Village of Niles, Illinois Public Works

Excellence in Snow and Ice Control Award Application

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Niles Public Works

Incorporated in 1899, the Village of Niles, Illinois is approximately 15 miles from downtown Chicago and has grown from a population of 500 people in 1899, to nearly 30,000 residents today. The Village provides notable facilities and services to its residents, including the Niles Senior Center, the Niles Free Bus, the Teen Center, Family Services and the Family Fitness Center. The Village also has an extensive, high-quality park system and vibrant public library.

Figure 1: Niles location map.

Niles has long been known for its strong mix of retail and industrial development, and currently has over 4.5 million square feet of retail space within the Village. In 2017, Niles ranked twelfth in total retail sales among Illinois communities and second in retail sales per capita.

The Village of Niles is well located within the region given its proximity to the City of Chicago, O'Hare International Airport, and Interstates 90, 94 and 294. These assets have attracted residents, retailers, office users and industrial businesses alike, with 1,900 establishments and over 26,000 employees. At the heart of Niles is Milwaukee Avenue which traverses the length of the Village diagonally from southeast to northwest and provides an important connection between the City of Chicago and the northwest suburbs.

The vital street is also home to Pace Suburban Bus Services newly developed PULSE bus service, which provides enhanced express bus service to commuters using the latest technology and streamlined route design. Pulse is designed to provide fast, frequent and reliable bus service in heavily traveled corridors of suburban Chicagoloand. The Milwaukee Avenue corridor will be the first scheduled service offered by PACE, further highlighting the need to maintain roads in the best possible condition.

Because of the large residential, commercial retail and industrial development, perhaps no other event the Niles Public Works Department responds to has as much impact as snow and ice control. Consistent with the principles of good emergency planning for unpredictable, but inevitable circumstances, the Village has adopted a snow and ice control plan to serve as an operational guide during winter storms.

The Niles Public Works Department is composed of an administrative staff and eight divisions, which are collectively responsible for delivering public services and maintaining the quality of life for the residents of the Village of Niles. The divisions are Engineering, Facilities, Fleet, Free Bus, Forestry and Lights, Water and Sewer Distribution, Streets and Signs, and Water Plant. The Department's headquarters are located at 6849 W. Touhy Ave., Niles, Illinois and staffed with 55 full-time, 19 part-time and 8 winter seasonal

employees, however only 26 full-time and 8 seasonal employees are available for snow and ice control. Engineering, Administrative and Free Bus staff (15 full-time and 18 part-time) do not assist in snow removal efforts. Fleet Maintenance (8 full-time and 1 part-time) employees serve in a support role. Facilities employees (6 full-time) are dedicated to snow removal at various facilities.

The Village provides snow removal services to the following assets:

- 57.5 center line miles of Village streets, which requires 230 plowing miles to plow curb to curb.
- 62.66 lane miles of highways owned by the Illinois Department of Transportation via a maintenance agreement
- 6 miles of alleys
- 16 municipal parking and plaza areas (Village Hall, Police Department, Public Works Department, Fire Station 2, Fire Station 3, Senior Center, Family Fitness Center, Touhy Avenue Water Plant, Ballard Water Plant, Memorial Waterfall parking, 7649 and 7735 Milwaukee Municipal Parking Lots, Harlem Municipal Parking Lot, Leaning Tower, Albion Monument, and Historical Society).
- 12 municipal bus shelters

Historically the Village receives 37 inches of snow per year, however snowfall in the metropolitan area has ranged from as little as 9.8 inches, to as much as 89.7 inches, requiring us to be prepared for all possibilities. The Snow and Ice Control plan developed by the Village, which is annually reviewed and updated, uses a number of best management practices to meet the needs of the motoring public. This manual provides guidance for typical snowfall events, a prolonged winter storm, a blizzard of great intensity or a rapid succession of smaller storms that strain employee resources and/or limit the effectiveness of certain pieces of snow removal equipment.

For normal snow and ice control procedures, three road supervisors are assigned the duty of coordinating department operations on a rotating weekly basis during the snow and ice season, from November to mid-April. Along with rotating road supervisors are two rotating road crews comprised of full-time employees. Upon determination a snow and ice plan is to be initiated, the road supervisor contacts the appropriate number of road crew employees from the on-call group to report to work for

RESIDENT TESTIMONIALS

"No matter where you drive from, the roads are always best in Niles."

"I just have to give HUGE KUDOS to the Niles Public Works department!!! I honestly have to say -- The roads look like they never even get TOUCHED until one arrives at or near Golf Road!! Then, from there on end ... all the way through Niles ... clean as a whistle and dry as a bone!! THANKS, Niles Public Works!!!"

"Tonight I drove from Gurnee to Niles and as always the only clean roads were in Niles! A BIG thanks to the hardworking plow drivers who know how to team up to clear the roads so efficiently and ALWAYS keep us safe."

"We are always amazed to see our side street and more times than not, our alley, cleared before other villages have even finished cleaning their main roadways!"

"Niles Public Works is the Best!!"

snow and ice control operations. The rotation of supervisors and crews keeps employees from burn out, and has shown to provide a better plan for events outside of regular work hours. A separate supervisor is responsible for snow and ice control at Village facilities.

Materials/Handling

Handling and Storage

All road salt and liquid products are stored at the Niles Public Works facility at 6849 W. Touhy Avenue in Niles. This is a secured campus and requires programmed identification cards to access the site. Road salt is stored in a salt storage dome measuring 72 feet in diameter and 36.5 feet high, with a large entrance and reinforced wing walls that extend beyond the cone walls to prevent the elements from entering the building, as well as protect the canopy trusses. The salt storage dome has a stockpile capacity of 2,065 tons and is not allowed to exceed the rated capacity.

