Parkers Lake Chloride Reduction Outreach

Bassett Creek Watershed Management Commission
Hennepin County
March 2026

Real People. Real Solutions.

Submitted by:
Bolton & Menk, Inc.
3300 Fernbrook Lane N, Suite 300
Plymouth, MN 55447
P: 612-220-4999

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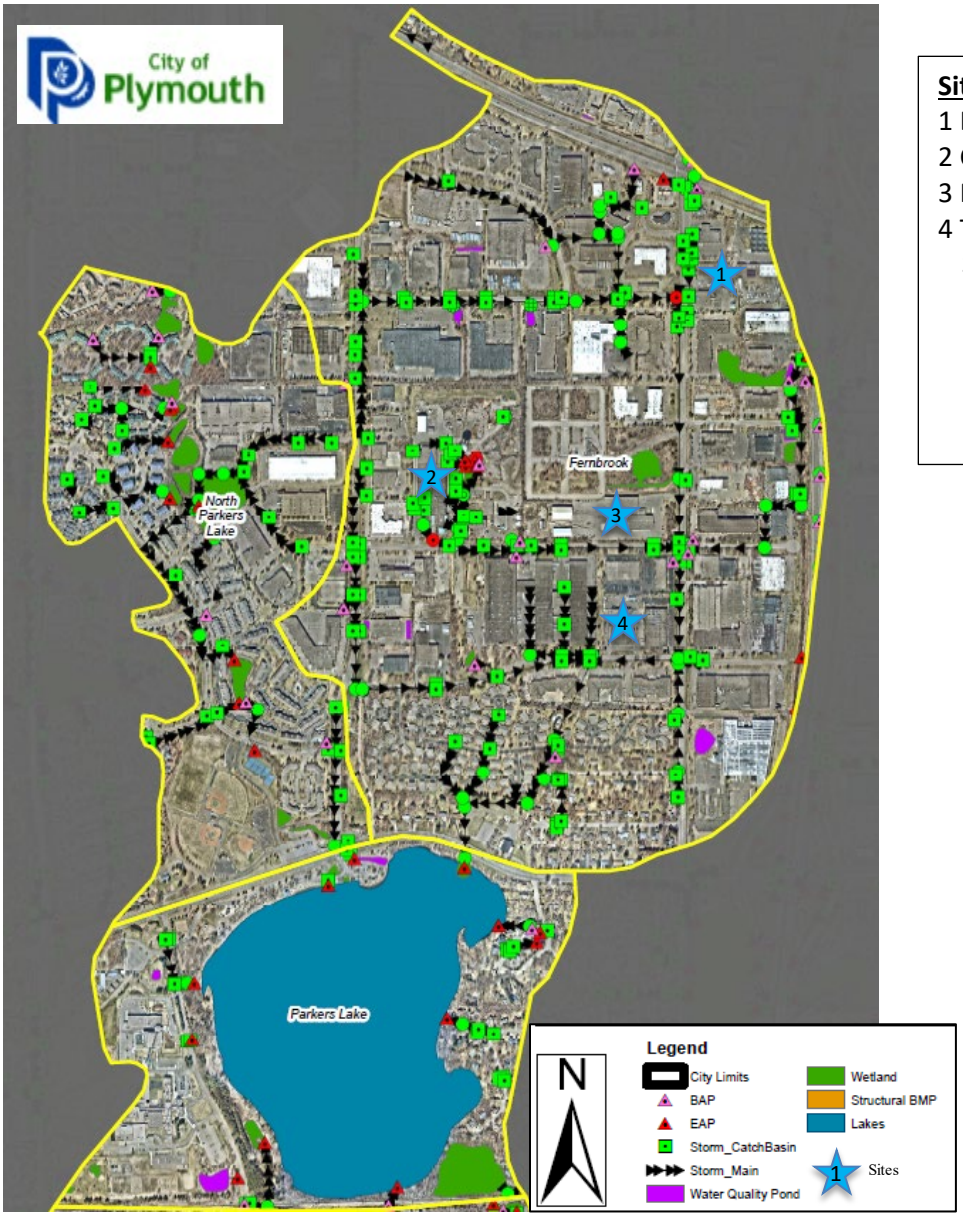
I. INTRODUCTION

Parkers Lake in Plymouth is impaired for chlorides. Bassett Creek Watershed Management Commission (Watershed), Hennepin County, and the City of Plymouth are working on reducing chloride loading to Parkers Lake. They identified four salt storage facilities within the Parkers Lake Watershed – two private winter maintenance companies and two public entities. Bolton & Menk was hired to conduct site visits to the facilities and evaluate salt storage practices as well as review overall winter maintenance operations.

II. PROJECT AREA

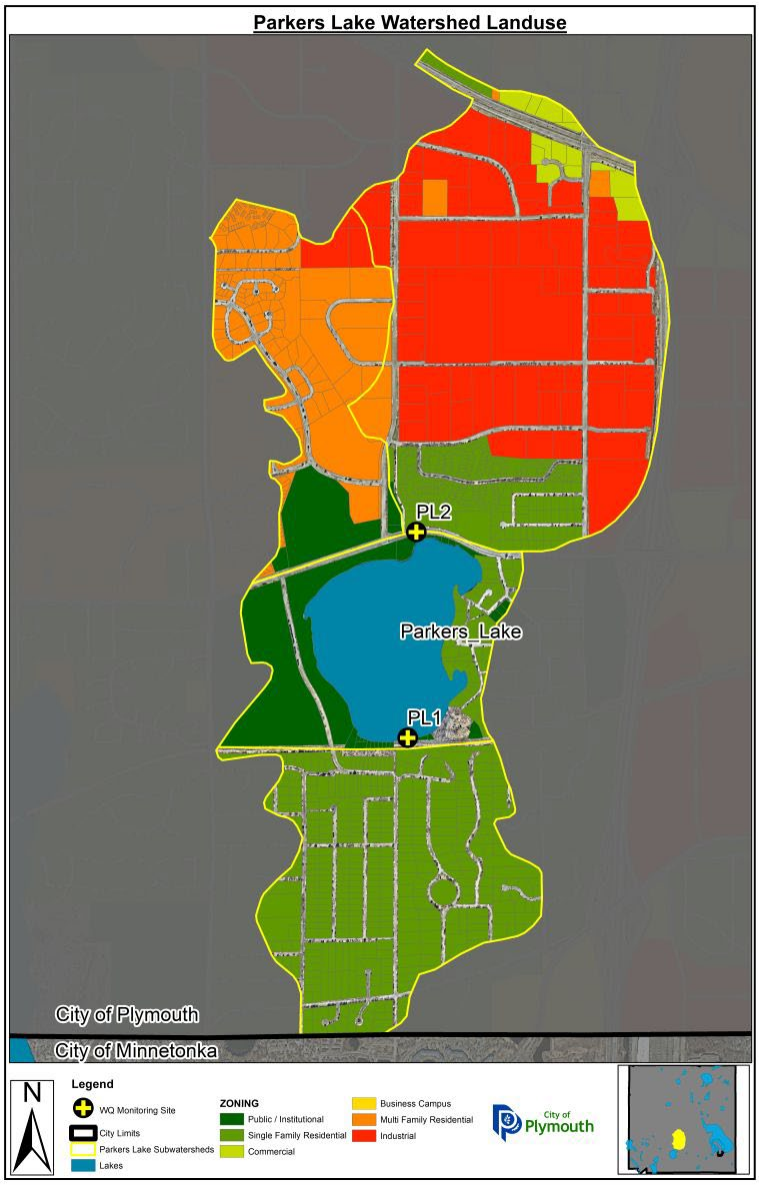
The project area is within the Parkers Lake Watershed but included only the Fernbrook subwatershed area north of Parkers Lake. The four sites are marked on the map below.



