

CHLORIDE TASK FORCE REPORT-2023

To: Hinkson Creek Collaborative Adaptive Management Teams

From: Hinkson Creek Chloride Task Force

Subject: Final Report and Recommended Next Steps

BACKGROUND

Chloride occurs naturally in lakes and streams, providing many organisms with natural levels needed to carry out essential life functions. However, elevated chloride concentrations can severely impact freshwater ecosystems and aquatic habitats, increasing water's corrosivity. Chlorides also alter soil composition, slow plant growth, damage vehicles, enter groundwater, and weaken concrete, brick, steel, and stone infrastructure.

Hinkson Creek Collaborative Adaptive Management (CAM)* studies have demonstrated that chloride concentrations in urban areas near Hinkson Creek are approximately four times higher than those in reference/control streams. Some of the chloride values that have been measured exceeded water quality criteria levels, indicating toxic chloride events have occurred in Hinkson Creek. While chloride is an apparent cause of aquatic life impairment in Hinkson Creek, other physical, chemical, and hydrological issues are likely contributing.

Sources of chloride in freshwater streams include wastewater treatment discharge, landfills, deicers, dust suppressants, legacy residues in sediment, fertilizers, water softeners, and groundwater pumping in some regions. This report focuses primarily on road salt application and how to find a balance between maintaining public safety and mitigating liability with the negative impacts chloride has on the environment. Future projects focusing on other sources contributing to chloride in the environment will increase the effectiveness of mitigating chloride in waterways.

Deicers are commonly used to remove snow and ice from roads, parking lots, driveways, and sidewalks during the winter. A common ingredient in most deicing products is chloride because it lowers the freezing point of water, making it easier to remove snow and ice from paved surfaces. Chloride deicers are used throughout the Hinkson Creek watershed to maintain public safety on transportation surfaces.

While deicers can substantially improve winter road safety, they introduce harmful chlorides to the environment and nearby waterways. Many community members are not informed on the negative impacts of chloride-based deicers on the environment and infrastructure. Following application of chloride-based ice melt, chloride is transported to waterways through stormwater runoff or by way of storm drains connected directly to the waterways.

OVERVIEW OF TASK FORCE:

The Hinkson Creek CAM process voluntarily established the Chloride Task Force. The purpose of this Chloride Task Force is not to blame chloride users or establish strict restrictions but rather to better understand how and where chloride is used in the community, its environmental impacts, and evaluate options for mitigating those impacts while maintaining public safety.

This Chloride Task Force is a collaboration of local stakeholders from private business, workers compensation insurance, academia, and local government. Members voluntarily joined the Chloride Task Force to work with other community leaders in understanding ice removal and to identify systemic chloride use and its potential effects. The Chloride Task Force worked together to better understand chloride-based deicers, study driving factors, application methods, deicing alternatives, and the impacts on Hinkson Creek caused by chloride-based ice melt with the following goals:

- Gain a better understanding of salt usage and public safety needs for the community;
- Recommend at least two practices and/or incentives for applying chloride wisely;
- Explore deicing alternatives that do not contain chloride.

The Chloride Task Force met nine times from September 2022 to June 2023. to develop an interdisciplinary understanding of road salt usage, study driving factors, and chloride's impact on Hinkson Creek. The Task Force established a mission to serve as a guide for the team's purpose and intention.

Mission Statement: *The Chloride Task Force will be successful if the team develops an interdisciplinary understanding of the actions and motivations driving the use of chloride-based deicers in the watershed and the resulting impacts of chloride on water quality, infrastructure, ecosystem, and human safety. The goal of the Chloride Task Force is to supply a path forward to expand community members' understanding of chloride impacts and Best Management Practices applicers can adopt.*

The Chloride Task Force found that there is not currently a replacement for chloride-based deicers' effectiveness, availability, and usability. Therefore, finding a balance between public safety and the environment through targeted application will help mitigate chloride's impact on the environment.

