Salt Management Strategy (SaMS) Technical Training Notes

May 24, 2018: 9:00 AM – 3:00 PM

Location: Griffith Water Treatment Plant, 9600 Ox Road, Lorton VA 22079

Welcome

Mr. Murray, Fairfax Water General Manager, welcomed participants to the Griffith Water Treatment Plant. During his remarks he underscored the importance of a multi-barrier approach to source water protection and described the effects of deicing salts on drinking water resources, particularly on the Occoquan Reservoir. He emphasized that source water protection and addressing deicing salts in particular are currently the utility's top priority. It is not practical for water suppliers to remove salt from their source water as the only available technology is reverse osmosis which is cost prohibitive and requires a significant amount of energy to run.

Mr. Thomas, DEQ Regional Water Permit and Planning Manager, highlighted the important role of deicing salts in maintaining public safety during winter storm events while focusing on limiting associated impacts to water quality.

Winter Storm Operations for Transportation

Slides from Ms. Mollerup and Ms. Carroll's (VDOT) presentation are available here, with a recording of the presentation available here.

Questions and Answers:

Q1: What happens to runoff that goes into the underground storage tanks and open ponds?

> A1: Following sediment removal, VDOT pays to discharge into a manhole that goes to a wastewater treatment plant. Some of the brine is reused for future winter weather events.

Q2: A meeting participant described a major salt spill that happened in her neighborhood. VDOT cleaned up the spill. She asked about the process to make sure spills like that don't happen again in the future. She was specifically interested in what kind accountability measures there are in place for VDOT contractors.

> A2: VDOT noted that they are aware of the event mentioned and that even though they were not certain it was their spill, VDOT cleaned it up to be good stewards. They have limited ability to track the exact location of vehicles. Even when they are able to identify trucks in the area around a specific time, it is still difficult to determine who was responsible for a spill. Citizens are encouraged to notify us online through the VDOT Customer Service system (24/7) https://my.vdot.virginia.gov/ and/or contact VDOT directly at 1-800-FOR-ROAD (800-367-7623).

Winter Storm Operations for Private Commercial Properties

Slides from Mr. Sexton's (WIT Advisers) presentation are available here, with a recording of the presentation available here.

Questions and Answers:

Q3: How do we curb appetite of individual homeowners where potential cost savings are irrelevant?

> A3: It will be difficult to reach homeowners because the costs to them are low for salt use and they don't face consequences from over-salting directly. One approach might be to explain the damage salt can do inside a home (when it is brought in on the bottoms of shoes), such as corrosion and wood damage.

Q4: Do you have an example contract available to model incentive-type relationship?

> A4: We use the framework presented in the slides and have a proprietary contract, but it basically makes a fixed seasonal cost instead of a contract based on labor and materials. A key place to start is with measuring how much salt is put down.

Q5: To simplify the example provided in the slides, if folks have just waited for the first salt application to work, then it wouldn't be necessary to apply the second round…correct?

> A5: Yes.

Q6: What is the temperature where salt is most effective?

> A6: The practical lower surface temperature limit of NaCl is 15 degrees Fahrenheit. This can be pushed a bit if needed; however, surface temperatures in this region rarely get this low.

An Introduction to the Mechanics of Salt and Research in the Transportation Sector

Slides from Mr. Alden's (Virginia Tech Transportation Institute) presentation are available here, with a recording of the presentation available here.

Questions and Answers:

Q7: Are you still working with the biochar idea?

> A7: No, biochar has not generated enough interest here yet; however, others have proceeded (e.g. China). Using biochar is a complicated process.

Q8: Where is the pavement test site you mentioned?

> A8: Near Interstate 66 and Prince William Parkway in Fairfax. It's a VDOT installation – called the Virginia Connected Corridor (VCC).

Q9: Do you know of any native plant species that can be used to take up the salts?

> A9: Yes, the most promising terrestrial plants are native and they are becoming more prevalent as salts increase in the environment. Do not know of aquatic plant species per se.

Winter Storm Best Management Practices

Slides from Dr. Nixon's (Salt Institute) presentation are available here, with a recording of the presentation available here.

Questions and Answers:

Q10: How does your approach to salt management apply to sidewalks?

> A10: The key is to prevent the precipitation from freezing to the sidewalks in the first place, rather than getting it off later. Anti-icing can be conducted on sidewalks just like on roads, they just require different application rates.

Q11: How effective is brine once it has dried on the roads?

> A11: It depends on the storm and on the situation. Brine shouldn't be used in storms that start as rain. If the storm starts with snow, the brine can be applied. How long it stays there depends. The persistence of the brine can be increased by adding beet juice because it's sticky. In general, for typical brine, a 12 hour delay in a storm would probably be OK.

Q12: Is ambient air temperature relevant?

