Southeastern Wisconsin

Regional Planning Commission

Chloride Impact Study Update and Regional Water Quality Management Plan Prospectus

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Waukesha Stormwater Workshop

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#280266

Presentation Outline

- Chloride Impact Study
  - Background and Scope
  - Chloride Overview and Toxicity
  - Data Analysis and Technical Report Development
  - Next Steps
- Prospectus for Regional Water Quality Management Plan Update

Chloride Impact Study

Chloride Impact Study Background

- Prospectus Development (2014 – 2016)
- Water Quality Monitoring and Field Work (2017 – 2021)
- Data Analysis and Technical Report Development (2022 – present)

Funding Provided By:

U.S. Department of Transportation
Federal Highway Administration

Fund for Lake Michigan

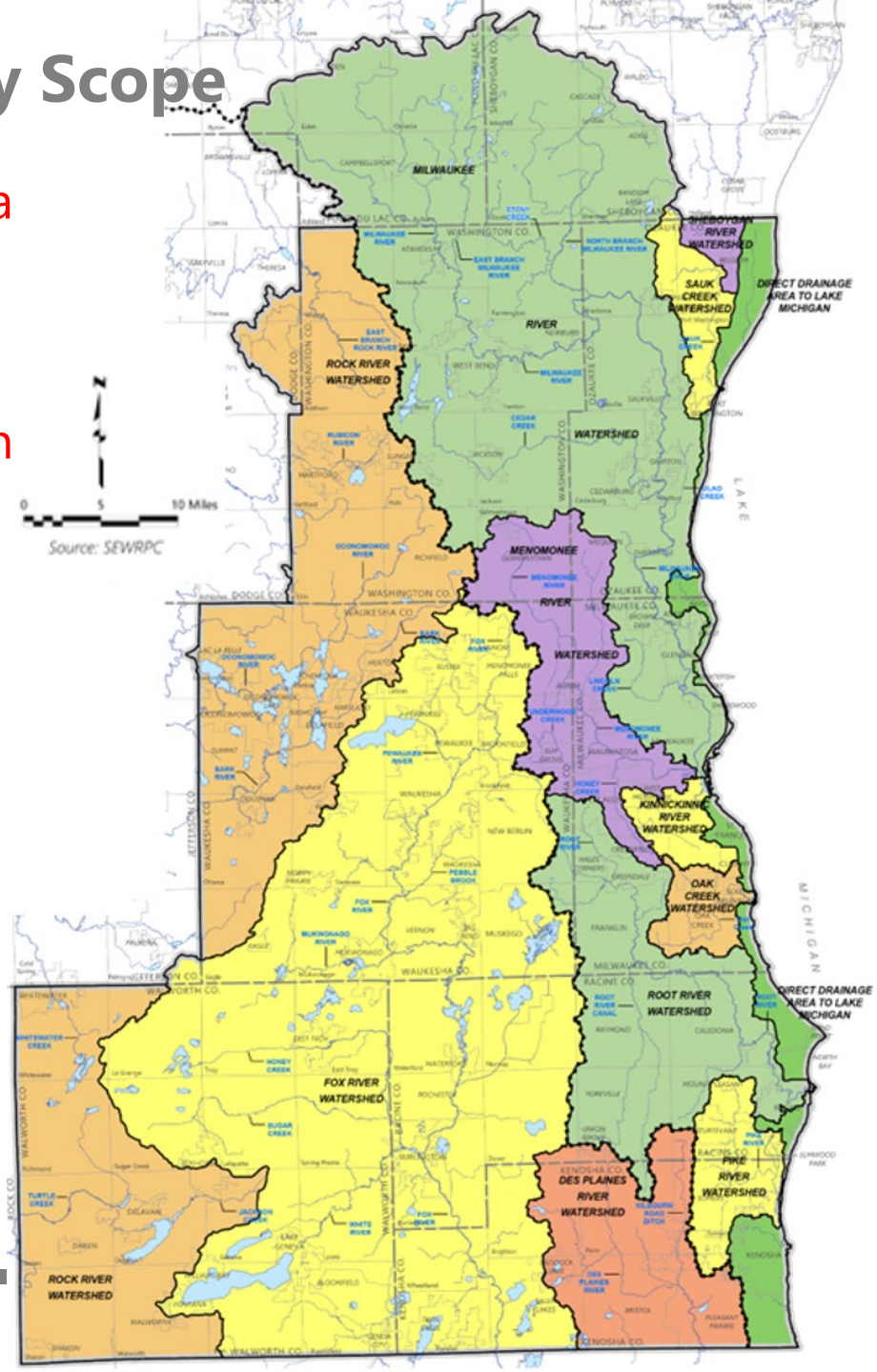
MMSD
PARTNERS FOR A CLEANER ENVIRONMENT

SEWRPC
Serving the counties of Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha

WISCONSIN DEPT. OF NATURAL RESOURCES

Chloride Impact Study Scope

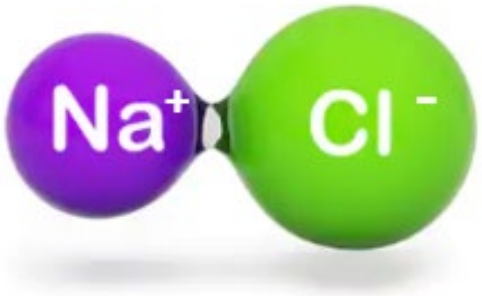
- Collect water quality monitoring data for up to 40 stream locations and 6 lakes in the Region
- Compile existing data to assess chloride conditions and trends within the Region
- Develop relationships between specific conductance and chloride concentrations
- Estimate chloride loads from various chloride sources for study period
- Gather state-of-the art information for managing sources of chloride to the environment
- Consider future conditions and alternative management practices



What is Chloride?

- Naturally occurring mineral – Halite (rock salt or table salt)
- Primary component of salt (NaCl)
- An essential electrolyte
- Soluble and highly mobile
- Relatively non-reactive
- Difficult to remove from the environment
- Problematic at high concentrations

Source: Henry Jorgenson (via Reflo's Milwaukee Water Stories, by Michael Timm)



