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# CHLORIDE REDUCTION PLAN

POLICY-PORCUPINE BROOK  
POLICY BROOK  
UNNAMED TRIBUTARY TO HARRIS BROOK

FULFILLING THE REQUIREMENTS OF  
THE NEW HAMPSHIRE MS4  
GENERAL PERMIT

JUNE 2019  
UPDATED JUNE 2021



TOWN OF  
**Salem**  
NEW HAMPSHIRE

# crp

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## 1.0 INTRODUCTION AND BACKGROUND

The Town is regulated by the 2017 National Pollutant Discharge Elimination System (NPDES) Phase II General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) (2017 MS4 Permit), which became effective on July 1, 2018. The 2017 MS4 Permit requires municipalities that discharge stormwater to receiving waters that are impaired for chloride to develop a Chloride Reduction Plan. For those receiving waters that have a Total Maximum Daily Load (TMDL) in place for chloride, the Chloride Reduction Plan must be developed in Permit Year 1. EPA defines a TMDL as “a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL includes wasteload allocations (WLAs) for point source discharges, load allocations (LAs) for nonpoint sources and/or natural background, and must include a margin of safety (MOS) and account for seasonal variations.” Policy-Porcupine Brook (NHRIV700061102-18) is designated as a water body impaired for chloride for which a Total Maximum Daily Load (TMDL) has already been developed and is therefore included under Category 4A-P in the most recent EPA-approved New Hampshire Integrated Report of Waters. Category 4A-P indicates that the impairment is severe and causes poor water quality conditions. Therefore, to comply with the requirements of the 2017 MS4 Permit, the Town must develop a Chloride Reduction Plan for Policy-Porcupine Brook.

In addition, both Policy Brook (NHRIV700061102-17) and the unnamed tributary to Harris Brook (NHRIV700061102-21), require the development of a TMDL for chloride, and therefore the Town is subject to the requirements of Appendix H of the MS4 Permit, which outlines requirements related to discharges to water quality limited water bodies where chloride is the cause of impairment, but there is no approved TMDL. Policy Brook is included under Category 5-P, and the unnamed tributary to Harris Brook is included under Category 5-M in the most recent EPA-approved New Hampshire Integrated Report of Waters. The requirements under the MS4 Permit for chloride-impaired water bodies with and without an approved TMDL are the same. The only difference relates to the year of implementation. For Policy Brook and the unnamed tributary to Harris Brook, the Chloride Reduction Plan must be developed by the end of Permit Year 3.

The goal of this Chloride Reduction Plan is to identify specific actions designed to achieve chloride load reductions within the watersheds of each of these impaired water bodies such that the water bodies will meet water quality standards. The New Hampshire Department of Environmental Services (NHDES) prepared a Total Maximum Daily Load (TMDL) Study for Waterbodies in the Vicinity of the I-93 Corridor from Massachusetts to Manchester, NH, which focuses on Policy-Porcupine Brook in Salem and Windham, NH, in April 2008. This TMDL identified the chloride reduction target for Policy-Porcupine Brook. The TMDL also determined that the chloride load in the watershed can primarily be attributed to parking lot snow removal and maintenance (50%) and de-icing on state (9%) and municipal (27%) roads. The various owners of roads and parking lots to which salt is applied are jointly responsible for meeting the TMDL waste load reduction in order to meet water quality standards. The NHDES intends to work with the various sectors to achieve load reductions, prior to any enforcement actions being taken. However, if needed, NHDES can use authority in state law (RSA 485-A:12, Enforcement of Classification)

to implement the plan as necessary or can defer to EPA to use its NPDES permit authority to enforce control of stormwater runoff.

