Interim
After Action Report

2/12/08 Icing Incident—Northern Virginia

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With Cooperation From:
The Virginia State Police
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INTRODUCTION

One of the most important services the Virginia Department of Transportation (VDOT) provides to the citizens of the Commonwealth of Virginia is responding to snow and ice events, as well as other emergencies that affect mobility.

The impact of a severe weather event on a region's economy, mobility and commerce can be significant. A winter weather event occurred in Northern Virginia on 2/12/08 that illustrates this impact. This was a perfect storm with the type of freezing that took place, the time of day it hit and the lack of advanced notice that would have allowed a better response. VDOT understands that it must keep roadways safe, traffic flowing, and citizens informed about incidents that impact their commute. Recognizing the significance of the event to all citizens of the region, the Commonwealth Transportation Commissioner immediately called a meeting of VDOT executive management, NOVA district staff directly involved in the response to the event, representatives from the Virginia State Police (VSP), and representatives from the Office of Commonwealth Preparedness to conduct a full review of the event.

This report reflects the results of that meeting and subsequent reviews conducted by the Commissioner. The report includes facts surrounding the event, significant findings, and immediate corrective action items. This interim review and report are first steps. Additional reviews and meetings with VDOT district staff; the VSP; key staff from Washington, D.C., Maryland, and other agencies; and citizens will form the basis of a longer range action plan to ensure that VDOT is fully prepared for response to winter events and other emergency situations throughout the Commonwealth.

BACKGROUND

The winter weather event of 2/12/08 resulted in difficult travel conditions throughout the region, particularly in the Springfield Interchange area. The interchange is composed of a complex series of ramps connecting I-95, I-495, and I-395 and includes the busiest roadway segments in the Commonwealth. When freezing rain began to fall, weather and traffic conditions deteriorated rapidly. At approximately 3:00 PM, the beginning of the afternoon rush period, the ramps quickly became covered with a thin coat of ice.

Although VDOT had mobilized equipment at the interchange, the rapid nature of the icing made the response difficult. As a result of the icy ramps, crashes occurred, and the ramps quickly became impassable. At the height of the event, five major ramps and the general purpose and HOV mainline lanes of I-95 South were impassable. Some ramps that remained open in the early stages of the event became impassable later. For example, the ramp from I-495 East to I-95 South experienced 7 crashes between 6:30 and 10:30 including a jackknifed tractor trailer, making travel at that location very difficult. VDOT crews and the Virginia State Police (VSP) worked to clear crashes and apply de-icing chemicals to the congested roadways and were able to open the last ramp at approximately midnight.

Figure 1 illustrates the portions of the Springfield Interchange where traffic was blocked for some portion of the afternoon and evening of 2/12/08. Icing was present and crashes occurred at other locations within the interchange area, but those locations were not identified by VDOT or VSP as being impassable for extended periods.

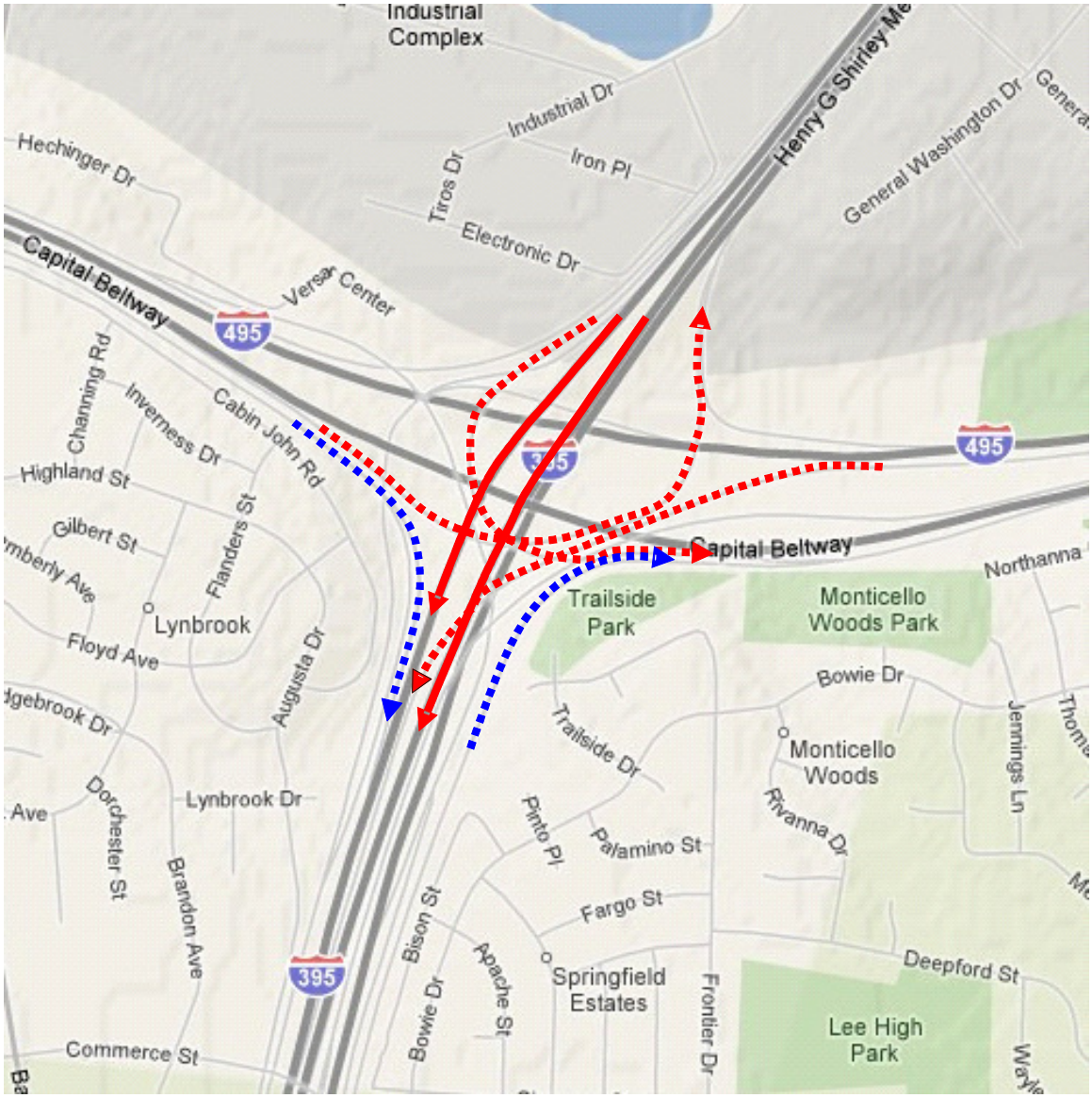

Figure 1. Impassable Roads and Ramps at the Springfield Interchange on 2/12/08. *Dotted lines* represent closed ramps, and *solid lines* represent impassable mainline or HOV lanes. Information designated by red lines was reported by VDOT and VSP, and information designated by blue lines was reported by VSP only.