Sites
1 Brightview
2 City of Plymouth
3 MnDOT
4 Twin City Outdoor Services

Project area. Map- City of Plymouth

Land use in the project area is primarily industrial.



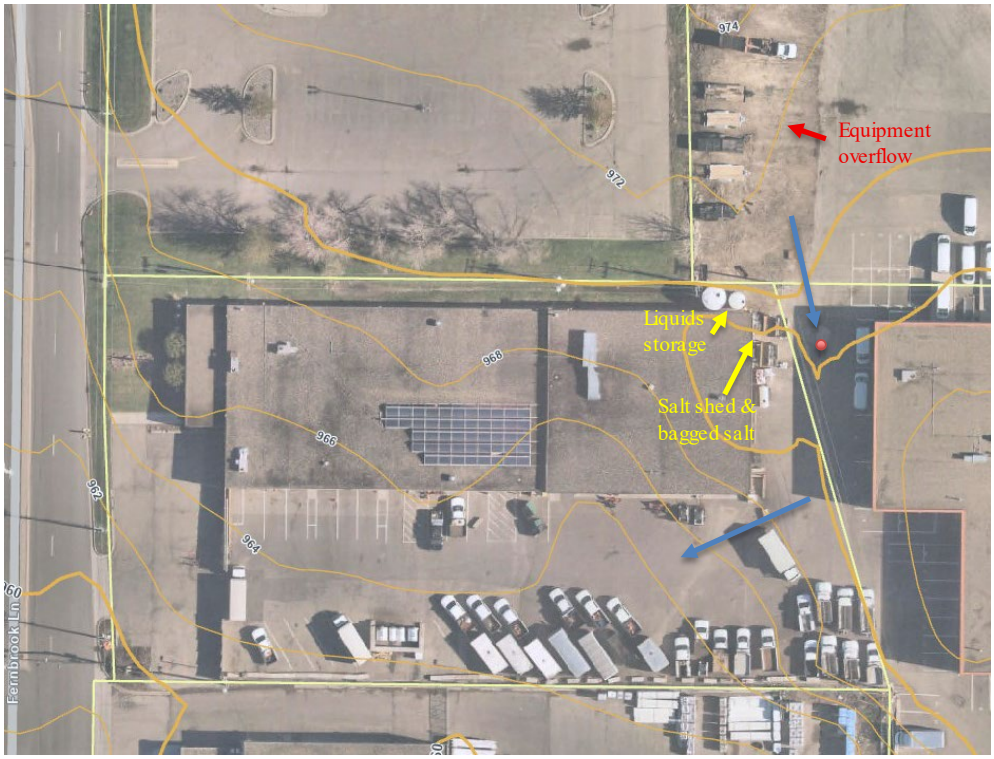
III. METHODS

Evaluation of four private and public winter maintenance facilities was completed. Information was collected by in-person or virtual meetings, email, phone calls, and on-site visits. Aerial maps of the facilities with topographic contours and stormwater maps were reviewed to identify drainage related to on-site salt storage. After gathering information and viewing the facilities, recommendations were made on potential changes in practices and equipment that could help reduce chloride loading from the facilities. Recommendations were provided to BCWMC, City of Plymouth, and Hennepin County staff. Tasks or activities that were approved for funding were provided to and discussed with facility staff. Follow-up calls and emails were completed to schedule technical assistance and gather equipment need details.

IV. BRIGHTVIEW LANDSCAPE SERVICES

BrightView Landscape Services is a landscape service contractor that services areas within the Parkers Lake Watershed as well as other Twin Cities locations. On March 27, 2025, Carolyn Dindorf and Craig Eldred of Bolton & Menk met with Matt Cannon from BrightView Landscapes to discuss operations and salt storage and tour the facility.

BrightView has approximately 120 full-time and 30 temporary staff. They service about 140 commercial, and residential (excluding individual homes) parking lots, sidewalks, and walking paths. Fifteen to 20 sites are located in Plymouth, including some Hennepin County facilities. Their main office is in Plymouth with storage for equipment indoors and outdoors as well as limited salt storage. They also have a storage facility in Brooklyn Center with a staging area with yard space and indoor storage. At the Plymouth site, they are also storing some equipment north of the building on an adjacent property (Metropolitan Mosquito Control District) through an agreement with them that they will provide winter maintenance and turfgrass maintenance in trade for the use of the area.



BrightView facility with salt storage areas labeled and drainage arrows

A. SALT STORAGE

Both granular bulk and bagged materials and liquids are stored on the site and at a Brooklyn Park property owned by BrightView.

1. Granular Materials

- On-site

Bulk salt is stored in a framed hoop house with block lower walls located on the east side of the building with the main opening facing to the east. It has a capacity of about 30 tons. It is covered with a tarp roof, however, there is a small hole in the tarp at the

west end which is close to but not right up against the building. It is not covered and precipitation can fall or blow into the shed from the west end.

Bagged material is stored outdoors on pallets. Unopened pallet loads are covered in plastic. Summer salt storage- we were told that bagged material is tarped once they are done using it. It was not tarped when we visited the site, but it was still during the winter season.

Both bulk salt and bagged salt are stored on an asphalt (impermeable) surface. The storage area is on the top of a slope draining to the east to a storm drain in the drive lanes between their buildings and an adjacent building. Note: BrightView does not own the office building.

They also store some equipment on the property of the Metropolitan Mosquito Control District (MMCD) office. They have been given permission to do this in exchange for lawn and snow maintenance services.

At the time of the visit there was a small amount of salt residue on the pavement outside of the shed. It appears they are doing a good job of housekeeping to clean up the salt, considering the poor pavement conditions. Drainage from the granular storage site is to the east to a storm sewer catch basin in between the storage site and an adjacent building. There was some granular material visible where the equipment is stored on the MMCD site. It appears it may be coming from the gravel area. Ideally that should be swept up.

Salt shed

Drainage to storm sewer from salt shed

Bagged material storage

Salt residue on pavement near equipment storage area

- Distributed storage

They use shipping containers for storage at customer sites. They have 5-gallon or trash can storage for salt at entrances at about 30% of sites. They also have some salt/sand mix containers at sites.

2. Liquids

One large tank (10,000 gallons) for liquid storage is located at this site. Additional storage is at the Brooklyn Center location. At least some of it is indoors. The tank at the Plymouth location is on an unpaved permeable surface. The tank is not marked and appears to be a single-walled tank. A double-walled tank or secondary containment is required for this size tank. Additional labeling is also required.