NaCl

Sodium chloride

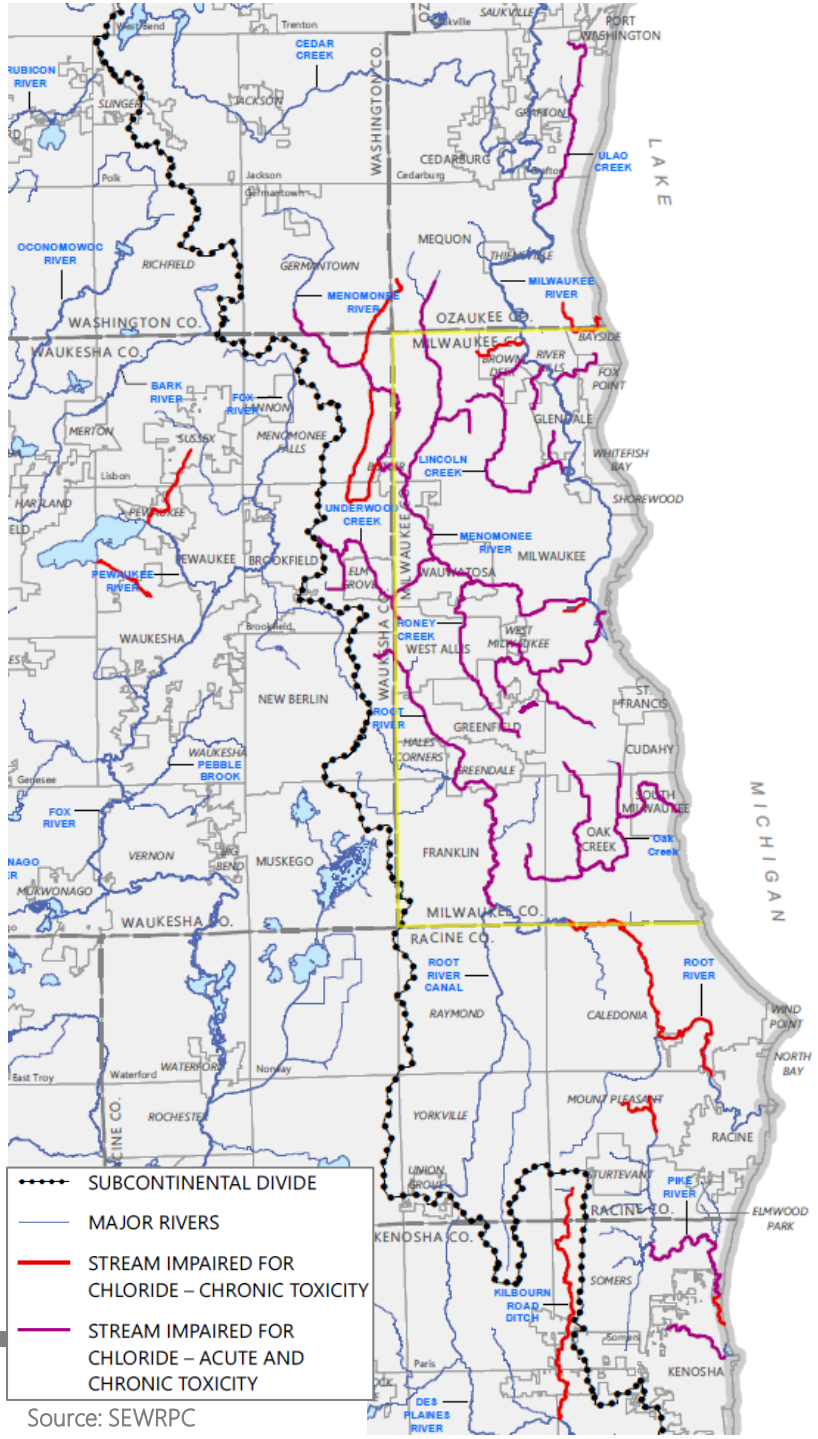
Salt

Chloride Toxicity

- As of 2022, 35 waterbodies in southeastern Wisconsin were listed as impaired due to exceeding chloride toxicity thresholds

- Wisconsin criteria for chloride toxicity
  - Chronic 395 mg/l (10)
  - Acute 757 mg/l (25)

Jurisdiction	Chronic Toxicity Criterion (mg/l)	Acute Toxicity Criterion (mg/l)	General Chloride Criterion (mg/l)
Canada	120	640	--
Illinois	--	--	500
Michigan	150	640	--
Minnesota	230	860	--
Wisconsin	395	757	--



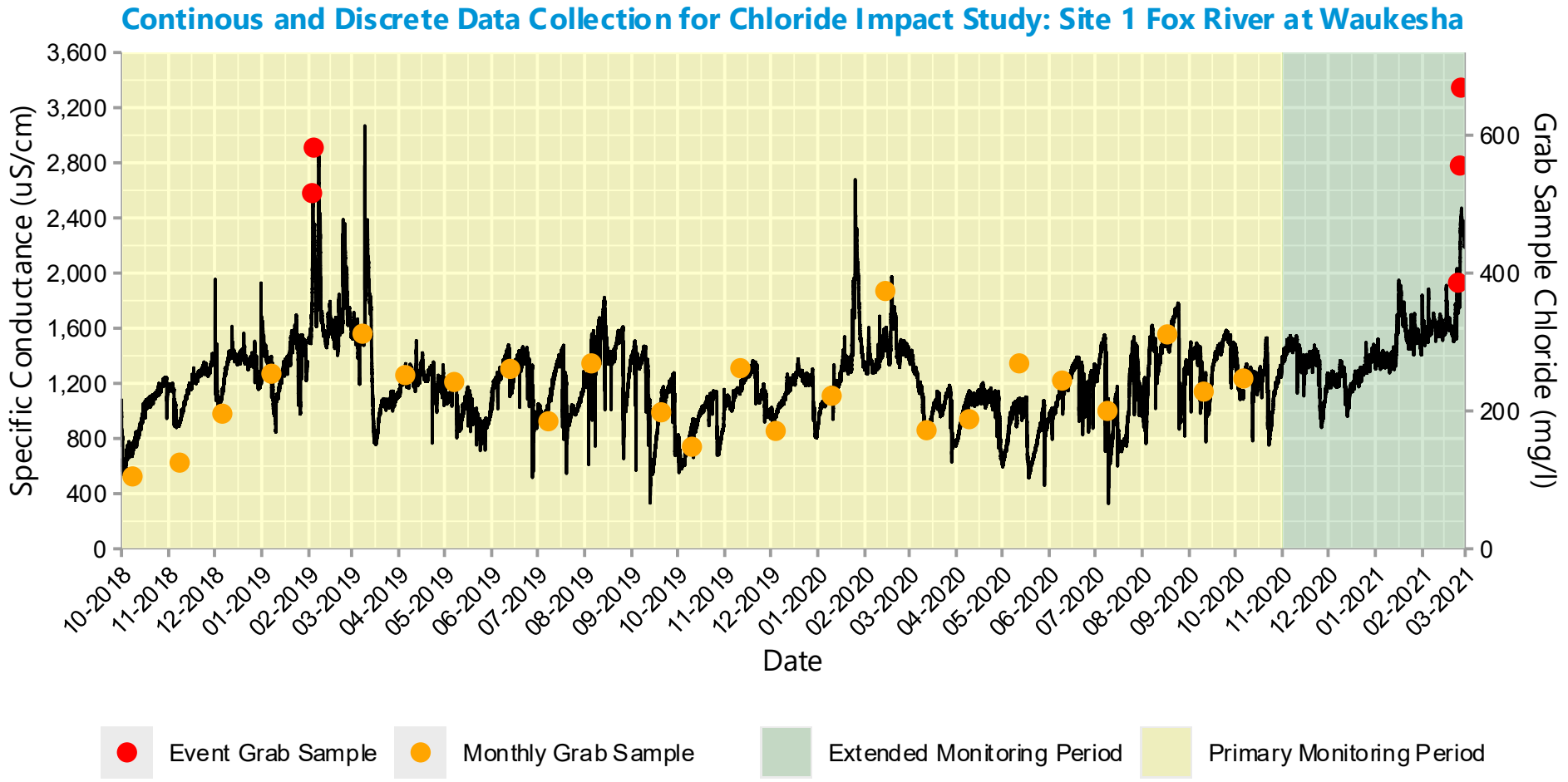
Source: SEWRPC


Data Analysis and
Technical Report Development

Chloride Impact Study Reports

- TR-61 Field Monitoring and Data Collection for the Chloride Impact Study
- TR-62 Impacts of Chloride on the Natural and Built Environment
- TR-63 Chloride Conditions and Trends in Southeastern Wisconsin
- TR-64 Regression Analysis of Specific Conductance and Chloride Concentrations
- TR-65 Mass Balance Analysis for Chloride in Southeastern Wisconsin
- TR-66 State of the Art for Chloride Management
- TR-67 Legal and Policy Considerations for the Management of Chloride
- PR-57 A Chloride Impact Study for Southeastern Wisconsin

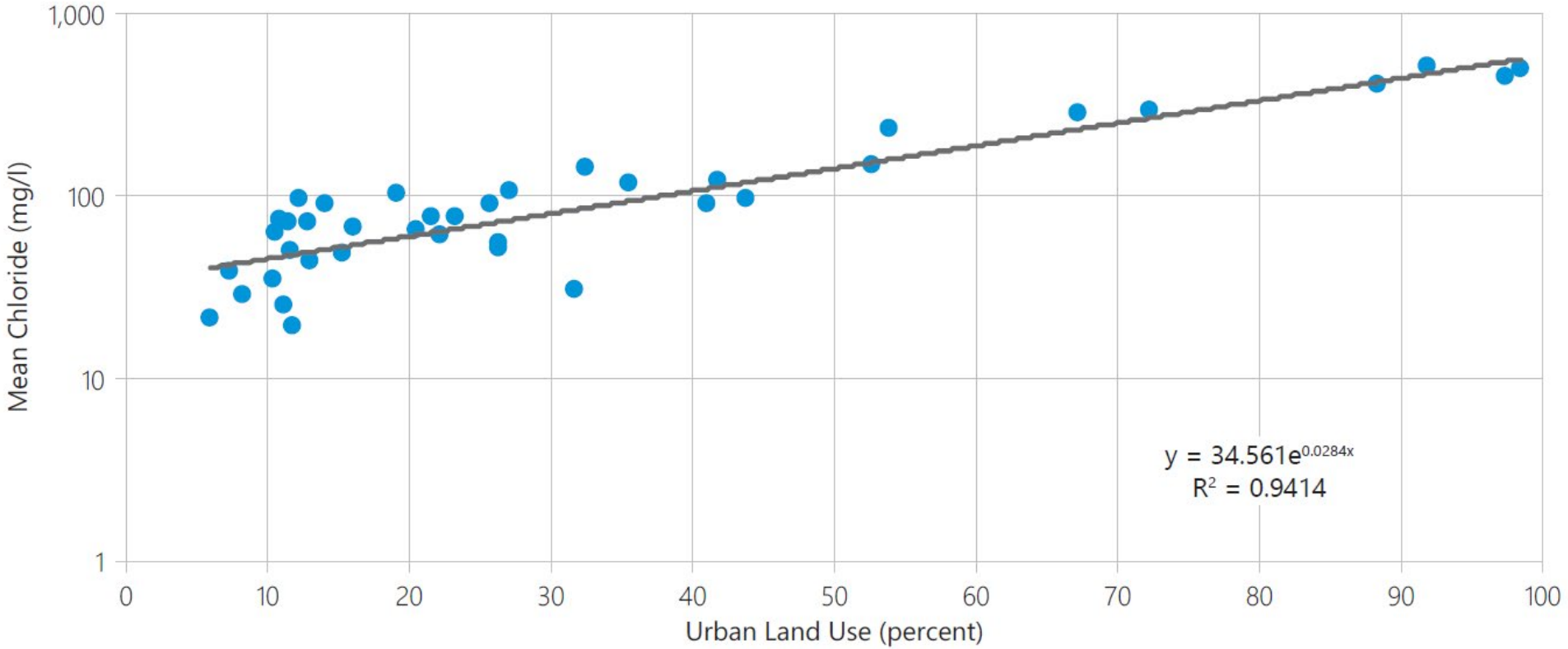
TR-63 Data Collection – Streams



- Converted specific conductance to estimated chloride using regression models (TR-64)
  - Could not develop model for Site 55 Bark River Downstream
- Extended monitoring period in winter 2020-2021 to capture spike events

