



# **COG REGIONAL SALT AND WATER QUALITY WORKSHOP**

**April 1, 2019**

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District Maintenance Engineer**



**Northern Virginia District Background**



- **Fairfax, Loudoun, Prince William, and Arlington\***  
*\* Cities/towns and Arlington maintain own road network*
- **Population: 2.4 million**
- **Commuter lots: 24**
- **Bridges/large culverts: 2,000**
- **Traffic signals: 1,400**
- **VDOT employees: 866**







## Total lanes miles: 13,942

- **Interstate: 770 • Primary: 1,791 • Secondary: 11,306**
- **Gravel: 318 • Frontage: 78**
- **Subdivision streets: 16,000**





## **18 maintenance headquarters**

Arlington:1 • Fairfax: 9 • Loudoun: 4 • Prince William: 4





**2018-2019 Snow removal budget \$55.6 million**





**Pieces of equipment: 4,000**  
*(mostly contracted)*





**Materials at start of season**  
Salt: 120,000 tons • Sand: 25,000 tons  
Brine: 250,000 gallons





**Contractor vehicles are inspected and fitted for A-frames and spreaders**



# Planning for winter weather









A few days  
before a storm

SALT BRINE  
←

240-000083-N  
CHLORIDE, MAGNESIUM, LIQUID  
UOM-GAL →

USE CAUTION

DRIVERS MUST EXERCISE DUE  
DILIGENCE DURING THE LOADING  
AND UNLOADING OF MATERIAL  
REMAIN WITH THE VEHICLE AND  
STAY ATTENTIVE WATCHING FOR LEAKS

**DANGER**

CONFINED SPACE  
ENTER BY  
PERMIT ONLY

VIRGINIA DEPARTMENT OF TRANSPORTATION  
Sodium Chloride Deicing (23%) Solution

**Health**  
Irritant to sensitive skin and eyes.  
Ingestion may cause vomiting  
and stomach irritation. Excessive  
ingestion may cause vomiting, edema  
and/or elevated blood pressure.

**Flammability**  
Nonflammable.  
Product can be used to smother fires.





# PRE-STORM TREATMENT

- Brine applied when pavement temps are 20+ degrees and forecast does not begin as rain
- Helps prevent ice/snow bond to pavement during onset of weather



- **2,150 lane miles of interstates & major roads** including bridges, ramps, and overpasses are pre-treated with brine or liquid magnesium chloride.





## Mobilization begins

- **Small events:** 12-18 hours before forecasted start
- **Large events:** 18-24 hours before forecasted start







## Subdivisions

Main roads made passable, then remaining streets and cul-de-sacs





## **What does “passable” mean?**

- **An 8- to 10-foot path** cleared for emergency vehicle access
- **Drivable with extreme caution**
- Road remains **snow-packed**, will **not be curb-to-curb or bare pavement**