Liquid storage

B. GENERAL WINTER OPERATIONS

1. Operations

Brightview staff indicate that they watch the weather and communicate frequently. When they call out the crews, first they open the drive lanes and entrances, and may come back every 2 to 3" of snow during a larger storm event. When the event is done, they will plow/shovel what they can get to. They come back at night when the lots are empty to do a full plow and then salt. Time of day can dictate salt use. For ice events they will salt during the day. Call-out timing depends on client budgets. Some are at start of precipitation, Malls 2-4", Homeowner's Associations 1.5. A callout of 1" snow for parking lots and ½" for sidewalks is common. They don't usually salt during events but may spot salt as needed. Homeowner's associations usually do not request salt use.

2. Calibration

   They calibrate all equipment annually, but could benefit from hands-on instruction.

3. Equipment

   They have a variety of equipment for removing snow. Plows- they like the steel edges, have 2 -3 with rubber edges, some poly for coated or dyed surfaces, and areas with expansion joints.

   Smaller sized equipment- they have several units that can have brooms, plows, or snow blowers as attachments. They have backpack blowers for low moisture events for some sites.

   Spreaders for granular materials. They have no groundspeed-based vehicles for spreading granular deicers (application rate is not automatically adjusted based on speed).

   For liquids, they have all VSI equipment on trucks and are ground-speed oriented, equipped with GPS and blue tooth enabled. Additional liquids equipment: Camion, Deicing Depot, Boss/VSI. They use some ATVs.

4. Weather

   They use a weather service, WeatherWorks, Novak Weather, and NOAA for weather information. Weather Works Verifreeze provides data on snowfall totals and other conditions after events that helps them prove the callout was justified. Novak provides forecasts that include predicted snow totals out 7 days (trigger graph) and hourly precipitation forecasts and predicted snow total for an event, snow consistence, snow/liquid ratio, snow potential maps, ice potential, height of storm, and winds. It looks like there are rough pavement temperatures e.g., "Pavements temps: below 32 degrees" but not detailed. It is not clear if it can provide a forecast for a specific location. The examples show the whole Upper Midwest.

5. Deicers

   They use Ice B Gone Magic granular product which is a $MgCl_2$ blended with a carbohydrate (Distillers condensed solubles from the vodka or rum distilling industry). For liquids, they make their own brine and use the ice-b-gone additive. Two sites want a 50:50 salt/sand mix. At two sites they are using sand only where there is new concrete. Salt use will void the concrete warranty.

6. Liquids use

   They will anti-ice based on customer desire. It is more costly due to a pre and post trip. They do some direct liquid application, especially with parking garages. Four of their 6-yard salters have prewet rigs on them.

7. Application rates

   For granular materials they currently don't have set application rates but are working on getting something together. He estimated they use about ½ ton per acre NaCl for parking lots. Sidewalks they base more on visual look. During colder weather they use about 1/3 ton per acre treated salt. They have an Excel chart that could be used to calculate rates.

   Liquids application rates are 80 – 100 gal/acre post storm. For anti-icing they are using 40 gal/ac.

8. Tracking/Documenting

They use apps to track and document their work, time and materials, equipment, timing, and more.

9. Training

They conduct some in-house training for staff that covers scope, callout triggers, sites, push points. They go over routes and may visit sites. They are interested in more MPCA training if they can do it for their group. Currently only one staff member is MPCA certified with the certification expiring October 20230.

C. REVIEW OF SMART SALTING LEVEL 2 CERTIFICATION REPORTS

BrightView obtained MPCA Smart Salting Level 2 certification in October of 2024. With their permission, we obtained the reports from MPCA which show their answers to the questions and ratings and reviewed them.

1. BMP Summary Report

Most of their practices are listed as Advanced and Best Practices. There is a shorter list of poor practices. This would be a good list to use for considering making some improvement. They may have already made some changes this past winter since it was completed prior to the winter. Some information in the reports differs from what we were told.

- "Poor Practices" from Level 2 Certification reports

Some of the "poor" practices from the report are included below along with some additional discussion.

Primary method of deicing was listed as "Dry Salt." Prewetting would allow for lower salt use.

They put out deicers for customers to use themselves with no guidance. There is no guidance on use of these materials so too much is likely used. They are interested in labeling the containers.

After the storm they apply to areas that are both clear and icy. They treat all surfaces. All surfaces are treated after plowing rather than just those that are visibly icy or not clear of snow.

They are not changing any salted areas to reduce salt use. I believe this may be referring to improving drainage or closing off entrances or parts of stairways. Since they do not own properties, they don't have control over this but could suggest improvements to property managers in some cases where they know there are problem areas that require a lot of salt use.

They take salt deliveries outdoors. The setup at the site is all outdoor storage so outdoor delivery makes sense.

2. Level of Service Summary Report

The Level of Service Summary report does not appear to have been completed, or there was an error in the reporting.

3. Salt Savings Summary Report

The Salt Savings Summary report did not include data on salt use, so it did not show

salt savings potential.

D. RECOMMENDATIONS FOR CHLORIDE REDUCTION

1. Salt storage

Repair hole in bulk storage tarp roof. Add additional tarping to cover the west end of salt shed. One thing that was not discussed with Brightview is moving the salt storage shed. Moving it south edge of the property may be a better option if it is possible given their other storage needs.

Ideally cover any opened pallets of bagged salt with a tarp in case any bags are broken open, or place broken bags under cover in the salt shed.

The liquid storage tank appears to be a single-walled tank. Matt thought it was a double-walled tank, but the liquid was clearly visible through the tank. Double-walled tanks or secondary containment are required per MPCA regulations. The tank should also be labeled indicating the type of substance stored and tank capacity. A sign with emergency response contact information must be posted. Additional details on these requirements are found on the linked MPCA site.

2. Application rates

They currently do not have application rate charts for deicers. Matt indicated they are interested in establishing some application rate guidelines. Bolton & Menk staff could work with them to develop application rate charts, so they have better guidelines to provide for supervisors who provide application rates to operators. The rates mentioned during the meeting are on the higher side although they were just estimates.

We think it may be worth working with them on calibration. Better calibration often leads to lower rates.

BrightView does not have a way to measure granular material use on the truck spreaders. There was an after-market sensor by AccuSalt that could be installed on different brands of granular spreaders (or hoses for liquids) that provided real time application rate information for the operator. It appears that this device is no longer sold. There are some sensor devices that are spreader brand specific sensors such as SnowEx, but there may not be others available that will work on different brands. Additional investigation into equipment options would be needed to determine if there is anything that will work with their equipment.

Better tracking of salt use will help them identify where rates can be reduced and salt reduction can occur.

3. Pavement temperature Sensors

They have only one or two handheld infrared temperature sensors. Truck-mounted sensors are more accurate. The Level 2 reports indicated they weren't basing their application rates on pavement temperatures. Additional handheld sensors and some truck-mounted sensors would provide better onsite condition information for determining application rates.

4. Cutting edges

Possible change to more rubber edges. Maybe segmented edges.

5. Contracts

Some of their contracts are Time and Materials contracts. These may promote salt use. Suggest moving away from these types of contracts.