The dome was constructed on an impervious concrete foundation to prohibit groundwater leaching, and is elevated above the ground to prevent surface water from reaching the stockpile. The unobstructed interior space allows for easier loading, moving and rotation of stored materials. The salt storage dome and loading area must be kept clear of spilled material and no spilled salt is allowed to remain exposed to weather. Should spillage occur during loading of trucks, materials are collected and returned to the stockpile.

Figure 2: Stockpile treatment of salt as it is loaded in the salt dome.

The Village maintains two separate salt contracts with a primary and secondary salt supplier. The primary salt contract is a one-year contract bid independently by the Village, with the option to extend the contract up to three additional years. The secondary supplier is bid via the State of Illinois Central Management Services Department. The two contracts ensure a continuous salt resupply during the winter season, and also maintains an active secondary supplier should there be shortage of salt availability in the metropolitan area during extreme winter conditions. The initial fill of salt dome is completed utilizing a conveyor system, and subsequent loads are placed with a front-end loader. When loading the dome with the conveyor, salt is pretreated with a liquid organic deicer formulated for stockpile treatments.

The Village has a total of six liquid storage tanks for salt prewetting and anti-icing materials. The liquid products used are an organic based, corrosion inhibited, liquid deicer containing a highly refined carbohydrate concentrate, two exothermic chlorides and two non-exothermic chlorides, and has passed the testing standards of the Pacific Northwest Snowfighters (PNS). It is listed on the PNS Qualified Products List, and also has been authorized to carry the USEPA *Designed for the Environment* label.

The Village has four 5,000 gallon tanks to store 20,000 gallons of liquid for salt prewetting, and one 5,000 gallon and one 8,000 gallon tanks for 13,000 gallons of a similar product for anti-icing. The products can be used interchangeably depending upon weather conditions, such as air or pavement temperature. Tanker loads of additional liquid products are ordered as needed during the winter to replenish supplies. To ensure no solids are present that could damage pumps, liquids are filtered by passing through a screen as they leave the tanker, as they enter the storage tank, and again when loaded into tailgate and anti-icing tanks. Liquids are also filtered while they are being recirculated.

Figure 3: Liquid distribution and recirculation controls.

The liquid distribution system is configured to allow for the easy recirculation of product to avoid settling of the product, as well as the easy loading of tailgate tanks and anti-icing tanks. The system has a primary and back-up pump to avoid service interruptions, and a defoaming treatment system. As liquid products are recirculated or loaded into trucks, a pump adds small amount of defoaming agent to hinder the formation of foam, allowing crews to efficiently load or recirculate products without waste. Drivers are able to easily connect the tailgate tank supply port to the fill hose utilizing a swing gate which supports the fill hose. This allows the product to be loaded with minimal effort and reduces the likelihood of injury to employees. Additionally should a prewetting tank not be available, the liquid system also has the ability to treat the salt in the truck bed via an overhead spray system. A licensed plumber on staff maintains and services the liquid distribution system equipment.

When the Village started anti-icing operations in 2009, storage equipment purchases were made with the plan to expand the program. Subsequently, the original equipment purchased is still in operation today, even as the system has grown from 5,000 to 33,000 gallons. This saved funds as new equipment was simply added to the system as our program services increased. All pumping facilities are located in a heated building constructed by Public Works crews, prolonging the service life of equipment because it is not exposed to harsh weather, and provides the ability of crews to operate equipment in a controlled environment.

Prewetting salt has many benefits. As shown in studies conducted by the Michigan Department of Transportation, treated salt stays in the target area of the road instead of bouncing off. The result is less salt is spread, saving money and reducing environmental impact. Second, prewetting salt provides the moisture needed to start the melting process. Third, when an organic based prewetting agent is used, it reduces the corrosiveness of salt, and fourth, boosts the performance of salt in all temperatures. The combination of all the items has allowed the Village of Niles to reduce salt application rates.

When salt is loaded on a vehicle, a dedicated loader operator records the unit number and the weight of the salt provided by the onboard loader scale. Should there be salt remaining on the truck after the storm, excess is dumped and returned to the stockpile after being weighed again to provide the actual usage for that storm event. The data from the loader scale is stored on a portable data device and confirms the field reads as part of the after action review.

Figure 4: Salt dome, liquid storage tanks and pump control facility.

When liquids are loaded in a prewetting or anti-icing tank, all products pass through a dedicated meter, and gallons loaded are recorded by drivers. Excess product can also be off-loaded through a metered supply line. Like the salt, the unused product is deducted from the original amount loaded, and the actual amounts used are recorded by the driver. These totals are provided to the supervisor who completes a summary storm report detailing this and other information, such as employees, hours worked, mileage and route assignments.

The facilities department also treats areas with liquids and salt, however uses slightly different materials due to facility and landscaping concerns. Stairs, walkways and sidewalks are pretreated with an ecofriendly clear, odorless ice melt that is biodegradable, non-hazardous, non-staining and will not produce a white residue. Two 275-gallon toters of the liquid material is stored indoors on a custom built storage rack and used to fill wheeled sidewalk spreading equipment or battery powered back pack tanks, used to treat stairs, landings and areas with limited access.

Equipment

The Village of Niles has a wide variety of common, specialized and custom built equipment available for use for anti-icing, roadway snow removal, parking lot snow removal, sidewalk snow removal, snow hauling and after storm removal of snow. Prior to commencement of snow and ice operations in the late fall, all

equipment is inspected, calibrated and tested so repairs or enhancements can take place in advance of the winter season.

Anti-Icing Equipment includes:

- Repurposed ambulance with a 1,000 gallon tank
- Pickup truck with a 300 gallon tank
- Large dump truck with 400 gallon tank

Figure 5: Latest addition to the Public Works fleet.