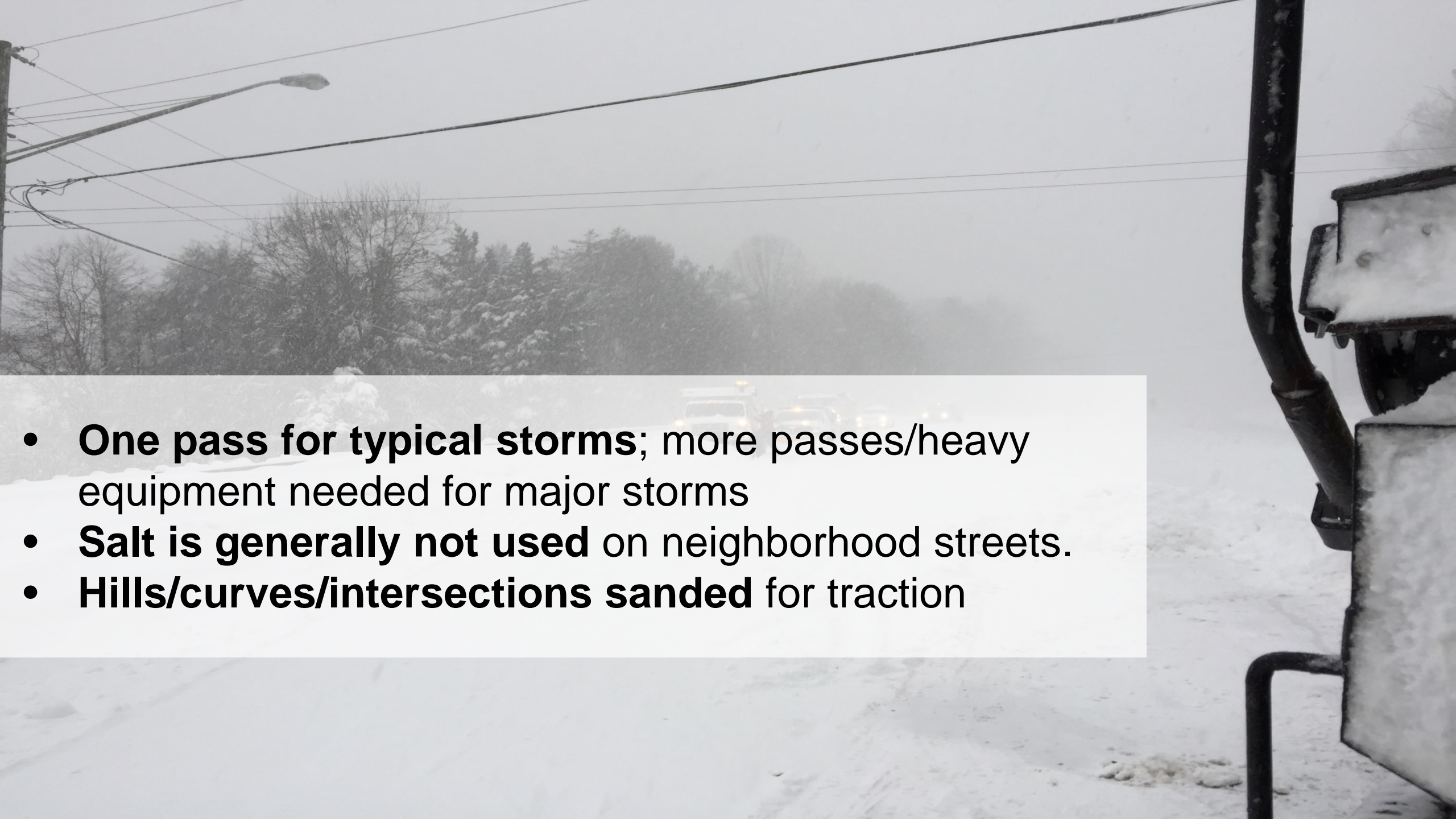


## Passable lane goals:

- **2-4" of snow:** 24 hours
- **4-6" of snow:** 48 hours
- **6"+ of snow:** 72+ hours







- **One pass for typical storms;** more passes/heavy equipment needed for major storms
- **Salt is generally not used** on neighborhood streets.
- **Hills/curves/intersections sanded** for traction

