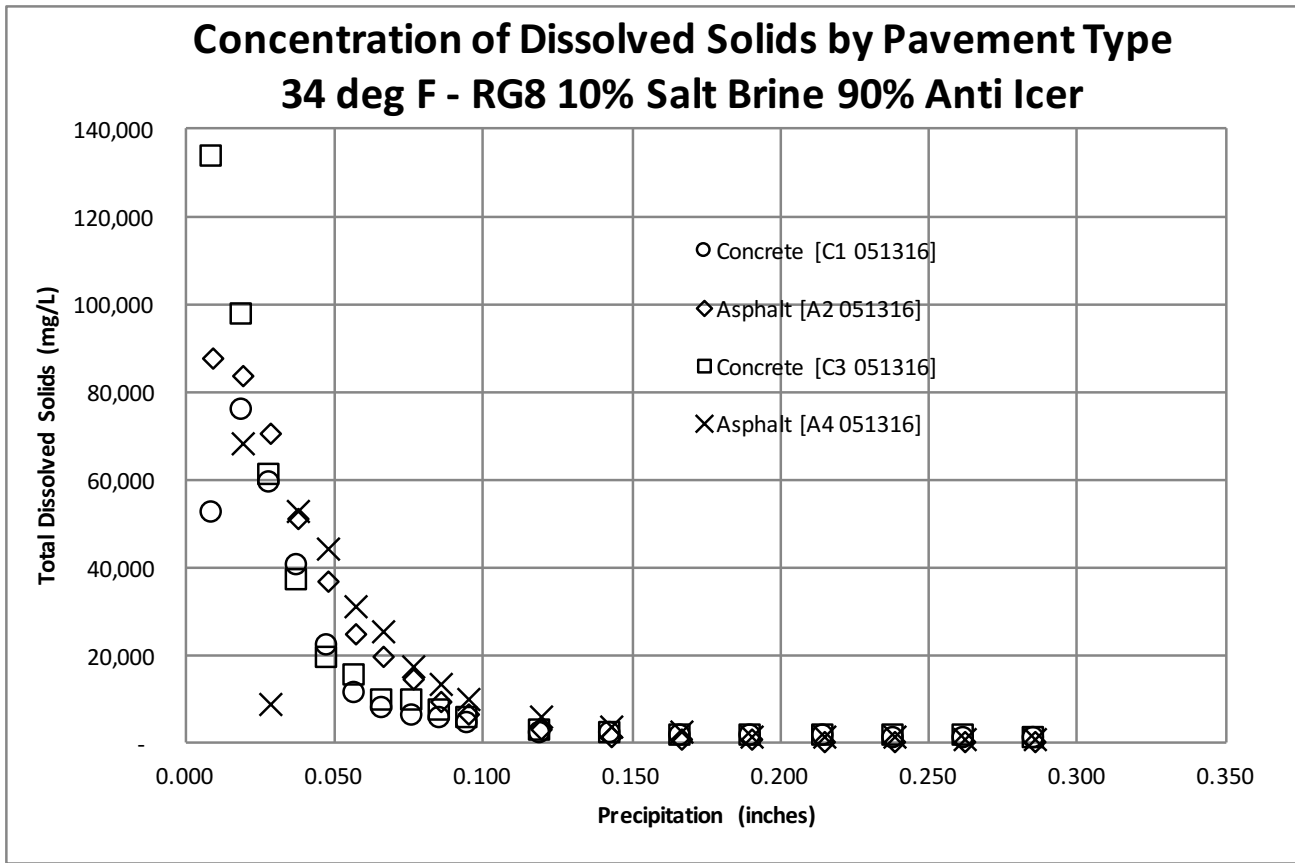
Test Date: May 19, 2016  
Pavement: Asphalt #4  
Anti Icer: Corn Syrup 25% Salt Brine 50%  
Pavement  
Temperature: 24° F

Precip Total (mL)	Precip Net (mL)	Dish Mass (g)	Liquid + Dish (g)	Solids + Dish (g)	Solids Net (g)	Liquid Net (g)	TDS (mg/L)	Cummulative Solids (g)	Precip Total (inches)	Cummulative Solids (lbs/LM)	Cummulative Drainage (inches)
10	10	2.08760	4.04700	2.11600	0.02840	1.95940	14,494	0.03	0.010	9	0.002
20	10	2.08010	8.85220	2.27400	0.19390	6.77210	28,632	0.22	0.019	70	0.008
30	10	2.09040	9.07620	2.28890	0.19850	6.98580	28,415	0.42	0.029	132	0.015
40	10	2.08900	11.70530	2.33460	0.24560	9.61630	25,540	0.67	0.038	209	0.024
50	10	2.07200	12.24350	2.28000	0.20800	10.17150	20,449	0.87	0.048	275	0.034
60	10	2.08890	10.75370	2.24840	0.15950	8.66480	18,408	1.03	0.057	325	0.042
70	10	2.05970	11.13820	2.18460	0.12490	9.07850	13,758	1.16	0.067	364	0.051
80	10	2.08680	11.65160	2.18450	0.09770	9.56480	10,215	1.26	0.076	395	0.060
90	10	2.08170	11.64220	2.16060	0.07890	9.56050	8,253	1.34	0.086	420	0.069
100	10	2.08330	11.51060	2.15680	0.07350	9.42730	7,797	1.41	0.095	443	0.078
125	25	2.09990	27.84990	2.23550	0.13560	25.75000	5,266	1.54	0.119	486	0.103
150	25	2.09640	27.81950	2.22070	0.12430	25.72310	4,832	1.67	0.143	525	0.127
175	25	2.08500	24.31710	2.18300	0.09800	22.23210	4,408	1.77	0.167	555	0.148
200	25	2.09810	26.56160	2.17750	0.07940	24.46350	3,246	1.85	0.191	580	0.172
225	25	2.05870	26.74470	2.13500	0.07630	24.68600	3,091	1.92	0.215	604	0.195
250	25	2.08320	27.56070	2.14810	0.06490	25.47750	2,547	1.99	0.238	625	0.219
275	25	2.09550	25.85910	2.14070	0.04520	23.76360	1,902	2.03	0.262	639	0.242
300	25	2.06840	27.45910	2.10790	0.03950	25.39070	1,556	2.07	0.286	651	0.266

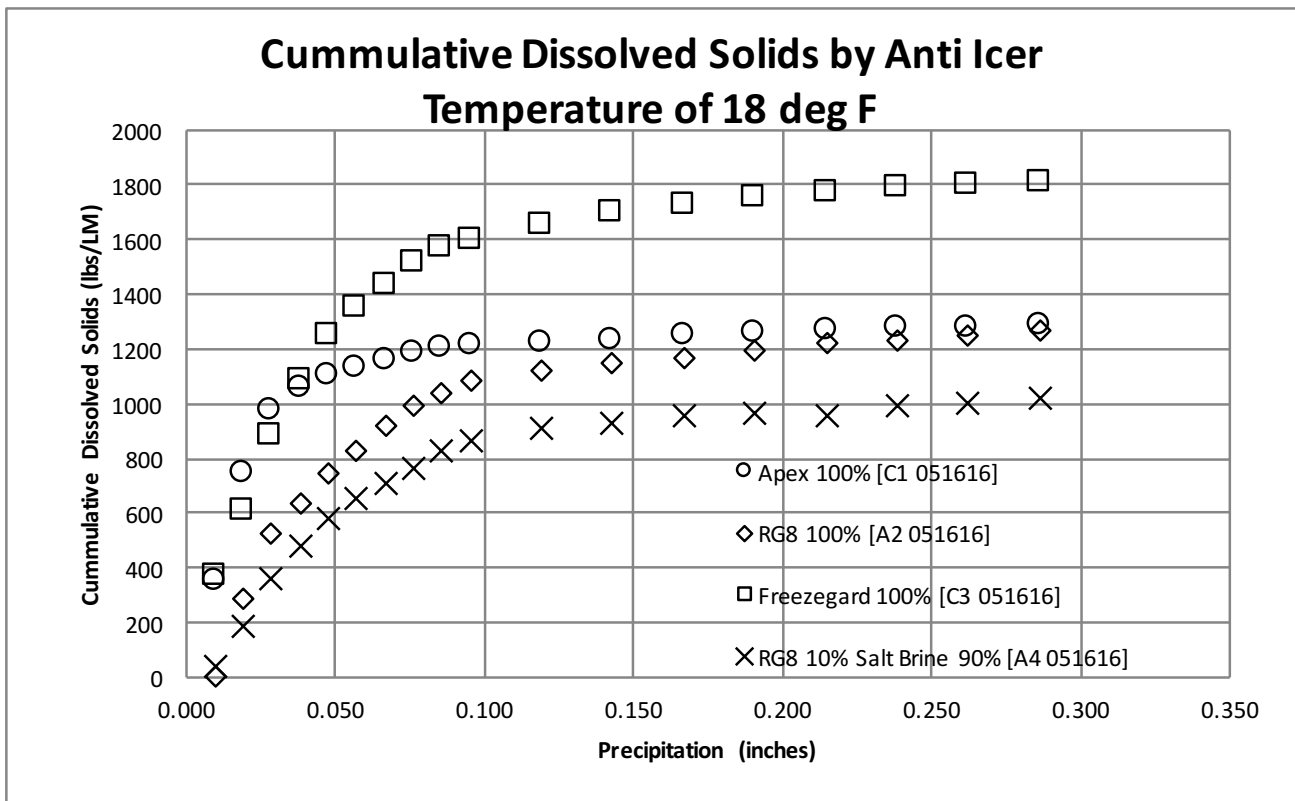
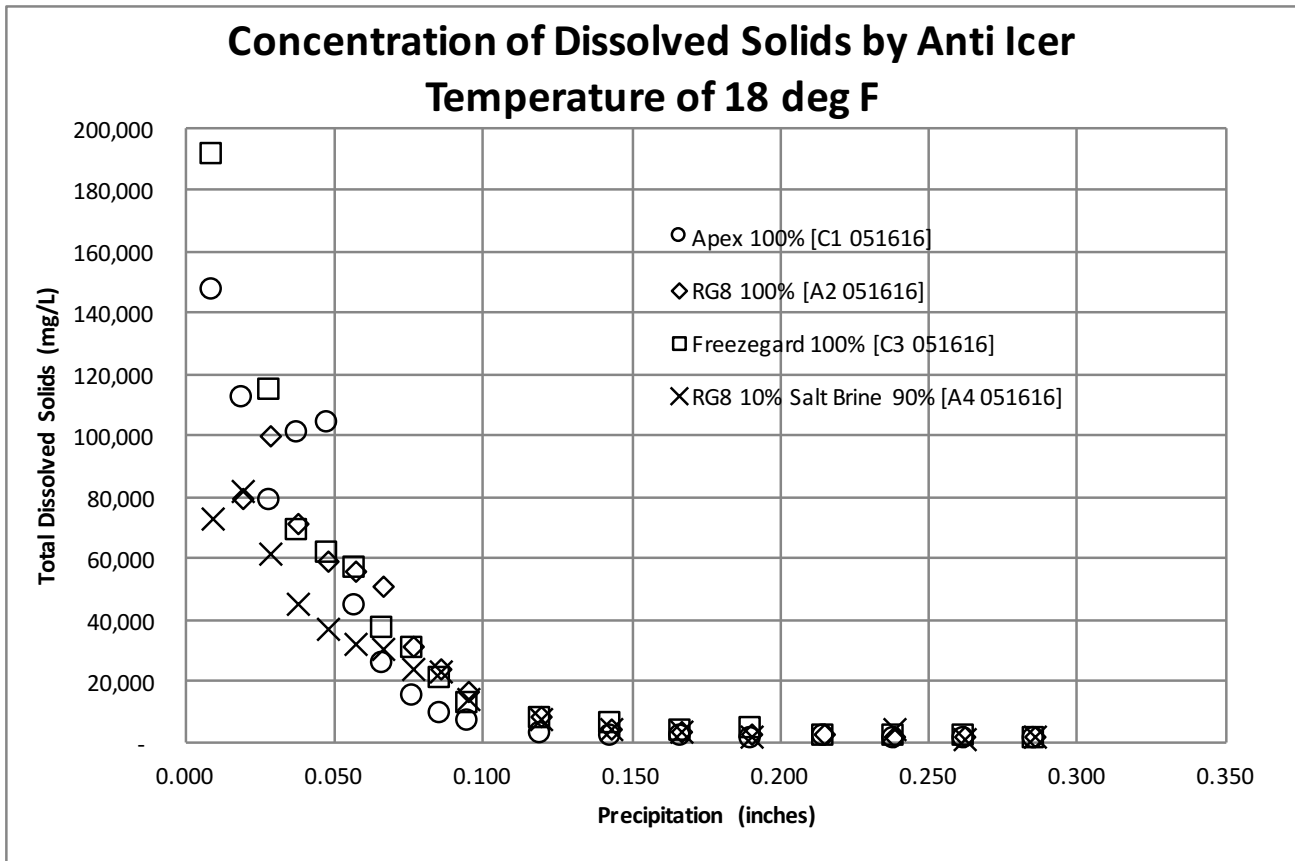


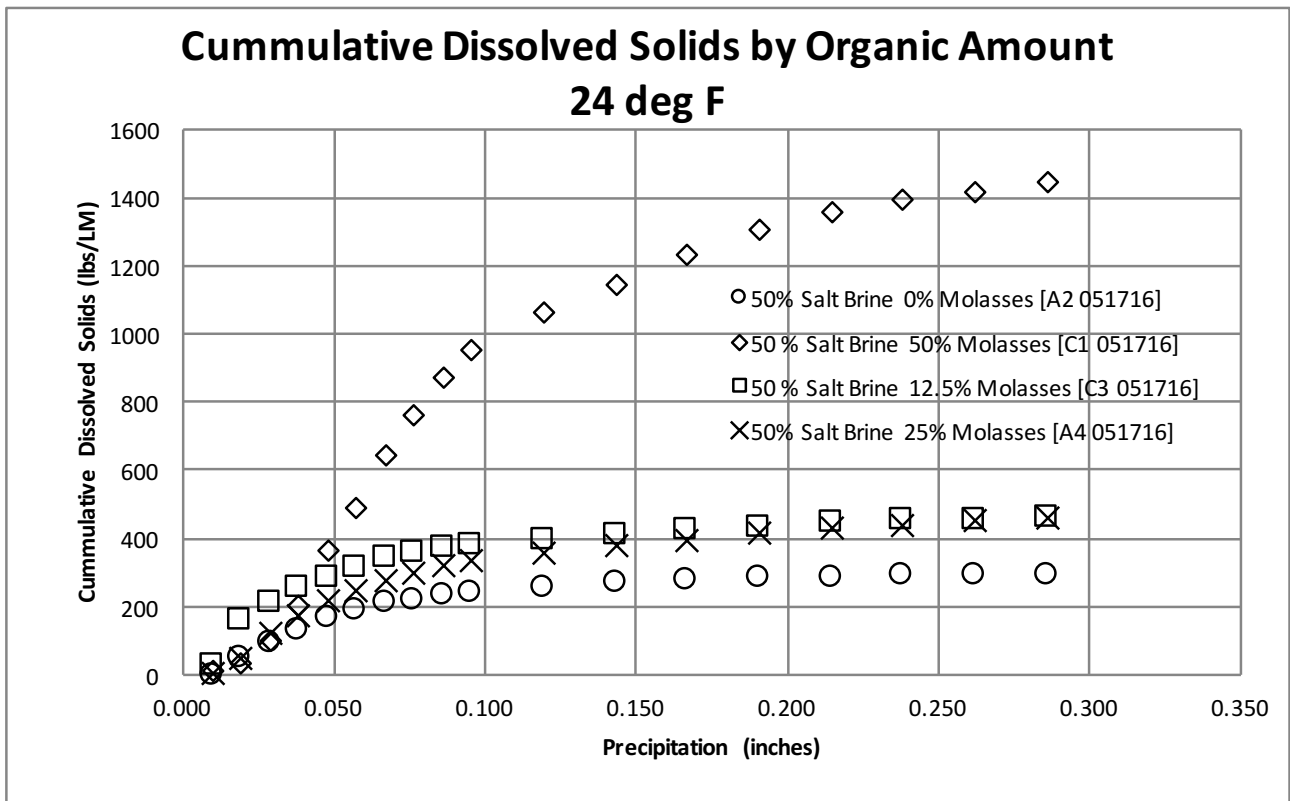
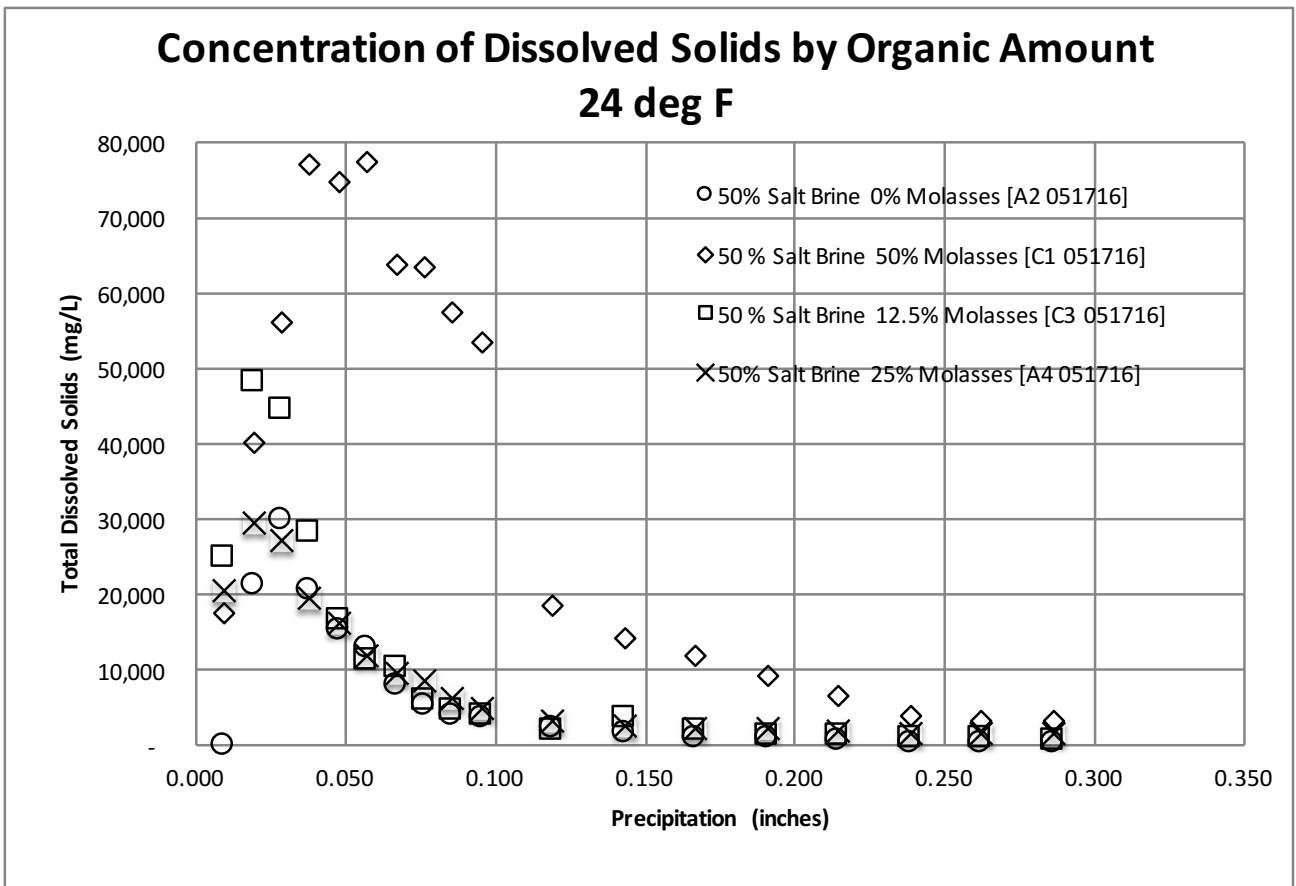
## **APPENDIX O: COMPARISON OF ANTI-ICER PERSISTANCE IN PAVEMENT DRAINAGE**

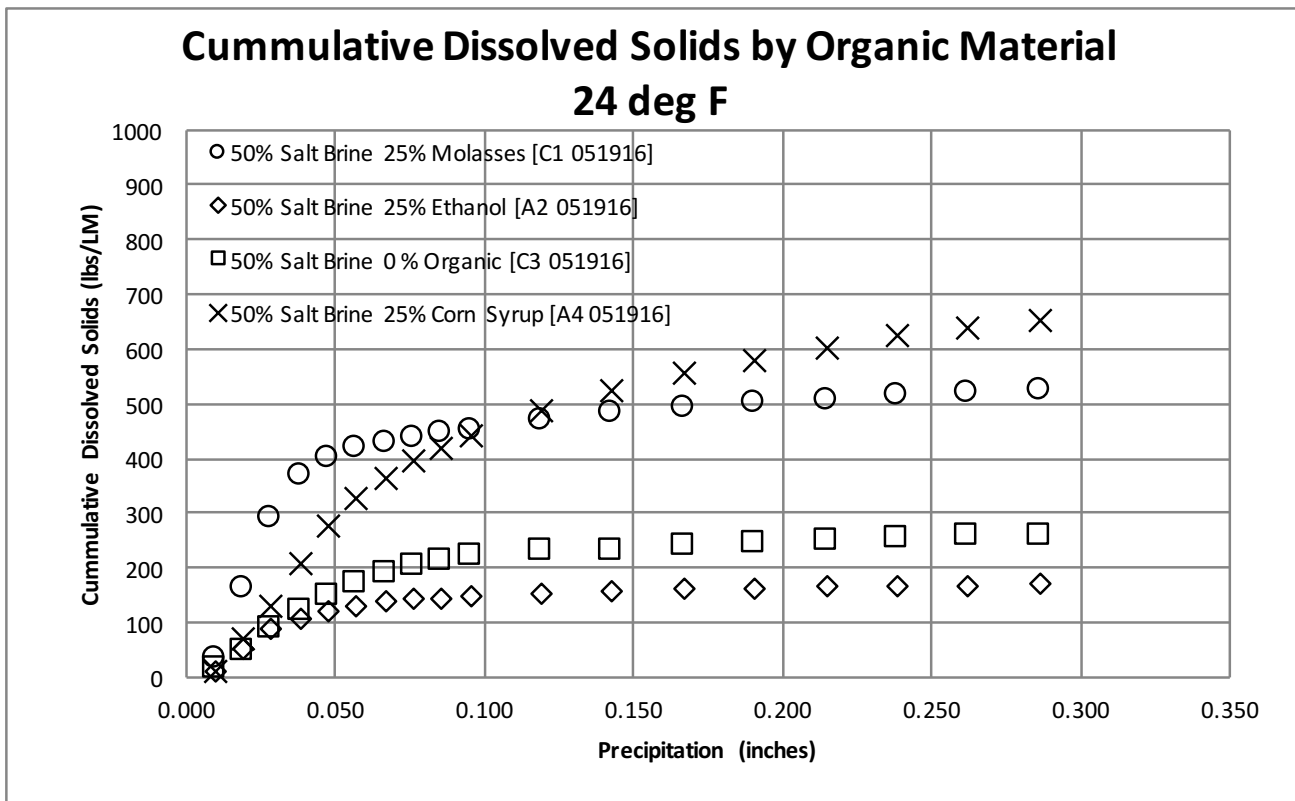
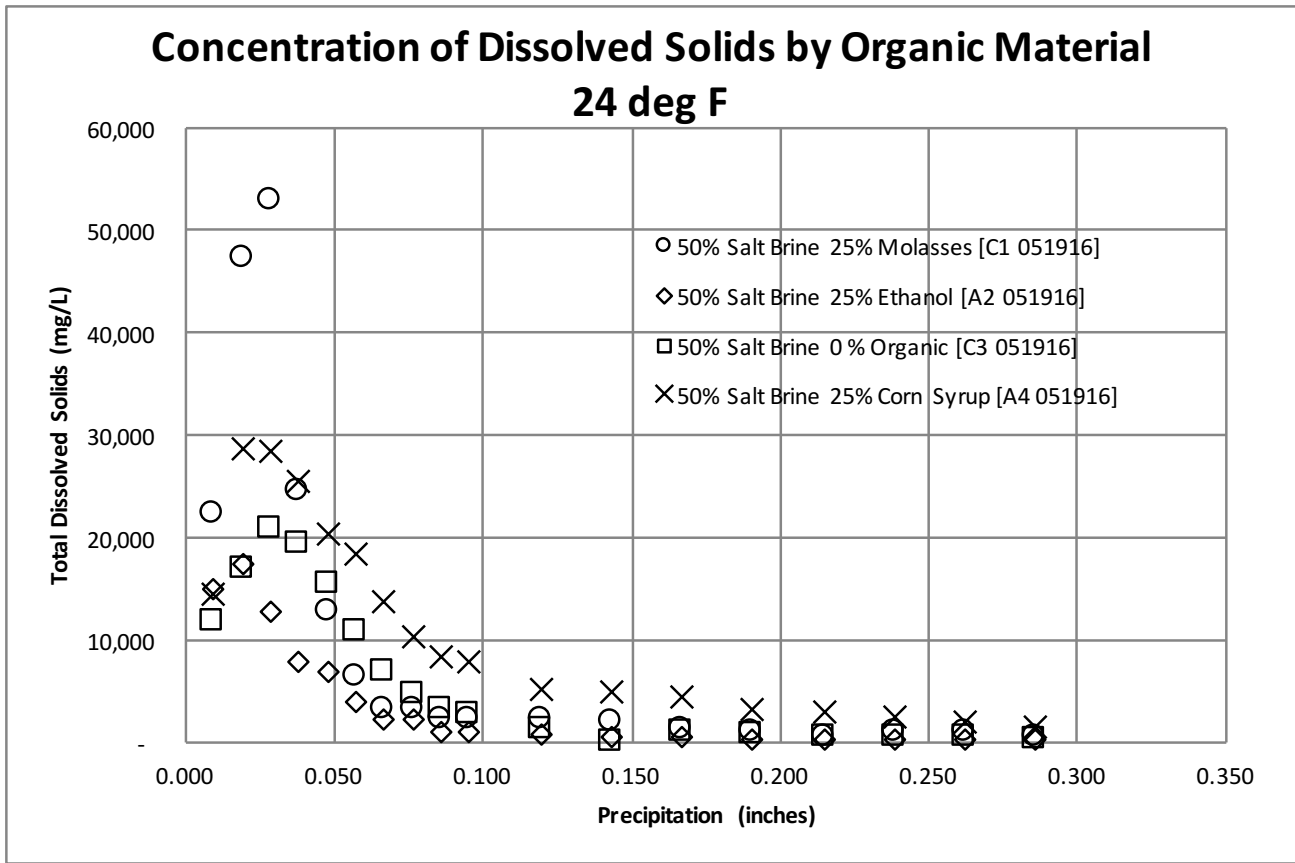




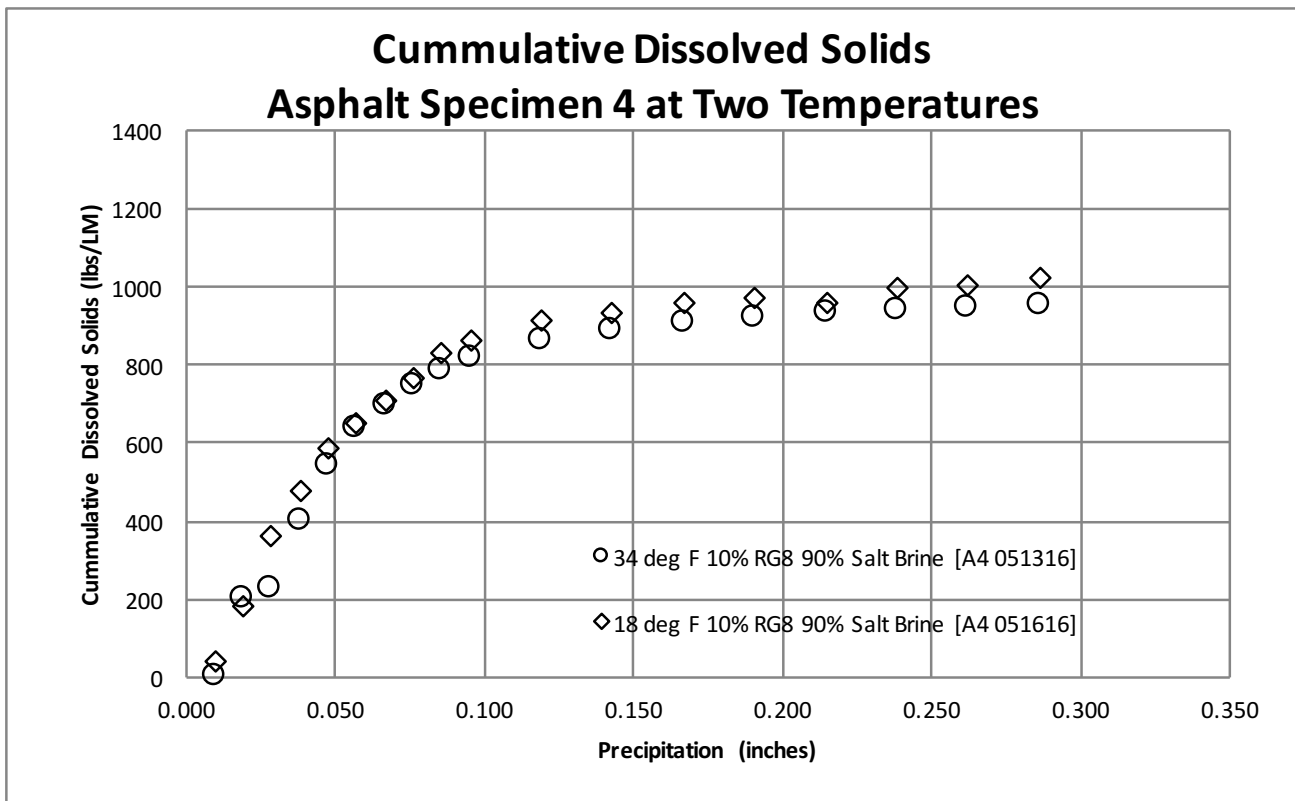
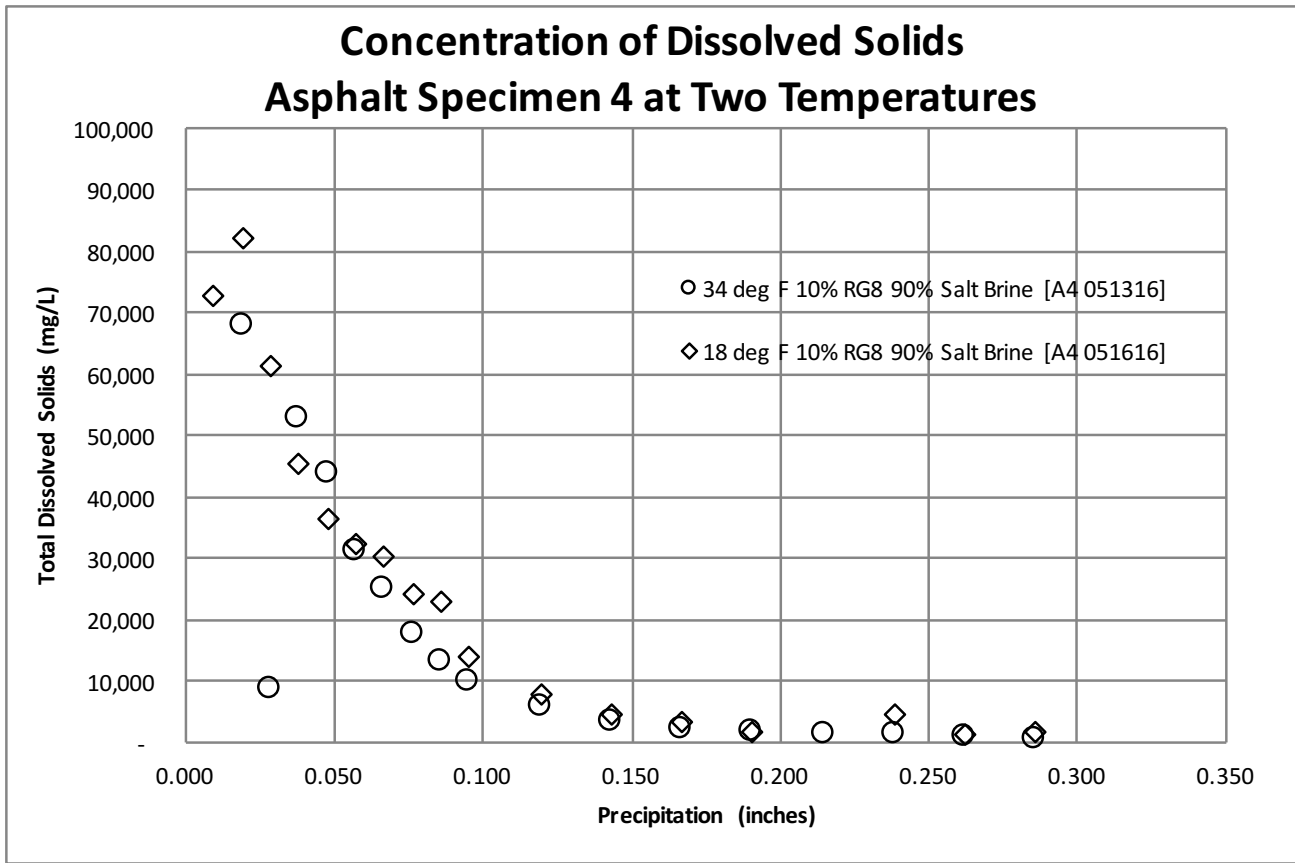


