# Smart Salting

## Enhanced Winter Maintenance Training Program

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Chesapeake Conservation Landscaping Council

CHESAPEAKE BAY Landscape Professional | ENVIRONMENTAL FINANCE CENTER | Maryland Department of the Environment

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Last year's in-person equipment calibration training

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Images from McHenry County Public Works PPT & MDE

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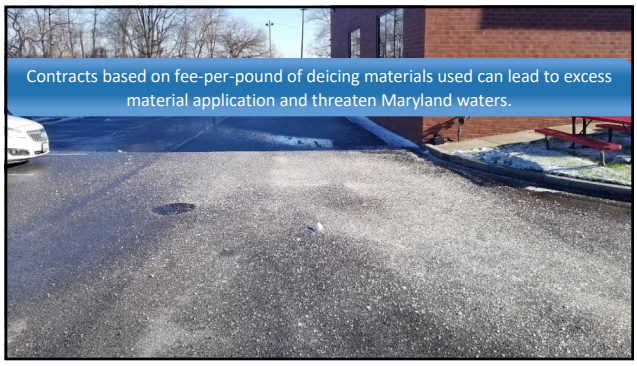

Contracts based on fee-per-pound of deicing materials used can lead to excess material application and threaten Maryland waters.

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De-icing Application Rate Guidelines
for Parking Lots, Sidewalks and Trails
For best results remove as much snow and ice as possible before applying deicers

| Pavement Temp. (°F) | Application Rate in lbs./per 1000 square foot area Apply with calibrated equipment | | | | | |
|---|---|---|---|---|---|---|
| | Rock Salt* | Bagged Blend Mostly Sodium Chloride | Bagged $MgCl_2$ or $CaCl_2$ | Wet at 6-12 gal/ton Rock Salt wet with Salt Brine | Rock Salt wet with other liquids | Winter Sand** |
| 28 ° to 32 ° | 2.3 | 2.3 | | 1.6 | | |
| 23 ° to 28 ° | 2.3-4.5 | 2.3-4.5 | | 1.6-3.2 | | |
| 15 ° to 23 ° | 2.3-6.8 | 2.3-6.8 | | 1.6-4.8 | 1.6-4.8 | |
| 0 ° to 15 ° | | | 2.3-6.8 | 3.2-4.8 | 3.2-4.8 | Spot treat as needed |
| -5° to 0° | | | 6.8 | | 4.8 | |
| < -5° | Plow Only | | | | | |
| SPEED of melting | AVERAGE The colder it is the slower it works | Faster than rock salt if gradation is finer | ABOVE AVERAGE | FAST | FAST | NONE |

* Dry rock salt is not recommended in cold temps. It is slow to melt and leads to over application.
**Winter sand contains ≤ 5% salt. It will not melt snow or ice. It is used for traction only.
For subsequent passes use ⅓ rate to the full initial rate.

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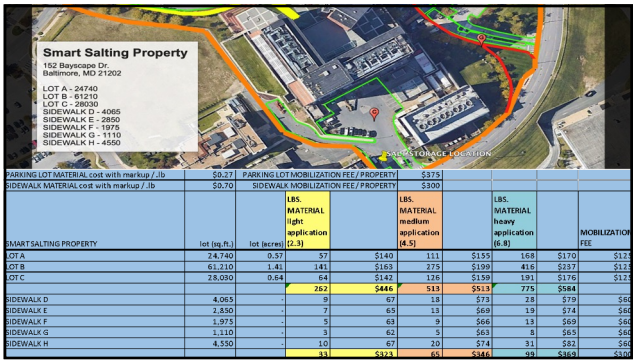


| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PARKING LOT MATERIAL cost with markup / .lb | $0.27 | | PARKING LOT MOBILIZATION FEE / PROPERTY | | $375 | | | | |
| SIDEWALK MATERIAL cost with markup / .lb | $0.70 | | SIDEWALK MOBILIZATION FEE / PROPERTY | | $300 | | | | |
| SMART SALTING PROPERTY | lot (sq.ft.) | lot (acres) | LBS. MATERIAL light application (2.3) | | LBS. MATERIAL medium application (4.5) | | LBS. MATERIAL heavy application (6.8) | | MOBILIZATION FEE |
| LOT A | 24,740 | 0.57 | 57 | $140 | 111 | $155 | 168 | $170 | $125 |
| LOT B | 61,210 | 1.41 | 141 | $163 | 275 | $199 | 416 | $237 | $125 |
| LOT C | 28,030 | 0.64 | 64 | $142 | 126 | $159 | 191 | $176 | $125 |
| | | | 262 | $446 | 513 | $513 | 775 | $584 | |
| SIDEWALK D | 4,065 | - | 9 | 67 | 18 | $73 | 28 | $79 | $60 |
| SIDEWALK E | 2,850 | - | 7 | 65 | 13 | $69 | 19 | $74 | $60 |
| SIDEWALK F | 1,975 | - | 5 | 63 | 9 | $66 | 13 | $69 | $60 |
| SIDEWALK G | 1,110 | - | 3 | 62 | 5 | $63 | 8 | $65 | $60 |
| SIDEWALK H | 4,550 | - | 10 | 67 | 20 | $74 | 31 | $82 | $60 |
| | | | 33 | $323 | 65 | $346 | 99 | $369 | $305 |

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## WHY WE SHOULD USE SMART SALTING PRACTICES

- Storm drains don't go to a treatment plant — they go to local waterways.

Image from Anne Arundel County, MD (11county.org)


Image from Wisconsin Salt Wise (wisaltwise.com)

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## WHY WE SHOULD USE SMART SALTING PRACTICES

- Salt is called a "forever pollutant" because it is not easy to remove once it enters the environment.

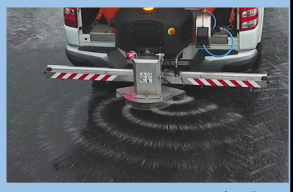

Image from Hilltip.com

- MDE 2017 study showed that a large portion of winter salts were coming from unregulated sources like parking lots.

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## Enhanced Winter Maintenance Training Manual

*A guide to Smart Salting practices that protect our waterways, infrastructure, and health*

Prepared by the
Interstate Commission on the Potomac River Basin
for the Maryland Department of the Environment

SCAN TO LINK TO A FREE DOWNLOAD

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## Maryland Smart Salting: Enhanced Winter Maintenance Training Program Partners

Maryland Department of the Environment
- Spearheaded project
- Oversaw the writing of the *Enhanced Winter Maintenance Training Manual*

Maryland Department of the Environment

University of Maryland Environmental Finance Center
- Helped developed the training program model and manage course.

ENVIRONMENTAL FINANCE CENTER

Chesapeake Bay Landscape Professional Program
- Subject matter expert

CBLP

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## Blended Learning Model

- Read each of the six modules in the manual
- View the six online eLearning modules. Each eLearning module corresponds to the manual and includes quizzes which must be completed to proceed to the next module.
- Attend virtual discussion forums. Each discussion forum includes a homework assignment to be completed prior to the discussion forum
- Attend a hands-on calibration training session.

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Enhanced Winter Maintenance Training Manual

*A guide to Smart Salting practices that protect our waterways, infrastructure, and health*

Prepared by the Interstate Commission on the Potomac River Basin for the Maryland Department of the Environment

**Module 1:** Basics – Why Should I Reduce Winter Salt Use

**Module 2:** What is Smart Salting?

**Module 3:** Pre-Season Preparations

**Module 4:** Site Planning and Contracts

**Module 5:** Storm Operations

**Module 6:** Post-Storm and End of Season Actions

**Hands On Class:** Calibrating Equipment

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## MODULE 1 - BASICS: Why should I reduce winter salt use?

- Learn about the history of road salt.
- Summarize the impacts these materials have on public health, infrastructure, and the environment.

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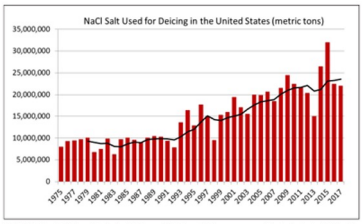
## NaCl Salt Used for Deicing in the US (metric tons)




*(US Geological Survey, 2017, Salt statistics, in Kelly, T.D., and Matos, G.R., comps., Historical statistics for mineral and material commodities in the United States: US Geological Survey Data Series 140, available online at http://pubs.usgs.gov/ds/2005/140/)*

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## WHY: IMPACTS OF SALT IN THE ENVIRONMENT

- **Human health:** Winter salts applied to roadways make their way into local surface and groundwater, which are our sources of drinking water
- **Risk to pets:** Pets may ingest salts
- **Infrastructure and property damage**: Bridges, cars, stormwater treatment facilities, roads, tunnels, concrete surfaces
- **Environmental:** Loss of aquatic life, damage to vegetation, negative soil chemistry

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## SALT AND PUBLIC HEALTH

- Salt enters our drinking water supplies through runoff entering into our freshwater rivers
- Salt is NOT removed from drinking water when treated for public consumption
- Salt can also enter into underground water reservoirs and wells when runoff with salts soaks into the soil profile.

