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Dated: November 12, 2026

Respectfully submitted,

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CERTIFICATE OF SERVICE

I, Fredric Andes, hereby certify that I have filed the attached Notice of Filing and the Time Limited Water Quality Standard for Chloride Re-Evaluation Report Years 1-4 (November 2026) and served a copy on the below service list by electronic mail on November 12, 2026.

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Time Limited Water Quality Standard for Chloride Re-Evaluation Report Years 1-4

November 2026

Prepared by the Chicago Area Waterways Chloride Workgroup and
Lower Des Plaines Watershed Group

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1.0 Purpose of Document

This report fulfills the re-evaluation reporting requirements, paragraph 6(A-D, see below), included in the Time Limited Water Quality Standard for Chloride (TLWQS) general permit (ILG103) for the Chicago Area Waterways Chloride Workgroup (CAWCW) and the Lower Des Plaines Watershed Group (LDWG):

"6. Re-evaluation

A. By the deadline listed in Table 4, each discharger must ensure that their CWG submits a proposed re-evaluation under 35 Ill. Adm. Code 104.580, which assess the HAC using all existing and readily available information.

B. Each discharger must ensure their CWG evaluates whether the chloride sampling plan and data collection needs to expanded or otherwise modified.

C. At each re-evaluation, each discharger must ensure their CWG evaluates each required BMP, analyzes its effectiveness, and provides a recommendation about whether it must be continued as is, modified to improve its effectiveness, or eliminated. Each discharger must ensure that their CWG evaluates and provides recommendations for any BMPs that were identified in the Annual Reports required by Paragraph 3(B). Each discharger must ensure that their CWG evaluates and provides recommendations for any new or innovative technology that could improve water quality if implemented and identifies all such technologies. The BMPs that are adopted by the Board will be fully implemented during the next five years.

D. As required by 35 Ill. Adm. Cide 104.580(e)1, if any re-evaluation yields a more stringent HAC, that HAC becomes the applicable interim TLWQS for the remaining duration of the TLWQS."

Additionally, this report fulfills the re-evaluation reporting requirements, paragraph 6(A-F, see below), included in the Time Limited Water Quality Standard for Chloride (TLWQS) Opinion and Order of the Illinois Pollution Control Board dated November 4, 2021 and clarified January 6, 2022:

"6. Re-evaluation

A. By the deadlines listed in Table 4, each discharger must ensure that their CWG submits a proposed re-evaluation under 35 Ill. Adm. Code 104.580, which assesses the HAC using all existing and readily available information.

B. Each discharger must ensure that their CWG evaluates whether the chloride sampling plan and data collection needs to be expanded or otherwise modified.

C. At each re-evaluation, each discharger must ensure their CWG evaluates each required BMP, analyzes its effectiveness, and provides a recommendation about whether it must be continued as is, modified to improve its effectiveness, or eliminated. Each discharger must ensure that their CWG evaluates and provides recommendations for any BMPs that were identified in the Annual Reports required by Section 3(B). Each discharger must ensure that their CWG evaluates and provides recommendations for any new or innovative technology that could improve water quality if implemented and identifies all such technologies. The BMPs that are adopted by the Board will be fully implemented during the next five years.

D. As required by 35 Ill. Adm. Code 104.580 (b) and (c), the Board will make the information submitted in Section (6)(C) available to the public and provide an opportunity for any person to submit information about additional BMPs and new or innovative technologies that could improve water quality if implemented.

E. Based on the information provided in sections (6)(C) and (D) or any other information available to the Board, the Board will identify any updates to Table 3 needed to achieve the greatest chloride reduction achievable for the whole watershed. For each discharger category, the Board will identify all additional BMPs and new or innovative technologies that are achievable for any discharger in the category and issue an order updating Table 3 to include any such BMPs or technologies for the entire category except that, if any such BMP or technology is achievable for some but not every discharger within a discharger category, the Board may identify in Table 3 sub-categories of each discharger for whom the BMP or technology is not practicable.

F. As required by 35 Ill. Adm. Code 104.580(e)(1), if any re-evaluation yields a more stringent HAC, that HAC becomes the applicable interim TLWQS for the remaining duration of the TLWQS."

This re-evaluation report also includes information from the TLWQS Annual Reports submitted by Workgroup members to the CAWCW and LDWG.

2.0 TLWQS Permittees and Workgroup Membership

2.1 Discharger Category Definitions

To improve BMP implementation, the CAWCW and LDWG recommend that the discharger categories be more clearly defined as currently several permittees are permitted under multiple categories. Clearly defining these categories will reduce confusion amongst the permittees as to which discharger category of BMPs applies to their operations.

POTW – Publicly Owned Treatment Works, a government-owned and permitted (NPDES) facility that treats water collected from the sanitary sewer system (or combined sewer system) and includes the pipes, pumps, and treatment plants that manage wastewater.

MS4 – Municipal Separate Storm Sewer System, a publicly owned and permitted (NPDES) network of pipes, ditches, and catch basins that collects rain and melting snow, keeping it separate from sanitary sewage before discharging into local waterways.

CSO – Combined Sewer Overflows, systems that are designed to discharge untreated wastewater and stormwater directly into local waterways when heavy rain or snowmelt exceeds a sewer system's capacity. Combined sewer systems are wastewater systems designed to carry sanitary sewage and stormwater in a single pipe to a bypassed treatment facility for discharge to a waterbody.

IS – Industrial Source, stormwater discharges associated with any primary industrial activity and any associated industrial activity from areas (except offsite access roads and rail lines not on property owned or controlled by the permittee) where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to stormwater. Such facilities may have an NPDES permit.

IDOT/Tollway – Facilities and property owned and or operated by the Illinois Department of Transportation and Illinois Tollway

SSF – Bulk salt storage facility, facility primarily dedicated to storing bulk quantities of salt, and where salt is stored, processed, and unloaded and loaded for delivery to other parties. Includes all salt storage facilities not covered by the other discharger categories included in the TLWQS. Such facilities may have an NPDES permit.

BMPs that directly address proper salt storage for the POTWs, Industrial Sources, CSO communities, MS4 communities, and IDOT/Tollway discharger categories are included in their table of BMPs in the TLWQS permit and order.

2.2 Workgroup Members including TLWQS Discharger Categories

Members of the CAWCW are listed in Table 1 and members of the LDWG that are TLWQS Permittees are listed in Table 2.

Table 1: Chicago Area Waterways Chloride Workgroup Members that are ILG103 Permit Holders

ILG103 PERMIT ID	PERMITTEE NAME/LOCATION	DISCHARGER CATEGORY[1]
ILG103001	HOMEWOOD, VILLAGE OF	MS4
ILG103002	ORLAND PARK, VILLAGE OF	MS4
ILG103003	MIDLOTHIAN, VILLAGE OF	MS4
ILG103004	TINLEY PARK, VILLAGE OF	MS4
ILG103006	WILMETTE, VILLAGE OF	MS4, CSO
ILG103010	EVANSTON, CITY OF	MS4, CSO
ILG103011	SKOKIE, VILLAGE OF	MS4, CSO
ILG103012	SKOKIE, VILLAGE OF	MS4, CSO
ILG103014	MWRDGC - CALUMET	POTW
ILG103015	MWRDGC - LEMONT	POTW
ILG103016	MWRDGC - LOCKPORT POWERHOUSE	IS
ILG103017	MWRDGC - STICKNEY	POTW
ILG103018	MWRDGC - O'BRIEN	POTW
ILG103020	RICHTON PARK, VILLAGE OF	MS4
ILG103021	LINCOLNWOOD, VILLAGE OF	MS4, CSO
ILG103022	OAK FOREST, CITY OF	MS4
ILG103023	LYNWOOD, VILLAGE OF	MS4
ILG103024	CITGO PETROLEUM CORP, LEMONT REFINERY	IS
ILG103029	MORTON SALT INC, CALUMET SITE	SSF

[1] Discharger category based on updated definitions in Section 2.1 and these are the discharger categories that the relevant TLWQS permittee will be reporting under during the next phase of the TLWQS.

ILG103030	PALOS HEIGHTS, CITY OF	MS4
ILG103033	IMTT ILLINOIS LLC, JOLIET FACILTIY	IS
ILG103034	IMTT ILLINOIS LLC, LEMONT FACILTIY	IS
ILG103035	STEPAN COMPANY (ELWOOD)	IS
ILG103036	PARK FOREST, VILLAGE OF	MS4
ILG103037	OZINGA READY MIX CONCRETE, INC (EVANSTON)	IS
ILG103038	OZINGA READY MIX CONCRETE, INC (CHICAGO)	IS
ILG103039	OZINGA READY MIX CONCRETE, INC (ALSIP)	IS
ILG103040	OZINGA READY MIX CONCRETE, INC (LEMONT)	IS
ILG103041	OZINGA READY MIX CONCRETE, INC (CHICAGO)	IS
ILG103042	OZINGA READY MIX CONCRETE, INC (MOKENA)	IS
ILG103043	OZINGA READY MIX CONCRETE, INC (CHICAGO)	IS
ILG103044	OZINGA MATERIALS, INC (CALUMET PARK)	IS
ILG103045	OZINGA READY MIX, INC (MIDWEST MARINE TERMINALS LLC)	IS
ILG103051	GLENWOOD, VILLAGE OF	MS4
ILG103052	GLENWOOD, VILLAGE OF	MS4
ILG103054	LANSING, VILLAGE OF	CSO, MS4
ILG103060	COOK COUNTY HIGHWAY DEPT (COOK COUNTY DOT AND HIGHWAYS)	MS4
ILG103061	NILES, VILLAGE OF	CSO, MS4
ILG103062	SKYWAY CONCESSION COMPANY, LLC (CHICAGO SKYWAY TOLL BRIDGE, SKYWAY CONCESSION COMPANY LLC)	MS4
ILG103064	CHICAGO DEPARTMENT OF WATER MANAGEMENT, CITY OF	MS4, CSO
ILG103065	CRESTWOOD, VILLAGE OF	MS4
ILG103067	SOUTH HOLLAND, VILLAGE OF	MS4
ILG103070	FLOSSMOOR, VILLAGE OF	MS4

Table 2: Lower Des Plaines Watershed Group Members that are ILG103 Permit Holders

ILG103 PERMIT ID	PERMITTEE NAME/LOCATION	DISCHARGER CATEGORY[2]
ILG103005	EXXONMOBIL OIL CORP, JOLIET REFINERY	IS
ILG103009	INEOS JOLIET LLC	IS
ILG103013	IDOT (SPRINGFIELD)	IDOT/TOLLWAY
ILG103025	NEW LENOX, VILLAGE OF	POTW, MS4
ILG103026	LOCKPORT, CITY OF	POTW, MS4
ILG103027	CREST HILL, CITY OF	POTW, MS4
ILG103028	JOLIET, CITY OF	POTW, MS4, CSO
ILG103031	ROMEOVILLE, VILLAGE OF	POTW, MS4
ILG103032	ROMEOVILLE, VILLAGE OF	POTW, MS4
ILG103046	MOKENA, VILLAGE OF	POTW, MS4
ILG103047	MOKENA, VILLAGE OF	POTW, MS4
ILG103055	FRANKFORT, VILLAGE OF	POTW
ILG103056	FRANKFORT, VILLAGE OF	POTW
ILG103059	CHANNAHON, VILLAGE OF	POTW, MS4
ILR103063	ELWOOD - DEER RUN, VILLAGE OF	POTW
ILG103066	RIVERSIDE, VILLAGE OF	CSO

[2] Discharger category based on updated definitions in Section 2.1 and these are the discharger categories that the relevant TLWQS permittee will be reporting under during the next phase of the TLWQS.

3.0 Re-Evaluation of the HAC/Interim Criterion

3.1 Accumulated Winter Season Severity Index

When examining winter chloride concentrations, it is important to consider the winter conditions. Chloride is a component of winter deicing road salt which is used as a means of improving safety for the traveling public during winter weather.

The Accumulated Winter Season Severity Index (AWSSI) from the Midwest Regional Climate Center (MRCC) measures winter severity by air temperature, snow fall, snow depth, and length of a winter season. The AWSSI is not limited to the typical meteorological winter time period and instead the scores begin accumulating when the first measurable snowfall is greater than 0.1 inches, the maximum temperature is less than or equal to 32^{O}F, or if neither the previous two conditions have been met then the scores begin accumulating on December 1.[3] Higher AWSSI scores indicate a more severe winter. The MRCC further categorizes winters using a scaling system based on percentiles to identify mild, moderate, average, severe, and extreme winter seasons. The AWSSI is a more complete measure of a winter season's severity compared with solely using snowfall totals. The AWSSI explicitly does not account for mixed precipitation, freezing rain, or wind. For the Chicago region, the AWSSI scores are measured based on conditions at O'Hare International Airport. While outside of the TLWQS watersheds, O'Hare International Airport is the official weather data location for Chicago and provides a reasonable approximation of winter severity across the TLWQS watersheds.

The average AWSSI score for the HAC/interim criterion reference period of 2012-2017 was 633 and included one of the most severe winters (winter of 2013-2014 with an AWSSI score of 1,105) since winters of 1977-1978 (AWSSI Score of 1,153) and 1978-1979 (AWSSI Score of 1,383). The average AWSSI score for TLWQS Years 1-4 (2022-2026) was 386 and included some of the mildest winters on record.

Figures 1 and 2 show graphs of AWSSI scores by winter season for the TLWQS HAC/interim criterion reference period of 2012-2017 and TLWQS Years 1 – 4 of 2022-2026, respectively.[4] Figure 2 also includes the winter of 2021-2022. AWSSI scores broken down by temperature and snow sub-scores from 1950 to 2026 for Chicago are included in Appendix A.

[3] About AWSSI, https://mrcc.purdue.edu/awssi/about-awssi, accessed 8/26/2026
[4] AWSSI: "IL – Chicago", https://mrcc.purdue.edu/research/AWSSI/chart?stn=ORDthr, accessed 8/26/2026

Figure 1: AWSSI Scores, IL - Chicago, 2012-2017

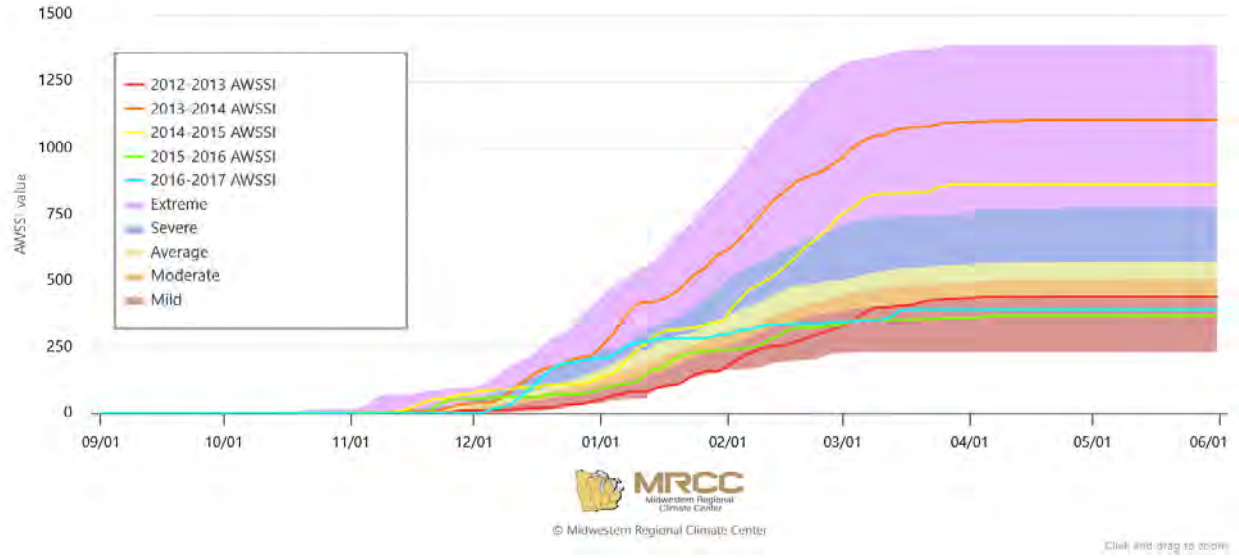
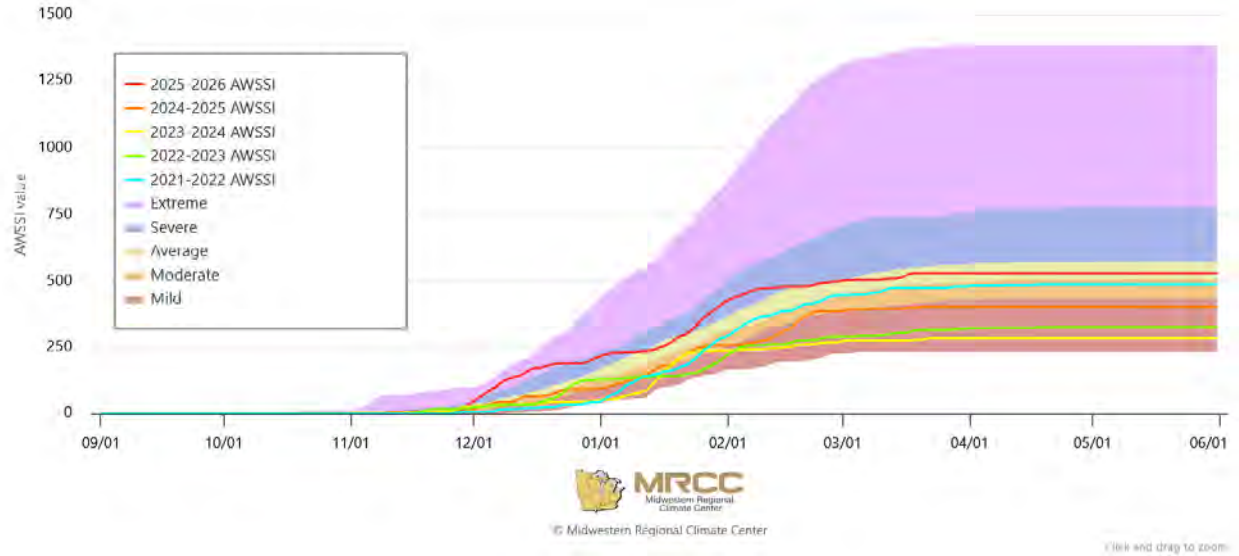


Figure 2: AWSSI Scores, IL – Chicago, 2021-2026



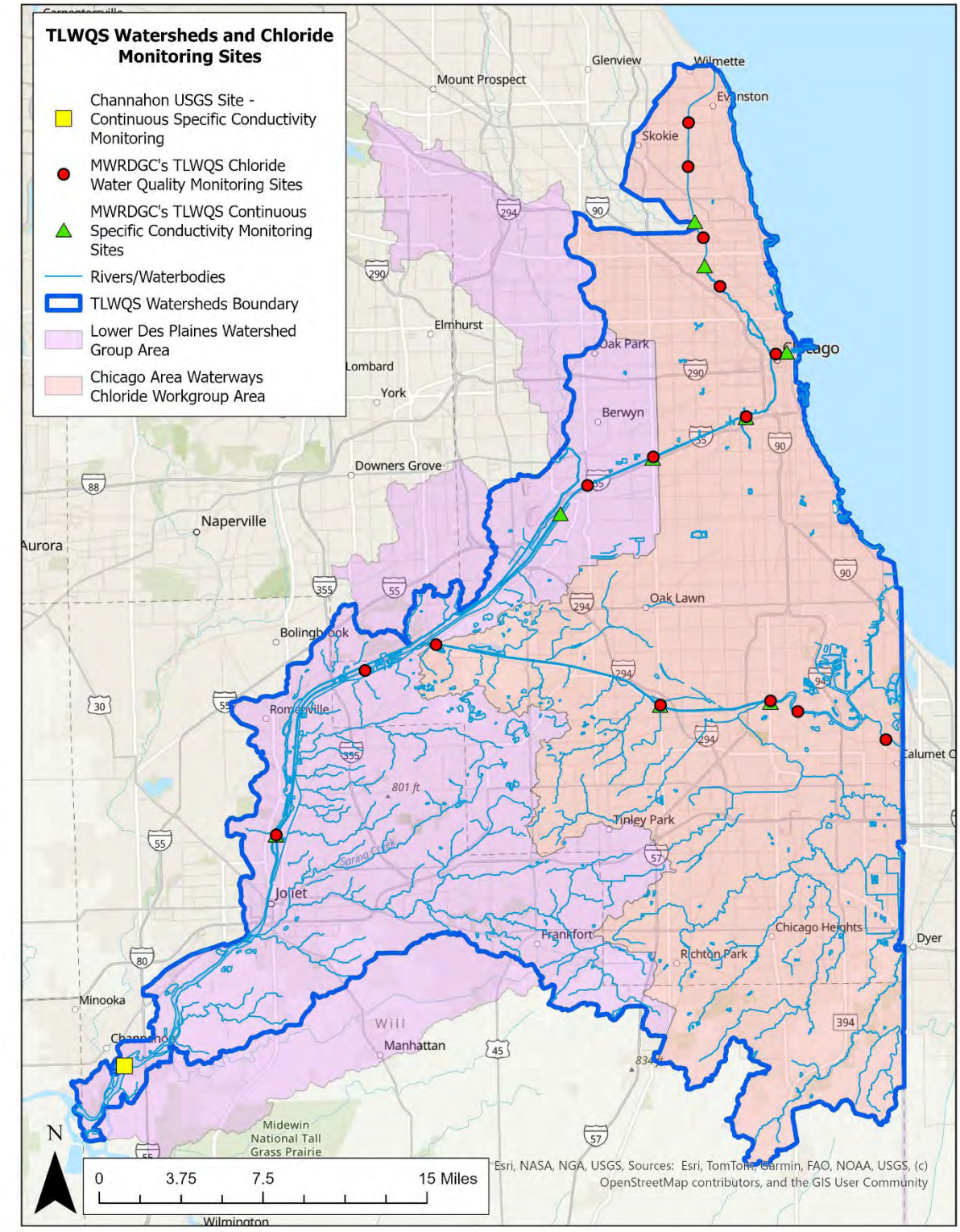
3.2 Chloride Monitoring Data

Chloride data was collected as a requirement of the TLWQS. The chloride monitoring data collected, which included data collected by Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), was both in-stream chloride grab samples to measure chloride concentrations at specific monitoring sites and continuous specific conductivity data used to estimate chloride values[5] based a linear regression model developed for specific sampling locations. Specific conductivity data at US Geological Survey (USGS) station #5539670, Lower Des Plaines River at Channahon was also used with a

[5] Estimated chloride concentrations based on linear regression model from the regressive relationship between specific conductivity and chloride are referred to as "estimated chloride values" throughout this report because they are not in-stream collected grab samples and using this phrasing stays consistent with the chloride monitoring data summary report prepared by the workgroups each year.

linear regression model to estimate chloride values at the base of the Lower Des Plaines River watershed. Current sampling points are shown in Figure 3.