TR-63 Land Use Correlations

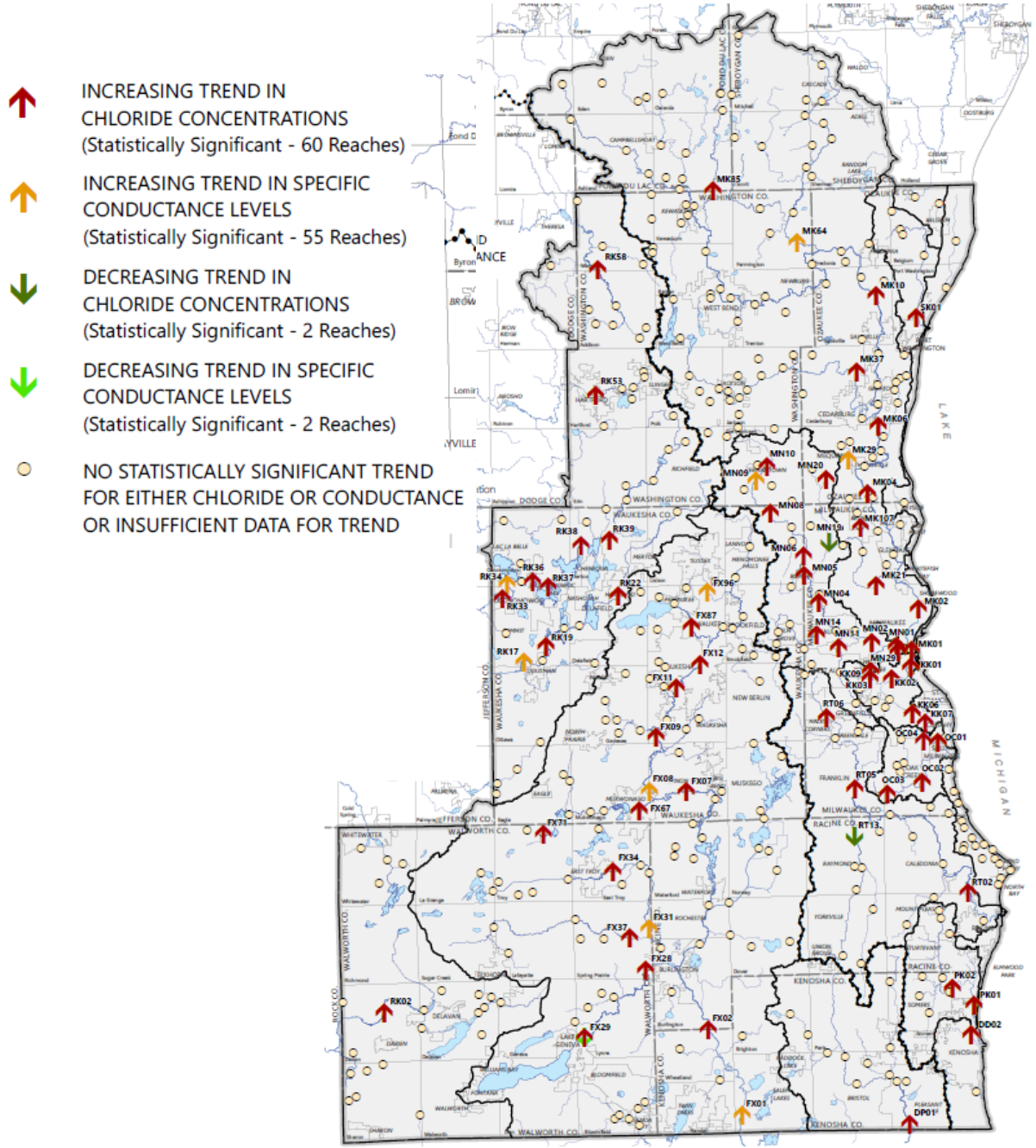
Relationships Between Drainage Area Land Use and Mean Chloride Concentration at Chloride Impact Study Stream Monitoring Sites



- Utilized 2015 land use in delineated drainage areas for each site
- Significant, positive correlations between chloride concentrations with urban land use and roads and parking lots

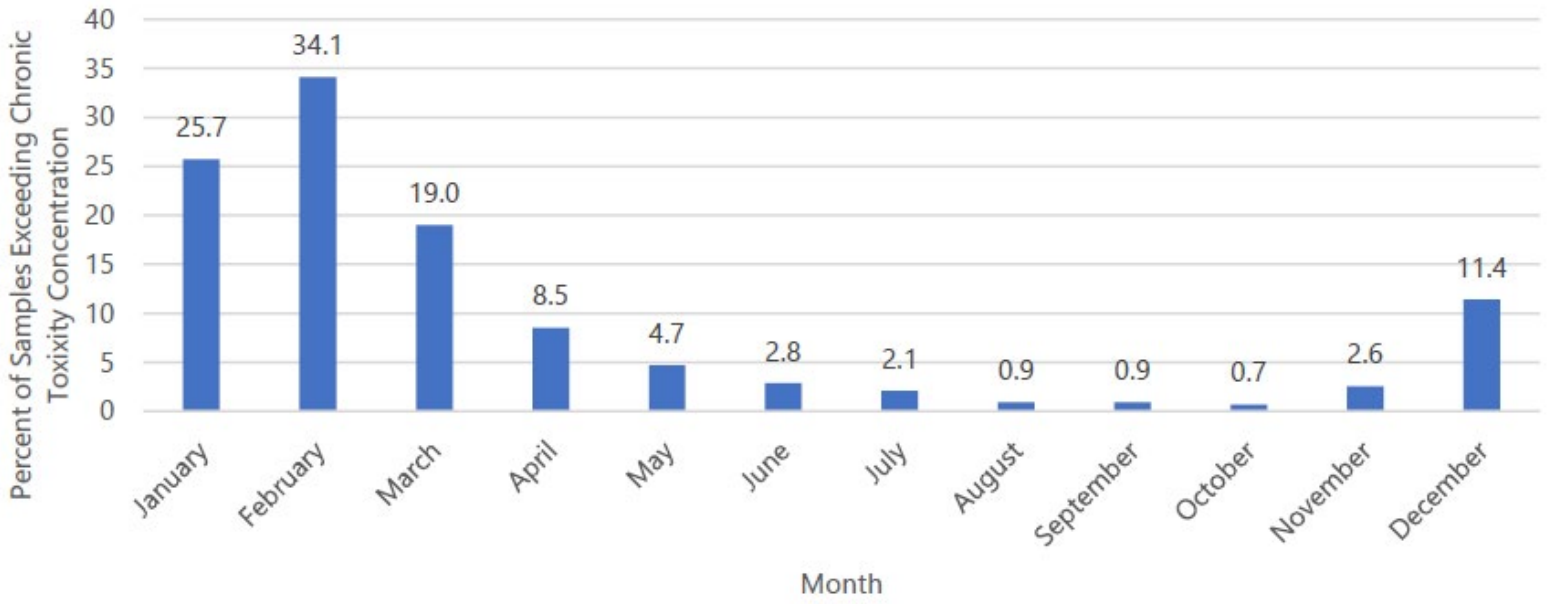
TR-63 Trends in Chloride and Conductance - Streams

- 1961-2022
- Increasing chloride trends:
  - 60 reaches
  - 80% of reaches with balanced datasets
- Decreasing chloride trends:
  - 2 reaches
  - Little Menomonee River & Root River Canal



TR-63 Monthly Exceedance Trends - Streams

Figure 4.10
Percent of Chloride Samples Exceeding Chronic Toxicity Concentration Among All Samples Collected During the Full Period of Record: 1961-2022