Additionally, new dump truck purchases will be outfitted with 400-gallon tanks. Application of liquid materials in advance of a storm are completed in designated areas, and are applied using automated control systems with GPS technology and ground speed monitor for a precise application rate. The Village has treated main highways, collector roadways, cul-de-sac/dead end areas and alleys, and has observed benefits treating each type of roadway surface. Of interesting note, treating cul-de-sac and dead end areas prior to a salting event kept the road surface in perfect condition and allowed crews to stay on main roads, reducing time to complete the routes. This also and greatly improved service levels to areas often classified as lower priority.

As mentioned before, the facilities department uses various hand operated wheeled equipment and back pack equipment to spread liquids, and also uses an MT Trackless with a 200 gallon tank to treat larger pedestrian areas and sidewalks adjacent to municipal facilities.

Snow removal equipment includes:

- 7 - large size dump trucks outfitted with plows, spreaders and liquid treatment tanks
- 8 - medium size dump trucks outfitted with plows, spreaders and liquid treatment tanks
- 5 - one-ton dump trucks outfitted with plows and spreaders
- 14 - one-ton pickup trucks outfitted with plows
- 2 - MT Trackless (with snow blower, plow, drop spreader and liquid spray attachments)
- 3 – Front-end Loaders
- 2 - Loader mounted snow plows
- 1 - Loader mounted snow blower
- 2 - Skid Steers
- 2 – Skid Steer mounted snow boxes
- 8 - Snow Blowers


Figure 6: Niles large snow plow unit.

In the near future a new addition to the fleet will be our first wing plow with laser guidance for use on major roads and highways.

All new equipment comes outfitted with a computer controlled dispensary systems for salt and 400 gallons of prewet liquids which maintains a consistent application rate based on ground temperature and other weather conditions, and as the ground speed increases or decreases. Almost all other existing equipment has been upgraded to this type of control system using existing 100 or 200 gallon mounted tanks. Road temperature gauges are installed in new and converted equipment to provide drivers with real time data, allowing them to modify salt application rates accordingly.

Figure 7: New driver controls.

After each storm, equipment and attachments are thoroughly flushed, cleaned and serviced. A custom-built attachment allows us to quickly flush all components of the prewet system to ensure nozzles and other equipment are free flowing for the next storm. Once cleaned truck beds are treated with a clear coating to create a super-slick, friction resistant shield on spreaders and truck beds to enhance the normal flow of gravity. This prevents material from bridging, arching or sticking and easily slide out. All equipment is then stored indoors in a heated garage, so equipment can dry properly.

AVL equipment is installed in the entire plowing fleet and provides us with the opportunity to:

- Monitor vehicle movement and plow-route coverage;
- Monitor the system during winter storms or emergencies and, if needed, see the closest truck to an area that needs additional service and direct trucks to that location;
- Review data on effectiveness in returning traffic to pre-storm conditions;
- Review usage of materials through the various stages of a weather event; and
- Interface with other department technology to combine real-time weather and road conditions with corresponding material-usage rates.

Another innovative and custom built piece of equipment was a spray bar used to provide a stockpile treatment of salt while it is being loaded on a conveyor. A supply line is connected from our liquid pumping facility to a spray bar attached to a bracket over the conveyor. The spray bar has several moveable nozzles which are each controlled by an independent valve, giving us the ability to adjust spray volume and direction. The flow is metered, and application rate of the liquid stockpile treatment to the salt on the conveyor is adjusted based upon the conveyor fill rate.

Figure 8: Scan the code to watch the stockpile treatment of salt.

When done for the winter season, all attachments, such as tailgate tanks and spreaders, are cleaned, flushed, treated and stored indoors on a racking system.

Training

Just as one winter season comes to a close, training and operational improvements for the next winter season are already underway. Public Works employees in administrative, operations and fleet capacities attend the annual APWA Snow Conference. Village of Niles Information Technology (IT) employees have also attended the event, as a great deal of new equipment is computer based working in tandem with software systems in the office. Having the IT staff involved at the ground floor is important when selecting software and hardware to ensure systems are compatible and operate seamlessly.

In the late spring an after season review is completed each year, and equipment and operational improvements goals for the following winter season are developed. This sets a plan to institute changes such as routing, personnel assignments, equipment purchases or other operational improvements prior to the next winter.

Training opportunities that are available are varied and focus on management/operational issues as well as operator training, and utilized during the summer and fall.

The APWA Chicago Metro Chapter holds an annual Snowplow and Loader Roadeo Competition. The competition reinforces the desire of employees to improve their skills each year. Competitions may also be held in house to determine the Village representatives.

The Northeastern Illinois Public Safety Training Academy (NIPSTA) has been a useful tool for training current and seasonal employees. NIPSTA offers a one-day interactive program to enhance snowplow drivers performance by training safely and effectively while operating a vehicle in the most extreme simulated conditions. Realistic scenarios have been developed in both city and suburban environments, on wide and narrow streets and in daytime and nighttime conditions. This helps drivers prepare for a variety of situations faced during the snow season, and reinforces road awareness and plowing skills.

The NIPSTA Driver Training Simulators are designed for realism, responsiveness, and results. Along with the high-resolution graphics on large-screen plasma displays, the seat, steering wheel, brake, and accelerator pedals enhance retention and application to the road. The force-loaded steering provides real-time feedback to augment muscle memory in situations such as tire blow-out or collisions. The

system provides instant feedback about student actions and decision-making, thereby improving accountability and on-the-job performance.

Additional features to challenge drivers include directional plowing, spreader control with blast button, windblown snow and whiteout conditions, obscured windshield, and snow, ice, and other treacherous driving conditions. Layers of difficulty are added to scenarios to accommodate and improve any driver experience level.

