Chloride Source Identification Work Group

Developed for the Ann Arbor Sustainability Commission

June 9, 2026

Agenda

- Background
- Workgroup Structure
- Outcomes

Background

Purpose of Workgroup

- Chloride – an element (halogen) that can be toxic to aquatic life
  - Main source in environment is road salt (NaCl, $CaCl_2$)
- Freshwater mussels particularly sensitive
  - Osmoregulatory impairment
  - Impairement during reproductive cycle, impacting glochidia
  - Mussels are waters natural purifiers
- Chloride is highly water soluble, moves through aquatic systems quickly, infiltrates into groundwater
- Complicated & difficult to prevent chloride releases due to the need of road salt for safety
- How do we ensure we are doing all we can to reduce chloride loading?

Regulatory Framework & Need

- EGLE Chloride criteria for aquatic life set 2018:

  Rule 57, Part 4 Water Quality Standards
  - Aquatic Maximum Value (AMV) = 320 mg/L
  - Final Chronic Value (FCV) = 150 mg/L
- Impairment listings for Creeks in 2024:
  - Millers, Mallets, Swift Run, Honey, and School Girls, Travers, Allen Creek Drain
- Potential concern for city-wide permits:
  - NPDES - Water Resource Recovery System
  - MS4 - Separate Storm Sewer System
  - However, currently no TMDLs have been set
- USFWS Threatened and Endangered Species Act

Work Group Goals

- **Deliverable**. White paper detailing the following:
  - Review surface water quality data
  - Identify areas that contain elevated chloride
  - Provide recommendations to address elevated chloride

- **Critical Success Factors**
  - Evidence-based recommendations
  - Recommendations are feasible and implementable

Workgroup Structure

Work Group Structure

City Staff*

- Jennifer Lawson – Water Quality Manager
- Miekyn Cotton – Stormwater Regulatory Coordinator
- Co-Chair: Erin Donnelly, Environmental Services Manager

Sustainability Commission

- Co-Chair: Sara Nedrich
- Steve Brown

External Members

- Austin Crane - EGLE
- Dana Wilkinson – University of Michigan
- Kelly McCabe – HRWC

*Special thanks to Paul Matthews (Public Works Manager) and Ethan Miller (Infrastructure Data Asset Manager)

Work Group Outcomes

Source Identification – Data Review

- Huron River Watershed Council chloride dataset
  - 2012-2024 April – September (summer only)
  - Analyzed at Ann Arbor Water Treatment Plant, EPA Method 300/9056A
- GIS tool development: https://a2-mi.maps.arcgis.com/apps/instant/sidebar/index.html?appid=af7595fcaf2746e1b3325708aa4a7341

Source Identification – Data Review

Chloride concentrations (mg/L) in Ann Arbor tributaries, 2012-2024							
	Honey Creek	Allen Creek	Traver Creek	Fleming Creek	Malletts Creek	Millers Creek	Swift Run
Count	85	88	87	85	87	87	86
Mean	154.0	158.0	163.4	97.2	382.5	464.4	390.4
Max	430.0	380.0	354.00	547.2	1248.4	1342.0	1052.6
Exceeds standard?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