Figure 3: TLWQS chloride monitoring points within the TLWQS watersheds



The average winter chloride concentration at the Lockport Forebay, Chicago Sanitary and Ship Canal (Lockport) was 246mg/L for the December 1 through April 30 period for Years 1-4 (2022-2026). The average estimated chloride value at Channahon, Lower Des Plaines River was 234mg/L for the December 1 through April 30 period for Years 1-4 (2022-2026). This was an approximate 15% decrease in the chloride concentration at Lockport and an approximate 19% decrease in the chloride concentration at Channahon from the HAC/interim criterion reference period average winter chloride concentration of 289mg/L (for both sites). The average chloride concentration at Lockport is based on in-stream weekly grab samples and the average estimated chloride value at Channahon is based on linear regression modeling for chloride and specific conductivity to estimate chloride values using the LPRCW_03 formula from the Huff & Huff study submitted with the TLWQS Joint Petition. Graphs of the chloride concentration (mg/L) at Lockport and estimated chloride value (mg/L) at Channahon are presented in Figures 4 and 5 respectively.

Figure 4: Chloride concentration (mg/L) at Lockport Forebay, Chicago Sanitary and Ship Canal from May 1, 2022 through April 30, 2026

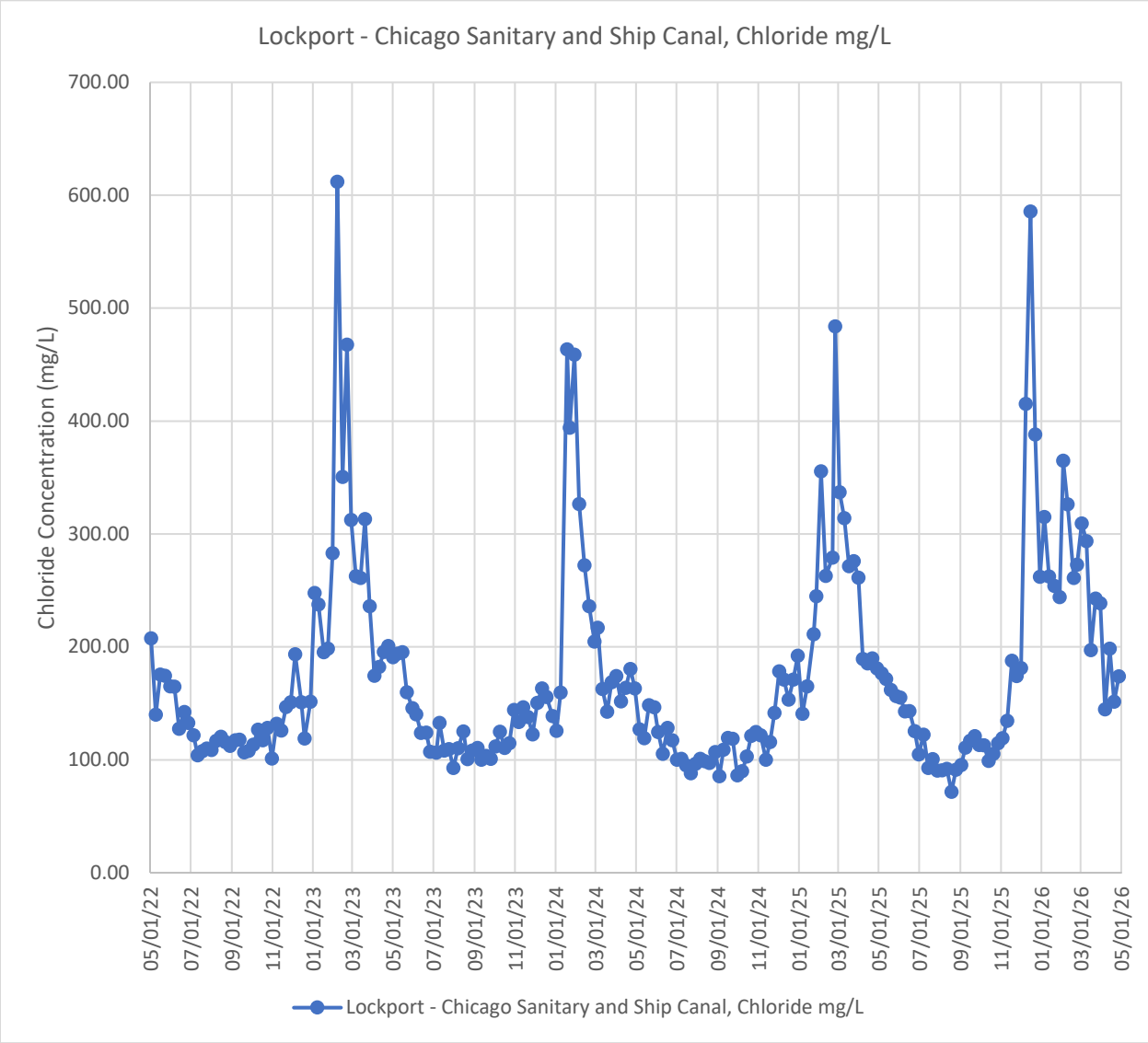
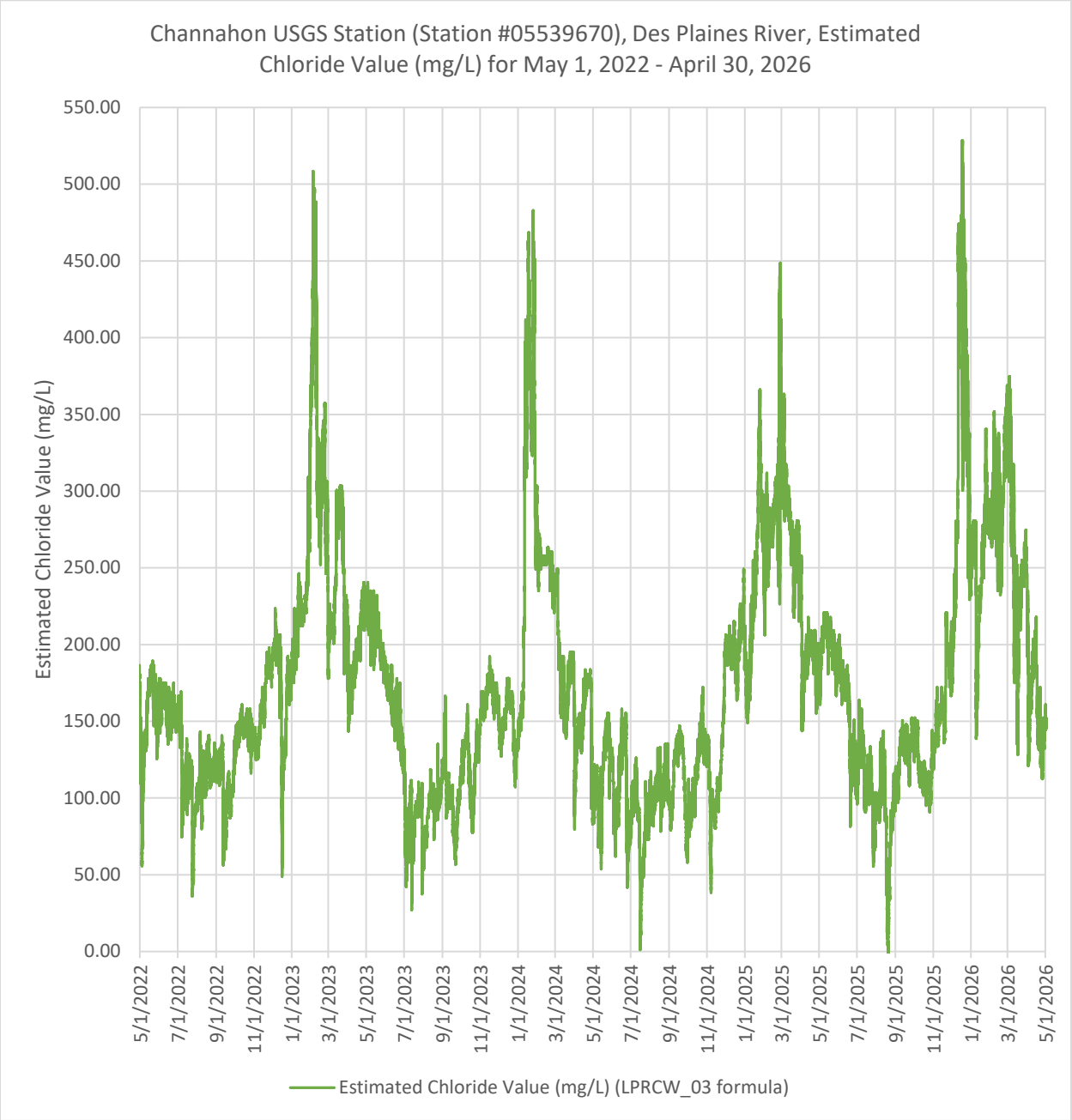


Figure 5: Estimated Chloride Value (mg/L) for Channahon USGS Station #05539670 for May 1, 2022 through April 30, 2026.



Chloride monitoring data including in-stream grab samples and estimated chloride values based on linear regression modeling for chloride and specific conductivity for designated monitoring sites within the TLWQS watersheds are presented in Figures 6 and 7, respectively. This data was collected and shared with the CAWCW and LDWG by MWRDGC as part of the requirements of the TLWQS.

Figure 6: Chloride Concentrations (mg/L) at MWRDGC TLWQS In-Stream Grab Sample Sites. In-stream grab samples at these are collected on a monthly basis.

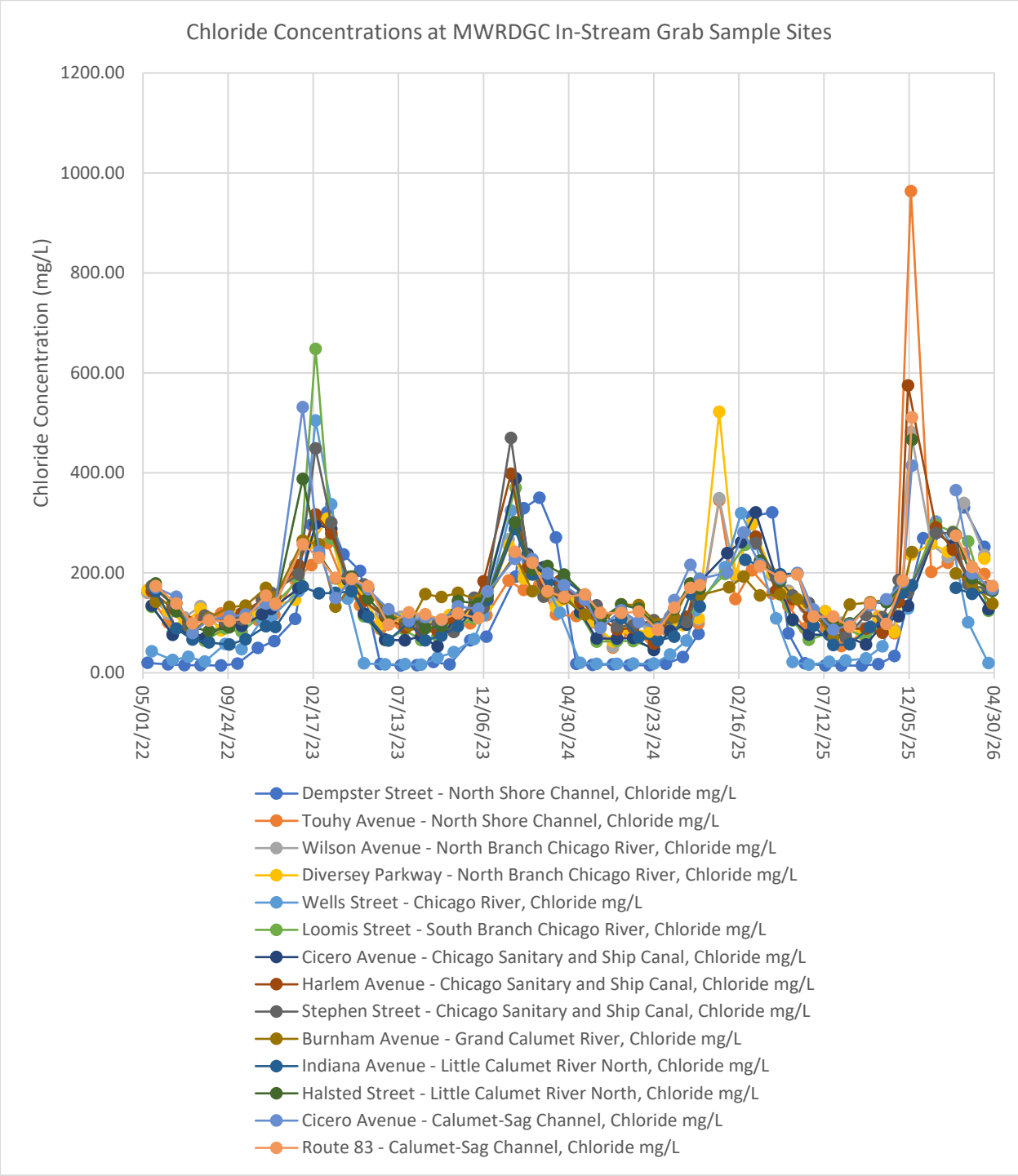
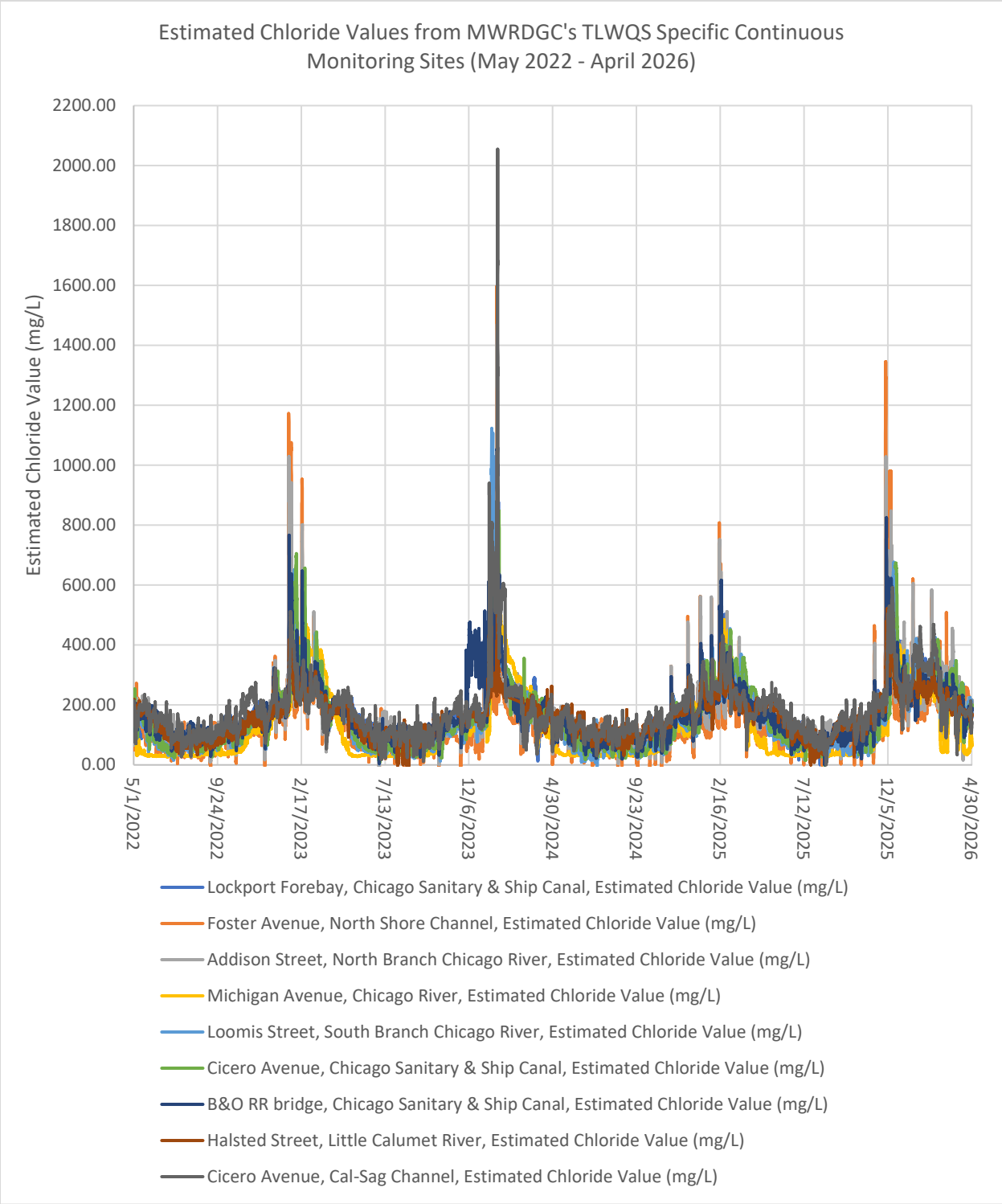
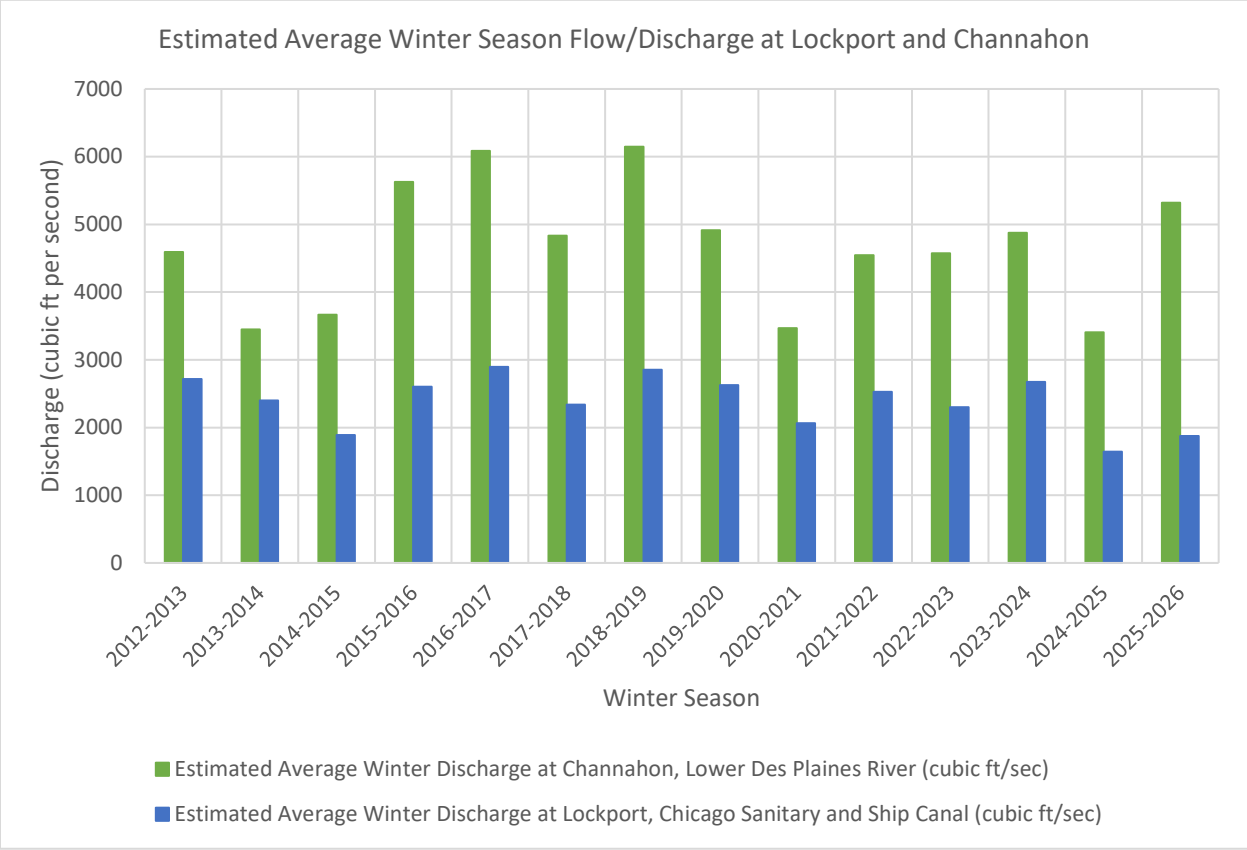


Figure 7: Estimated Chloride Values from MWRDGC's TLWQS Specific Continuous Monitoring Sites (May 2022 - April 2026). Specific conductivity data is collected as micro siemens per centimeter (µS/cm) and converted to chloride mg/L as estimated values.