Several employees each year also attend workshops offered by nearby Lake and McHenry Counties. This training focuses on salt usage, and the need to balance effective ice and snow removal practices that do not compromise safety. Road salt is the most commonly used tool to manage snow and ice removal, and the training provides best practices to follow sensible methods and alternatives to use that can be more environmentally friendly and cost-effective.

While arguably the best product for deicing, salt used for snow and ice management has negative impacts on the aquatic environment, local economics, public health, and our watersheds. This training highlights ways to reduce road salt used on sidewalks, parking lots, and roadways while still providing a treatment program that meets the goals of the community. Some of the methods discussed are equipment calibration, use of prewetting liquids and using the correct amount of salt based upon roadway and weather conditions.

For a number of years, the APWA Suburban Branch and Metro Chicago Chapter have teamed with Vaisala, Incorporated to hold an annual Snow and Ice Leadership Seminar. This training brings in local and national speakers to present successes and failures and discuss new trends from highway agencies of all sizes. The diversity of speakers gives insights on how to face a variety of challenges. Drivers and supervisors attend and bring this knowledge back and develop ways to incorporate improvements to our program.

In 2018 the Village of Niles also was a presenter at the seminar, detailing our snow route optimization program, and how the new plowing and salting routes were developed and then uploaded into a GPS navigation device to provide in cab turn-by-turn directions to drivers. Route optimization made our routes more efficient, and the GPS navigation unit made it simple for all drivers, from experienced to seasonal, to follow the routes. This program is discussed further in the Technical portion of the application.

All the preseason training culminates with the final in-house training and preparation. Supervisory staff lead a day long training session covering the snow and ice control plan for the Village. Items covered include staff assignments, overtime callout procedures, equipment usage, pre and post trip inspection and maintenance, anti-icing and deicing procedures and products, application rates, equipment calibration, weather impacts and route assignments. While a full snow and ice procedure manual is available, condensed user instruction guides or "how to" guides are also provided to drivers that cover everything from loading and unloading anti-icing and prewetting tanks, to application controls, to routing equipment.

Following the final inspection of the equipment, while all routes are preloaded into the GPS navigation unit installed in each truck, drivers drive the primary and secondary routes they are assigned. The preloading of all routes into the GPS navigation device allows drivers to navigate other routes if needed without hesitation. While performing the preseason route review, should obstacles such as raised manholes be identified, they are repaired prior to the winter season. Should they be identified during the winter, or if they are minor issues, the Village also uses a heavy-duty, durable intersection grade preformed thermoplastic pavement marking material which can be quickly positioned and heated in place, removing the hazard. This provides a precut neat appearance and no heavy equipment to install, and removes hazards to snow plowing crews.

New drivers, even with snow plowing experience, first observe snow plow operations as a passenger while on salting and plowing routes. This provides them with a familiarity of the routes, and reinforces expectations the Village has of drivers. Once they have had adequate observation training, new drivers are then placed with an experienced driver to provide more reinforcement on proper plowing techniques. Only after drivers have had more than adequate training experience are they allowed to drive on their own. The vehicle size and route difficulty generally progresses as their experience increases.

The Public Works Department has developed a snow and ice control plan to be used as an operation guide during a "typical" and an extraordinary snow emergency to maintain the ability of traffic to utilize streets throughout the Village. The plan covers the two basic snow and ice control strategies:

- Anti-Icing – This is a proactive strategy for prevention of a strong bond between frozen precipitation or frost and a pavement surface by the timely application of a chemical freeze point depressant, usually liquids.
- Deicing – This is a reactive strategy where treatment of a deicer is applied to the top of an accumulation of snow, ice or frost that is already bonded to the pavement surface.

In 2009, the Village of Niles began its anti-icing program. While it was a relatively short time ago, anti-icing was still a newer method at the time. While supervisors supported the concept, they felt uneasy making the decision to anti-ice roads. First, a liquid product was being applied to a road in good condition during winter. Supervisors were concerned it would cause a hazard if not applied correctly. Second, there is a substantial cost for labor, equipment and material to place the product on the street. What if the road was anti-iced but it was not needed?

Because of these issues, Niles staff developed an Anti-icing Application Decision Flowchart in cooperation with McHenry County Department of Transportation to help guide supervisors through the decision making process. Over the years we have refined our process slightly, however it remains largely unchanged. A record detailing the weather conditions present at the time anti-icing application is commenced, as well as additional information, is documented and forwarded to the road supervisor.

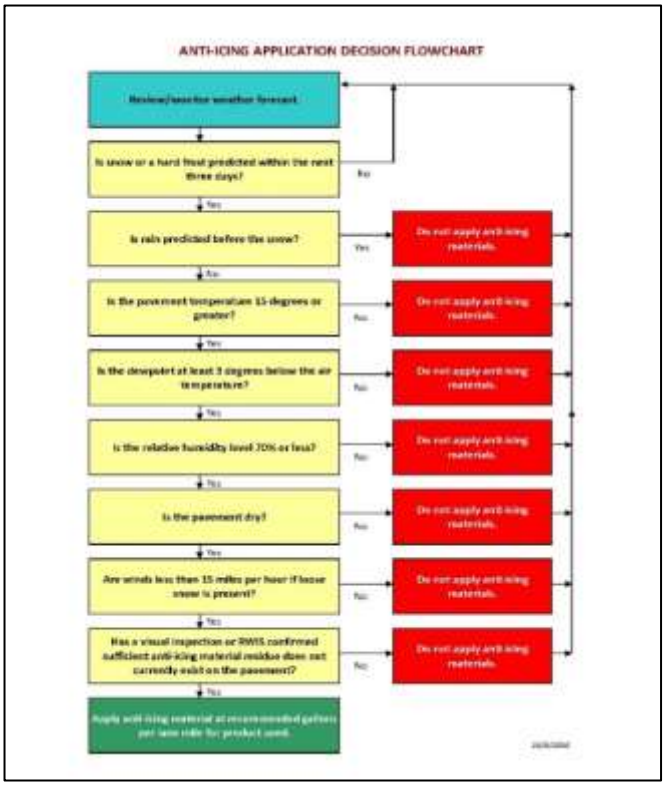

Figure 9: Niles Anti-Icing Decision Making Flowchart.