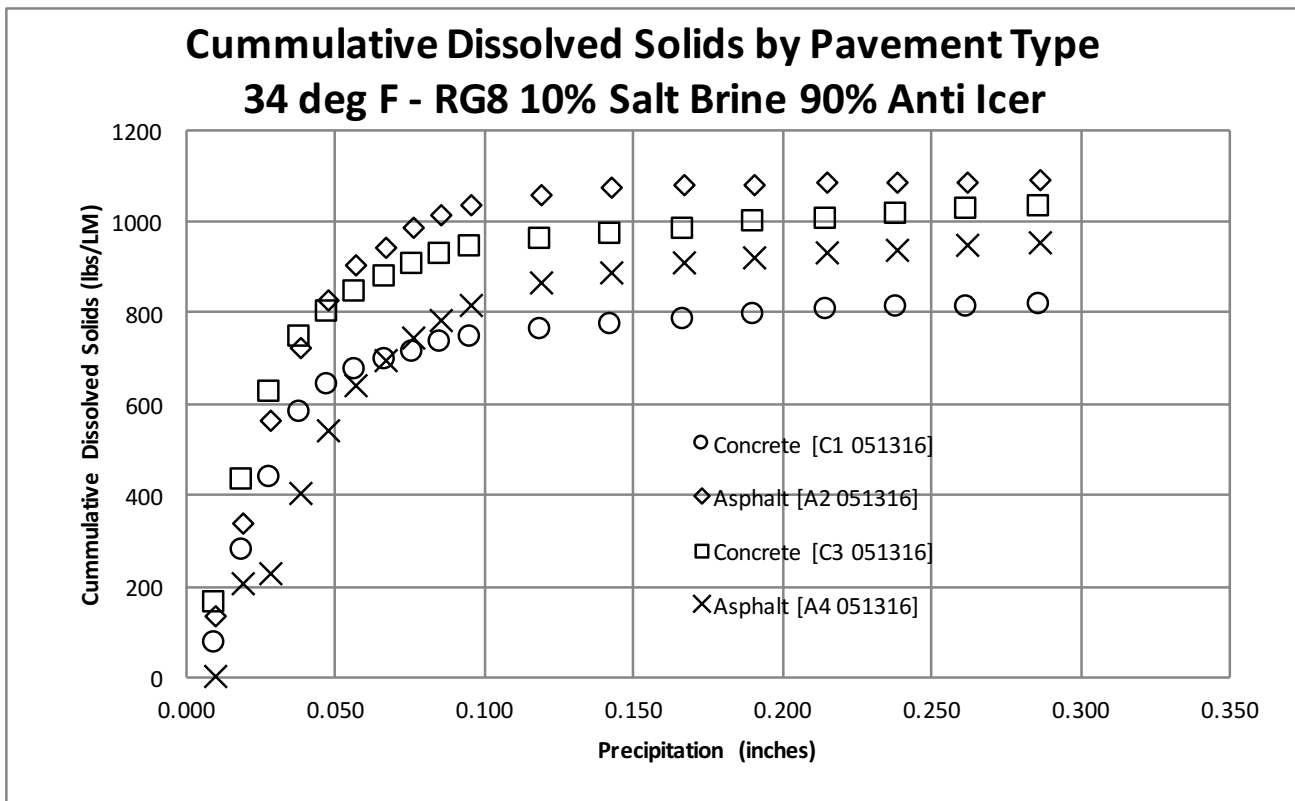
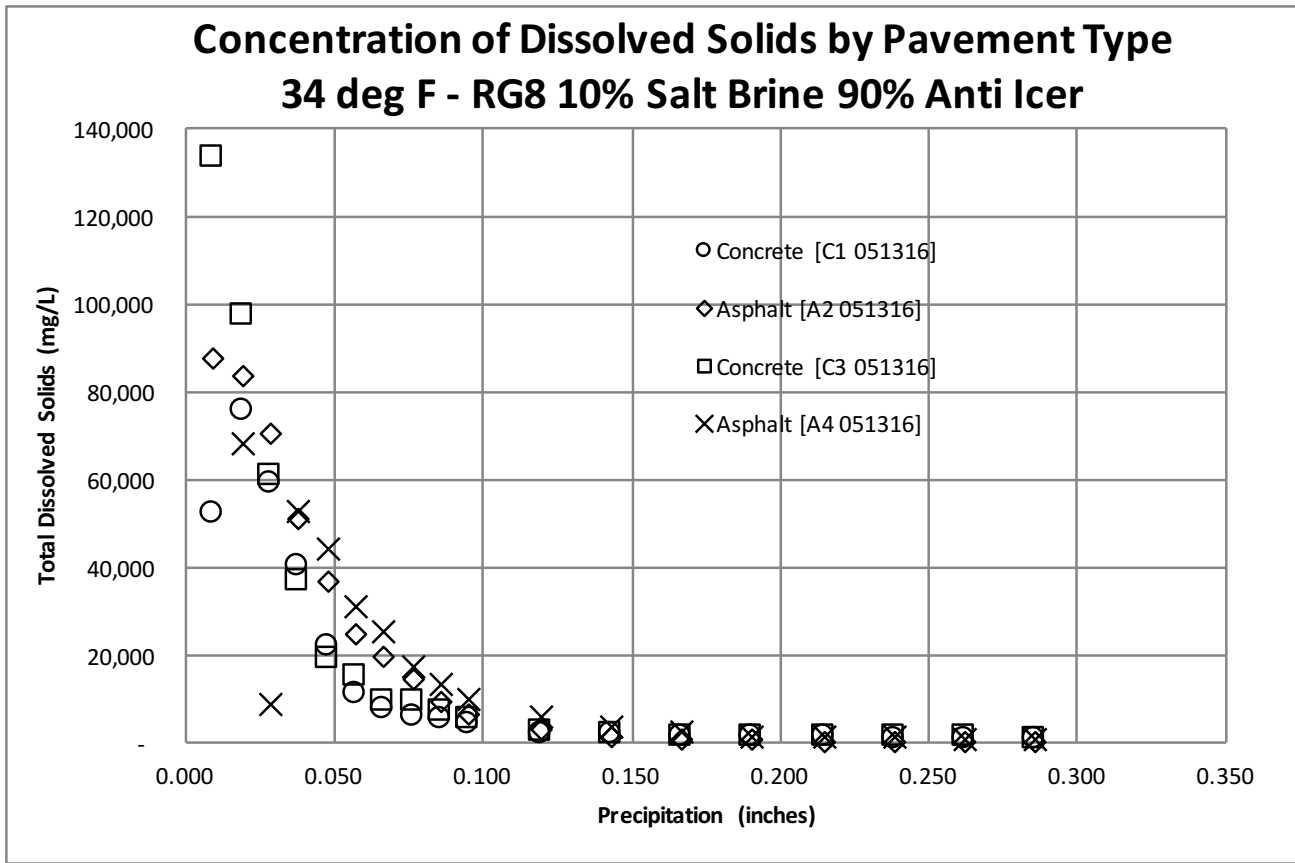


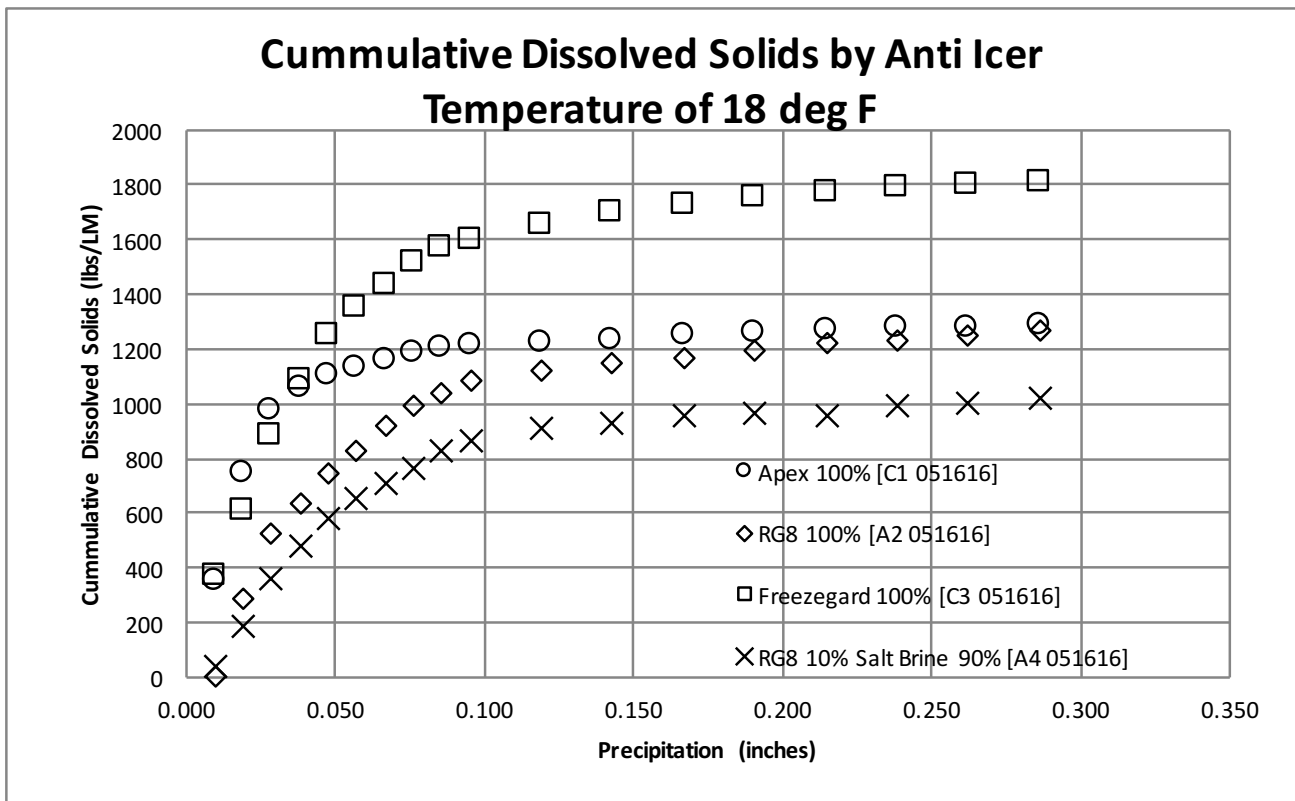
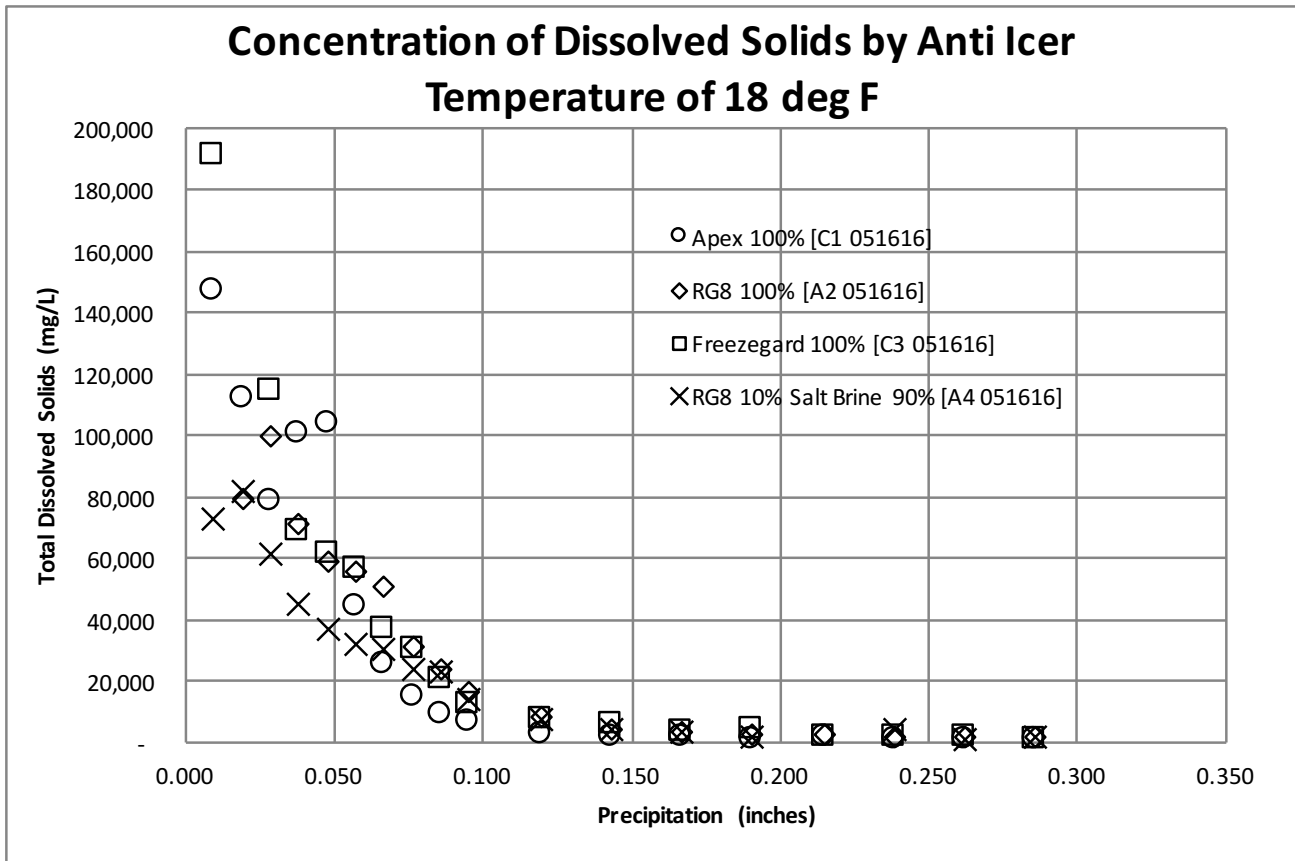




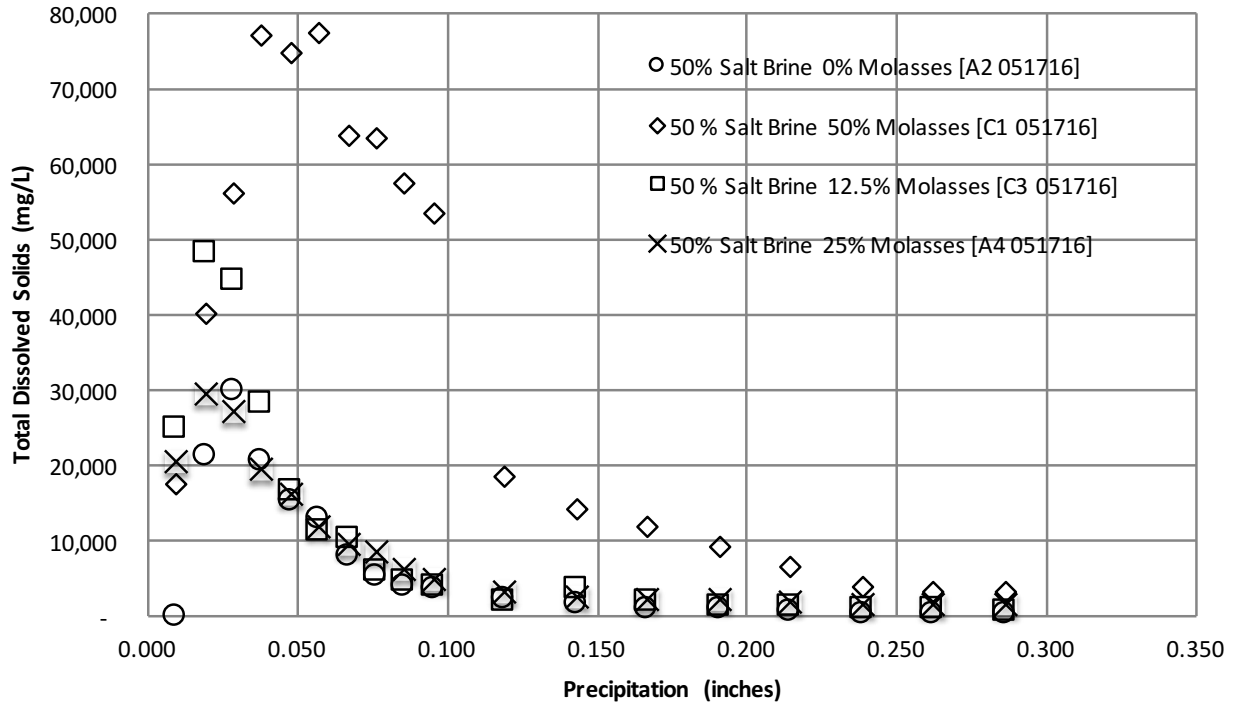
<http://mndot.gov/research/reports/2017/201745.pdf>



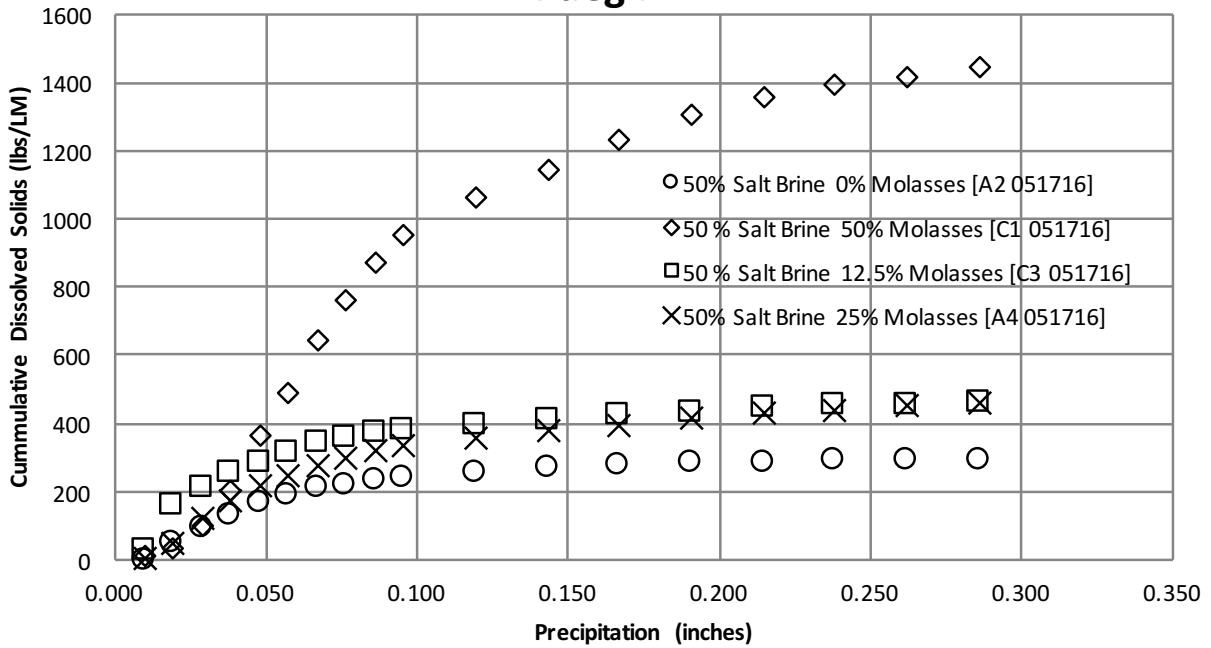




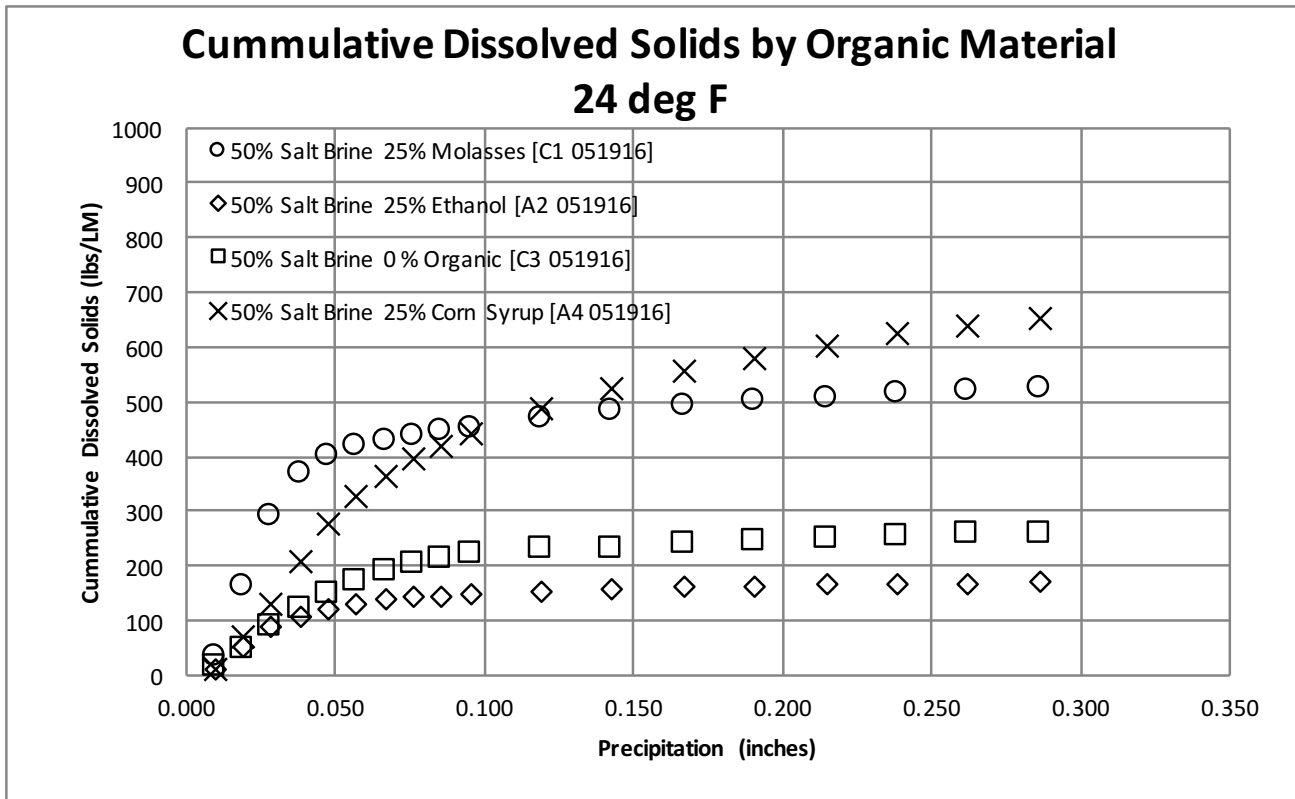
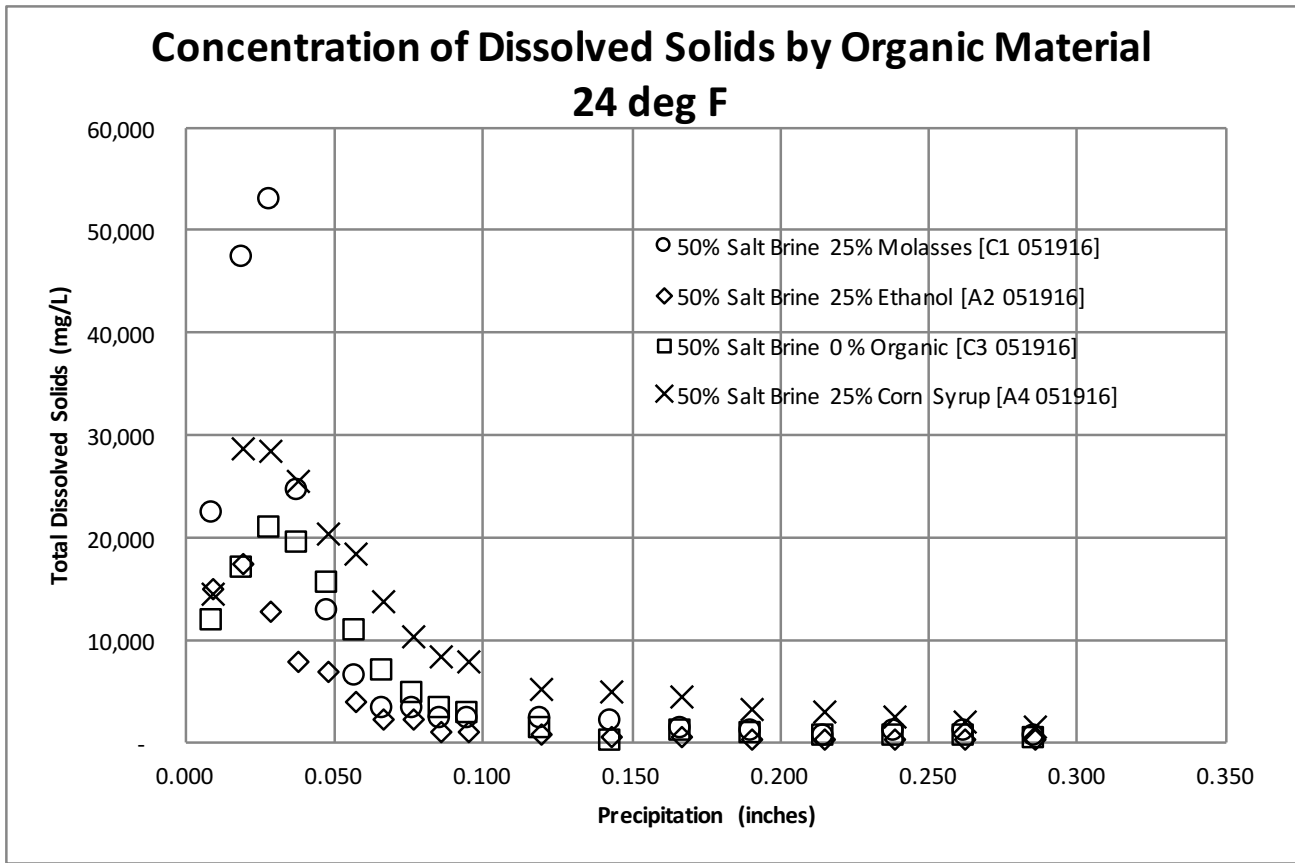
### Concentration of Dissolved Solids by Organic Amount 24 deg F














### Cummulative Dissolved Solids by Organic Amount 24 deg F



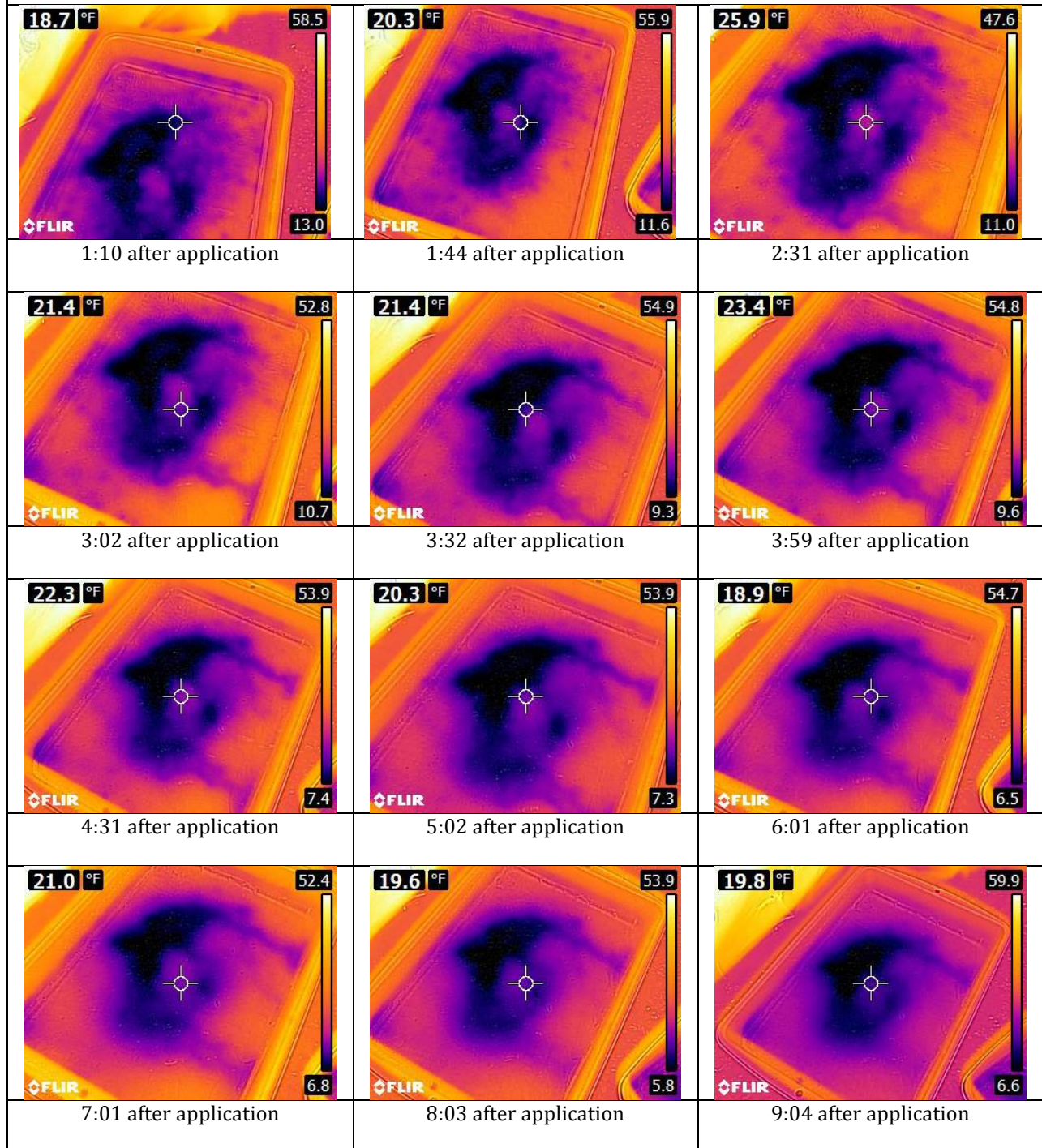




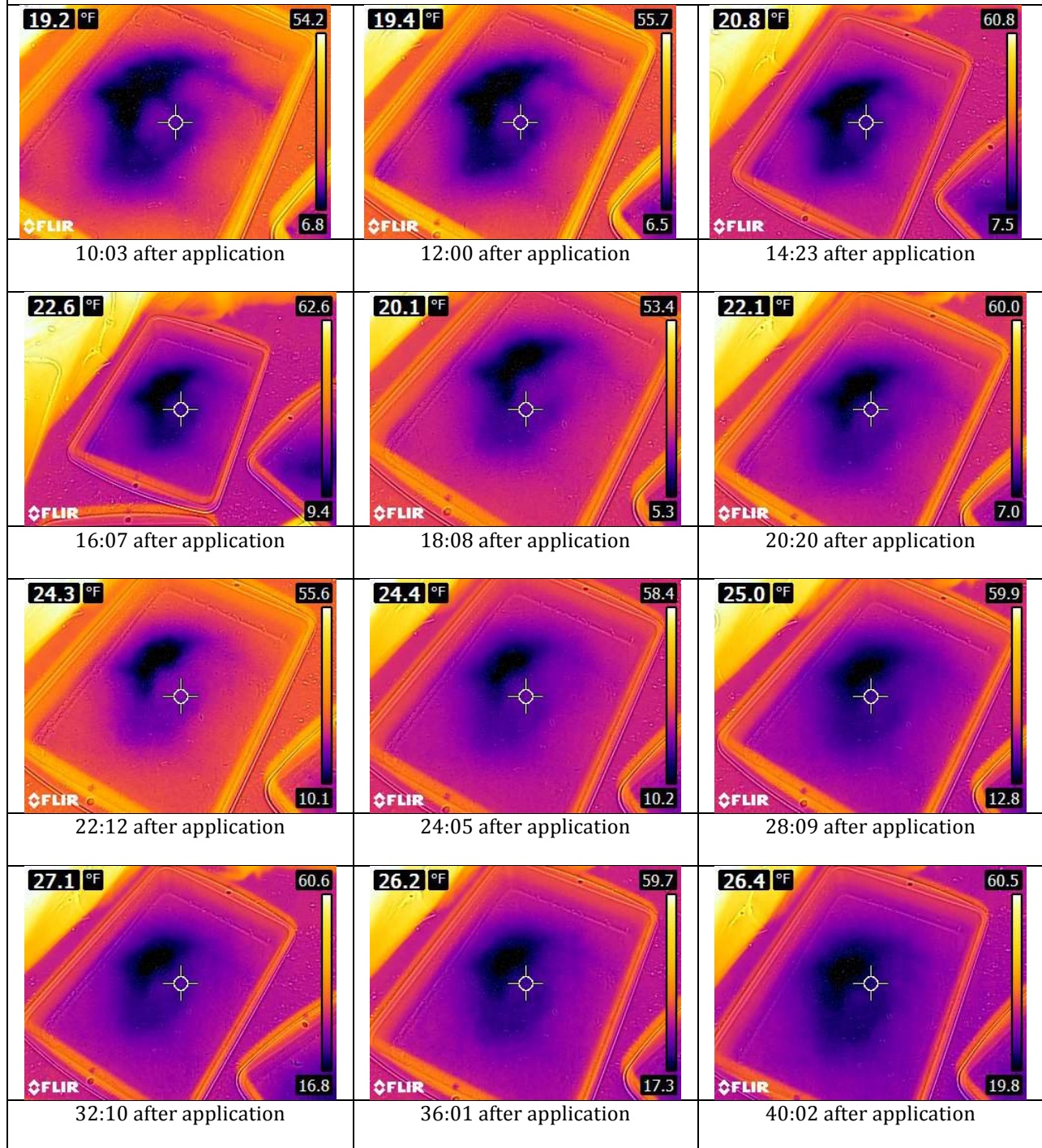
## **APPENDIX P: 28° F MELT INITIATION AND EXPANSION EVALUATION**

Rock salt with no prewet		
Retained on #4 sieve	Passing #4 sieve and retained on #10 sieve	Passing #10 sieve
		
1:10 after application	1:10 after application	1:10 after application
		
16:07 after application	16:07 after application	16:07 after application
Rock salt with 15 gal/ton prewet (RG8 10%, salt brine 90%)		
		
1:10 after application	1:10 after application	1:10 after application
		
16:07 after application	16:07 after application	16:07 after application

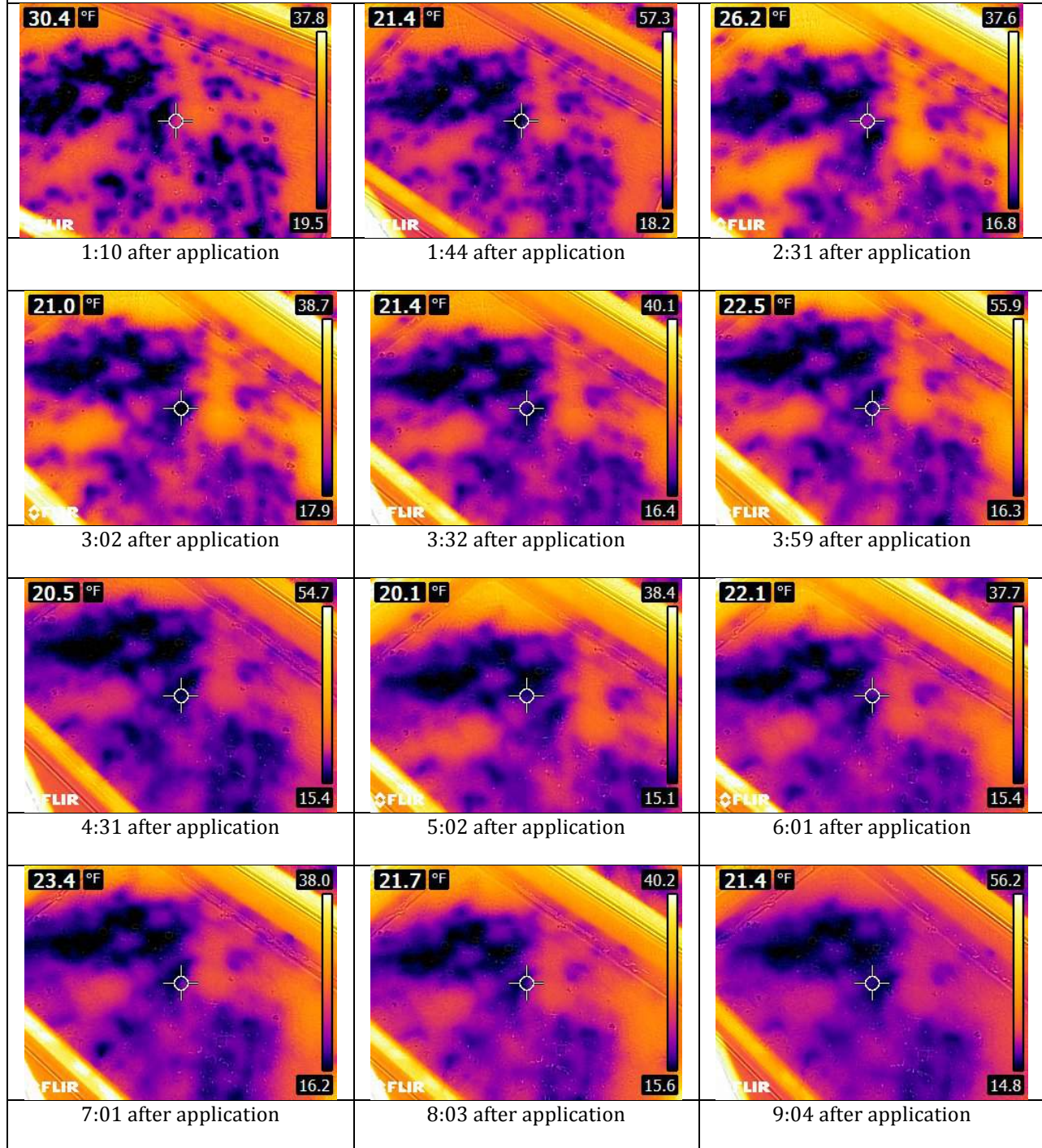
Rock salt passing #10 sieve with no prewet



