

# Montgomery County Department of Transportation

## Salt Management Plan

2024



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## 1. Preface

The Montgomery County Department of Transportation (MCDOT) is committed to providing safe and efficient roadways during the winter months, allowing citizens to travel with confidence and minimal disruption. Winter storms present a unique challenge, requiring a delicate balance between effective snow removal, public safety, and environmental stewardship. The practices outlined in this document represent MCDOT's Best Practices for Salt Management, designed to guide the agency in maintaining roadways during winter weather events while minimizing environmental impact and optimizing the use of resources.

These Best Practices serve as a comprehensive framework covering all aspects of winter operations, from the planning and preparation stages before a storm, to the post-storm analysis and cleanup. This document seeks to emphasize the importance of utilizing the least amount of material necessary to achieve safe, passable roads, while incorporating proven methods, innovative technologies, and continuous improvement strategies.

The information presented in this document is drawn from a combination of MCDOT personnel experience and the guidance presented in the Maryland Department of Transportation State Highway Administration (MDOT SHA)'s Maryland Statewide Salt Management Plan. In November 2021, Maryland Department of the Environment (MDE) issued Montgomery County (the County) a new National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit (herein after referred to as 2021 MS4 Permit.) The 2021 MS4 Permit requires that "the County shall reduce the use of winter weather deicing and anti-icing materials, without compromising public safety, by developing a County Salt Management Plan to be submitted to the Department [MDE] in its third-year annual report and implemented thereafter." This plan has been updated and prepared in accordance with the requirements of the 2021 MS4 Permit.

This living document will be updated regularly to reflect the latest advancements in snow and ice control practices, materials, and technologies. By maintaining a flexible approach and embracing new ideas, MCDOT seeks to lead by example in providing the safest, most efficient, and environmentally responsible winter maintenance services possible.

## 2. Introduction

MCDOT's mission is to move people and connect places with seamless, equitable transportation options that are safe, environmentally responsible, and support economic growth and vibrancy in Montgomery County. MCDOT's goals include:

### 2.1 Public Safety

Winter storm operations can impact both roadway users and the personnel responsible for maintaining the roads. Ensuring safety for everyone involved is a top priority, as hazardous conditions can pose risks to drivers and road maintenance teams alike. Public Safety is the primary goal of this Salt Management Plan.

### 2.2 Environmental Protection

Due to the environmental impact of the use of road salt (sodium chloride), its application must be balanced with the need to prioritize public safety. Sodium chloride levels have been steadily increasing in our waterways and is extremely difficult and expensive to remove. Reducing the use and impact of ice control materials is essential to protect ecosystems, water quality, and soil health. By using the right amount of salt or using salt alternatives, we can ensure safety and reduce damage to our environment. The Best Management Practices contained in this plan minimize the use and application of road salt, thereby reducing environmental impacts.

### 2.3 Multi-Modal Transportation System

MCDOT is dedicated to providing efficient transportation systems that maintain the mobility necessary for economic stability and upholding the quality of life expected by the communities we serve. It is also essential to keep uninterrupted access open to first responders. This Salt Management Plan has been developed with these priorities in mind.

### 2.4 Fiscal Responsibility

Montgomery County operates within budgets established by its governing bodies, making it essential for the Salt Management Plan to align with their financial constraints.

### 2.5 Continual Improvement

To drive continual improvement in reducing salt usage and its environmental impacts, MCDOT consistently seeks new ways to enhance its practices. Through ongoing evaluation of goals,



technologies, methods, materials, and equipment, MCDOT identifies and implements advancements that contribute to more sustainable and effective salt management.

### 3. Safety and Mobility

MCDOT is fully dedicated to ensuring public safety and mobility during winter storms in a cost-effective manner while striving to minimize environmental impacts. Outside of winter events, MCDOT’s Level of Service (LOS) framework establishes the priority for road maintenance. During a winter storm, these typical LOS priorities may be adjusted to address the immediate demands of the community.

Following the guidance in the MDOT SHA’s 2018 Maryland Statewide Salt Management Plan, MCDOT defines a “passable roadway” as a roadway surface that is free from snow drifts, snow ridges, and as much ice and snow as is practical that can be traveled safely at a “reasonable speed for the conditions”. In the case of winter storm events, “reasonable speed” is defined as the speed at which a vehicle can travel without losing traction. During and immediately after winter storm events, the reasonable speed is assumed to be lower than the posted speed limit.