Using the nearest USGS gauges to the Lockport and Channahon monitoring sites that have discharge data in cubic feet per second (Chicago Sanitary and Ship Canal NR Lemont, IL – USGS #05536890, Des Plaines River at Route 53 at Joliet, IL – USGS #05537980, Hickory Creek at Joliet, IL – USGS #05539000, and DuPage River at Shorewood, IL – USGS #05540500), discharge data was obtained and flow was estimated for Lockport and Channahon. Estimated average winter discharge data is presented in Figure 8.

Figure 8: Graph of Estimated Discharge data for Lockport and Channahon



At Lockport, comparing the HAC/interim criterion reference period (2012-2017) to TLWQS Years 1-4 (2022-2026), the average winter season flows were higher during the HAC/interim criterion reference period than TLWQS Years 1-4. At Channahon, comparing the HAC/interim criterion reference period (2012-2017) to TLWQS Years 1-4 (2022-2026), the average winter season flows were higher during the HAC/interim criterion reference period than TLWQS Years 1-4.

3.3 Estimated Chloride Loadings for TLWQS Watershed

The CAWCW and LDWG contracted with LimnoTech to help with estimated chloride loading calculations. Two methods were used to calculate the estimated chloride loadings, multiplying winter harmonic mean flow by winter season average chloride concentration (harmonic mean method) and multiplying daily average flow by daily average estimated chloride values and summing daily loads over the winter season (daily average method). The daily average method is the preferred method as it provides a more robust method of calculating loads compared to using seasonal averages.

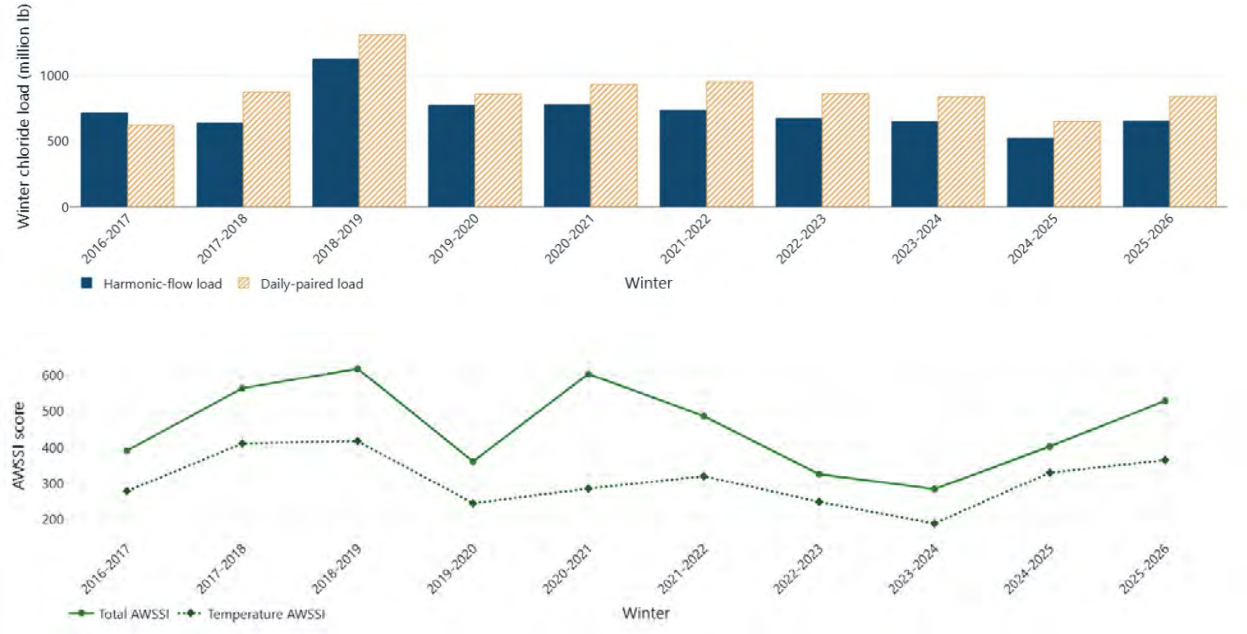
Graphs of the estimated chloride loadings at Lockport are included in Figure 9 and estimated chloride loadings at Channahon are included in Figure 10, respectively. Included in the figures are AWSSI scores and AWSSI temperature subscores by winter season.

Figure 9: Estimated chloride loadings in pounds at Lockport, Chicago Sanitary and Ship Canal, from 2011 to 2026 with AWSSI scores and AWSSI temperature subscores.[6]



[6] LimnoTech Memorandum Report, September 2026, Figure 8. Attached as Appendix B.

Figure 10: Estimated chloride loadings in pounds at Channahon, Lower Des Plaines River, from 2016 to 2026 with AWSSI scores and AWSSI temperature subscores.[7]



Comparing the estimated chloride loading information across the winter seasons shows a decrease in total chloride mass at both Lockport and Channahon. Directly comparing the original reference period used to establish the HAC/interim criterion to the TLWQS Years 1-4, shows a downward trend in total chloride loading.

The average estimated loading using the harmonic mean method from 2012-2013 through 2016-2017 was approximately 455,900,000 pounds; and the average estimated loading from 2022-2023 (TLWQS Year 1) through 2025-2026 (TLWQS Year 4) using the harmonic mean method was approximately 307,050,000 pounds at Lockport. This represents a 32.6% decrease in estimated chloride loadings. Comparing winter season 2012-2013 to 2024-2025 (TLWQS Year 3) where the AWSSI score was similar (439 vs 403), total estimated chloride loadings at Lockport decreased by approximately 172,900,000 pounds or approximately 43.8%. At Channahon, the total estimated chloride loadings using the daily average method decreased by approximately 33,100,000 pounds or approximately 3.8% from winter 2017-2018 to winter 2025-2026 (TLWQS Year 4).

Comparing estimated chloride loadings from TLWQS Year 1 to TLWQS Year 4 at Lockport using the daily average method, shows a decrease of approximately 97,600,000 pounds or approximately a 20.9% decrease. At Channahon, the estimated chloride loadings using the daily average method decreased by approximately 21,100,000 pounds or approximately an 2.4% decrease from TLWQS Year 1 to TLWQS Year 4. This decrease in estimated chloride loadings occurred despite TLWQS Year 1 winter being less severe than TLWQS Year 4 winter (when chloride use would be expected to be higher due to winter severity).

[7] LimnoTech Memorandum Report, September 2026, Figure 9. Attached as Appendix B.

3.4 Estimated Chloride Loadings and Chloride Monitoring Data Evaluation for TLWQS HAC/Interim Criterion Compliance

The CAWCW and LDWG contracted LimnoTech to evaluate compliance with the HAC/interim criterion and evaluate the chloride monitoring data in conjunction with weather severity as measured by the AWSSI score and chloride loading using discharge/flow data obtained from USGS sites located closest to Lockport and the USGS Station at Channahon (which does not provide discharge data). LimnoTech prepared a memorandum report of their analysis, conclusions, and recommendations. A full copy of the memorandum report from LimnoTech is included as Appendix B.

LimnoTech evaluated the ambient chloride concentration data against the AWSSI scores and identified a direct relationship. During more severe winters, average winter chloride concentrations were higher and during milder winters, average winter chloride concentrations were lower.[8] LimnoTech identified that winter chloride concentrations continue to be highly variable when compared between the HAC/interim criterion reference period and TLWQS Years 1-4 in terms of variability.[9] During the winter months of TLWQS years 1-4, chloride concentrations continue to exceed the current chloride water quality standard of 500 mg/L but exceedances declined during the TLWQS Years 1-4 relative to the HAC/interim criterion reference period[10]. However, the winters of TLWQS Years 1-4 were less severe than the HAC/interim criterion reference period. Winter severity is outside the TLWQS permittees control but does strongly influence chloride concentrations within the TLWQS watersheds.

Evaluating the estimated chloride loading data against winter severity shows that total estimated chloride loading is decreasing over time against a background of winter weather variability. It is important to consider that BMP implementation prior to the TLWQS is less well documented and that organizations very likely have been implementing some number of BMPs for chloride and road salt reduction in their operations prior to the TLWQS. Differences in BMP adoption prior to the TLWQS, may lead to differences in chloride reduction possibilities. The estimated chloride loading data at both Lockport and Channahon suggests that TLWQS BMP implementation may have a direct impact on reducing the estimated chloride loading within the TLWQS watersheds. Collectively, these results indicate progress toward reducing chloride loading and achieving watershed improvement goals.

LimnoTech evaluated the chloride loading data against winter weather variability through the AWSSI data. In winters with higher flows due to increased precipitation (not only snow amounts) and lower temperature subscores, which indicates warmer temperatures, chloride concentrations were typically lower. With continued winter variability, chloride loading will continue to fluctuate. LimnoTech identified that even in years with low percentage of exceedances, or no exceedances, of the 500mg/L water quality standard for chloride, winter chloride loadings may still have been above average due to higher-than-average winter flows. Chloride concentrations should remain the main metric to gauge improved water quality conditions for the TLWQS.

Even though the average winter chloride concentrations for TLWQS Years 1-4, averaged over the four winter seasons, of 246mg/L at Lockport and 234mg/L at Channahon were below the HAC/interim criterion of 280mg/L, it is recommended to continue with the 280mg/L HAC/interim criterion for TLWQS for Years 6-10. The mild winters of TLWQS Years 1-4 (2022-2026) were not an opportunity to evaluate

[8] LimnoTech Memorandum Report, September 2026, Figure 7. Attached as Appendix B.
[9] LimnoTech Memorandum Report, September, Figure 4. Attached as Appendix B.
[10] LimnoTech Memorandum Report, September 2026, Figure 1. Attached as Appendix B.

the chloride concentration reduction from the TLWQS BMPs against the previous conditions in the HAC/interim condition period of 2012-2017. This conclusion is based on chloride concentration variability analysis, unknown future winter conditions that will include more severe winters, and winter weather severity variability.

4.0 Chloride Sampling Plan Evaluation

Based on the chloride data collected and analysis discussed in Section 3 of this re-evaluation report, the main stems of the TLWQS watersheds are well covered by existing in-stream winter chloride sampling and continuous specific conductivity monitoring sites. The data collected allowed for a re-evaluation of the HAC/interim criterion at the identified sites at the base of the TLWQS watersheds. Current sampling points are shown in Figure 1.

The CAWCW and LDWG have identified gaps in the tributaries to the main stems of the TLWQS watersheds that would benefit future TLWQS re-evaluation efforts. The tributaries identified for expanded sampling in the next five-years of the TLWQS are Hickory Creek, Marley Creek, and Long Run Creek in the Lower Des Plaines River watershed and Thorn Creek in the Chicago Area Waterways System (CAWS) watershed. These tributaries were identified because current TLWQS permittees are located within these tributary sub-watersheds; and it would allow for any winter chloride long term trends to be identified going forward in TLWQS Years 6-10.

Six total sites will be identified between the Lower Des Plaines River watershed and the CAWS watershed. These will consist of one site to be identified on Hickory Creek, Marley Creek, and Long Run Creek in the Lower Des Plaines River watershed and three sites will be identified on Thorn Creek in the CAWS watershed. Sites will be chosen to provide for a range of urban and rural conditions within the TLWQS watershed. Each identified site will have a specific conductivity probe installed and chloride grab samples will be collected to establish a chloride regression model at each site to allow for continuous chloride monitoring during the December through April winter period of the TLWQS.

5.0 Evaluation of Best Management Practices

The purpose of implementing the required TLWQS BMPs is to reduce chloride impacts on the CAWS and LDPR watersheds. TLWQS Permittees have reported their progress to the workgroups on meeting the required BMPs by submitting Annual Reports.

Based on the annual reports, after the first year (2022-2023) permittees were implementing an average of 85% of the BMPs; and by the end of the fourth year (2025-2026) permittees were implementing an average 92% of the BMPs with 19 of the TLWQS permittees implementing 100% of the BMPs. From TLWQS Year 1 to TLWQS Year 3, BMP implementation resulted in approximately an 8.5% decrease in total salt use over three similarly mild winters per the AWSSI scores. Salt use did increase in TLWQS Year 4 due to more severe winter conditions compared to the previous three years.

Most of the required BMP impediments reported by TLWQS permittees fell into two main categories: equipment supply chain issues or budgetary. Ten TLWQS permittees reported supply chain problems that resulted in challenges to obtain new or replacement equipment. Ten TLWQS permittees reported

that budget or equipment expenses were an impediment to making capital purchases. Additionally, two permittees reported needing board approval to make purchases and one of the two permittees has not yet been successful in obtaining the approval for the purchases they needed to make but will continue to request funding.

The following sections provide an evaluation of the current BMPs and proposed updates with modifications to the BMPs to improve implementation. Included as Appendix C is a complete table of the proposed updates to the BMPs with adjusted numbers/letters based on the proposed updates.

5.1 Evaluation and Proposed Updates Improve Implementation of Currently Required BMPs for the TLWQS for POTWs, Industrial Sources, CSO Communities, MS4 Communities, and IDOT/Tollway

BMP #1: Applies to POTW, IS, CSO, MS4, IDOT/Tollway

1. *The permittee must participate in a chlorides workgroup for the CAWS or LDPR, depending on the watershed within which the facility's discharge is located.*

The two workgroups, CAWCW and LDWG, coordinate closely to ensure that there is a joint approach to coordinating the chloride reduction efforts across the CAWS and Lower Des Plaines River Watersheds. CAWCW meetings are attended by both CAWCW and LDWG members to facilitate an open dialogue between all TLWQS permittees and share chloride reduction knowledge between all workgroup members. TLWQS information is distributed at LDWG meetings for those unable to attend the CAWCW meetings. Workgroup meetings also support members by providing a space for questions or discussion regarding BMP implementation.

Recommendation: Keep as is.

BMP #2 and 3: Applies to POTW, IS, CSO, MS4, IDOT/Tollway

2. *Store all salt on an impermeable pad that must be constructed to ensure that minimal stormwater is coming into contact with salt unless the salt is stored in a container that ensures stormwater does not come into contact with the salt.*
3. *Cover salt piles at all times except when in active use, unless stored indoors.*

Preventing stormwater from coming into contact with salt piles and covering outdoor salt piles reduces salt loss from stormwater contacting the salt piles. Both practices are considered best practices for salt storage. Both practices are well detailed in the Salt Storage Handbook (2015) from the Salt Institute.[11] Clear Roads, a national research consortium focused on rigorous testing of winter maintenance materials, equipment and methods for use by highway maintenance crews, completed a project regarding salt shed design and identified improper salt storage as contributing to negative chloride

[11] Salt Institute, Salt Storage Handbook, 2015. https://www.nwpa.us/uploads/1/2/9/8/129889926/salt-institute-salt-storage-handbook.pdf

impacts on the environment.[12] Similar wording is included in the State's ILR40 permit. Both these BMPs encourage proper salt storage.

Recommendation: Keep as is.

BMP #4: Applies to POTW, IS, CSO, MS4, IDOT/Tollway

4. *Good housekeeping practices must be implemented at the site, including: cleanup of salt at the end of each day or conclusion of a storm event; tarping of trucks for transporting bulk chloride; maintaining the pad and equipment; good practices during loading and unloading cleanup of loading and spreading equipment after each snow/ice event, a written inspection program for storage facility, structures and work area; removing surplus materials from the site when winter activity finished where applicable, annual inspection and repairs completed when practical; evaluate the opportunity to reduce or reuse the wash water.*

Implementing good housekeeping practices are well recognized pollution prevention measures. The practices included in BMP #4 have been implemented by permittees and in some cases were already part of a permittee's practices.

Recommendation: Modify language to clarify and improve implementation. The CAWCW and LDWG recommend modifying the language of the BMP to reduce duplicate measures, clarify what is required of the permittees, and provide a detailed list of practices to improve implementation.

Recommended Update to BMP #4:

4. Good housekeeping practices must be implemented at the site, including:
   A) cleanup of salt at the end of each day or conclusion of a storm event;
   B) tarping of trucks for transporting bulk chloride;
   C) maintaining the pad and equipment;
   D) good practices during loading and unloading;
   E) cleanup of loading and spreading equipment after each snow/ice event and evaluate the opportunity to reduce or reuse the wash water;
   F) a written inspection program for storage facility, structures and work area and complete repairs when practical;
   G) removing surplus materials from the site when winter activity is finished where applicable.

BMP #5: Applies to POTW, IS, CSO, MS4, IDOT/Tollway

5. *Calibrate all salt spreading equipment at least annually before November 30th. Records of the calibration results must be maintained for each piece of spreading equipment.*

Calibration is an important practice to make progress towards reducing salt use. Calibration is well recognized as a way to document and verify how much material is being spread by equipment. It is

[12] Clear Roads Salt Shed Design Template Final Report, Project 20-06, December 2024, Pages 2-4, https://www.clearroads.org/project/20-06/

considered to be an industry accepted best practice. The CAWCW and LDWG have hosted calibration events and calibration mentoring sessions to provide opportunities for workgroup members to learn how to calibrate their equipment.

Recommendation: Keep as is.

BMP #6: Applies to POTW, IS, CSO, MS4, IDOT/Tollway

6. *Pre-wet road salt before use, either by applying liquids to the salt stockpile, or by applying liquids by way of the spreading equipment as the salt is deposited on the road.*

Use of liquids as pre-wetting on the equipment or on the stockpile prior to applying salt to the road or pavement surface allows it to enter solution faster and reduces bounce and scatter. A study done in Michigan demonstrated that using pre-wetted salt can reduce salt loss to bounce and scatter by up to 30%.[13] This means that salt that has been pre-wetted typically stays where it is placed on the pavement surface and application rates can be reduced accordingly. This practice is considered an industry accepted best practice for safe surfaces.

Recommendation: Keep as is.