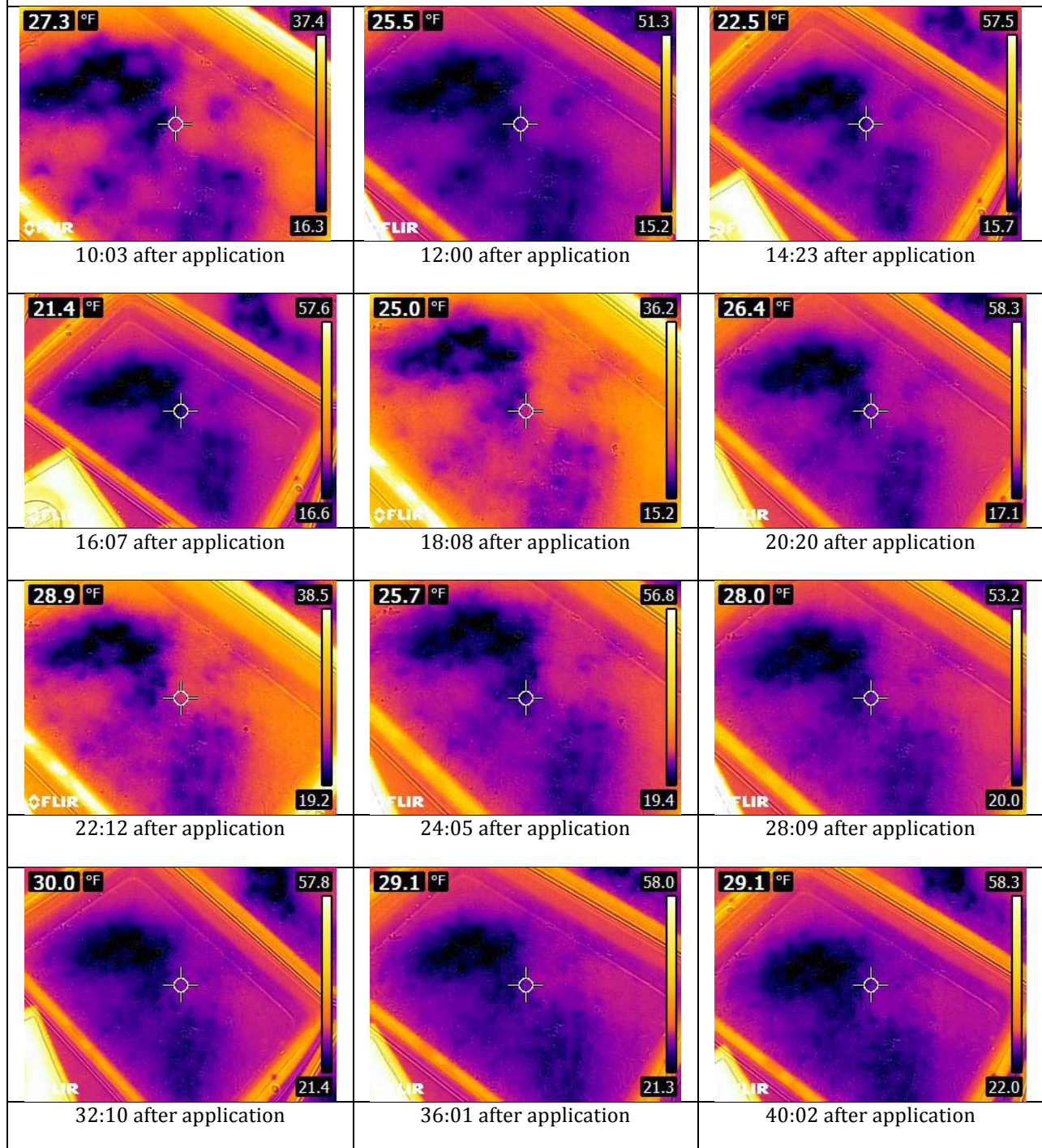
Rock salt passing #10 sieve with no prewet



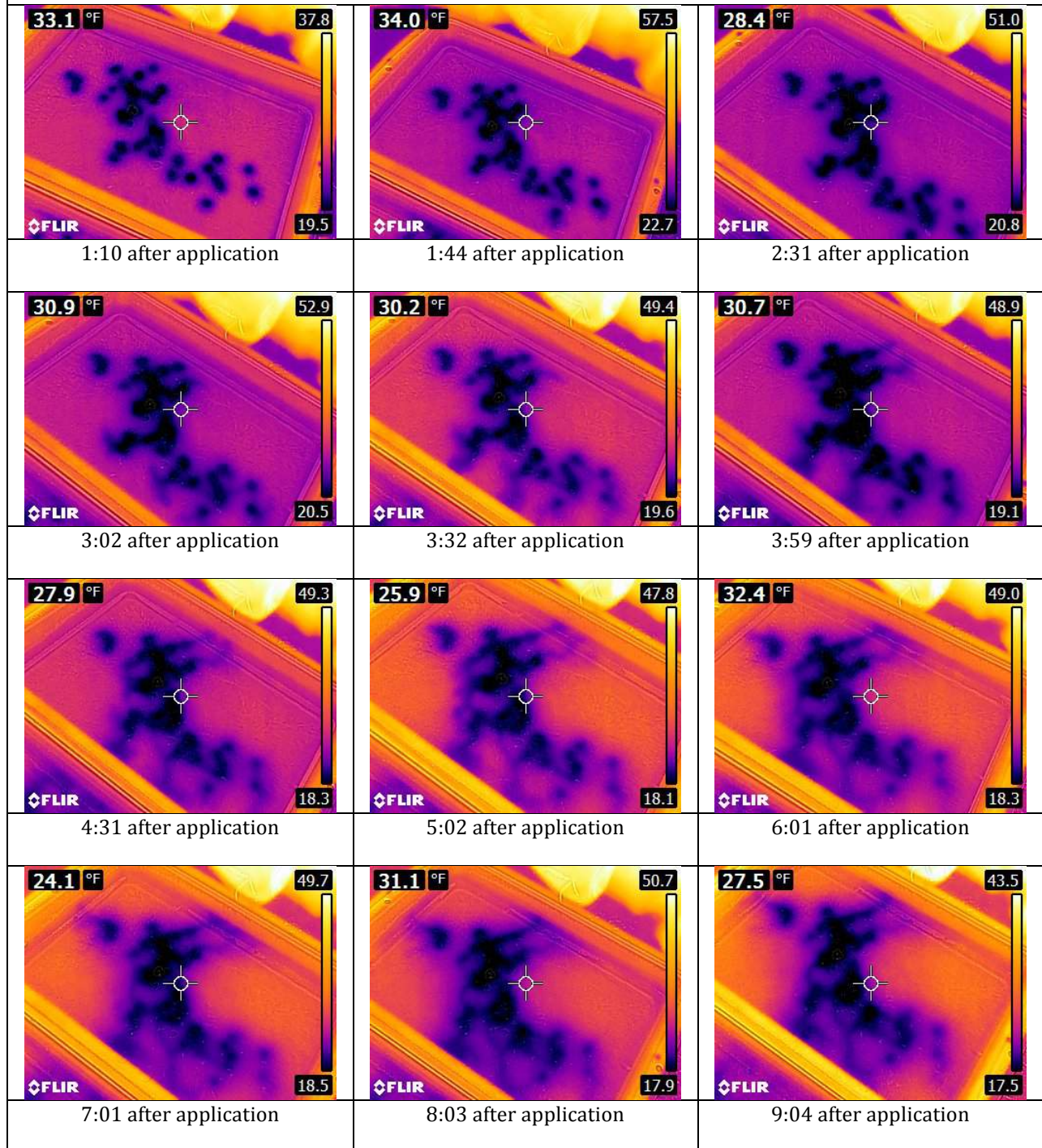
Rock salt passing #4 sieve but retained on #10 sieve with no prewet



Rock salt passing #4 sieve but retained on #10 sieve with no prewet

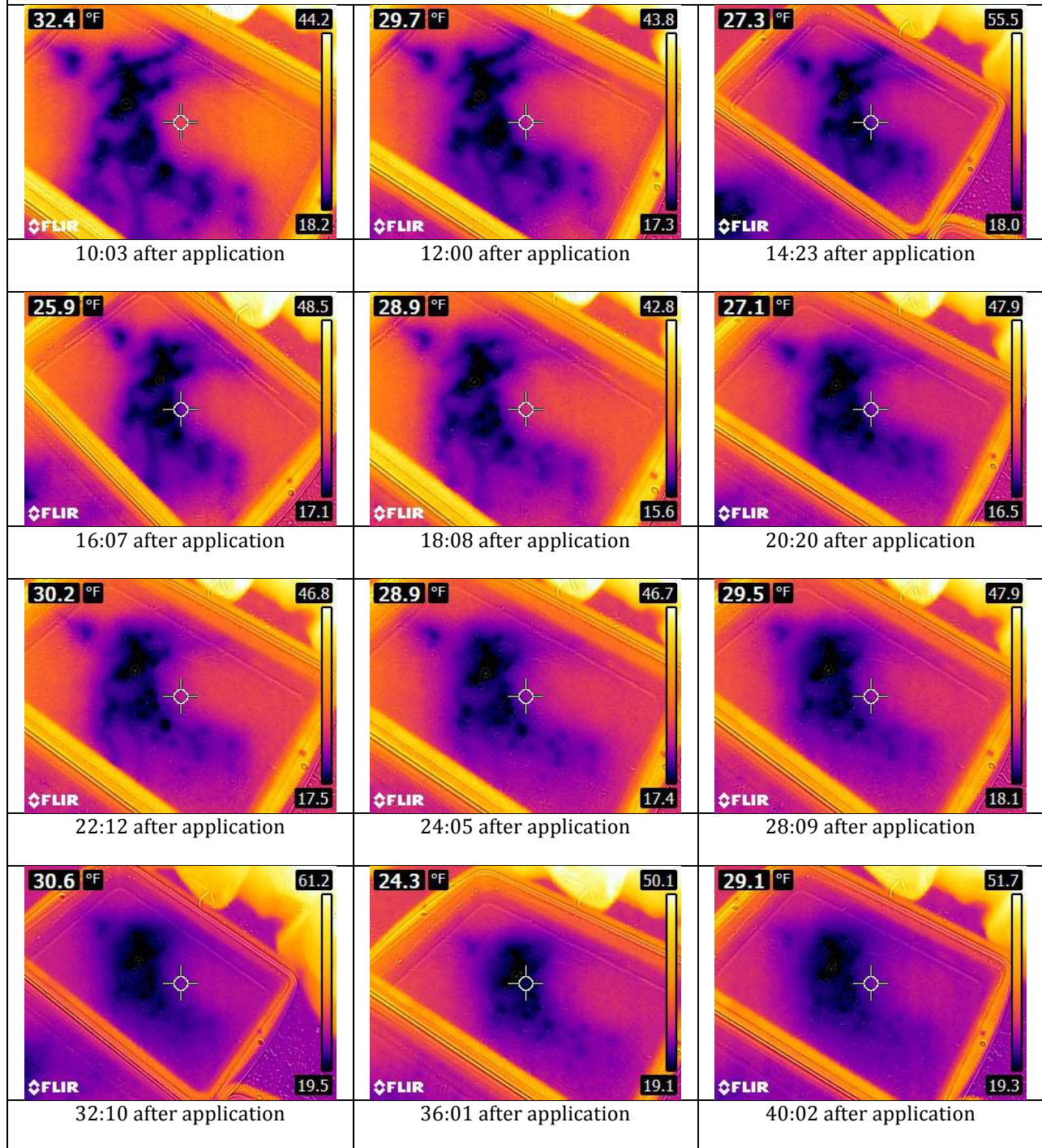


Rock salt retained on #4 sieve with no prewet

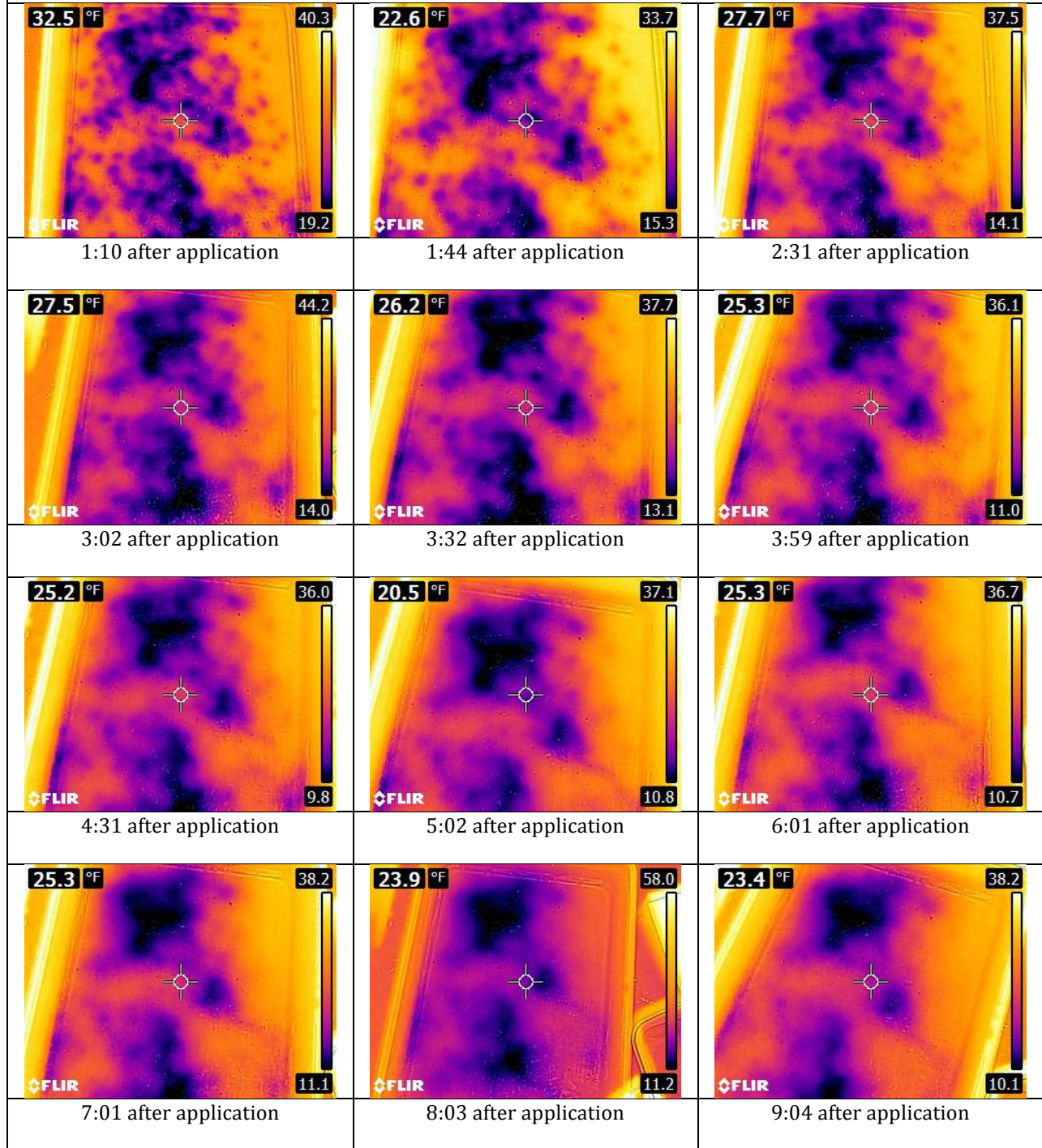


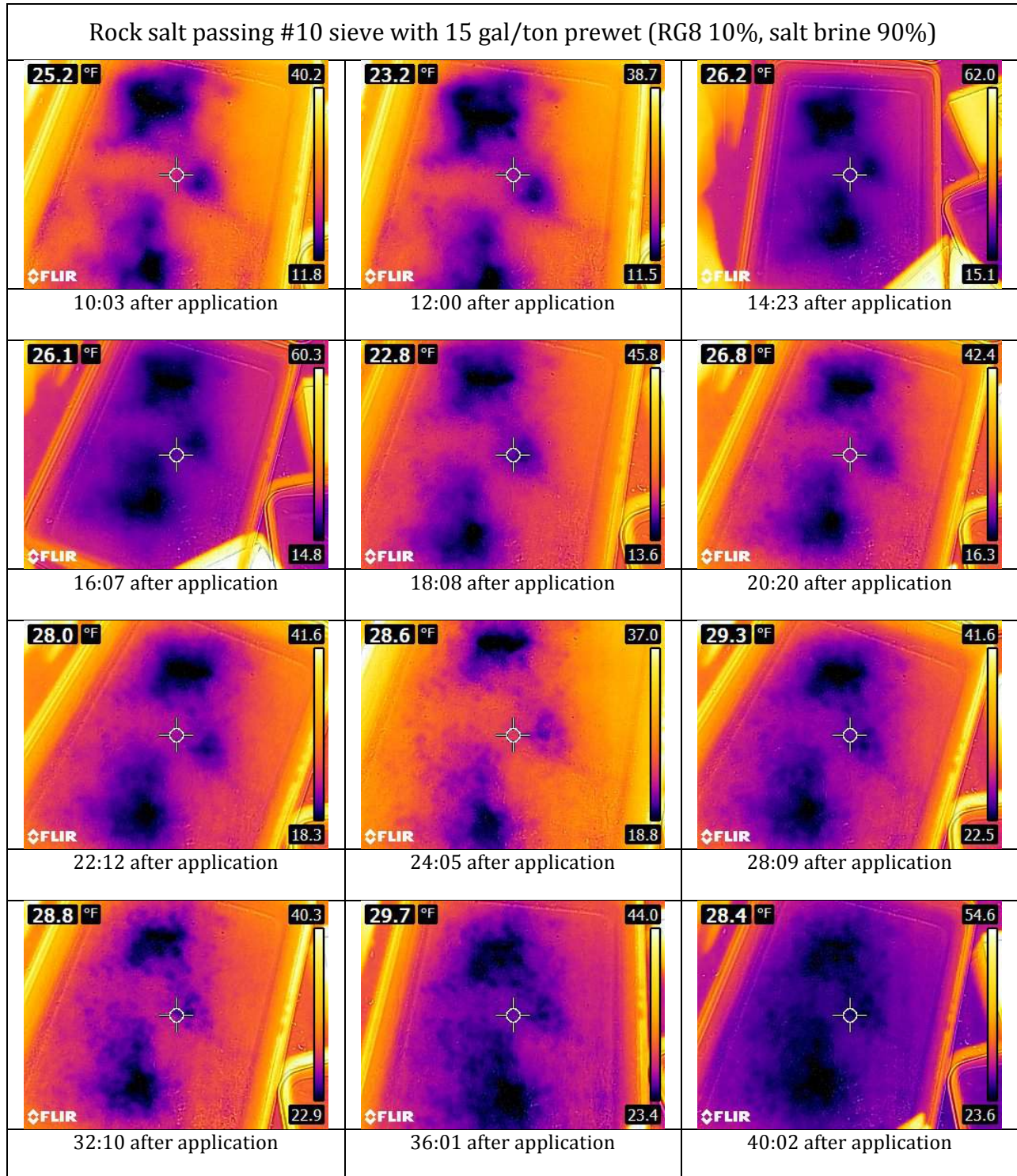


Rock salt retained on #4 sieve with no prewet

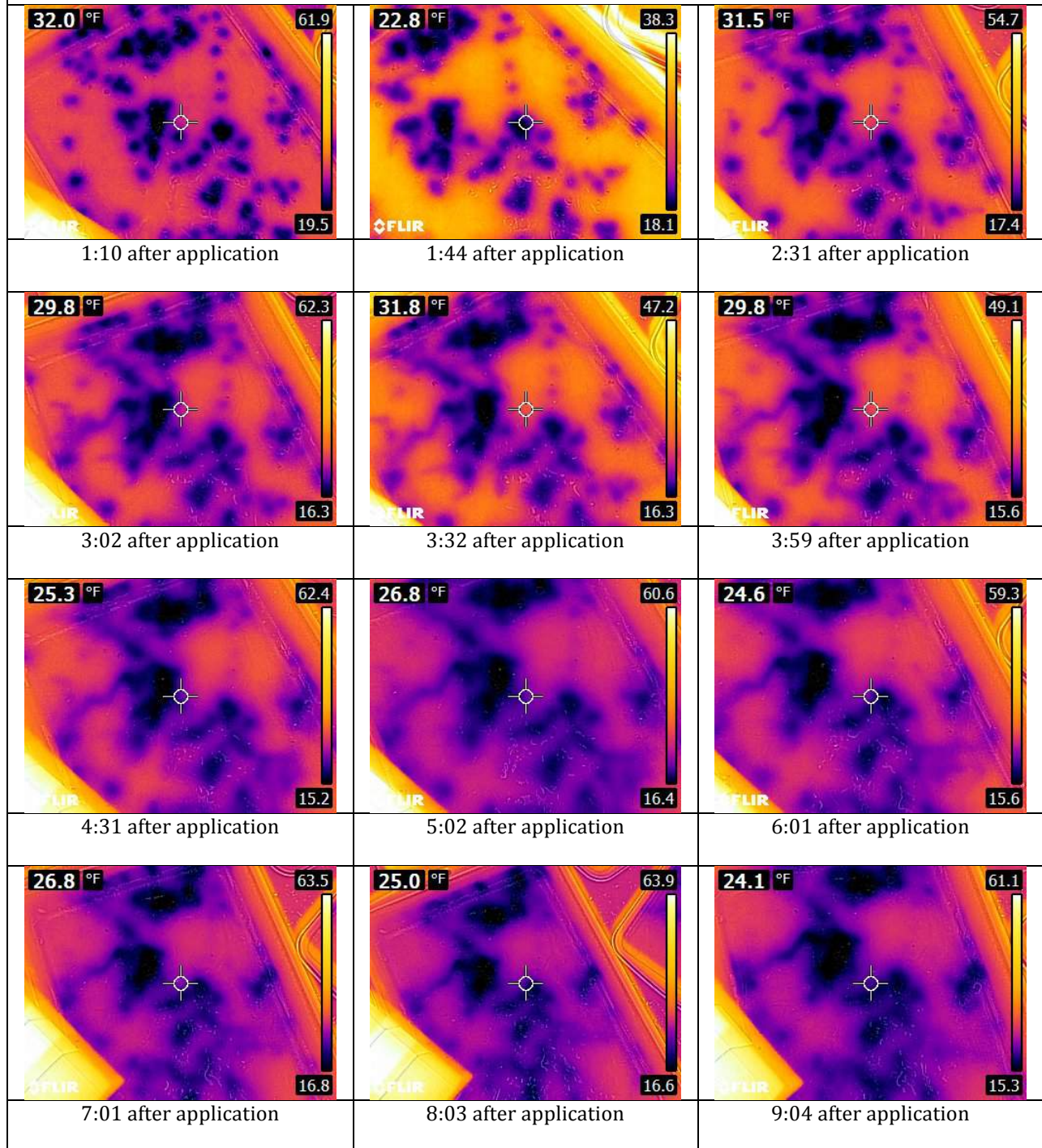


Rock salt passing #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)

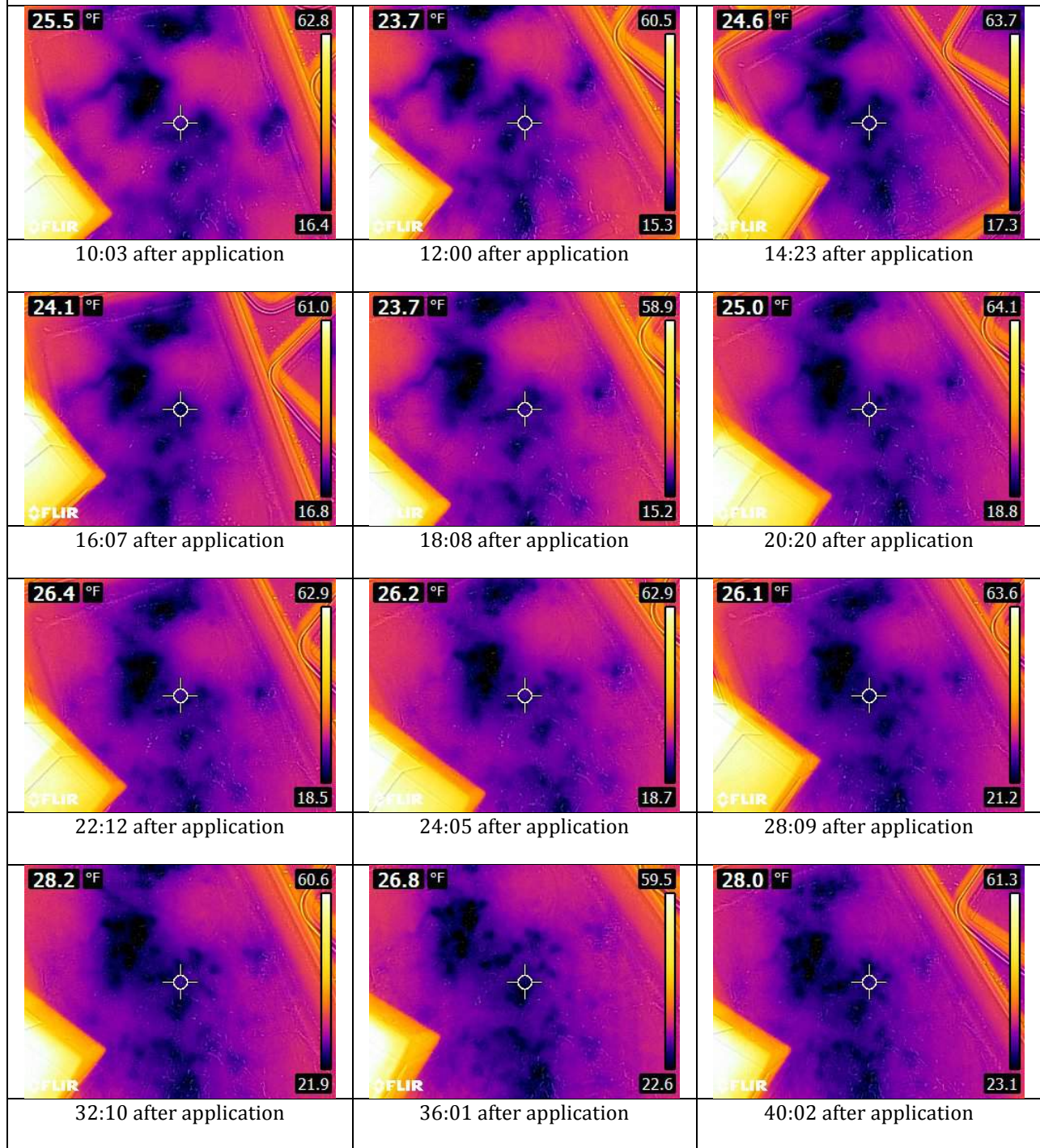




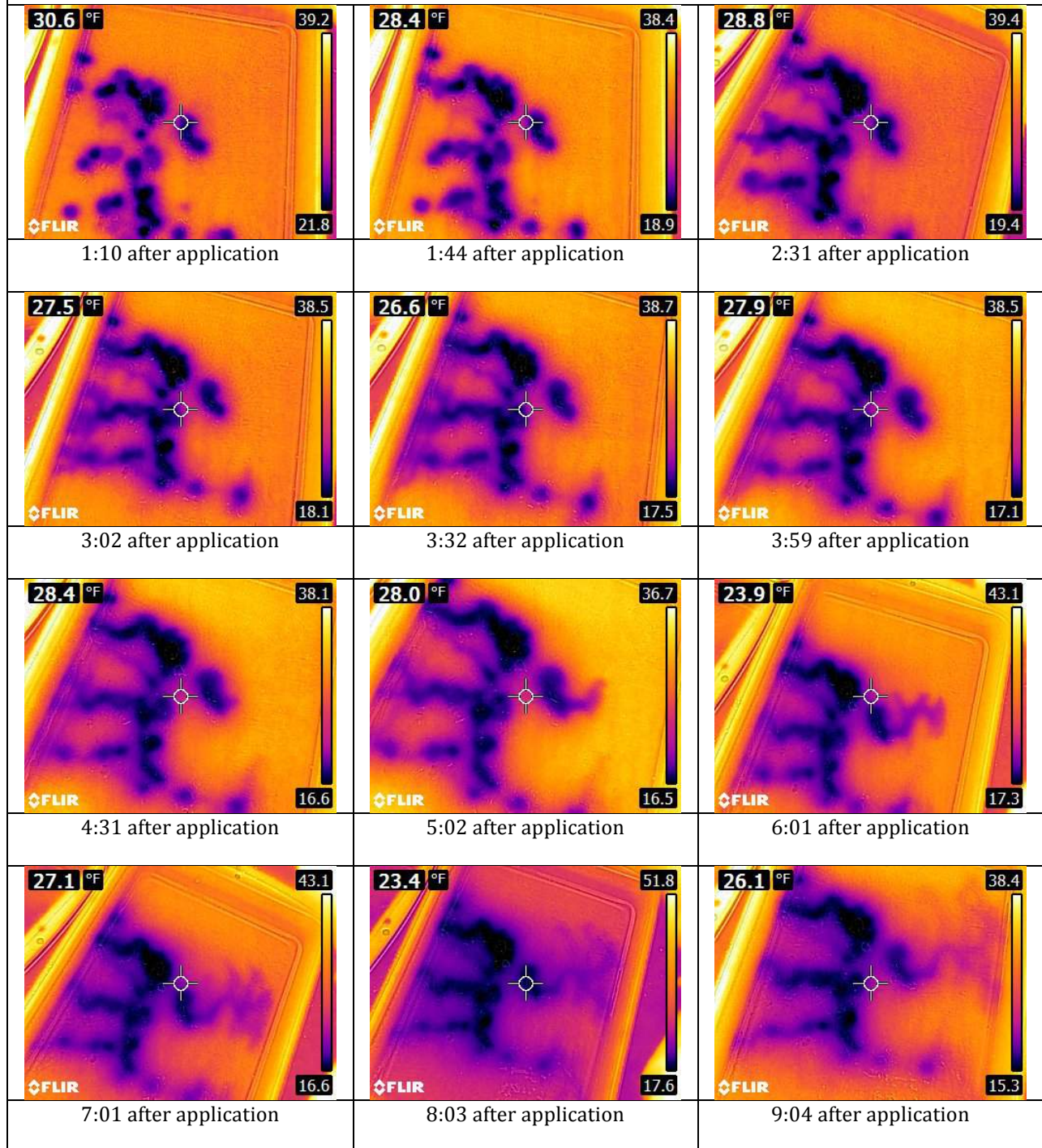
Rock salt passing #4 sieve but retained on #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



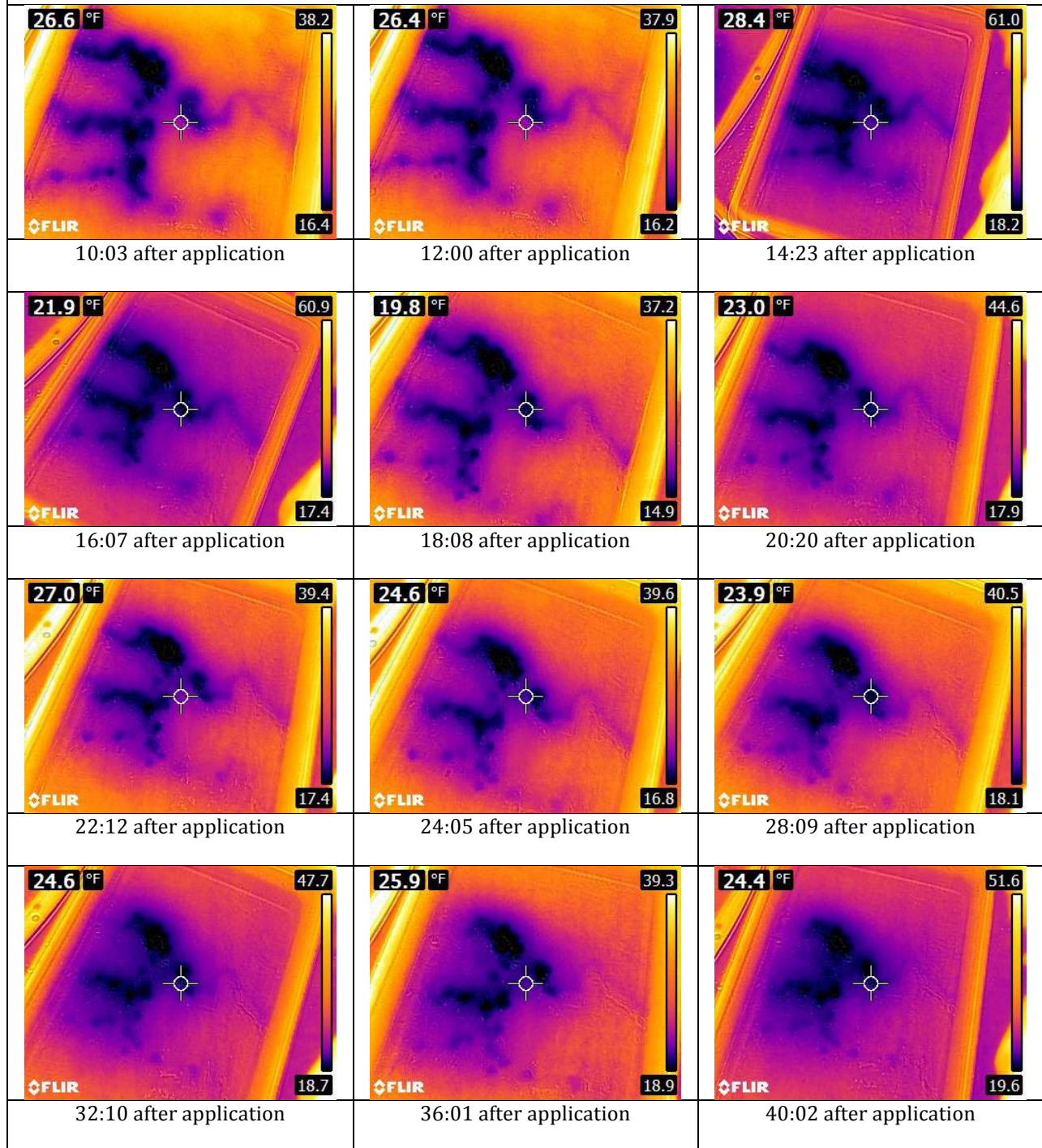
Rock salt passing #4 sieve but retained on #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