It is important to note that although the Springfield Interchange was the subject of significant attention, it was not the only location where icing occurred. Early forecasts for 2/12/08 indicated that the winter weather would be focused in the western areas of the region. As Figure 2 illustrates, the precipitation was widespread, with Loudoun County receiving the most precipitation and the area around the Springfield Interchange seeing between 0.15 and 0.25 inches of precipitation from this storm. In addition to the Springfield Interchange, the NOVA

District reported that several other locations in the district were also impassable for short periods of time during the 2/12/08 event. They include:

- I-66 near Route 234
- I-395 Southbound HOV lanes near the 14th Street Bridge
- Dulles Toll Road.

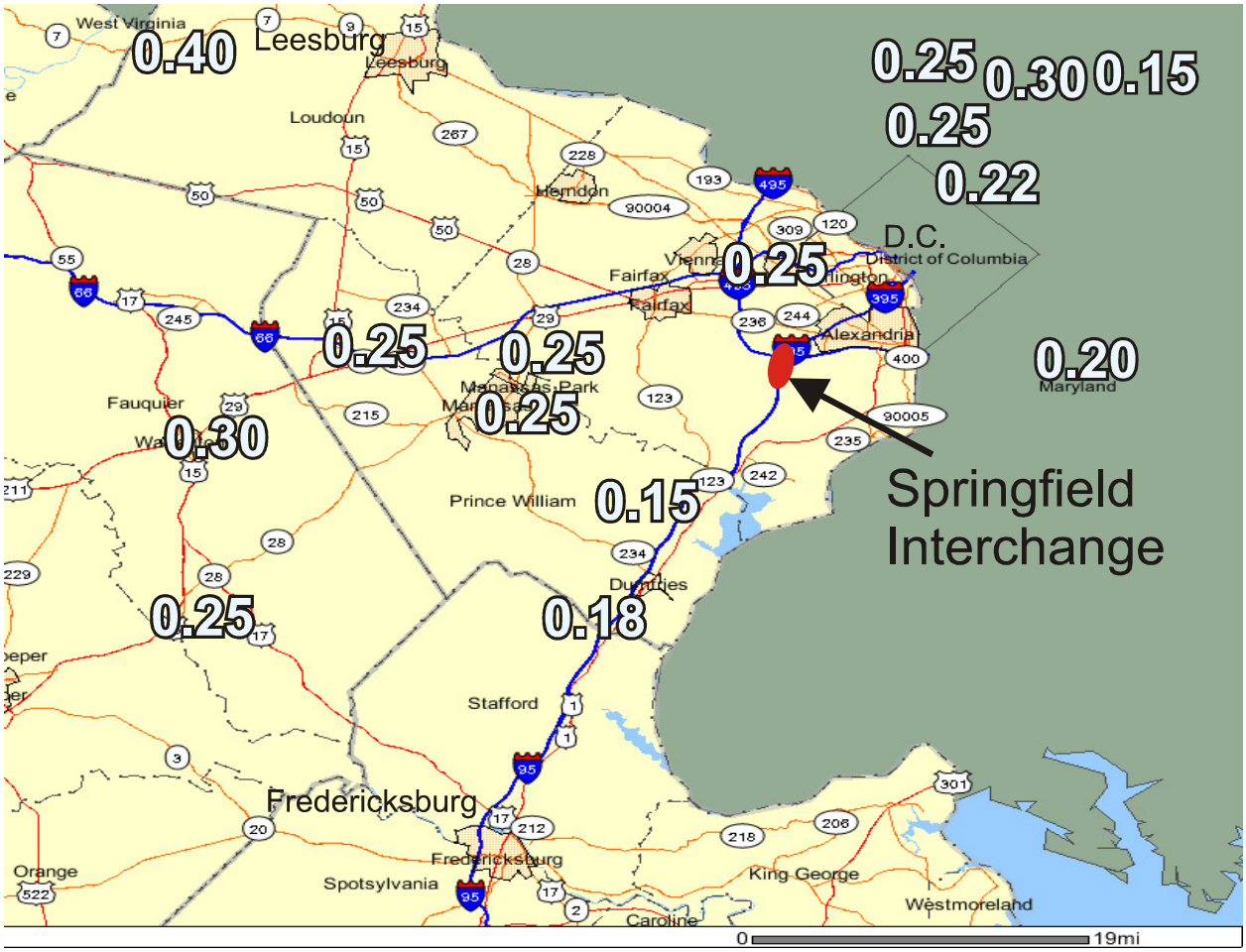

Figure 2. Precipitation Amounts in the Northern Virginia Region on 2/12/08

Crashes were also distributed throughout the region. Although a third of the weather-related incidents that were reported on 2/12/08 occurred within a 3-mile radius of the Springfield Interchange, over 200 crashes were also reported on interstates in other parts of the region. Washington, D.C. and Maryland also saw an increase in crashes as compared to an average day. Without a doubt, this was an event that had region-wide impacts.

EVENT REVIEW

The following event summary is composed of three parts: (1) weather forecasts pertaining to the 2/12/08 event, (2) VDOT's event response, and (3) communications/ coordination between and among agencies and with the public

Weather Forecasts Pertaining to the Event

The Transportation Emergency Operations Center in Richmond (TEOC) and the NOVA district maintenance management and staff had several sources of weather data available prior to and during the event. The main source of forecast data was the National Weather Service (NWS). VDOT also has a contract with a private meteorological company to give more discrete weather forecasts than those provided by the NWS. This service did not forecast the ice storm for the Northern Virginia region.

Supplemental data on pavement temperatures were available from Vaisala Corporation, a private service employed by VDOT to provide site-specific data and forecasts on atmospheric and road conditions including both air and pavement temperature. The data Vaisala uses for their forecasts comes from Road Weather Information System (RWIS) stations located around the state. Five RWIS stations in the NOVA District were operable during the event. No RWIS stations are located at the Springfield Interchange. Therefore, no site-specific atmospheric or road condition data were available at the Springfield Interchange.