> A12: Essentially, ambient temperature is not important. The relationship between air temperature and pavement temperature is complicated and there is no simple translation between the two. For the purpose of winter maintenance, pavement temperature is the key. VDOT has monitoring stations (http://www.511virginia.org/).

Alternative Chemical Products and Treatments

Slides and a recording are not available for Ms. Clonch's presentation – key points from the presentation as well as the discussion with participants are captured in this section.

Key Points

There is no one size fits all approach to winter maintenance. There are treatment choices/strategies. There has to be a decision of what are you trying to do (level of service) and what you have to work with (resources available/dedicated).

There are three options for treatment: do nothing, anti-icing, and deicing. The traditional approach to winter maintenance is deicing. It's a reactive approach where the more snow/ice that can be removed early on in a storm the better. The application of materials for this approach depends on a number of

social and environmental factors like funding available, route length, required level of service, material properties, temperature, weather conditions and forecasts, topography, microclimates, etc.

Common materials were discussed including chemicals and abrasives. Non-chloride options include acetates, formates, succinate-based, and glycol-based products. Chloride deicers and non-chloride deicers each have pros and cons. Rock salts are readily available, easy to use, and work in most situations. There are very few occasions where pavement temperatures are too low for rock salt in this area. Other products are expensive and require greater application rates. The chemicals change the freezing point of water allowing the snow and ice to melt. Acetates work at about the same temperatures as rock salts but are more expensive so they are not commonly used. While expensive, acetates are commonly used at airports.

In terms of negative effects from the different treatment options, chloride deicers don't break down, accumulate in the environment, and cause corrosion. Non-chloride options exert a high biological oxygen demand that can create toxic conditions for aquatic species. Reference: Field Usage of Alternative Deicers for Snow and Ice Control, TRS 1760, 2017.

Constraints on winter service includes decreasing budgets, resistance to change, and environmental issues.

The real issue is not rock salt, it is the misuse of rock salt – overapplication and overuse. Application guidance suggests that 100 lbs-400 lbs per lane mile is sufficient depending on conditions; however much more is used in practice.

Too much road salt is often used because of the traditional practices in place, resistance to change, performance issues (contractual language, political concerns, demands of customers and citizens), liability issues, knowledge, skills, available tools, and limited budgets.

The question is to determine how much of a reduction would make a difference and if it is attainable.

You can't manage what you don't measure. Output needs to be controlled to provide 1) increased liquid use, 2) decreased dry salt use, cost, and recovery time, and 3) increased level of service, effectiveness, and efficiency.

Questions to consider: Why do BMPs/EMPs exist that are not employed? Incentives, budget, knowledge, skill set, updated/new equipment and resources are key factors.

During implementation, there can be a disconnect between policies on paper and what's happening on the ground. It's important to know/find out what those disconnects are.

Strategic planning: taking care of long-term priorities is achieved by actions in the short run. Proper training is critical to managing change.

Alternatives are needed that identify the real problem, not a symptom; formulate workable solutions that take into consideration funding sources, implementation actions, follow-up, evaluation, and adjustment; and include a holistic approach that incorporates leadership, staff, and stakeholders.

This approach has been successful in DC. Policy changes were implemented. Meetings were held with leadership and staff to get everyone onboard. A liquids program was developed.

Questions and Answers

Q13: Public sector winter maintenance is regulated, but there is no motivation for improved operations in the private sector. Have you ever seen private sector regulation?

> A13: Regulations are only as good as the ability to enforce.
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> One example is the McHenry County, Illinois, annual training requirements for applicators and/or owners
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> New Hampshire has liability protection for folks who go through training. This protection has only been tested in court once. New Hampshire legislation has likely avoided some claims that would have otherwise been brought through the court.
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> In Virginia, all liability is transferred to the contractor – so more is likely used than needed.
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> Rather than negative consequences, there is the option to use the carrot of saving money.

Panel Discussion

Speakers from the day participated in a panel discussion. Questions, comments, and major discussion points are recorded below.

Q14 (DEQ): Considering the characteristics of the Northern Virginia region, what are the greatest opportunities for reducing impacts and hurdles for implementing them?

> A14 (Nixon): It is a local decision, but the number one component of a strategy should be to measure. The barriers include the challenge of getting folks to write things down. A way to overcome this is to automate the recording process.
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> A14 (Mollerup): Challenges = emergency situations, level of expectations, economy (particularly in this region there is a great potential for the federal government/businesses to lose a lot of money if employees are unable to work), substantial inventory of VDOT-managed roadways. It's hard to tell the public to just wait for the salt to melt the snow. Opportunity = becoming better with technology and equipment.
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> A14 (Sexton): Opportunity = parking lots using a business-to-business model that provides incentives for participation by saving companies money. Challenges = environmental awareness, pain of salt cost, pain of change

A14 (Clonch): What is the greatest opportunity? What is the real problem? No one size solution fits all. Find the real problem and address it.