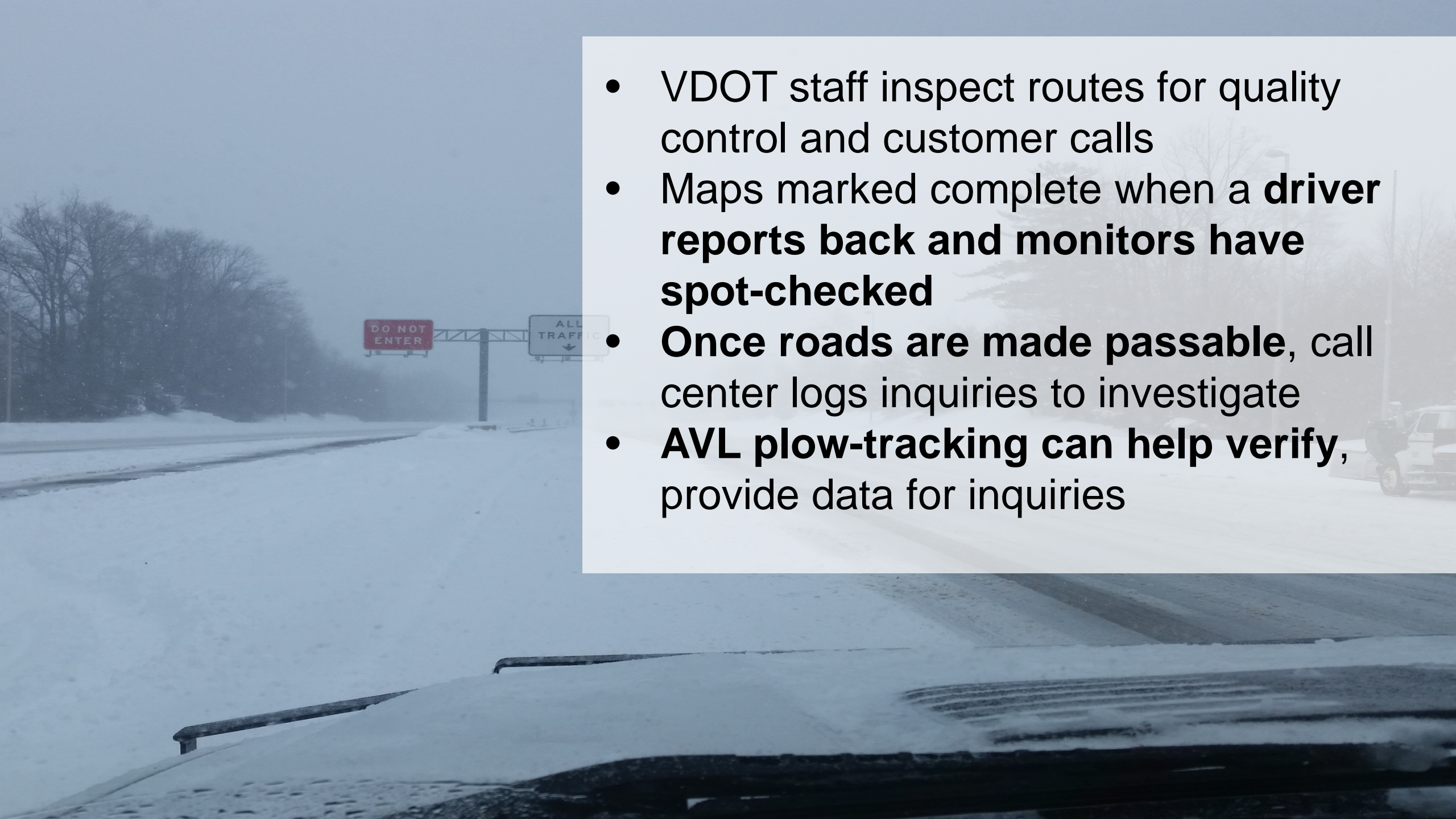




## **Additional priorities:**

- Making all roads **as safe as possible**
- Shoulders, ramps, turn lanes, intersections
- 12,000 park-and-ride spaces