6. Hand tools

Better tools may reduce salt use. Snow Plow brand shovels and ultimate scrapers are liked by contractors for their ability to scrape and remove snow and ice.

Broadcast spreaders could be equipped with shields to prevent overspreading on sidewalks.

E. FUNDING TO REDUCE CHLORIDE LOAD

1. Training

- Internal

BrightView Landscapes is a Smart Salting certified organization. The certification expires in October of 2026. They are interested in private Smart Salting training for their staff. They currently have two staff that are Smart Salting certified but would like to train more of their staff. They would be willing to do joint training with another contractor if that is needed to help fund it.

- Property/Facility Managers

BrightView is interested in having a fact sheet or brochure type document about the MPCA Smart Salting Property Management Training they could share with their customers. They also stated that training for facility managers would be helpful. Their work is directed by client requests. Holding Smart Salting for Property Management training for customers of BrightView and TCOS in the Bassett Creek Watershed may be a good option to help in this area.

2. Liquids use

They would probably use more liquids but are limited by the number of vehicles they have that can apply liquids, and liquid storage. This would be a large expense.

3. Pavement temperature sensors

They may be interested in some truck mounted temperature sensors if they can easily be transferred to another vehicle. They replace their vehicles about every 5 years.

4. Labels for salt storage containers

They are interested in labels (stickers) for their buckets and trash cans for deicers they place at customer building entrances. These may be available for free through the MPCA. (Update: They are not available in quantities).

Despite expressed interest and several contacts, none of these options were implemented.

V. TWIN CITY OUTDOOR SERVICES

Twin City Outdoor Services (TCOS) is another landscape service contractor located in the Parker's Lake watershed that services areas within the Parkers Lake Watershed as well as other Twin Cities locations. TCOS staff were interviewed on 3/31/25, and a site visit was conducted in November to be able to observe their salt storage and equipment. TCOS services over 200 commercial sites with 80 full-time staff and about 300 seasonal staff. Sites include retail shopping centers, industrial parks and facilities, office complexes and corporate campuses, multi-family residential communities, educational institutions, and healthcare facilities. Only four sites (including their office) were located in Plymouth in 2025.

A. SALT STORAGE

Salt is stored in a hoop shed with block walls. The asphalt floor and part way up the walls is sealed with mastic. It is 3-sided with a west facing opening. No holes or open areas in the cover or back were observed. TCOS staff mentioned that they were getting a new cover this year. They sweep the salt back into the shed after loading. There is some salt residue outside of the shed, but it appears to have been swept up as much as possible.

Liquids are stored indoors in heavy-walled tanks. Totes of liquid are also stored indoors as well as bags of bulk granular product on pallets. Bagged products are also used. The site is generally flat with only about 2' difference in elevation. Drainage from the salt shed is to the east and south as shown below.

TCOS does have distributed covered storage at customer sites for quick access and salt buckets at about 25% of sites for entrances.

Salt storage

Site drainage

Indoor liquids storage

B. GENERAL WINTER OPERATIONS

1. Operations

When a weather alert is received, TCOS equips and mobilizes the crew. Some sites are anti-iced before the storm hits. Crews plow parking lots and clear sidewalks. They try to get out early before traffic causes bonding. Deicers are applied as needed. There are also post-storm inspections and reporting. Spot treatment of deicers may be completed if a need is identified. If personnel are on site, open ups (this usually refers to clearing drive lanes and probably the entrance) will be completed followed by clearing and deicing.

The trigger for service is ½ - 1" of snow but many properties even have them come out at a trace. Ice is also a trigger. They have a high level of service. Most customers want bare pavement, with zero tolerance for slips and falls. Liability is a big reason for the high level of service.

2. Calibration

Staff stated they had not calibrated their equipment in about 10 years. They do ask staff to estimate salt use and how much salt is returned at the end of the shift. They don't know their application rates but rely on experience. For sidewalks they use the lowest setting. They generally use the lowest rate and do a second application if more is needed.

3. Equipment

They have a variety of equipment for removing snow. Plows- they have commercial snowplows and use steel edges for parking lots, have Snow Raiders with plows with rubber edges, poly for parking ramps and sidewalks. Customers don't like the rust streaks on sidewalks from steel edges. They also use loaders when snow hauling is needed.

Spreader controls are digital and inside the truck. They do not have ground-speed oriented spreaders. They stated it doesn't pay for itself, and they want drivers to make decisions and control spinners to prevent hitting vehicles. All trucks are equipped with AVL (GPS).

Smaller sized equipment- they have Ventrac brooms, skid steers, Snow Raiders with tanks for sidewalks, and walk-behind broadcast spreaders, drop spreaders for sidewalks, and snow blowers. Backpack blowers are used for low moisture events.

Staff mentioned they switched to drop spreaders on their vehicles and cut salt use by about 50%.

They have Snow Plow brand snow push snow shovels which work well at getting down to bare pavement with both shoveling and scraping.

4. Weather

The owner of TCOS subscribes to a few different services and he consults with the field leadership team for planning. TCOS staff monitor local weather forecasts and models to track storms and track temperatures and snowfall estimates. Zone managers have handheld pavement temperature sensors to check pavement temperatures. They recommend field staff watch NOAA forecasts and radar to avoid unexpected call outs.

5. Deicers

TCOS uses straight salt and a granular Spring Valley product called Professional Ice melter which is a blend of calcium, potassium, magnesium, and sodium chloride which is rated to -16°F for cold weather needs. They are using sand at two sites. They tried using beet juice, but customers didn't like the dye. They didn't want it on their shoes. They have about 250 tons on-site + off-site storage.

A few facilities require magnesium chloride flakes or pellets. They have found they needed to reapply these products more often.

6. Liquids use

They will anti-ice some but not a lot. They don't feel it works well if there isn't a lot of traffic. They find it dilutes and refreezes on sidewalks. TCOS has a Varitech Industries brine maker and makes brine only. They purchase other liquids.

They use Snow Raiders with tanks for sidewalks and also have Ventrac stand-on vehicles. Some have 3-gallon pump sprayers used to treat entries.

They do some prewetting for parking lots.

Liquid use includes brine, magnesium chloride, and potassium acetate. One client uses the potassium acetate.

Some facilities are asking for direct liquid application, and they are trying it on a limited basis.

7. Tracking/Documenting

They use apps to track and document their work, time and materials, equipment, timing, and more.

8. Training

Sixty-five staff are MPCA Smart Salting certified. Certification expires 11/17/2027. They conduct a large group training to familiarize the driver and field leadership with each other and lay out expectations, language, and best practices. They also do on-site training for the first few storms. Generally, they overapply at first, so they are trained on lower application rates.

C. RECOMMENDATIONS FOR CHLORIDE REDUCTION

1. Truck-mounted Temperature Sensors

   TCOS does not have any truck-mounted temperature sensors. They replace their equipment fairly often so were concerned about ease of installation. Force America has a wireless unit that can easily be moved from truck to truck.

2. Calibration Assistance

   TCOS said they haven't calibrated in a long time. Hands-on assistance with the calibration process for their various vehicles/spreaders could lead to salt savings.