BMP #7: Applies to POTW, IS, CSO, MS4, IDOT/Tollway and BMP #14: Applies to CSO, MS4, IDOT/Tollway

7. *Use equipment to measure the pavement temperature unless such equipment has already been installed on road salt spreading vehicles.*

14. *Install equipment to measure the pavement temperature on the winter maintenance fleet for a sufficient number of vehicles to provide sufficient information to adjust application rates for the most efficient levels. Develop and complete a plan to equip the winter maintenance fleet before the first re- evaluation.*

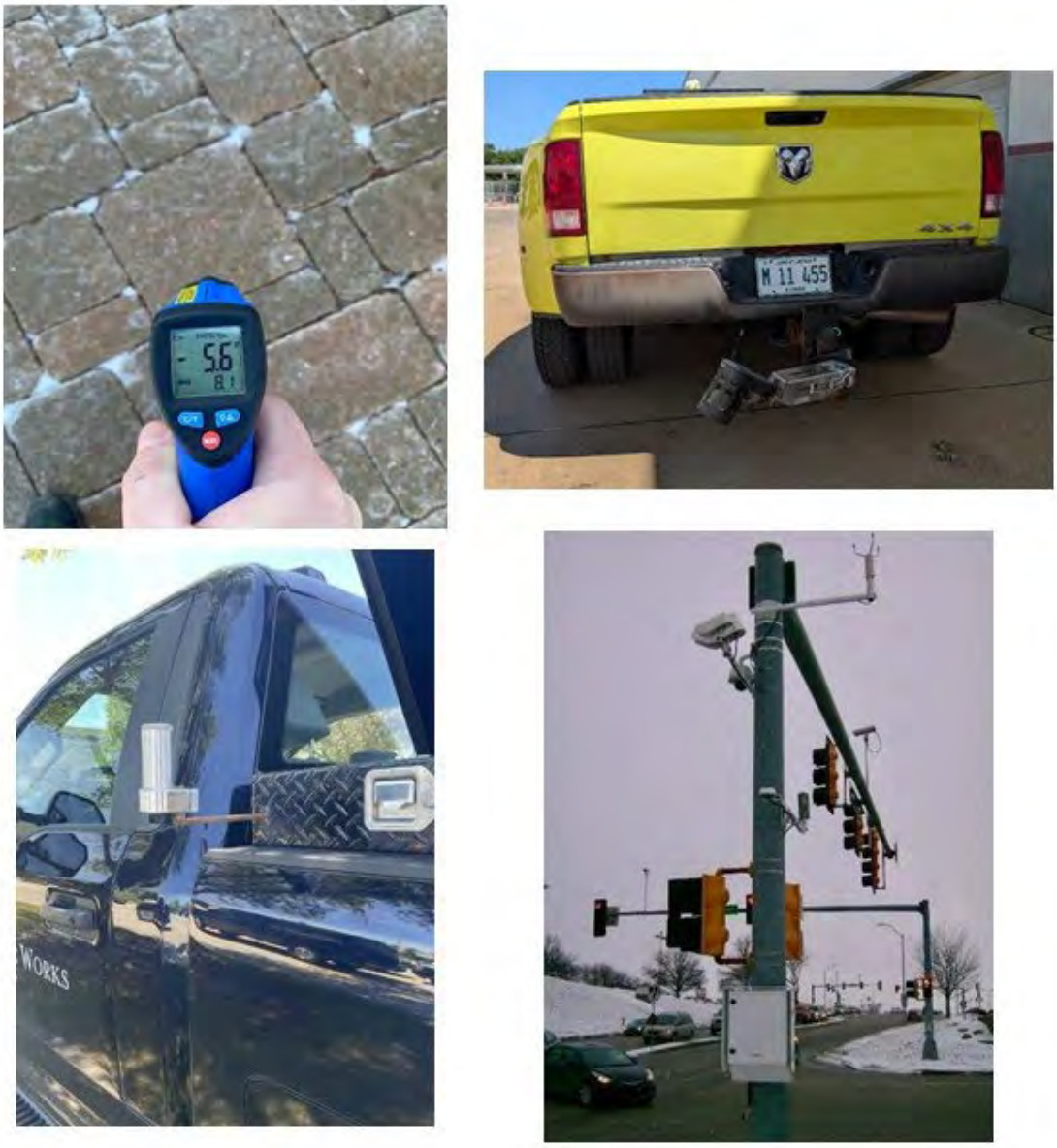
Measuring pavement temperature and basing decisions for both application rates and winter operations strategies are key best practices. By measuring pavement temperature, permittees have the needed information to implement BMP #8 and follow their application rate guidance based on pavement temperature.

Recommendation: Modify BMP #7 and eliminate #14 to improve implementation. There are numerous types of tools to measure pavement temperature and different organizations utilize different methods with success. Pavement temperature tools are not necessarily limited to only what can be installed on a vehicle. There are handheld temperature sensors, pole mounted systems, in-road sensors, and a variety of vehicle mounted options to measure pavement temperature, that are available from a variety of vendors, and have been used by permittees to meet BMP #7 and #14 shown in Figure 11. By allowing options for measuring pavement temperature, implementation will be improved as permittees will be

[13] Michigan DOT, 2012. Salt Bounce and Scatter Study (Project Summary Report). Michigan Department of Transportation.

able to choose from a wider variety of options to gain necessary pavement temperature information and meet their budget and operational needs.

Figure 11: Photos of various methods to measure pavement temperature including a handheld temperature gun (top left), two different styles of truck mounted sensors (top right and bottom left), and a pole mounted system (bottom right) used locally by organizations located in Northeast Illinois.



Recommended Update to BMPs #7, Eliminate BMP #14:

7. Use sufficient equipment to measure and provide the pavement temperature data to guide application rate decisions.

BMP #8: Applies to POTW, IS, CSO, MS4, IDOT/Tollway

8. *Develop and implement a protocol to vary the salt application rate based on pavement temperature, existing weather conditions, and forecasted weather conditions.*

Using application rate guidance based on pavement temperature and pavement weather conditions encourages following the methodology of "using the RIGHT material, for the RIGHT conditions, applied at the RIGHT time, in the RIGHT amount". This continues to encourage organizations to choose materials and application amounts based on actual conditions.

Recommendation: Keep as is.

BMP #9: Applies to POTW, IS, CSO, MS4, IDOT/Tollway

9. *Track and record salt quantity used and storm conditions from each call-out.*

Documenting winter operations creates a record of the actions taken to provide safe surfaces. It also allows organizations to evaluate winter operations and find ways to further improve their operation's salt reduction efforts. This BMP also ensures that organizations will have the information needed to complete their annual report.

Recommendation: Keep as is.

BMP #10: Applies to POTW, IS, CSO, MS4, IDOT/Tollway

10. *Develop a written plan for implementing anti-icing, with milestones. The plan must consider increased use of liquids (e.g., carbohydrate products) beginning with critical locations such as bridges over streams.*

Anti-icing is considered a best management practice for salt reduction by applying a liquid deicer to the pavement surface ahead of winter weather to prevent snow and ice from bonding to the pavement surface.[14] The practice is not recommended for wet conditions as the product is easily washed off the transportation surface. It is difficult to evaluate the effectiveness of this BMP due to the mild, wet winters that occurred during the last permit period. They presented few opportunities for TLWQS permittees to use anti-icing ahead of winter weather. Multiple permittees reported that they did not have opportunities or few opportunities to pilot test or use anti-icing.

Recommendation: Modify to improve implementation. For organizations new to anti-icing, the terminology can be unclear. While the workgroups engaged members in educational opportunities around the practice of anti-icing, several permittees interpreted "anti-icing" as eliminating ice (de-icing), rather than preventing snow from bonding to the pavement. Clear Roads defines anti-icing in their "Liquid Roadway Treatments Technical Reference Guide" as "Anti-Icing: A proactive treatment (sometimes called pretreatment) that involves applying a liquid treatment prior to the onset of a snow

[14] Clear Roads Manual of Best Management Practices for Road Salt in Winter Maintenance, Project 14-10, November 2015, Pages 24-25, https://www.clearroads.org/project/14-10/

event that prevents snow and ice from bonding to the road surface."[15] To improve implementation of the BMP, the workgroups recommend adding clarifying language defining anti-icing. To further improve implementation, the workgroups recommend removing the language "e.g. carbohydrate products". At a municipal level the active freeze point depressant in anti-icing liquid is a chloride, or mix of chlorides, chosen based on pavement temperature conditions. Carbohydrates are sometimes used to increase residency time and may have impacts on ice formation. However, they also increase storage complexity. We argue that rather than reference a specific material type permittees can best choose the materials to use based on pavement weather conditions, storage options and what is available to their organization.

The original BMP required permittees to develop a plan. The workgroups recommend updating this BMP to reflect that most permittees have developed their plans and should now be at the implementation stage if they are not already using anti-icing in their operations. If communities have not yet developed a plan, they are again reminded that they are obliged to do so.

The language "when practical" within the recommended updated language refers to using anti-icing when weather conditions allow for the practice to be most beneficial.

Recommended Update to BMP #10:

10. Implement the written plan developed for implementing anti-icing (pre-treatment of surfaces with liquid deicers ahead of winter weather) when practical. If the plan has not been developed, develop a written plan, with milestones for implementing anti-icing.

BMP #11: Applies to POTW, IS, CSO, MS4, IDOT/Tollway

11. *Provide employees involved in winter maintenance operations with annual training before November 30th on best management practices in the use of road salt in operations, including the practice of plowing first and applying salt only after snow has been cleared.*

Annual training provides an opportunity to educate staff on the best management practices for salt reduction. Because winter operations can be complex, it is important to provide training as a refresher each year to remind staff about how these practices are used within their organization and the benefits of these practices. Training gives an opportunity for organizations to develop staff buy-in on the best practices so that practices implemented are effective. Several permittees have the capacity to provide their own training to their staff on the TLWQS required BMPs, while other permittees choose to use training provided by other organizations. The CAWCW and LDWG worked together with other watershed groups through the Salt Smart Collaborative program to develop trainings that meet the needs of TLWQS permittees while still providing meaningful training to other organizations to encourage region-wide use of salt reduction practices.

[15] Clear Roads Liquid Roadway Treatments Technical Reference Guide, Project 16-06, September 2017, Page 1, https://www.clearroads.org/project/16-06/

Recommendation: Modify to improve implementation. This BMP should reflect that the permittees need to ensure that their training for staff covers BMPs for use in road salt operations rather than including the specific practices listed in the required BMP table that are not BMPs.

Recommended Update to BMP #11:

11. Provide employees involved in winter maintenance operations with annual training before November 30th each year on best management practices in the use of road salt in operations.

BMP #12: Applies to POTW, IS, CSO, MS4, IDOT/Tollway

12. Be responsible for complying with all applicable BMPs even when deicing practices are contracted out and ensure that contractors are properly trained and comply with all applicable BMPs.

While most permittees report that they do not use contractors, there are several permittees who do. The contractors are primarily used for parking lots or sidewalks depending upon the permittee and their operations. The permittees who use contractors report that their contractors are following the BMPs required of the permittee.

Recommendation: Modify clarify language and to improve implementation. To improve implementation of the BMP, the workgroups recommend modifying the BMP language so that all permittees know what is asked of them when using contractors. By simplifying the language, the goal is to make it clear that relevant contractors working for TLWQS permittees are following the applicable and relevant BMPs that are required of the permittees.

Recommended Update to BMP #12:

12. Ensure that relevant contractors are properly trained and comply with all applicable winter deicing BMPs.

BMP #13: Applies to POTW, IS, CSO, MS4, IDOT/Tollway

13. Complete an Annual Report, as required by paragraph 3(B) of this order, which is standardized in an electronic format and submit to the IEPA's website and the watershed group.

Completing an Annual Report and submitting per the requirements of the permit allows for ongoing compliance management. The information provided in the annual reports aids the workgroups in evaluating the BMPs and chloride reduction, as well as providing the workgroups with information regarding barriers to implementation. The workgroups developed templates to standardize permittee annual reporting to make the annual reporting easier for permittees. The workgroups have posted the TLWQS permittee's annual reports to the respective workgroup websites to make the annual reports publicly available.

Recommendation: Modify to improve implementation. The workgroup recommends modifying the language of this BMP to be in line with the submittal requirements of paragraphs 3(B) of the permit and IPCB order by simplifying the wording and to have the same annual reporting language in BMP #13 and BMP F.

Recommended Update to BMP #13:

13. Complete an Annual Report, as required by paragraph 3(B) of this order, standardized in an electronic format and submitted to the IEPA and the watershed group.

BMP #15: Applies to CSO, MS4, IDOT/Tollway

15. *Before the first re- evaluation, develop a method for conducting a post-winter review to identify areas of success and areas in need of improvement. Items to be completed as part of the review must include, but are not limited to, an evaluation of each salt spreader's application rate, variations in application rates, and discussion of the variation compared to the recommended rates. Once developed, the review must occur annually in the spring/early summer following each winter season.*

Evaluating operations is key to finding ways to improve operations and improve BMP implementation. It allows organizations to identify areas of success or improvement. As operations are improved to achieve service goals while reducing salt use, environmental benefits may be realized over the long term.

Recommendation: Eliminate. The workgroups recommend that this BMP be eliminated as it is duplicative. The post-winter review is already included in the annual reporting outlined in paragraph 3(B) of the permit and order, which applies broadly across the all permittees and discharger categories. The annual reporting on their progress implementing the BMPs, analyzing their implementation, and outlining next steps for their program in effect encourages all permittees to analyze and optimize their operations which aids them in furthering their salt reduction efforts. The workgroups are committed to encouraging their members and TLWQS permittees to evaluate their operations and reduce their salt use.

BMP #16: Applies to POTW, IS, CSO, MS4, IDOT/Tollway

16. *For working areas, provide berms and or sufficient slope to allow snow melt and stormwater to drain away from the area. If snow melt and stormwater cannot be drained away from the working area, channeling water to a collection point such as a sump, holding tank or lined basin for collection, discharge at a later time, use for prewetting, and use for make-up water for brine must be considered.*

This BMP has been challenging for permittees to implement. It had been included in the TLWQS at the request of IEPA to be consistent with other permits[16]. The IPCB determined that their intent to keep this BMP in was to reduce chloride spikes in the receiving streams.[17]

[16] Illinois Environmental Protection Agency Recommendation (Electronic Filing), April 5, 2019, Page 16 https://pcb.illinois.gov/documents/dsweb/Get/Document-100018

[17] Opinion and Order of the Board by J. Van Wie: Board granted Petitioners' request for a chloride time-limited water quality standard in the Lower Des Plaines River watershed and portions of the Chicago Area Waterway System watershed, November 4, 2021, Pages 36-37, https://pcb.illinois.gov/documents/dsweb/Get/Document-104825

While several permittees report in their annual reports that their facilities have sufficient slope to drain stormwater away from the working area, there has not been an effective solution implemented for this BMP by other permittees.

Working Area Study Discussion

The CAWCW and LDWG developed and completed a study in conjunction with the DuPage River Salt Creek Workgroup (DRSCW) to have empirical data on the amount of salt left following a normal loading and unloading cycle during and following a call out. Because TLWQS permittees are required to follow good housekeeping practices, including clean-up at the end of each day or conclusion of a storm event, use of good housekeeping practices were included.

A case study comparing indoor and outdoor loading and delivery of road salt at a facility in Massachusetts suggested that approximately 0.3% of outdoor delivered or loaded road salt spilled onto pavement and was lost. Switching to indoor delivery and loading, reduced the percentage of spilled salt to 0.06%.[18] It was not clear if good housekeeping practices of cleanup following a loading or delivery event were factored into the case study. Based on the case study results, similar salt loss percentages for outdoor operations from the workgroup study were expected.

Participating organizations in the CAWCW/LDWG/DRSCW study (workgroup study) were asked to perform an additional and highly thorough sweep of the loading and (where relevant) unloading area immediately following their normal good housekeeping practices of cleaning up at the end of a loading/unloading cycle and collect the remaining material. The objective was to capture as much of any rock salt remaining as possible. The analysis period would begin at the loading of the first vehicle and finished at the following of normal cleanup/good housekeeping activities. Participating organizations were also asked to document the size of the working area, how many trucks were loaded or unloaded, how much salt was used for the event, and what cleanup/good housekeeping practices were used. Organizations provided their collected residual material to workgroup staff to be weighed.

Seven organizations participated in the workgroup study, collecting data for a total of eighteen loading and or unloading events. Working areas (loading and unloading areas) ranged from 300 square feet to 5,750 square feet, the number of trucks loaded and unloaded ranged from 8 to 31, and the total amount of salt loaded or unloaded ranged from 2 tons to 1,110 tons. Three collection events also included unloading of delivery trucks of salt. Good housekeeping practices were followed by all organizations and the practices used included using a loader to push material, sweeping with a mechanical broom, sweeping with a hand broom, and/or using a leaf blower to move material back into the salt dome/storage structure. Most organizations reported using multiple forms of clean-up methods. The collected materials ranged in weight from 0.3 pounds to 207.3 pounds with a median of 4.6 pounds. Fourteen out of eighteen collections weighed 9 pounds or less.

For every ton of salt used during an event, the median was 0.029 pounds of salt collected per ton of salt used to deice surfaces. The total amount of materials collected ranged from 0.0001% to 0.1675% of the total amount of salt used per event with the average being 0.0280% of the total used per event. The

[18] Ostendorf, D. W., Hinlein, E. S., and Choi, S., (2012). "Reduced Road Salt Spillage Owing to Indoor Delivery and Loading," J. Environmental Engineering, Vol. 138, Issue No. 2.

total amount of material collected from all collection events included in the workgroup study (429.3 pounds) was 0.0051% of the total amount of salt used/delivered for all the events (4,183.46 tons).

The collection results were normalized to a square footage of working area to 1,000 square feet. The size of 1,000 square feet was chosen as most application rate guidance available for parking lots and sidewalks is published using this metric. The median amount of salt collected per 1,000 square feet of working area was 3.9 pounds (0.0039 pounds per square foot). Using the average number of call outs for a winter season (approximately 17 call outs using the number of call outs reported per winter for each permittee in their TLWQS Annual Reports submitted to the CAWCW and LDWG), the amount of salt left for an entire winter season was estimated and ranged from 6.0 to 3,524.1 pounds. The median amount of salt left following good housekeeping practices would be approximately 82.6 pounds for a winter season.

To put the workgroup study results into perspective several comparisons can be made to published application rate guidance, chloride concentrations in stormwater runoff from a working area, and chloride loadings for the CAWS and Lower Des Plaines River.

Based on parking lot and sidewalk deicer application rate guidance for Illinois published by the DRSCW[19] and the Salt Smart Collaborative[20], the application rates range from 3 pounds per 1,000 square feet (pavement temperature of greater than 30°F) to 8 pounds per 1,000 square feet (pavement temperature of 5°F to 15°F). Comparing the median value from the working study of 3.9 pounds per 1,000 square feet to the application rate guidance, the median amount of material remaining falls into the low range of these application rate guidance documents. The largest amount of material collected during a single event in the workgroup study, 207.3 pounds, is comparable to what an organization would use to treat a lane mile of road depending upon the pavement conditions and application method following application rates published by Wisconsin Salt Wise (a coalition of organizations working together to reduce salt pollution in Wisconsin lakes, streams, and drinking water)[21] and by the Minnesota Pollution Control Agency in their Smart Salting for Roads Manual[22].

Pre-filed testimony for the February 18, 2020 hearing from Cook County Department of Transportation and Highways, included estimated water runoff volumes produced for a 0.7-acre drainage site for a 2-year and 10-year, 12-hour storm ranging from 50,916 to 80,671 gallons.[23] Estimated remaining salt after following good housekeeping practices for a site of 0.7 acres, using the median value of 0.0039 pounds of salt per square foot from the workgroup study, would be approximately 118.8 pounds of salt. This would equate to an estimated chloride concentration of 105.9mg/L to 167.8mg/L in the volume of water

[19] DuPage River Salt Creek Workgroup, Parking Lot Deicing Salt Application Rate Guidance, https://www.drscw.org/wp-content/uploads/2019/01/DRSCW-Parking-Lot-Salt-Guidance-Document-v2-Front.jpg
[20] Salt Smart Collaborative, Application Rates, https://saltsmart.org/resources/application-rates/
[21] Wisconsin Salt Wise, Deicing Application Rates, https://www.wisaltwise.com/documents/Road-Deicing-Application-Rate-Chart--1-.pdf
[22] Minnesota Pollution Control Agency, Smart Salting for Roads Manual, 2023, Pages 60-65, https://www.pca.state.mn.us/sites/default/files/p-tr1-13.pdf
[23] Pre-Filed Testimony of Adam James on Behalf of Petitioner Cook County Department of Transportation and Highways (electronic filing), January 17, 2020, Page 4, https://pcb.illinois.gov/documents/dsweb/Get/Document-101697

collected as runoff in the Cook County DOTH example (50,916 to 80,671 gallons). This is below the Illinois Water Quality Standard for Chloride of 500mg/L.