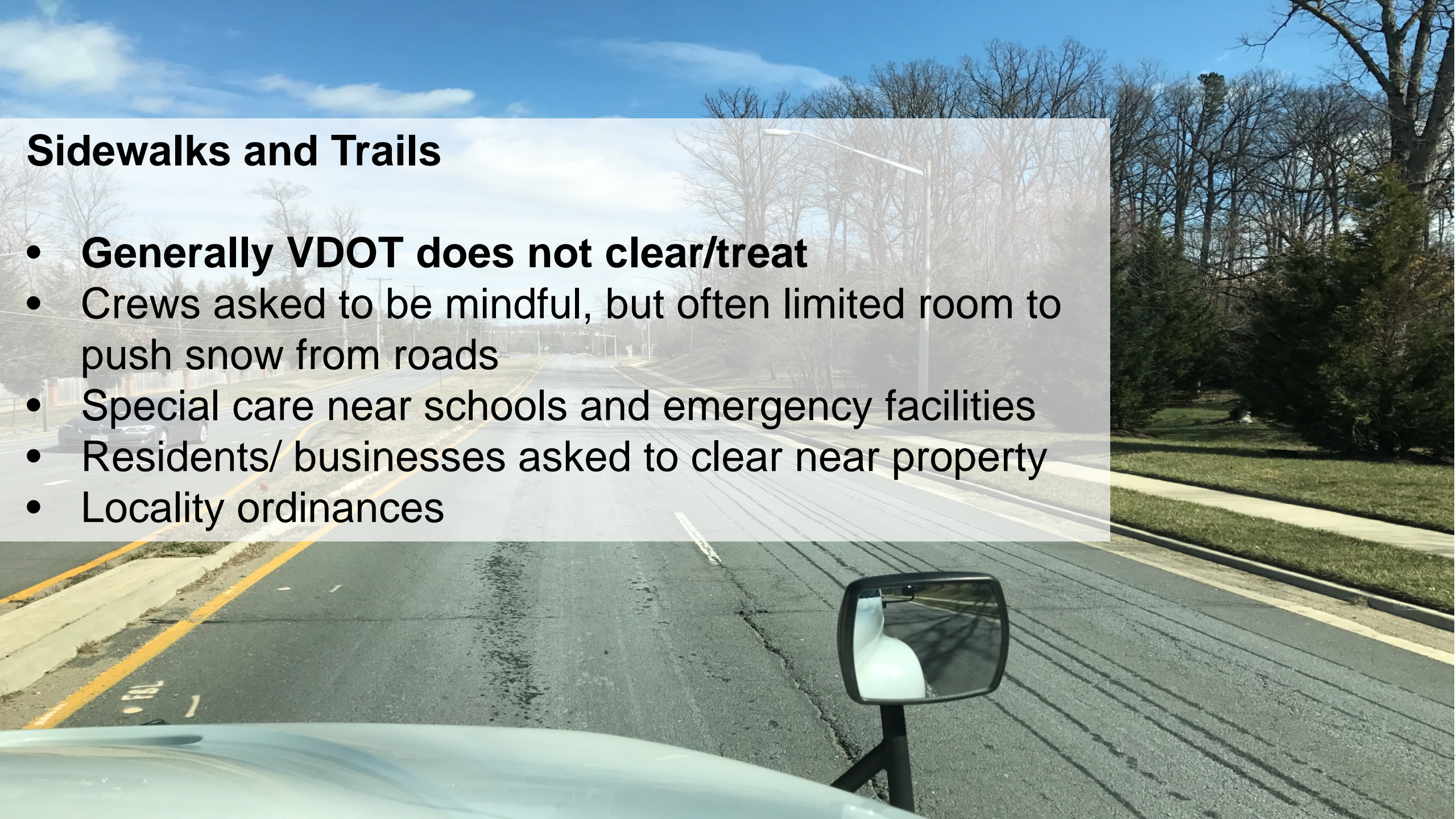


- VDOT staff inspect routes for quality control and customer calls
- Maps marked complete when a **driver reports back and monitors have spot-checked**
- **Once roads are made passable, call center logs inquiries to investigate**
- **AVL plow-tracking can help verify, provide data for inquiries**



## Sidewalks and Trails

- **Generally VDOT does not clear/treat**
- Crews asked to be mindful, but often limited room to push snow from roads
- Special care near schools and emergency facilities
- Residents/ businesses asked to clear near property
- Locality ordinances





## Demobilization

- Trucks offloaded of materials, spreaders removed
- Materials restocked between events
- Continuous monitoring of inventory levels across the state through the winter