Table 1-1 provides the results of the NHDES Chloride TMDL for Policy-Porcupine Brook, which found 4,814.3 tons of salt was imported into the watershed in fiscal year (FY) 2007 for various uses. The TMDL recommends reducing the tons of imported salt to 3,635 tons per year. Table 1-1 lists the suggested salt import allocations for meeting this target. The load allocations have been designated based upon the following assumptions:

- Essentially all (96%) of the salt import reductions will need to come from reducing the salt load from deicing activity. Roads and parking lots owned by state, municipal, and private entities will be expected to reduce salt imports for deicing by the same percentage.
- The allocation for salt pile runoff will be zero because all salt and salt-sand piles should be covered. The 2017 MS4 Permit requires that all piles containing salt are enclosed or covered by the end of Permit Year 2 or June 30, 2020.
- The existing loads from water softeners, food waste, and atmospheric deposition will be used as the allocation for these sources.

**Table 1-1:  
Existing Salt Imports and Load Allocations, NHDES Policy-Porcupine Brook Chloride TMDL 2008**

Source	Agency/Town	FY07 Salt Imports (tons salt/yr)	Allocation of Loads (tons salt/yr)
State Roads	NHDOT PS 514	160.5	128.3
	NHDOT PS 528	295.6	236.4
Municipal Roads	Salem	1,247.9	997.9
	Windham	57.8	46.2
Private Roads	Salem	119.6	95.6
	Windham	5.4	4.3
Parking Lots	Salem	2,379.1	1,902.5
	Windham	47.3	37.8
Salt Piles	Salem	315.2	0.0
Water Softeners	N/A	101.8	101.8
Food Waste	N/A	52.3	52.3
Atmospheric Deposition	N/A	31.9	31.9
<b>Total</b>		<b>4,814.3</b>	<b>3,635.0</b>

For municipally maintained surfaces, Salem is responsible for tracking the amount of salt applied to all municipally owned and maintained surfaces and reporting salt use using the UNH Technology Transfer Center online tool (<http://www.roadsalt.unh.edu/salt/>) beginning in the Town's Year 2 MS4 Annual Report. Salem is also responsible for planning activities to reduce salt on municipally owned surfaces, which may include, but are not limited to:

- Operational changes such as pre-wetting, pre-treating the salt stockpile, increasing plowing prior to de-icing, monitoring of road surface temperature, etc.;
- Implementation of new or modified equipment providing pre-wetting capability, better calibration rates, or other capability for minimizing salt use;
- Training for municipal staff and/or contractors engaged in winter maintenance activities;
- Adoption of guidelines for application rates for roads and parking lots;
- Regular calibration of spreading equipment;
- Designation of no-salt and/or low salt zones;
- Public education regarding impacts of salt use, methods to reduce salt use on private property, modifications to driving behavior in winter weather, etc.; and
- Measures to prevent exposure of salt stockpiles (if any) to precipitation and runoff.

The Town is responsible for estimating the total tonnage of salt reduction expected by each activity enacted and preparing a schedule for implementation of planned activities. This includes immediate implementation of operation and training measures, continued annual progress on other measures, and full implementation of the Plan by the end of the MS4 Permit Term (June 30, 2023).