Extrapolating the percentage of total material collected across all collection events (0.0051%) to the total amount of salt used as reported in Year 4 of the TLWQS Annual Reports from all permittees submitting an annual report to the CAWCW and LDWG of 474,521.97 tons of salt, approximately a total of 24.35 tons of salt (or approximately 14.61 tons of chloride) would be left on working areas following good housekeeping practices for an entire winter season. This amount of material would reflect approximately 0.003% of the average estimated chloride loading during the winter months of the HAC/interim criterion reference period (2012-2017) at Lockport, approximately 0.007% of the average estimated chloride loading during the winter months of TLWQS Years 1-4 (2022-2026) at Lockport, approximately 0.002% of the average estimated chloride loading during the winter months of 2017-2018 at Channahon, and approximately 0.004% of average estimated chloride loading during the winter months of TLWQS Years 1-4 (2022-2026). Reducing these percentages to zero by capturing and containing the runoff water would not have a detectable impact on chloride concentrations in the TLWQS watersheds.

Applying Regression Analysis to the Working Area Study Data

The data collected during the study (salt weight in lbs. at pickup, working area in ft^2, and number of vehicles used since the last housekeeping sweep) was subjected to a multiple linear regression analysis. The results showed that the only independent variable with significant explanatory value was working area size (see Table 4 and Figure 11), which explained 64% of the variance in weight (54% when adjusted for the number of predictors relative to sample size).

Table 4: P values and R^2 for independent variables

Individual Predictor Significance

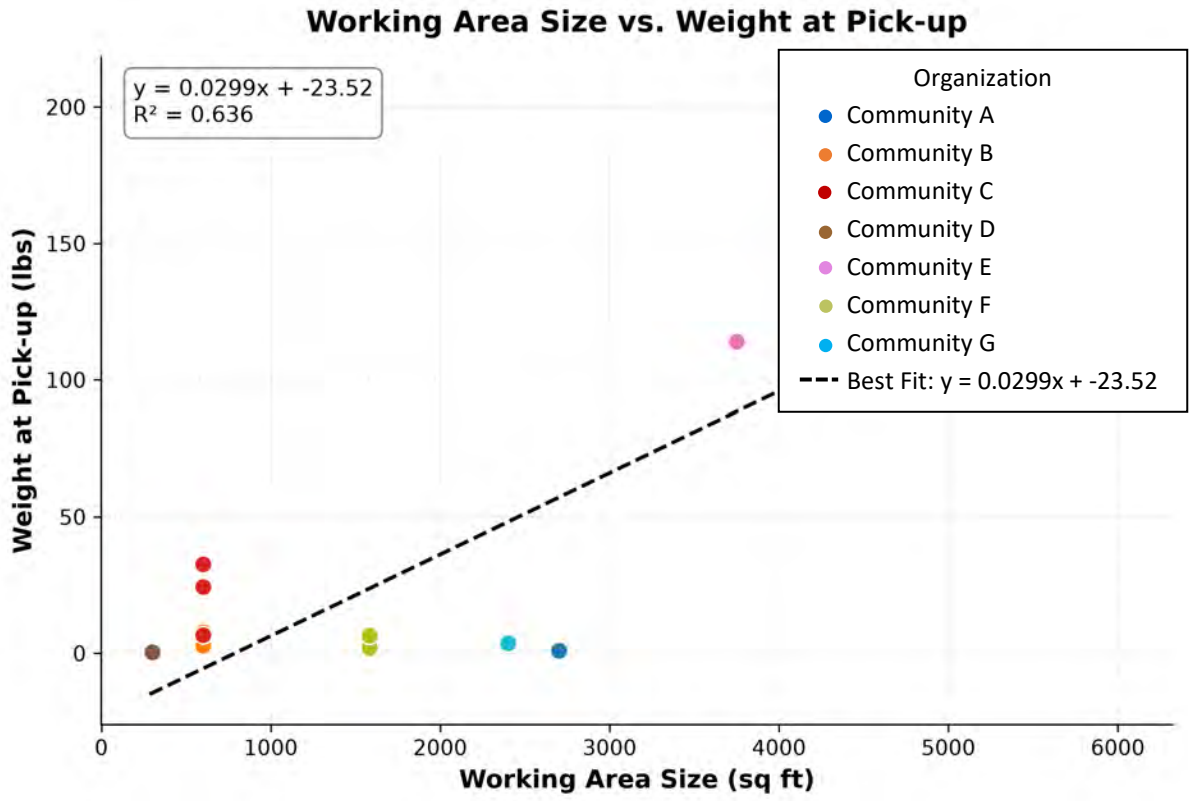
Variable	Coefficient	p-value	Significant?	R^2 (individual)
Working Area Size (sq ft)	+0.0308	0.0013	Significant	0.6364
Salt Used for Event (tons)	+0.0202	0.6982	Not significant	0.0339
Number of Trucks	-0.1998	0.7623	Not significant	0.0019
Model R^2 (all 3 predictors)	0.6416			
Adjusted R^2	0.5439			

This result suggests several conclusions:

- Good housekeeping is effective – This is demonstrated by the inability of total volume of salt loaded and total number of trucks in the sample to have explanatory power. Both variables would result in an increased amount of salt on the surface prior to the housekeeping sweep. However, good housekeeping practices nullified this effect.
- Importance of surface area: That loading/unloading surface area size proved important was not a surprise: the more area there is from which to collect residual (weight at pickup), the larger the residual weight is likely to be. The study assumes that salt dropped during loading/unloading is

confined to the loading/unloading area, so the residual salt per unit area will be higher there than in other areas of the yard. The study could be expanded to test this assumption by also sweeping up residue outside the loading/unloading area and comparing the results. If the results were found to be consistent with expectation (unit area residual load higher in the loading/unloading area than outside of it), than investigating shrinking the loading area may be useful.

Figure 12: Working area size and weight at pick up. The outlier for Community E is clearly visible in the graphic. The Workgroup is working with Community E to explain the difference.



Limitations of Regression Analysis

This result should be treated as preliminary. With only 15 observations and three predictors, the model has limited statistical power, and sensitivity testing confirms it is highly dependent on a small number of high-leverage observations. Excluding the two Community E events from the analysis reduces the model's explanatory power from 64% to approximately 21% and the working area size coefficient loses statistical significance entirely ($p = 0.23$ vs. $p = 0.001$ in the full model). Excluding only the single largest Community E event produces the same result.

Unlike a typical small-sample concern, this sensitivity does not appear to be simply a matter of needing more data points. The loading observed at Community E is unusually large relative to every other site in the study, and this magnitude is likely a site-specific characteristic rather than a pattern that would be expected to average out or replicate as the sample size grows. Until the cause of the Community E discrepancy is understood (see Figure 11), the relationship between working area size and pickup weight

should be considered provisional, and any operational decisions based on it should be weighed accordingly.

Recommendation: Modify to improve implementation. Based on the working area study, the CAWCW and LDWG are of the opinion that the effort and money to collect water from working areas will not have a positive impact on chloride reduction. With working area size being the most statistically significant factor to how much salt was collected from working areas following good housekeeping practices after a winter event, the CAWCW and LDWG recommend modifying the BMP to encourage a review of working area size loading and unloading practices to reduce salt spillage. The modifications to the BMP should improve implementation across the permittees while meeting the goal of reducing chlorides in runoff from working areas.

Recommended Update to BMP #16 with updated BMP number:

14. For working areas, review and adjust spreading equipment loading and unloading operations to reduce salt spillage and where feasible reduce the working area size.

BMP #17: Applies to POTW, IS, CSO, MS4, IDOT/Tollway

17. Obtain and put into place equipment necessary to implement all salt spreading/deicing measure specified in this BMP, such as any new or retrofitted salt spreading equipment necessary to allow for pre- wetting and proper rates of application.

Recommendation and Discussion: Modify to Improve Implementation and Clarify language. The original intent for this BMP by IEPA was to require dischargers to obtain equipment necessary to implement the other BMPs. The current wording of this BMP is not clear as it references "all salt spreading/deicing measure specified in this BMP" but there are no measures specified in the BMP. To improve implementation by permittees, the workgroups recommend that the language be updated to reflect implementation based on the BMPs that are specific to the table of BMPs required by discharger category.

Recommended Update to BMP #17 with updated BMP number:

15. Assess the need for new or retrofitting of existing equipment to implement all BMPs specified in this table as required by the permittee's discharger category.

BMP #18: Applies to CSO, MS4

18. Use deicing material storage structures for all communities covered under General Permit ILR40 for MS4 communities.

As included above for BMP #2 and BMP #3, providing proper salt storage protects salt from stormwater runoff. This practice is well detailed in the Salt Storage Handbook (2015) from the Salt Institute.[24] Clear Roads completed a project regarding salt shed design and identified improper salt storage as

[24] Salt Institute, Salt Storage Handbook, 2015. https://www.nwpa.us/uploads/1/2/9/8/129889926/salt-institute-salt-storage-handbook.pdf

contributing to negative chloride impacts on the environment.[25] Covering salt piles under permanent cover ensures proper storage of salt.

Recommendation: Eliminate. This BMP is already a permit requirement in the General NPDES Permit ILR40 for MS4 communities and for MS4 and CSO communities covered under the TLWQS. Per the November 4, 2021 TLWQS Opinion and Order they were required to use permanent salt storage by March 1, 2018[26]. The MS4 and CSO permittees should already be complying with their other NPDES permit requirements and including this BMP is redundant.

5.2 Evaluation and Proposed Updates to Improve Implementation of Currently Required BMPs for the TLWQS for Salt Storage Facilities

BMP A, B, C, and I: Applies to SSF

A. All salt will be stored on an impermeable pad constructed to ensure that minimal stormwater comes into contact with salt.

B. Pads will be constructed to direct stormwater away from the salt pile. The permittee must consider directing any drainage that enters the pad to a collection point where feasible.

C. Outdoor salt piles not stored under permanent cover must be covered by well-secured tarps at all times except when in active use. While working on the pile, fixed or mobile berms must be incorporated around non- working face to minimize stormwater contact. The permittee must stage tarp when starting final lift and tarp over the edge of the berm/pad where possible.

I. The Permittee must make use of fixed and mobile berms where appropriate to redirect flow and tarp over the edge of the pad where possible to minimize stormwater contact.

As detailed above for BMP #2 and #3, preventing stormwater from coming into contact with salt reduces salt loss from the pile and covering salt piles not stored indoors prevents stormwater from contacting the pile. These practices are considered best practices for bulk salt storage. Storing salt on an impermeable pad also prevents salt from infiltrating groundwater. Using fixed or mobile berms also reduces stormwater runoff through the salt pile and re-directs stormwater. These practices are well detailed in the Salt Storage Handbook (2015) from the Salt Institute for bulk or large stockpiles.[27] These BMPs encourage proper salt storage for large scale salt stockpiles that prevent salt laden runoff.

Recommendation: Keep as is and update BMP I letter designation to BMP H.

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[25] Clear Roads Salt Shed Design Template Final Report, Project 20-06, December 2024, Pages 2-4, https://www.clearroads.org/project/20-06/

[26] Opinion and Order of the Board by J. Van Wie: Board granted Petitioners' request for a chloride time-limited water quality standard in the Lower Des Plaines River watershed and portions of the Chicago Area Waterway System watershed, November 4, 2021, Page 40, https://pcb.illinois.gov/documents/dsweb/Get/Document-104825

[27] Salt Institute, Salt Storage Handbook, 2015. Page 17, https://www.nwpa.us/uploads/1/2/9/8/129889926/salt-institute-salt-storage-handbook.pdf

BMP D: Applies to SSF

D. Good housekeeping practices must be implemented at the site, including cleanup of salt at the end of each day or conclusion of a storm event; tarping of trucks for transporting bulk chloride; maintaining the pad and equipment; good practices during loading and unloading cleanup of loading and spreading equipment after each snow/ice event, a written inspection program for storage facility, structures and work area; finished where applicable, annual inspection and repairs completed when practical; evaluate the opportunity to reduce or reuse the wash water.

Implementing good housekeeping practices are well recognized as pollution prevention measures. The practices included in this BMP minimize the potential for salt mobilization and reduce impacts to stormwater.

Recommendation: Modify language to clarify. The workgroups recommend modifying the language of the BMP to reduce duplicate measures, clarify what is required of the permittees, and separate the list of practices to improve implementation.

Recommended Update to BMP D:

D. Good housekeeping practices must be implemented at the site, including:
A) cleanup of salt at the end of each day;
B) tarping of trucks for transporting bulk chloride;
C) maintaining the pad and equipment;
D) good practices during loading and unloading;
E) cleanup of equipment as needed using dry clean-up methods when possible and evaluate the opportunity to reduce or reuse any wash water;
F) a written inspection program for storage facility, structures and work area and complete repairs when practical.

BMP E: Applies to SSF

E. Annual training must be conducted for employees responsible for loading/unloading/handling at docks and trucks at the facility.

Annual training provides an opportunity to educate staff on the best management practices for salt reduction. Because operations can be complex, it is important to provide training as a refresher each year to remind staff about how these practices are used within their organization and the benefits of these practices. Training gives an opportunity for organizations to develop staff buy-in on the best practices so that practices implemented are effective.

Recommendation: Keep as is.

BMP F: Applies to SSF

F. An Annual Report must be completed as required by paragraph 3(B) of this order. The report must be standardized in excel, and must be submitted to the IEPA and to the watershed group.

Completing an Annual Report and submitting per the requirements of the permit allows for ongoing compliance management. The information provided in the annual reports aids the workgroups in evaluating the BMPs and chloride reduction efforts being made by the permittees as well as providing the workgroups with information regarding barriers or challenges to implementation. The workgroups developed templates to standardize permittee annual reporting and to make the annual reporting easier for permittees. The workgroups have posted the TLWQS permittee's annual reports to the respective workgroup websites to make the annual reports publicly available.

Recommendation: Modify to improve implementation. The workgroup recommends modifying the language of this BMP to be in line with the submittal requirements of the permit and IPCB order by simplifying the wording and having the same annual reporting language in BMP #13 and BMP F.

Recommended Update to BMP F:

F. Complete an Annual Report, as required by paragraph 3(B) of this order, standardized in an electronic format and submitted to the IEPA and the watershed group.

BMP G: Applies to SSF

G. The Permittee must participate in a Chlorides workgroup for the CAWS or LDPR, depending on the watershed within which the facility's discharge is located.

Both workgroups, CAWCW and LDWG, coordinate closely to ensure that there is a joint approach to the chloride reduction efforts across the CAWS and Lower Des Plaines River watersheds. CAWCW meetings are attended by both CAWCW and LDWG members to facilitate an open dialogue between all TLWQS permittees and share chloride reduction knowledge between all workgroup members. TLWQS information is distributed at LDWG meetings for those unable to attend the CAWCW meetings. Workgroup meetings also support members by providing a space for questions or discussion regarding BMP implementation.

Recommendation: Keep as is.

BMP H: Applies to SSF

H. For working areas, provide berms and or sufficient slope to allow snow melt and stormwater to drain away from the area. If snow melt and stormwater cannot be drained away from the working area, channeling water to a collection point such as a sump, holding tank or lined basin for collection, discharge at a later time, use for prewetting, and use for make-up water for brine must be considered.

As detailed above for BMP #2 and #3 and BMPs A, B, C, and I, preventing stormwater from coming into contact with salt reduces salt loss from the pile and covering salt piles not stored indoors prevents stormwater from contacting the pile. Using fixed or mobile berms also reduces stormwater runoff through the salt pile and re-directs stormwater. Use of berms are well detailed in the Salt Storage

Handbook (2015) from the Salt Institute for bulk or large stockpiles.[28] These BMPs (#2, #3, A, B, C, I) encourage proper salt storage for large scale, bulk salt stockpiles.

Recommendation: Eliminate.

This BMP (H) is duplicative to the above BMPs (A, B, C, and I). By complying with BMPs A, B, C, and I, the permittees would be meeting H. As part of BMP C and I, they are required to use fixed or mobile berms to redirect stormwater (included in BMP H). As part of BMP B, they are required to consider directing runoff to a collection point (included in BMP H). BMP H does not add any new practices to the current list of BMPs and instead re-phrases practices already laid out in the other BMPs.

BMP J: Applies to SSF

J. The Permittee must consider retaining stormwater which contacts the salt from a 25- year/24- hour storm event where feasible. Such retention could be either within the berm or in a separate basin, or the impacted stormwater could be stored and used as pre-wetting brine.

Recommendation: Eliminate. Through their Annual Reports, the SSF permittees have reported that this BMP is either not feasible for their organization or that they are still evaluating its feasibility. The volume of water needing to be collected is substantial and permittees do not have the space to allow for its retention. Instead, the other BMPs included for SSF focus on pollution prevention and eliminating majority of salt laden runoff through covering of salt piles and redirection of stormwater using fixed or mobile berms. By focusing efforts on pollution prevention, the need to retain salt in runoff is reduced or eliminated. Further the salt concentration in such runoff is low and contains other foreign material. It would need settling out, to be filtered, and considerable chloride mass to be added before it could be used as a winter brine.

6.0 Evaluation of Additional Practices and New Technology

In annual reports submitted to the workgroups, TLWQS permittees identified additional practices or technology they are either implementing, testing for future implementation, or researching as a possible future BMP to implement. The permittees effort shows commitment towards both program improvement and further chloride reduction.

6.1 Additional BMPs Recommended to be added to TLWQS BMPs for Years 6, 7, 8, 9, and 10

Based on the number of TLWQS permittees either implementing or testing for future implementation, the CAWCW and LDWG recommend the following BMPs be added to the list of required TLWQS BMPs and apply to discharger categories for POTW, IS, MS4, CSO, and IDOT/Tollway. These BMPs have been added to the table of the proposed updates to the BMPs with adjusted numbers/letters based on the proposed updates to be included as Appendix C.

[28] Salt Institute, Salt Storage Handbook, 2015. page 17, https://www.nwpa.us/uploads/1/2/9/8/129889926/salt-institute-salt-storage-handbook.pdf

6.1.1 Mechanical Snow Clearing

Prioritizing mechanical methods of clearing snow, like plowing, is a well-accepted practice. Many organizations use mechanical methods to clear snow before applying deicers to be efficient in their operations regardless of their level of service goals. Instead of using deicers to melt all snow on the pavement surface, clearing snow and ice with mechanical methods followed by deicer application can be more efficient and may reduce the amount of deicer needed. Using deicers to break the bond between the snow and ice and pavement surface can make plowing hardpack more efficient after the bulk of the snow has been removed from the pavement surface.

Several permittees have reported that they have made adjustments to their various methods to clear snow using mechanical methods. Permittees have reported using wing-plows in situations where the road is wide enough to accommodate and articulating cutting plow blades to better remove compacted snow.

Wing plows, when used in conjunction with traditional nose plows, allow for a wider swath of roadway to be plowed in one pass. To be used successfully, the roadways need to be wide enough to accommodate the wing plow and the plow truck must be able to be outfitted with the wing plow, not all can be. Use of wing plows is highly situational and not able to be broadly applied across all permittees.

Articulated plow blades have been used or tested by several permittees. Articulated plow blades have multiple cutting-edge sections that adjust to accommodate changes in the road surface. This can improve plowing performance. One permittee reported success using the articulated blades; however, another permittee reported that they tested them did not have success. With mixed success across various permittees using this plow blade technology, it is recommended that this technology not be included as a BMP at this time. The workgroup will continue to work with the permittees to evaluate new plow blade technology as it is identified.

The workgroups recommend adding a BMP for MS4 communities, CSO communities, and IDOT/Tollway to prioritize mechanical snow clearing before applying deicing materials rather than implement specific plow technology that cannot be implemented broadly across all permittees.

Recommended BMP Language for New BMP #16: Prioritize plowing and other mechanical methods to clear snow from the pavement surface before considering applying deicers.

6.1.2 Weather Forecasting Services

Numerous permittees reported using a weather forecasting service. Weather forecasting services provide key weather information that can aid organizations in making winter operational decisions. Depending upon the weather forecaster used, they may be able to provide organizations with road weather information in addition to winter storm information specific to the organization’s location. Having this available information regarding winter weather, informs and supports winter operational decisions. Using a weather forecasting service is not a replacement for measuring the pavement temperature. Receiving information from a weather forecasting service furthers implementation of measuring pavement temperature (BMP #7) to be intentional about actions taken during winter weather and to make intentional decisions about application rates (BMP #8). The workgroups will

continue to encourage their members and TLWQS permittees to use methods available to them to gather needed information to be intentional about their actions during winter operations.

The workgroups recommend adding a BMP for MS4 communities, CSO communities, and IDOT/Tollway discharger categories to use a weather forecasting service.

Recommended BMP Language for New BMP #17: Use a weather forecasting service to supply winter weather information to support decision making for winter operations.

6.2 Additional Practices or Technology Not Recommended to be added to TLWQS BMPs for Years 6, 7, 8, 9, and 10

The following practices or technology are not recommended to be added to the TLWQS as BMPs because these practices or technologies are building upon existing BMPs required by the TLWQS, not necessarily implementing entirely new practices or technology. For many of these additional practices or technology, there were only a small number of permittees investigating for implementation or implementing these practices. It is difficult to definitively say if these practices can be implemented within operations broadly. There are other ways of achieving the same goals that these practices meet and these practices do not necessarily reflect the best or only way to achieve these goals.