Rock salt retained on #4 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



Rock salt retained on #4 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)

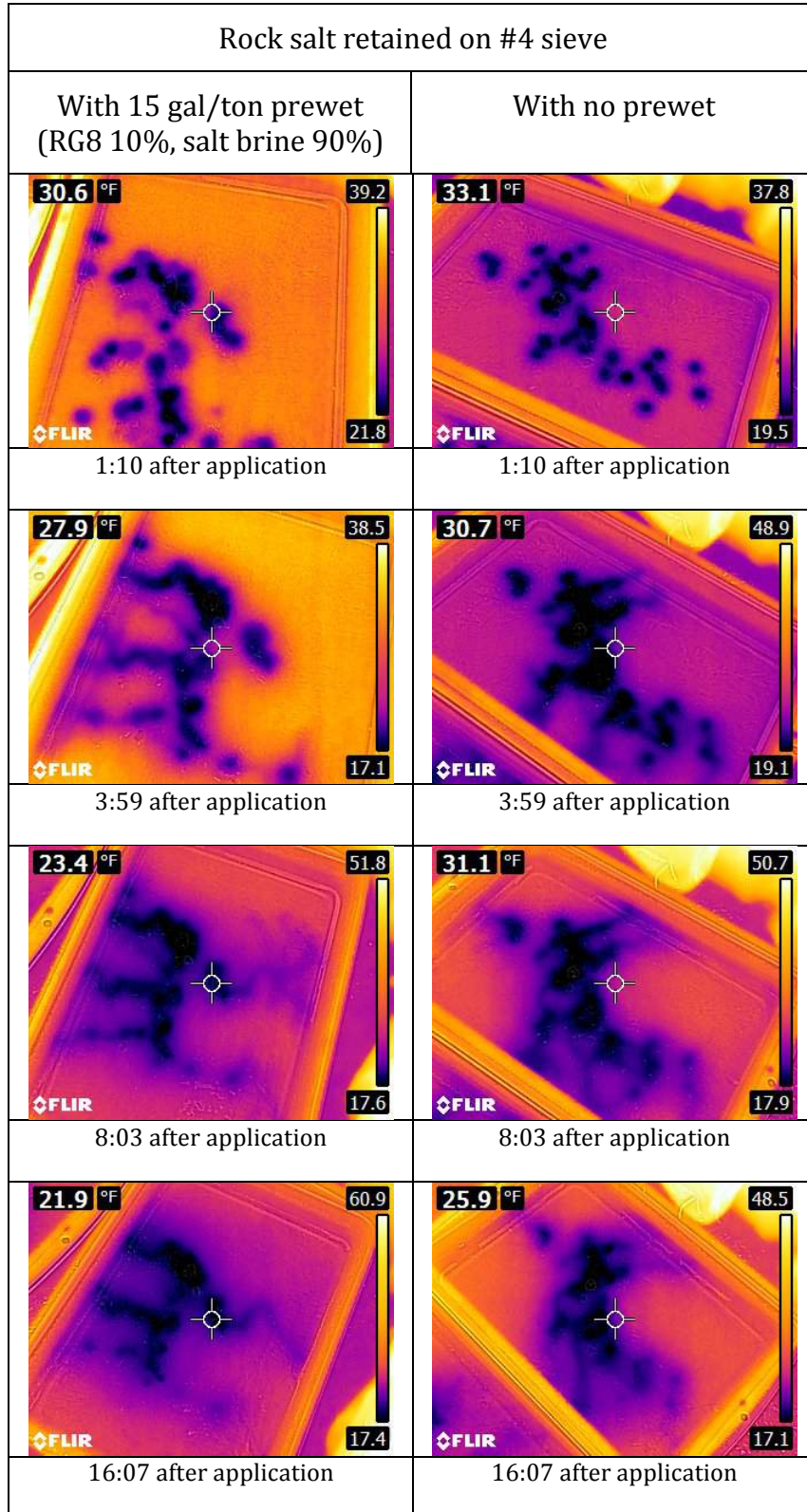


Rock salt with 15 gal/ton prewet (RG8 10%, salt brine 90%)

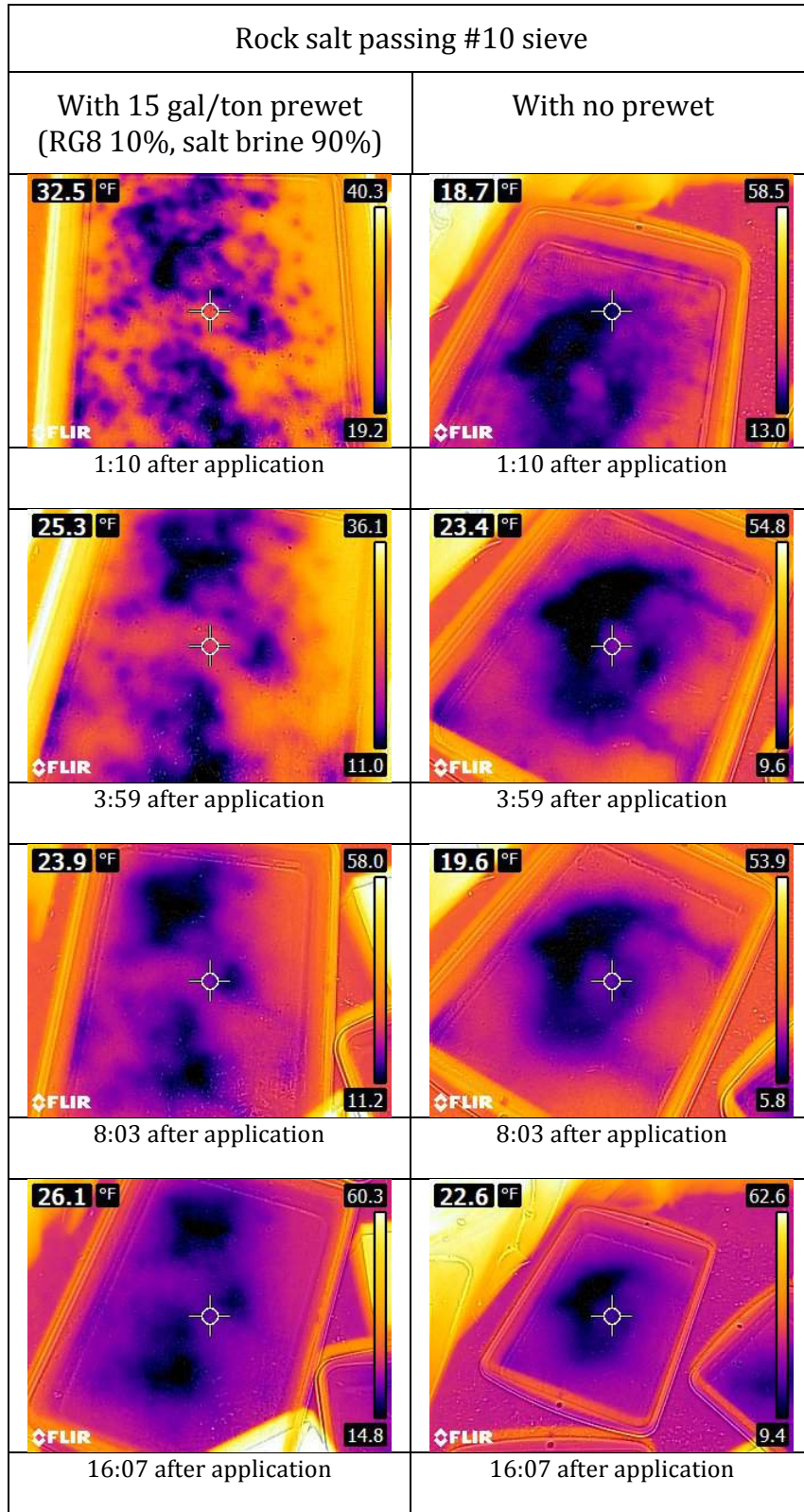
Retained on #4 sieve	Passing #4 sieve and retained on #10 sieve	Passing #10 sieve
<p>30.6 °F 39.2 21.8</p> <p>FLIR</p>	<p>32.0 °F 61.9 19.5</p> <p>FLIR</p>	<p>32.5 °F 40.3 19.2</p> <p>FLIR</p>
1:10 after application	1:10 after application	1:10 after application
<p>27.9 °F 38.5 17.1</p> <p>FLIR</p>	<p>29.8 °F 49.1 15.6</p> <p>FLIR</p>	<p>25.3 °F 36.1 11.0</p> <p>FLIR</p>
3:59 after application	3:59 after application	3:59 after application
<p>23.4 °F 51.8 17.6</p> <p>FLIR</p>	<p>25.0 °F 63.9 16.6</p> <p>FLIR</p>	<p>23.9 °F 58.0 11.2</p> <p>FLIR</p>
8:03 after application	8:03 after application	8:03 after application
<p>21.9 °F 60.9 17.4</p> <p>FLIR</p>	<p>24.1 °F 61.0 16.8</p> <p>FLIR</p>	<p>26.1 °F 60.3 14.8</p> <p>FLIR</p>
16:07 after application	16:07 after application	16:07 after application















Rock salt with no prewet		
Retained on #4 sieve	Passing #4 sieve and retained on #10 sieve	Passing #10 sieve
<p>33.1 °F 37.8 19.5 FLIR</p>	<p>30.4 °F 37.8 19.5 FLIR</p>	<p>18.7 °F 58.5 13.0 FLIR</p>
1:10 after application	1:10 after application	1:10 after application
<p>30.7 °F 48.9 19.1 FLIR</p>	<p>22.5 °F 55.9 16.3 FLIR</p>	<p>23.4 °F 54.8 9.6 FLIR</p>
3:59 after application	3:59 after application	3:59 after application
<p>31.1 °F 50.7 17.9 FLIR</p>	<p>21.7 °F 40.2 15.6 FLIR</p>	<p>19.6 °F 53.9 5.8 FLIR</p>
8:03 after application	8:03 after application	8:03 after application
<p>25.9 °F 48.5 17.1 FLIR</p>	<p>21.4 °F 57.6 16.6 FLIR</p>	<p>22.6 °F 62.6 9.4 FLIR</p>
16:07 after application	16:07 after application	16:07 after application



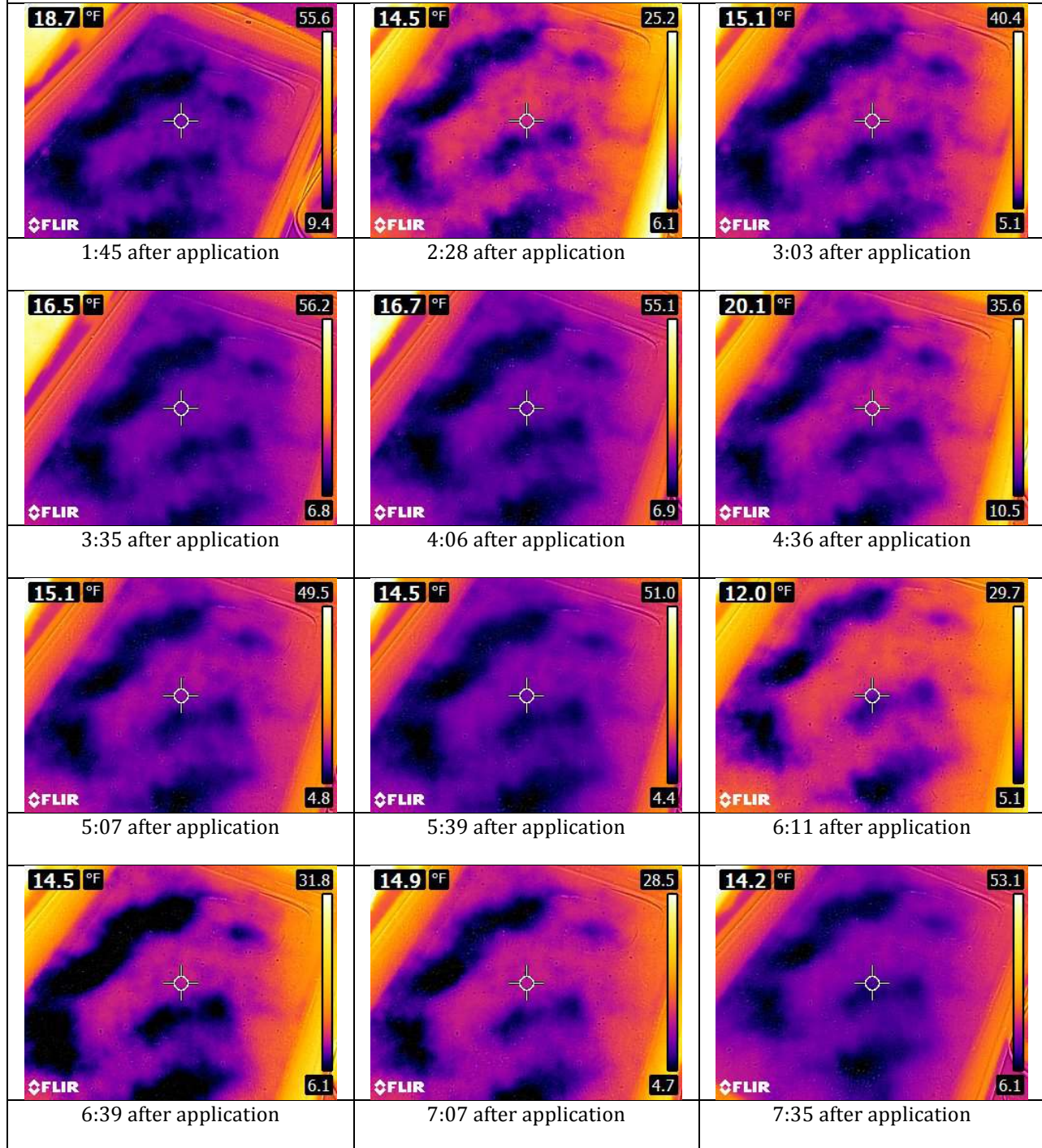
Rock salt passing #4 sieve and retained on #10 sieve	
With 15 gal/ton prewet (RG8 10%, salt brine 90%)	With no prewet
<p>32.0 °F 61.9 19.5</p>	<p>30.4 °F 37.8 19.5</p>
1:10 after application	1:10 after application
<p>29.8 °F 49.1 15.6</p>	<p>22.5 °F 55.9 16.3</p>
3:59 after application	3:59 after application
<p>25.0 °F 63.9 16.6</p>	<p>21.7 °F 40.2 15.6</p>
8:03 after application	8:03 after application
<p>24.1 °F 61.0 16.8</p>	<p>21.4 °F 57.6 16.6</p>
16:07 after application	16:07 after application



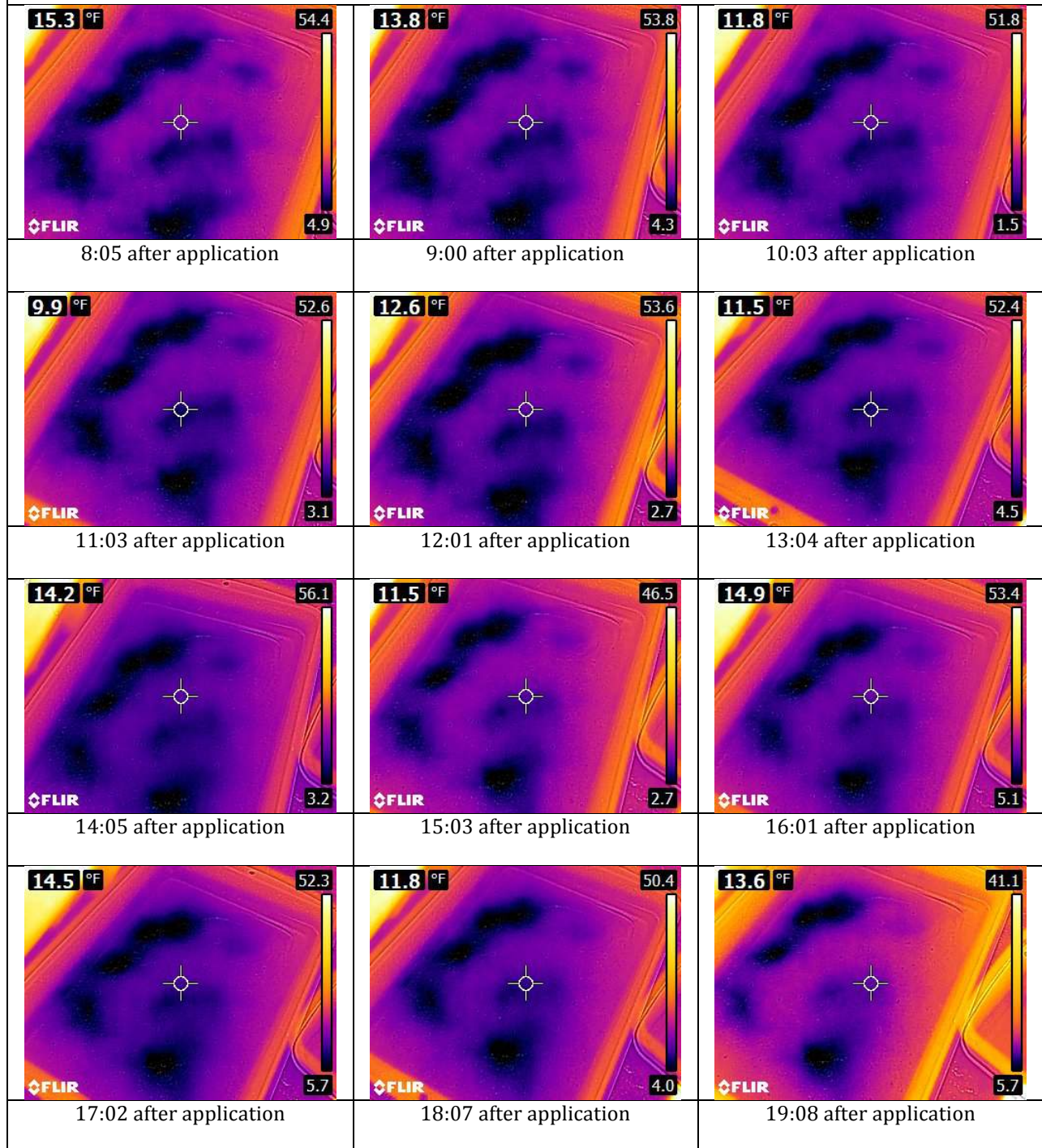
## **APPENDIX Q: 13° F MELT INITIATION AND EXPANSION EVALUATION**

Rock salt with no prewet		
Retained on #4 sieve	Passing #4 sieve and retained on #10 sieve	Passing #10 sieve
		
1:45 after application	1:45 after application	1:45 after application
		
16:01 after application	16:01 after application	16:01 after application
Rock salt with 15 gal/ton prewet (RG8 10%, salt brine 90%)		
		
1:45 after application	1:45 after application	1:45 after application
		
16:01 after application	16:01 after application	16:01 after application

Rock salt passing #10 sieve with no prewet

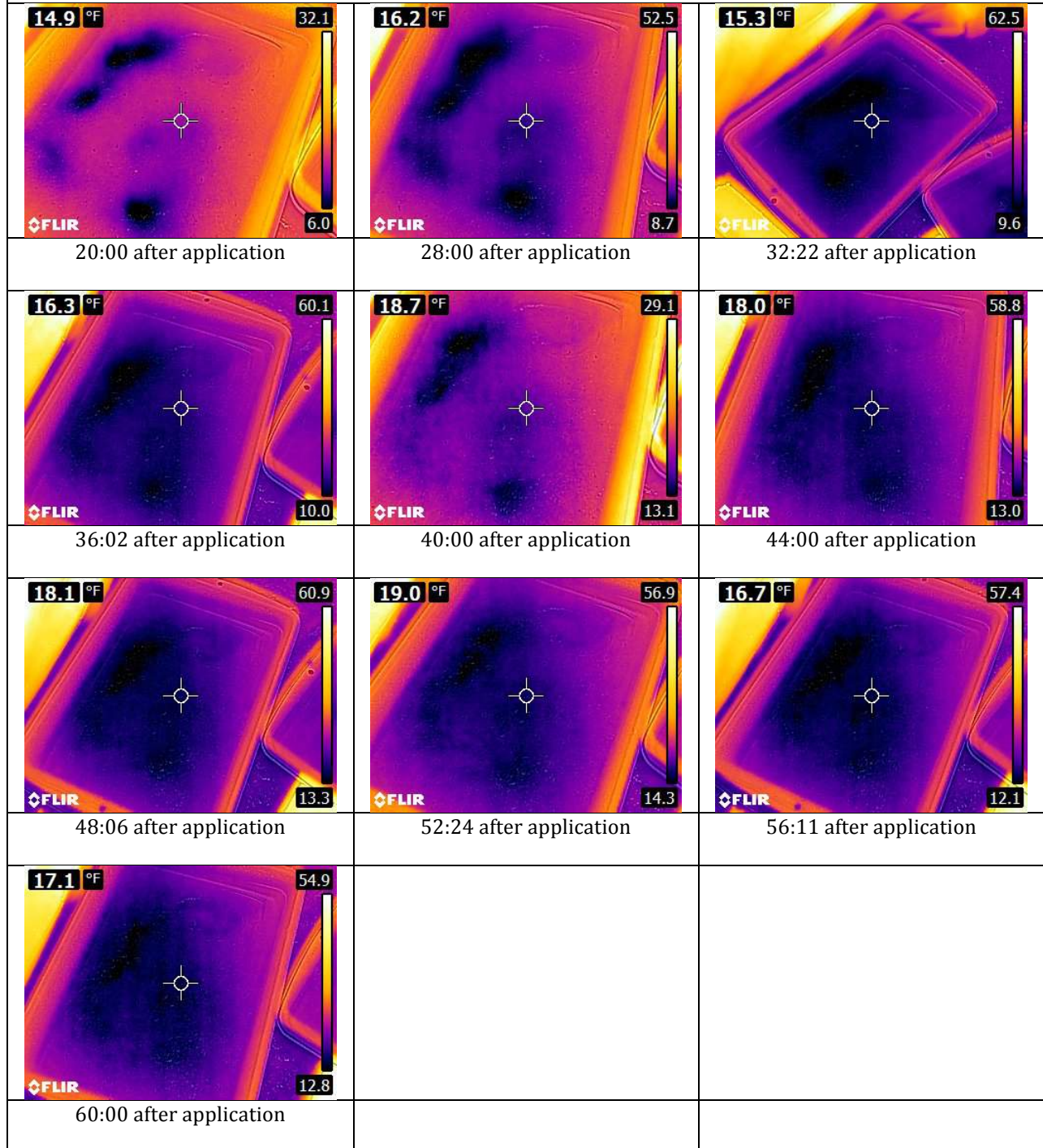


Rock salt passing #10 sieve with no prewet

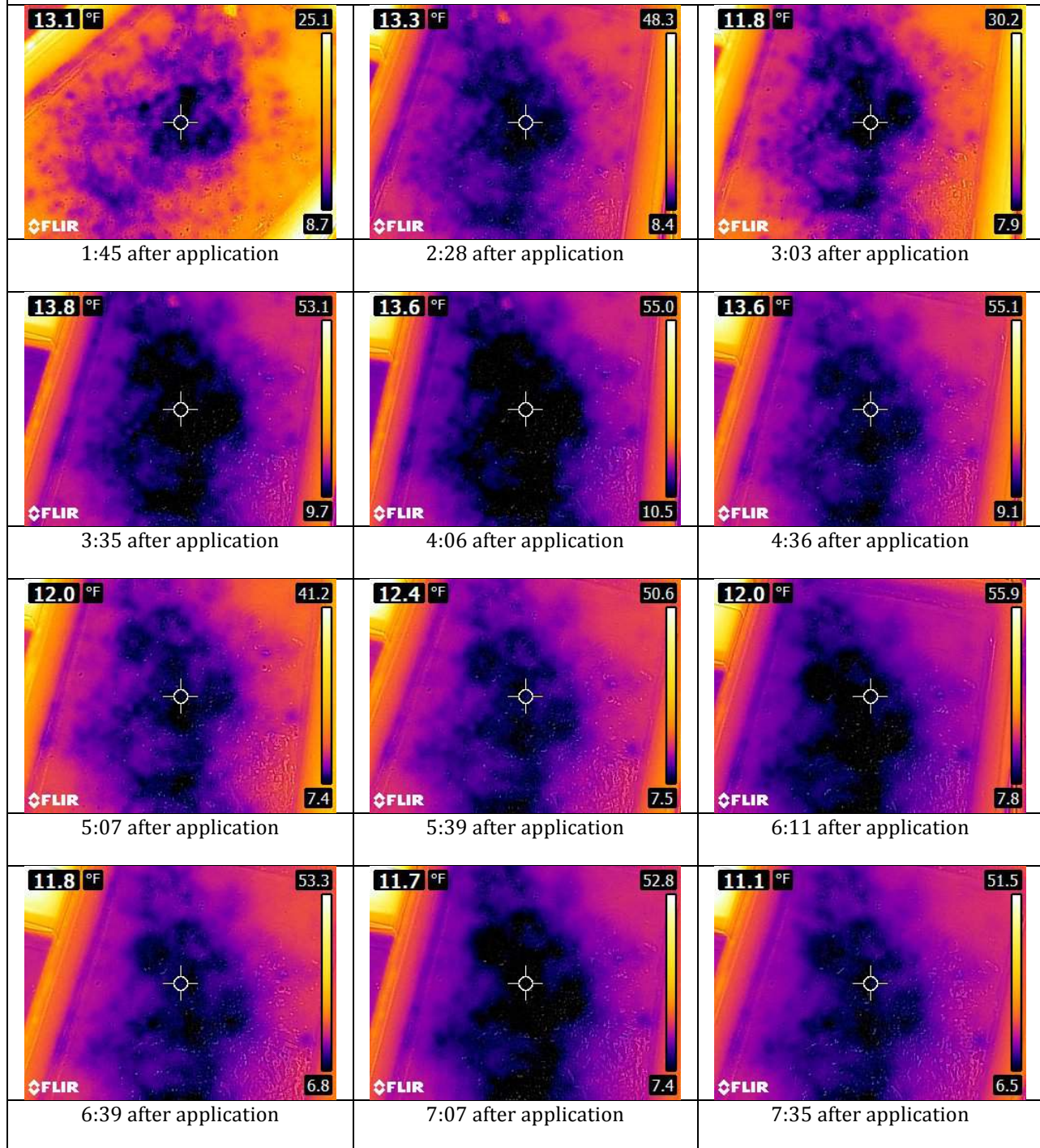




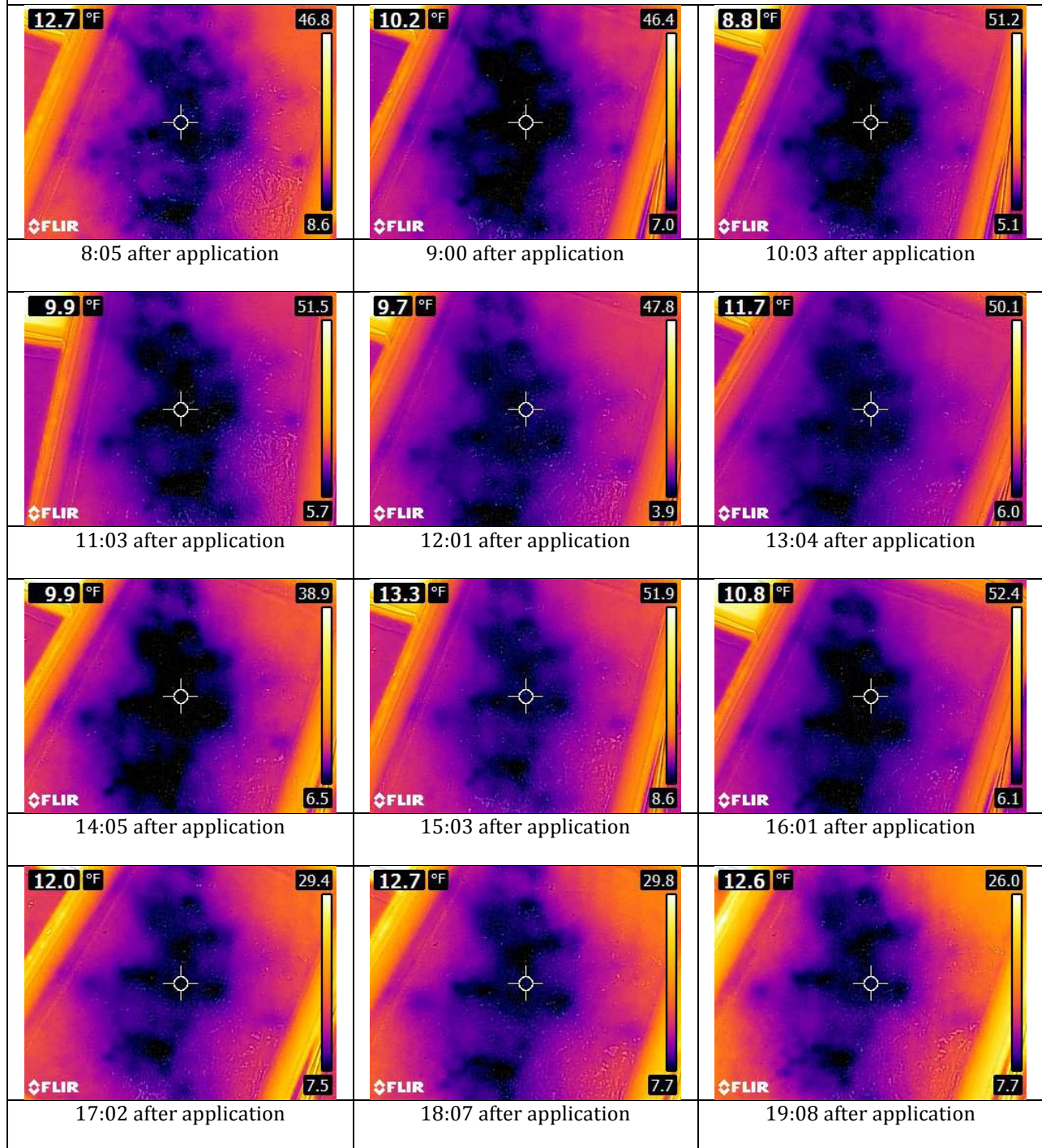
Rock salt passing #10 sieve with no prewet



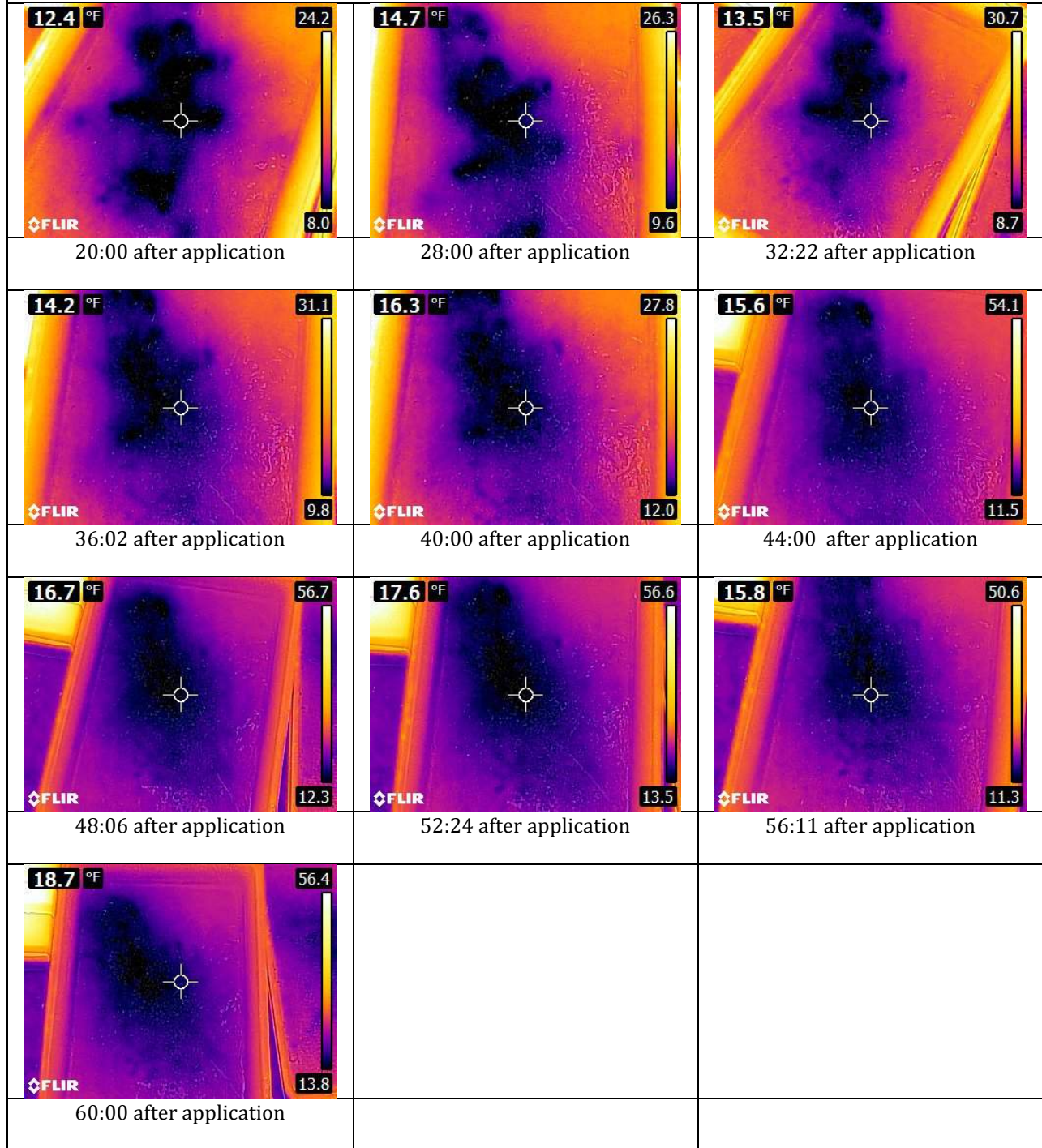
Rock salt passing #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