A timeline of the forecasts produced by NWS and Vaisala from 2/11/08 through 2/12/08 is presented in Table 1. The weather information timeline shows two levels of information provided by NWS: Zone Forecasts and Warnings and Advisories:

1. *Zone Forecasts.* Zone forecasts are regional forecasts covering the entire NOVA District area. They are updated every 6 hours, and VDOT staff must actively pull those forecasts from the NWS website.

2. *Warnings and Advisories.* Warnings and advisories are pushed to VDOT through a purchased service. The NOVA District, the county Emergency Operations Center (EOC), and the TEOC all receive these notices.

The NWS definitions of *Winter Weather Advisory* and *Ice Storm Warning* are as follows:

- *Winter Weather Advisory:* Issued for winter weather situations that may cause significant inconvenience and, if caution is not exercised, could lead to life-threatening situations. Issued when events are occurring, imminent, or highly likely to occur. Issued when a combination of 5 inches or less of snow, freezing precipitation, and/or sleet is expected. Also issued for a combination of sleet and freezing precipitation light enough not to bring down trees, branches, or power lines.

- *Ice Storm Warning:* Issued when damaging accumulations of ice are expected during a freezing rain event. Significant ice accumulations are 1/4 of an inch or greater, leading to dangerous walking or driving conditions and the pulling down of power lines and trees.

Table 1. NWS and Vaisala Weather Forecast Timeline

- *2/11/08, 4:24 AM (NWS Zones Forecast for 2/12/08):* A slight chance of snow in the morning then a chance of rain in the afternoon. Highs around 40. Chance of precipitation 50%.

- *2/11/08, 4:30 AM (Vaisala Forecast for I-66 at Rosslyn for 2/12/08):* Freezing rain with sleet and rain likely in the afternoon. Little or no sleet accumulation. High mid 30s. Chance of precipitation 90%.

- *2/11/08, 3:00 PM (NWS Zones Forecast for 2/12/08):* Cloudy, freezing rain with sleet and rain likely in the afternoon. Little or no sleet accumulation. Highs mid 30s. Chance of precipitation 90%.

- *2/11/08, 4:30 PM (Vaisala Forecast for I-66 at Rosslyn for 2/12/08):* Atmospheric forecast is identical to 3:00 PM NWS zones forecast. Pavement temperature forecast indicates temperatures above 40 degrees after noon on 2/12/08. Current air temperature was 30 degrees and current pavement temperature was 37 degrees.

- *2/11/08, 9:30 PM (NWS Zones Forecast):* Cloudy, slight chance of snow in the morning, then freezing rain, sleet and rain likely in the afternoon. Ice accumulations of less than a tenth of an inch possible. Highs mid 30s. Chance of precipitation 70%.

- *2/12/08, 4:14 AM (Vaisala Forecast for I-66 at Rosslyn):* Atmospheric forecast is identical to 9:30 PM NWS zones forecast. Pavement temperature forecast indicates temperatures above 40 degrees from noon to 3:00 PM. Pavement temperatures expected to drop after 3:00 PM, but not below freezing. Current air temperature was 25 degrees and current pavement temperature was 30 degrees.

- *2/12/08, 4:22 AM (NWS Advisory):* Loudoun County - Winter Weather Advisory in effect from noon today to 10 PM EST this evening. A slight chance of snow this morning then rain, sleet and freezing rain this afternoon. Little or no snow and sleet accumulation. Ice accumulation less than one tenth of an inch. Highs lower 30s. Chance of precipitation 90%.

- *2/12/08, 4:22 AM (NWS Zones Forecast):* Rest of NOVA District. Cloudy a slight chance of snow this morning, then rain and sleet this afternoon. Little or no snow or sleet accumulation. Highs mid 30s. Chance of precipitation 80%.

- *2/12/08, 4:30 AM.* NOVA District indicates they received 4:22 AM NWS Winter Weather Advisory for Loudoun County.

- *2/12/08, 7:30 AM (Vaisala Forecast for I-66 at Rosslyn):* Atmospheric forecast is the same as 4:22 AM NWS zones forecast, except with a 90% chance of precipitation. Pavement temperature forecast indicates temperatures above 40 degrees from noon to 4:00 PM. Pavement temperatures expected to drop after 4:00 PM, but not below freezing. Pavement forecast shows snow accumulating on pavement after 4:00 PM. Current air temperature was 24 degrees and current pavement temperature was 30 degrees.

- *2/12/08, 10:30 AM (Vaisala Forecast for I-66 at Rosslyn):* A few sprinkles and flurries will move across Northern Virginia between 9:00 and 11:00 this morning. Pavement forecast shows snow accumulating on pavement after 4:00 PM. Current air temperature was 26 degrees and current pavement temperature was 35 degrees.

- *2/12/08, 10:51 AM (NWS Advisory):* Loudoun County - Winter Weather Advisory in effect from noon today to 10 PM EST this evening. Rest of day, snow and sleet late this morning then rain, sleet and freezing rain this afternoon. Little or no snow or sleet accumulation. Additional ice accumulation of less than one quarter inch. Highs lower 30s. Chance of precipitation 90%.

- *2/12/08, 10:51 AM (NWS Zones Forecast):* Rest of NOVA District. Cloudy, a chance of snow and sleet late this morning, then rain, sleet and freezing rain this afternoon. Little or no snow and sleet accumulation. Additional ice accumulation of less than one quarter of an inch. Highs mid 30s. Chance of precipitation 80%.

continues

Table 1 (continued)