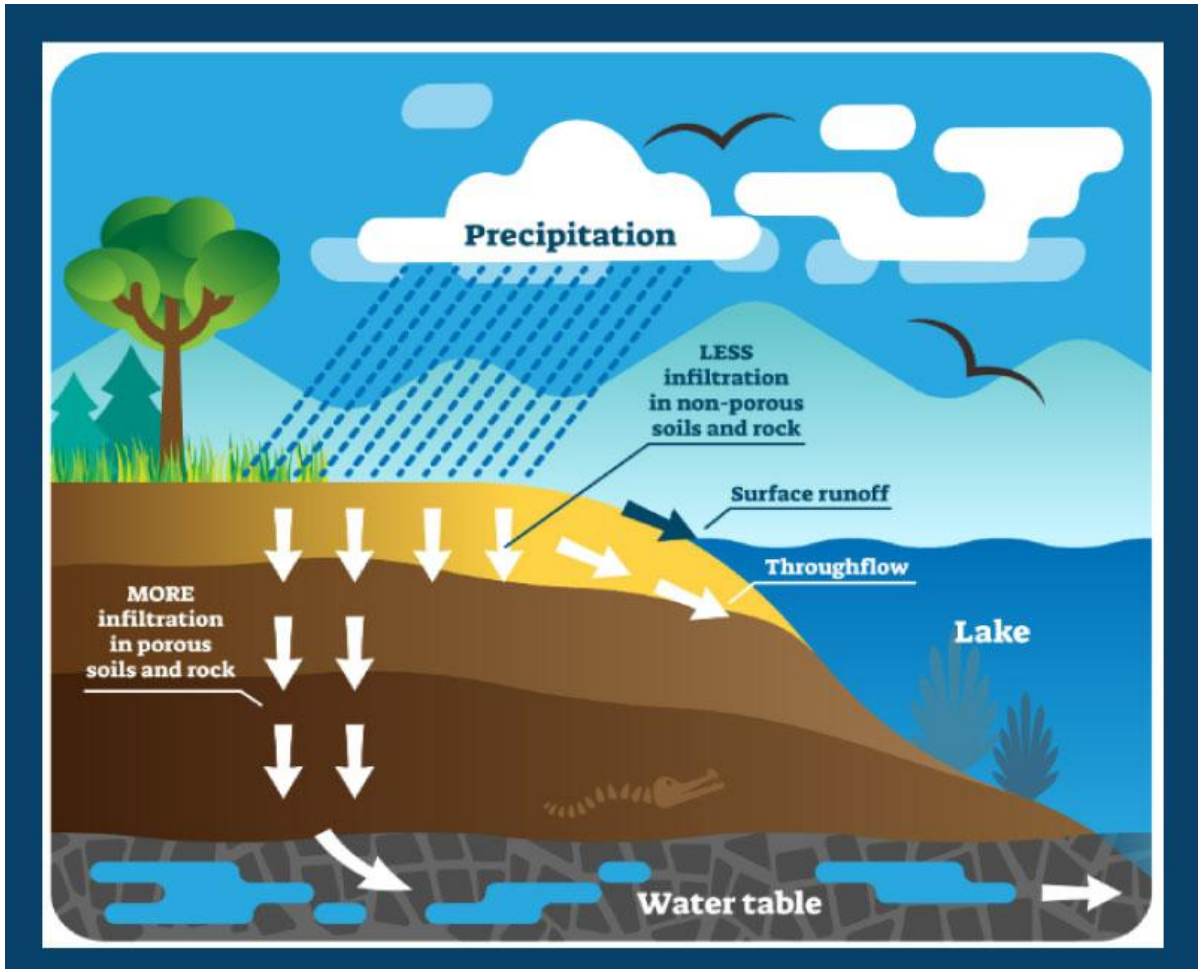
Applicable Criteria

150 FCV

320 AMV

Source Identification – Major Findings

- Generally, dry conditions (low flow) leads to highest chloride values, suggesting an on-going source in groundwater
- Some creeks have spatially bound increases in chloride with location, although insufficient data for source ID (further sampling needed)
- All creeks have diffuse (non-point) sources of chloride, above native background (~50 mg/L)



Source Identification – Major Findings

- Millers and Mallets have highest chloride impacts & relatively high impervious surface coverage (33-39%)
- Allen Creek Drain had the highest imperious surface coverage but respectively lower chloride (48.1%, mean 158 mg/L)
- Generally, the amount of imperious surface area the city actively manages ranges from 3.9-32.6%, suggesting collaboration with private landowners is needed

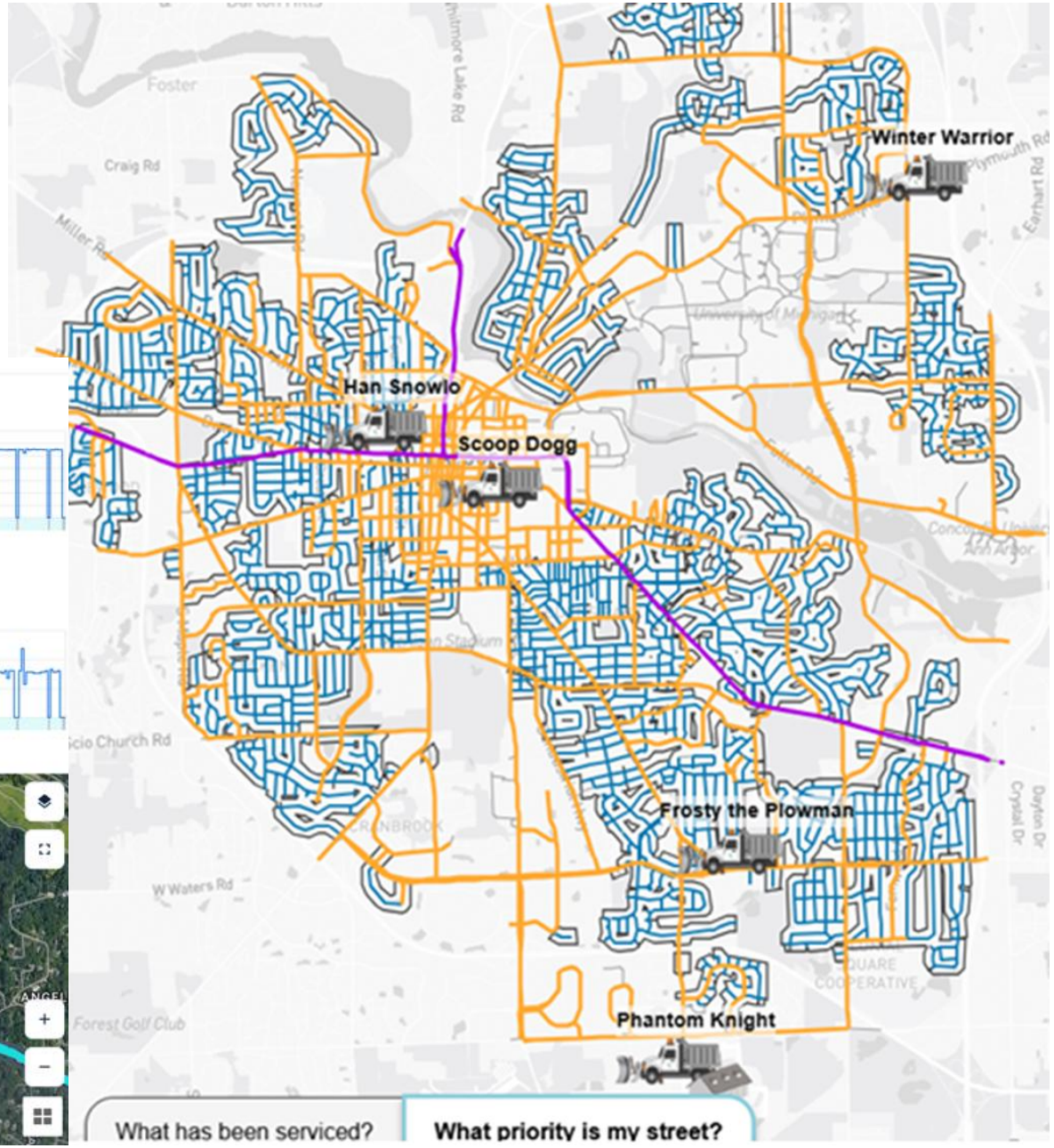
City Winter Maintenance Best Management Practices Comparison