A14 (Alden): Legislation and policy changes are needed; BMPs and technology are not enough.

Q15 (DEQ): What kind of legislation is needed?

A15 (Alden) Need case studies to define the problem before legislation can be used to address the problem.

A15 (Clonch) First step to define the problem: Start by asking the contractors how many of the trucks are calibrated to determine the size of the problem.

A15 (Nixon) The problem has to be measured. How much salt is being put down and what is the reduction needed? Also, be careful what you're trying to legislate for. Even if we take liability away, level of service won't change because people will think quality has decreased. If the liability is changed, it is just passed on to someone else. There is currently no legislation on salt truck licensing, etc.

Q16 (winter service provider): There are multiple public service announcements about using cell phones while driving, wearing seatbelts, etc. To further educate the public, how about including public service announcements about winter service expectations? Can a level of warning system be created?

A16 (Mollerup): VDOT works to link resources with news agencies, but can always do better and is willing to explore new avenues to communicate information – Twitter/Facebook, etc. A good web resource during winter weather:
http://www.virginiadot.org/projects/northern_virginia/nova_emergency.asp .

Q17 (drinking water utility): This problem is a lot about public expectations. There are a number of campaigns we've seen over time like Smokey the Bear, Johnny Horizon, and Protect the Chesapeake. Today, we also have situational alerts, social media, and COG. This is not all about salt, it's all about people. We need a campaign. And we need to acknowledge that changing expectations will take a long time. Where have you seen success stories and big behavioral changes?

A17 (Clonch): Folks are not taught to drive on snow and ice. The Clear Roads Project has a free example of snow and ice campaign.

A17 (Nixon): GPS devices and iPhones were put on trucks in Iowa. This information was put on website with public photos of roads every five minutes. Helped people see conditions of roads and make decisions.

A17 (Sexton): Developed a framework of proposed interventions by stakeholder group. There are already a couple of stakeholder groups missing from this effort. These stakeholders need to be brought into the process. Also, DEQ should work with agencies from other states/localities working on the same problem.

Comment (community representative): The problem is people, not roads. The solution is education and training.

Comment (VDOT): In Richmond, TV stations run programs on getting ready for winter. It may be really useful to expand topics to include information about impacts, costs, and opportunities related to deicing when telling people to stay in during winter storm events.

Q18: Does monitoring show excessive salt?

> A18 (Mollerup): Yes it does, but don't always know which contractor is doing what. There are automatic vehicle locators, but it's not sufficient to really figure out who caused the problem. If an inspector sees excessive salt usage, it's fixed quickly (but maybe not right during the storm event). VDOT does look for geographic areas with problems and focus on solving the issue.

Q19: Are contractors required to bring materials (salt, sand, etc.) back to VDOT after maintenance operations?

> A19 (Mollerup): Yes – they also receive mobilization and demobilization payments if they have complied with our contract requirements all season – so there is incentive to bring materials back.

Q20 (community representative): Risk mitigation on highways has a lot to do with driver behavior.

> A20 (VA State Police SAC rep): When start to have bad weather event, get minor crashes because not used to operating in those conditions. As winter continues, people get better at it and have fewer accidents. The most dangerous time is when the roads start to clear after a storm and people go back to driving normally when they should still be cautious.

Q21 (DEQ): This is a local issue. Start locally and find what works here, but there is no reason to reinvent the wheel. So, what's the best approach to getting BMPs actually implemented?

> A21 (Sexton): Set objective: salt reduction of X% by Y year. Then, what should the different stakeholders do to achieve this goal. Within stakeholder groups, need to know what are the barriers to achieving the goal. All stakeholders need to be at the table.
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> A21 (Nixon): The Transportation Research Board meetings in DC each year. This year includes a half-day workshop on the environmental impacts of chlorides. You can come learn what other agencies have done. The solutions are out there, the question is how do you implement the change?
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> A21 (Alden): There could be a national or local certification program to know if applicators are qualified – this moves the needle of awareness. Such a program could start as voluntary.

Q22 (drinking water utility): Could you provide additional information on the New Hampshire model?

A22 (Sexton): It is still a voluntary program. Started with no fee for certification and offered grants for completion. Has definitely raised awareness but don't know about the impact on application rates. It created a stronger carrot with tiers of protection/certification. If it is a business-level certification, both the company and the contractor are protected. Certification goes to people who want it, not those who need it.

A22 (snow and ice contractor): Yes, but there is the cost of the certification versus the benefits of having it. If the cost of the certification is too high, just won't do that work anymore. Clients ultimately pay for it. It comes down to what client wants and what you're willing to do for the client. Contractors may try to find a way around it. They may take the risk of being able to do 100 jobs without the certification and only getting caught once.

Q23 (VDOT): How can highway examples be translated to commercial projects?