The following priority classifications have been adopted by MCDOT based on the direction of MDOT SHA’s 2018 Maryland Statewide Salt Management Plan.

1 <sup>st</sup> Priority	Primary/ Arterial and Emergency Routes
2 <sup>nd</sup> Priority	Secondary Roads
3 <sup>rd</sup> Priority	Neighborhood Roads

#### 3.1 Passable Roadway Expectations

MCDOT strives to maintain passable roadways through the proper combinations of plowing and ice control materials. A passable roadway should not be confused with "bare pavement," which is free of all ice, snow, and any moisture. It should be assumed that a bare pavement condition may not exist until the weather conditions improve and plowing is allowed to remove the full amount of snow and slush from the pavement.

#### 3.2 Class 1: Primary/ Arterial and Emergency Routes

For a winter event that is forecast to start as snow or sleet, Primary/Arterial and Emergency Routes in this category should be pre-treated with salt brine between two hours and two days prior to the anticipated start of the event. This will provide a thin layer of salt to adhere to the pavement and prevent the frozen precipitation from bonding to the surface. During the active winter storm event, roadways should be maintained in passable roadway condition on all lanes and ramps. Plowing is the primary tool for snow removal, with road salt and/ or salt brine as a re-application, to continue preventing the bond of ice or snow to the pavement. As of 2022, MCDOT pre-treats roughly 1,600 lane miles of Primary/Arterial and Emergency roadways.

### 3.3 Class 2: Secondary Roads

On Secondary Roads, MCDOT strives for passable roadway conditions on the driving lanes, turn lanes and acceleration/deceleration lanes during the winter storm event. Only enough road salt and/or salt brine should be applied to prevent bonding from occurring. Salting, followed by plowing, should be the priority for snow removal.

### 3.4 Class 3: Neighborhood Roads

On Neighborhood Roads, MCDOT strives for passable roadway conditions on the driving lanes during the winter storm event. Salting, followed by plowing, should be the priority for snow removal. The goal is to keep snow from packing on the driving lanes during the event, only applying enough road salt and/ or salt brine to keep the precipitation from bonding to the roadway surface.

### 3.5 Exceptions

Exceptions to this roadway salt application guideline will occur when a winter storm event is followed by subsequent storms that happen at a frequency where it is not possible to obtain passable roadway conditions and bare pavement between events. The duration, severity of an event, roadway pavement temperatures, and availability operators and resources will dictate how soon passable roadway conditions and bare pavement can be obtained. Passable roadways during winter storm events allow emergency responders to provide adequate response times and transport to emergency facilities.



## 4. Goals for Reduction of Environmental Impact

MCDOT's Salt Management Plan contains best practices to balance the use of ice control materials to ensure safe roadways with the management of these materials to minimize environmental impact. The goal is to deliver safe and efficient roadway systems during winter storms while prioritizing safety and environmental awareness.

Setting annual reduction goals is challenging due to the unpredictable nature of winter storms. In 2017, MCDOT launched SnowIQ as a pilot program to improve efficiency by tracking trucks and reducing missed streets. Since then, the program has expanded to monitor the amount of salt loaded and applied by each truck. By analyzing these trends and adhering to the Salt Management Plan, MCDOT can work toward establishing long-term goals for reducing ice control material usage.

The county is currently developing a special salt management area in the Patuxent Reservoir Watershed. For more information, please see Section 7.7.

## 5. Equipment and Materials

Winter operations require specialized plowing and salting equipment and materials to keep roads safe and passable. This equipment must be serviced, calibrated, and repaired as necessary before the start of the season. These materials need to be stored, handled, and distributed properly throughout the roadway system to ensure effective winter maintenance.

### 5.1 Types of Winter Materials

Salt (sodium chloride) is the primary snow and ice control material used by MCDOT and many other agencies throughout the country due to its effectiveness in winter storms, low cost, ease of storage, and wide availability. Granular road salt is typically applied during storms once precipitation has begun. While granular road salt will remain the main ice control material used in the County, MCDOT is committed to finding ways to reduce its usage through ongoing improvements and alternative methods.