## Public Resources During Winter Weather

- [virginiadot.org/novaemergency](https://virginiadot.org/novaemergency)  
One-stop shop for news releases, Twitter feed, status updates, VDOT Plows, customer service, FAQs and more.
- [511virginia.org](https://511virginia.org)  
Road conditions and traffic cameras
- [vdotplows.org](https://vdotplows.org)  
Status of subdivisions once 2" have fallen
- [@vadotnova](https://twitter.com/vadotnova) on Twitter





**Customer Service Center**

**[my.vdot.virginia.gov](https://my.vdot.virginia.gov) or 800-FOR-ROAD (367-7623) to report safety concerns**

**Public is asked to wait a few days after storm ends to report roads as**

**‘missed.’ Once drivers have completed maps, calls sent to local areas to revise**



# Additional Efforts

- Inventory percentage levels **closely monitored and reported** across the state for restocking (field offices update every two hours)
- Continued **technology enhancements**:
  - AVL reporting
  - Data reporting pilots
  - All VDOT trucks use speed/hydraulic-controlled materials application
- Continued **enhancements to agency best practices** streamline processes, improve costs, speed of mobilization/demobilization, etc. (which also help facilitate judicious materials usage)



# Evaluating Alternatives to Salt

| VDOT Location     | Product           | Observations  | Recommendations                                  |
|-------------------|-------------------|---|--|
| Northern Virginia | Chemshield        | Pine sap product demo'd in Loudoun. Costly and challenges getting the right mix.  | Not recommended                                  |
| Hampton Roads     | Blue Salt         | Tested winter 2016-17. NaCl with blue dye; expected same environmental impact; expensive and no real benefit found.                     | Not recommended                                  |
|                   | Peanut by-product | Peanut husks mixed with salt, discarded from roasting process   | Delivered in bags; not practical for regular use |
| Staunton          | Blue Salt         | Contains anti-coagulation compound to prevent clumping (recurring issue for Staunton District); did not evaluate environmental impacts. | District uses when available                     |
|                   | Bio-Melt AG64     | Evaluated winter 2015-16; well-promoted, evaluation showed not as environmentally-friendly as represented.                              | Not recommended                                  |



# WINTER MAINTENANCE RESEARCH CONDUCTED BY VDOT

Provided by **Michael Fitch, Ph.D.**

**Deputy Director, Virginia Transportation Research Council**

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# Winter Maintenance Research Published by VDOT (cont.)

## Environmental Life-Cycle Assessment of Winter Maintenance Treatments for Roadways

(*Journal of Transportation Engineering*, 2013) <https://ascelibrary.org/doi/pdf/10.1061/%28ASCE%29TE.1943-5436.0000453>

- Researchers performed LCA for granular NaCl, NaCl brine, and calcium magnesium acetate
- CMA, long considered one of the most environmentally promising treatment chemicals, had higher total impacts than either salt alternative
- Brine determined as best option available when considering all environmental burdens

## Recycling of Salt-Contaminated Stormwater Runoff for Brine Production at VDOT Road-Salt Storage Facilities

(*Transportation Research Record*, 2008) [http://www.virginiadot.org/vtrc/main/online\\_reports/pdf/08-r17.pdf](http://www.virginiadot.org/vtrc/main/online_reports/pdf/08-r17.pdf)

- Examined use of stormwater captured at VDOT's maintenance facilities to generate brine for anti-icing
- Concluded that (1) sediment levels were not so high to negatively affect brine quality or equipment; (2) a high percentage of the water requiring disposal (60 million gallons) could be reused; (3) by avoiding disposal of this water, significant savings could be realized

## Potential Use of Reverse Osmosis in Managing Saltwater Waste Collected at Road-Salt Storage Facilities

(*VTRC*, 2006) [http://www.virginiadot.org/vtrc/main/online\\_reports/pdf/06-r26.pdf](http://www.virginiadot.org/vtrc/main/online_reports/pdf/06-r26.pdf)

- Pilot using RO to determine feasibility for use by VDOT (in lieu of stormwater disposal)
- Primarily due to extremely large volume of water VDOT collects, RO not recommended as treatment method
- Potential for using the stormwater for the purpose of brine was identified as potential option