- *2/12/08, 1:17 PM (Vaisala Forecast for I-66 at Rosslyn):* Pavement forecast shows sharp drop in pavement temperature within the next hour, but not dropping below 34 degrees. Some snow accumulation on pavement possible from 1:00 PM to 4:00 PM. Current air temperature was 28 degrees and current pavement temperature was 40 degrees.
- *2/12/08, 3:16 PM (NWS Advisory):* All of NOVA District. Winter Weather Advisory in effect until 7 AM EST Wednesday (2/13). Rest of today, a chance of freezing rain likely this evening, then rain after midnight. Ice accumulation of less than one quarter of an inch. Lows in the mid 30s. Temperatures steady or slowly rising after midnight. Chance of precipitation 90%.
- *2/12/08, 4:08 PM.* NOVA District indicates that they receive 3:16 PM NWS Winter Weather Advisory.
- *2/12/08, 4:16 PM (Vaisala Forecast for I-66 at Rosslyn):* For rest of today, cloudy with a chance of rain and freezing rain. High mid 30s. Chance of precipitation 50%. Pavement temperature expected to go no lower than 33 degrees and rise slowly overnight. Precipitation on pavement surface was forecast. Current air temperature was 29 degrees and current pavement temperature was 33 degrees.
- *2/12/08, 5:39 PM (NWS Advisory):* Winter Weather Advisory in effect until 7 Am EST Wednesday. Tonight, freezing rain and sleet this evening, mixing with rain after midnight. Ice accumulations around one tenth of an inch. Lows around 30 this evening. Temperatures steady or slowly rising after midnight. Chance of precipitation 90%.
- *2/12/08, 6:43 PM (NWS Warning):* Ice Storm Warning in effect until 7 AM EST Wednesday. Tonight, freezing rain this evening, mixing with rain after midnight. Ice accumulation around one quarter of an inch. Lows around 30 this evening. Temperatures steady or slowly rising after midnight. Chance of precipitation 100%.
- *2/12/08, 7:10 PM:* NOVA District indicates that they receive 6:43 PM NWS Ice Storm Warning.

VDOT EVENT RESPONSE

VDOT Mobilization and Activities Before the Event

The NOVA District has been pilot testing a mobilization plan for snow and ice events this winter shown in Appendix A. It defines seven levels of mobilization based on the severity of the weather forecast, with Level I being the lowest level of mobilization and Level VII being 100% mobilization. An event response plan guide, a lane-mile standard per truck, the number of trucks required, and support services are defined for each level of mobilization.

On 2/12/08, the mobilization of staff and equipment followed the following timeline:

- *7:23 AM:* The NOVA District Maintenance Engineer requested mobilization plans from the Prince William, Fairfax, Loudoun, and Interstate maintenance sections.
- *8:30 AM (approximately):* Superintendents submitted their plans to address the forecast conditions. The Dulles Toll Road and Interstate units mobilized at Level II for the Dulles Toll Road and I-66 because the forecast for those areas was more severe than for other portions of the district. I-95 was mobilized at Level I because the forecast at that time did not call for severe weather, with six trucks in the area of

the Springfield Interchange. Four tanker vehicles capable of applying liquid chemicals were not part of this mobilization plan. Unlike sand/salt mixtures, liquid chemicals can be applied before the start of the storm.

- *9:47 AM:* The mobilization plan was distributed, calling for a total of 278 trucks to be mobilized. A 1:00 PM conference call was also scheduled with the superintendents to review any needed changes in the plan.

- *11:00 AM (approximately):* Six additional contractor trucks were mobilized by the superintendent for the area around the Springfield Interchange.

- *1:00 PM:* A conference call was held to review information and update mobilization plans. NWS forecasts were discussed, and 12:00 PM RWIS data from Vaisala for the stations at U.S. 15 (Lucketts), the Dulles Toll Road, and I-66 at Rosslyn were reviewed. The forecasts from Vaisala indicated pavement temperatures would remain above 32 degrees. At this point, there were 54 trucks deployed along I-95, which the NOVA District felt was sufficient to take care of any hot spots in the area given the forecast.

- *2:30 PM:* A revised mobilization plan was distributed, calling for 295 trucks to be mobilized, a net increase of 17 trucks.

Deployment Response

Two area headquarters (AHQ) are responsible for the Springfield Interchange: the Dale City AHQ and the I-495 AHQ. At the onset of precipitation, trucks were positioned at the following locations in the general vicinity of the Springfield Interchange:

- six trucks (3 state, 3 contractor) at the weigh pad by the I-495 AHQ; these trucks were assigned to the Springfield Interchange ramps

- one roaming state vehicle

- two trucks at Commerce Street for the flyovers at Franconia Road

- two trucks at Edsall Road north and south

- additional trucks at the Woodrow Wilson Bridge, 14th Street Bridge HOV and mainline lanes, American Legion Bridge, and Stafford/Prince William county line.

- four loaded contract tankers that could spray magnesium chloride brine pretreatments were in a contractor yard ¼ mile from the Van Dorn interchange with the Beltway; they were not deployed at the time precipitation began to fall.

Event Response Timeline

- *3:00 PM (approximately):* The Dale City Superintendent noted that light rain had begun. He notified the Interstate maintenance crew and directed the drivers of the trucks to start operations. Since only one truck was available to cover most segments, the drivers of the trucks were instructed to get in the center lane to dispense as much granular material as possible. The I-495 AHQ also called for the mobilization of the four contractor tanker trucks.

- *3:00 to 3:30 PM:* Weather and traffic conditions deteriorated rapidly at the Springfield Interchange.

- *3:15 PM (approximately):* Multiple crashes were reported in the Springfield area. As crashes occurred, ramps and mainline lanes were effectively shut down. The exact times that ramps were closed due to accidents is unclear based upon available information. Based on VSP data, 50 crashes occurred in the area between 3 and 8 PM.

- By 4:00 PM, it became clear that the mobilization plan and deployment were insufficient for the conditions.

- *4:00 PM (approximately):* Additional equipment resources were called in from other areas to assist at the Springfield Interchange. Equipment arrival at the interchange was hindered by the heavy traffic congestion.

- *4:00 to 4:30 PM:* Four tanker trucks arrived at Springfield and began treating. Two were assigned to I-95, and two were assigned to I-495.

- *6:45 PM:* Ramp I-395 South to I-495 East reopened to traffic.

- *7:10 PM:* I-395 South to I-95 South mainline reopened to traffic.

- *7:40 to 7:55 PM:* I-395/I-95 HOV lanes reopened to traffic.

- *7:48 PM:* I-495 East to I-395 North reopened to traffic.

- *11:00 PM to12:00 AM (approximately):* I-495 East and West to I-95 South reopened to traffic.

- *1:30 AM:* VSP reported traffic flowing freely.