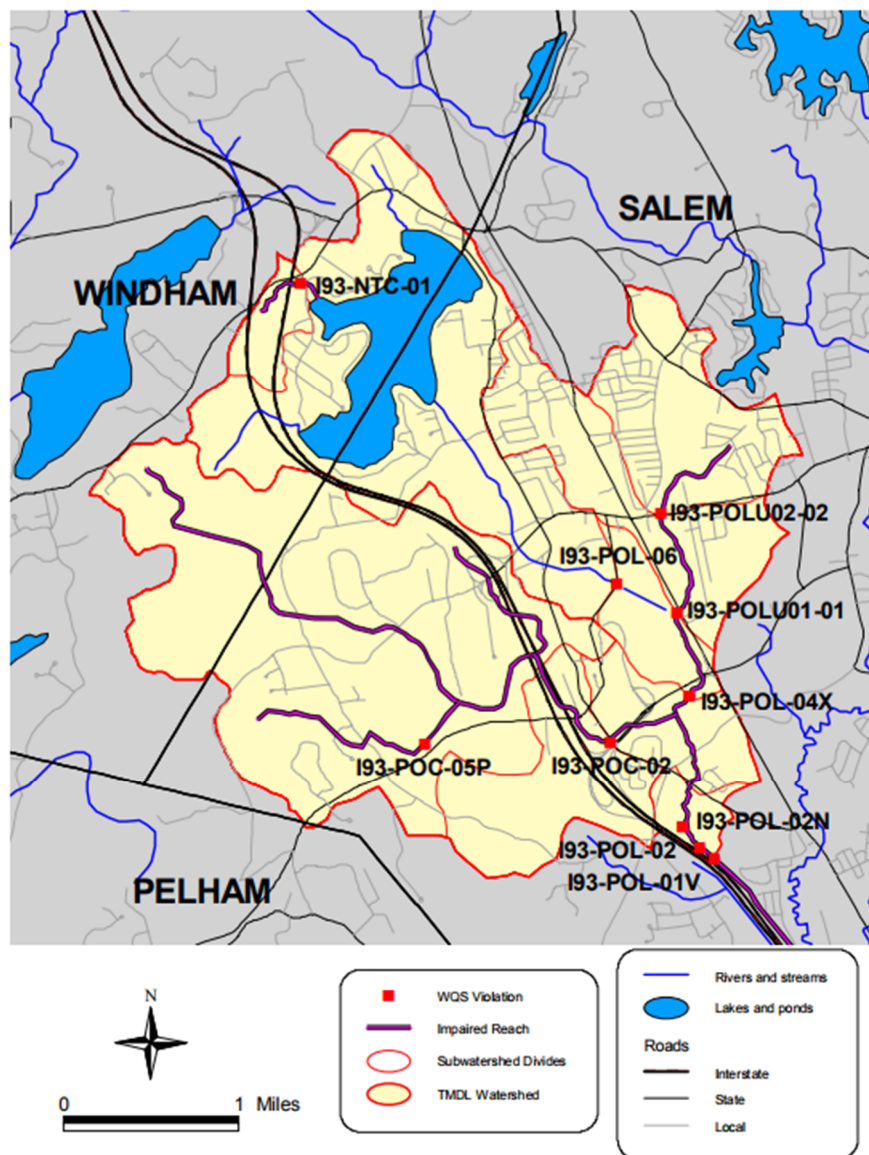
Salem is also responsible for identifying private parking lots with ten or more parking spaces that drain to the MS4 (municipal storm drain), and then working with private owners of these parking lots to reduce salt loadings from their property. The Town will create a system to ensure commercial salt applicators are trained and certified in accordance with Env-Wq 2203. Private parking lot owners with ten spaces or more will also be asked to report their annual salt usage within the municipal boundaries using the UNH Technology Transfer Center online tool (<http://www.roadsalt.unh.edu/salt/>) or report salt usage directly to the Town. The Town will include annual salt usage from private parking lot owners in the MS4 Annual Report. The Town shall also outline requirements for new developments and redevelopment to minimize salt usage, and to track and report amounts used using the UNH Technology Transfer Center online tool (<http://www.roadsalt.unh.edu/salt/>).

Public safety and potential liability are at the forefront of concerns when dealing with chloride reduction efforts. This plan uses an integrated management approach with a framework that provides recommendations for various state and municipal agencies, road and parking lot maintainers and the general driving public. Innovative techniques for chloride reduction efforts will continue to develop over time; therefore, this implementation plan should be reviewed and modified every five years until the chloride water quality standards in each of these impaired water bodies are met.