Top image by Steve Adams and obtained from MCPA.
Bottom image Missouri Department. of Natural Resources

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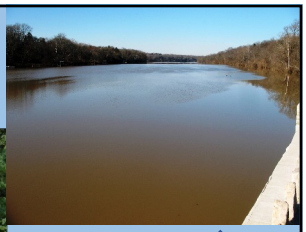
## SALT AND THE ENVIRONMENT



Turbid water with sediments

Algae blooms

Image from Flickr Commons

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SALT AND INFRASTRUCTURE OR PROPERTY DAMAGE

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## MODULE 2 – Smart Salting

- Recognize the many ways that smart salting can safely improve winter operations while saving money, time, and effort.
- List the main practices that are involved in smart salting.

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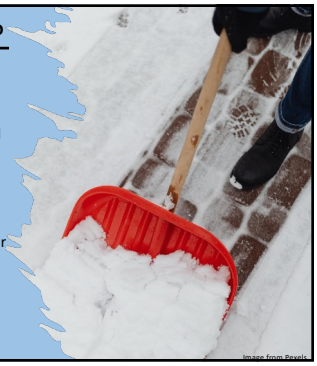
## WHAT IS SMART SALTING?

Key practices of Smart Salting are:

- Focus on manual removal vs. material use
- Use existing and new equipment
- Maintain safety during winter weather events
- Use best management practices to prevent the waste and inefficiency of overapplications

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## HOW: SMART SALTING PRACTICES

- Prepare and calibrate equipment
- Develop operations policies
- Prepare and train staff
- Create a site plan
- Calculate applications and material requirements
- Develop 'per application' pricing instead of 'per pound'
- Brine pre-treatment when applicable
- Remove snow prior to applications during weather events
- Use application charts in decision making
- Cleanup spills and debris
- Equipment maintenance
- Accurate record keeping

Pre-Season

Weather Events

Post-Storm

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## MODULES 3 & 4 – Site Planning & Contracts

- Prepare staff and equipment for winter operations (e.g., calibration, repairs, trainings).
- Identify the different types of materials used during winter maintenance and how they work.
- Calculate area treated for your property and the amount of material using Smart Salting BMPs.
- Determine the correct usage of salt for sidewalks, building entrances and parking lots.
- Describe proper site drainage and storage of onsite material, and why they are important.
- Develop site-specific service agreements and maintenance operation policies.

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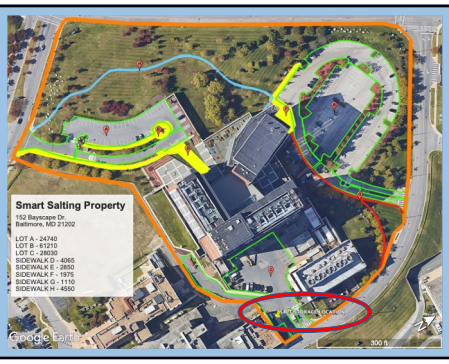