Composite Timeline Showing Weather Forecasts and VDOT's Responses

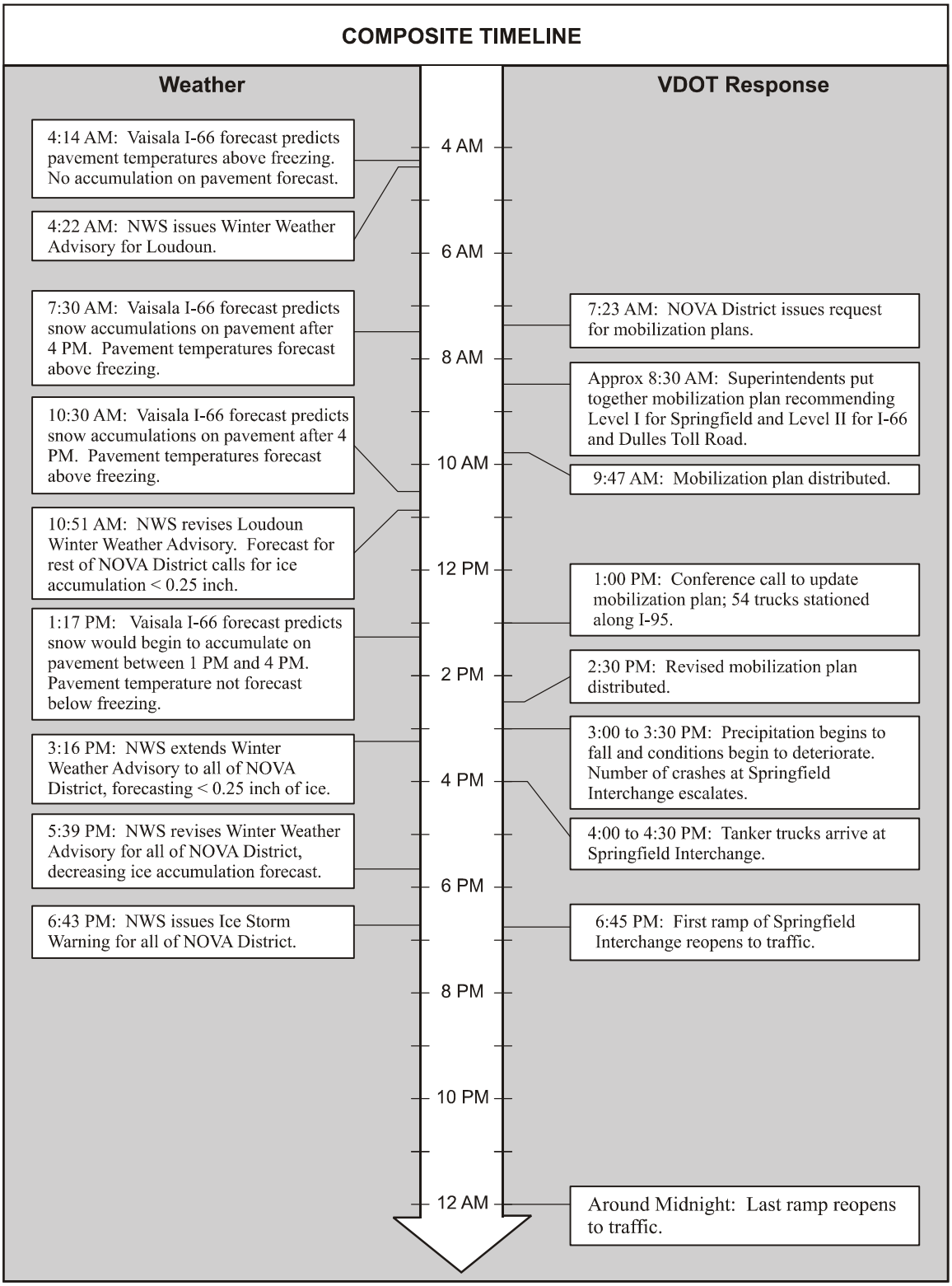

Figure 3. Composite Timeline Showing Weather Forecasts and VDOT's Responses

Communications/Coordination Between and Among Agencies and with the Public

Two centers were used in this event: the Northern Virginia TMC and the TEOC in Richmond. The primary responsibilities of the TMC are:

- Monitor traffic conditions
- Inform the public of traffic conditions.
- Coordinate the activities of the Safety Service Patrol (SSP).
- Enter information on current conditions into VOIS.

The primary responsibilities of the TEOC during a weather event are:

- Monitor weather information from a variety of sources, including a private meteorologist on contract to VDOT.
- Distribute relevant weather information to all VDOT districts.
- Respond to requests for information from the public during winter events. This includes monitoring the Virginia Operations Information System (VOIS), updating 511 Virginia messages, coordinating the update of road conditions on VirginiaDOT.org, answering 511 Virginia and Highway Helpline calls, and keeping the State Emergency Operations Center (SEOC) informed of conditions.
- Keeping VDOT's executive management apprised of situations across the state that cause significant traffic impacts.

TMC Response on February 12

- During the 2/12/08 event, the Northern Virginia TMC was staffed with one supervisor and six controllers.
- In addition to the events at the Springfield Interchange, the TMC was dealing with a large number of incidents on I-66, I-395, and the arterials.
- At the Springfield Interchange, 108 incidents were reported between 3 PM and midnight, of which 63 were reported between 3 and 8 PM.
- VSP data shows an additional 223 incidents on the interstates and major arterials in the rest of the District between 3 PM and midnight.
- Personnel in the TMC were quickly overwhelmed by the number of calls and requests for information. Personnel were focused on responding to media calls and communicating with SSP and VSP personnel.

- During the event, data on road conditions were not entered into VOIS, which feeds the 511 Virginia phone system and website.

- No messages related to the Springfield Interchange were posted to permanent DMSs in the NOVA District. Operators did not attempt to activate the DMSs along I-95 because of known communications issues with the devices. Only one DMS north of Fredericksburg was activated.

- The TMC did not contact the TEOC or other regional traffic management centers to coordinate public information to divert motorists away from the area.

TEOC Response

- TEOC noted that 2,052 telephone calls were made from Northern Virginia to 511 Virginia between the hours of 4 PM and midnight. An additional 582 calls were made to the Highway Helpline during this same period.

- TEOC posted six "floodgate" messages for the event on 511 Virginia. Floodgate messages are intended to provide information "up front" on 511 Virginia without users being forced to drill down into submenus. The transcript of the floodgate messages and the times they were posted were as follows:

- *2/12/08 511 Floodgate Messages:*

    - 4:45 PM NOVA - as of 4:45 PM parts of I-395 south as far as Springfield, and on and off ramps of I-495 south to I-395 north are temporarily closed. Motorists should seek alternate routes and expect major delays.