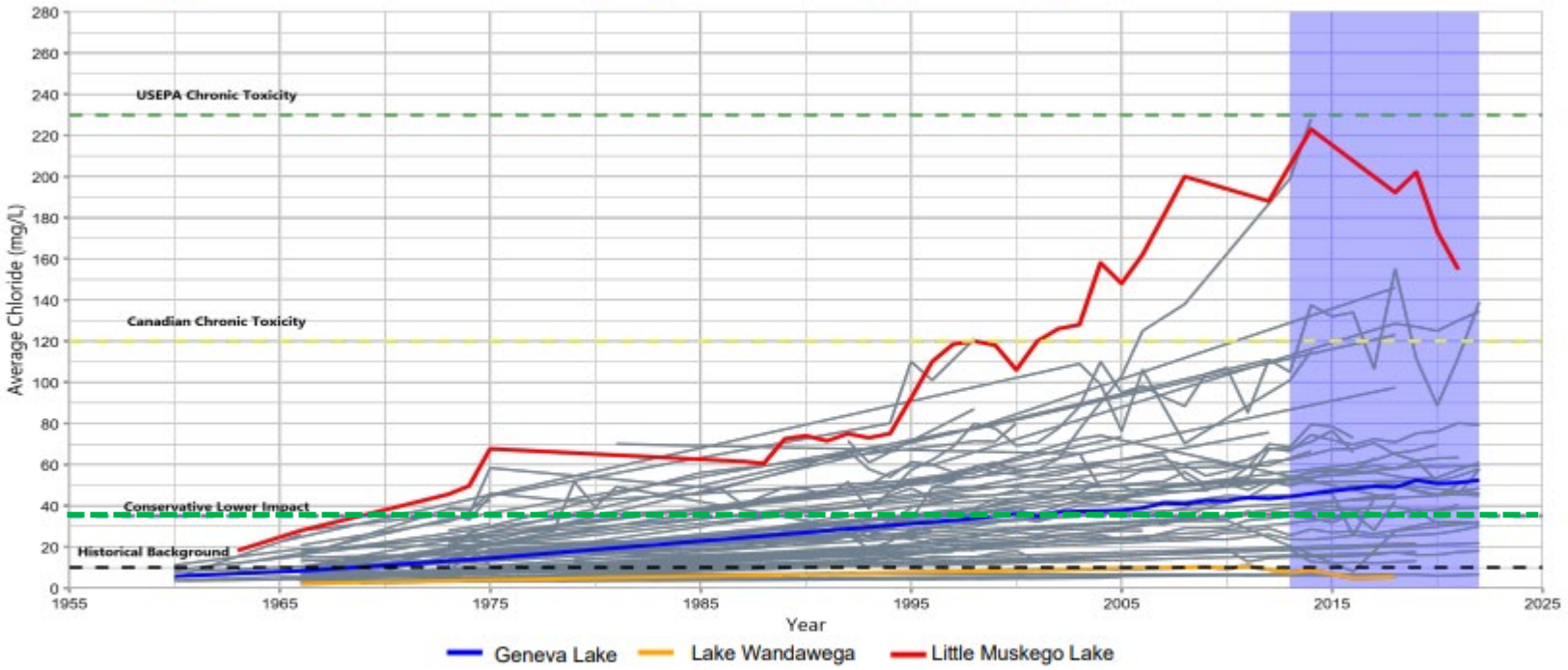


- Most chronic toxicity exceedances occur in colder months, highlighting significant impact of winter deicing practices
- Exceedances decreased significantly May through November; Lowest in August through October
- Nonetheless, 387 chronic toxicity concentration exceedances June through November

TR-63 Lake Chloride Levels

Figure 5.31

Annual Average Chloride Concentrations Among Study Area Lakes Compared to Biological Thresholds: 1960 - 2022

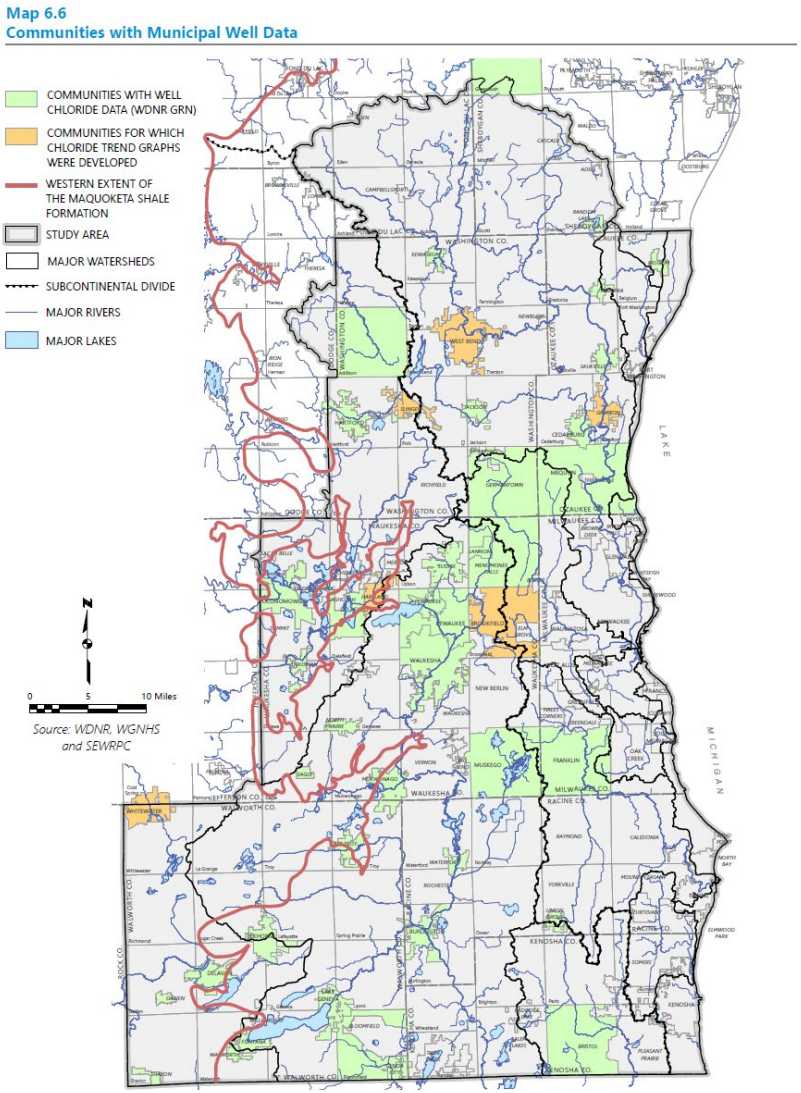


Note: The shaded blue area indicates the recent conditions (2013 through 2022) used for this study. The colored dashed lines indicate the natural background concentrations for the Region (background) or the various biological impacts of increasing chloride concentrations. Each lake is represented by a grey line or a colored line to highlight individual lakes.