# Winter Maintenance Research Conducted by VDOT

## **Characterization and Environmental Management of Stormwater Runoff from Road-Salt Storage Facilities** (*Transportation Research Record, 2005*) [http://www.virginiadot.org/vtrc/main/online\\_reports/pdf/05-r15.pdf](http://www.virginiadot.org/vtrc/main/online_reports/pdf/05-r15.pdf)

- Performed complete chemical characterization of salt-laden stormwater captured at VDOT's maintenance locations
- Developed thorough understanding of how this runoff is captured, stored, managed, and disposed
- Methods of reducing runoff generated recommended and potential treatment methods requiring additional study

## **Environmental Implication of the Use of Ice Ban as a Pre-Wetting Agent for Sodium Chloride** (*Transportation Research Record, 2000*) [http://www.virginiadot.org/vtrc/main/online\\_reports/pdf/00-r12%20.pdf](http://www.virginiadot.org/vtrc/main/online_reports/pdf/00-r12%20.pdf)

- Examined use of an agricultural by-product patented for use as deicing agent
- Evaluated effectiveness in removing snow and compared impacts on the environment and highway infrastructure
- Was recommended that VDOT not use Ice Ban as pre-wetting agent as it showed no appreciable benefits

## **Exploring Ways to Prevent Bonding of Ice to Pavement** (*VTRC, 1998*) [http://www.virginiadot.org/vtrc/main/online\\_reports/pdf/98-r18.pdf](http://www.virginiadot.org/vtrc/main/online_reports/pdf/98-r18.pdf)

- VDOT's first attempt to determine other states and countries methods re: anti-icing
- Recommended using liquid chemicals for anti-icing purposes



# Advantages of Using Brine for Anti-icing

- **Significantly reduces the amount of NaCl needed to achieve equivalent level of service by preventing the formation of a bond between ice/snow and pavement**
- **This allows more complete mechanical removal (e.g., plowing) of ice/snow from the roadway**
- **Depending on a number of variables, including storm duration, temperature, and precipitation intensity, this practice can reduce total NaCl application volumes needed for a given storm by 30 to 65%**

**References:** National Cooperative Highway Research Program Report 577, 2007 (<http://www.trb.org/Publications/Blurbs/158876.aspx>)  
National Cooperative Highway Research Program Synthesis Report 449, 2013 (<http://www.trb.org/Publications/Blurbs/169520.aspx>)



Questions?