- City objective: provide road surfaces that are safe for travel at reasonable speeds while using materials and methods as efficiently and responsibly as possible
- The City implements all state recommended chloride reduction BMPs
  - Generally focused on optimizing material use, equipment calibration, equipment technology, appropriate salt storage, and public education
- City BMP Highlights
  - Tiered approach: prioritize major roads while maintaining defined level of service for local roads
  - Anti-icing and de-icing material selection based on pavement temperatures
  - Advanced weather forecasting and real-time monitoring

City Winter Road Maintenance

Internal dashboard utilizing Automated Vehicle Location (AVL) technology

Public-facing real-time plow tracker



Summary of Recommendations

- Source control is the most cost-effective option
- Limited remedial approaches vetted, but could include:
  - Halophytic plantings in riparian areas or along major roadways
    - Michigan natives include: dwarf spikerush, threesquare bulrush, seaside golden rod, etc.
  - Green infrastructure to encourage halophytic uptake
  - For major groundwater sources, there is currently no practicable technology to remove it
    - (pump and treat with carbon beds... not economically viable)

Summary of Recommendations

- Expand education and behavior change efforts
  - Commercial properties
  - Residential properties
  - Partner agencies
- Regional coordination
  - Huron River Watershed Council, SEMCOG, and Eastern Michigan University
- Policy
  - Support state or regional supported chloride reduction strategy
  - Advocate for liability protections for certified applicators
- Continue regular monitoring and evaluate potential for targeted sampling

Correct application rate (above) vs incorrect rate (below) for entryways, steps, and ramps. *Photos courtesy of U of M*

Next steps

- Collect input from this meeting and finalize draft report
- Implement action items outlined in report

Questions

Table 8. Recommended Actions			
Action	**Responsible party**	**Partner(s)**	**Timeline**
Ongoing chloride monitoring in Ann Arbor creeksheds and evaluate potential for targeted sampling.	HRWC	City of Ann Arbor Public Services	Ongoing
Pursue funding for education targeting commercial and residential salt applicators through grant-funded initiatives, support model ordinance development, and build a Middle Huron-wide best management practice de-icing strategy.	HRWC	City of Ann Arbor Public Services	Summer 2026
Meet with Eastern Michigan University Department of Geology to learn about their ongoing research in Millers Creek	City of Ann Arbor Public Services	HRWC	Summer 2026
Identify new properties/owners for participation in Community Partners for Clean Streams	City of Ann Arbor – Public Services	-	Summer 2026
Engage with Community Partners for Clean Streams on chloride reduction strategies	City of Ann Arbor – Public Services	-	Fall 2026
Consult with SEMCOG about potential for chloride prioritization	City of Ann Arbor Public Services	-	Fall 2026
Regular coordination with AAPS and other organizations/institutions that apply chloride	City of Ann Arbor Public Services	Ann Arbor Public Schools	Fall 2026
Residential chloride education campaign including City webpage development	City of Ann Arbor Public Services	HRWC, University of Michigan	Fall/Winter 2026
Advocate for state-driven voluntary program to reduce chloride use	Sustainability Commission	City of Ann Arbor Public Services	November 2026
Advocate for liability protections for certified applicators	Sustainability Commission	City of Ann Arbor Public Services	November 2026