The second most used material by MCDOT and other agencies nationwide is salt brine (liquid sodium chloride). Primarily used in anti-icing operations before storms, salt brine is applied to Primary/Arterial and Emergency roads. It is sprayed on roadways using a precisely measured application rate per lane mile, typically two hours to two days before precipitation begins, to prevent snow and ice from bonding to the pavement. Additionally, it is used to pre-wet granular salt as it is spread on roads to reduce bounce and scatter. De-icing involves plowing and applying salt to remove snow or ice that has bonded to the roadway surface. More information on anti-icing and de-icing can be found in Section 7.

Salt brine is widely used due to its ease of manufacturing and low freeze point. To make it, dry salt is dissolved in fresh water and brought to a concentration of 23.3% sodium chloride. The salt brine solution is then pumped to storage tanks where it is available for application on roadways. Dry salt loses effectiveness at 20 degrees, whereas salt brine has a freeze point of -6 degrees, meaning salt brine will work in cases when dry salt is ineffective. MCDOT will continue to explore and research innovative materials which can produce results equal to or better than sodium chloride.

### 5.2 Material Storage and Handling

MCDOT stores salt in salt barns, salt domes, and other permanent structures. These structures undergo quarterly inspections for bulging, expansion, leaking, dripping, and any other findings. All necessary maintenance and repairs are performed during the non-winter months. MCDOT can minimize environmental impacts by loading the salt structure correctly and adhering to good housekeeping practices.

MCDOT employs various methods, including straw bales and gates, to prevent salt from spilling out of storage structures. Any salt spilled during loading and unloading operations is collected and returned to the storage facility. MCDOT also maintains Stormwater Pollution Prevention Plans

(SWPPPs) for all primary and satellite salt storage facilities. Large salt spills are addressed using equipment like front-end loaders, while smaller spills can be cleaned up with a shovel and broom. To ensure proper containment and prevent exposure to stormwater, routine inspections are conducted by facility personnel.

Salt brine is stored in well maintained and labeled storage tanks with secondary containment that can hold the volume of the tank contents. Routine maintenance is performed on the storage tanks fittings, valves, and pumps to keep them in proper working order.

## 5.3 Snow and Ice Control Equipment

MCDOT purchases a variety of equipment and assigns it across the County to meet the needs of each maintenance facility.

### 5.3.1 MCDOT Equipment

MCDOT is committed to using the most effective snow removal equipment available. Plowing is the most environmentally friendly snow removal method, as it reduces the need for ice control materials.

All dump trucks are equipped with well-maintained front plows to mechanically remove as much snow as possible from roadways. When necessary, side or “wing” plows are also used to enhance the snow removal process. All dump trucks are fitted with well-maintained and calibrated salt spreaders and spinners that apply salt in an effective pattern to minimize material overuse. Recently, MCDOT initiated a pilot program using new hybrid rubber/ceramic plow blades that are designed for high performance and efficiency. These blades have been expanded for use throughout the County to improve snow removal operations.

MCDOT’s fleet includes dump trucks, most of which are single-axle units capable of carrying 9 tons of salt, as well as smaller single-axle units that carry up to 3 tons. The fleet also includes tandem and tri-axle trucks with the capacity to carry up to 18 tons of salt.

MCDOT calibrates all salt spreading equipment before the start of the winter season and conducts periodic checks its accuracy throughout the season.

When necessary, MCDOT uses specialized snow removal equipment. Snow blowers are used to clear heavy snow buildup from roadway shoulders, while front-end loaders handle large snow accumulations on roads that plows cannot reach, such as narrow residential streets with parking on both sides. Motor graders are used when snow or ice has become compacted on roadways, making it difficult for plows to remove. The use of these specialized tools helps minimize the need for salt application.

MCDOT has invested in new loaders equipped with built-in scales to accurately weigh the salt being loaded into trucks. This allows for better tracking of salt usage by each truck as it completes its

assigned routes. This feature is particularly useful for monitoring application rates in environmentally sensitive areas, such as watersheds, residential wells, and public reservoirs.

### 5.3.2 Hired Equipment Contract for Snow Removal Services

MCDOT hires supplemental contract equipment to support its operations when needed to maintain prescribed service levels. All contracted equipment must be equipped with well-maintained plows and spreaders for effective and efficient snow removal and salting operations.