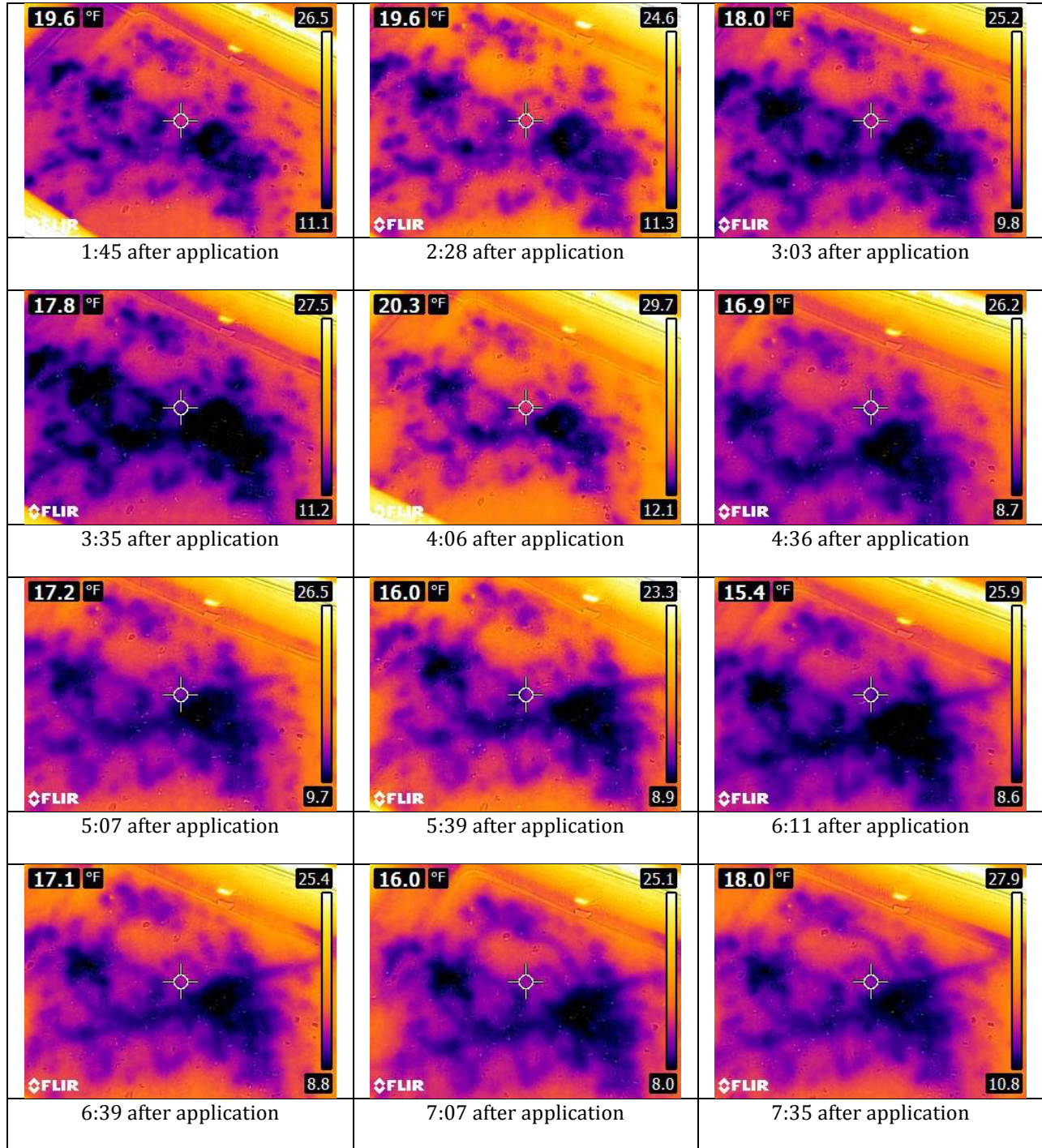
Rock salt passing #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



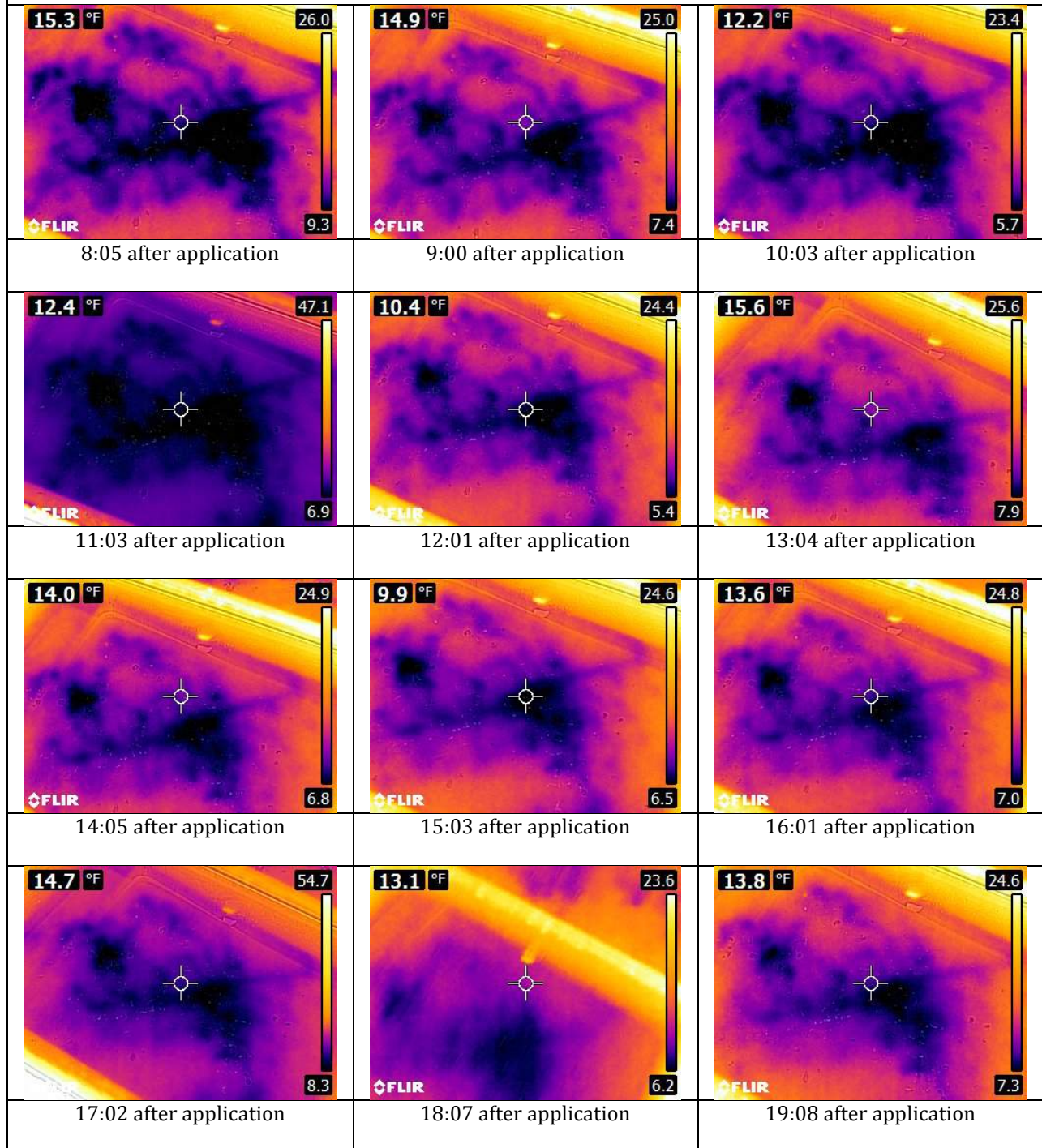
Rock salt passing #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



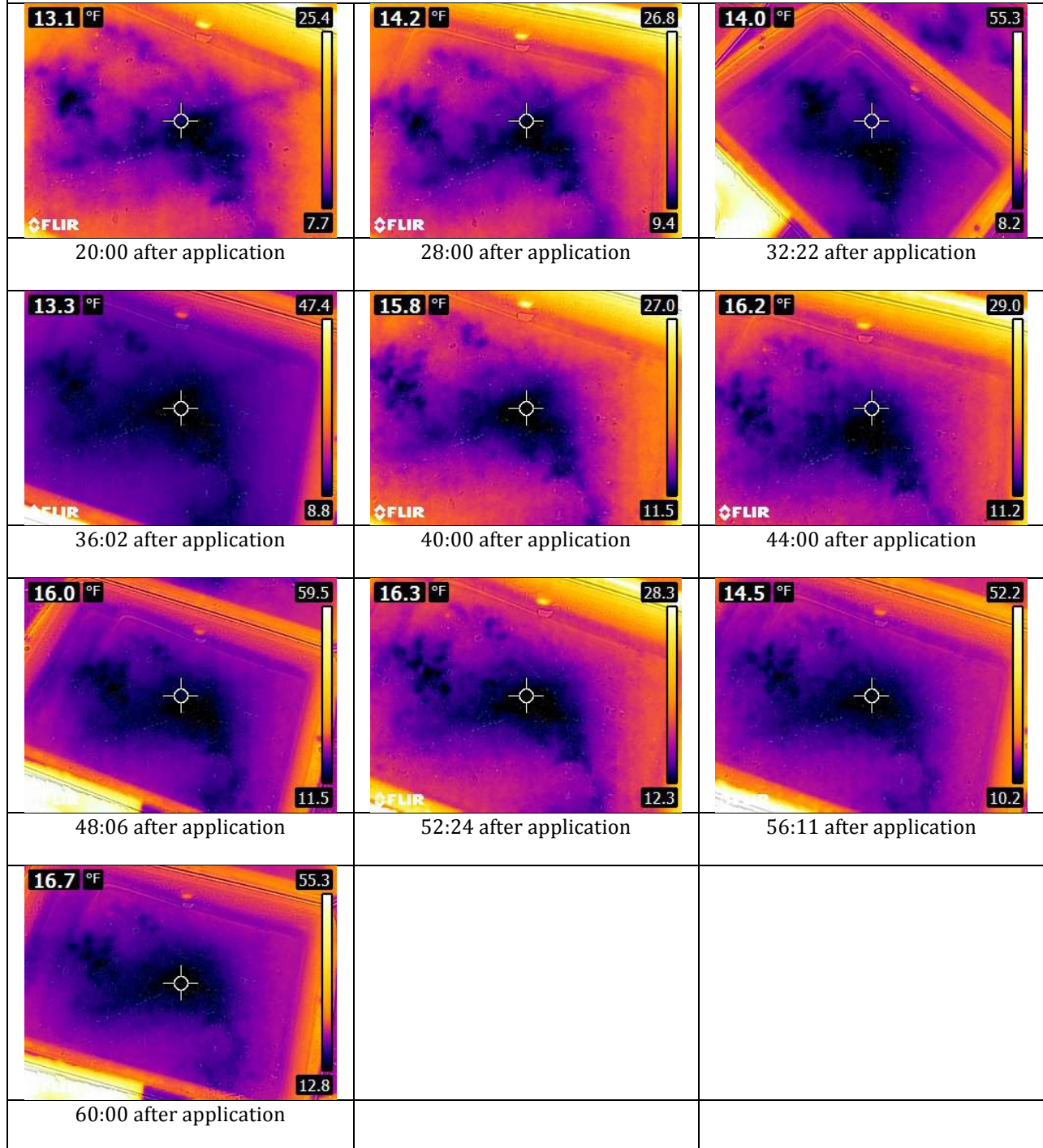
Rock salt passing #4 sieve but retained on #10 sieve with no prewet



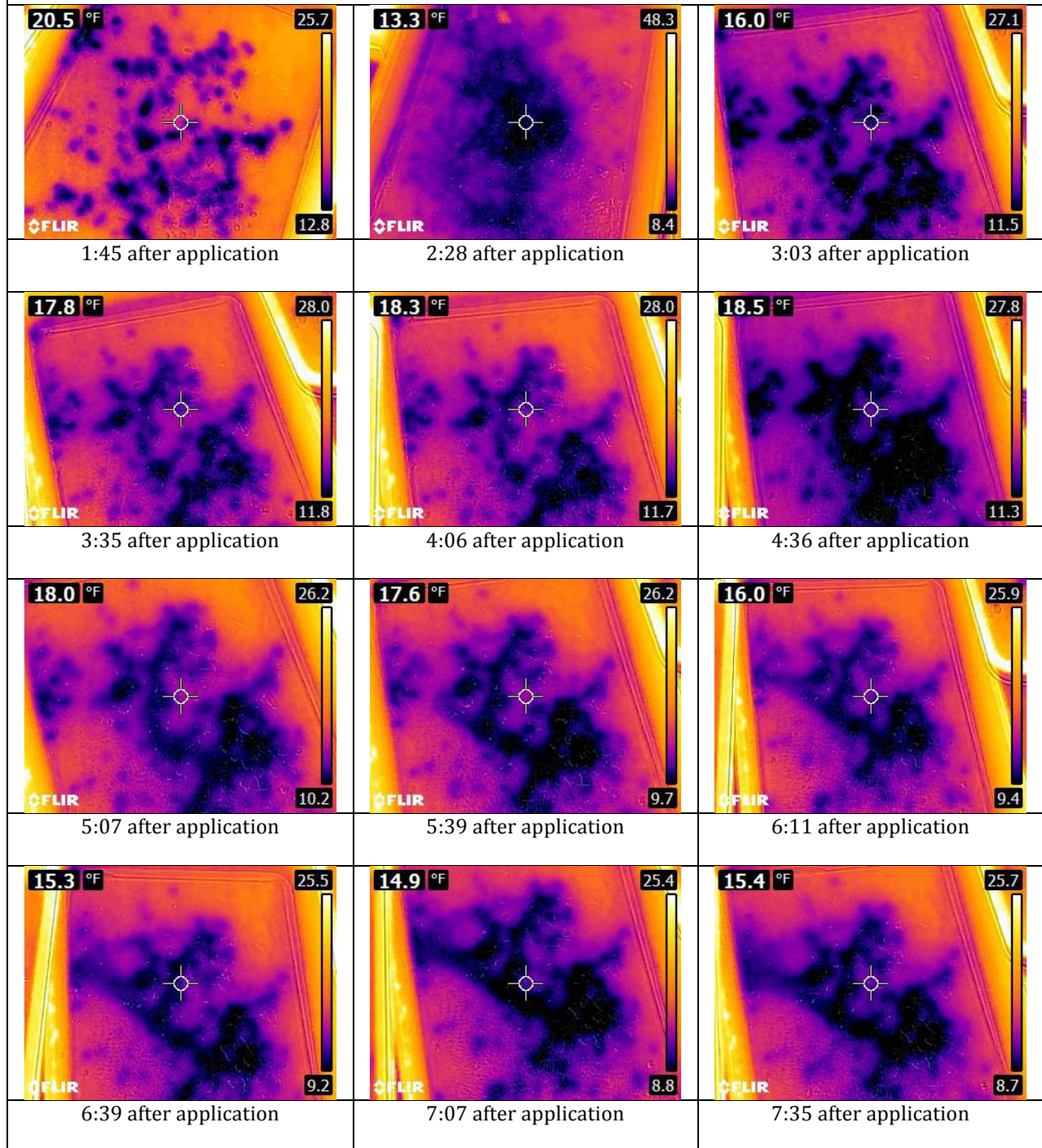
Rock salt passing #4 sieve but retained on #10 sieve with no prewet



Rock salt passing #4 sieve but retained on #10 sieve with no prewet

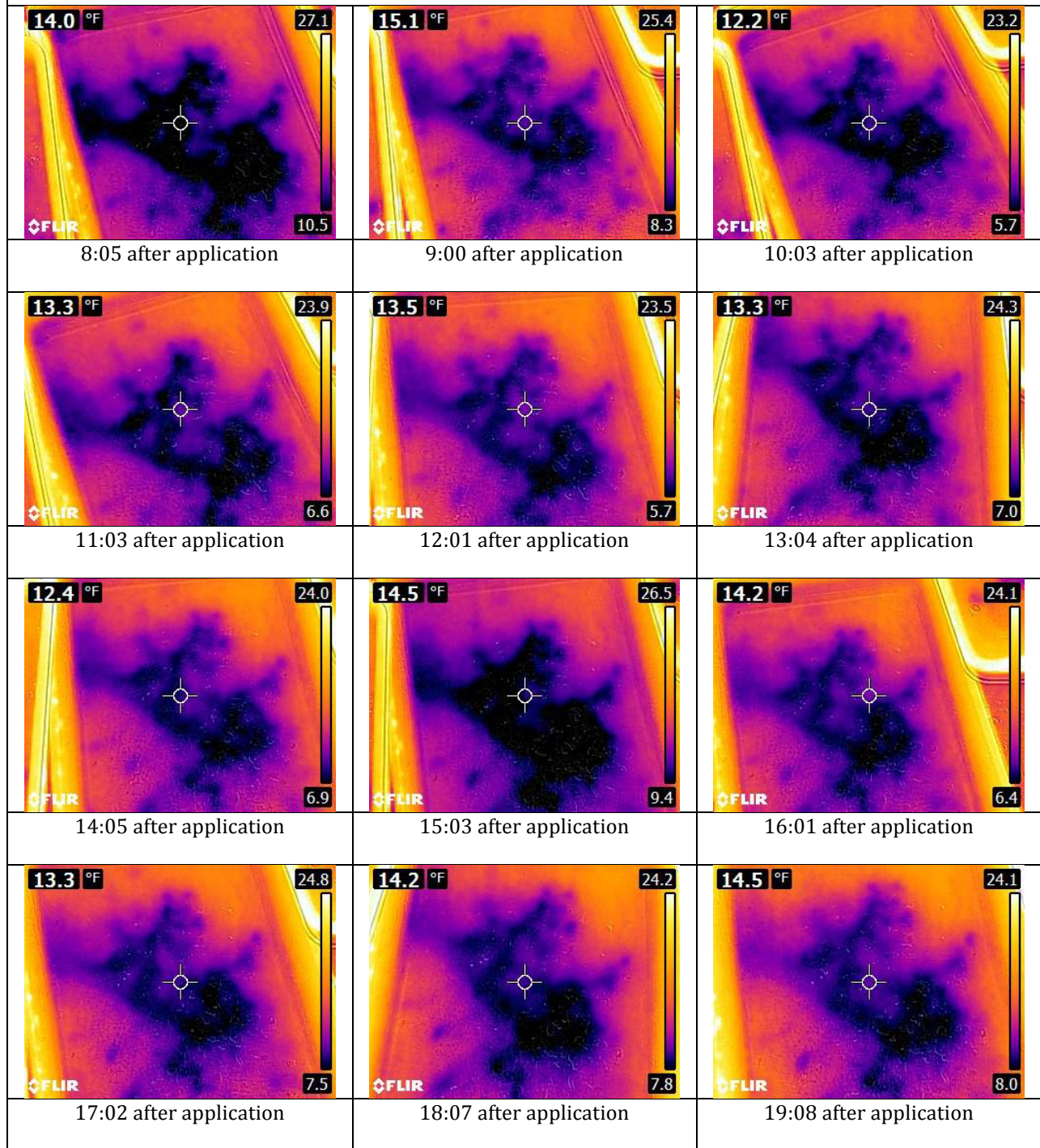


Rock salt passing #4 sieve but retained on #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)

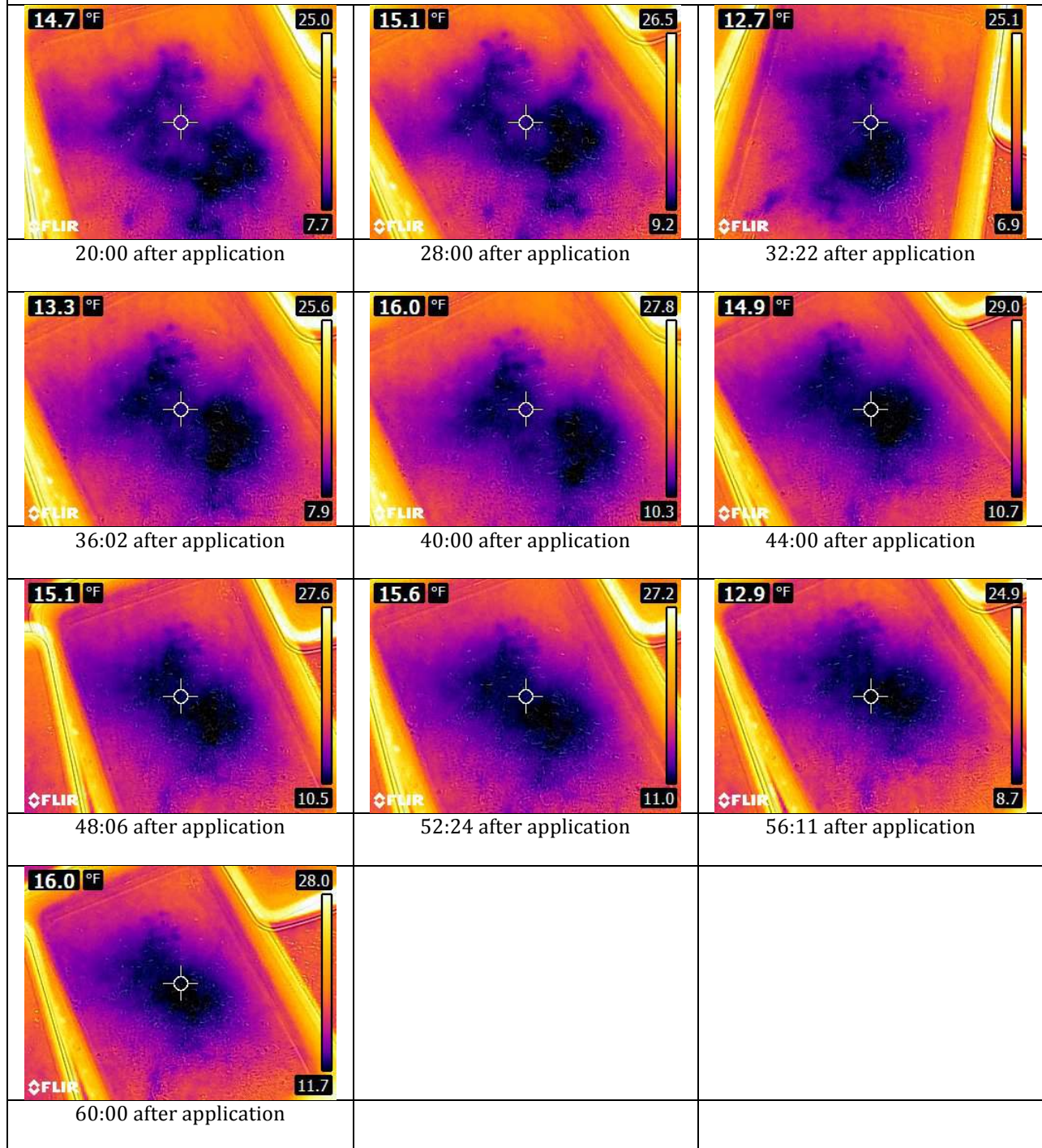




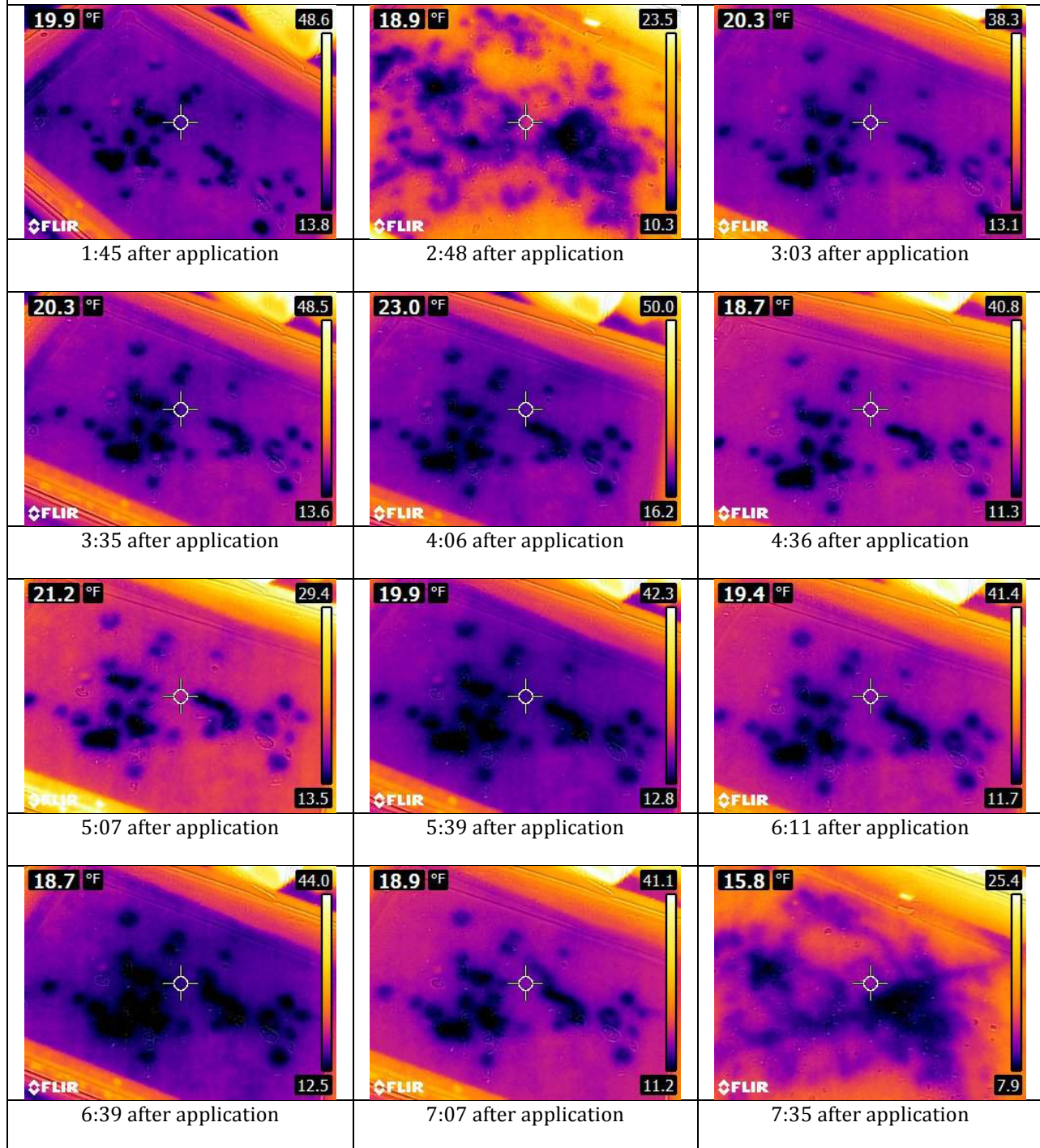
Rock salt passing #4 sieve but retained on #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



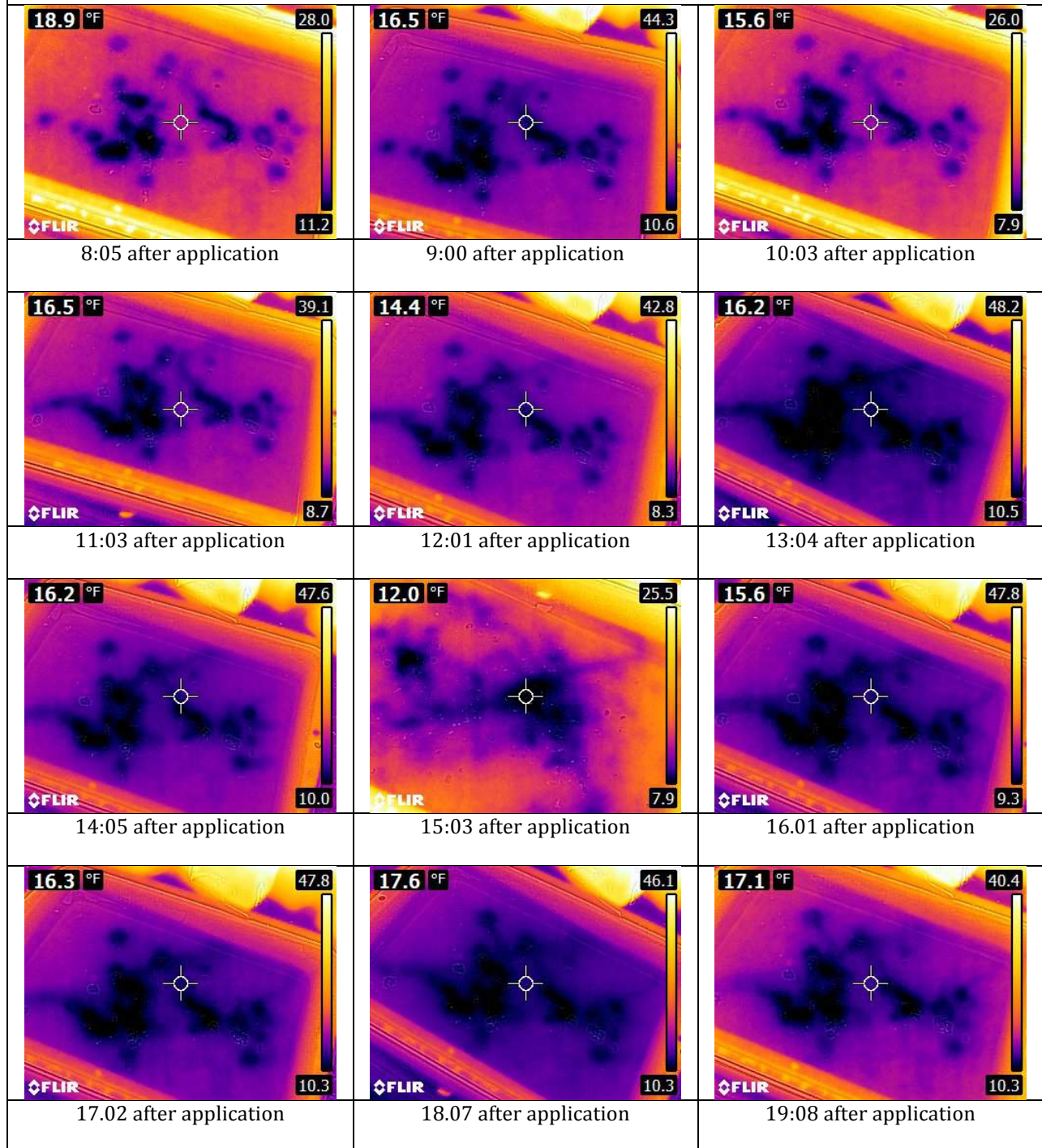
Rock salt passing #4 sieve but retained on #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



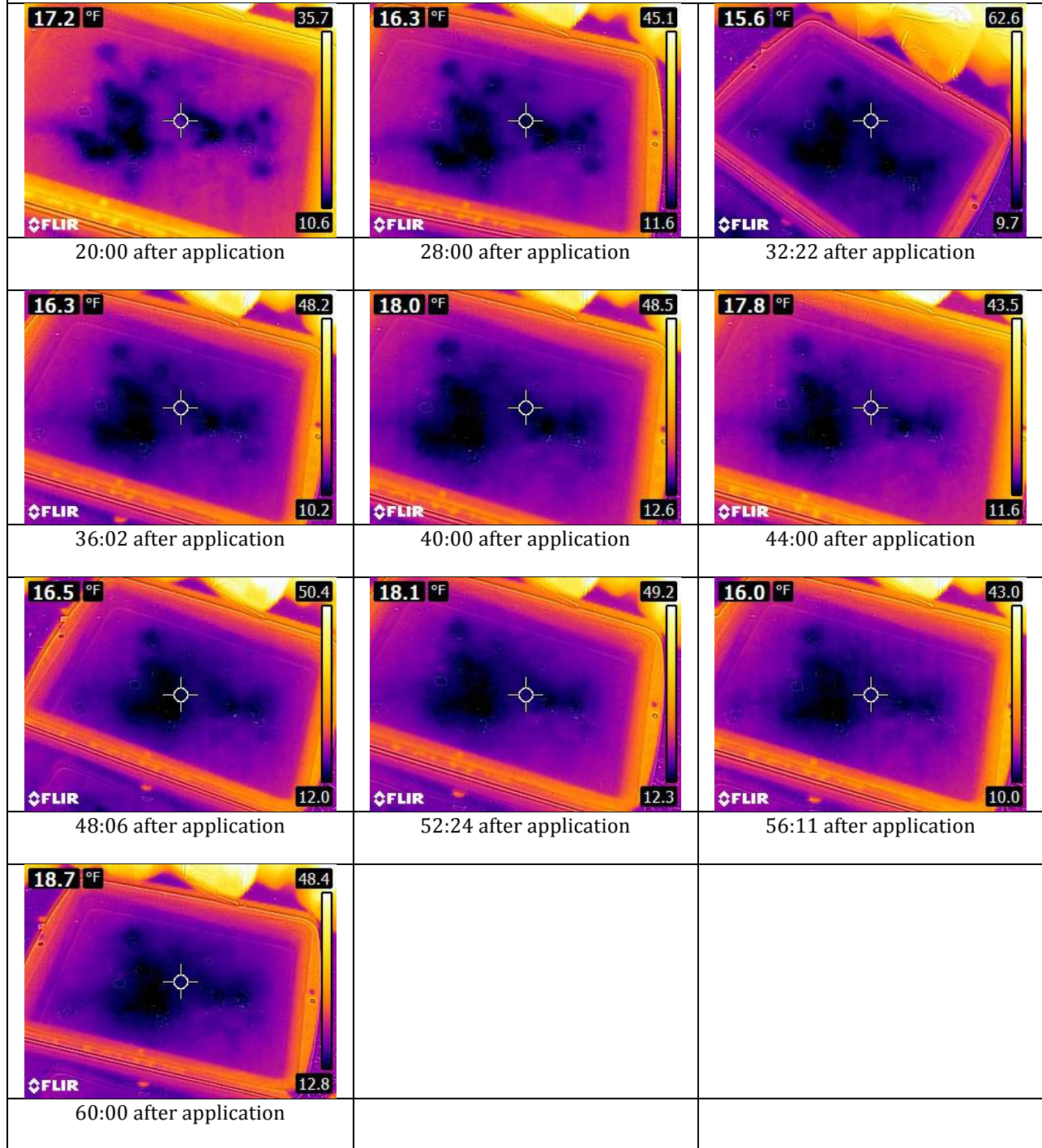
Rock salt retained on #4 sieve with no prewet