3. Application Rate Charts

   TCOS doesn't use application rate charts. They do have drivers estimate how much materials they used and returned. If they are interested, we would help them figure out their current application rates and create appropriate charts for them.

4. Ultimate Scrapers

   TCOS has not tried these tools which do a great job of getting under and removing ice.

D. FUNDING TO REDUCE CHLORIDE LOAD

Several recommendations and costs were provided to the Watershed and were approved for funding. However, the problem was getting TCOS to respond to schedule assistance or finalize equipment purchases. The TCOS general manager approved the items listed in part C. The only thing implemented was the purchase of Ultimate Scrapers. Two were purchased and delivered to TCOS.

Personalized training was suggested as well as a property management training.

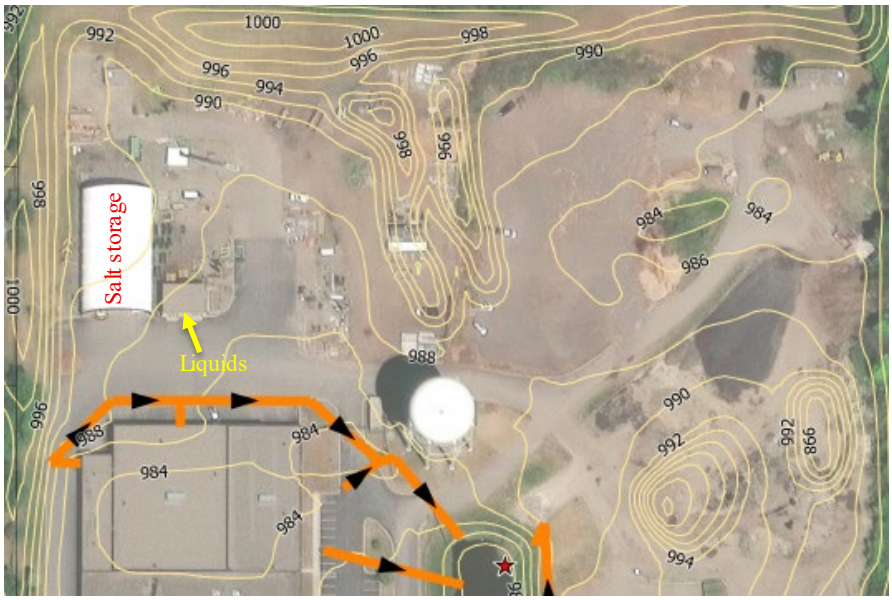
Several attempts were made to move work along. It may have been the timing of things. They were busy with fall clean-ups and getting ready for winter and then winter started and that kept them busy.

VI. CITY OF PLYMOUTH MAINTENANCE FACILITY

The City of Plymouth maintains 760 – 780 lane miles (335 center lane miles) of city streets. The Parkers Lake watershed is included in one route. Plymouth does not have a bare lane policy. It often does get to bare pavement, but it is not required in the policy. Deicing focuses on hills, curves, intersections, and trouble spots. The city limits salt use to protect environmental resources.

A. SALT STORAGE

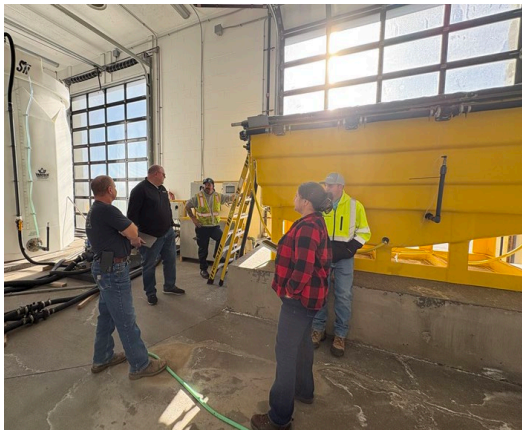
Salt is stored in a large 3-sided coverall building. Liquids are stored in a separate building. Both are set up so that there is no water drainage into the shed/building and it appears that no drainage will flow into or out of the building. It is large enough so loading can be done within the building. All salt is stored at the maintenance facility.



Plymouth maintenance facility with salt storage labeled and drainage arrows

Plymouth salt storage building

The city makes its own brine and has a separate brine-making and liquids storage building. They have 10,000 gallons of storage for brine and a 6,000-gallon tank for Apex (cold weather). They use an Accubrine brine maker.



Brine maker and liquid storage tanks in separate building

B. GENERAL OPERATIONS

When a snowstorm is predicted, anti-icing may be completed. The trigger for plowing is 2" of snow, but if they have time they will plow with smaller amounts. For snowfalls of 2 – 6" efforts are to provide reasonable driving conditions at critical times. Complete plowing is done once the snowfall ends. For snowfalls greater than 6", major streets may be continually plowed until snowfalls lets up and then operations move to other streets, including residential streets. The Streets Supervisor goes out to fire stations to measure snow depth. The city communicates with Maple Grove and Minnetonka regularly about conditions and responses. Plow routes are 17 – 42 (average 30) lane miles. In addition, 942 cul-de-sacs are plowed, 2/3 of them by contractors. Eight to 16 trucks are used with a cycle time of 6 hours. Truck speeds are 20 – 25 mph to minimize bounce and scatter. Trucks are equipped with prewet tanks and treated salt is also available. Deicing focuses on mains, with very little used on residentials. The city aims to have streets and cul-de-sacs cleared within nine hours after snow stops falling.

The city clears 123 miles of trails within about 48 hours of the end of the snow event. The city does not salt trails or sidewalks. They do salt city parking lots.

They make use of cameras at intersections to check snow and ice conditions.

1. Calibration

   City staff calibrate all equipment annually, sometimes twice a year or if issues are identified with a truck.

2. Equipment

   The city plow trucks all have digital controls (Force America) and ground speed orientation. Trucks are equipped with real-time decision support systems and AVL. Trucks are equipped with plow blades with steel edges. They tried segmented edges on front plows. Joma underbody blades are used to remove as much ice as possible. Trucks have prewet tanks and spray bars. Two trucks that have larger tanks used for liquids application also have wind blockers in front. Loaders are also used for plowing, blowing, or moving snow.

Smaller John Deere and Kubota equipment with plows or snow blowers are used for sidewalks and parking lots.

3. Weather

The city does not use a subscription weather service. Weather information is through the National Weather Service. All trucks except their one-ton truck, used for parking lots, are equipped with truck mounted temperature sensors. A live map of plow locations is available to the public. They can get reports on conditions from the Plymouth Police.

4. Deicers

The city presets the blast button limit on the trucks to a maximum of 250 lbs./lane mile compared to the factory setting of about 800 lbs./lane mile. The application rate goal overall is 200 lbs./lane mile. They average closer to 270 lbs./lane mile excluding liquids.

The city hasn't used sand in 4 years, but has a little winter sand available.

5. Liquids use

Plymouth uses liquids for anti-icing, prewetting, direct liquid application (DLA), and mix pretreated deicer. They anti-ice mains, bridge decks, and secondaries if time allows when there is a predicted snow event. Anti-icing is limited to pavement temperatures of 15°F and higher.