A main thrust the past several years was ensuring all salt was prewet prior to being spread, to increase effectiveness and reduce bounce and scatter. Additionally a greater understanding of pavement temperature as it relates to salt's effectiveness has been emphasized time and time again. This emphasis, combined with anti-icing, calibration of equipment and route optimization has led to a 40% decrease of salt usage over comparable storms from previous years.

The Village of Niles snow and ice control plan is designed to provide coverage and response to events 24/7. Three road supervisors are assigned the duty of coordinating department snow and ice operations (Snow Commander) on a rotating weekly basis during the snow and ice season, from November to April.

Figure 20: One of our first anti-icing tests clearly shows the benefits of anti-icing. On this day, extremely cold temperatures allowed a minor snowfall to bond to the pavement quickly and cause icing conditions. Areas that were anti-iced had no service issues. Shown here are pictures of two adjacent streets taken within a minute of one another.

Along with rotating Snow Commanders are two crews comprised of full-time employees which rotate on-call coverage each week. The weekly rotation of supervisors and crews keeps employees from burn out, and also provides a better plan for events outside of regular work hours for employees.

Should there be a snow event during regular work hours, the designated Snow Commander is responsible for coordinating department efforts, including the assignment of available employees and equipment. Should the event continue past regular work hours, the Snow Commander will assign members of the on-call group to remain at work. When a snow/ice event is forecast to begin during non-regular work hours, salt trucks and prewetting tanks are loaded prior to the end of the work day. The number of trucks loaded may vary based upon the anticipated severity of the event.

If the weather event will occur shortly after the end of the employee's regular shift, an adequate number of employees will stay at the end of their regular shift. Should the forecast anticipate the event occurring later, when possible the Snow Commander will schedule a return to work time in advance of the anticipated start time of the weather event. This helps keep crews ahead of the storm and allows them to rest and prepare for storms appropriately. One of the most important items in snow fighting is responding to the event in a timely manner, therefore we always err on the side of caution and make certain crews are available to respond.

For other events, an RWIS notification or the Shift Commander for the Police Department will contact the designated Snow Commander when parameters are met indicating weather conditions warrant response to an imminent or actual snow/ice event. Employees will then be contacted to report to work.

While weather conditions may warrant a full snow removal operation begin immediately, generally snow/ice events begin as a salting operation with eight to eleven pieces of equipment assigned to service the roads, in addition to a dedicated front-end loader operator and facility crews treating parking lots and pedestrian areas.

Crews are assigned to one of the following routes:

- Highway Routes A, B or C
- Subdivision Routes 1, 2, 3 or 4
- Factory Area
- Facilities

While each crew member will generally be assigned the same route each storm, because of the GPS navigation devices providing in cab turn-by-turn directions for each route, full-time and seasonal employees can be adjusted to complete any of the routes with little if any disruption to efficiency.

Should snow continue to fall and salting by itself is no longer effective, the Snow Commander will contact the Streets Superintendent who will mobilize the department for a snow removal operation. For snow removal operations, the Village divided into predefined routes, and the number of employees and

equipment assigned to a snow removal operation vary depending upon the type and intensity of the storm into the following routes:

- Highway A Route
- Highway B Route
- Highway C Route
- Factory Route
- Black Route
- Blue Route
- Green Route
- Orange Route
- Purple Route
- Red Route
- Yellow Route
- Cul-De-Sac North Route
- Cul-De-Sac South Route

For normal snow removal efforts, the following is the priority of the roadway network.

Priority 1 - Arterial, major collector roadways and Snow and Bus Routes are addressed first.

- Arterials are major roadways with high traffic volumes and high operating speeds that provide critical access and links within the Village. Clearing these roads is a top priority to ensure safe access for emergency vehicles, provide adequate land width for traffic, and minimize surface re-icing.
- Major collector roadways distribute traffic between arterial roadways and residential streets and often serve as vital link between arterials and subdivisions.
- Snow and Bus Routes. These are the first roadways plowed within a local street area to provide safe passage for the bus roadway network.
- Parking lots of open Village facilities.

Because these are critical to the transportation and emergency needs of the Village, snow removal equipment will remain on these roadways until the snow storm dissipates.

Priority 2 - Local streets and cul-de-sacs

- Local streets and cul-de-sacs provide for low and moderate traffic volumes within subdivisions and provide direct access to residences or private property.

The plowing of local streets and cul-de-sacs is typically addressed after Priority 1 roadways have been cleared, however storm conditions often permit Priority 1 and Priority 2 streets to be serviced at the same time.

Priority 3 – Alleys and parking lots of closed Village facilities.

Priority 4 – On-street parking areas.

If a snow removal operation is anticipated to last an extended period of time, the workforce will be split into shifts, working twelve-hour work shifts. After the twelve-hour work period, employees must have at least eight hours of rest. Generally, if a shift works through the night, they will be sent home at 7:00 a.m., and the second shift will then work until 7:00 p.m. If the storm has continued, the first shift will return to work at 7:00 p.m. to continue snow removal operations.