## 2.0 WATERSHED INFORMATION

Policy-Porcupine Brook is a stream segment that is 8.3 miles (10.18 square mile drainage area) in length in Salem and Windham, NH (Figure 2-1). Policy-Porcupine Brook encompasses multiple waterbodies starting from Canobie Lake in the north to the Salem rest area on I-93 northbound in the south. Downstream of the watershed, Policy Brook discharges to the Spicket River in Methuen, Massachusetts. The Town has 76 outfalls discharging directly to Policy-Porcupine Brook. These include: POR-1100-OF, POR-0904-OF, POR-900-OF, POR-0888-OF, POR-0887-OF, POR-0883-OF, POR-810-OF, POR-809-OF, POR-759-OF, POR-752-OF, POR-0636-OF, POR-0631-OF, POR-0628-OF, POR-0627-OF, POR-0595-OF, POR-0594-OF, POR-0591-OF, POR-0200-OF, POR-0103-OF, POR-0041-OF, POR-0040-OF, POR-0038-OF, POL-1142-OF, POL-1132-OF, POL-1119-OF, POL-1106-OF, POL-1056-OF, POL-1011-OF, POL-1010-OF, POL-0994-OF, POL-0978-OF, POL-967-OF, POL-0847-OF, POL-0807-OF, POL-804-OF, POL-0780-OF, POL-0744-OF, POL-0706-OF, POL-0643-OF, POL-0642-OF, POL-0634-OF, POL-0585-OF, POL-0579-OF, POL-0578-OF, POL-0363-OF, POL-0358-OF, POL-0357-OF, POL-0356-OF, POL-347-OF, POL-0344-OF, POL-0342-OF, POL-0341-OF, POL-336-OF, POL-335-OF, POL-0321-OF, POL-0320-OF, POL-297-OF, POL-0130-OF, POL-0129-OF, POL-0128-OF, POL-0121-OF, POL-112-OF, POL-0091-OF, POL-0055-OF, POL-0054-OF, POL-0037-OF, POL-0034-OF, POL-0028-OF, POL-0027-OF, POL-0026-OF, POL-0020-OF, POL-0016-OF, POL-0015-OF, POL-0014-OF, LSR-0100-OF, and LSR-0098-OF.

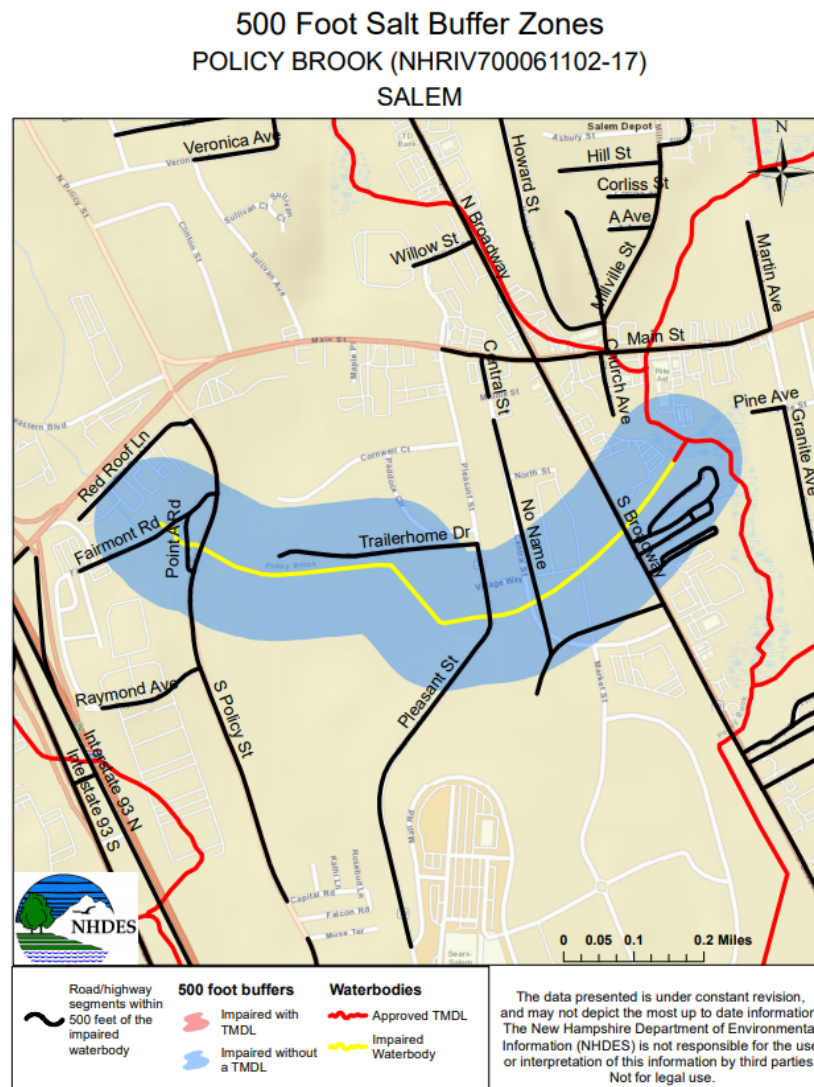
Figure 2-1. Policy-Porcupine Brook Watershed, NHDES Chloride TMDL 2008