Source: SEWRPC

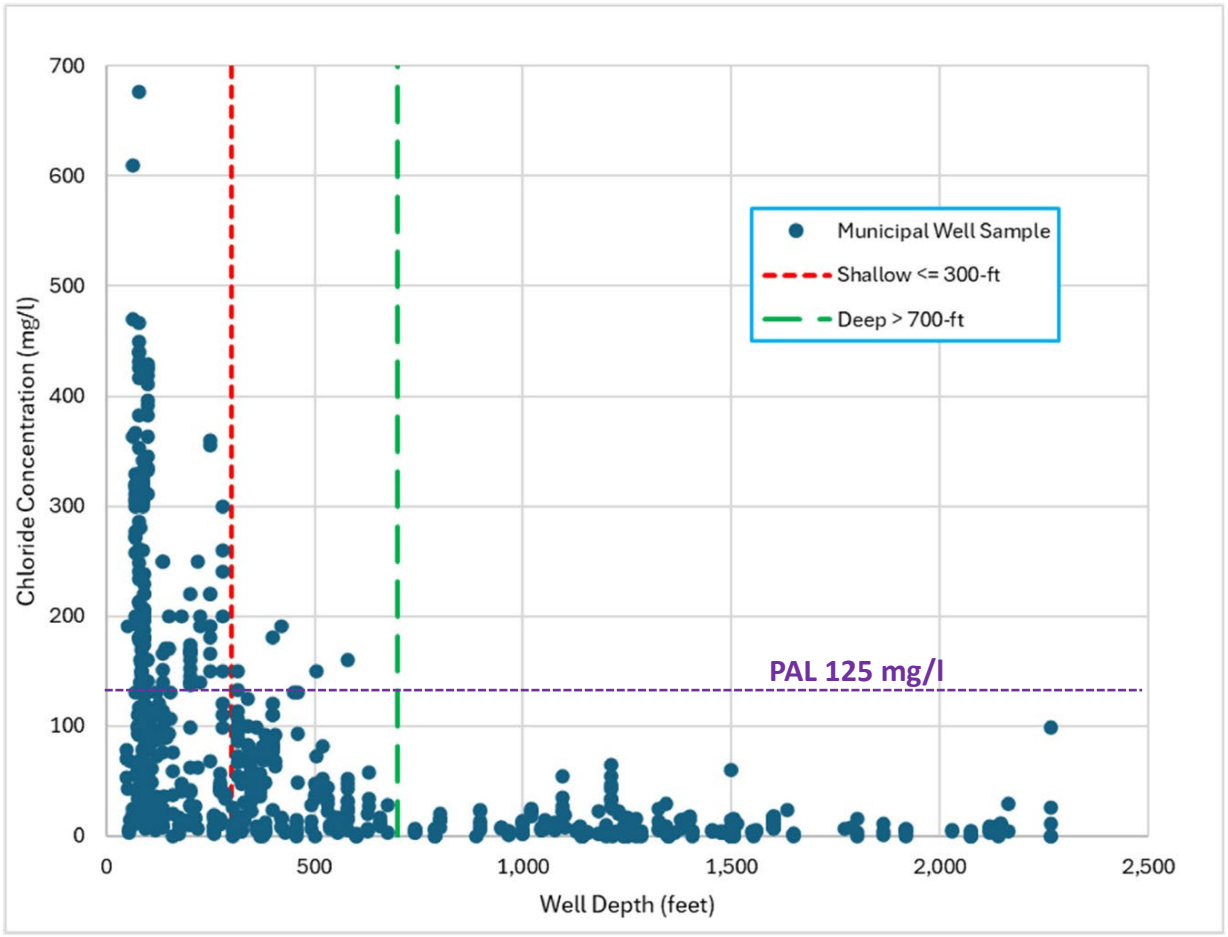
TR-63 Municipal Wells

- 46 Municipalities
- 1977-2025
- Most munis only had 1-2 chloride datapts for record
- Those with more typically had a chloride value about every 10 years



TR-63 Municipal Wells

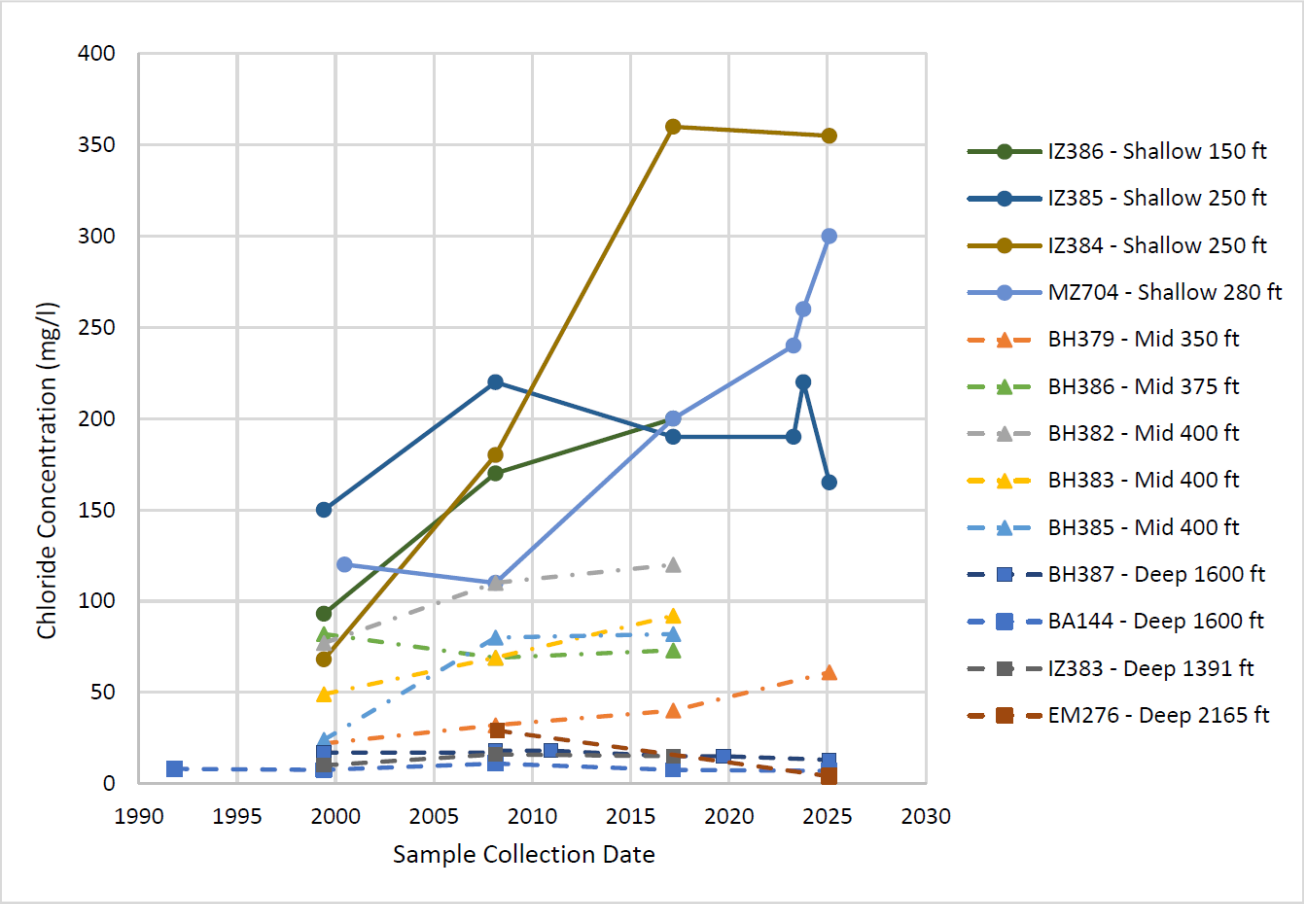
Figure 6.11
All Active Municipal Well Data: 1977-2025



Source: WDNR, SEWRPC, City of Brookfield, Village of Slinger, and City of West Bend

TR-63 Municipal Well Example

Figure 6.12
Municipal Well Chloride Trend – City of Brookfield: 1991-2025



Source: WDNR, SEWRPC, City of Brookfield

TR-65 Chloride Mass Balance Analysis

- Identify the significant sources of chloride and estimate the quantity of chloride from various sources
  - Region-wide
  - Study monitoring site contributing drainage areas

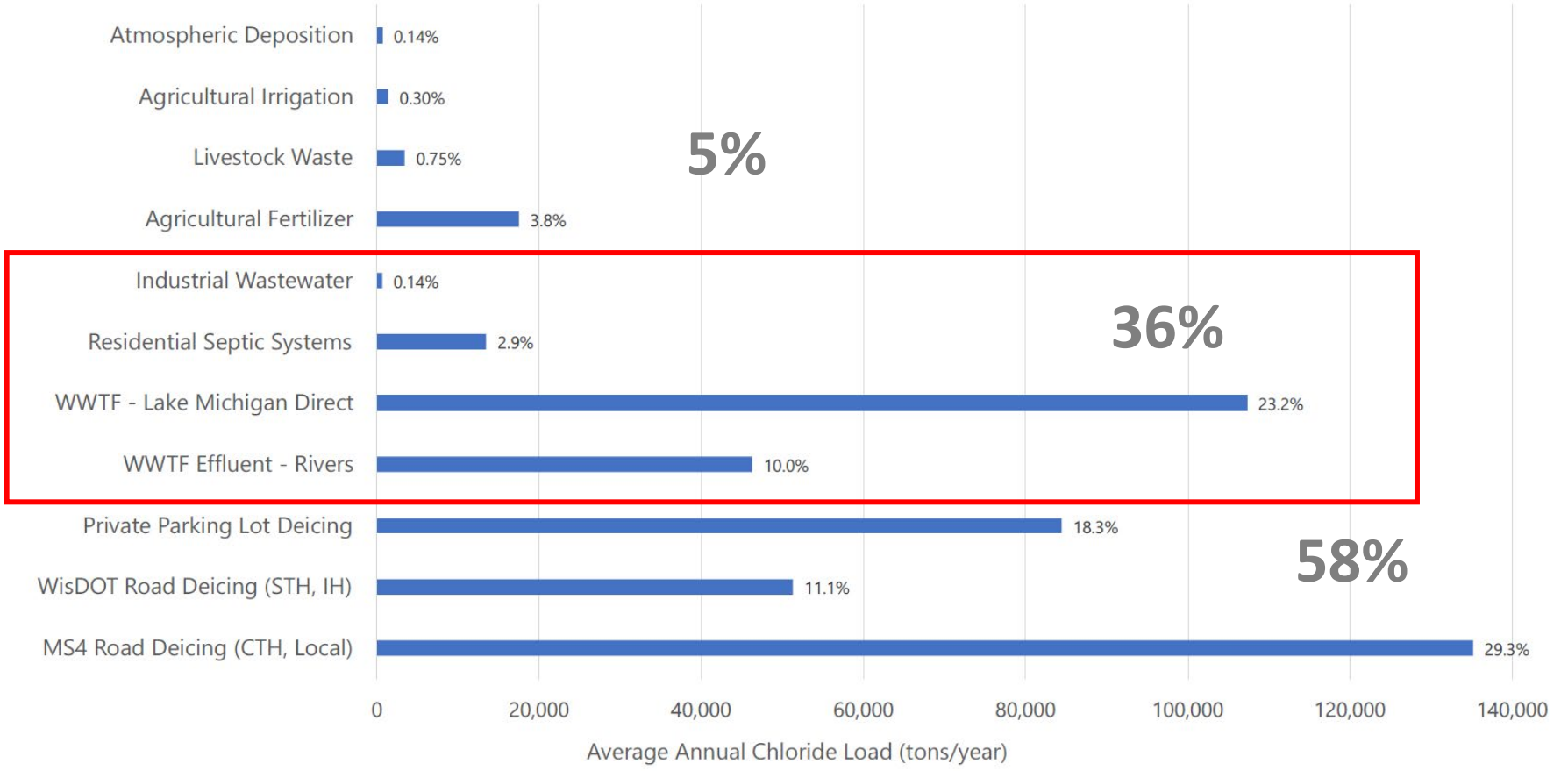
- Estimate in-stream chloride mass load for monitoring sites located near USGS gages