    - 4:46 PM: Fairfax co. – I-66 WB at MM 44 – all lanes blocked due to an accident. Expect delays.

    - UPDATE: NOVA: as of 5:30 PM there are multiple lane and ramp closures on I-395 near exit 8, Washington Blvd, and on I-66 both directions inside the beltway. Motorists should seek alternate routes and expect major delays.

    - 8:29 PM: Motorists traveling in the Northern Virginia region should expect delays and congestion on interstates and major primary routes due to earlier incidents in the area.

2/13/08:

- 1:02 AM: Fairfax county: There is a tractor trailer accident I-95 north at exit 161 (Lorton Road). All northbound lanes are closed.

- 3:40 AM: Northern VA Traffic Alert: Many roads have spots of ice. Numerous accidents are being reported throughout the area to include I-495/I-395/I-66 and I-95. Please drive with caution.

VSP Actions

VSP responded to a total of 331 incidents related to the weather event across the NOVA District between 3 PM and midnight on 2/12/08. The average number of incidents for VSP for a normal day is 157. The crashes were widespread across the entire region, although the majority of the incidents on 2/12/08 were minor crashes. Approximately one third of all weather-related incidents (108 incidents) that VSP responded to in the NOVA District were located within a 3-mile radius around Springfield, with the other two-thirds distributed across the region. Tables 2 and 3 show the number of weather-related incidents recorded in the VSP computer aided dispatch (CAD) system for all of NOVA District and the Springfield Interchange, respectively.

Table 2. Weather-related Incidents by Time of Day, 3 PM to Midnight, All of NOVA District. Data from VSP CAD system.

		Time Period									
Incident Type		**3-4 PM**	**4-5 PM**	**5-6 PM**	**6-7 PM**	**7-8 PM**	**8-9 PM**	**9-10 PM**	**10-11 PM**	**11 PM - 12 AM**	**Total**
Disabled Vehicles		2	1	5	6	10	7	10	7	6	*54*
Crashes	Injury	16	9	6	4	2	2	3	1	1	*44*
	Property Damage	37	26	35	24	28	22	9	19	6	*206*
	Total	*53*	*35*	*41*	*28*	*30*	*24*	*12*	*20*	*7*	*250*
Response to Traffic Problems and Requests for Traffic Control		2		5	1	2	6		5	4	*25*
Medical Emergencies								1		1	*2*
Total		*57*	*36*	*51*	*35*	*42*	*37*	*23*	*32*	*18*	*331*

Table 3. Weather-related Incidents by Time of Day, 3 PM to Midnight, Springfield Interchange Only. Data from VSP CAD system. Locations within 3 miles of Springfield Interchange.

		Time Period									
Incident Type		**3-4 PM**	**4-5 PM**	**5-6 PM**	**6-7 PM**	**7-8 PM**	**8-9 PM**	**9-10 PM**	**10-11 PM**	**11 PM - 12 AM**	**Total**
Disabled Vehicles		0	0	3	2	5	1	5	5	4	*25*
Crashes	Injury	4					1	1			*6*
	Property Damage	14	6	11	8	8	4	1	10	4	*66*
	Total	*18*	*6*	*11*	*8*	*8*	*5*	*2*	*10*	*4*	*72*
Response to Traffic Problems and Requests for Traffic Control		1				1	4		2	1	*9*
Medical Emergencies								1		1	*2*
Total		*19*	*6*	*14*	*10*	*14*	*10*	*8*	*17*	*10*	*108*

VSP personnel on the ground noted several problems at Springfield. Getting vehicles off the long, elevated ramps was problematic, with several instances where vehicles that attempted to back down the ramps slid into the jersey barrier. VDOT trucks had difficulty getting past congested traffic so that they could treat the ramps. Once the mainline began to flow around 8

PM, VSP assisted VDOT trucks to back up ramps, applying chemicals as they went, to try to clear the I-495 West to I-95 South ramp.

VSP personnel noted a number of communications difficulties in the field. The ability of VDOT and VSP personnel to communicate directly with one another was limited. VSP radios do not have access to the TMC. A VSP sergeant noted that he went to the AHQ to try to get trucks to help treat some of the ramps.

FINDINGS

The icing event that occurred in Northern Virginia on 2/12/08 makes crystal clear that treating winter events as emergencies is critical to the lives of the citizens of Virginia. The findings noted here are the result of the review of the event.

NWS and Vaisala Forecasts

- *It is clear that there was a rapid change in the weather conditions that set off the events, which then overwhelmed the resources available at the Springfield Interchange.*

- *The weather event on 2/12/08 was wide-spread and not isolated at the Springfield Interchange.* The effects of the storm impacted transportation in the District of Columbia and Maryland.

- *NWS weather forecasts provided a strong indication that freezing rain and sleet would occur on 2/12/08.* Although Warnings and Advisories applicable to Springfield were not issued until 3:16 PM, after the event had begun, NWS forecasts consistently indicated a possibility of sleet or freezing rain across the NOVA District. Starting at 3:00 PM on 2/11/08, every NWS Zone Forecast called for the possibility of freezing rain and/or sleet to occur on 2/12/08 across the region.

- *There appears to have been a delay in the NWS extending Warnings and Advisories across the region.* A Winter Weather Advisory was issued for Loudoun County at 4:22 AM on 2/12/08, but it was not extended to the remainder of the region until 3:16 PM (after the start of icing at Springfield). Likewise, an Ice Storm Warning was not issued until 6:43 PM on 2/12/08, almost 4 hours after the start of icing at Springfield.

- *RWIS data provided an additional indication of the potential for problems at Springfield.* The closest RWIS station to the Springfield Interchange is located on I-66 at Rosslyn, approximately 9 miles away. Vaisala forecasts for this location never indicated that pavement temperatures would drop below freezing and did forecast air temperatures to be above freezing during the afternoon hours. Data from the station showed that this forecast was in error as the air temperatures at Rosslyn never rose above freezing on 2/12/08. Further, starting at 7:30 AM on 2/12/08, the forecast predicted the possibility of snow accumulation on the pavement at Rosslyn around 4:00 PM.