6.2.1 Use of Additional Equipment

Across the first four years of the TLWQS, two permittees reported on use of additional equipment. One permittee reported exploring future purchases of tailgate mounted spreaders for better utilization of their existing fleet. One permittee reported purchasing a dedicated salt trailer unit to refill existing sidewalk equipment during major snow events. This resulted in better service to their community as it reduced the need to pull trucks from their routes to refill sidewalk equipment. These actions support current implementation of required BMPs by these two communities, including BMP #17 (obtaining equipment to meeting BMPs). For these two permittees, having the additional equipment for their operations needed to meet the BMPs required for their discharger categories allowed them to implement the required BMPs. Adding an additional BMP to use additional equipment to meet the current BMPs included in the TLWQS would be duplicative. It is not recommended that a BMP for use of additional equipment be added.

6.2.2 Automated Vehicle Location

One permittee reported using automated vehicle location technology installed on all their plow trucks, giving them the ability to balance road salt usage and level of service. Per the permittee's reports, they reported that supervisors can get real-time data and after-storm reports to have better data on application rates used, plow up or down, and spreader on or off. Having access to this information supports their implementation of BMP #9 (document material use) and BMP #13 (evaluation of BMPs used as reported in annual reports). While this technology represents one method for this one permittee to collect the needed information to document material usage and have detailed information regarding plow truck operation to evaluate their operations, it does not represent the only method for other permittees to collect that information.

6.2.3 Truck and Loader Scales

Several permittees reported to the workgroups that they are utilizing loaders with weigh-in bucket capabilities and or truck scales to measure how much material was loaded or used on a route. Having access to this information supports their implementation of BMP #9 (document material use) but does not represent the only method for permittees to collect information regarding material use. While this technology does provide for accurate records, other permittees are able to report accurate amounts of material used through other means.

6.2.4 Public Education and Outreach

Several permittees have reported on the benefits of doing public education and outreach on their winter operations. They have used the opportunity to inform the public about their operations and level of service they provide. This can aid in buy-in from their community members on the best practices that reduce salt use.

Education and outreach about chlorides is a requirement of the TLWQS for the chloride working groups and is outlined in paragraph 4(E) of the order and permit. The CAWCW and LDWG provide education and outreach materials to workgroup members to use within their communities. The CAWCW and the LDWG develop chloride specific education and outreach materials in collaboration with the Salt Smart Collaborative. These education and outreach materials highlight the problem with excess salt use and what the general public can do about it, as well as what the member communities are doing to reduce chlorides. These materials include social media graphics, posters, blog posts/newsletter articles, and handouts that include brochures, bookmarks, and salt scatter cups. A selection of these materials is posted to each watershed group's respective website and the full suite of outreach materials is made available through the Salt Smart Collaborative's website, www.saltsmart.org. These materials are available for all members to use in their own communications with members of their community. Both the CAWCW and LDWG are active partners in the Salt Smart Collaborative.

The CAWCW and LDWG will continue to coordinate with the Salt Smart Collaborative and other watershed workgroups within the region to develop education and outreach materials for their workgroup members to use and distribute as part of the requirement in paragraph 4(E) of the order and permit and do not recommend that it is included as a specific BMP for the permittees because it is already requirement for the workgroups.

6.2.5 Route Optimization

Several permittees have reported optimizing their snow plow and salting routes. One permittee reported that optimizing their routes has helped to reduce travel time and provided for a more even distribution of the workload. This practice can optimize operations specific to their organization and may lead to reduced salt use if route overlaps can be reduced. Going through the process of optimizing routes is one method of evaluating and adjusting the winter operations for further salt reduction and builds upon the analysis and evaluation completed within the TLWQS annual report in BMP #13. There are other ways that organizations can evaluate their operations to improve efficiency. With only a few organizations specifically going through the process to optimize their routes, more investigation is needed to determine if this is a practice that could be used by more organizations before requiring it as BMP for the TLWQS.

6.2.6 Use of Liquids

Numerous permittees reported on increasing their use of liquids through various practices. As permittees implemented liquid deicers as pre-wetting or anti-icing, several reported taking further steps to add more liquids.

Several permittees reported adding brine making equipment to make salt brine in-house versus needing to purchase salt brine from a supplier. Adding the capability to make brine in-house allowed for further use of liquids by having it more readily accessible for these permittees.

Several permittees investigated increasing the pre-wet liquids application rate and decreasing the granular material used. Some permittees were able to increase their pre-wet liquid application rate to 15-20gallons/lane-mile while decreasing the granular application rate, while others were unable to test this specific practice due to the mild winters. This is an expansion of BMP #6 (pre-wet road salt before application) not necessarily adding a new BMP.

Several permittees reported wanting to add or adding an all-liquid route, deicing roadways with liquids, or utilizing liquid only applications. Utilizing liquid deicers in place of granular material can have salt reduction benefits. Clear Roads completed a study comparing direct liquid application of salt brine and granular salt utilizing divided highway stretches in Wisconsin for the study.[29] At the test locations, one side of the highway was treated with liquid only deicer applications and the other side was treated with granular material during the same storm events. The study showed similar friction performance between the study and control routes and the time to reach bare/wet conditions were similar for both types of treatments. The Clear Roads study determined that the liquid treatments used 40-72% less salt than the granular treatments while maintaining safety and meeting level of service goals.[30]

For permittees using liquids in place of granular materials, success was dependent on conditions that allowed for the liquid applications, with one permittee reporting liquids worked better in mild winter conditions. These permittees were able to make use of liquids in place of granular materials when conditions allowed. One permittee is in the process pilot testing liquid only routes. To expand into their operations, they reported needing additional equipment that is being budgeted as part of their capital improvement program. Another permittee reported they would like to explore an all-liquid route but have not been able to meet that goal with their current equipment.

Using liquids can present operational challenges for permittees. Permittees are responsible for more than just providing safe surfaces during winter. Having dedicated equipment for liquids only can make it difficult to reuse trucks for other needs and requires facility space that may not be available for the dedicated equipment. While annual training can support employee buy-in for liquids use, it also takes time and experience and with the mild winters in recent years, there have been limited opportunities to test or gain the needed hands-on experience to successfully use liquids.

The workgroups do not recommend adding additional liquids practices as required BMPs at this time. Permittees are still working on implementing anti-icing as most have developed their written plan and

[29] Clear Roads Evaluation of Direct Liquid Application of Salt Brine vs Granular Salt as Measured through Various Performance and Safety Metrics, Project 22-04, December 2025, https://www.clearroads.org/project/22-04/
[30] Clear Roads Evaluation of Direct Liquid Application of Salt Brine vs Granular Salt as Measured through Various Performance and Safety Metrics, Project 22-04, December 2025, https://www.clearroads.org/project/22-04/

are beginning to implement anti-icing. Winter conditions during the first four years of the TLWQS did not present opportunities for most permittees to test or implement using liquids consistently.

Appendix A: Accumulated Winter Season Severity Index Scores 1950-2026

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Appendix A
Accumulated Winter Season Severity Index Scores for IL - Chicago
Midwest Regional Climate Center
https://mrcc.purdue.edu/awssi

Season	Start	End	Length	# of missing data values	Temp Max Subscore	Temp Min Subscore	Total AWSSI Temp Subscore	Snowfall Subscore	Snow Depth Subscore	Total AWSSI Snow Subscore	AWSSI Score (Temp+Snow)	# of Events (snowfall =>0.1")	Road AWSSI (Temp+Snow sub-score only on dates with measurable snowfall, total snow on ground not included)
1950-1951	11/10/1950	4/1/1951	143	0	118	399	517	82	191	273	790	37	265
1951-1952	11/2/1951	4/4/1952	155	0	64	310	374	97	169	266	640	32	205
1952-1953	10/20/1952	3/9/1953	141	0	34	200	234	34	36	70	304	17	92
1953-1954	11/5/1953	4/3/1954	150	0	43	219	262	62	65	127	389	25	109
1954-1955	10/29/1954	3/27/1955	150	0	59	245	304	56	76	132	436	34	166
1955-1956	11/2/1955	3/18/1956	138	0	59	282	341	45	42	87	428	24	115
1956-1957	11/21/1956	4/12/1957	143	1	65	277	342	56	95	151	493	33	163
1957-1958	10/26/1957	3/20/1958	146	0	83	267	350	34	103	137	487	21	84
1958-1959	11/26/1958	4/8/1959	134	0	122	378	500	61	164	225	725	29	203
1959-1960	11/6/1959	3/26/1960	142	1	80	297	377	84	187	271	648	43	210
1960-1961	11/9/1960	4/17/1961	160	0	79	270	349	63	81	144	493	26	154
1961-1962	11/19/1961	4/13/1962	146	0	105	348	453	101	259	360	813	53	288
1962-1963	10/25/1962	3/12/1963	139	0	153	406	559	69	157	226	785	40	283
1963-1964	12/1/1963	4/1/1964	123	0	86	319	405	55	54	109	514	24	124
1964-1965	11/19/1964	3/28/1965	130	0	99	339	438	83	160	243	681	34	218
1965-1966	11/28/1965	5/11/1966	165	0	87	278	365	42	97	139	504	28	135
1966-1967	11/2/1966	4/24/1967	174	0	72	289	361	102	316	418	779	36	211
1967-1968	10/26/1967	3/23/1968	150	0	68	293	361	46	61	107	468	30	139
1968-1969	11/18/1968	3/31/1969	134	0	77	285	362	44	84	128	490	25	111
1969-1970	11/13/1969	4/3/1970	142	0	106	338	444	118	218	336	780	49	328
1970-1971	11/14/1970	4/3/1971	141	0	90	327	417	61	68	129	546	32	148
1971-1972	11/8/1971	4/8/1972	153	0	75	303	378	69	92	161	539	36	176
1972-1973	10/18/1972	4/12/1973	177	0	60	251	311	53	73	126	437	34	139
1973-1974	12/1/1973	4/5/1974	126	0	82	261	343	89	131	220	563	41	242
1974-1975	11/13/1974	4/9/1975	148	0	54	268	322	89	92	181	503	48	218
1975-1976	11/12/1975	5/2/1976	173	0	60	272	332	71	168	239	571	38	161
1976-1977	10/27/1976	4/5/1977	161	0	163	468	631	87	222	309	940	47	349
1977-1978	11/13/1977	4/20/1978	159	0	159	458	617	125	411	536	1153	47	377

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1978-1979	11/20/1978	3/26/1979	127	0	163	441	604	129	650	779	1383	45	339
1979-1980	11/27/1979	4/15/1980	141	2	84	329	413	58	106	164	577	34	186
1980-1981	11/18/1980	3/19/1981	122	0	86	327	413	57	67	124	537	30	166
1981-1982	11/20/1981	4/10/1982	142	0	145	479	624	95	197	292	916	42	358
1982-1983	11/4/1982	4/16/1983	164	0	50	254	304	44	41	85	389	28	118
1983-1984	11/24/1983	4/3/1984	132	0	152	426	578	72	175	247	825	37	250
1984-1985	12/1/1984	3/5/1985	95	0	118	360	478	60	264	324	802	26	194
1985-1986	11/20/1985	4/15/1986	147	0	115	423	538	53	66	119	657	34	196
1986-1987	11/11/1986	3/15/1987	125	0	41	215	256	40	55	95	351	20	85
1987-1988	10/20/1987	3/30/1988	163	0	91	347	438	73	144	217	655	32	172
1988-1989	11/6/1988	5/6/1989	182	0	75	323	398	45	71	116	514	30	168
1989-1990	10/18/1989	4/11/1990	176	0	78	312	390	58	97	155	545	33	172
1990-1991	12/1/1990	3/31/1991	121	0	68	277	345	40	74	114	459	21	113
1991-1992	11/2/1991	4/2/1992	153	0	39	272	311	47	69	116	427	25	116
1992-1993	10/20/1992	4/2/1993	165	0	63	303	366	66	134	200	566	32	145
1993-1994	11/6/1993	3/6/1994	121	0	121	352	473	67	199	266	739	30	243
1994-1995	12/1/1994	4/12/1995	133	0	62	249	311	35	82	117	428	15	68
1995-1996	11/8/1995	3/26/1996	140	59	-99	-99	-99	-99	-99	-99	-99	-99	Missing Data
1996-1997	11/10/1996	4/13/1997	155	124	-99	-99	-99	-99	-99	-99	-99	-99	Missing Data
1997-1998	11/3/1997	3/15/1998	133	109	-99	-99	-99	-99	-99	-99	-99	-99	Missing Data
1998-1999	11/8/1998	3/16/1999	129	57	-99	-99	-99	-99	-99	-99	-99	-99	Missing Data
1999-2000	12/1/1999	4/8/2000	130	0	52	236	288	44	112	156	444	20	119
2000-2001	11/16/2000	4/16/2001	152	0	106	394	500	66	324	390	890	27	176
2001-2002	12/1/2001	4/4/2002	125	18	39	206	245	51	78	129	374	22	114
2002-2003	11/17/2002	4/8/2003	143	0	93	352	445	44	52	96	541	21	124
2003-2004	11/24/2003	3/18/2004	116	0	78	276	354	42	120	162	516	25	140
2004-2005	11/24/2004	3/25/2005	122	0	63	250	313	64	119	183	496	27	146
2005-2006	11/16/2005	3/24/2006	129	0	52	244	296	48	92	140	436	28	121

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2006-2007	10/12/2006	4/12/2007	183	0	94	294	388	53	118	171	559	23	126
2007-2008	11/21/2007	3/28/2008	129	3	87	325	412	88	185	273	685	44	256
2008-2009	11/16/2008	4/6/2009	142	0	117	398	515	83	228	311	826	40	265
2009-2010	12/1/2009	3/20/2010	110	0	84	249	333	77	199	276	609	30	166
2010-2011	11/26/2010	4/18/2011	144	3	101	330	431	82	241	323	754	32	204
2011-2012	12/1/2011	3/4/2012	95	0	22	144	166	34	34	68	234	18	91
2012-2013	11/24/2012	4/19/2013	147	0	50	263	313	53	73	126	439	29	137
2013-2014	11/11/2013	4/15/2014	156	0	158	498	656	122	327	449	1105	51	392
2014-2015	10/31/2014	3/27/2015	148	0	127	397	524	80	257	337	861	35	269
2015-2016	11/20/2015	4/8/2016	141	0	54	214	268	49	52	101	369	24	130
2016-2017	12/1/2016	3/16/2017	106	0	60	218	278	39	74	113	391	15	101
2017-2018	11/10/2017	4/19/2018	161	0	91	320	411	57	96	153	564	31	195
2018-2019	11/9/2018	4/27/2019	170	0	90	328	418	76	125	201	619	37	234
2019-2020	10/30/2019	4/17/2020	171	0	34	210	244	55	62	117	361	29	110
2020-2021	11/24/2020	3/16/2021	113	0	65	220	285	71	248	319	604	29	212
2021-2022	11/26/2021	4/18/2022	144	0	59	261	320	52	115	167	487	27	131
2022-2023	11/15/2022	4/22/2023	159	0	48	200	248	36	42	78	326	24	88
2023-2024	10/31/2023	3/22/2024	144	0	35	153	188	32	64	96	284	17	65
2024-2025	11/21/2024	3/20/2025	120	0	76	254	330	31	42	73	403	21	110
2025-2026	11/9/2025	3/18/2026	130	0	91	274	365	62	102	164	529	32	199

minimum	234	15	65
maximum	1383	53	392
average	589	31	179
median	540	30	166

Appendix B: Re-Evaluation of the Time Limited Water Quality Standard for Chloride Memorandum Report from LimnoTech

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MEMORANDUM

From: Ben Roush, Luka Ludden, Hans Holmberg, Kathy Hall
To: Chicago Area Waterways Chloride Workgroup
Lower Des Plaines Watershed Group

Date: October 28, 2026

SUBJECT: Re-Evaluation of the Time Limited Water Quality Standard for Chloride

A Time Limited Water Quality Standard (TLWQS) for chloride in portions of the Chicago Area Waterways System (CAWS) and Lower Des Plaines River (LDPR), adopted in 2021, requires a re-evaluation of the TLWQS every five years, including determination of the highest attainable condition (HAC). LimnoTech has completed an evaluation of winter chloride data for the CAWS and LDPR based on the most recent data. The evaluation noted highly variable chloride concentrations, including exceedances of the statewide water quality standard, 500 mg/L. Average winter chloride concentrations also show a clear correlation to the severity of winter conditions. Based on our assessments of the data, LimnoTech recommends maintaining the HAC at the current level, 280 mg/L, for the next 5-year period of the TLWQS.

BACKGROUND

Winter weather in the Chicago area includes a mix of temperature and precipitation conditions ranging from snow and ice, to freezing rain, to rain. Obviously, these conditions can result in public safety concerns. Various entities, both public and private, are tasked with keeping roads, parking lots, and sidewalks safe. Road, parking lot, and sidewalk winter maintenance practices to protect public safety include snow removal, de-icing, and anti-icing. Chemical products used in anti-icing and de-icing can vary and frequently include chloride compounds as their active ingredient. For example, common road salt is also known as sodium chloride. Winter precipitation events treated using winter maintenance activities lead to runoff that transports chloride from the areas of application to local waterways, contributing to elevated concentrations of chloride in the receiving waters.

The Illinois Pollution Control Board (Board) establishes water quality standards (WQS) for chloride and other pollutants. The WQS for chloride that applies in the CAWS and the LDPR watersheds can be found in 35 Ill. Adm. Code 302.208(g) and 302.407(g)(3). This standard requires chloride concentrations not to exceed 500 mg/L. However, water quality monitoring data in the CAWS and LDPR during the winter season (December through April) show exceedances of 500 mg/L occur often following winter events and winter maintenance activities. Meeting the 500 mg/L WQS at all times

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and protecting public safety during winter events presents a significant challenge even when implementing best management practices (BMPs) for the winter maintenance activities.

A group of entities submitted a Joint Petition to the Board on July 24, 2018 for relief from the 500 mg/L WQS. The petition proposed a variance from the 500 mg/L WQS in the form of a time-limited water quality standard (TLWQS).

In response to the Joint Petition, the Board issued an Opinion and Order on November 4, 2021 for a Time Limited Water Quality Standard (TLWQS) for chloride for portions of the CAWS and LDPR. The TLWQS has a 15-year term and includes an interim criterion for the first five years. The interim criterion is 280 mg/L as a four-year winter seasonal average for the months December through April, based on sampling points at Lockport and Channahon. This interim criterion represents the highest attainable condition (HAC) for chloride concentrations in the CAWS and LDPR based on the evaluations included in the Joint Petition and the Opinion and Order.

The interim criterion, or HAC, is required to be re-evaluated every 5 years. The Chicago Area Waterways Chloride Workgroup contracted LimnoTech to evaluate compliance with the HAC and re-evaluate the criterion using recent monitoring results, specifically winter data from 2022 to 2026. This memorandum presents LimnoTech's assessment of the data and re-evaluation of the HAC.

DATA SUMMARY

The Chicago Area Waterways Chloride Workgroup (CAWCW) and Lower Des Plaines Watershed Group (LDPWG) provided LimnoTech with data from a number of sources for the assessment and re-evaluation of the HAC. These data included:

- Continuous (hourly) specific conductivity data and corresponding estimated chloride concentrations using conductivity-chloride regression for multiple locations within the CAWS. May 2022 – April 2026. Locations include:
    - Lockport Forebay, Chicago Sanitary & Ship Canal
    - Foster Avenue, North Shore Channel
    - Addison Street, North Branch Chicago River
    - Michigan Avenue, Chicago River
    - Loomis Street, South Branch Chicago River
    - Cicero Avenue, Chicago Sanitary & Ship Canal
    - B&O RR bridge, Chicago Sanitary & Ship Canal
    - Halsted Street, Little Calumet River
    - Cicero Avenue, Cal-Sag Channel

- Continuous (15-minute) specific conductivity data for the Des Plaines River at Channahon. Includes corresponding estimated chloride concentrations using conductivity-chloride regression. April 2022 – April 2026.

- Chloride grab sample data at all 15 Ambient Water Quality Monitoring (AWQM) stations including weekly frequency at Lockport and monthly at the other 14 AWQM stations. May 2022 through April 2026.

- Winter severity as measured by the Accumulated Winter Season Severity Index (AWSSI), a metric developed by National Weather Service researchers to objectively quantify and describe the relative severity of a winter season, based on factors such as temperature averages and extremes, snowfall totals, snow depth, number of snowfall events, and the duration between onset and cessation of winter-weather conditions. Annual scores included for 1950-2026.