MCDOT trains frontline supervisors to effectively manage contractors and their equipment. MCDOT provides direct training to contract operators before the winter season begins to ensure they follow the agency's policies and procedures.

Before signing contracts for winter operations, contracted dump trucks and spreaders must be calibrated. Testing must be conducted to verify that the amount spread on the roadway aligns with the settings on the truck's control knobs. MCDOT closely monitors all contracted trucks and operators to prevent the overuse of ice control materials.

## 6. Training Initiatives

Training is a critical component of salt management and a best management practice in winter operations. MCDOT regularly provides training in salt management to its employees, emphasizing best practices that prioritize using the least amount of material necessary to maintain safe, passable roadways for motorists. The training materials are updated annually to reflect operational changes, including feedback from post-storm and season reviews, new materials, equipment, and technologies.

Shop or garage managers and frontline supervisors receive additional training that covers the science of snow removal, effective winter storm management, winter materials inventory, the properties of salt, and data collection and analysis.

MCDOT representatives attend the American Public Works Association Annual Snow Conference, which covers the best methods and practices for salt management and application. These representatives share the knowledge gained about salt usage, storage, and operations with each maintenance facility. The training discussions address all aspects of MCDOT's salt usage, focusing on the agency's responsibility to both its customers and the environment.

## 7. Winter Storm Management

Winter storm management involves effective planning, execution, and review.

### 7.1 Weather and Pavement Condition Forecast

Effective winter storm management requires reliable weather and pavement condition forecasting. Forecasting impacts every stage of a winter storm, from the planning period 24 to 72 hours prior to the storm, during the storm, as the storm conditions change, and during post-storm operations when cleanup actions are occurring.

MCDOT relies on the National Weather Service (NWS), contracted weather services, pavement condition forecasters, and their own network of Road Weather Information System (RWIS) sites as tools for winter storm management. The NWS provides a strategic forecast, alerting agencies of the potential for storms well in advance of their arrival. As a storm nears, the NWS will provide forecasts for approximate starting times and snowfall amounts over generalized areas of a County. The NWS does not provide localized site-specific forecasts, nor does it provide information on pavement temperature or conditions, which are key components needed by winter storm roadway managers.

Contracted weather and pavement condition forecasters provide the generalized forecasting provided by NWS and enhance it with localized, site-specific information. The contracted services not only forecast when snow will begin to fall and how much is anticipated to fall, but also forecasts the anticipated pavement temperatures that play a large part in how much snow will accumulate on roadways. These hyper-local forecasts are especially important within the County, as North County and South County often have varying conditions.

The RWIS network is a series of strategically located local weather stations placed along an agency's roadway system. Each weather station provides localized data such as type and intensity of precipitation, air temperature, wind direction and speed, dew point, and relative humidity. Each station has sensors in the pavement that detect pavement surface and sub-surface temperature, surface freeze point, and salinity concentration. RWIS networks can also include non-invasive pole or structure mounted pavement temperature sensors at critical locations that give pavement-only data at specific sites, which eliminates the need to embed sensors in the pavement. On some occasions the RWIS information will eliminate the need to apply salt due to the current pavement temperatures.

MCDOT relies on these three sources of information at each stage of its winter storm management to help determine when the conditions warrant the application of any chemical treatments. MCDOT maintains four RWIS stations across the County and has access to the Maryland State RWIS station data. Beyond receiving regular reports from the weather forecasters throughout the winter, MCDOT engages in conference calls with them prior to and during significant winter events.

## 7.2 Pre-Storm Planning

Effective resource planning prior to storms will equate to better performance during a storm. MCDOT's planning for typical winter storms begins 18 to 24 hours prior to events. For major winter storms, MCDOT's Countywide pre-storm planning can begin as early as 72 hours prior.

MCDOT personnel and hired contractors will report to their maintenance depots with enough lead time to inspect the equipment and make any minor repairs. All units responding to winter storm events are required to be working properly. Any necessary repairs must be completed prior to the beginning of the winter season or immediately after the end of the previous winter storm.

MCDOT and hired truck operators will load salt and other ice control materials onto the equipment, following the environmental guidelines outlined in their facility's SWPPP.