The city mixes their own treated salt. Granular sodium chloride treated at 7 gals/ton with brine or with Ice B Gone for temperatures under 15°F.

Prewetting is at 30-40 gallons per ton. Some trucks have pumps and some still rely on gravity feed which is hard to set.

6. Tracking/Documenting

Salt use on trucks is tracked automatically. They post salt use by truck. The city Public Works Operations manager completed an in-depth analysis of salt use. There is a live plow location map for residents use.

7. Training

Currently, 80 staff are MPCA Smart Salting certified for roads and six for parking lots and sidewalks. Thirty-six expire in October or November 2026, five in January 2027, 41 in January 2028 and two each in 2030 and 2031. They were previously Level 2 certified but that has expired, but they are still using the BMPs.

C. RECOMMENDATIONS FOR CHLORIDE REDUCTION

The city is doing well at tracking and reducing salt use. They have a good selection of equipment and use a lot of liquids, which is a strategy for reducing salt use. One possibility discussed was use of a truck mounted friction detector. The Vaisala MD30 mobile detector provides real-time measurements of pavement temperature; thickness of water, snow or ice layer; and grip or friction. It will automatically adjust the spreader application rates based on a combination of these readings and agency policy. Some agencies have reported up to 50% reductions in salt use. A 2025 Clear Roads study found that "…agencies that have integrated grip data have improved

resource efficiency, enhanced their measurement of winter maintenance operations performance and more effectively treated roadways by incorporating real-time feedback." The report also pointed out that models using the grip data need to be refined to maximize future uses. Truck mounted friction sensors are expensive.

D. FUNDING TO REDUCE CHLORIDE LOAD

The city was interested in exploring the friction sensor option for one truck used for the Parkers Lake Watershed route. Since salt use is limited on residential streets, there isn't a lot of salt used on that route. Friction sensors are expensive. At this time, the Watershed did not fund this option.

An additional option not previously discussed is a mini-Road Weather Information System station which can provide a prediction of friction based on parameters measured (friction coefficient or grip). This is much more affordable and would be a helpful tool for Plymouth's snow and ice operations. See more detailed explanation in Recommendations section.

VII. MNDOT PLYMOUTH TRUCK STATION

The MnDOT Plymouth Truck Station is located adjacent to and east of the Plymouth Public Works facility. They maintain 230 to 240 lane miles on I-494 from County Road 7 to I-94 and part of Highway 55. Plow routes are 20 – 30 miles long and multi-lane. They maintain only a small area that falls within the Parkers Lake Watershed on I-494 and Highway 55. The truck station has a 95% bare lanes policy with a 3 hour regain for 494 and 5-6 hours for Highway 55.

Plymouth maintenance facility drainage

A. SALT STORAGE

Salt is stored in a large 3-sided coverall building with concrete slab lower walls. The salt coverall is set up so that there is no water drainage into or out of the shed/building. It is large enough so loading can be done within the building. Liquids are stored in four double-walled tanks on an elevated concrete area outside and against the main building. A small three-sided roofed shed covers a liquid blending unit.

Liquids blending unit

MnDOT salt storage building

Liquid storage tanks and brine blending shed

B. GENERAL OPERATIONS

The MnDOT Plymouth truck station typically plows when there is any snow accumulation during the storm and continues plowing throughout the storm. They are short-staffed, 16 instead of 28 staff. Gang plowing is used to clear the width of the road all at once but also is used partly for safety. Truck speeds are about 30 mph to minimize bounce and scatter. If operators go over 35 mph, supervisors have a conversation with them about lowering speed. Trucks are equipped with prewet tanks and treated salt is also available.

Deicers are typically applied after the storm is complete. In addition to anti-icing and prewetting, MnDOT also uses direct liquid application after the storm. Cycle times (the amount of time to complete the route and get back for additional plowing) are about 2

hours so with the traffic on I-494 they use higher application rates to prevent compaction.

After plowing during and after the event, it takes one to two days for cleanup. They have to use the same plow trucks to haul snow from bridge decks.

1. Calibration

   Equipment is calibrated annually or more often if there are issues with a truck. Calibration is completed District-wide in Maple Grove.

2. Equipment

   The MnDOT Plymouth Truck Station has 14 plow trucks. All have digital controls except one (Force America 6100). Trucks are equipped with plow blades with Joma segmented edges and steel/carbide underbody plows. They are equipped with ground-speed orientation, AVL and MDSS. They have had technical issues with MDSS but they use it as a starting point for deicing application rates.

   Four trucks are well-equipped for liquids use. They use 11 trucks. They have one tow plow that has two tank trailers with plows for plowing and liquids applications at the truck and both tanks. This allows them to treat three lanes.

3. Weather

   All trucks are equipped with truck mounted temperature sensors. Trucks are equipped with real-time decision support systems including weather, and AVL.

4. Deicers

   MnDOT has a maintenance manual that includes an application rate chart. The manual states that MDSS should be the guide for applying material. The application rate charts provide general guidelines. The Plymouth station uses MDSS mainly as a starting point since it doesn't always function properly.

   Deicers include granular sodium chloride prewet at the spinner with brine or a blend with APEX. Use about 7 gals/mile with 200 lbs. of salt, with brine or with Ice B Gone for temperatures under 15°F.

   MnDOT Plymouth truck station does not use sand.

Dry Granular Salt Application (in lb/lane mile)					
Storm Type	Pavement Temperature Range				
	Above 32° F and constant	Above 32° F but dropping	20-32° F	5-20° F	Below 5° F
Light Snow	Apply nothing – just monitor	100-150	100-150	150-250	Apply no salt
Light to Moderate Snow	Apply nothing – just monitor	100-200	200-250	250-350	Apply no salt
Moderate to Heavy Snow	Apply nothing – just monitor	100-150	200-250	250-500	Apply no salt
Freezing Rain	Apply nothing – just monitor	75-100	150-300	250-500	Apply no salt

5. Liquids use

   MnDOT uses liquids for anti-icing, prewetting, and direct liquid application (DLA). The truck station has a Brine-Extreme brine maker and Blending Boss mixer for blends. Trucks are equipped with saddle tanks and some with wedge tanks.

   One truck is equipped with a system they constructed using two fan nozzles mounted inside agricultural pipes to spray the salt with liquid as it is applied to the road. This

seems to apply the liquids more uniformly to the granular salt than applying at the spinner as well as delivering the salt closer to the road to minimize bounce and scatter.

Plymouth truck station agriculture pipe with fan sprayers for prewetting

MnDOT has a goal of 200 gal/ton prewet. This is a slurry. Plymouth has only two trucks that can reach this.

The MnDOT maintenance manual includes DLA application rates ranging from 20 to 80 gals/lm. DLA rates are much higher than anti-icing rates.