The Chloride Task Force discussed and compared snow removal operations, road and facility practices, and types of deicers, including potential chloride alternatives used in the watershed. Research has been conducted on Hinkson Creek's chloride levels and the meaning behind the data. Analyzing why people use chloride, including community desire for quickly cleared paved surfaces and the liability that accompanies not using ice melt.

Summary of the Chloride Task Force Findings:

- There must be a balance between public safety and environmental health;
- Ice melt is used for protection against slips, trips, and fall liability;
- Many people are simply unaware of chloride's impact on the environment;
- Education on how to appropriately apply ice melt is needed;
- Reduction of chloride through non-structural best management practices;
- Collaboration between organizations and peers to increase knowledge and reduce chloride usage;
- More information is needed on private and community members' application of chloride-based products;
- More information is needed about the source and prolongation of chloride in the watershed.

This report, which outlines recommendations for next steps, concludes the work of the current Chloride Task Force. A list detailing the recommended strategies can be found in Appendix II.

CHLORIDE TASK FORCE RECOMMENDATIONS:

Based on the work sessions and professional experiences, the Task Force recommends the following for the CAM teams;

Weather Information Systems

- **Purpose:** Weather information systems, including road temperature sensors and local weather forecasts, can make deicing applications more strategic, targeted, and reduce the unnecessary application of deicing material.
- **Goal:** Information can be utilized by either/both meteorologists or operational staff to make more informed decisions about forecasting and operational response. This information would enhance services and increase ice melt application accuracy. Making this information available to the public would help private contractors and residents in the Hinkson Creek watershed reduce unnecessary chloride applications.
- **Strategies:**
 - Specialized weather services and forecasting;
 - Atmospheric data;
 - Road weather information systems for the users and community;
 - Hydrologic data (surface water levels and soils);
 - Cooperative information sharing between agencies.

Assessing and Addressing Knowledge Gaps

- **Purpose:** Filling data gaps can direct effective chloride mitigation efforts. Currently, there are unknown factors regarding the use and potential overuse of chloride-based ice melt and its resulting impacts.
- **Goal:** Data on chloride usage would help the program be more effective, including the source, quantity, location, and reason behind the chloride application. This information would also assist in directing the implementation of programs to reduce chloride entering the environment.
- **Strategies:**
 - Data gathering (business, residential, applicators);
 - Stream, lake, and drainage system monitoring;
 - Publication of chloride data in the environment.

Outreach, Information, & Education Program

- **Purpose:** Develop a watershed wide outreach, education and information program with the goal of reducing the amount of chloride entering environment.
- **Goal:** The program will be multi-pronged: inform on the harmful environmental and structural impacts of winter deicing material and provide best management practices (rates and when to apply) when using winter deicing material for public, private businesses, and residents. The plan should evolve over time to share the knowledge gained through assessing and addressing knowledge gaps.
- **Strategies:**
 - Broad and cohesive messaging;
 - Strategic information, outreach, & education plan;
 - Cooperative group for ice melt applicators;
 - Peer to peer learning;
 - Promoting winter weather plans for businesses, residences, and snow removers;
 - Advertising and outreach;
 - Techniques for personal safety;
 - Proper storage and disposal;
 - Communicating expectations surrounding a snow and ice event.

Suggestions for future development

- Hinkson Creek CAM Stakeholder prioritization of Chloride Task Force recommended strategies;
- Assessing and addressing additional chloride sources;
- Building design considerations;
- Cooperative system for applicators to share resources;
- Alternate methods for ice removal;
- Best management practices to remove chloride and limit applied chloride from reaching the stream;
- Certification process for building design and application methods;
- Training for applicators;
- Accessible chloride data;
- Post-storm reports that are cohesive between agencies include cost, methods, limitations, and effective approaches to prepare for future storms and evaluate alternative methods.