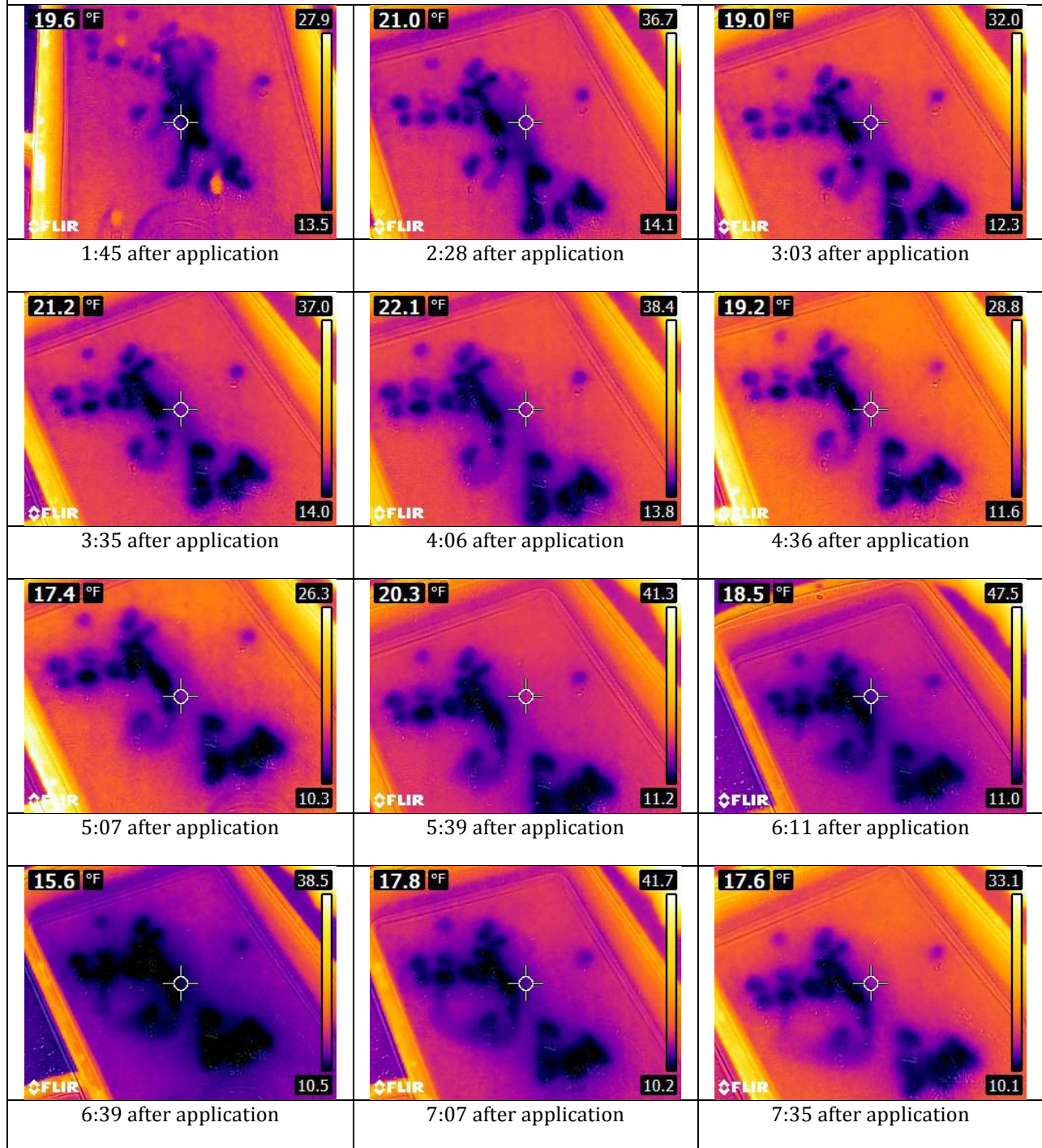
Rock salt retained on #4 sieve with no prewet



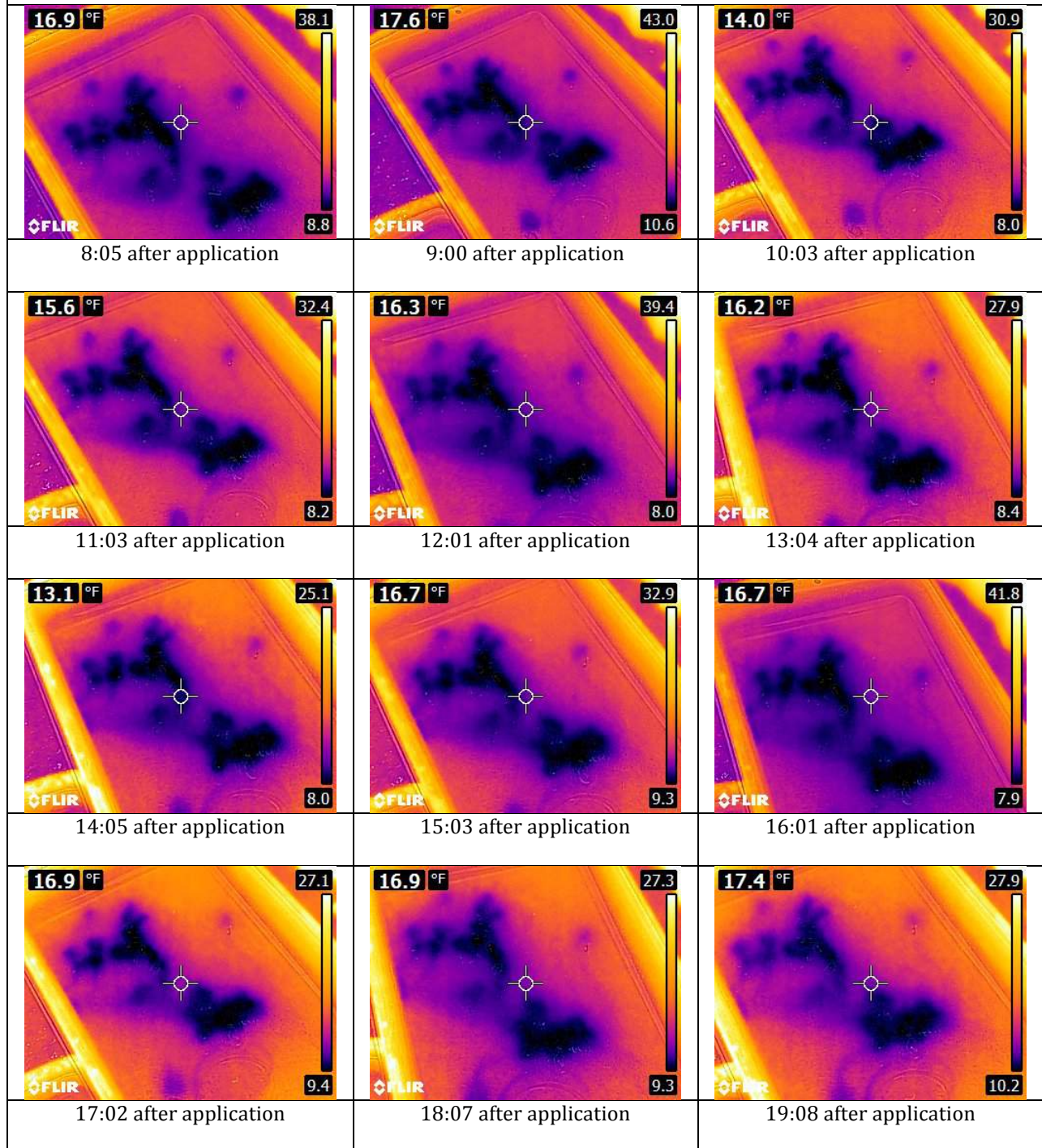
Rock salt retained on #4 sieve with no prewet



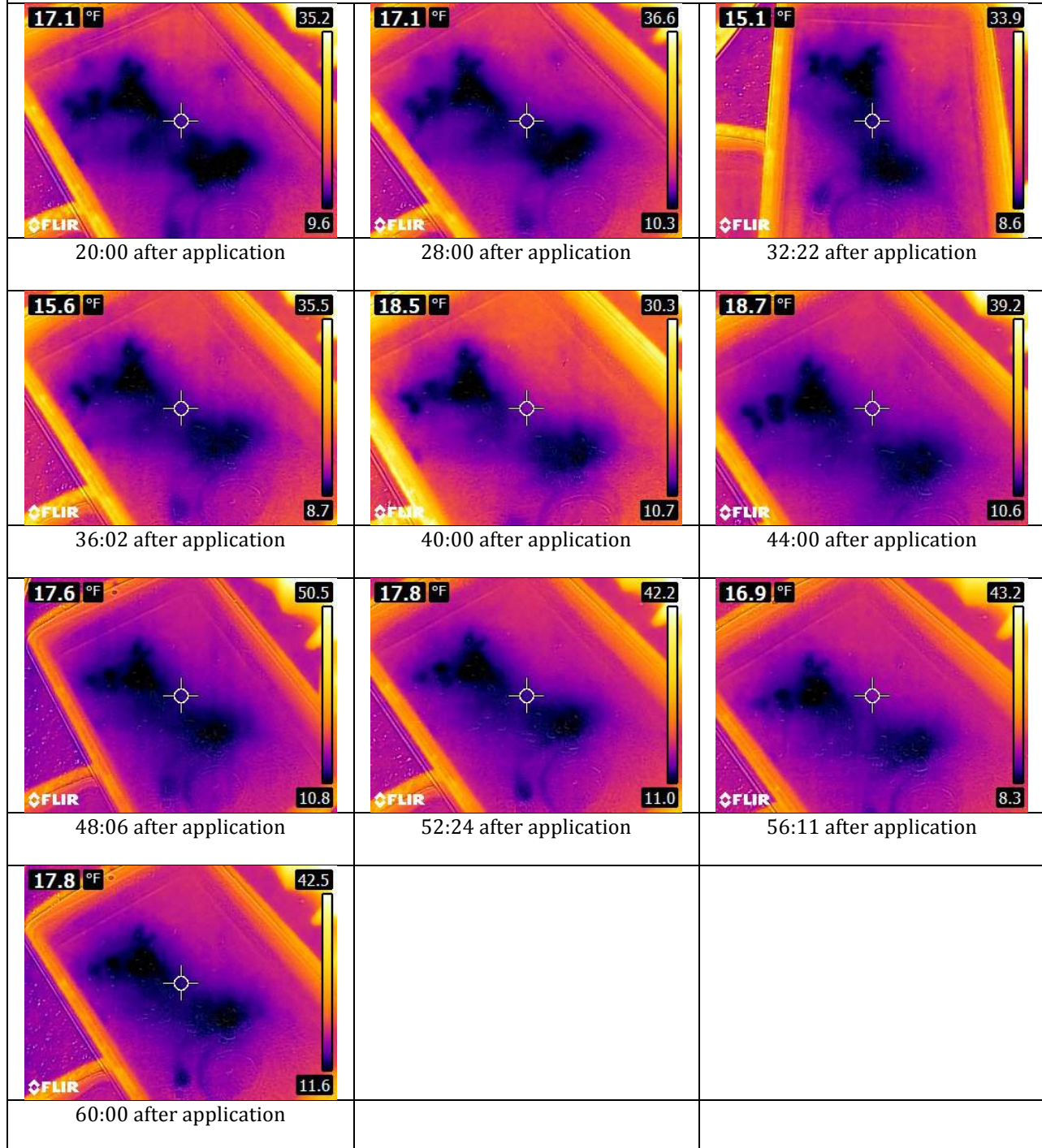
Rock salt retained on #4 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



Rock salt retained on #4 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)

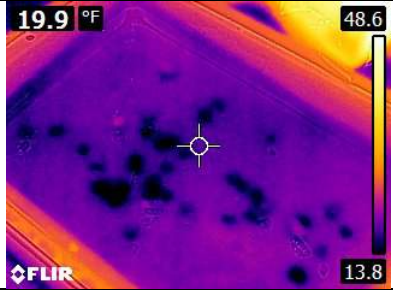
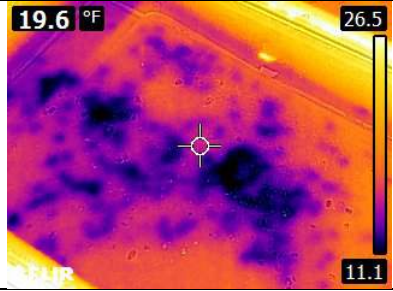
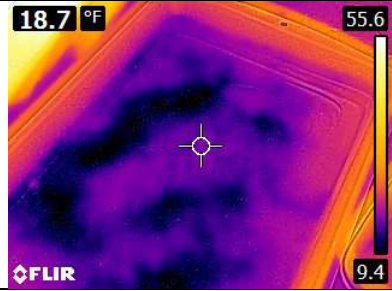
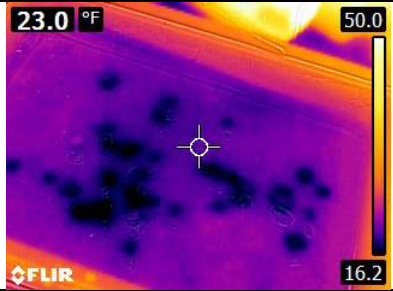
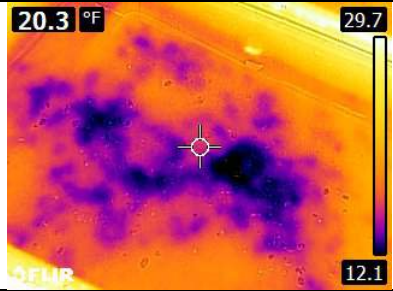
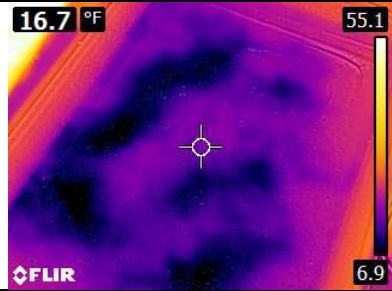
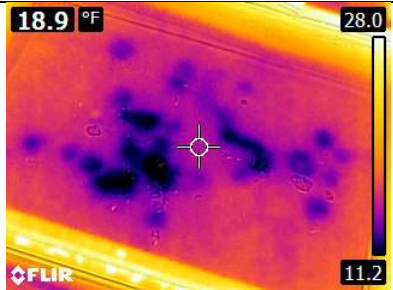
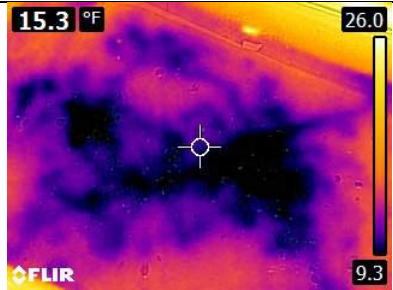
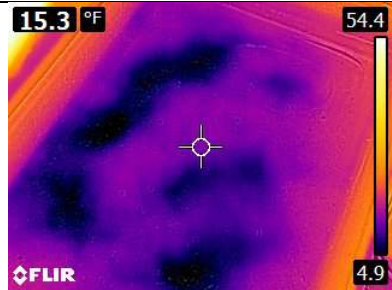
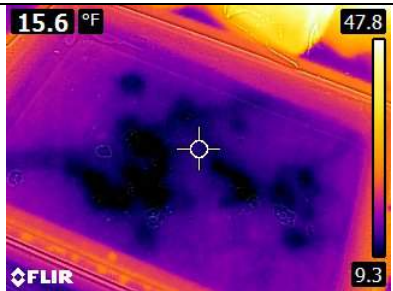
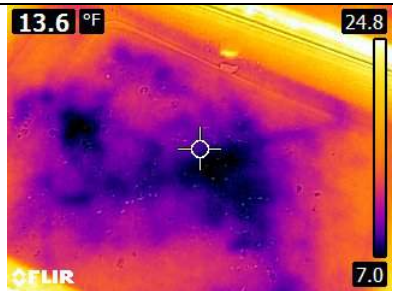
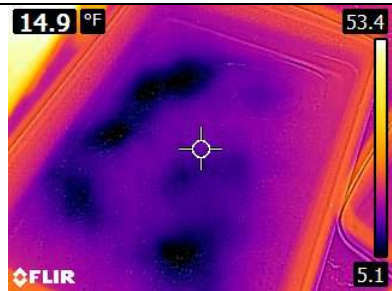


Rock salt retained on #4 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)

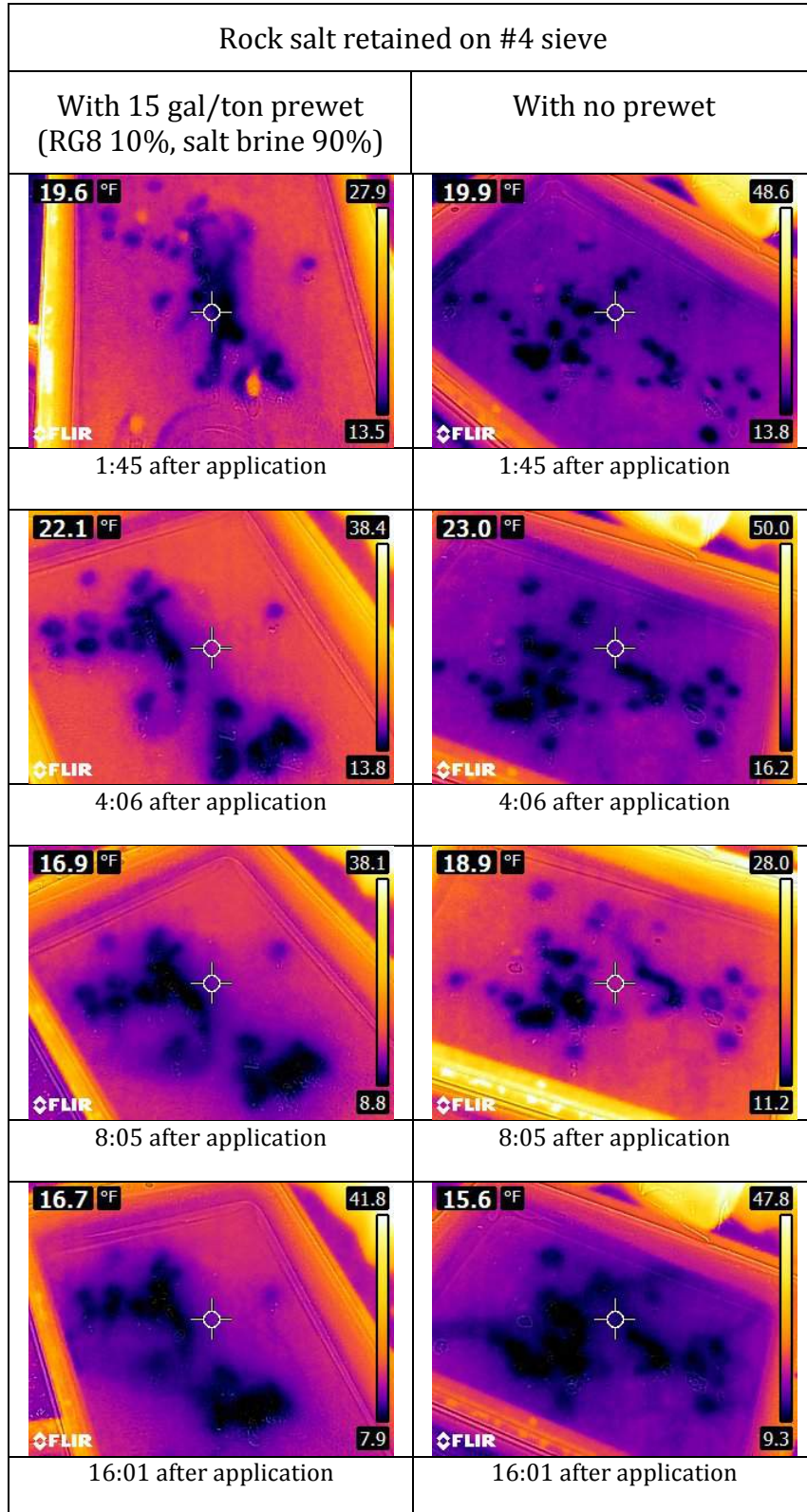




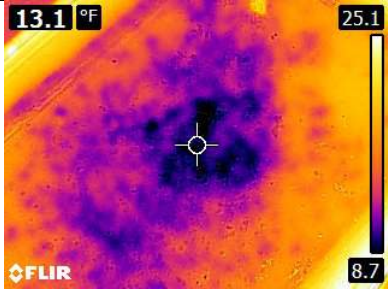
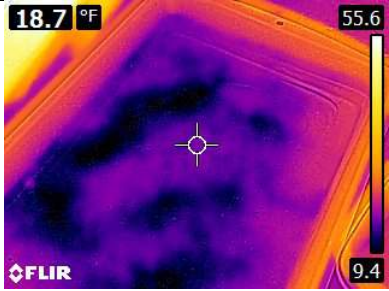
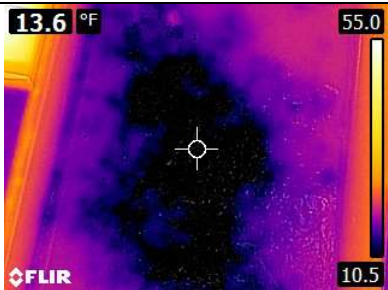
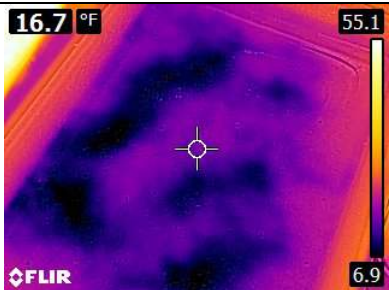
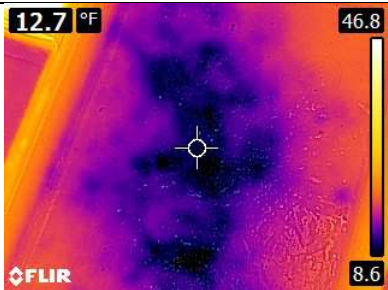
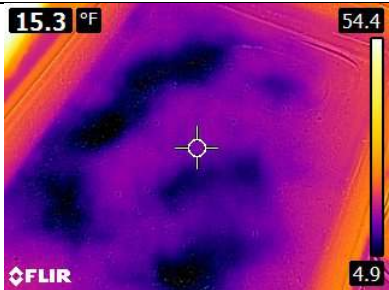
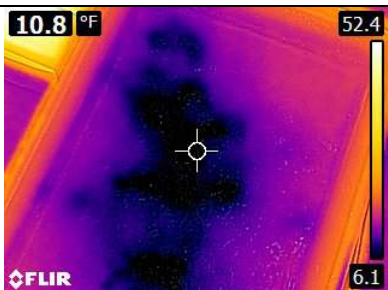
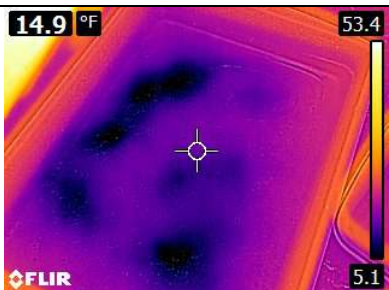
Rock salt with 15 gal/ton prewet (RG8 10%, salt brine 90%)













Retained on #4 sieve	Passing #4 sieve and retained on #10 sieve	Passing #10 sieve
 <p>19.9 °F 48.6 13.8 FLIR</p>	 <p>19.6 °F 26.5 11.1 FLIR</p>	 <p>18.7 °F 55.6 9.4 FLIR</p>
1:45 after application	1:45 after application	1:45 after application
 <p>23.0 °F 50.0 16.2 FLIR</p>	 <p>20.3 °F 29.7 12.1 FLIR</p>	 <p>16.7 °F 55.1 6.9 FLIR</p>
4:06 after application	4:06 after application	4:06 after application
 <p>18.9 °F 28.0 11.2 FLIR</p>	 <p>15.3 °F 26.0 9.3 FLIR</p>	 <p>15.3 °F 54.4 4.9 FLIR</p>
8:05 after application	8:05 after application	8:05 after application
 <p>15.6 °F 47.8 9.3 FLIR</p>	 <p>13.6 °F 24.8 7.0 FLIR</p>	 <p>14.9 °F 53.4 5.1 FLIR</p>
16:01 after application	16:01 after application	16:01 after application

Rock salt with no prewet		
Retained on #4 sieve	Passing #4 sieve and retained on #10 sieve	Passing #10 sieve
1:45 after application	1:45 after application	1:45 after application
4:06 after application	4:06 after application	4:06 after application
8:05 after application	8:05 after application	8:05 after application
16:01 after application	16:01 after application	16:01 after application

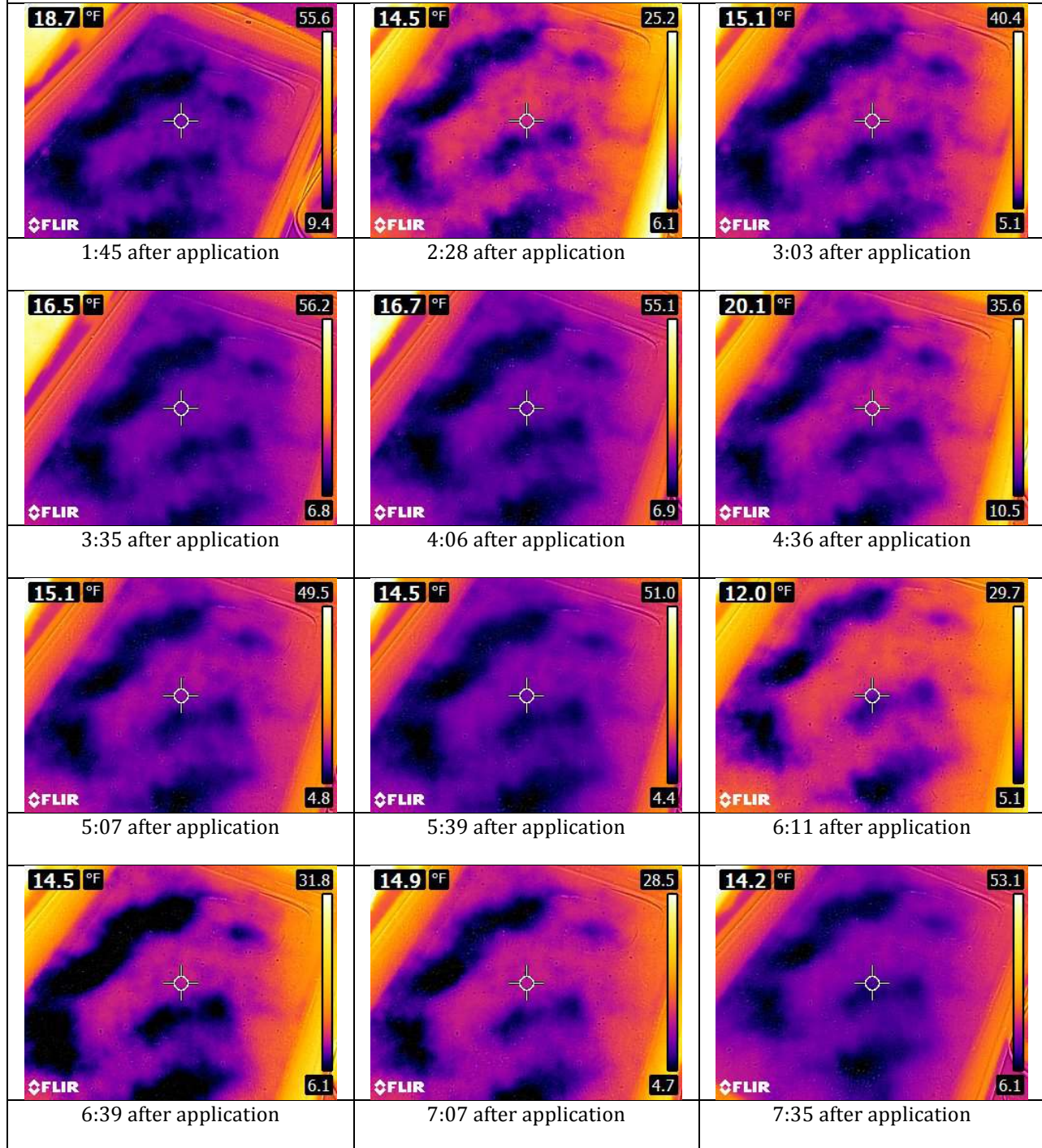


Rock salt passing #4 sieve and retained on #10 sieve	
With 15 gal/ton prewet (RG8 10%, salt brine 90%)	With no prewet
<p>20.5 °F 25.7                      12.8                      FLIR</p>	<p>19.6 °F 26.5                      11.1                      FLIR</p>
1:45 after application	1:45 after application
<p>18.3 °F 28.0                      11.7                      FLIR</p>	<p>20.3 °F 29.7                      12.1                      FLIR</p>
4:06 after application	4:06 after application
<p>14.0 °F 27.1                      10.5                      FLIR</p>	<p>15.3 °F 26.0                      9.3                      FLIR</p>
8:05 after application	8:05 after application
<p>14.2 °F 24.1                      6.4                      FLIR</p>	<p>13.6 °F 24.8                      7.0                      FLIR</p>
16:01 after application	16:01 after application

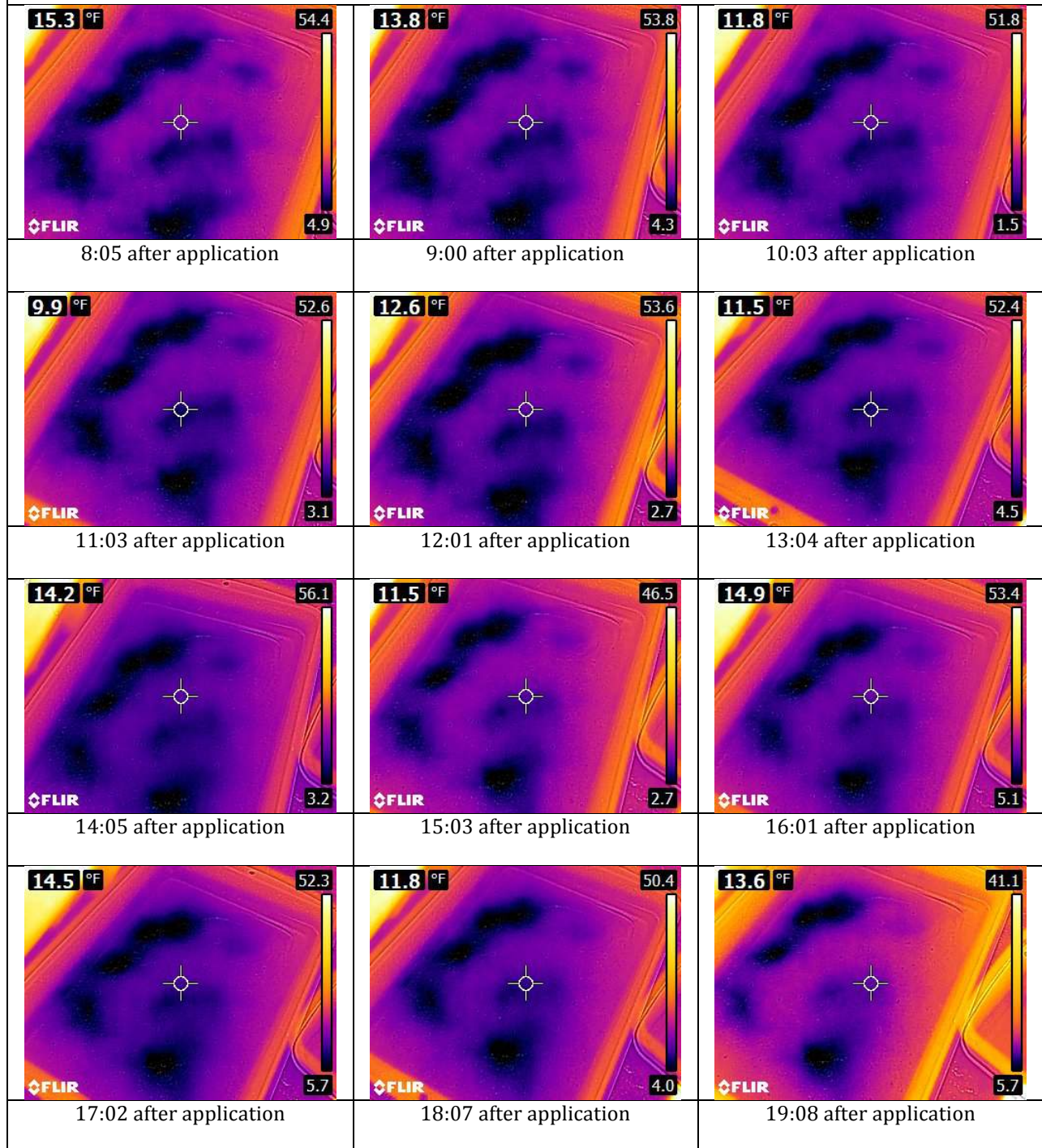
Rock salt passing #10 sieve	
With 15 gal/ton prewet (RG8 10%, salt brine 90%)	With no prewet
	
1:45 after application	1:45 after application
	
4:06 after application	4:06 after application
	
8:05 after application	8:05 after application
	
16:01 after application	16:01 after application

Rock salt with no prewet		
Retained on #4 sieve	Passing #4 sieve and retained on #10 sieve	Passing #10 sieve
		
1:45 after application	1:45 after application	1:45 after application
		
16:01 after application	16:01 after application	16:01 after application
Rock salt with 15 gal/ton prewet (RG8 10%, salt brine 90%)		
		