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| Material | Sodium Chloride | | Magnesium Chloride | Calcium Chloride | Acetates | | | Abrasives |
|---|---|---|---|---|---|---|---|---|
| | Rock Salt | Salt Brine | | | Calcium Magnesium | Sodium | Potassium | |
| Typical Form | Solid granular | Liquid | Solid or liquid | Solid or liquid | Solid or liquid | Solid or liquid | Liquid | Granular* (mixed with salt) |
| Lowest Practical Melting Temp. | 15◦ F | 15◦ F | -10◦ F | -20◦ F | 20◦ F | 0◦ F | -15◦ F | N/A |
| Usage | Deicing anti-icing | Prewetting anti-icing | Deicing prewetting anti-icing | Deicing | Anti-icing | Anti-icing | Anti-icing | Temporary traction |
| Positive Attributes | Cheaper than other products; Excellent melting capacity | Cheaper than other products; No granular scatter; Prevents bonding of ice and snow to pavement | Compared to rock salt: Less product needed; Better melting capacity; Persist on pavement; Longer prevention of black ice | Compared to rock salt: Less product needed; Better melting capacity | Less corrosive than chlorides | | Less corrosive than chlorides | Good for spot treatments; Effective at very low temperatures; Useful in no salt zones |
| Negative Attributes | Corrosion to infrastructure and vehicles; Pavement deterioration | Corrosion to infrastructure and vehicles | Higher cost than rock salt; More corrosive than sodium chloride; Pavement deterioration; Leaching/runoff from | Higher cost than rock salt; More corrosive than sodium chloride; Pavement deterioration | Compared to chlorides: Expensive; More product need; Performs worse below 5° F, for heavy snow fall and | Compared to chlorides: Expensive; More product need; Performs worse below 5° F, for heavy snow | Compared to chlorides: Expensive; More product need; Performs worse below 5° F, for heavy snow | Requires more plow passes and applications than chemicals; No deicing; Must be cleaned up after season; Corrosive when mixed |

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**De-icing Application Rate Guidelines**
**for Parking Lots, Sidewalks and Trails**
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* Dry rock salt is not recommended in cold temps. It is slow to melt and leads to over application.
**Winter sand contains ≤ 5% salt. It will not melt snow or ice. It is used for traction only.
For subsequent passes use ½ rate to the full initial rate.

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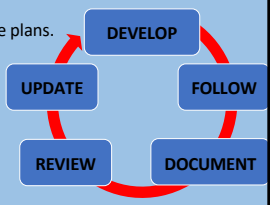
## PROPERTY OWNERS, MANAGERS & CONTRACTORS SHOULD:

- **DEVELOP** operations policies and maintenance plans.
- **FOLLOW** the plan.
- **DOCUMENT** maintenance activities to prove you followed the plan.
- **REVIEW** and update the maintenance policy and plan each year.
- **UPDATE** the maintenance policy and plan each year.

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## Module 5: Storm Operations

- Decision Making Factors
- Putting your plans into action

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## DECISION MAKING FACTORS

- Weather forecast
- Pavement temperature
- Air temperature and trends
- Precipitation type
- Wind speed and direction
- Practical melting temperature of products
- Application charts
- Level of service

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Image from MCPA

Deicing Application Rate Chart

| Pavement Temp. (°F) and Trend (↑↓) | Weather Condition | Maintenance Actions | Application Rate in lbs./1000 ft² area: Salt Pre-wetted/ Pretreated with Salt Brine | Salt Pre-wetted/ Pretreated with Other Blend | Dry Salt | Winter Sand (Abrasives) |
|---|---|---|---|---|---|---|
| ~~30°F~~ | Snow | Plow, treat intersections only | 0.75 | 0.5 | 0.75 | Not recommended |
| | Freezing Rain | Apply chemical deicers | 1.25 | 1.0 | 1.5 | Not recommended |
| 30°F & ↓ | Snow | Plow & apply chemical deicers | 1.25 | 1.0 | 1.5 | Not recommended |
| | Freezing Rain | Apply chemical deicers | 1.5 | 1.25 | 1.75 | Not recommended |
| 25-30°F & ↑ | Snow | Plow & apply chemical deicers | 1.25 | 1.0 | 1.5 | Not recommended |
| | Freezing Rain | Apply chemical deicers | 1.5 | 1.25 | 1.75 | Not recommended |
| 25-30°F & ↓ | Snow | Plow & apply chemical deicers | 1.25 | 1.0 | 1.5 | Not recommended |
| | Freezing Rain | Apply chemical deicers | 1.75 | 1.5 | 2.25 | 3.25 |
| 20-25°F & ↑ | Snow or Freezing Rain | Plow & apply chemical deicers | 1.75 | 1.5 | 2.25 | 3.25 for freezing rain |
| 20-25°F & ↓ | Snow | Plow & apply chemical deicers | 2.0 | 2.0 | 2.75 | Not recommended |
| | Freezing Rain | Apply chemical deicers | 2.5 | 2.0 | 3.0 | 3.25 |
| 15-20°F & ↑ | Snow | Plow & apply chemical deicers | 2.0 | 2.0 | 2.75 | Not recommended |
| | Freezing Rain | Apply chemical deicers | 2.5 | 2.0 | 3.0 | 3.25 |
| 15-20°F & ↓ | Snow or Freezing Rain | Plow & apply chemical deicers | 2.5 | 2.0 | 3.0 | 3.25 for freezing rain |
| 0 to 15°F & ↑ or ↓ | Snow | Plow, treat with blends, & sand hazardous areas | Not recommended | 3.0 | Not recommended | 5.0 for spot treatment as needed |

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Correct:
Spaces between granules

Spacing between granules, as seen above, will vary with rate.