TASK FORCE MEMBERS

***Alba Argerich:** Stream Ecologist - Assistant Professor - University of Missouri Columbia*

***Cody Luebbering:** Scientist - Geosyntec Consultants*

***Greg Edington:** Director - Boone County Road & Bridge*

***Georganne Bowman:** Sr. Environmental Specialist - Missouri Department of Transportation*

***Mark Fuchs:** Senior Service Hydrologist - National Weather Service - St. Louis, Missouri*

***Mark Woodward:** Senior Safety and Risk Trainer - Missouri Employers Mutual*

***Pete Millier:** Director of Landscaping Services - University of Missouri Columbia*

***Richard Stone:** Engineering and Operations Manager - City of Columbia Public Works*

***Rusty Strodtman:** Sr. General Manager - Brookfield Properties*

***Tom Boland:** Vice President of Operations - Columbia LandCare*

***Tom Trabue:** Hinkson Creek CAM Stakeholder Committee Member*

*Facilitator: **Michele Woolbright:** Stormwater Educator - Boone County Resource Management*

APPENDIX I- HINKSON CREEK CAM SCIENCE TEAM STATEMENT ON CHLORIDES

Chloride is a known chemical stressor to aquatic life with concentrations potentially exceeding water quality standards in Hinkson Creek. While chloride is an apparent cause of aquatic life impairment in Hinkson Creek, there are likely other physical, chemical, and/or hydrological issues contributing. Studies have demonstrated that chloride concentrations in urban areas of Hinkson Creek are about four-times higher than those in reference/control streams. In general, chloride concentrations in Hinkson Creek tend to be lower in upstream sites where the watershed is more rural and increase downstream as the watershed becomes more urbanized. Some of the chloride values that have been measured exceeded water quality criteria levels, indicating toxic chloride events have occurred in Hinkson Creek. Conductivity* can fluctuate greatly in Hinkson Creek during the winter months, indicating water quality can change dramatically. Studies have shown that while high chloride levels are most likely to occur during winter months, high levels can occur during non-winter months.

* "Conductivity is a measure of water's capability to pass electrical flow. This ability is directly related to the concentration of ions in the water. These conductive ions come from dissolved salts and inorganic materials such as alkalis, chlorides, sulfides, and carbonate compounds. Compounds that dissolve into ions are also known as electrolytes. The more ions that are present, the higher the conductivity of water."-Fondriest Environmental, Inc

APPENDIX II- ACTIONS STRATEGIES RECOMMENDATIONS BY THE CHLORIDE TASK FORCE

Weather Information Systems Strategies:

- Specialized weather services and forecasting
 - Description: Specializes in weather services and forecasting, providing detailed weather updates before, during, and after the storm. It would increase precision application to reduce unnecessary or ineffective chloride application, thereby reducing the amount of chloride entering the environment. This service should include timely, accurate, and dependable meteorological services that forecast the amount of snow or ice to expect and potential road conditions and provide recommendations for pre-treating shift scheduling and deicer amounts.
- Atmospheric data
 - Description: Local and real-time atmospheric data, including temperature, precipitation, wind, pressure, and cloud cover, can improve forecasting information, particularly if snow removers should prepare for rain, sleet, ice, or snow. The atmospheric data with specialized weather forecasting and road weather information systems would mitigate unnecessary or unsuitable chloride.
- Road weather information systems available to the public
 - Description: Road Weather Information Systems (RWIS) are used to monitor the atmospheric conditions in a specific location. There are different capabilities of both the individual units and software analysis that can be performed based on the data collected. Most RWIS systems capture weather phenomena-specific information such as dew point, moisture at that moment, wind, temperature and other conditions along with specialized information such as pavement temperature and rising and falling data for what they are collecting.
- Hydrologic data (surface water levels and soils)
 - Description: Water level and floodplain information would help direct chloride-based ice melt applicators to reduce chloride application and limit snow disposal in vulnerable areas. This would reduce chloride infiltration and conveyance to nearby surface and ground waters.
- Cooperative information sharing between agencies
 - Description: Cooperative information sharing between agencies enhancing existing relations between the University of Missouri, the City of Columbia, Boone County and encompassing municipalities, and the Missouri Department of Transportation, public schools and incorporated private contractors and businesses.