MCDOT holds pre-storm meetings with depot personnel. These meetings provide managers with an opportunity to alert personnel about the latest weather and road forecasts, emphasize the need for effective plowing, reiterate the need for sensible salting, identify appropriate salt application rates, and recommend the use for additives such as salt brine. These meetings allow for information exchange and a sharing of opportunities for improvement.

Once the equipment is ready, it should be pre-positioned on its snow route prior to the start of the event. Pre-positioned snow equipment speeds up the response time of an agency. This is particularly important if the forecasted start time of the storm could affect morning or evening rush hour traffic. If snow fighting equipment becomes trapped by traffic congestion, it may not be able to get to its snow route in an acceptable time. A forecast that estimates a storm's start during rush hour also highlights the need for pre-treating roadways with salt brine, discussed below.

## 7.3 Anti-Icing Operations

Anti-icing is an effective, proactive winter strategy that should be implemented whenever suitable for an impending storm. This process involves applying a material, typically a liquid like salt brine, to roadways before precipitation begins. Anti-icing can also be done by spreading salt just before a winter storm starts or by applying it as snow begins to accumulate on the pavement.

The primary goal of anti-icing is to prevent snow and ice from bonding to a roadway or bridge surface, allowing for more effective and efficient plowing and salting operations during the event. This will often lead to lower overall salt usage during storms and an increase in the safety of motorists at the start of a storm. If snow or ice is allowed to bond to a pavement, heavy plowing and salting is needed to break the bond.

MCDOT's experience has shown that timely application of brine prior to the start of storms keeps roadways in the best condition once precipitation begins to fall. This is particularly important if a storm begins well in advance of its forecasted arrival time, and maintenance forces are not fully mobilized. The anti-icing application of brine becomes the first application of salt that can "hold" the road until salt trucks can address the situation.

MCDOT does not perform anti-icing operations for every forecasted winter event. If a winter storm is forecasted to begin as rain, anti-icing will usually not be performed. In this case, rain would wash the salt brine off the roadway surface, wasting materials, time, and money. If pavement temperatures are forecasted to be 15 degrees or colder at the onset of the storm, anti-icing is not usually performed. If a winter storm has recently occurred and the prior storm's salt residue is present on roadway surfaces, anti-icing may not be necessary.

## 7.4 De-Icing Operations

Occasionally, winter storm conditions may prevent the use of an anti-icing strategy. A common example is an ice storm, where the initial bond between ice or snow and the pavement cannot be prevented. In such cases, MCDOT transitions from an anti-icing strategy to a de-icing strategy. De-icing focuses on breaking the bond between the ice or snow and the pavement through the application of ice control materials and methods.

Once a storm begins and precipitation starts to accumulate on roadway surfaces, MCDOT initiates de-icing operations. If a typical winter storm begins with a light snowfall, a light coat of granular salt or salt brine is applied. For moderate to heavy snowfall, material applications are adjusted accordingly. The methods of application depend on weather conditions, accumulation levels, and the state of the road surface. Different types of snow or ice accumulation require specific application techniques; for example, pre-wetted salt is used on packed snow, while liquid brine is applied to black ice or frost. In cases of very cold pavement temperatures, granular salt should always be pre-wetted with a liquid deicer to enhance its effectiveness. By improving the efficiency of the ice control materials, less material is needed overall.

The goal is to apply materials onto the roadways as early in the storm as possible to prevent the snow or ice from bonding to the roadway surface. This will allow for effective plowing and lighter salt application throughout the remainder of the storm. Ice control materials should be applied close to the high points of the road so that the salt brine runs downhill from the crown to coat the rest of the surface. The salt spinner speed should be set low enough so that the salt remains on the road surface, rather than being flung beyond the roadway.

As the initial application of ice control materials begins to lose effectiveness and accumulation increases on roadways, plowing operations commence. If the initial application was effective, the buildup will be easier to remove with proper plowing techniques. The plow operator should then reapply just enough ice control materials to prevent subsequent snowfall from bonding to the pavement. This process may need to be repeated several times throughout a winter storm to maintain safe road conditions.

The LOS provided to motorists during winter storms can vary based on factors such as time of day, storm type and severity, and location. For example, if a storm occurs overnight, some snow may accumulate on the roads, but if it does not become compacted, the road can remain passable, requiring less salt. However, if the same amount of snow falls during peak traffic times, more salt will be necessary to maintain the road's service level. Winter storms during rush hour present significant challenges for effective salt management. If ice control materials are not applied before



heavy traffic, snow can become packed, requiring heavy plowing and additional salting. Treating the roads prior to rush hour can help minimize the amount of salt used during winter storm events.