Mobilization of VDOT Crews

- *As the earlier event response timeline documents, approximately 3½ hours elapsed between the time that the ramps closed and the time the first ramp reopened.* The last ramp did not return to service until almost 8 hours after the start of the event. Deployment of equipment was hampered by the crashes and traffic congesting the ramps. Slowly, equipment made

progress in applying chemicals to the roadway, treating the ramps from both ends. VSP assistance was crucial in this operation.

- *Although the NOVA District's systematic approach to mobilization is a good one, the time lag required to mobilize contract equipment can be anywhere from 1 to 3 hours, too long to respond effectively to fast moving or changing weather events. In addition, the approach does not give consideration to the impact of low air temperatures on elevated structures such as the Springfield Interchange.*

Communications Between Agencies

- *There is currently no common interface for communications between VSP and VDOT maintenance forces.* Although SSP patrollers have VSP radios in their vehicles, VDOT maintenance supervisors do not. The volume of radio traffic during the event would have made the use of VSP radio channels challenging. Incident-specific communications channels could be employed (e.g., tactical VSP channels), but they were not used in this particular event. As a result, all communications between the VSP troopers in the field and VDOT had to occur through the VSP dispatcher. This proved to be very inefficient, and in at least one instance, a VSP trooper drove to a VDOT AHQ and personally requested additional equipment to deal with the situation.

Internal Agency Communications

- *Communications protocols between and among the TEOC, the TMC, and others in the field were not comprehensive or as effective as they could have been.*

Communications with the Public

- *VirginiaDOT.org, 511 Virginia, statewide media contacts, and DMSs were underutilized during the event. Personnel in the Northern Virginia TMC were quickly overwhelmed by the situation and the volume of calls. Specific findings include:*

  — TMC operators were focused on reactive communications with the media calling in for information as well as on communications with SSP and VSP personnel. District public affairs personnel were not brought into the loop at an early stage to help interface with the media. These actions split the attention of TMC Operators and weakened their ability to focus on traffic management duties.

  — Data on road conditions were not entered into VOIS, which feeds 511 Virginia and VirginiaDOT.org in a timely manner. It was not until 1 hour 45 minutes after the event began that messages were posted to 511 Virginia and VirginiaDOT.org to provide motorists with updates on traffic conditions and warnings about altering their travel.

— The absence of messages being posted to permanent DMSs resulted in a missed opportunity to mitigate the traffic conditions or to alert drivers to avoid the area in time for them to take alternate routes or leave the mainline until the conditions could be improved.

— The fact that the TMC did not notify the TEOC in Richmond or other regional traffic management centers early in the event inhibited the ability to coordinate public information and perhaps to help divert motorists away from the area.

Chain of Command

- *Although an incident command structure is commonly accepted and implemented for other incident types, this was not the case for this event.* There are multiple entities within and outside VDOT that have a role to play in managing a weather-related event, and the communication links between and among these entities are not clearly spelled out; in some cases they simply do not exist. There is a need for an incident command structure for snow and ice events that is consistent with the National Incident Management System (NIMS) and an all hazards approach.

Snow and Ice Removal

Although many northern and western states have implemented liquid pretreatment anti-icing programs that prove effective in certain kinds of winter events, and although some small amount of contract anti-icing equipment is available to the NOVA District, neither the NOVA District nor VDOT has adopted a comprehensive anti-icing policy or protocol. (For example, of the 1,300+ pieces of equipment available to the NOVA District for snow removal operations, only 5 are capable of anti-icing. All 5 are contractor-owned.

- *The NOVA District currently lacks sufficient equipment, information, site specific weather data, and training to support an effective pretreatment anti-icing program.*

- *With respect to weather information, there were not sufficient road temperature data to predict pavement temperature conditions accurately at the Springfield Interchange.*

- *This is the seventh winter weather event that the NOVA District has responded to in the 2007/2008 winter season. A summary of the response to the six prior events is provided in Appendix B. That data show that liquid pre-treatment was used at the Springfield Interchange in two of those six events, based on the conditions.*

IMMEDIATE ACTION ITEMS

1. The Northern Virginia Traffic Management Center (TMC) is now designated as the central command point during winter weather events. The District Maintenance Engineer, the Regional Operations Director, a supervisor from the Virginia State Police (VSP), and the District Administrator or an Assistant District Administrator will all be on-site to coordinate response during snow or ice events to provide a clear command and control structure. A public information officer will also be assigned to the TMC to coordinate the information exchange aspects of the event.

2. The NOVA District will inform the Transportation Emergency Operations Center in Richmond (TEOC) any time they raise their mobilization levels above Level I. The command post at the TMC will fully mobilize at this point as well.

3. All VDOT districts will be required to inform the TEOC any time they anticipate mobilizing for a winter snow or ice event.

4. Full mobilization of forces will occur at the Springfield Interchange any time a Level I or higher event is anticipated (a Level I event is one with light precipitation and temperatures near or below 32 degrees). Full mobilization involves 15 trucks and 4 tankers dedicated solely to the Springfield Interchange. Pretreating of the interchange will be included before the start of precipitation, when appropriate.

5. Equipment and staff will be positioned prior to each predicted event to ensure that there is no delay in response time.

6. The experimental NOVA Severe Weather Mobilization Plan will be adopted as a standard protocol for the NOVA District. The amount of equipment being mobilized will be increased across all mobilization levels.

7. The NOVA District will relocate portable message signs and complete repairs to all dynamic message signs (DMSs) that were in an inoperable status on February 12, 2008.

8. Portable changeable message signs (PCMSs) will be used to provide redundancy in the event of another communications failure of the permanent DMSs. DMSs used for HOV lanes will also be used to display traffic information if a severe weather event occurs.

9. Existing protocols for communicating regional problems with the TEOC in Richmond and the District of Columbia Department of Transportation will be re-emphasized to staff.

10. The NOVA District will shift all responsibility for snow and ice removal at the Springfield Interchange to the I-495 Area Headquarters to ensure a coordinated response.

11. The NOVA District will distribute infrared thermometers to allow staff to monitor pavement temperatures until the Road Weather Information System (RWIS) is upgraded.

12. The NOVA District will implement an anti-icing pretreatment protocol for critical Interstate locations.

13. A 24/7 communications protocol will be implemented between the TEOC and all VDOT Districts. The TEOC will be used to supplement TMC staff in the event of severe weather events.

14. The NOVA District will establish earlier pre-event briefings with staff and the TEOC to ensure that they are aware of weather forecasts and to determine required responses.