Assessing and Addressing Knowledge Gaps Strategies:

- Data Gathering (business, residential, applicators)
 - Description: Quantifying chloride use by governmental, municipal, private businesses, and citizen applicators would provide critical information for strategic outreach and education efforts, with increased results.

- Stream, lake, and drainage system monitoring
 - Description: Understanding when and where chlorides are entering local waterways provides critical information for targeted mitigation efforts. Identifying frequency, duration and magnitude of chlorides in local waterways characterizes the immediate and long-term environmental impacts on aquatic resources. Consistently monitoring for chlorides in local waterways over time will inform climatic variation (season to season and year to year) and identify positive or negative water quality trends as watersheds develop. The above information would be shared with local stormwater managers to make informed decisions.
- Publication of chloride data in the environment
 - Description: Accessible and understandable chloride data would connect people and ice melt applicators to the health of the streams and surrounding environment. Live data could influence the method of chloride application and its use when not required.

Outreach, Information, & Education Program Strategies:

- Broad and cohesive messaging
 - Description: Cohesive messaging on chloride's use and impact will strengthen the outreach and information credibility and community awareness.
- Strategic information, outreach, & education plan
 - Description: Develop an education strategy that's foundational based on public and private partnerships with the goal of reducing chloride use to improve water quality. Stormwater pollution control is most effectively implemented when people and organizations understand the impact of stormwater pollution, its sources, and actions they can take to control it. The strategic plan should be adaptable and crafted to encompass information gathered through Assessing and Addressing Knowledge Gaps Strategies.
- Cooperation group for ice melt applicators
 - Description: Equipment cost, knowledge, and accessibility can be barriers to adopting alternative best management practices. A cooperative group for sharing equipment, facilities, knowledge, and experiences may reduce these barriers and promote adoption of best management practices.
- Peer to peer learning
 - Description: Facilitate different property owners gathering annually to discuss best practices for snow removal.
- Promoting winter weather plans for business, residences, and snow removers
 - Description: These plans would consider working from home, alternative schedule, prioritization of safe pathways access to buildings, closing unsafe parking lots and entrances, proper footwear, and where to place snow piles

- Advertising and Outreach
 - Description: Advertising and outreach programs will help foster positive behavior change for residents, businesses, and ice melt applicators to mitigate chlorides' environmental impact. Advertising and Outreach should be directed by the Strategic Information, Outreach, & Education Plan, to develop outreach and education efforts designed to engage customers, promote program success, and Hinkson Creeks CAM's goal. Public education materials will include visual and graphic images to ensure that residents and businesses are informed and actively participating in the mitigation of chloride impact and become better informed on chloride impact on the environment.
 - Outreach messages, methods, and materials should be tailored to target groups and messaging goals. Key message topics should include the following:
 - giving plows space and time;
 - applicator communications with customers;
 - "Salt Wise" applicator methods;
 - community members' tips for application;
 - work-from-home initiatives.
- Techniques for personal safety
 - Description: Community members adopting personal safety practices could significantly reduce the need for frozen precipitations to be burnt to the pavement or entirely removed by ice melt. Providing techniques could empower the community to traverse slick surfaces appropriately.
- Proper storage and disposal
 - Description: Proper storage of chloride materials is crucial for preventing contaminated runoff and salt loss. The best practice for storing chloride-based ice melt include the following:
 - keeping material on a sheltered impervious pad;
 - located away from waterways and floodplains;
 - directing storm drain systems to flow around storage areas;
 - ensuring that the salt is covered.
- Communicating expectations surrounding a snow and ice event
 - Description: To manage expectations, agencies should communicate strategies to community leadership, internal employees, and the community. Communication subjects include the following:
 - snow and priority routes;
 - road prioritization methods;
 - potential lag in responses causing such as labor shortage;
 - cost of the winter event removal;
 - temperature and precipitations impact on removal efforts;
 - possible road conditions.