MCDOT makes extensive use of plow trains on multi-lane roadways, which are individual plow trucks spanning diagonally across the roadway. If a plow train is effective and the surface is passable, minimal salt is needed to keep the roadway in an acceptable condition until the train comes through again.

MCDOT has conducted pilot programs to use salt brine not only for the initial pre-storm application but also during the storm event itself. The department continues to expand the use of liquid-only routes throughout the County. Additionally, sensitive watersheds are closely monitored to prevent over-salting and protect water quality.

## 7.5 Severe Winter Storms

During a severe winter storm, MCDOT ramps up operations to address heavy snow, freezing rain, or blizzard conditions, focusing on keeping roadways passable. In such conditions, the primary focus shifts to plowing, with limited application of ice control materials. Plow trucks will apply a small amount of ice control materials to prevent snow from packing onto the road, but the main effort remains on continuous plowing. Once the storm begins to subside and most of the snow has been cleared, salt will be applied to help remove any remaining frozen precipitation.

In the case of an ice storm, MCDOT pre-treats the roads and reapplies salt brine to prevent ice from bonding to the surface. To prepare for an ice storm, MCDOT positions trucks at strategic locations along the roadway system to respond quickly to problem areas. This “scattered truck” method contrasts with normal storm operations, where trucks typically operate in plow trains.

Severe winter weather events, such as back-to-back storms, demand more intensive plowing operations, which can challenge plow train cycle times. To prevent packed snow or ice buildup, salt should be applied during each plow train cycle. This helps keep subsequent snowfall in a plowable state for the next cycle.

The safety of employees is MCDOT’s top priority during all winter events, whether severe or not. It is essential to maintain adequate staffing levels to ensure equipment operators and repair technicians can get proper rest during these events. A well-rested workforce is critical to the success of an effective Salt Management Program.

## 7.6 Stockpiling of Removed Snow

In the event of back-to-back storms or severe storm events, snow accumulation may reach a point where it cannot be effectively plowed off the roads, particularly in heavily populated or congested areas. In such cases, snow will be loaded onto dump trucks and hauled to pre-approved storage locations. MCDOT will collaborate with MDE and the Montgomery County Department of Environmental Protection (DEP) to identify storage locations where the snow will be held until it gradually melts over time.

## 7.7 Operations in Sensitive Areas

MCDOT works closely with MDE and DEP to establish criteria for identifying areas sensitive to salt exposure and runoff. In addition to high-risk areas, roadside areas and receiving waters showing signs of salt contamination should be monitored. Salt management practices in these areas will be assessed to determine if changes in practices and salt usage can be made to reduce environmental impacts.

The County is considering the development of a special salt management area within the Patuxent River Watershed. This watershed is a vital source of potable water, supplying approximately 30% of WSSC Water's 1.9 million customers. Since conventional water treatment processes do not remove sodium or chloride, extra precautions are necessary to prevent salt pollution from reaching the streams and groundwater that feed the reservoirs. A special salt management plan for this area is currently under development and will implement management techniques that go beyond the standard practices applied in other areas in the County.

## 7.8 Automatic Vehicle Location SnowIQ

Automatic Vehicle Location (AVL) systems are used in the County to track the locations of dump trucks and other snow-fighting equipment during winter storms. These systems provide managers with real-time data, helping to monitor progress during storms and deploy the nearest truck to roadway incidents, improving emergency response times.

AVL systems also track material application rates, including the rate at which trucks are plowing and spreading salt. Data collected through AVL can be analyzed after winter storms to identify areas for improvement and enhance the efficiency of winter operations. Most importantly, AVL technology plays a crucial role in improving driver safety.

In 2018, MCDOT implemented a system called SnowIQ, an AVL-based platform that allows cell phones and tablets to function as AVL units. All MCDOT dump trucks, supervisor vehicles, and contractor equipment are tracked using this system. SnowIQ provides real-time information on road treatment status, indicating whether roads have been plowed or treated, and tracks the amount of salt applied across various routes.