Source: Wikimedia/Michael Dibb

Source: SEWRPC

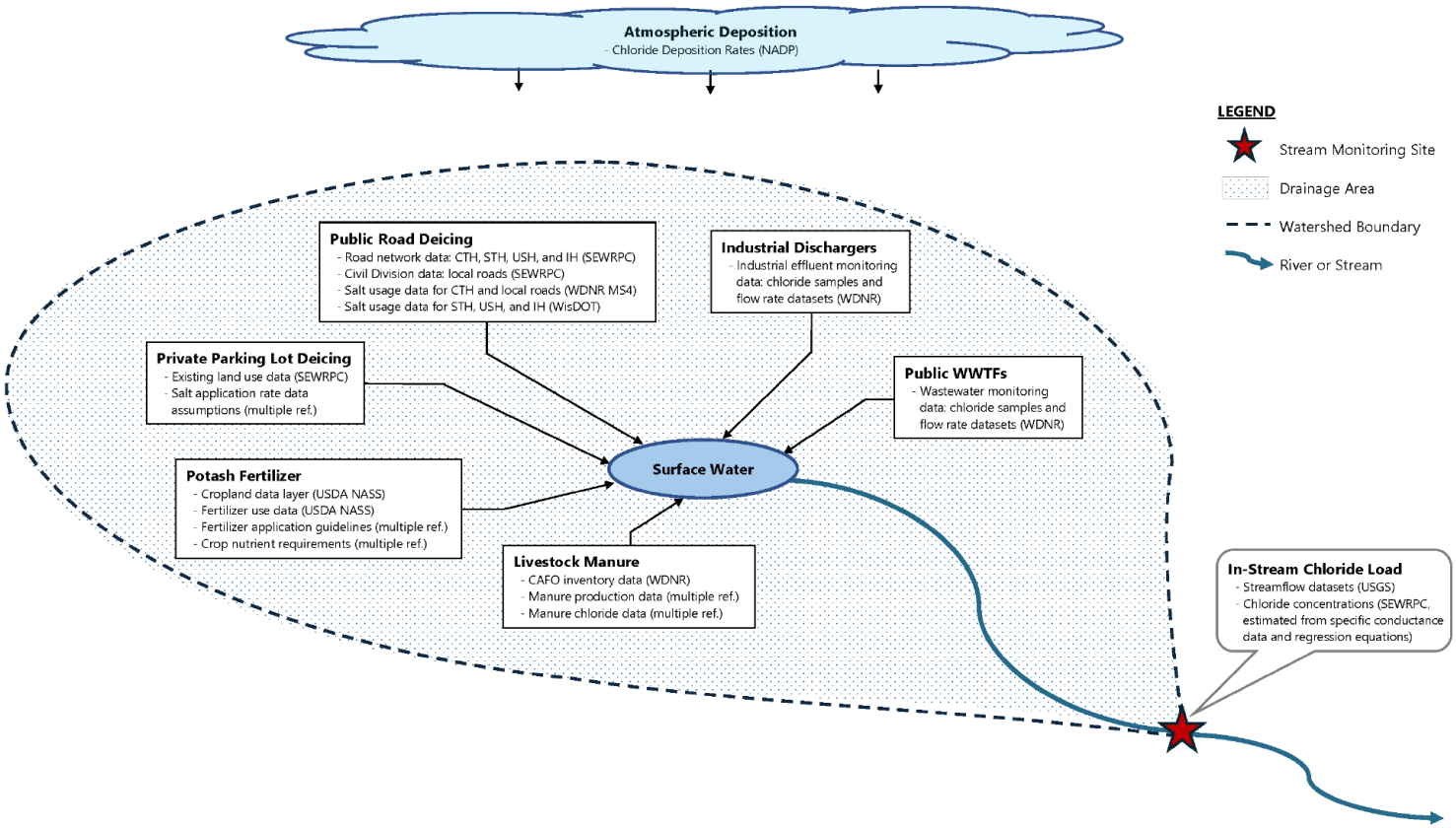
TR-65 Regional Chloride Budget (2018-2020)

Figure 4.1
Regional Chloride Budget: Average Annual Chloride Source Loads for Southeastern Wisconsin



TR-65 Mass Balance Analysis (2018-2020)

Figure 3.1
Chloride Mass Balance Schematic for Stream Monitoring Sites

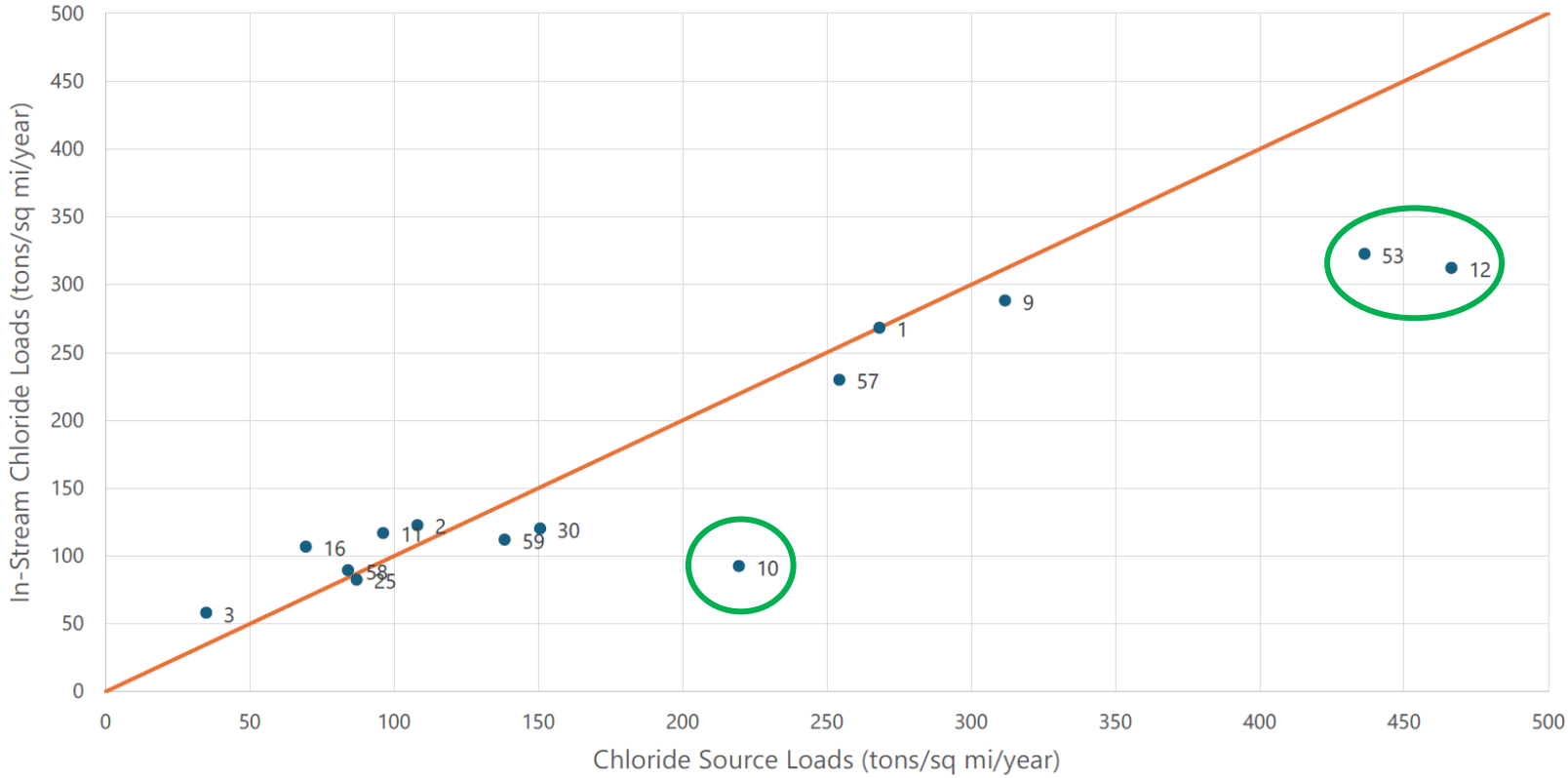


Note: Interactions between surface water and groundwater were not quantified for the mass balance analysis.