In rare instances, when a single storm event with extreme blizzard type conditions, or when a series of severe snow storms occur in rapid succession prior to full recovery from the previous storm, it is anticipated the physical conditions caused by these natural events will exceed the capability of existing Public Works staff and equipment.

In such circumstances, the Streets Superintendent or Director of Public Works will activate the Emergency Snow Clearance Plan in concurrence with the Village Manager. Under this plan, snow plowing services shall first be concentrated on opening arterial, collector, significant roads, and bus and snow routes within the corporate limits. Snow removal equipment will be staffed around the clock by reassigning personnel to one of two twelve-hour shifts as provided above. During such emergency periods, the Department shall make provisions to meet basic nutritional needs of employees, and in extreme storms, housing needs. In extreme circumstances, contractual assistance may be necessary.

After a major event, crews will load and haul snow from areas with heavy pedestrian traffic, or where driver site lines need to be improved. The snow is hauled to a designated area, which when it melts, filters through a bioinfiltration facility to remove pollutants prior to discharge into the storm sewer. This is discussed further in the Environmental Section.

Community Outreach

Typical of many communities, the Village of Niles uses a number of internet-based tools to provide messages and information to residents about snow removal and storm events. On the Village's main website www.vniles.com, information about the overall snow removal program, reminders about parking vehicles, and where to place shoveled snow and refuse containers are provided in nine different languages due to the diversity of the residential population.

The website and social media accounts, such as such as Facebook, Twitter and Instagram are also used to provide information about anticipated storms so residents can adequately prepare, as well as timely information about snow removal efforts, especially during large storms or extended length storms. The Village also utilizes an "E" Newsletter to provide similar information via email to individuals not on social media. Of course, the Village still prints and mails a quarterly newsletter to all residents with this information.

Figure 31 Scan the QR code to watch the Village of Niles Snow Plowing PSA video.

You Tube is a platform used to provide many Public Service Announcement videos, such as this one for snow removal. You can scan the QR code to the right to watch the video or go to the following website: https://www.youtube.com/watch?v=p5AUSAtTL4Q.

Should urgent notice be needed for all residents before or during a storm, the Village also has utilized a reverse 911 calling feature that sends a prerecorded phone message to all residents. If needed for a limited geographic area, the message can be selected to only be sent to residences in that area.

Figure 4: A snow plow painted by East Maine School District 63 Expanded Learning students serves as a Mobile Mural on plows serving areas near District 63 schools. (Niles Journal & Topics).

To heighten awareness of snow plowing efforts and equipment, as part of a larger outreach effort to schools made by Public Works staff during National Public Works Week, the Niles Public Arts & Culture Advisory Council worked with local grade schools to paint mobile murals on snow plows. This is a fun and creative way to connect students to their community. Understanding the size and weight of the plow also helps teach them more about highway safety and understand the power of the equipment. The painted plows are on display during the annual 4th of July parade, and then are used throughout the year, bringing smiles whenever the plow passes by the school with their artwork leading the way.

Figure 5: Director of Public Works Fred Braun and Asst. to the Director Bob Pilat present at the APWA Snow and Ice Leadership seminar in Medinah, Illinois in August, 2018.

As mentioned previously, the Village was a presenter at the APWA Suburban Branch and Metro Chicago Chapter annual Snow and Ice Leadership Seminar. With over 125 attendees, the program allowed us to reach a wide audience to share our knowledge of snow route optimization, as well as how we were able take the optimized routes and provide in cab turn-by-turn directions to drivers using GPS navigation devices.

Technical

Making good decisions requires good information. That is why a number of years ago the Village hired a contracted weather service to provide site specific forecast information, as well as consultation and support from meteorological staff 24/7. Accurate weather and pavement forecasts coupled with insights of a professional support staff gives us the ability to plan and execute effective operations. For example, knowing whether our area will receive rain before a snow event determines our anti-icing strategy, and knowing when a storm is forecast to stop helps us plan our crew resources. This was evident when a blizzard struck the area in 2011 and the forecast service was spot on with their prediction. Village staff can access this information from web-based browser, or via an app on a hand-held device. Weather data is always available for supervisors.

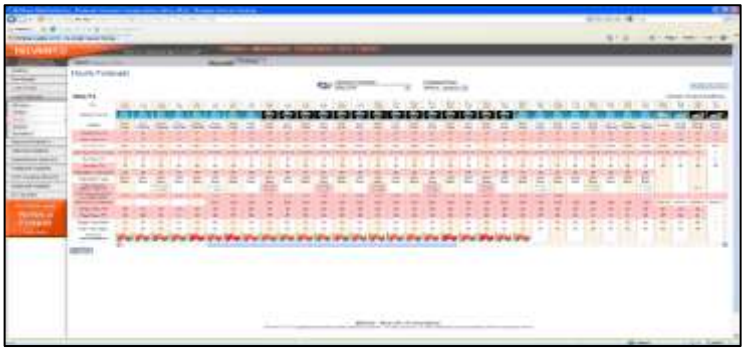

Figure 6: Weather forecast from 2011 blizzard.

This year the Village entered into a data services agreement with a company to provide data from two newly installed Road Weather Information System (RWIS) stations in Niles. RWIS consists of remote sensing equipment, which gathers and transmits road-related weather information. The information includes atmospheric (temperature, wind, precipitation, etc.), roadway (temperature, pavement conditions, friction level), and sub-surface pavement temperature characteristics. RWIS has been around for decades, however recent improvements allows data to be obtained non-invasively using infrared and laser technology, and is the equipment obtaining our data.

This weather data will allow us to better coordinate the pre-treating of roads via anti-icing, efficiently plan winter maintenance, reduce the amount of deicing chemicals used to clear roads, and reduce the wear and tear on maintenance vehicles. This provides safer roads, improved road maintenance decision making, and data for an after event review to enhance future transportation planning.