- Joint Petition Appendix 2, CAWS Chloride Data Jan2006-Apr2017: Instream chloride concentration data, including location and date, for multiple locations within the CAWs

ANALYSIS

LimnoTech has examined the dataset, with particular focus on the Lockport Forebay on the Chicago Sanitary & Ship Canal sampling location and the Channahon sampling location on the Des Plaines River. Both sites represent the two farthest downstream sampling locations in the watershed. LimnoTech developed a **Chloride Monitoring Dashboard** to support our analysis of the data. Data were examined using a variety of methods in this dashboard to assess conditions and inform a recommendation for an appropriate HAC for the next 5-year TLWQS period. Key assessments are described below.

Chloride concentrations

Figure 1 presents the percent of measurements greater than 500 mg/L in each year at each location. This figure shows the common recurrences of exceedances of the 500 mg/L criterion and demonstrates the need for continuing the TLWQS for the CAWS and LDPR. These data support the Board findings noted in the 2021 Opinion and Order of the Board that the human-caused condition of seasonal salt loading to reduce ice accumulation necessary to maintain public safety prevents attainment of the chloride WQS of 500 mg/L in the CAWS and LDPR watersheds.

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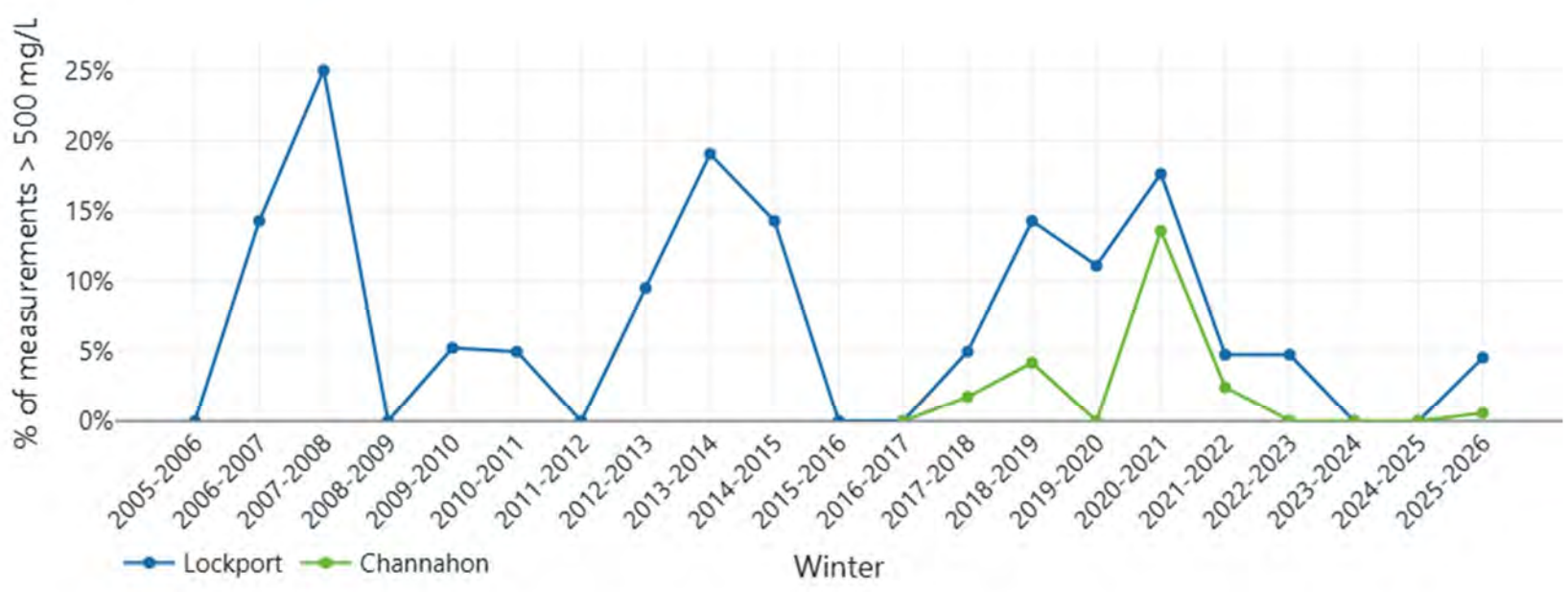


Figure 1. Percent of winter season chloride measurements exceeding 500 mg/L water quality standard at Lockport (based on grab samples) and Channahon (estimated based on continuous conductivity data), 2005-2026

Figure 2 presents average winter chloride concentrations each year for the Channahon and Lockport Forebay locations. The average chloride concentrations at each location follow similar patterns of yearly variability. The figure also shows individual years with average winter concentrations exceeding the HAC of 280 mg/L. Recent years, primarily 2022-2026, which is the 4-year period for calculating compliance with the TLWQS, show generally lower concentrations and less variability year-to-year relative to the other years. Less variability may be a result of more consistent winter conditions and improved implementation of winter maintenance BMPs. In addition, to sampled chloride concentrations, continuous conductivity measurements were provided for Lockport starting with 2022 data and for Channahon, beginning in 2017. Applying conductivity-chloride relationships to these continuous conductivity measurements throughout the winter season provides more robust datasets for evaluation than weekly or monthly chloride concentrations alone.

Mean chloride concentrations are compared in Figure 3 between the HAC reference period (five winters, 2012-2017) and current TLWQS evaluation period (four winters, 2022-2026) at the Lockport Forebay site. The mean concentration has decreased in the current period (246 mg/L), compared to the original HAC reference period (289 mg/L). The Channahon average estimated chloride concentration for the current evaluation period was 234 mg/L. However, as shown in the "box and whisker" plots[1] in Figure 4, there is substantial variability in the concentrations, with chloride concentrations (including both grab samples and values estimated based on conductivity) occasionally exceeding 800 mg/L during both periods. Thus, despite the decrease in the mean chloride concentrations, the 500 mg/L water quality standard remains unattainable for the CAWS and LDPR.

[1] A box and whisker plot provides a visual summary of data. The box represents the middle 50% of the data; the median is shown as the solid line inside the box, and the mean is the dashed line inside the box. The "whiskers" of the plot show the minimum and maximum values.

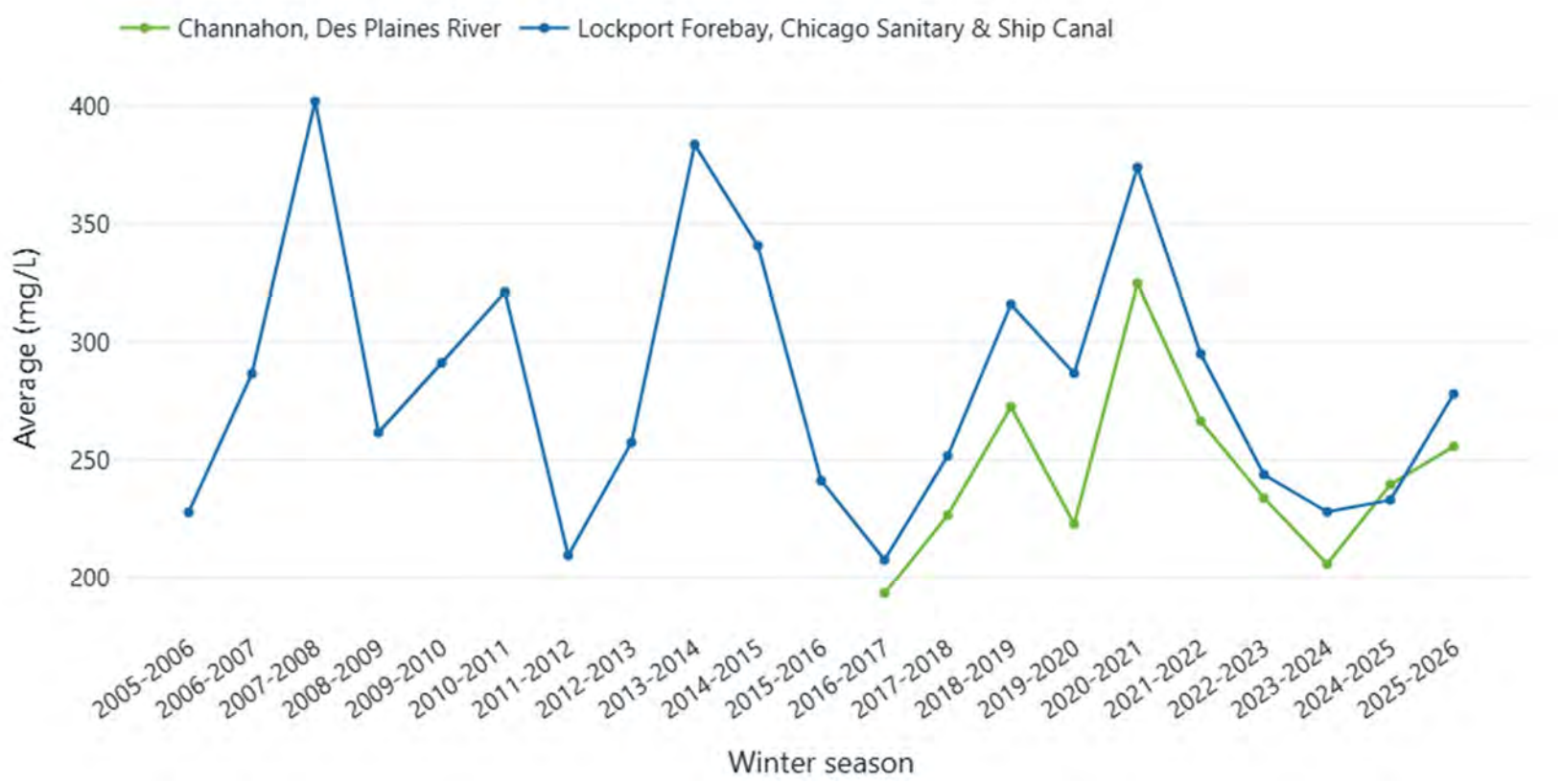


Figure 2. Average winter season chloride concentrations at Lockport (blue) and Channahon (green), 2005-2026. Lockport averages based on both grab samples and concentrations estimated from continuous conductivity monitoring data; Channahon averages based on concentrations estimated from continuous conductivity monitoring data.

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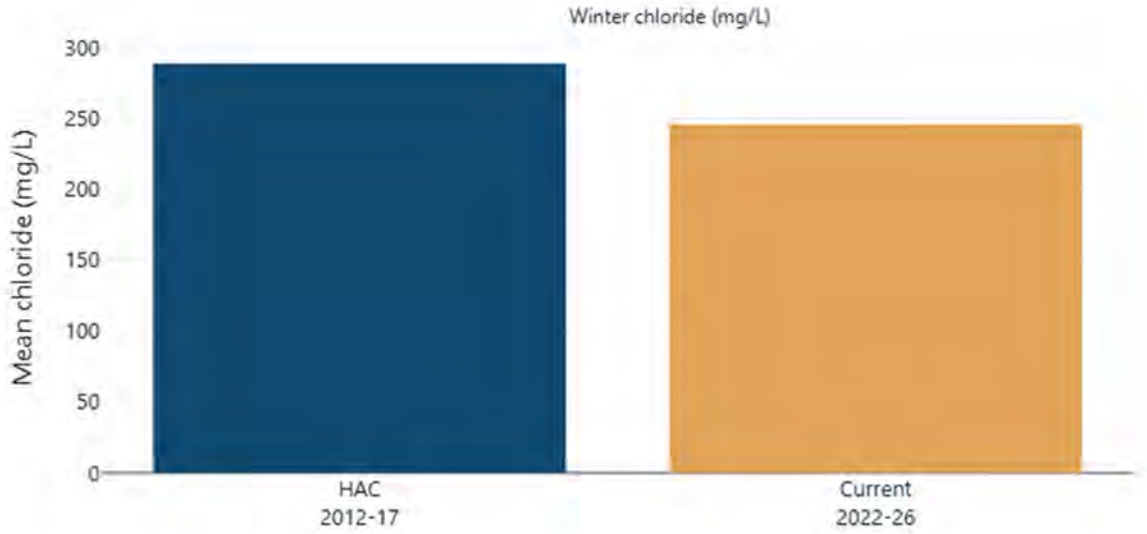


Figure 3. Mean chloride concentration at Lockport for HAC reference period (2012-2017) and most recent four-year period (2022-2026)

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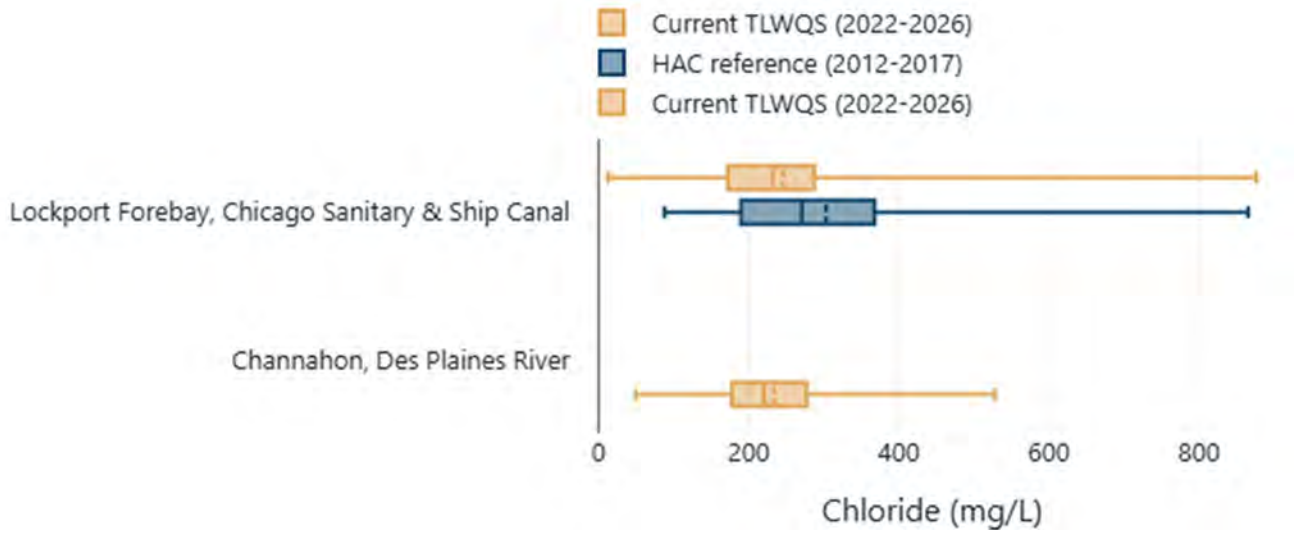


Figure 4. Range of winter chloride concentrations at Lockport (top) and Channahon (bottom). Lockport concentrations are shown during the HAC reference period, 2012-2017 (in blue), and the most recent four-year period, 2022-2026 (in orange); data for Channahon are only available for the most recent period. Chloride concentrations shown include both grab samples and estimates based on conductivity. Note that while mean (dashed line) and median (solid line) values are lower in the current period, maximums remain the same between the data sets.

Chlorides and Winter Severity

In evaluating winter chlorides in the CAWS and LDPR, it is important to assess not only chloride concentrations, but also the conditions associated with the monitored winters. Milder winters typically mean there is less need for road deicing, with an associated decrease in chloride runoff. Observed decreases in chloride concentrations, then, might be due to a less severe winter, rather than solely or mainly due to the implementation of BMPs. The **Accumulated Winter Season Severity Index** (AWSSI) characterizes the relative severity of a winter season, based on factors such as temperature averages and extremes, snowfall totals, snow depth, and the duration between onset and cessation of winter-weather conditions. The higher the AWSSI score, the more severe the winter.

Figure 5 shows the relationship between mean winter chloride concentrations at Lockport (circles) and Channahon (squares) and AWSSI scores. The HAC period is shown in dark blue; note the two very high AWSSI scores. The current TLWQS evaluation period is shown in orange; AWSSI scores are among the lowest in the data set. The relationship between mean winter chloride concentration and total AWSSI score is statistically significant ($r^2 = 0.6$), showing a moderate but discernible relationship between chloride concentration and winter severity. It is therefore essential to consider winter severity in any evaluation of the HAC and TLWQS.

Figure 6 shows AWSSI scores in northeast Illinois since 1999. The HAC reference period (2012-2017) values are shown in dark blue and the current evaluation period scores (2022-2026) are shown in orange. Figure 7 shows the average AWSSI scores for each period and the long term average. The HAC period experienced more severe winters than the current period, including two of the most severe winters since 1999, and averaged a score of 633. Conversely, the current TLWQS evaluation period experienced some of the least severe winters and averaged a score of 386. The long-term average AWSSI score is 589. The average AWSSI score was higher in the HAC reference period compared to both the longer-term record and the current evaluation period, confirming greater winter severity during the HAC reference period, while the average for the current period was the lowest of the three periods. Thus, the small observed decrease in the average chloride concentration for the current evaluation period could be attributed to less severe winters; any determination of an updated HAC must consider the likelihood of periods including a wide range of winter weather severity.

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Figure 5. Winter mean chloride concentrations at Lockport and Channahon vs. winter severity

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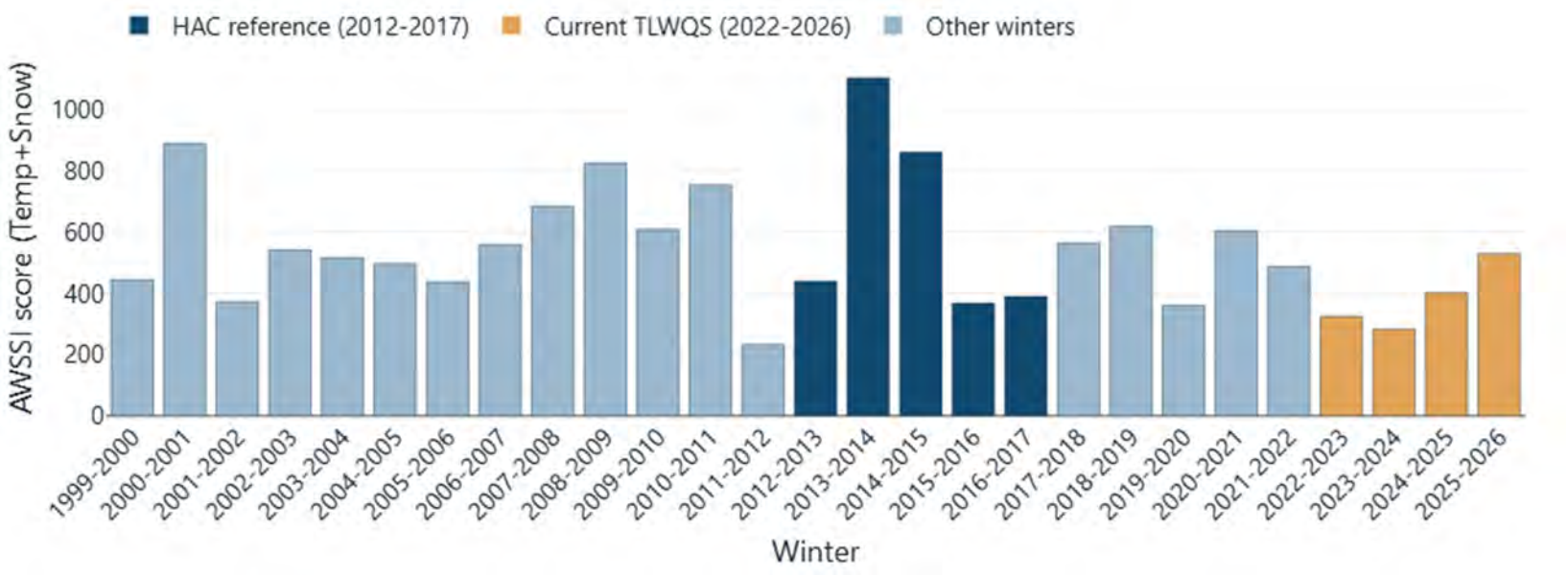


Figure 6. Weather severity index scores for the Chicago area, 1999-2026. The HAC period is shown in dark blue; the current TLWQS evaluation period is shown in orange

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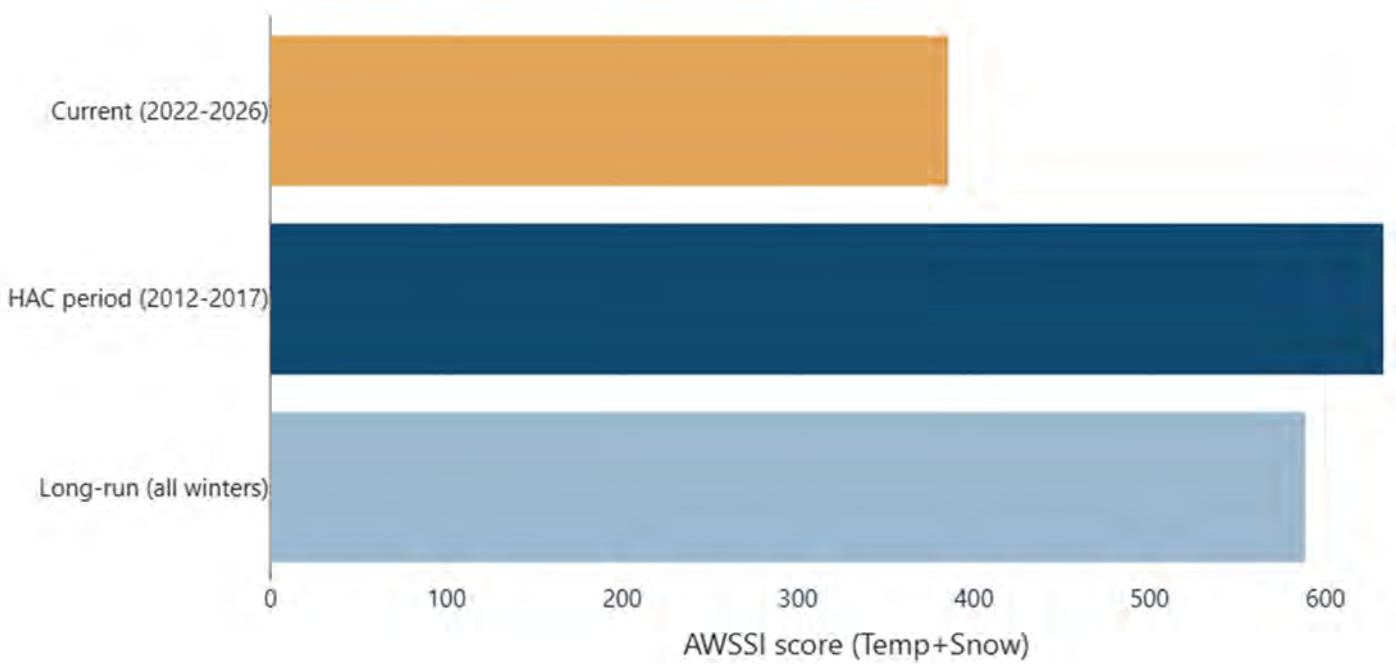


Figure 7. Comparison of AWSSI scores for the current (top), HAC (middle), and long-term (bottom).