Source: SEWRPC

TR-65 Mass Balance Analysis

Figure 4.5
Comparison of Chloride Source Loads with In-Stream Chloride Loads During the Study Period

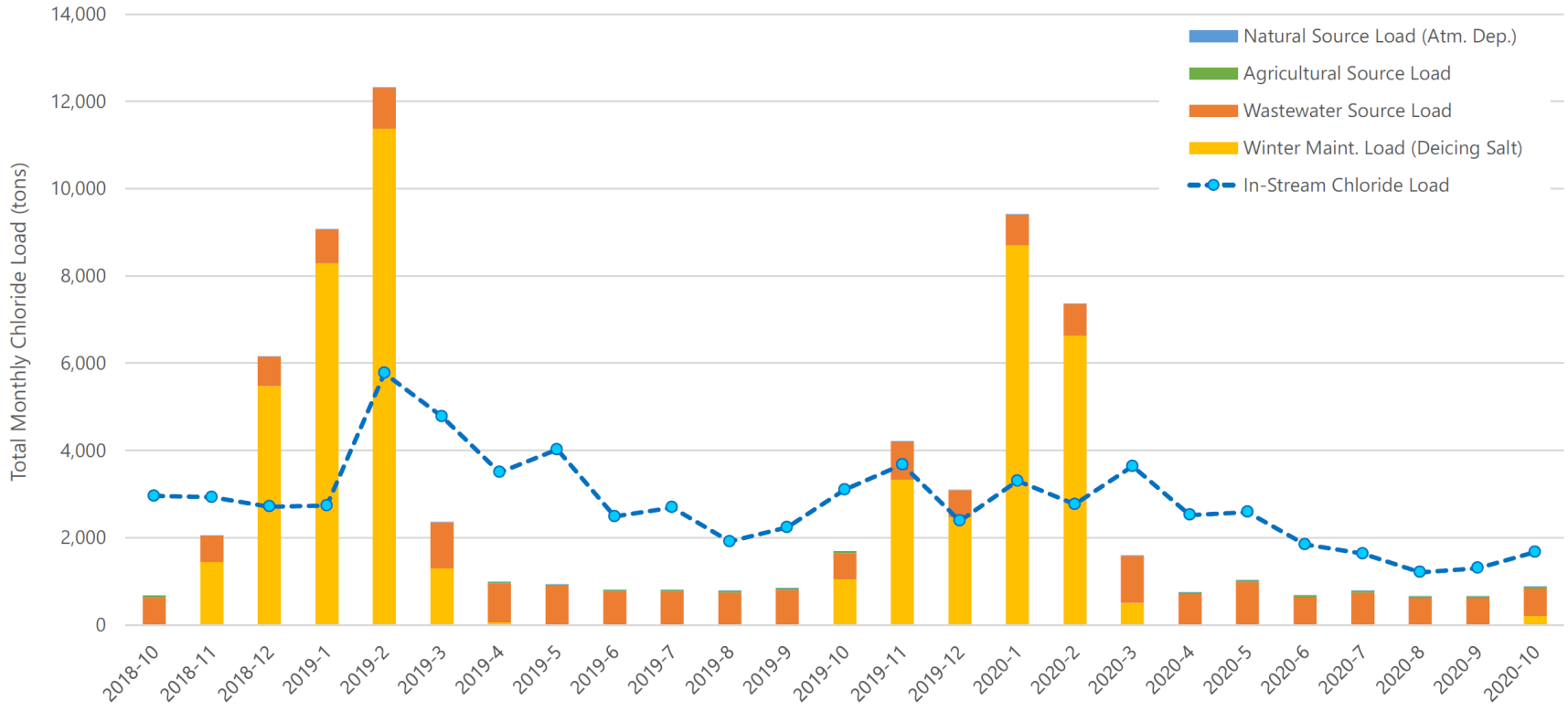


Note: The chloride source loads and in-stream chloride loads were computed for the study period, annualized, and normalized by drainage area. The orange line on the plot represents the line of parity, for which the x- and y-values are equal.

TR-65 Mass Balance Analysis

Figure C.1
Chloride Loads and Mass Balance Analysis Results at Site 1 Fox River at Waukesha

(a) Monthly Chloride Sources Loads Versus In-Stream Chloride Loads



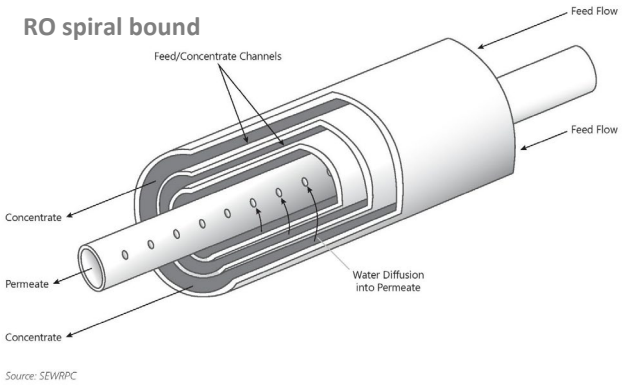
Site 1 Results Summary

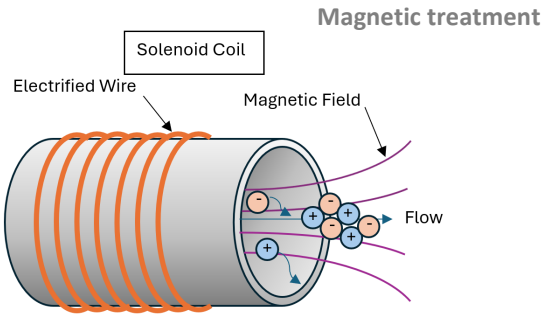
Chloride mass balance over the study period

- **0.21%** (sources > in-stream)

TR-66 State-of-the-Art for Cl Management

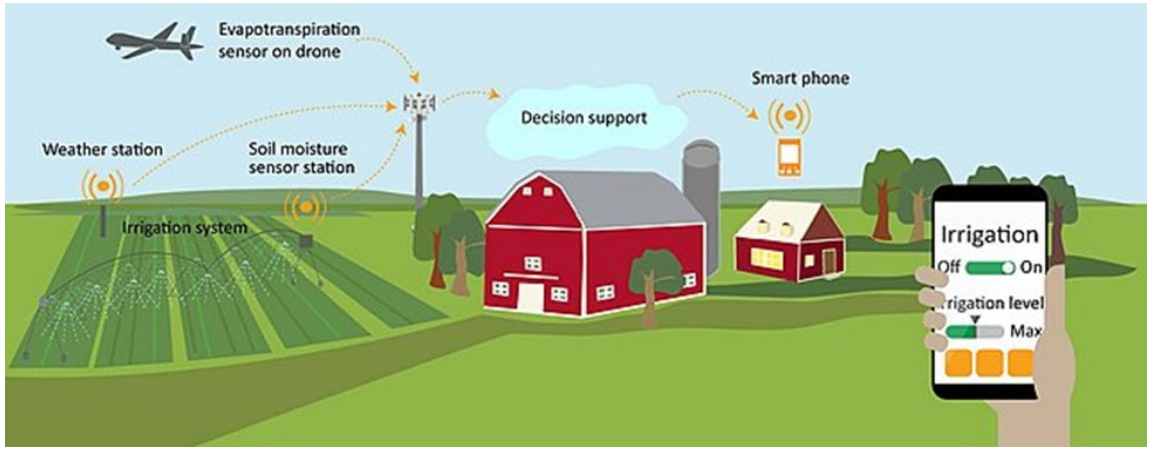
- Municipal Systems
  - Wastewater Treatment Plants – chloride removal options are cost prohibitive
  - Water Supply – centralized softening options at plants are viable but expensive
- Private Softening – optimization of softeners work, other treatment technologies need additional research and buy-in from local plumbers