The RWIS sensor is non-invasive and measures:

- Surface conditions (dry, damp, wet, snow, ice)
- Waterfilm height or snow height
- Ice percentage in water
- Freezing point and surface temperature
- Friction coefficient or grip

Figure 7: Typical RWIS equipment.

RWIS further promotes the shift from reactive to proactive operations. With RWIS, we can monitor real-time pavement temperature and moisture and plan our response better. As soon as the RWIS indicates various parameters are met, such as loss of traction, or moisture on the road with pavement temperatures falling to near freezing, the system will notify Public Works staff, giving us lead time to notify crews and respond before the event occurs – not after.

This information is also needed to comply with new Illinois Environmental Protection Agency and Illinois Pollution Control Board regulations. The level of chlorides allowed in the Chicago Area Waterway System during the winter used to be much greater. However, the Illinois Environmental Protection Agency and Illinois Pollution Control Board revised that standard, and chloride levels must be reduced to a year round standard. As part of a variance filed regarding this new standard, highway agencies will have a five-year period to implement various best management practices to reduce chloride usage. While we currently use most of these practices, one of the requirements is varying the rate of salt application based upon pavement temperature. As pavement temperature increases salt is more effective, therefore less can be used.

With RWIS equipment we can also observe the effect each treatment has and how long it takes to work. Instead of looking at how much salt we used, we will be able to tell when road grip or speed returned to normal or how well we were able to maintain road grip during the storm. Knowing how much salt we used is good data, but it really does not tell us anything about performance. Performance data will help us identify best actions, material mix rations and application timing for various types of road weather conditions. This information will let us move to outcome based performance measure, instead of output data measures.

While we receive a pavement forecast as part of the RWIS, an export feed will also go to our weather service provider, which will help make their forecast for us more accurate as they are using actual data from our location instead of data from O'Hare Airport or estimated data. We also hope to obtain RWIS data from other users in the network, so we can monitor approaching storms from other Illinois users.

Route Optimization with GPS Turn-by-Turn Directions

In the past, the Village created snowplow areas manually. Adjustments to the plowing areas were made from time to time because of increased traffic, lane miles, personnel availability and changes to equipment. Later GIS data and equipment gave us the ability to easily determine route mileage to more evenly distribute plow areas. However an actual route with turn-by-turn directions for each area did not exist. Drivers assigned to plow the same area often had different approaches, resulting in mileage, cycle time and deicing product variations.

Figure 8: Niles snow route optimization and turn-by-turn directions effort were featured in the August, 2018 APWA Reporter.

Making matters worse, the department was again going to see significant turnover in staff due to upcoming retirements. This, combined with the use of seasonal employees to supplement the reduced full-time staff for snow and ice operations resulted in a staff where almost 50% of the employees had less than five years of experience. Most had less than two years of experience. Quite simply the Village determined routes needed to be optimized to reduce travel time, distance travelled and provide a more even distribution of the workload. These changes would also lead to decreasing the amount of deicing products used.

Public Works staff worked with a software company to develop optimized routes. Some of the other items addressed in this optimization were:

- Minimizing left turns and U-turns
- Minimizing crossing major routes at uncontrolled intersections
- Completion of the routes within time goals
- Prioritize routes based upon roadway priority, and
- Modifying routes based upon real world realities

Several types of routes were created including:

- Salting only routes
- Plowing routes
- Cul-de-sac routes

New optimized routes with turn-by-turn directions were developed for each route, however implementing the changes remained a looming challenge. Niles has typical suburban subdivisions, with streets that do not go though, dead-ends, cul-de-sacs, one-way streets and unique configurations. That,

combined with the length of the route, would make it impossible for drivers to remember each turn for one route, let alone all of the routes. Moreover, with seasonal employees not knowing the streets of Niles, let alone the plowing routes, we wanted a better solution than having drivers constantly looking down at a map in a dark truck during adverse conditions. All parties knew reviewing a multiple page document for directions while driving is difficult and unsafe.

Figure 9: Scan the QR Code to watch a video produced by Garmin about the Niles routing system.

When Niles started the project, the ultimate goal was to provide directions with a navigation unit many people use in their daily life. However time and again we were told this was not possible. The ability to provide turn-by-turn directions on a complicated route did not exist. Navigation devices are designed to direct a motorist from Point A to Point B using the fastest or shortest route. Niles wanted a navigation unit that went from Point A to Point B, while plowing all the streets in between and in the desired order.

Two types of navigation applications were tested by the department, one in 2016 and the other in 2017, however neither provided the functionality or mapping desired. As we had some limited initial success trying to configure an off the shelf navigation unit, we decided to fully commit to this solution. While we were faced with many obstacles, staff members were confident they could accomplish their goal. Through much trial and error, Niles was finally able to determine how to recreate the optimized routes using the navigation units routing software and successfully uploading the route.

Once the routes were developed and uploaded to the navigation units, the next step was the most critical part – testing and feedback to improve the routes. In the fall of 2017, drivers took the navigation units and test-drove the routes. Typically, we had someone with no experience whatsoever in the area drive the route to see if there were any issues. This was done to avoid employee frustration when the system was put during real world situations, and provide a system that left no routing uncertainty in the driver's mind.

Sometimes drivers found a routing error. Even with the map and upcoming turn directions, sometimes the navigations units did not provide as much clarity as desired. Sometimes drivers came up with a better routing suggestion. Sometimes a way to provide better service was found. The routes were updated based upon the input, however the real test was in real world situations. Further refinements were made when the winter season started with salting runs, and then later in the season during plowing operations. For the most part, updates provided even more clarity, and the routes are now complete.