## 8. Post- Storm Operations

Post-storm operations involve a range of tasks, including equipment inspection, cleaning, storage facilitation, stockpile maintenance, and operation reviews. Due to the freezing conditions in which equipment operates, malfunctions can occur, sometimes resulting in salt spillages or over-application. To address this, MCDOT has expanded its quality control team to inspect all roads after a storm, checking for salt spillages or unusually high concentrations of salt. Community members can also report salt spillages through the 311 service. When necessary, equipment is deployed to remove any spillages or excess salt applications.

### 8.1 Equipment Cleaning and Maintenance

MCDOT has developed plans for equipment inspection, cleaning, and maintenance after winter storms. Snowplows and trucks are cleaned immediately after operations are complete, whenever possible. All cleaning of equipment and vehicles is done in a way that prevents wastewater from discharging into stormwater systems.

### 8.2 Material Cleanup at Storage Facilities

Immediately after winter storm operations have ceased, all unused salt will be returned to a storage facility. All exposed abrasives will either be moved to a covered facility or covered securely with a tarp. If salt or abrasive mixing has occurred in an uncovered area, any remaining stockpile will be returned to the salt storage facility. MCDOT's SWPPPs include requirements for material storage at maintenance facilities.

### 8.3 Operations Review for Continual Improvement

MCDOT conducts post-storm reviews at their maintenance facilities for most winter storms and agency-wide reviews for major storms. These reviews focus on three key areas: what worked, what didn't work, and what opportunities for improvement may exist. The insights gained from these reviews are used to update or develop new best management practices. Additionally, these reviews help identify "champions"- operators who successfully clear snow routes using less salt. The champions are encouraged to share their techniques and ideas with others to foster greater efficiency in salt application across the agency.

### 8.4 Post-Storm Data Analysis

MCDOT collects agency-wide salt usage data, tracking it by truck, snow route, shop or garage, and district. Salt usage is measured in relation to the number of lane miles served and the amount of snow fought. One key metric used is pounds of salt used per lane mile per inch of snow. This allows



MCDOT to assess and compare salt usage performance between trucks on the same route, across different routes, and between shops. This data helps identify opportunities to improve efficiency and reduce salt usage.

## 9. Spill Prevention and Pollution Control Plan for Winter Operations

MCDOT takes proactive steps to prevent the uncontrolled release of winter materials into the environment at storage facilities and on roadways. The agency has developed and implemented site-specific SWPPPs for each of its maintenance facilities. These plans assess potential sources of stormwater pollution and outline practices to mitigate these pollutants. While each plan is tailored to the specific site, they all follow a unified approach to managing spills of winter materials, ensuring consistency in spill response and environmental protection across the agency.

### 9.1 Salt Spill Prevention

Proper loading of salt onto trucks is essential to prevent spills. MCDOT requires tailgate flaps on all County and contractor trucks to prevent salt from spilling out the back. If salt still spills due to equipment malfunction, the salt will be swept up and returned to the truck bed.

### 9.2 Brine Mixing and Storage Tanks

To reduce the risk of leakage and spills from liquid storage tanks, secondary containment has been installed and a weekly inspection program implemented. If any drips or leaks are detected, immediate maintenance or repairs are conducted. If a repair cannot be completed right away, temporary containment measures will be put in place to prevent further environmental impact.

## 10. Recordkeeping and Annual Reports

MCDOT maintains comprehensive and up-to-date records for all winter operations, documenting each winter event and season. These records allow for seasonal analysis and the identification of trends in operations. Detailed tracking of salt usage, personnel, equipment, and materials is kept for each maintenance shop, alongside weather and pavement conditions during winter events. The data is summarized in reports that inform real-time operational decisions and post-processed for estimating operational costs.

At the end of each winter season, MCDOT conducts an in-depth analysis of winter operations, with a particular focus on salt usage. This analysis is included in MCDOT's annual winter report, which serves as a tool for learning lessons, identifying areas for improvement, spotting trends, and making recommendations for future operations. The report is used by senior management to evaluate necessary changes in policies, procedures, processes, and expenditures, as well as any budgetary implications. Additionally, MCDOT shares this information with DEP for inclusion in their annual MS4 reporting.