DLA Brine Application (in gal/lane mile)				
Event Type	Pavement Temperature Range			
	32-30° F	29-27° F	26-24° F	23-21° F
For 2-Hour (or less) Cycle Times				
Light Snow (less than 0.5"/hr.)	20	35	40	55
Medium Snow (0.5"/hr. to 1.0"/hr.)	35	45	55	Not Recommended
For 3-Hour Cycle Times				
Light Snow (less than 0.5"/hr.)	35	50	65	80
Medium Snow (0.5"/hr. to 1.0"/hr.)	50	65	80	Not Recommended

6. Tracking/Documenting

Salt use on trucks is tracked automatically and MDSS reports are available at the end of shift but are not always accurate. They also track salt use visually; how much salt is left when they return to the station. They do not have scales. MnDOT headquarters has access to truck data and has an asset management system for tracking. The Metro District has a map that shows salt use ranges in different colors by location. All stations have access to it. It is used in their post-storm meetings.

Currently only the supervisors are MPCA Smart Salting certified through the new MPCA/MnDOT training.

C. RECOMMENDATIONS FOR CHLORIDE REDUCTION

MnDOT generally has the most high-tech equipment compared to cities and counties. They have some good equipment, but have had problems with MDSS and are short one to two trucks and not all equipment is well-equipped for liquids use.

They have had some trouble with crew buy-in for using MDSS, likely due to a combination of equipment problems and generational issues.

They have some gravity flow liquids systems they would like to upgrade to pumps.

MnDOT has its own getting ready for winter training. The MPCA recently started doing some Smart Salting training with MnDOT's training. Supervisors have been trained but the truck station supervisor would like the whole crew trained.

D. FUNDING TO REDUCE CHLORIDE LOAD

The needs discussed are mostly high-cost equipment needs, most if not all beyond the budget of the watershed. The supervisor stated that money is not usually their problem so watershed funding is probably not needed. The staff person in charge of Salt Solutions can make things happen but it is more difficult to get his time.

VIII. RECOMMENDATIONS

The four facilities varied in use of best practices, equipment, training, and salt storage facilities. The MPCA has requirements for liquid storage that did not appear to be met by some, mainly the signage requirements, and staff we spoke with were not aware of all the requirements. A copy of the MPCA Liquid Salt Storage Guidance and Regulations fact sheet was provided to all.

Both MnDOT and the City of Plymouth have good equipment for using lower application rates and liquids as well as automated tracking. In contrast, the private companies are not as well equipped. None have truck-mounted pavement temperature sensors, or ground speed orientation. Below are some areas that could be addressed through the project.

A. PUBLIC AGENCIES

1. Equipment. MnDOT has some equipment issues with MDSS and potentially some other items that could be upgraded if there was enough support internally. Funding is not the issue. It might help to use the Parkers Lake Watershed chloride reduction project to show the need for chloride reduction with the Plymouth Truck Station and work with appropriate staff at MnDOT headquarters to get some fixes/upgrades prioritized for the Plymouth Truck Station.

   The only equipment identified to help the City of Plymouth is a truck mounted Friction sensor.

2. Training. MnDOT is interested in additional training for the crew. MPCA plans to do more training with MnDOT this year that will hopefully expand to include crews.

B. PRIVATE COMPANIES

1. Salt storage. BrightView's salt storage shed is in a poor location and needs repair or replacement. Moving it to a new location, if possible, or replacing/fixing the cover to repair holes and adding a cover over the back of the shed (currently the back is open) would help prevent salt release from the storage shed directly down to the nearby storm drain.

2. Calibration. TCOS has not calibrated in a long time. Both TCOS and BrightView could benefit from some hands-on assistance with calibration. Calibration can make a big difference in salt use.

3. Application rate charts. Neither company uses application rate charts. Assistance with developing and using application rate charts can help them lower salt use.

   Distributed storage is another area that could be addressed.

4. Training. BrightView has only one MPCA Smart Salting certified staff member currently. They expressed interest in a personalized training for their crew.

   In addition, an MPCA Smart Salting for Property Management training for the Parkers Lake Watershed, or Bassett Creek Watershed could help reduce salt from many properties in the watershed by educating local property managers on smart salting practices so they understand the problems with salt use, understand what their contractors are trying to do, and hopefully make better decisions to not require their contractors to use more salt when it is not needed.

C. PUBLIC AGENCIES AND PRIVATE COMPANIES

1. Mini road weather information station (RWIS). One piece of equipment that was not

discussed but could be beneficial to the city and private companies is a mini-RWIS station. One station could be installed in the Parkers Lake Watershed and be equipped with solar power, air and pavement temperature, and a camera. Some additional features can be added including relative humidity, surface conditions (dry/wet/snow/ice), lens or sensor deicing/heating, friction, short range hyperlocal forecasts, alert thresholds for frost, black ice, or freezing rain. Some of these systems include decision support local forecasting. They can be accessed remotely and require software and monthly cellular subscription. The City of Plymouth could manage the station and if they can provide access to the private companies operating in the area (if this is allowed) then all could use the information. Some cities create a network of these systems around the city to track and plan for winter maintenance. Typical costs for the units are:

- **Low-cost pilot site:**
  $1,500 hardware + $300–400 per winter season for
- **Operational trouble spot:**
  $2,000–2,800 hardware + $400–500 per season
- **Premium decision-support site:**
  $3,000+ hardware + advanced subscription

Friction can be modeled/estimated from pavement temperature, moisture state, camera imagery, and weather models. This friction coefficient/grip is in some systems (it is probably included in the Premium decision-support site cost) and is good for operational decisions. This is a more affordable way to incorporate friction and other helpful measurements into operations decisions. Additional information on mini-RWIS stations and return on investment is provided separately.

D. OVERALL

1. Timing

   Several recommendations were made for the two private companies that were not implemented. There was expressed interest and internal approvals but it appeared that time was what may have prevented them from being implemented. It may be that a different time of year would be better. They could be asked if there is still interest and what timing would work best, or if there is some reason why they didn't take advantage of the opportunities and funding.