1:45 after application	1:45 after application	1:45 after application
		
16:01 after application	16:01 after application	16:01 after application

Rock salt passing #10 sieve with no prewet

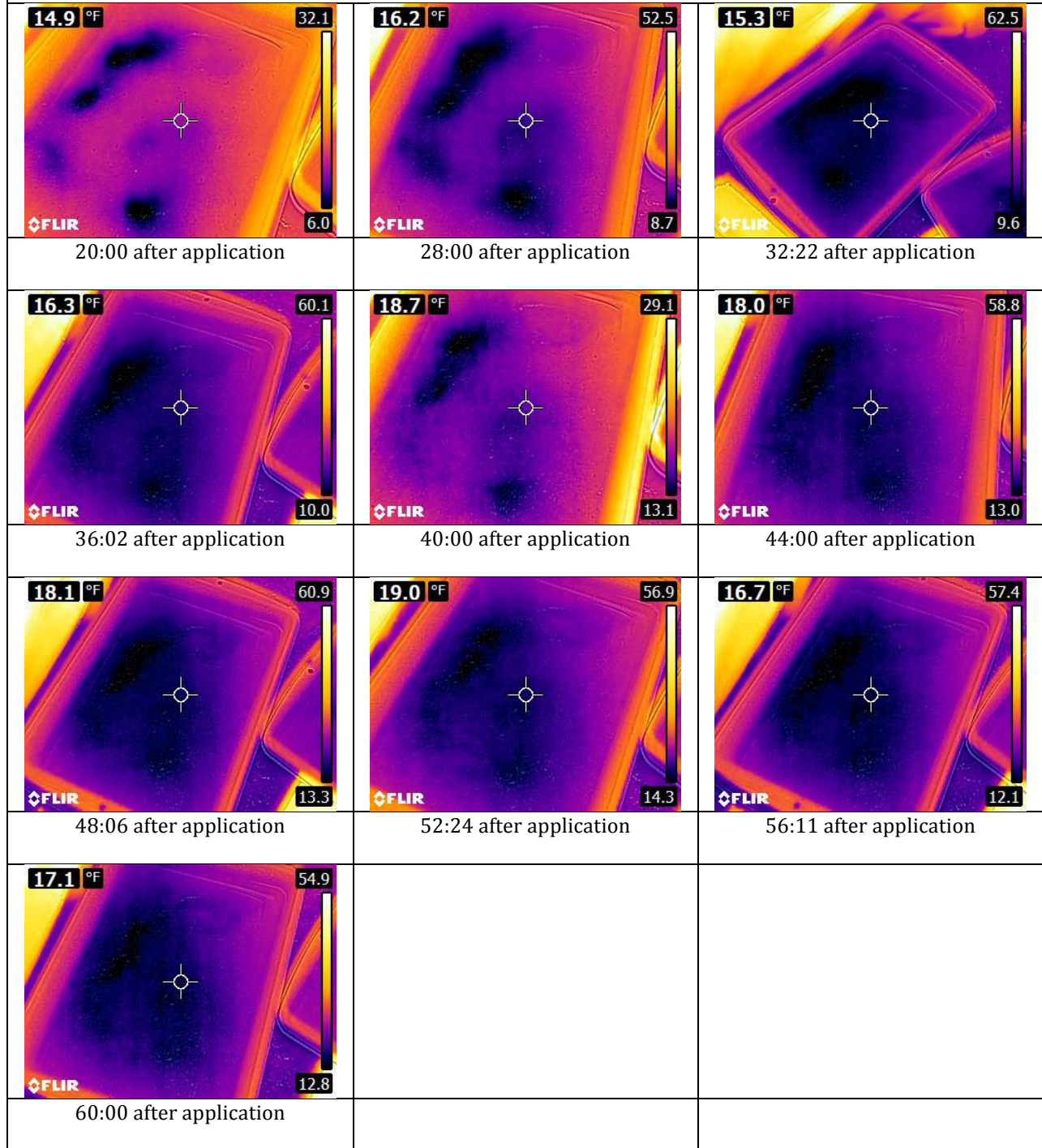


Rock salt passing #10 sieve with no prewet

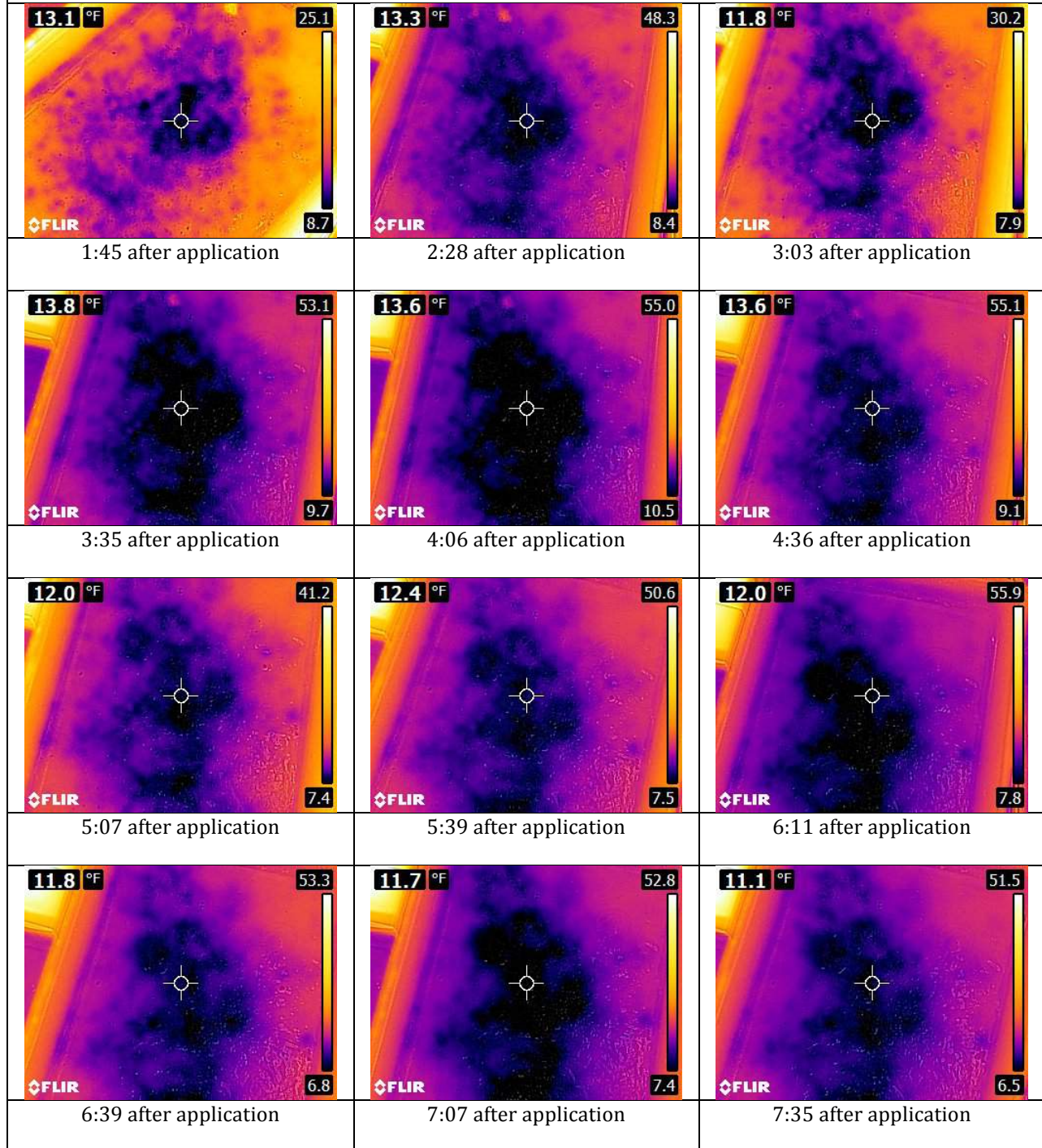




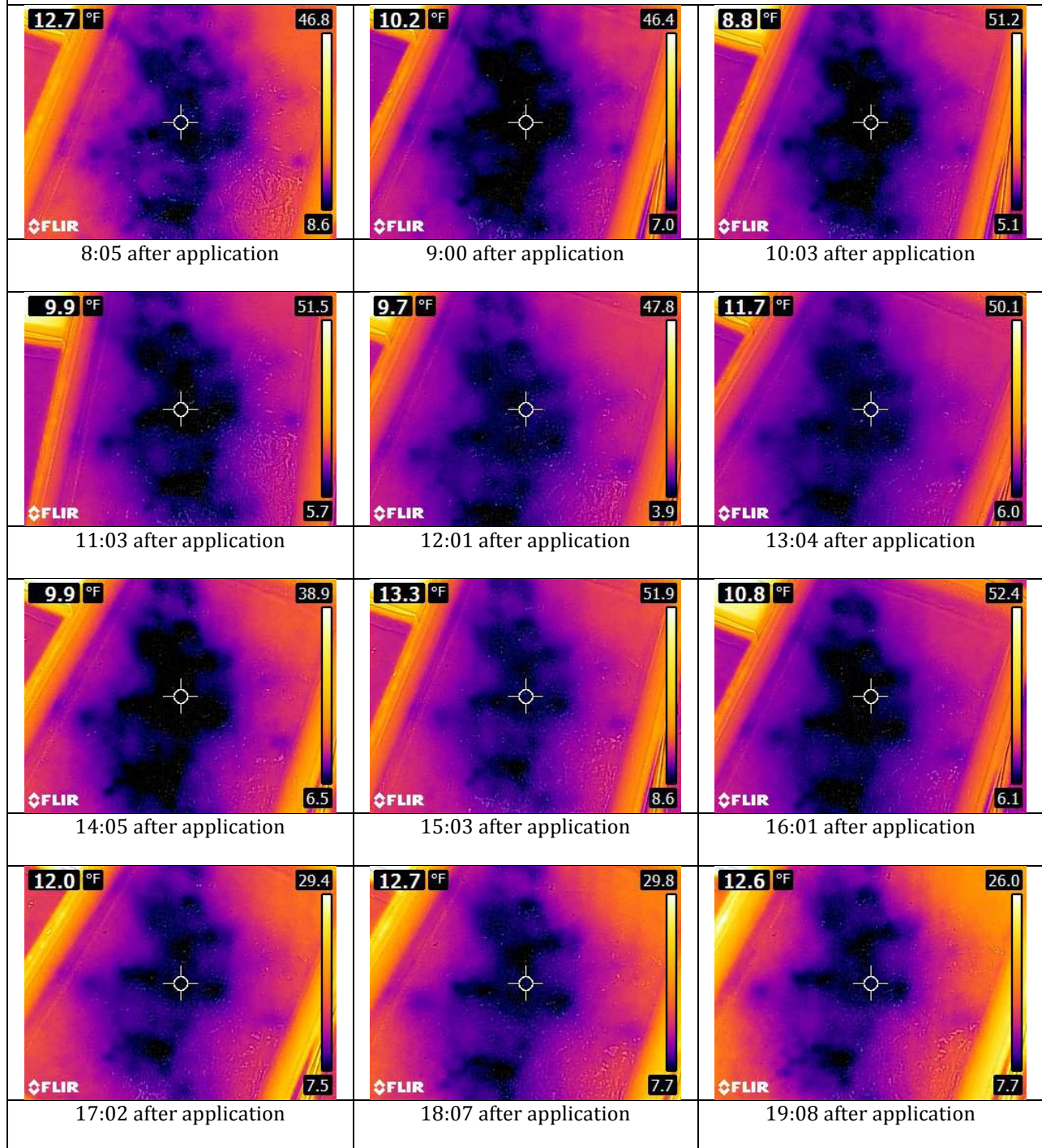
Rock salt passing #10 sieve with no prewet



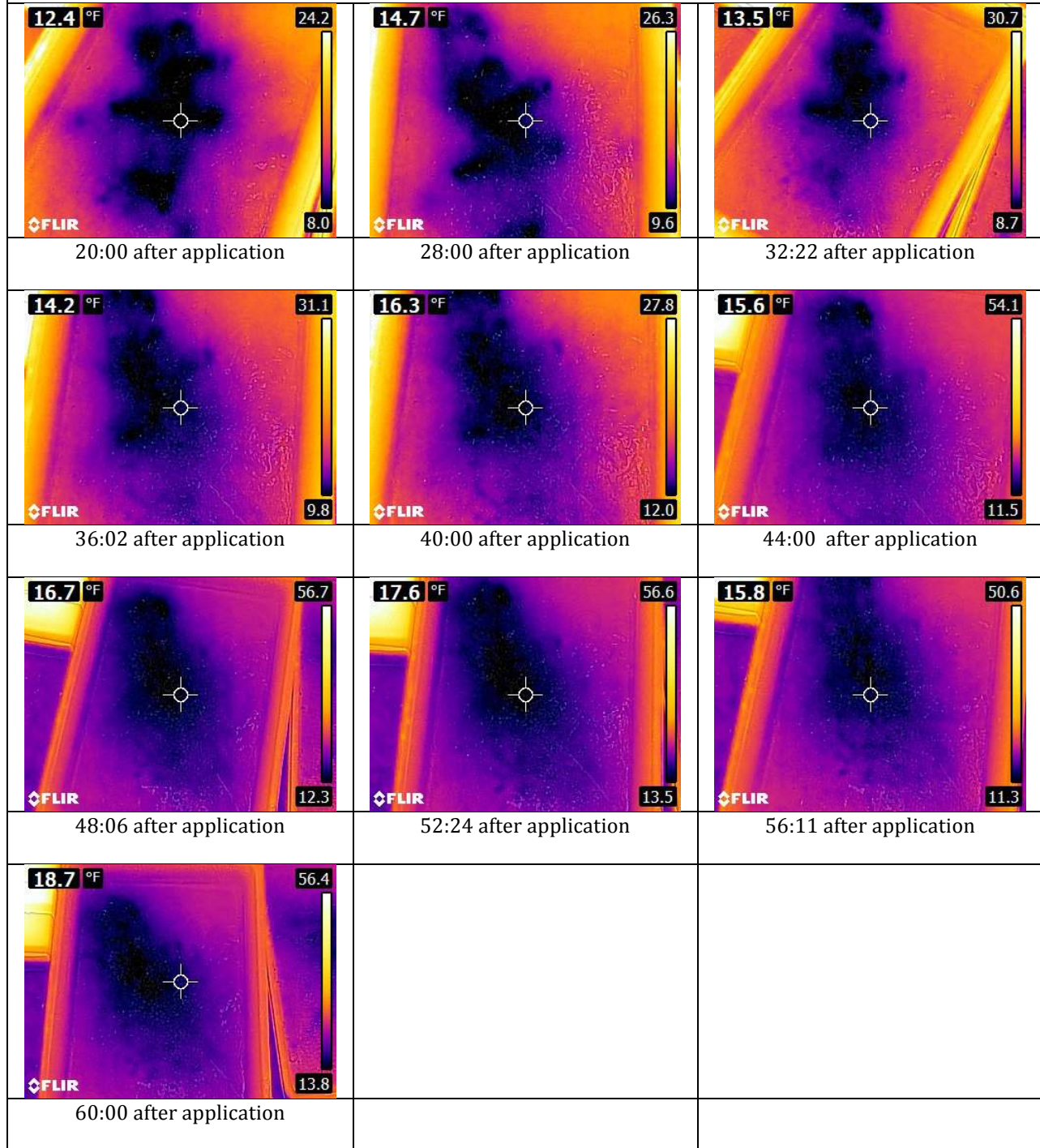
Rock salt passing #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



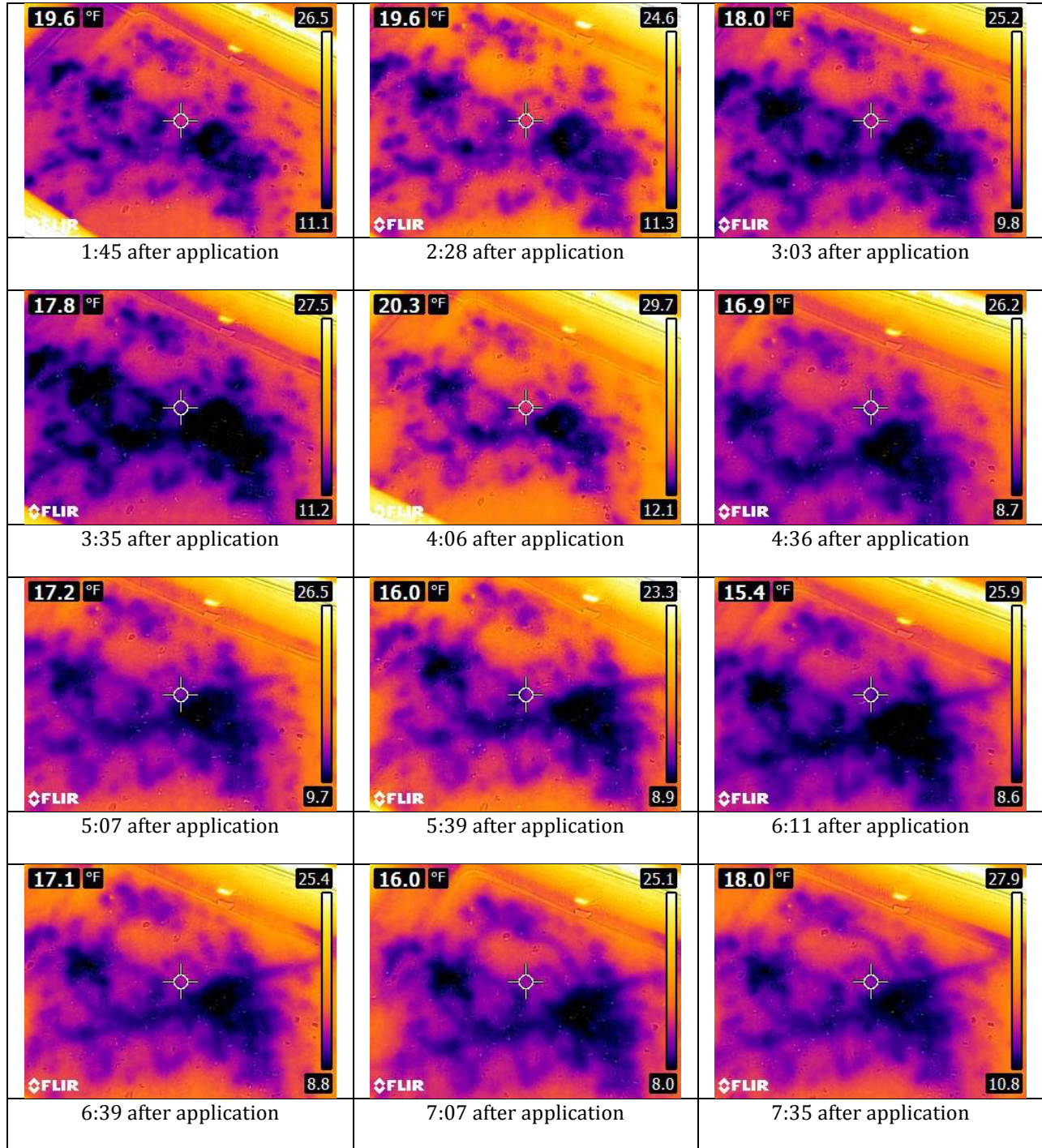
Rock salt passing #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



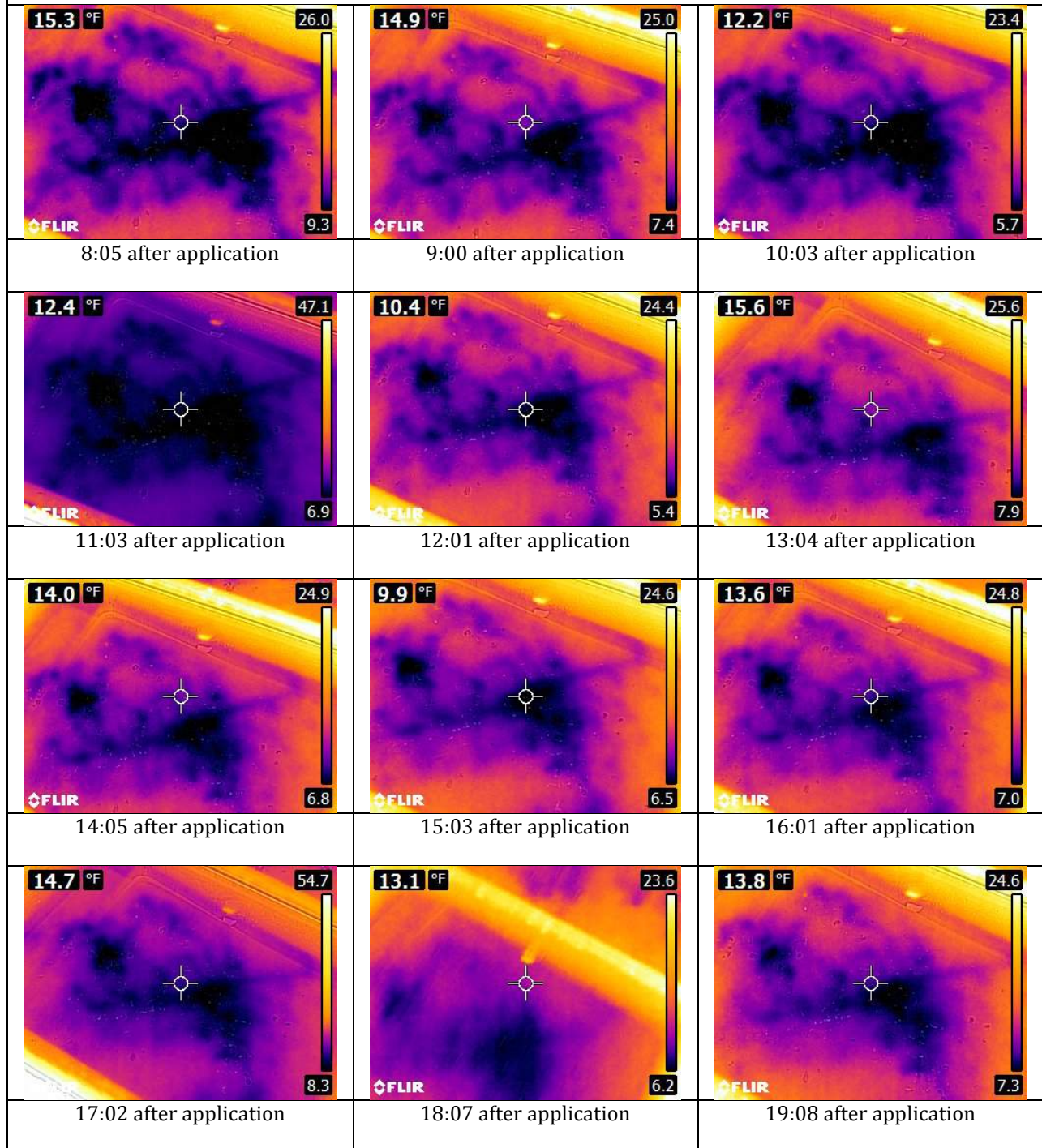
Rock salt passing #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



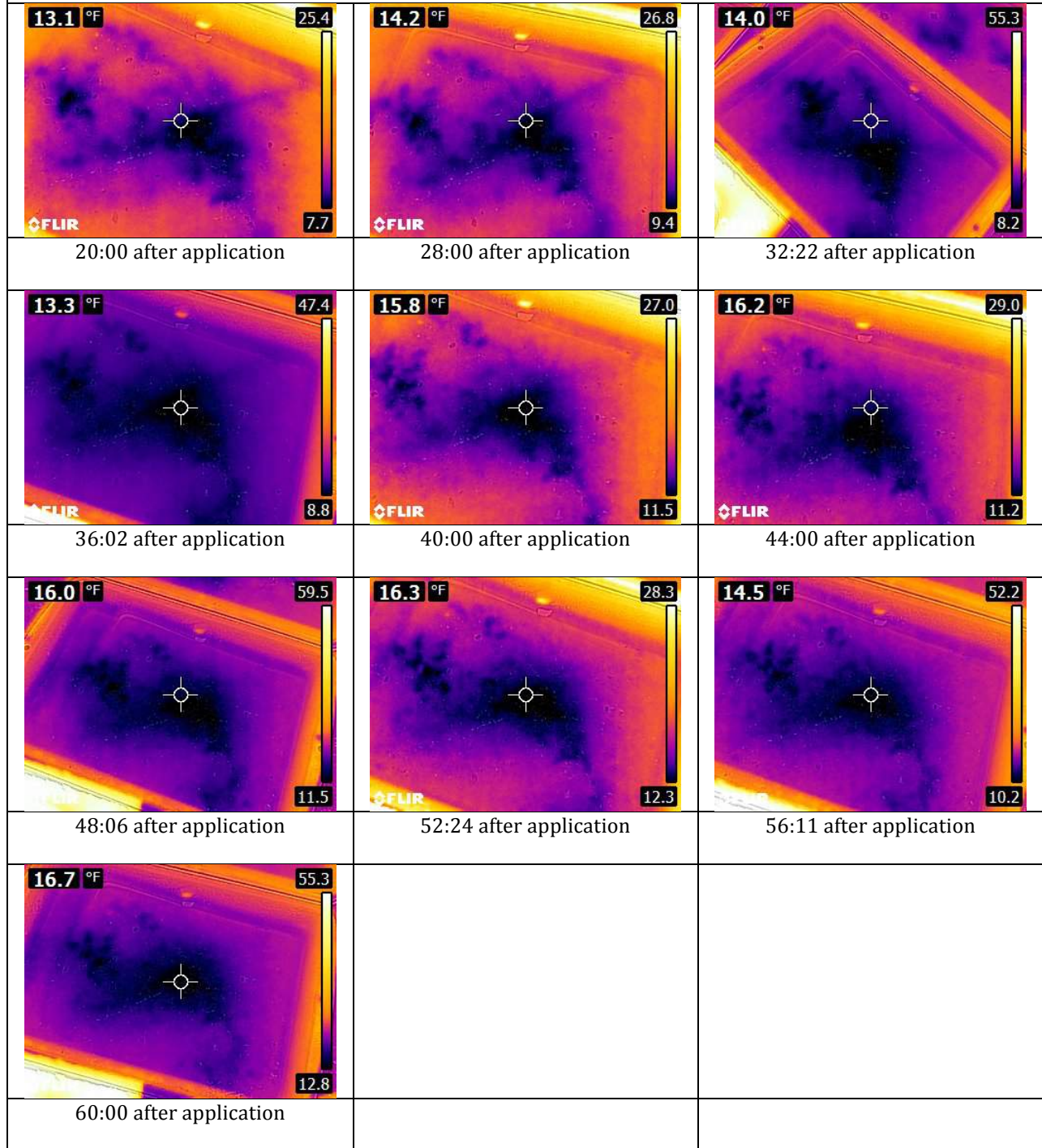
Rock salt passing #4 sieve but retained on #10 sieve with no prewet



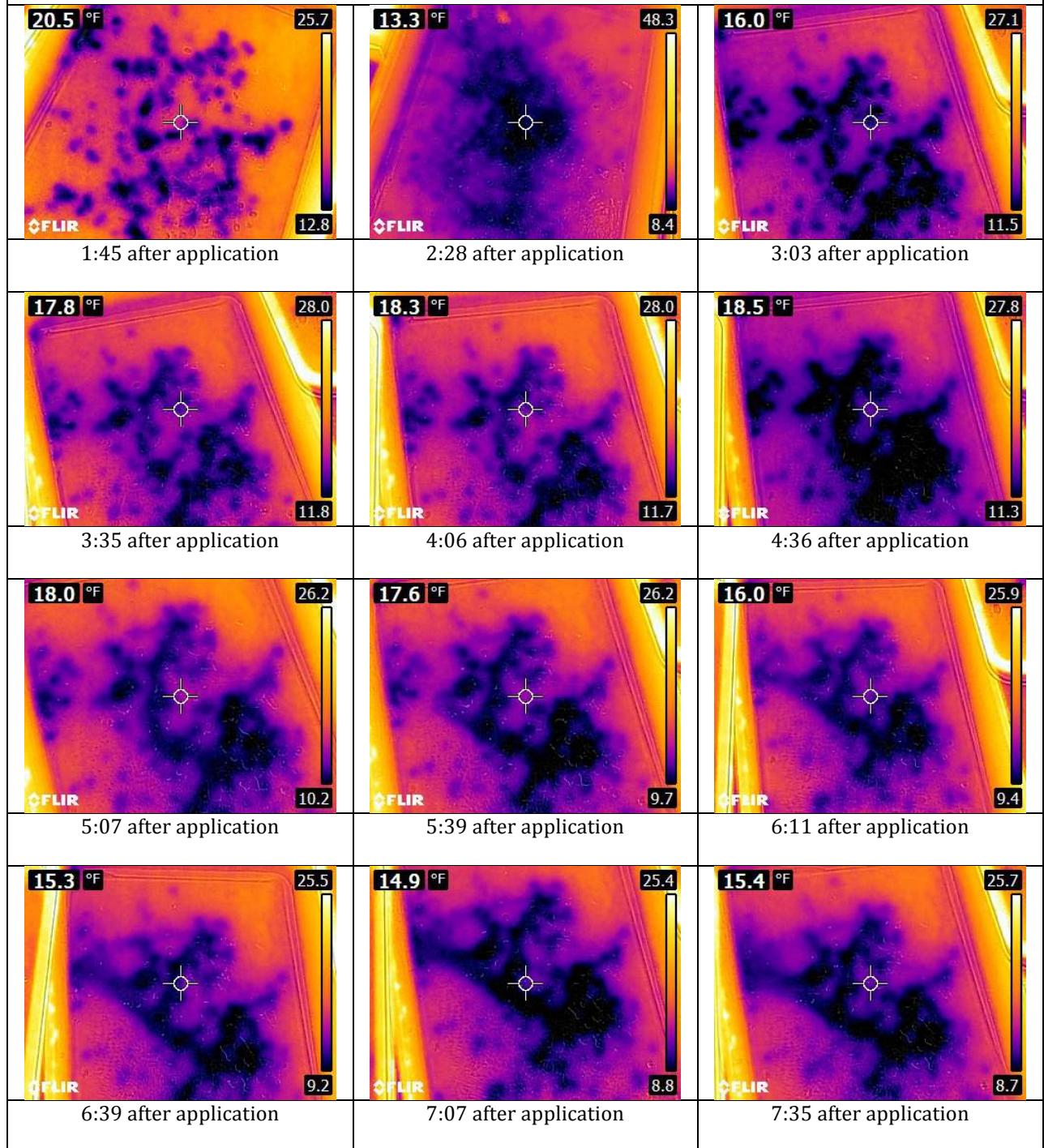
Rock salt passing #4 sieve but retained on #10 sieve with no prewet



Rock salt passing #4 sieve but retained on #10 sieve with no prewet

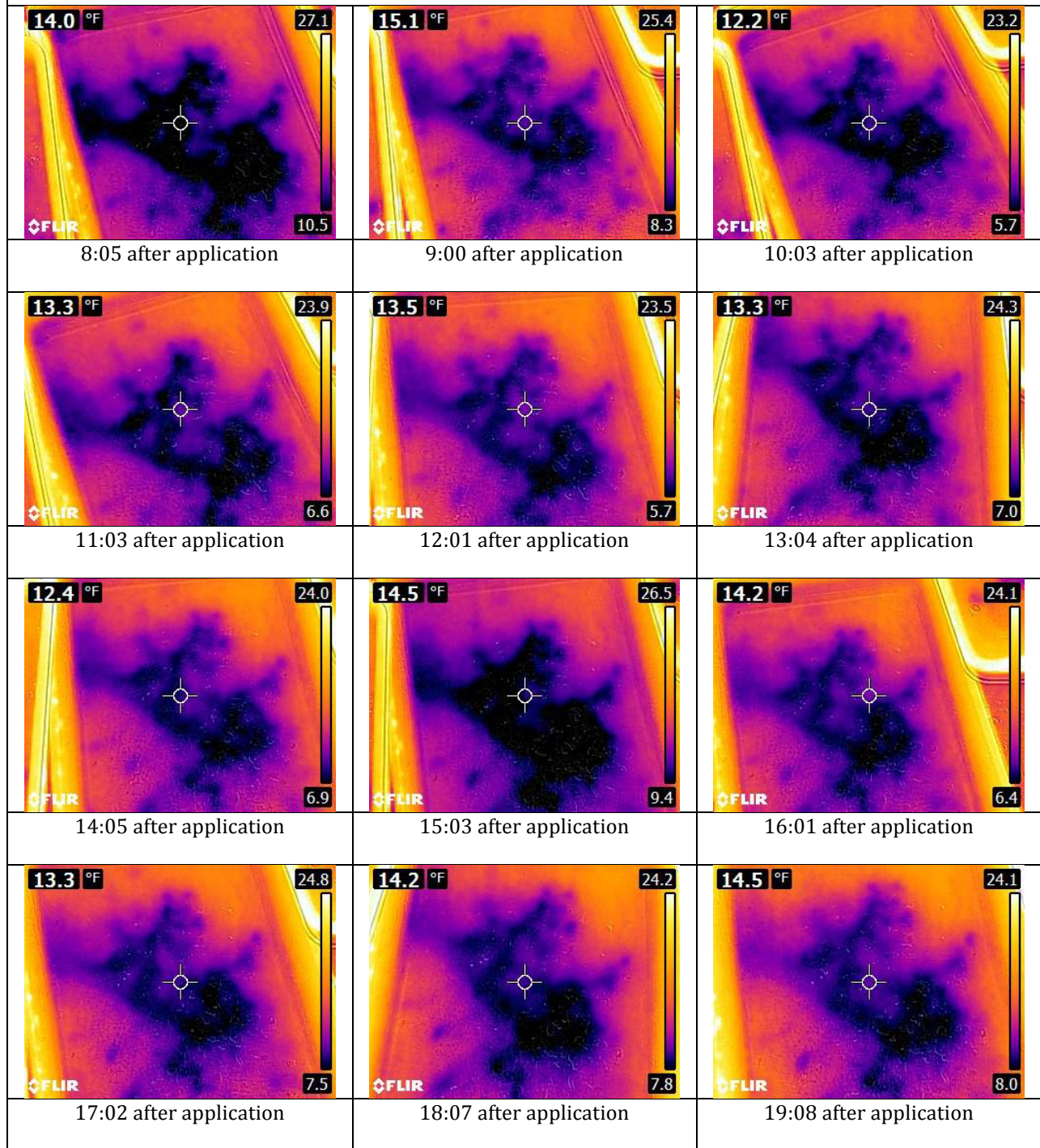


Rock salt passing #4 sieve but retained on #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)