## 11. Annual Winter Wrap-Up Meeting

MCDOT holds an annual meeting to review winter operations, focusing on insights from post-storm reviews and identifying areas for improvement, such as salt management and equipment upgrades. This meeting helps pinpoint key opportunities for improvement and forms teams to address them during the off-season. The teams' progress is closely monitored to ensure that their efforts are completed before the next winter season. This proactive approach effectively addresses any issues identified during the winter and that improvements are implemented in time for the following season's operations.

## 12. Public Education and Outreach

MCDOT makes every effort to provide the public with information concerning their winter operations and winter storm activities. MCDOT holds an annual media briefing to update radio stations, television and print media in the area about their winter operations program. MCDOT uses this opportunity to review their experiences during the past winter, discuss their plans for the upcoming winter, and highlight new initiatives. This information is then shared with the public.

MCDOT's Public Outreach Manager hosts an annual "Snow Press Conference" each fall, inviting the media for coverage to ensure the public is aware of how MCDOT is prepared for the winter season. During the briefing, MCDOT stresses the need for motorists to be mindful of the potential dangers of driving during winter storms. Elected officials and the County Executive typically participate in the briefing as well.

Agencies should consider having their emergency operations centers activated for winter storms and using them for outreach. MCDOT's Public Outreach Manager and Storm Operations Center (SOC) provides live interviews with media representatives and posts events on social media. This allows MCDOT to keep the public updated on the status of its operations and the overall condition of the roadway system.

Montgomery County provides customer service for their citizens during and after winter storm events via the county's 311 Customer Service agency. MCDOT's SOC can respond directly to citizen needs in real-time on a localized basis. General questions about operations can be handled through 311 or by MCDOT's office personnel.

DEP provides a series of educational opportunities and events to residents, employees and private contractors. Along with MCDOT and WSSC Water, DEP participates in the Snow Press Conference each year bringing attention to how residents can reduce their use of winter salt during the winter season. A Salt Wise campaign and website was developed to inform the public of the 1-2-3's of winter salt application, "Shovel, Sprinkle, and Sweep". This campaign is run annually and consists of social media ads, digital sign boards in County buildings, a press release and public resources. DEP participates in the jurisdictional winter salt outreach workgroup, where they report updates on activities, develop consistent messaging for use in radio ads, story maps and other publicly available resources.

DEP has issued grants to a non-profit organization to administer a winter salt applicator training for private businesses, homeowner associations and County agencies and partners to properly educate them on winter salt application. DEP also promotes MDE's [private applicator training](#) and other educational activities and campaigns such as the Izaak Walton League of America's (IWLA) [Salt Watch program](#) and the Interstate Commission for the Potomac River Basin's (ICPRB) [winter salt story map](#) and [website](#).

Local watershed groups worked with DEP and MCDOT to update the County 311 system's Knowledge Based Articles (KBAs) to better direct residents when issues with excessive salt on parking lots and in/near storm drains or streams arise.





WSSC Water hosts a Salt Summit in January which DEP participates to provide updates to jurisdictional agencies on County winter salt activities and research.

Finally, DEP has participated in several conferences presenting their outreach campaign and activities to local organizations. Recently, DEP has been working with partners to recognize and adopt the last week in January as Winter Salt Awareness Week.

### 13. Testing, Evaluation, and Strategies for Continual Improvement

MCDOT is committed to continually improving the efficiency of its winter operations by exploring and testing new ideas that can enhance salt management while maintaining operational effectiveness. This includes experimenting with innovative winter materials, updating standard operating procedures, deploying new plow spreaders or other equipment, and adopting new strategies for storm management. Testing and evaluating new technologies is an essential part of MCDOT's Salt Management Program, aiming to reduce salt usage without compromising safety.

MCDOT actively seeks out and leverages research from national organizations that test new materials and strategies, keeping the department at the forefront of best management practices. By adopting these research-based innovations, MCDOT continues to refine its approach to winter storm management, enhancing both efficiency and environmental responsibility.

## 14. Summary

MCDOT views these Best Practices for Salt Management as a foundation for its winter operations, always striving for optimal salt management and road safety. The department will continue to seek opportunities for collaboration with other state, county, and local roadway agencies after the winter season to share insights and lessons learned.

The Best Practices for Salt Management is a living document that will be regularly updated. Ultimately, the Best Practices for Salt Management serves as a tool to guarantee the safety and mobility of Maryland's citizens during winter storms, while promoting cost-effectiveness and environmental sustainability.