To use, drivers simply select the route they are assigned from one of the 26 preloaded routes, follow the prompts, and the navigation unit will provide them turn-by-turn directions for the route. While driving, if a plow is unable to travel down a block for any reason, the driver can simply detour around the street or distance where the issue is and the navigation unit will get it back on the route. If the driver needs to leave the route due to mechanical breakdown, salt reloading or other reason, they are able to pause and restart the route with the unit providing directions back to the location where they left off.

Another added bonus is staff is easily able to modify routes using the software. For instance, a bridge was undergoing reconstruction over the winter, therefore the routes impacted by this closure were modified by staff, and were changed back once the bridge reconstruction was completed.

Providing the route in an easy to understand format is vital to all transportation agencies snow fighting efforts. Successfully completing this project required managerial, technical and operations staff working together toward a common goal.

Figure 108: Not only is the route map easy to read, drivers also have the ability to use the upcoming turn notification for the next four turns on the route.

Automated Vehicle Location equipment is installed on all Village plow trucks, giving us the ability to use technology to balance road salt usage as wells as levels of service. Supervisors can get real-time data, replay of truck route and detailed after action reports for a number of activities including:

- Solid and Liquid Material Rates/Used
- Plow Up/Down -Spreader On/Off
- Road Temperature
- Driver Behavior

By being able to monitor driver activity, supervisors can ensure the right materials and material rates are being applied in real time. It also gives them the ability to monitor the fleet locations, routing and operational status of all vehicles. While not the primary reason for implementation, AVL systems also helps respond to resident concerns regarding service or vehicle damage.

Also as previously mention, equipment upgrades include items such as road temperature gauges, computer controlled dispensary systems for salt and prewet liquids and front-end loader scale

Environmental

Because of the impact of chlorides have in the environment, the Village of Niles has worked to reduce salt application rates by stockpile treating salt, prewetting salt, calibrating equipment and using weather related data, such as pavement temperature, to determine the least amount of salt that can be spread without compromising safety and maintaining our desired level of service. The organic liquid prewetting

agent described earlier in the application helps us achieve this goal by improving the effectiveness of the salt, especially in colder temperatures, and reducing bounce and scatter.

While great for deicing, salt's toxic effects on plants have been known since ancient times when it was used for biological warfare to destroy an enemy's fields and crops. The Village of Niles uses two methods to provide protection to plant materials, especially along main roads. In the first method, permanent base posts are sunken around the perimeter of a landscape areas, and in the late fall secondary posts are inserted into the base. A geo-tarp is then secured to the raised posts around the perimeter of the landscape area and help reduce the impact from salt overspray reaching the planting area.

Secondly, the Village treats trees along highways with gypsum to reduce salt damage. Gypsum is calcium sulfate, a naturally occurring mineral. It has been touted as beneficial for breaking up compact soil, especially clay soil. It is useful in changing the soil structure of excessively heavy soils which have been impacted by heavy traffic, flooding, overcropping, or simply overly weatherized. One of the main uses of gypsum is to remove excess sodium from the soil and adding calcium. Treatments are completed annually, as the effects only last a couple of months before the soil reverts to its original state.

One of the larger environmentally oriented projects completed in the Village of Niles was constructed in 2013. The content and volume of stormwater runoff of our snow melt from the snow dump created from the Village hauling snow, contributes to the Combined Sewer Overflow (CSO) at the North Branch Chicago River, Segment IL HCC-07. The nature of the work was construction of a bioinfiltration facility to collect stormwater runoff from a street, rooftop, parking lot, and snow dump. The project reduces CSO events, reduces the volume of sewage discharged during a CSO event, and augments groundwater infiltration. It also reduces the amount of chlorides present in CSO discharges that occur during winter months.

Figure 19: Bioinfiltration Site Plan

Installation of green infrastructure to reduce water input to the sewer system and augment groundwater infiltration directly addresses a recommendation of our stormwater plan. Upon completion, the project immediately reduced the volume of water reaching the combined sewer system, improved the water quality of stormwater runoff, and reduced the volume water released during a CSO event.

The project included construction of a stormwater Best Management Practice (BMP) at a key location in the Village of Niles' sewer system. The site is located north of the Niles Police station and water reservoir on property owned by the Village. This location is east of the south end of Neva Avenue, north of Touhy

Avenue and west of Milwaukee Avenue. There are approximately 494 acres tributary to this location and drainage is provided by a 21-inch combined sewer and 15-inch storm sewer that both drain to a 60-inch combined sewer. This combined sewer discharges to the MWRD's collection system through a drop structure. When CSOs occur, the discharge is through the 60-inch pipe at Outfall #8.

The BMP is a bioinfiltration facility with an integrated filter strip along its eastern edge. The bioinfiltration facility accepts excess runoff from the 494-acre subwatershed that cannot fit into the existing sewer system at the site. Due the size the subwatershed, the design of the facility ensures the storage capacity of the site is fully utilized during each storm resulting in a CSO event and provides 40,000 cubic feet of storage.

Approximately 70 percent of the storage is surface storage that is detained or infiltrated, while the remaining 30 percent of the storage is provided in engineered soils and a gravel aggregate storage layer. The facility is designed such that the storage provided will be fully utilized during each of the estimated 30 CSO events per year. USEPA's 2004 Report to Congress on the Impacts and Control of CSOs and SSOs included pollutant load information for CSO discharges.

Combined Sewer Overflow events occur year round, even during winter months. The eastern border of the bioinfiltration facility is constructed with a level spreader and filter strip to receive overland runoff from the adjacent vacant lot. This filter strip accepts overland runoff from the adjacent lot used by the Village for snow dumping after large snow events. By encouraging infiltration into the filter strip, potential discharge of chlorides during CSOs are reduced.

Figure 11: Niles bioinfiltration facility.