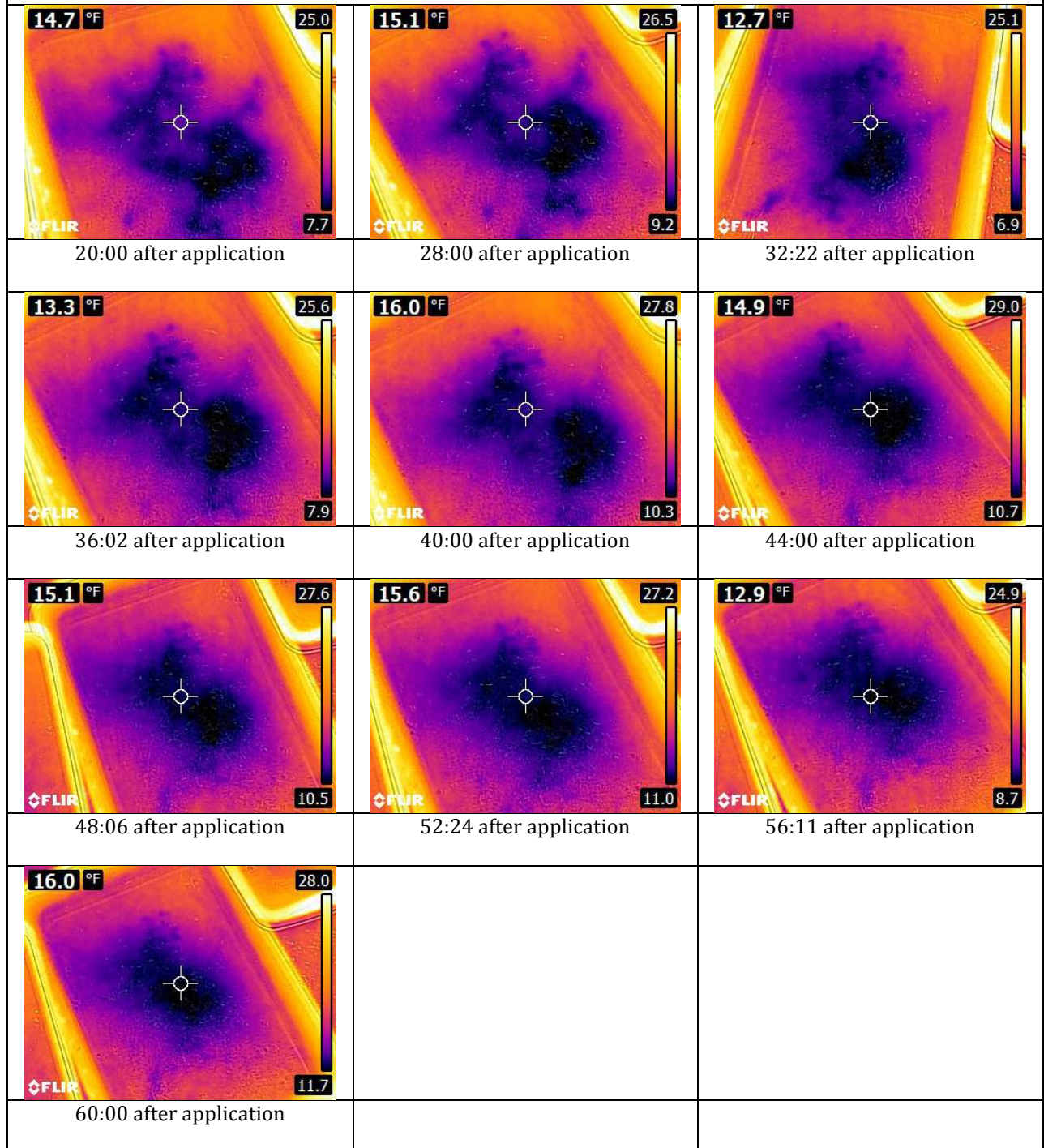




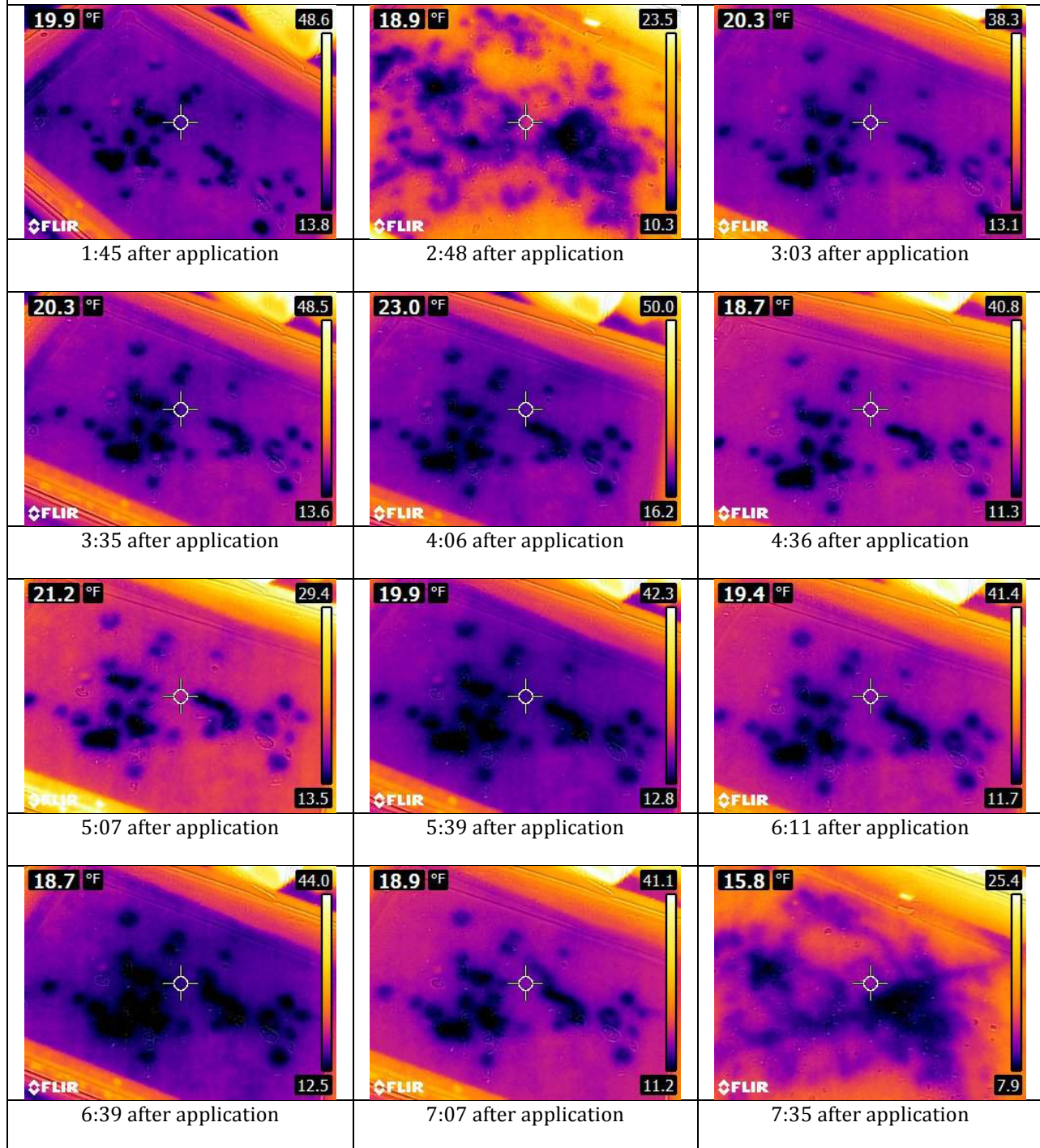
Rock salt passing #4 sieve but retained on #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



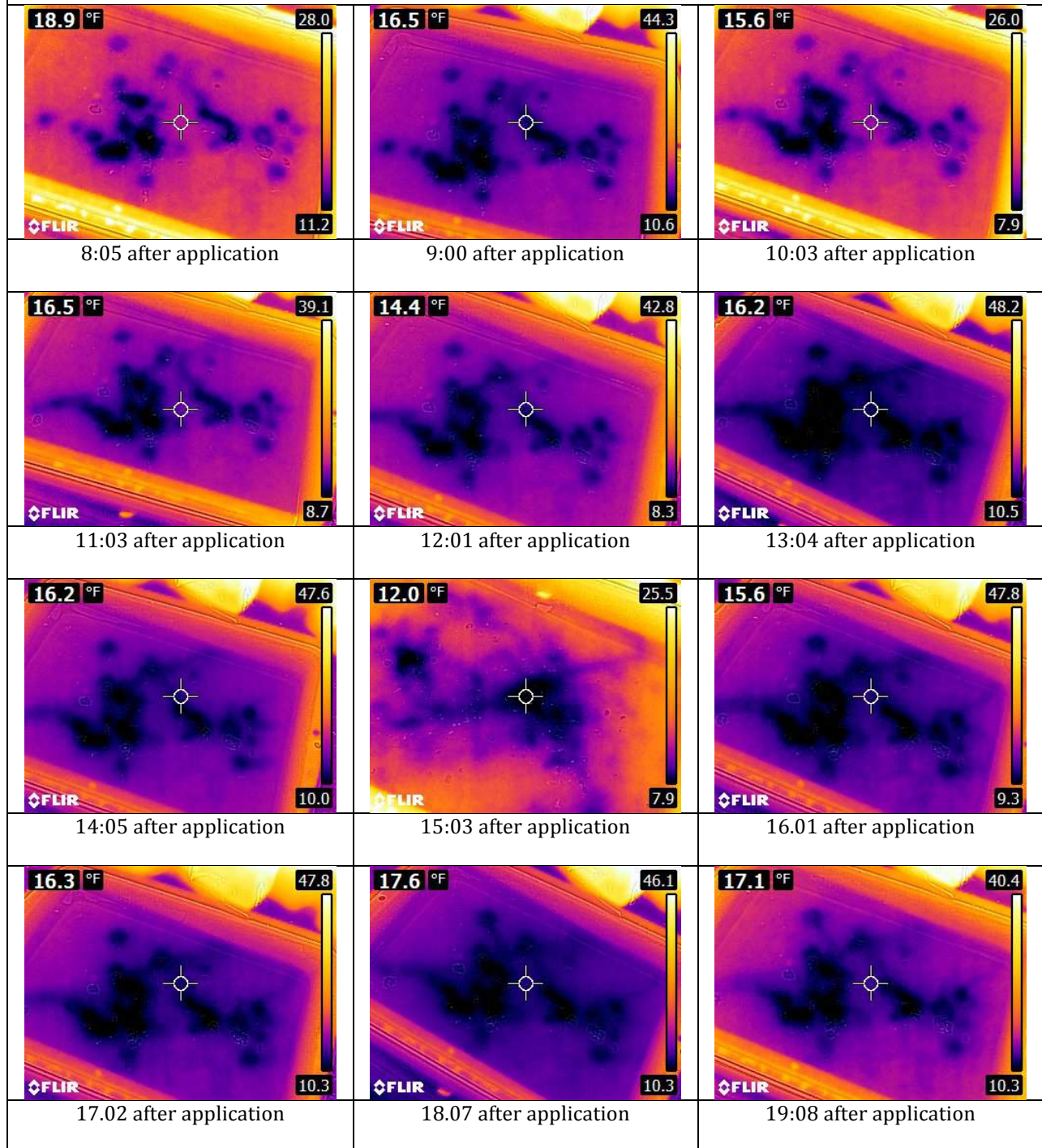
Rock salt passing #4 sieve but retained on #10 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



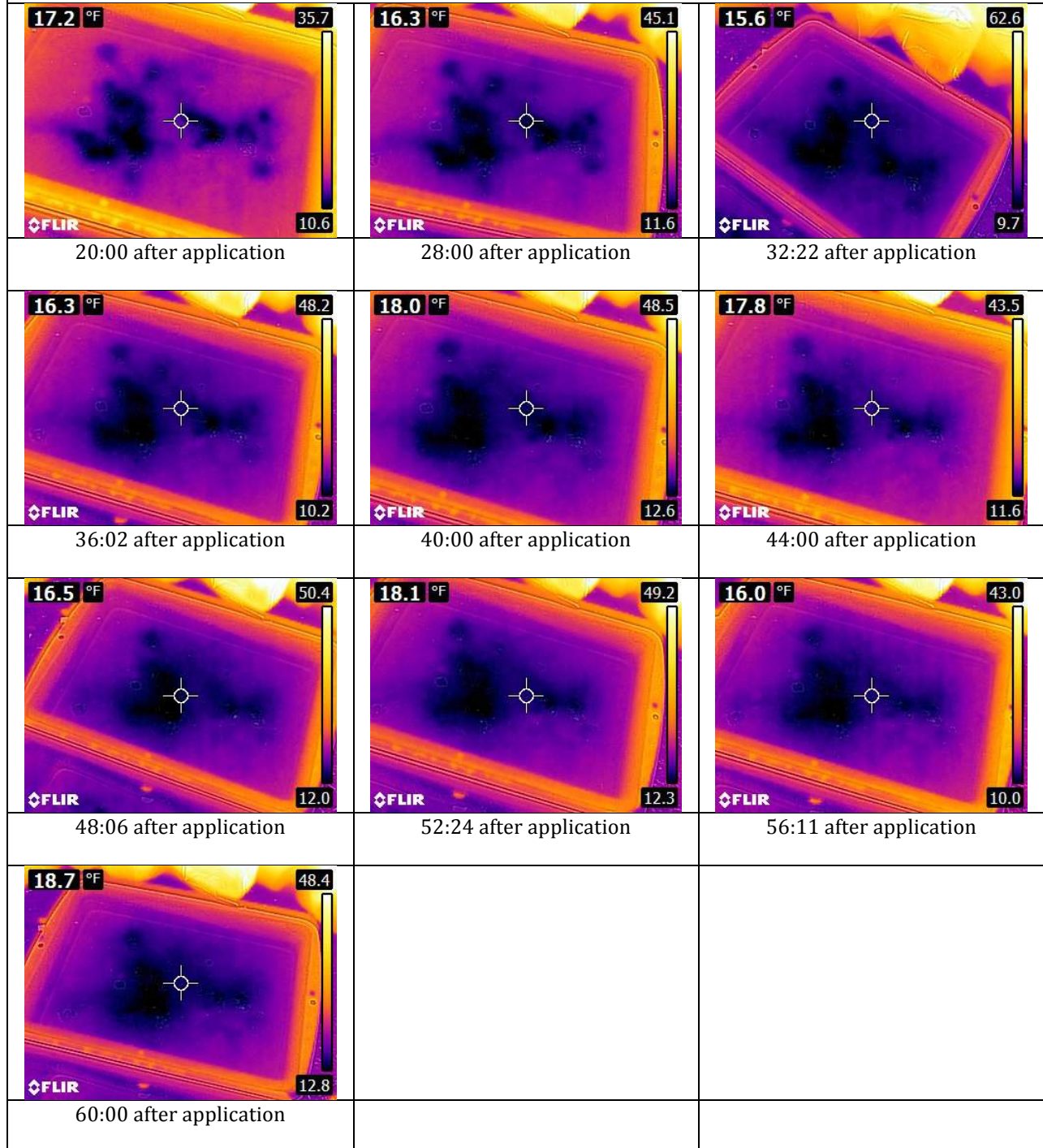
Rock salt retained on #4 sieve with no prewet



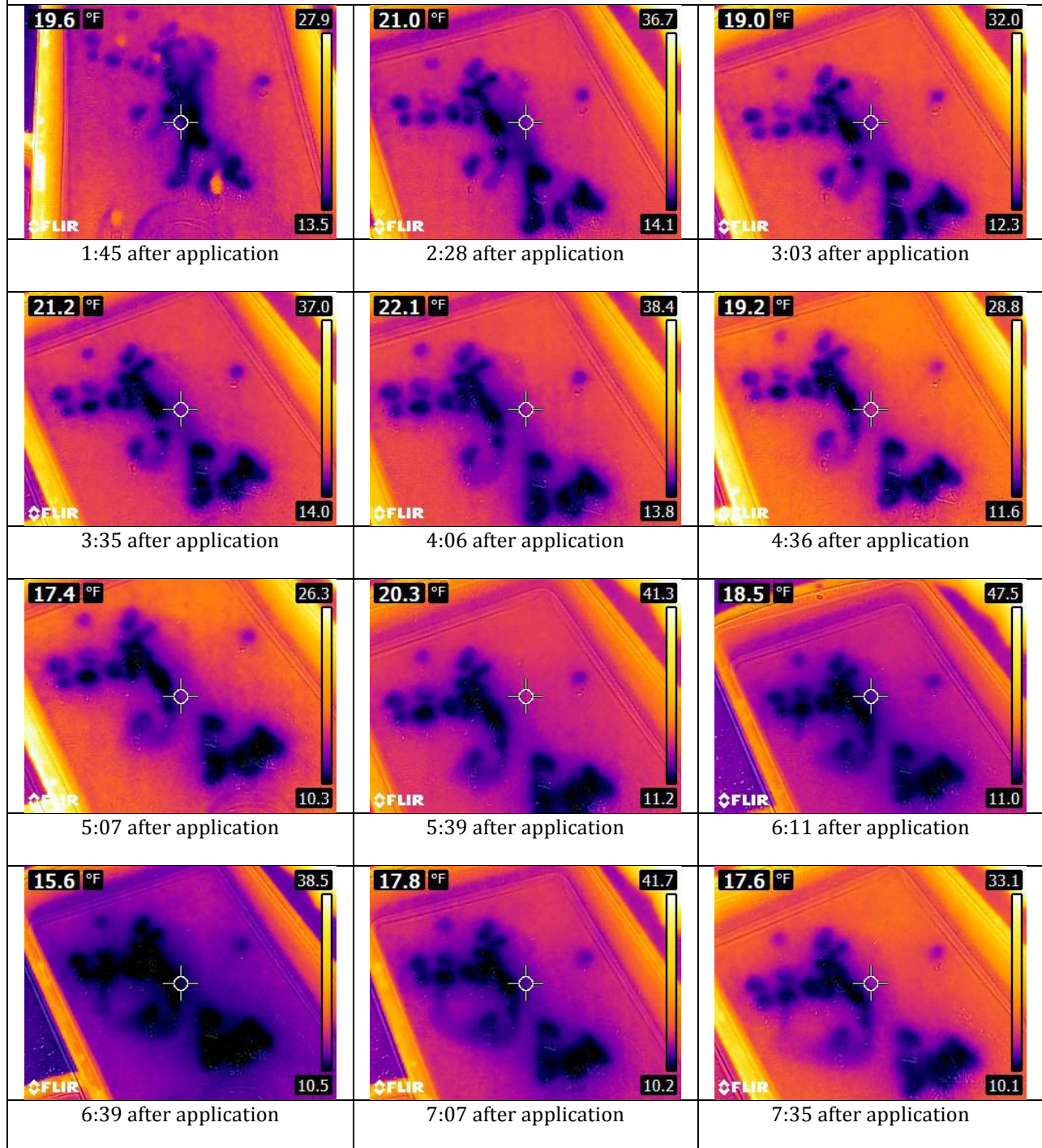
Rock salt retained on #4 sieve with no prewet



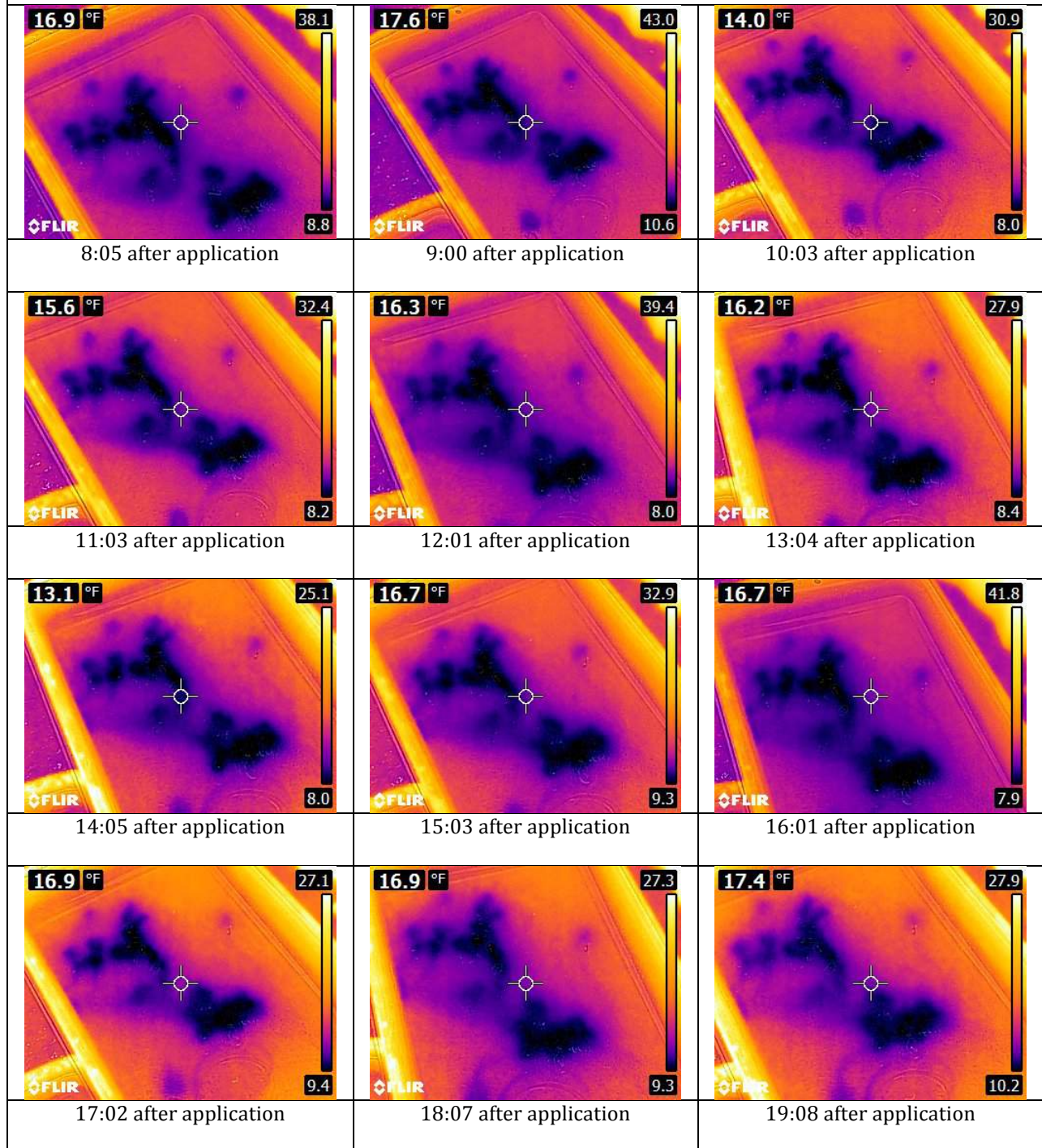
Rock salt retained on #4 sieve with no prewet



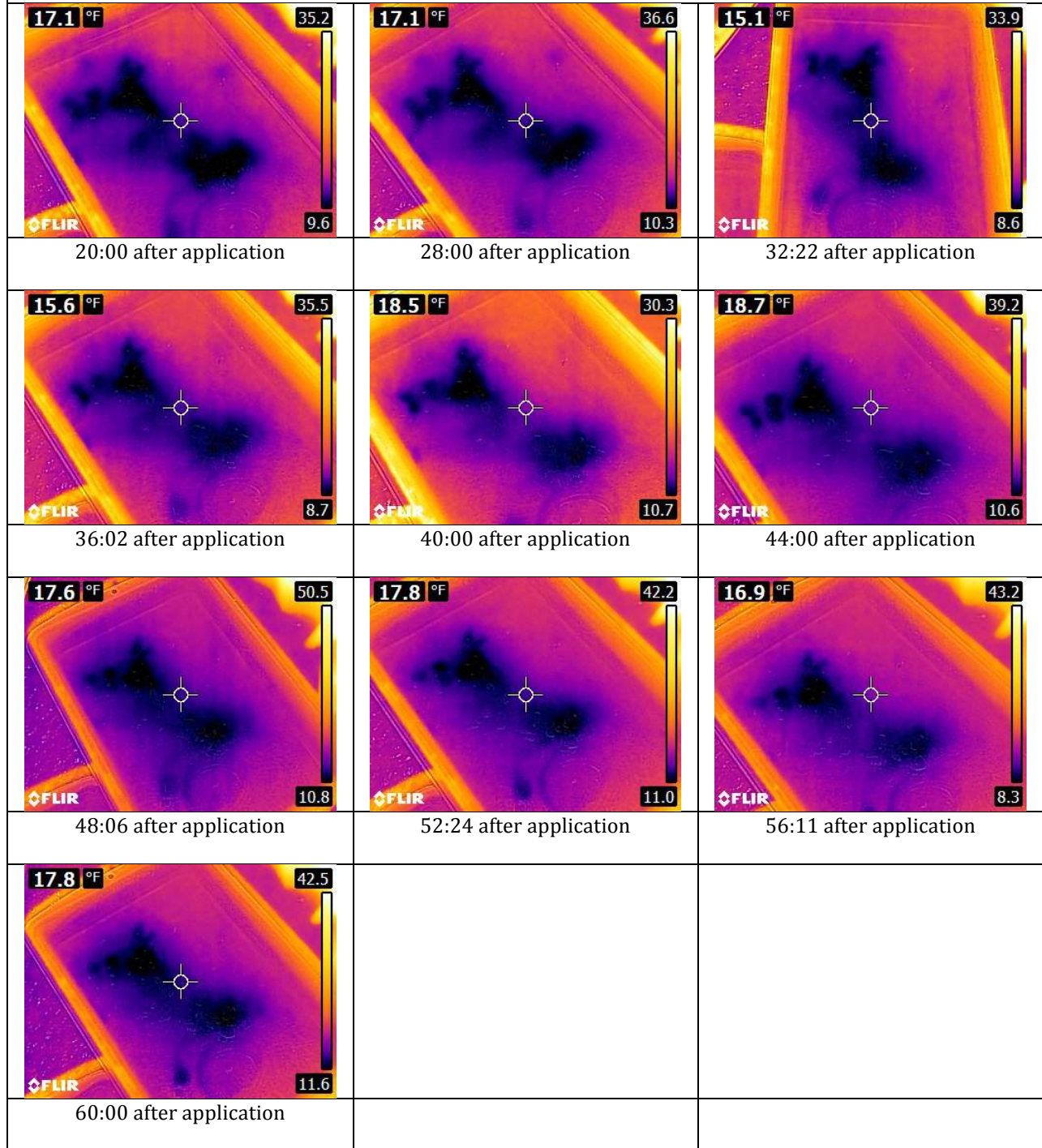
Rock salt retained on #4 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)



Rock salt retained on #4 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)

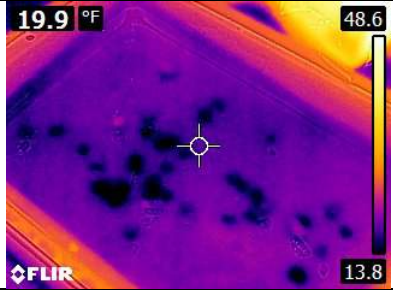
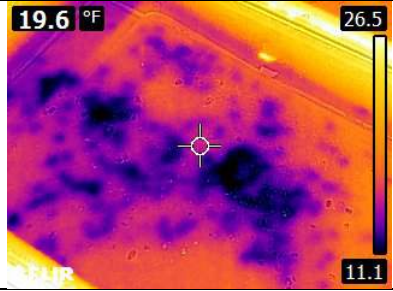
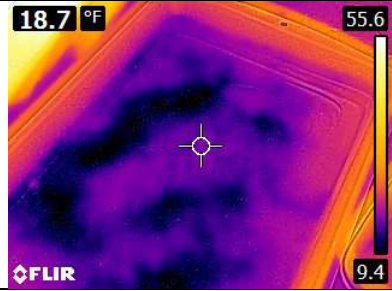
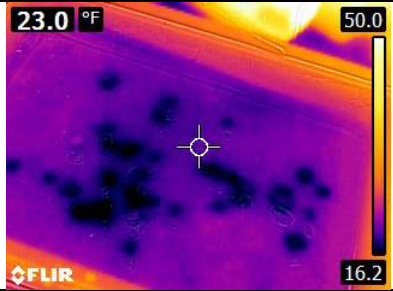
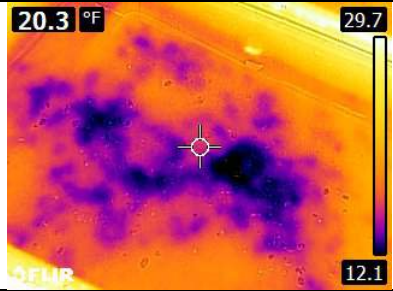
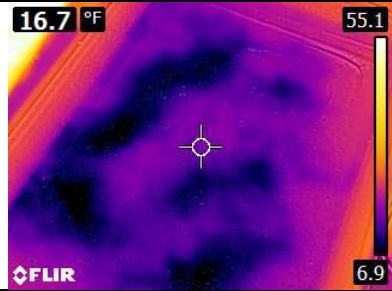
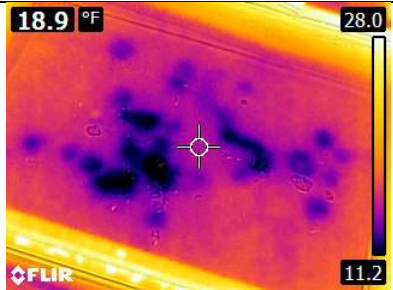
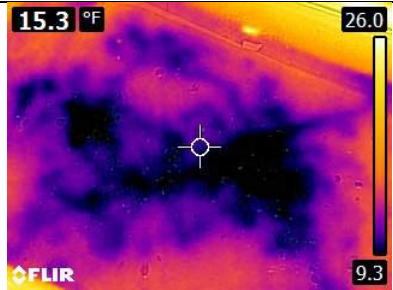
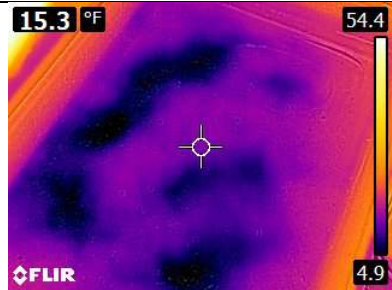
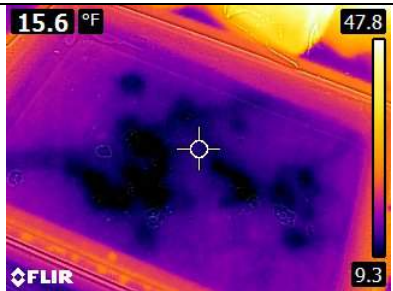
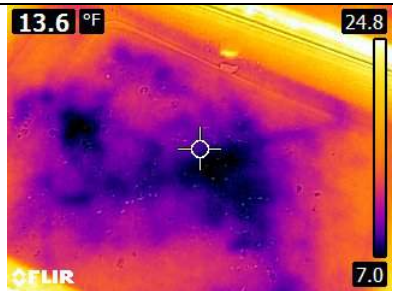
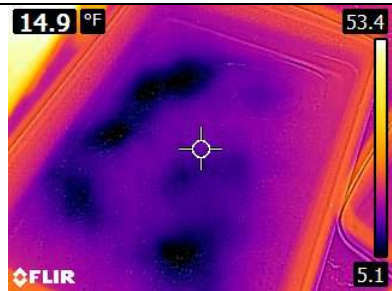


Rock salt retained on #4 sieve with 15 gal/ton prewet (RG8 10%, salt brine 90%)

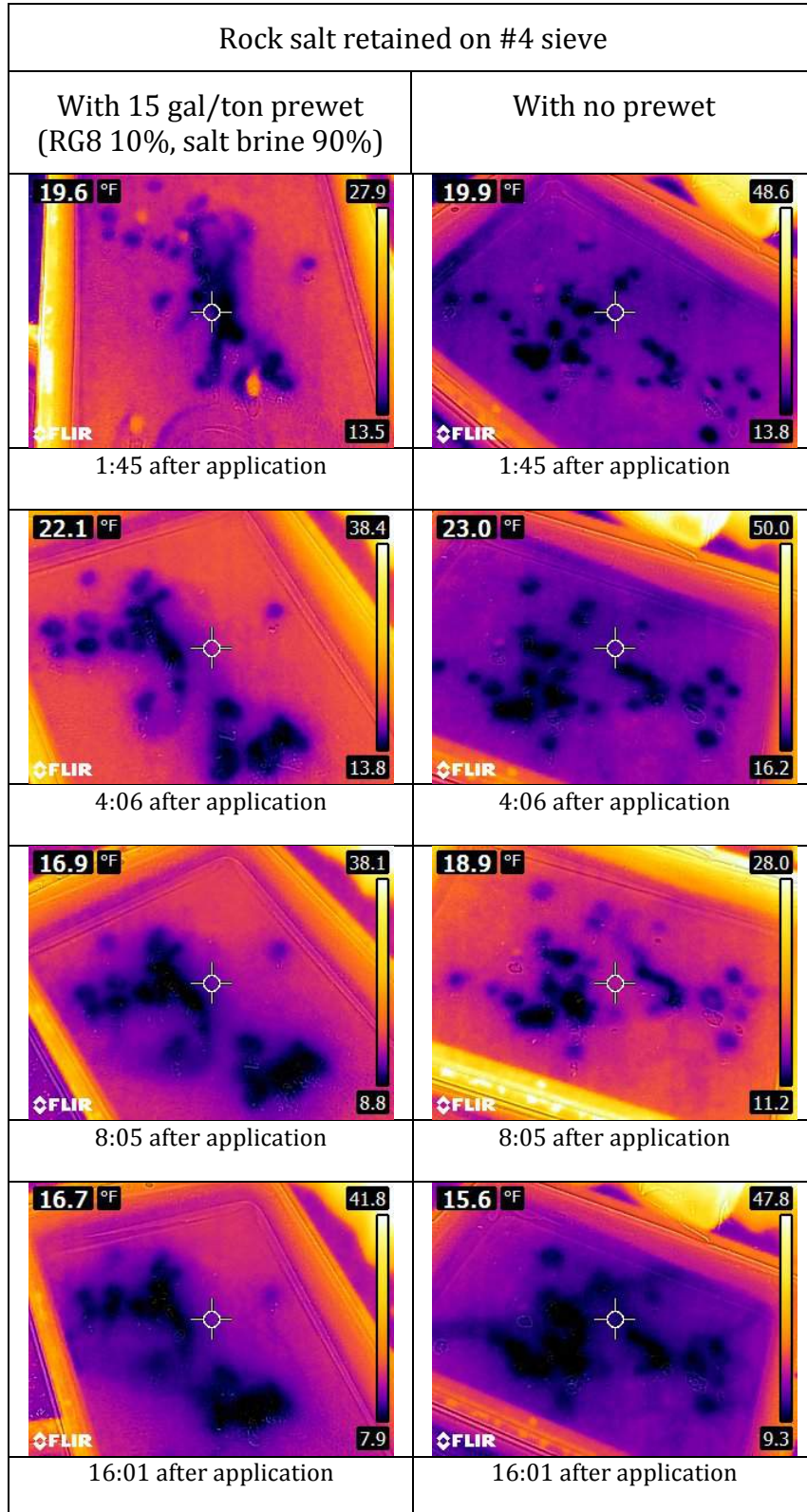




Rock salt with 15 gal/ton prewet (RG8 10%, salt brine 90%)

Retained on #4 sieve	Passing #4 sieve and retained on #10 sieve	Passing #10 sieve
 <p>19.9 °F 48.6 13.8 FLIR</p>	 <p>19.6 °F 26.5 11.1 FLIR</p>	 <p>18.7 °F 55.6 9.4 FLIR</p>
1:45 after application	1:45 after application	1:45 after application
 <p>23.0 °F 50.0 16.2 FLIR</p>	 <p>20.3 °F 29.7 12.1 FLIR</p>	 <p>16.7 °F 55.1 6.9 FLIR</p>
4:06 after application	4:06 after application	4:06 after application
 <p>18.9 °F 28.0 11.2 FLIR</p>	 <p>15.3 °F 26.0 9.3 FLIR</p>	 <p>15.3 °F 54.4 4.9 FLIR</p>
8:05 after application	8:05 after application	8:05 after application
 <p>15.6 °F 47.8 9.3 FLIR</p>	 <p>13.6 °F 24.8 7.0 FLIR</p>	 <p>14.9 °F 53.4 5.1 FLIR</p>
16:01 after application	16:01 after application	16:01 after application

Rock salt with no prewet		
Retained on #4 sieve	Passing #4 sieve and retained on #10 sieve	Passing #10 sieve
<p>19.6 °F 27.9 13.5 FLIR</p>	<p>17.2 °F 29.9 15.7 FLIR</p>	<p>13.1 °F 25.1 8.7 FLIR</p>
1:45 after application	1:45 after application	1:45 after application
<p>22.1 °F 38.4 13.8 FLIR</p>	<p>18.3 °F 28.0 11.7 FLIR</p>	<p>13.6 °F 55.0 10.5 FLIR</p>
4:06 after application	4:06 after application	4:06 after application
<p>16.9 °F 38.1 8.8 FLIR</p>	<p>14.0 °F 27.1 10.5 FLIR</p>	<p>12.7 °F 46.8 8.6 FLIR</p>
8:05 after application	8:05 after application	8:05 after application
<p>16.7 °F 41.8 7.9 FLIR</p>	<p>14.2 °F 24.1 6.4 FLIR</p>	<p>10.8 °F 52.4 6.1 FLIR</p>
16:01 after application	16:01 after application	16:01 after application



Rock salt passing #4 sieve and retained on #10 sieve	
With 15 gal/ton prewet (RG8 10%, salt brine 90%)	With no prewet
<p>20.5 °F 25.7 °F                      12.8 °F</p>	<p>19.6 °F 26.5 °F                      11.1 °F</p>
1:45 after application	1:45 after application
<p>18.3 °F 28.0 °F                      11.7 °F</p>	<p>20.3 °F 29.7 °F                      12.1 °F</p>
4:06 after application	4:06 after application
<p>14.0 °F 27.1 °F                      10.5 °F</p>	<p>15.3 °F 26.0 °F                      9.3 °F</p>
8:05 after application	8:05 after application
<p>14.2 °F 24.1 °F                      6.4 °F</p>	<p>13.6 °F 24.8 °F                      7.0 °F</p>
16:01 after application	16:01 after application

Rock salt passing #10 sieve	
With 15 gal/ton prewet (RG8 10%, salt brine 90%)	With no prewet
1:45 after application	1:45 after application
4:06 after application	4:06 after application
8:05 after application	8:05 after application
16:01 after application	16:01 after application