The section of Policy Brook which requires a TMDL for chloride, is a stream segment of 0.9 miles in length. The stream is a part of the Policy-Porcupine Brook watershed and is tributary to Policy-Porcupine Brook. The Town has eight outfalls discharging directly to the impaired segment of Policy Brook. These include: POL-1133-OF, POL-0764-OF, POL-0763-OF, POL-0762-OF, POL-0753-OF, POL-0132-OF, POL-0004-OF, and POL-0005-OF.

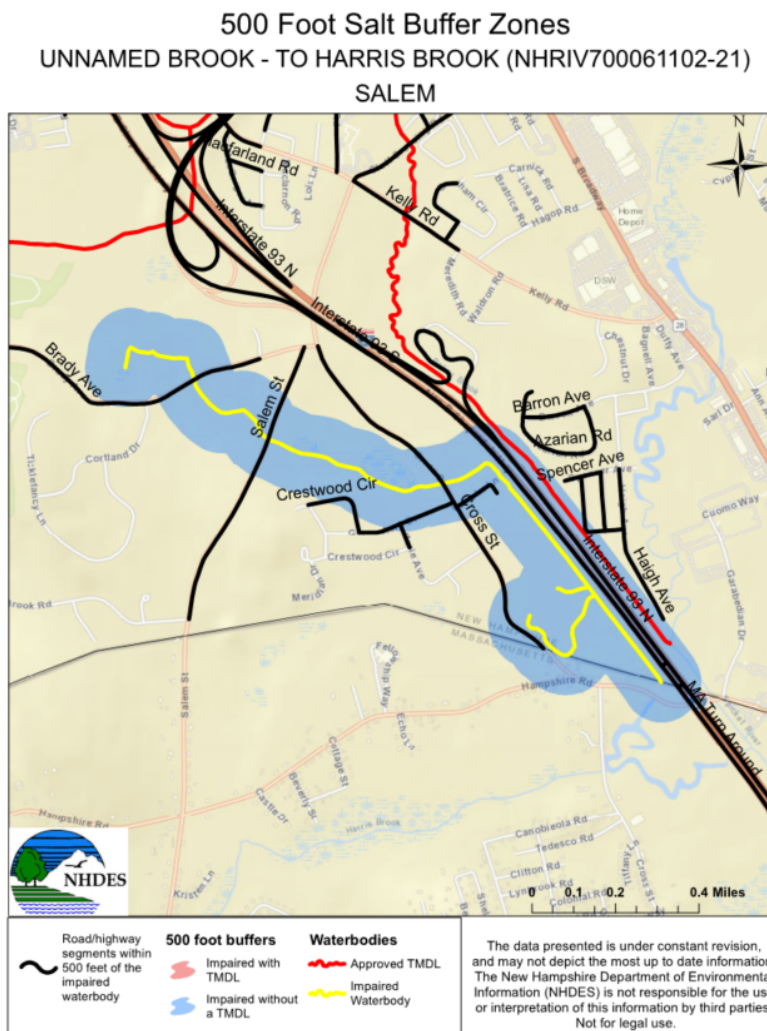
Figure 2-2. Policy Brook, NHDES Winter Maintenance