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Chloride Loads

Chloride loads were calculated at both Lockport and Channahon using the available stream gauge data and chloride and conductivity data. Loads were calculated using two different methods:

1. Multiplying the winter season average chloride concentration by the winter season harmonic mean flow; and
2. Multiplying daily average chloride values by daily average flow and summing daily loads over the winter season.

Both methods are shown in Figure 6for Lockport and Figure 9 for Channahon. The method based on daily values shows greater loads in all cases other than 2016-2017 at Channahon. When daily chloride concentrations based on conductivity are available, the daily method provides a more robust assessment of loads compared to the average concentration times harmonic mean flow approach. We examined daily flows and daily concentrations at each location to assess if a positive correlation existed, which would contribute to higher loads using the daily load approach. One-to-one plots of flow and concentration are presented in Figure 10 and Figure 11 for Lockport and Channahon, respectively. Neither shows a significant nor a positive correlation. Therefore, the greater loads using the daily approach are a result of the variability in daily flows and concentrations. As stated previously, the daily approach provides a more robust assessment of winter season loads.

Also shown on Figure 6and Figure 9 are the winter average chloride concentration, the winter harmonic mean flow, the AWSSI, and the AWSSI temperature subscore. Loads correlate to some extent to both mean chloride concentrations and harmonic mean flows, as would be expected because both concentration and flow are included in the load calculations. Loads show some relationship to AWSSI but deviations are observed in specific years, such as 2022-2023 and 2023-2024. In these years, a low AWSSI is observed yet loads do not drop (Figure 9). Higher flows are observed in these years, driving higher loads. The AWSSI temperature subscore shows low values in these years, indicating a generally warmer winter. Precipitation driving higher flows in these years is more likely to be rain rather than snow. In winters with normal or higher than normal precipitation yet warmer temperatures, higher flows may be experienced, yet chloride concentrations would be lower due to precipitation falling as rain rather than snow and a reduced need for road salt application. In a warming climate scenario, these conditions may occur more frequently. While chloride loads might not drop in these situations, the risk of chloride toxicity to aquatic life may be reduced due to the lower concentrations. Note that Figure 1 shows a low percentage of time exceeding the 500 mg/L standard, or no exceedance at all, in 2022-2023 and 2023-2024 even while winter season chloride loads were above average. Chloride concentrations, and not loads, should continue to be the metric to focus on in terms of improved water quality conditions resulting from implementation of winter maintenance BMPs.

While we are not able to ascertain trends in the load data over a relatively short period and due to the variability in weather conditions, the BMPs implemented during the initial TLWQS are likely contributing to lower chloride loads.

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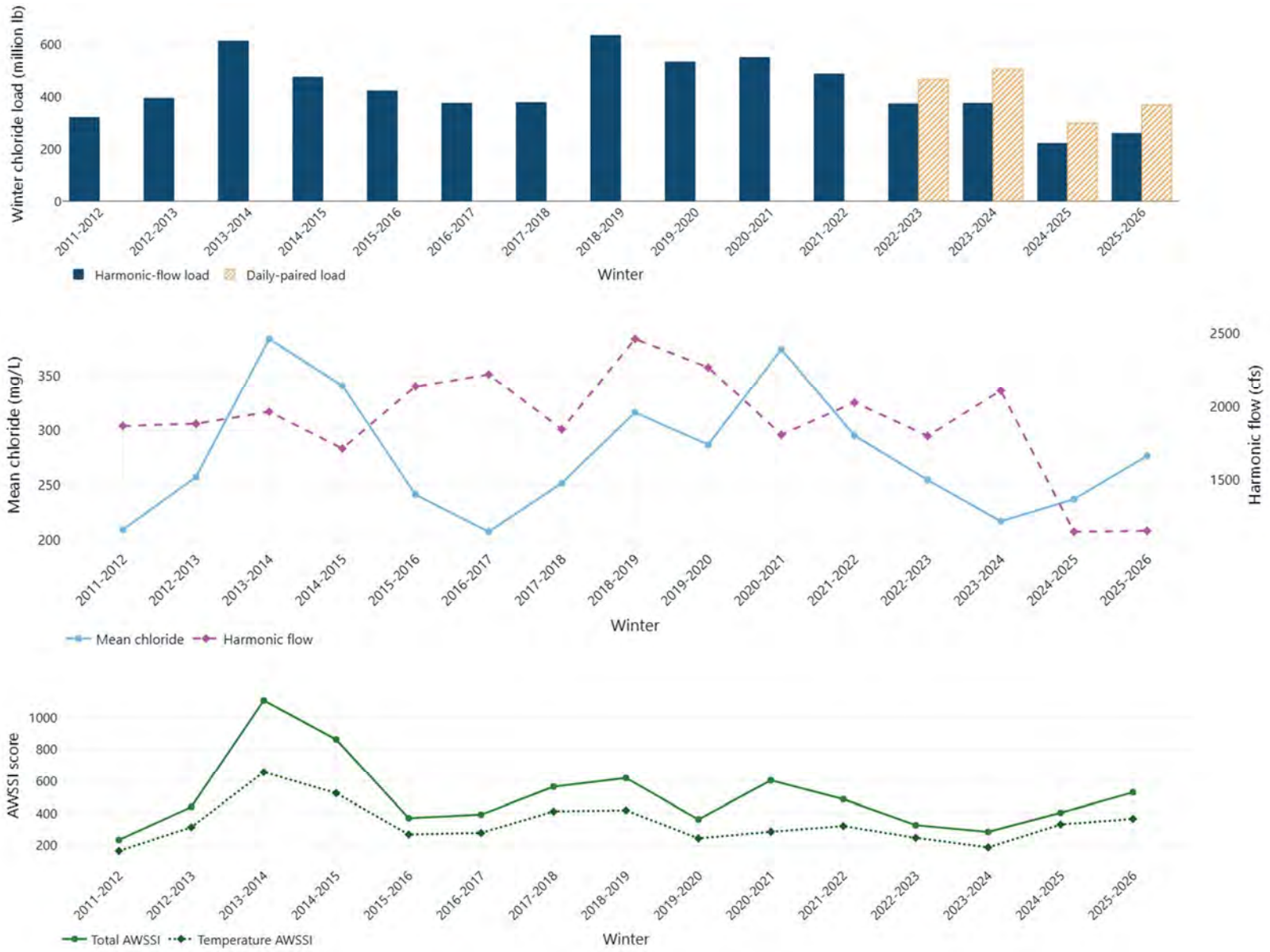


Figure 8. Lockport chloride loads, winter average chloride concentrations, winter harmonic mean flows, AWSSI, and AWSSI temperature subscore.



Figure 9. Channahon chloride loads, winter average chloride concentrations, winter harmonic mean flows, AWSSI, and AWSSI temperature subscore.

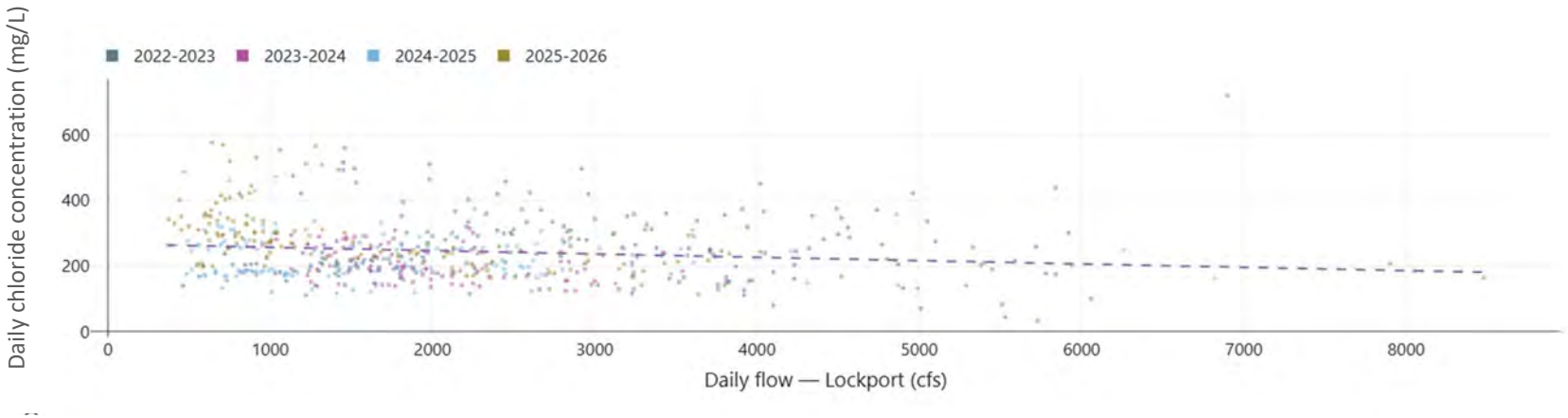


Figure 10. Lockport daily flows and daily chloride concentrations.

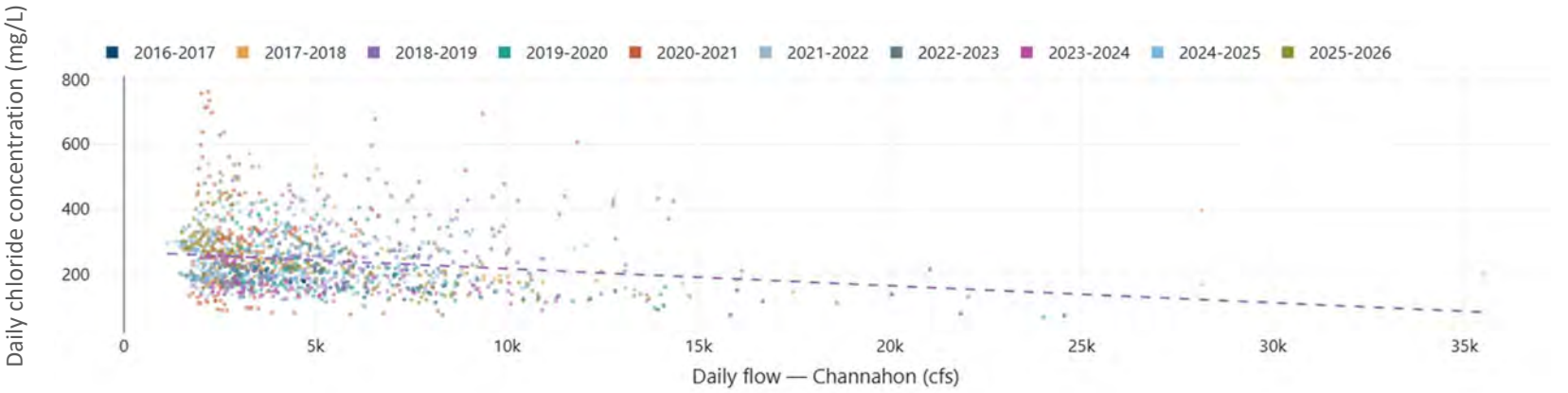


Figure 11. Channahon daily flows and daily chloride concentrations.

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CONCLUSION AND RECOMMENDATIONS

The primary objective of this work was to assess if there should be an adjustment to the chloride HAC of 280 mg/L in the CAWS and LDPR. LimnoTech utilized available datasets to examine chloride concentrations and winter severity. Key observations are listed below:

- Winter chloride concentrations continue to exceed the 500 mg/L statewide criterion. Therefore, continuing the TLWQS is needed.
- The average winter chloride concentration at the Lockport Forebay site during the recent evaluation period of 2022-2026 was 246 mg/L, and the average concentration at Channahon was 234 mg/L, both achieving the HAC of 280 mg/L. The average concentrations were lower than the average during the 2012-2017 period of 289 mg/L that was used to inform development of the HAC.
- The variability in chloride concentrations during the recent period has not changed. Chloride concentrations continue to be highly variable, including having violations of the WQS 500 mg/L.
- Average winter chloride concentrations show a clear correlation to the severity of winter conditions, as measured by the AWSSI. As winter severity increases, the average winter chloride concentration also increases.
- Winters during the recent 2022-2026 period have been less severe than during the 2012-2017 period, a contributing factor to the lower observed average chloride concentrations over the 2022-2026 period. While future conditions are uncertain, the Chicago area will experience periods composed of a wide range of winter weather severity.

Based on our assessments of the data, primarily noting the variability in chloride concentrations within a winter season and the variability in winter severity, LimnoTech recommends maintaining the 280 mg/L HAC for the next 5-year period of the TLWQS while entities continue to move forward with implementation of BMPs for the winter maintenance activities necessary to protect public safety.

Appendix C: Updated Table of TLWQS BMPs based on Proposed BMP Updates

Table 3: Best Management Practices

	Best Management Practice	POTWs	Industrial Sources	CSO Communities	MS4 Communities	IDOT / Tollway	Salt Storage Facilities
Permittees and entities covered under the Time Limited Water Quality Standard for Chloride (PCB 16-14 (Consolidated)) must implement the following Best Management Practices as applicable and indicated below for each discharger type:							
1.	The permittee must participate in a Chlorides workgroup for the CAWS or LDPR, depending on the watershed within which the facility's discharge is located.	X	X	X	X	X	
2.	Store all salt on an impermeable pad that must be constructed to ensure that minimal stormwater is coming into contact with salt unless the salt is stored in a container that ensures stormwater does not come into contact with the salt.	X	X	X	X	X	
3.	Cover salt piles at all times except when in active use, unless stored indoors.	X	X	X	X	X	

	Best Management Practice	POTWs	Industrial Sources	CSO Communities	MS4 Communities	IDOT / Tollway	Salt Storage Facilities
4.	Good housekeeping practices must be implemented at the site, including: A) cleanup of salt at the end of each day or conclusion of a storm event; B) tarping of trucks for transporting bulk chloride; C) maintaining the pad and equipment; D) good practices during loading and unloading; E) cleanup of loading and spreading equipment after each snow/ice event and evaluate the opportunity to reduce or reuse the wash water; F) a written inspection program for storage facility, structures and work area and complete repairs when practical; G) removing surplus materials from the site when winter activity is finished where applicable.	X	X	X	X	X	

	Best Management Practice	POTWs	Industrial Sources	CSO Communities	MS4 Communities	IDOT / Tollway	Salt Storage Facilities
5.	Calibrate all salt spreading equipment at least annually before November 30th. Records of the calibration results must be maintained for each piece of spreading equipment.	X	X	X	X	X	
6.	Pre-wet road salt before use, either by applying liquids to the salt stockpile, or by applying liquids by way of the spreading equipment as the salt is deposited on the road.	X	X	X	X	X	
7.	Use sufficient equipment to measure and provide the pavement temperature to guide application rate decisions.	X	X	X	X	X	
8.	Develop and implement a protocol to vary the salt application rate based on pavement temperature, existing weather conditions, and forecasted weather conditions.	X	X	X	X	X	
9.	Track and record salt quantity used and storm conditions from each call-out.	X	X	X	X	X	

	Best Management Practice	POTWs	Industrial Sources	CSO Communities	MS4 Communities	IDOT / Tollway	Salt Storage Facilities
10.	Implement the written plan developed for implementing anti-icing (pre-treatment of surfaces with liquid deicers ahead of winter weather) when practical. If the plan has not been developed, develop a written plan, with milestones for implementing anti-icing.	X	X	X	X	X	
11.	Provide employees involved in winter maintenance operations with annual training before November 30th each year on best management practices in the use of road salt in operations.	X	X	X	X	X	
12.	Ensure that relevant contractors are properly trained and comply with all applicable winter deicing BMPs.	X	X	X	X	X	
13.	Complete an Annual Report, as required by paragraph 3(B) of this order, standardized in an electronic format and submitted to the IEPA and the watershed group.	X	X	X	X	X	
14.	For working areas, review and adjust spreading equipment loading and unloading operations to reduce salt spillage and where feasible reduce the working area size.	X	X	X	X	X	

	Best Management Practice	POTWs	Industrial Sources	CSO Communities	MS4 Communities	IDOT / Tollway	Salt Storage Facilities
15.	Assess the need for new or retrofitting of existing equipment to implement all BMPs specified in this table as required by the permittee's discharger category.	X	X	X	X	X	
16.	Prioritize plowing and other mechanical methods to clear snow from the pavement surface before considering applying deicers.			X	X	X	
17.	Use a weather forecasting service to supply winter weather information to support decision making for winter operations.			X	X	X	

	Best Management Practice	POTWs	Industrial Sources	CSO Communities	MS4 Communities	IDOT / Tollway	Salt Storage Facilities
A.	All salt will be stored on an impermeable pad constructed to ensure that minimal stormwater comes into contact with salt.						X
B.	Pads will be constructed to direct stormwater away from the salt pile. The permittee must consider directing any drainage that enters the pad to a collection point where feasible.						X
C.	Outdoor salt piles not stored under permanent cover must be covered by well-secured tarps at all times except when in active use. While working on the pile, fixed or mobile berms must be incorporated around non- working face to minimize stormwater contact. The permittee must stage tarp when starting final lift and tarp over the edge of the berm/pad where possible.						X

	Best Management Practice	POTWs	Industrial Sources	CSO Communities	MS4 Communities	IDOT / Tollway	Salt Storage Facilities
D.	Good housekeeping practices must be implemented at the site, including: A) cleanup of salt at the end of each day; B) tarping of trucks for transporting bulk chloride; C) maintaining the pad and equipment; D) good practices during loading and unloading; E) cleanup of equipment as needed using dry clean-up methods when possible and evaluate the opportunity to reduce or reuse any wash water; F) a written inspection program for storage facility, structures and work area and complete repairs when practical.						X
E.	Annual training must be conducted for employees responsible for loading/unloading/ handling at docks and trucks at the facility.						X
F.	Complete an Annual Report, as required by paragraph 3(B) of this order, standardized in an electronic format and submitted to the IEPA and the watershed group.						X

	Best Management Practice	POTWs	Industrial Sources	CSO Communities	MS4 Communities	IDOT / Tollway	Salt Storage Facilities
G.	The Permittee must participate in a Chlorides workgroup for the CAWS or LDPR, depending on the watershed within which the facility's discharge is located.						X
H.	The Permittee must make use of fixed and mobile berms where appropriate to redirect flow and tarp over the edge of the pad where possible to minimize stormwater contact.						X