TR-66 State-of-the-Art for Cl Management

- Agriculture – optimize fertilizer (potash KCl) and manure applications by minimizing excess, alternative K fertilizers are expensive, not as effective, and not locally available
- Food Processing – dairy, meat, canning – most times salts are part of the process, so chloride removal would be done to the waste stream, which is very expensive



Chloride Impact Study – Next Steps

- Technical Report in progress
  - TR 66 – State-of-the-Art of Chloride Management – public and private deicing

- Planning Report PR 57 in progress
  - Summarizing the technical reports and provide consideration for alterative scenarios, future conditions, and recommendations.

www.sewrpc.org/chloride-study

Regional Water Quality Management Plan Prospectus

About the RWQMP

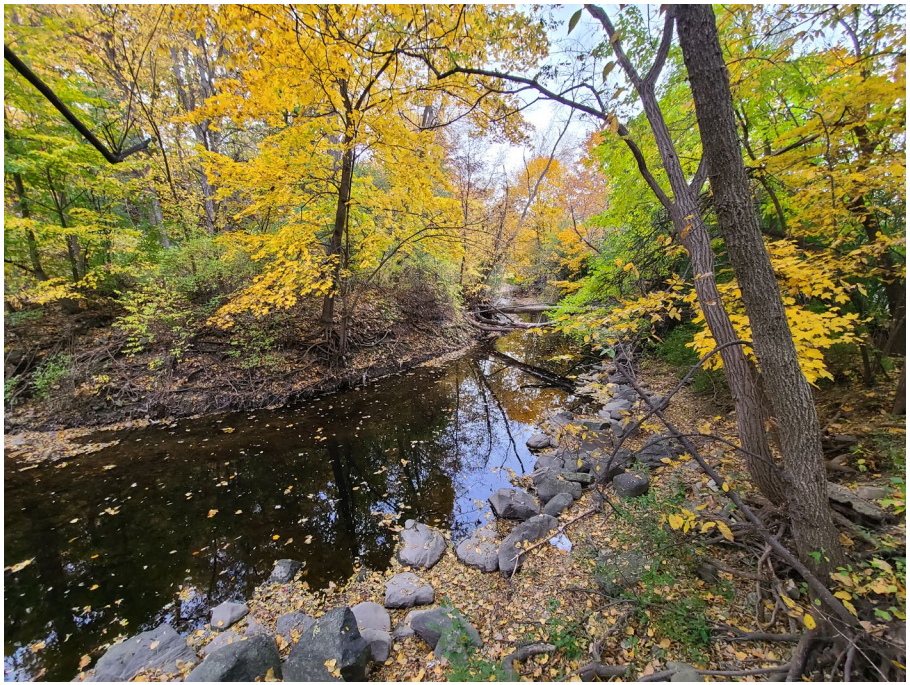


Image Credit: SEWRPC

➢ SEWRPC is the State designed Areawide Water Quality Management Planning Agency

➢ The RWQMP

- Foundation for all of the Commission's environmental, water quality, sewage treatment, and sanitary sewer planning work
- Summarizes essential data and information about the health of our Region's waters
- Provides data-informed recommendations with the goal of achieving fishable and swimmable waters
- In accordance with WI Administrative Code NR-121
  - Policies, procedures, and requirements for areawide water quality management planning under WDNR

Water Quality Management Timeline

1960 — Commission begins Regional Planning Program

1964 — Commission conducts extensive "benchmark" water quality study

1966 — **Technical Report No. 4,** *Water Quality and Flow of Streams in Southeastern Wisconsin*

1968 — Cooperative continued water quality monitoring agreement formed (SEWRPC & WDNR)

1971 — Monitoring efforts expanded to include lakes

1972 — **Federal Clean Water Amendments enacted**

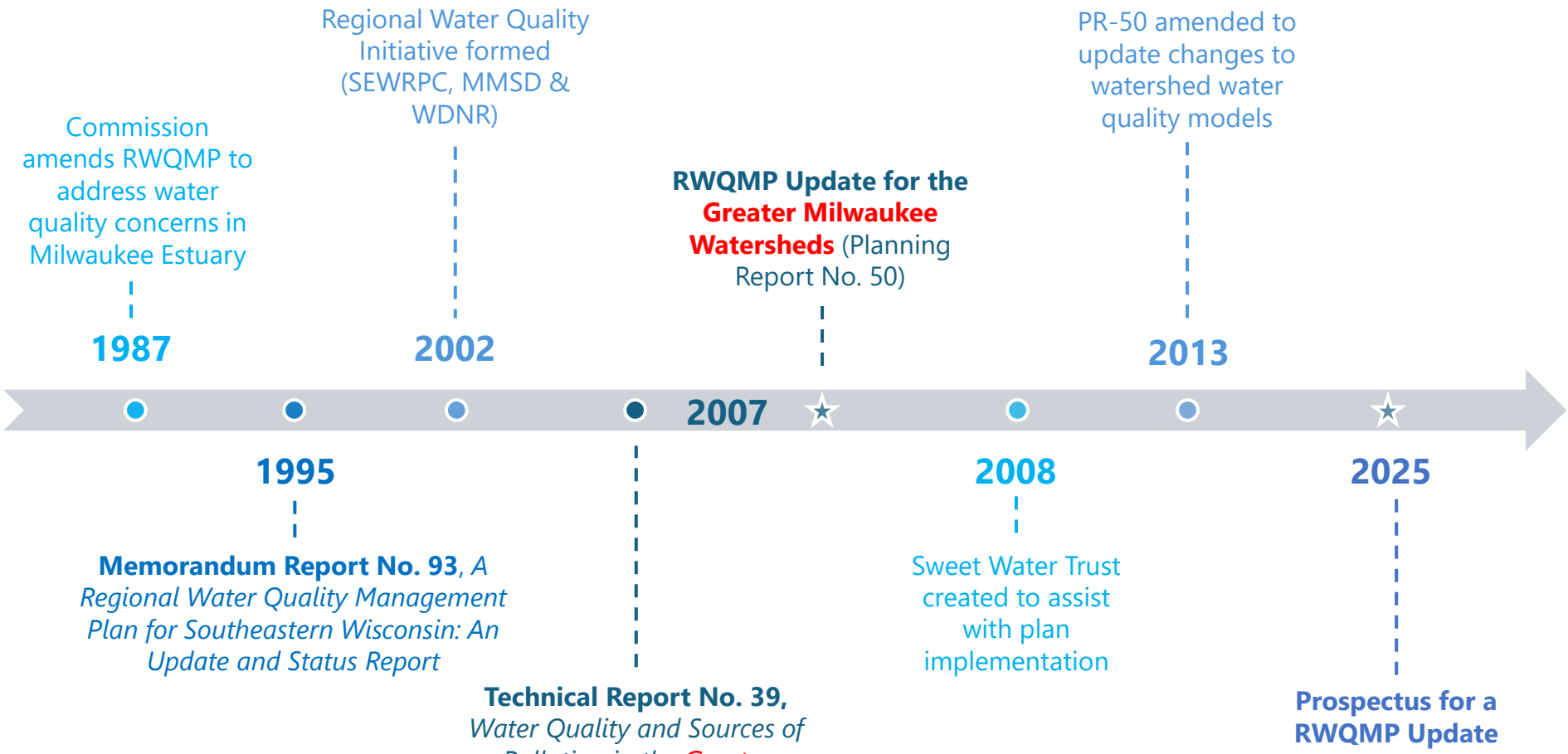
1974 — Commission designated as the Region's Water Quality Management Planning Agency

1975 — **Technical Report No. 21**, *Sources of Water Pollution in Southeastern Wisconsin*

1978 — **Technical Report No. 17**, *Water Quality of Lakes and Streams in Southeastern Wisconsin*

1979 — **Commission adopts Regional Water Quality Management Plan (Planning Report No. 30)**

Water Quality Management Timeline



RWQMP Update Prospectus

Prospectus Goal

To identify a workplan for a RWQMP update to support the goal of fishable and swimmable waters for the entire seven county Region.

The Prospectus will

- Establish the need for and purpose of a RWQMP update
- Identify the scope and content of the update
- Describe the efforts needed to evaluate historical and current regional water quality conditions
- Recommend the most feasible means for organizing and accomplishing the required work
- Determine a work schedule
- Recommend a budget and identify potential sources of funding

RWQMP Update Prospectus

- Currently working with a Technical Advisory Committee on scope components
  - Water quality inventories – stream, lake, groundwater
  - Wastewater inventories – WWTP, service areas, sewer extensions
  - Sources of pollution
  - Recommendations
- Goal is Prospectus done by end of 2026
- Can find more information on our Water Quality webpage

  www.sewrpc.org/Regional-Planning/Water-Quality

Thank You

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