Incorrect:
Thick spread of salt

Piles of salt, shown in the photo above, are an example of a wasteful practice

Image from Fortin Consulting

Image by Roland Tanglao from Flickr Commons

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## ADVANTAGES OF BRINE

- Brine can be applied 24-48 hours before a storm event giving applicators more time to prepare
- Brine is more cost-efficient than rock salt since less salt is used to make brine
- Brine delivers the optimal concentration of salt without waste - 23% is the ideal brine solution

Image by Seth Gravelle from Flickr Commons

Image by MPCA from Flickr Commons

**Applying salt prior to ice bonding to the pavement can save money since this removes the need for melting.**

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## Module 6: Post Storm & End Of Season Actions

- Cleanup, Storage, Maintenance
- Demonstrate spill and equipment clean-up procedures
- Documenting winter operation procedures
- Evaluating the effectiveness of winter operations

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## SPILLS

Image from ICPRB

Image from Jason Swope


Image from Wisconsin Winter Maintenance Manual:

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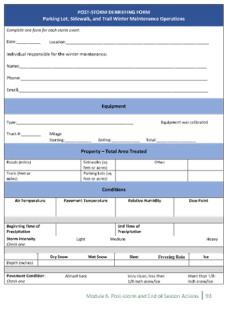

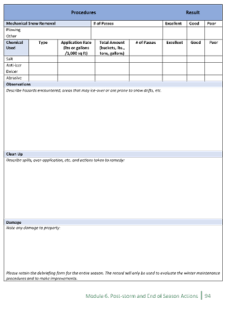

Remember: *Accurate records help with accurate invoicing!*

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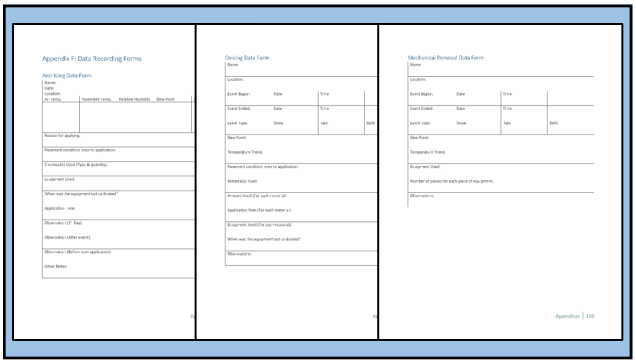


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**Evaluation**

**Does your contractor/crew adhere to best practices to fight snow and ice?**

**Location:**_____

**Date:**_____

**Check all that apply**

- € Stores product in a dry, covered area with appropriate drainage
- € Is knowledgeable about best winter maintenance practices
- € Mechanically removes snow/ice early and often
- € Applies anti-icing products before the storm if warranted by surface and weather conditions
- € Uses deicer only when needed and after removing snow
- € Does not use deicers on extreme cold days when they are ineffective
- € Chooses products depending on surface temperatures and weather conditions
- € Calibrates all equipment
- € Uses application rates suitable for prevalent weather conditions
- € Uses a light spread pattern
- € Sweeps up excessive salt/abrasives after a storm
- € Provides advice on drainage or other problems that could lead to slippery conditions
- € Records their actions.

**If fewer than eight practices are checked, encourage your contractor or crew to attend a Smart Salting certification training.**

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## Last year's in-person equipment calibration training

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## Feedback from the 2023 pilot training

- **100% of participants reported training was somewhat or very *valuable***
- **Participants rated all modules as somewhat or very *relevant***
- **Especially liked**
  - ✓ **Self-paced study**
  - ✓ **Hands-on day**
  - ✓ **Application charts and tables**
  - ✓ **Calibration exercise**
  - ✓ **Use of brine**
  - ✓ **Discussion of equipment**

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## Thank You!

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Chesapeake Conservation Landscaping Council

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