# VDOT BEST MANAGEMENT PRACTICES

Pollution Prevention & Salt Management on VDOT Facilities

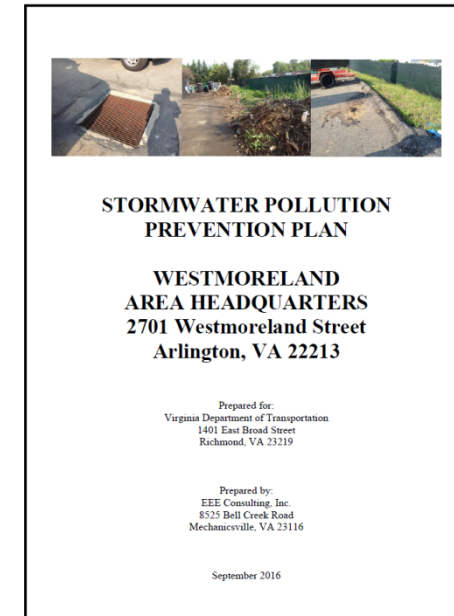
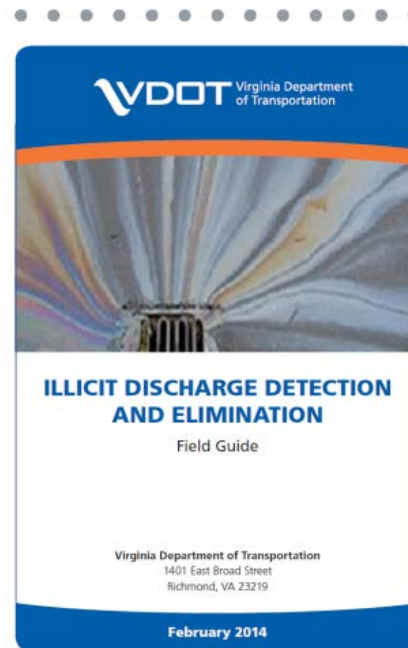
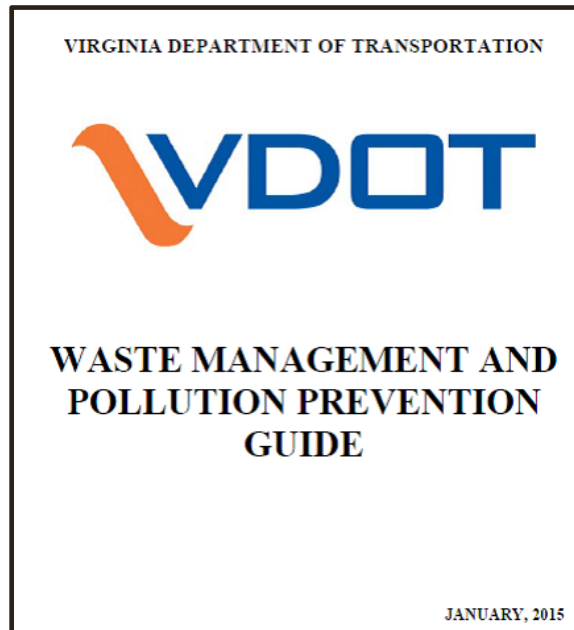
 Marian Carroll, NOVA District NPDES Coordinator

April 1, 2019



# Salt Management – Pollution Prevention

- **Facility Waste Management and Pollution Prevention Guide**
- **Municipal Separate Storm Sewer System (MS4) Program**
  - **Stormwater Pollution Prevention Plan (SWPPP) at VDOT Facilities**
  - **Illicit Discharge Detection and Elimination (IDDE)**





# Best Management Practices – Storage



Salt stored inside lined buildings



BMPs for liquid products, like brine, include secondary containment





# Best Management Practices – Runoff Control



Salt and mixed abrasives are loaded on lined and bermed mixing pads

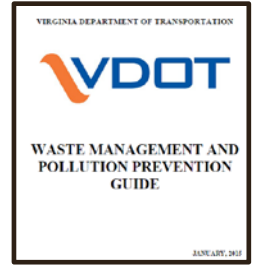


Salt laden stormwater directed to lined ponds or Underground Storage Tanks (USTs)





# Best Management Practices – Housekeeping

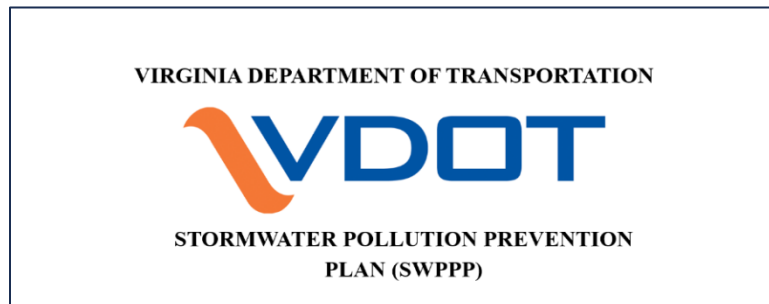


Recover salt & return to building

Maintain salt infrastructure (pads, ponds, tanks, etc)

Routine Inspections

- SWPPP Monthly & Annual
- Multi-Media Compliance Assessments





# Best Management Practices – Education



## VDOT Facility Training Videos

- Salt Infrastructure Good Housekeeping (GH) & Pollution Prevention (P2)
- Facility SWPPP
- Maintenance De-Salting Equipment

## In person classroom Facility SWPPP Training

## Monthly SWPPP Tip Emails

GH & P2 for Contractors  
(coming soon)



Facility Stormwater Pollution  
Prevention Plan (SWPPP) Training





**Questions?**