2. Distributed Storage

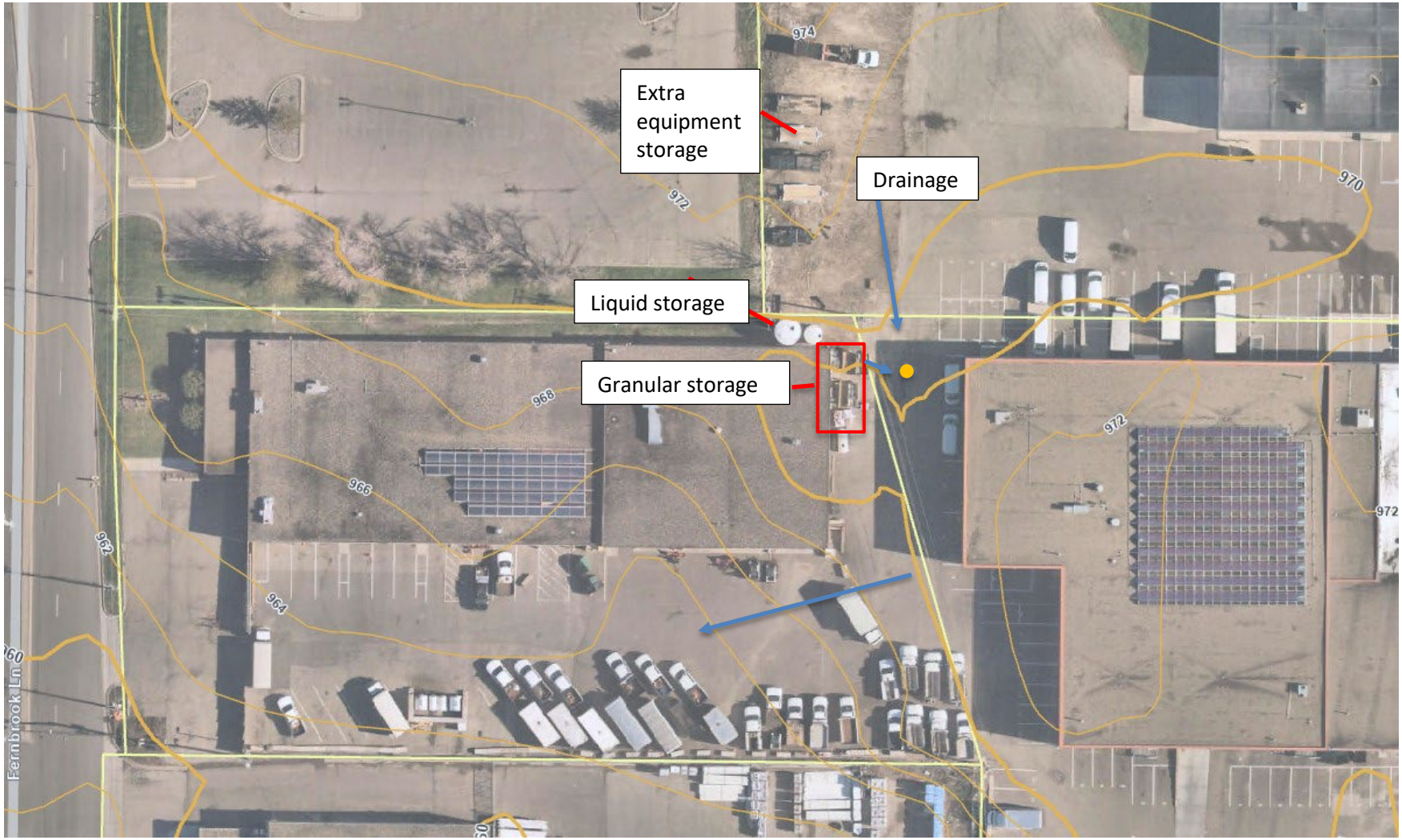
   One part of the original proposal discussion was to include inspecting distributed storage areas, areas where salt is stored on customer properties. This was not included but is something that could be pursued throughout the watershed but especially in areas where city monitoring shows high chloride levels.

3. Application Rate Observations and Follow-up

   During a February discussion with project leaders, it was discussed that the highest measured chloride levels were in different subwatersheds. Observations of application rates after a storm may help identify where overapplication is occurring. Follow-up with the local company/facility owner or manager to identify who is doing the application could lead to additional opportunities to fund training, equipment or other options to reduce chloride load from those sites.

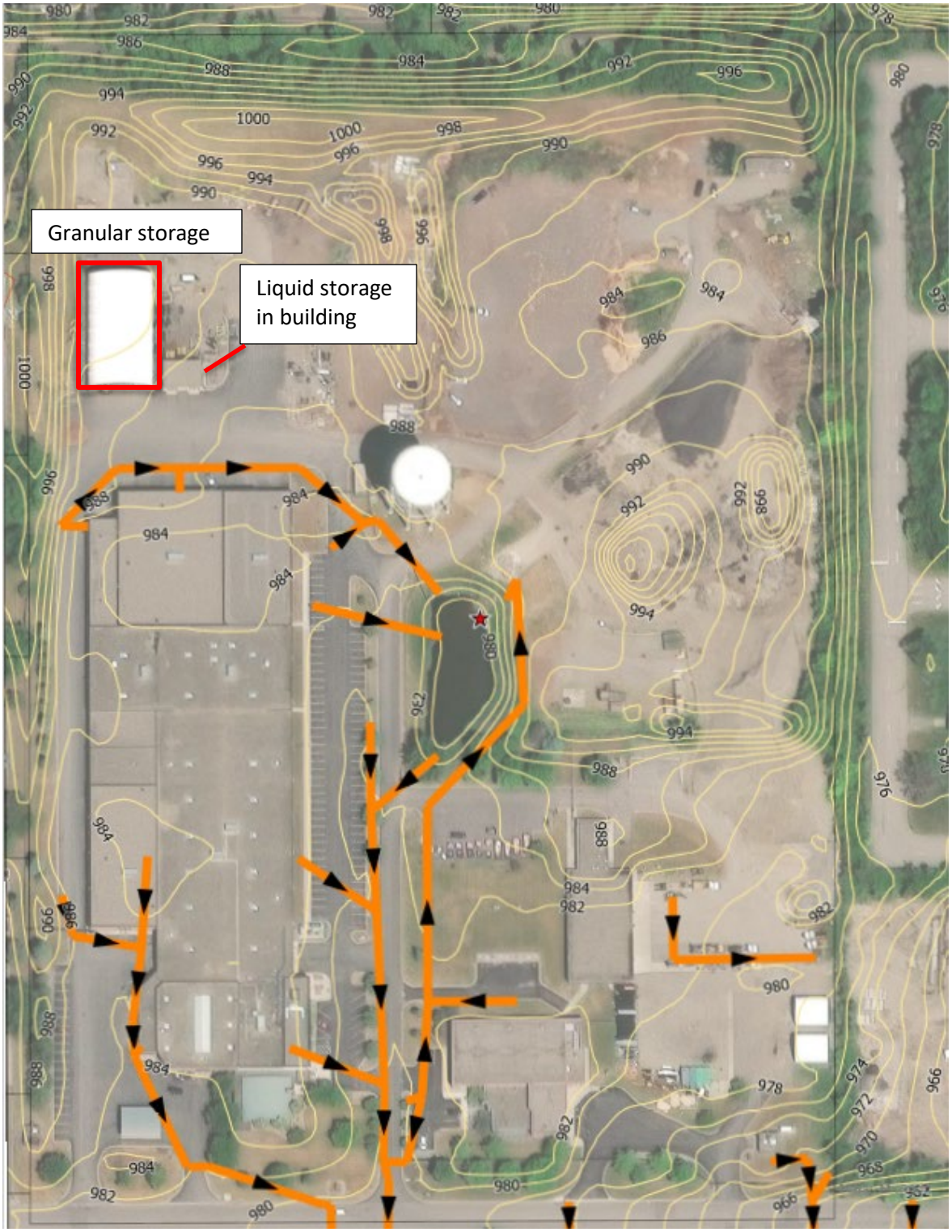
Appendix A: Larger Aerial Photos

APPENDIX A1: BRIGHTVIEW LANDSCAPES



APPENDIX A2: TWIN CITY OUTDOOR SERVICES

APPENDIX A3: CITY OF PLYMOUTH MAINTENANCE FACILITY



APPENDIX A4: MNDOT PLYMOUTH TRUCK STATION