A23 (Sexton, Clonch): An example is a homemade brine sprayer for homeowners. Vegetable watering sprayers can be used to spray brine on the steps and sidewalks during winter storms. There is a lot of information on this, it's just hard to implement. Also, retail stores like Home Depot could be used as educational resources – educate the public as they sell them the equipment/supplies.

Q24 (environmental group): How effective have the improved practices trainers discussed been at reducing the salt in the water?

A24 (Nixon): West Des Moines showed reductions of 40-50% in total salt usage. They were good stewards to begin with. Stevens Point cut usage by 50% by calibration of equipment alone. The states of Ohio and Minnesota also reduced chloride loads. It depends on your starting point.

A24 (Sexton): Long-term measurements of chlorides are hard to normalize because of weather changes. Lake George, NY, started reducing salts 3 years ago with a 50% salt reduction target to stop increasing trend (hoping for a 40% reduction in chloride in the water), but reversing trend may take up to 40 years. This is a potential barrier – long-term trend changes. Salt levels had been measured for a long time prior to this effort.

A24 (Clonch): The USGS in Ohio showed reductions in shallow groundwater aquifers following a liquids program to reduce salt usage. Suburb of Cleveland went from 17 tons to 9 tons per year with better level of service – has to have a big impact. DC has been able to save $1.7 million in costs.

Q25 (community representative): LEED is a motivator for buildings. Can it be used to address this challenge?

A25 (Sexton): Currently LEED standard only requires a salt and ice plan for certification. To get a half point LEED credit, have to use 100% $MgCl_2$. This doubles the chloride contributions and can be slippery if you use it wrong. Trying to help them improve requirements.

Q26 (DEQ): The initial investment in improved practices might be a barrier to landscape companies that do snow and ice work in the winters. . For instance, where do they mix and store brine? Is that a missed opportunity or a reality?

A26 (Sexton): There needs to be an efficient service model that is not paid by the amount, but paid by service. Selling brine by volume provides no financial incentive for being efficient.

Q27 (county government): "Level of service" can be loaded and can mean different things to different people – perceived level of service, better level of service, expected level of service. What is the appropriate language?

A27 (Clonch): The level of service refers to the maintenance objectives. There needs to be a written plan of what the exact level of service goals are – for example, in a contract with the client – the more specific the better. Level of service is the end goal. The application rate is how to get to the end goal in the most efficient/effective way possible. The tough part is communicating the level of service.

A27 (Alden): Level of service is a performance metric, but you could also have other types of performance metrics as well. Bare, wet, and black is written into many contracts and it's expected that there's salt on the ground in some cases.

A27 (Sexton): We've been able to shift the perception of what is good and bad. Are you willing to pay a contractor to use as little salt as possible?

Q28: Does VDOT participate in American Public Works Association (APWA)?

A28 (Mollerup): Yes, we partner with the organization.

Q29: Does VDOT pass motivation down from the contractor to the truck operator?

A29: VDOT criteria for operators include equal opportunity employer, English speaking managers/foremen, valid Commercial Driver's License, drivers rotating every 14 hours, etc.

Q30: Why is next year's VDOT budget smaller than this year's?

A30: VDOT is prioritizing budget items. A lot of work is planned on infrastructure maintenance (roads and bridge work -paving, pothole patching, etc.). In the event of a snow emergency, VDOT will ensure public safety.

Q31: What is the rough cost estimate for implementing SWiM for the three Wegmans?

A31: 3-3.5% of the 5-year average spent on winter maintenance. Approximately 2% of savings on snow removal dollar-wise. The seasonal variance contract, by which contractors get paid for service (not for the amount of salt applied), is not proprietary.. How to estimate the contract is what is proprietary. Wegmans buys the cameras, contractors buy tracking equipment and can use it everywhere they operate (not just Wegmans). Manufacturers need to be part of the

discussion (standardize spreaders, etc.). Smaller scale contracts are harder to do because they're part of a larger route. Make investments in middle steps of SWiM framework (see SWiM Framework in the presentation slides).

Q32: Do you [Sexton] provide consulting for contractors and project management, and SWiM?

A32: WIT consults with both property owners and contractors and provides training. SWiM is a packaged approach that includes the policy guidelines and practices, the nuts and bolts.

Comment (VDOT): The Wegmans example is a good model and it is a good business decision. It would be a good idea to connect with other organizations like the Chamber of Commerce, Urban Land Institute, churches, etc. as an efficient way to get messaging and training information out for reasonable expectations. We are all partners in this effort.

Comment (Sexton): There are many organizations and plenty for everyone to work on.

Comment: Education is a big part.

Comment (Sexton): We need the public side to drive awareness and demand on the business side.

Closing

DEQ thanked everyone for their participation, reminded everyone to participate in the survey to identify workgroup priorities, and closed the meeting.