15. Responsibility for all emergency response media contacts in the NOVA District will be consolidated into the district public affairs office. TMC operators will focus on managing traffic, responding to incidents, and communicating with the traveling public.

16. The TEOC will add VSP dispatch to the distribution for weather alerts. This will provide additional information to VSP to allow them to plan staffing levels.

17. The NOVA District Administrator and VDOT's Chief of Operations will report to the Commonwealth Transportation Commissioner regarding completion of the actions required herein no later than March 7, 2008.

18. The Commonwealth Transportation Commissioner will conduct additional meetings with the District Administrators, Maintenance Planning Leadership Group, and Regional Operations Directors to develop an institutional understanding of the changes outlined in this report. These meetings will include all of the VDOT districts.

19. This event illustrates the need for statewide discussions and the adoption of industry snow and ice removal best practices throughout VDOT. The knowledge learned from this event is not just relevant to the Northern Virginia region. Further recommendations for longer term improvements and additional statewide reviews will be documented and an action plan published by April 15, 2008.

APPENDIX A: NOVA DISTRICT MOBILIZATION PLAN

Severity of Weather Forecast	Risk/ Impact	Mob. Level	Response Plan	Lane Mile Standard Per Truck	Trucks Required	Support Services
Light precipitation; no accumulation on pavement; temp. above freezing.	None			N/A		None
Light precipitation; no accumulation on pavement; temperatures may fall below 32 degrees w/potential freeze back.	Low	I	Skeleton crews; spot treatment e.g. bridges, overpasses and cold spots.	Chemical: 100 Non-chemical: N/A	Fx: 32 Lou: 9 Int: 14 PW: 16 **District: 71**	None
Light precipitation; up to 1 inch of accumulation on pavement. Trace of freezing rain.	Low	II	Light treatment of Chemical Routes; Very limited work in subdivisions.	Chemical: 25 Non-chemical: N/A	Fx: 128 Lou: 36 Int: 56 PW: 64 **District: 284**	**Team Orange** Shops Optional: Snow Rooms, CSC, VITA, ATI
Moderate precipitation; 1-2 inches of accumu. on pavement. Up to ¼ inch of ice.	Medium	III	Chemical Operations; Includes hot spot treatment in subdivisions when temperatures are low.	Chemical: 20 Non-chemical: 50	Fx: 158 Lou: 73 Int: 78 PW: 105 **District: 414**	**Teams Orange and Red,** Shops, Onsite Mechanics Regional Dome Snow Rooms CSC, VITA, ATI
Moderate to heavy precipitation; 2-4 inches of accumulation on pavement. ¼-1 inch of ice.	High	IV	Chemical/Plow Operations; Includes plowing subdivisions and sanding as necessary.	Chemical: 15 Non-chemical: 20	Fx: 454 Lou: 133 Int: 117 PW: 194 **District: 898**	**Teams Orange and Red,** Shops, Onsite Mech., Reg dome, Snow rooms, facilities, procurement, CSC, VITA, ATI
Moderate to heavy precipitation; 4-6 inches of accumulation on pavement; light drifting. 1-2 inches of ice.	High	V	Chemical/Plow Operations; Includes plowing in subdivisions and sanding as necessary. Include heavy equipment as necessary.	Chemical: 12 Non-chemical: 15	Fx: 667 Lou: 172 Int: 148 PW: 249 **District: 1236**	**Teams Orange and Red,** Shops, Onsite Mech., Reg dome, snow rooms, Facilities, Procurement, CSC, VITA, ATI
Heavy Snow; more than 6 inches of accumulation on pavement; drifting expected. More than 2 inches of ice.	Very High	VI	Chemical/Heavy Plow Operations; Includes plowing in subdivisions and sanding as necessary. All possible resources are being employed.	Add 100 Pieces of Heavy Equipment Chemical: 12 Non-chemical: 15	Fx: 721 Lou: 186 Int: 160 PW: 269 **District: 1336**	**Teams Orange and Red,** Shops, Onsite Mechanics, Regional Dome, Snow Rooms, Facilities, Procurement, CSC, VITA, ATI
Heavy rains, high winds, hurricanes, and tornados.		VII	Refer to Non Ice/Snow Severe Weather Event Levels of Mobilization			

APPENDIX B: NOVA DISTRICT RESPONSE TO PAST STORMS, WINTER 2007-2008

It is informative to review some of the past experiences with storm events in the NOVA District to contrast experiences on 2/12/08 with those of earlier storms. The district has mobilized forces for six previous storms this winter, five of which included interstate crews. The responsibilities and assets available by district maintenance section are shown in Table C1, and a summary of the storm response is shown in Table C2. Chemicals were applied to the interstate in only two of the events (the 12/4/07 and 1/17/08 storms). For one of those two storms, the tankers of magnesium chloride were used to pretreat the Springfield Interchange. In the remaining storm, the tankers were deployed but did not begin applying brine until after the start of precipitation.

Table C1. Responsibilities and Equipment Available by NOVA District Maintenance Section

Maintenance Section	Highway Lane Miles	Local Lane Miles	Total Lane Miles	Number of State Equipment Available	Number of Hired Equipment Available
Fairfax	3177	4857	8024	118	668
Interstate	1349	545	1894	23	196
Leesburg	1051	1390	2441	40	240
Manassas	1646	1861	3507	38	250
Total	7223	8643	15866	219	1354

Table C2. Summary of NOVA District Storm Response, Winter 2007-2008

Start Date	End Date	Total Hours	Maintenance Sections Involved	Maximum Snow/Ice Depth (inches)	Temp. Range	Number of Hired Equipment	Total Cost
12/4/07	12/7/07	60	All	3.0	24 to 35	447	$2,237,558
			Interstate Only	2.0	27 to 35	65	$434,983
12/7/07	12/8/07	12	All	0.0	30 to 37	52	$142,731
			Interstate Only	0.0	33	27	$35,465
12/15/07	12/16/07	24	All	0.0	28 to 38	339	$396,315
			Interstate Only	0.0	30 to 35	58	$98,544
1/17/08	1/19/08	51	All	4.0	25 to 38	753	$2,671,312
			Interstate Only	2.5	32 to 38	89	$406,377
1/22/08	1/23/08	28	All	0.0	25 to 37	325	$374,877
			Interstate Only	0.0	33 to 40	47	$60,270
1/31/08	2/2/08	35.5	All	0.1	29 to 38	92	$266,753
			Interstate Only	0.0	33	48	$85,528