The unnamed tributary to Harris Brook is a stream segment 2.1 miles in length, which begins north of Brady Avenue and ends at the town line with Methuen, Massachusetts. This tributary discharges to Harris Brook, which then discharges to the Spicket River in Methuen. A total of 495 acres of land in Salem drains to this stream segment -- 99% of which is rural and residential, and 1% is industrial/commercial. The Town has four outfalls discharging directly to the unnamed tributary to Harris Brook. These include: POL-0413-OF, POL-0061-OF, POL-0056-OF, and POL-0406-OF.

Figure 2-3. Unnamed Tributary to Harris Brook, NHDES Winter Maintenance



## 2.1 Paved Surface Inventory

The NHDES TMDL states that approximately 98.4 percent of the Policy-Porcupine Brook Watershed is classified by the U.S. Census as “urbanized area”. The entire Policy Brook Watershed and unnamed tributary to Harris Brook Watershed is classified by the U.S. Census as “urbanized area”. Figure A-1 in Appendix A shows the municipal and private parking lots in the watershed with 10 or more parking spaces. Appendix A also provides a list of these parking lots with the associated square footage.

The New Hampshire Department of Transportation (NHDOT) is currently responsible for winter maintenance on 31 total lane-miles within the watershed. Table 2-1 identifies the number of existing NHDOT roadway lane-miles associated with each patrol shed within the Policy-Porcupine Brook Watershed. The Town of Salem is responsible for winter maintenance on approximately 122 lane-miles of road within the watershed. The Town also maintains approximately 14.5 acres of parking lots within the watershed.

Table 2-1: Number of Existing NHDOT Roadway Lane-Miles Associated with Each Patrol Shed within the Policy-Porcupine Brook Watershed	
Patrol Shed	Lane-Miles
PS 514	6
PS 528	25
<b>Total</b>	<b>31</b>

Existing private roads and parking lots are accounted for in the TMDL inventory. Within the watershed, there are 6 lane-miles of private roads, and 417.5 acres of private parking lots. There are also 35 miles of public sidewalks. Population growth is expected in the future as a result of the I-93 expansion. Growth will increase the use of chloride deicing chemicals. The TMDL, as written, does not include any allocations for future development. An allowance for increased use of salt due to additional development including roads and parking lots can be included in future implementation plans if there is an explicit offset of salt import for winter maintenance obtained from other sources in the watershed. Table 2-2 provides a comparison of the estimated existing and future annual road salt usages on NHDOT maintained roadways in comparison with the NHDES suggested TMDL allocation.

Table 2-2.

## Estimated Existing and Future Annual Road Salt Usages on NHDOT Maintained Roadways in Comparison to the NHDES Suggested TMDL Allocation

Watershed	Existing Estimated Average Annual Use (tons/yr)	Existing Estimated Average Annual Use with BMPs <sup>1</sup>	Estimated Future Average Annual Use with I-93 Expansion and BMPs <sup>2</sup>	NHDES Suggested Allocation	
				Tons/yr	% Decrease Needed to Meet Allocation
Policy-Porcupine Brook	676	545	1,002	365	63%

Notes: <sup>1</sup> Existing Average Annual Usage is based on historical records for a 10-year period. <sup>2</sup> Existing Average Annual Usage assumes a 20% reduction due to efficiency improvements with full implementation with BMPs.

In Salem, 50 percent of the salt contribution in the watershed comes from private parking lots. There are 323 private parking lots in the Town that have 10 or more parking spaces (Appendix A). The Town will develop an outreach program to the owners of these private lots about chloride reduction best management practices (BMPs).

## 2.2 Current Winter Road Maintenance Policies in the Policy-Porcupine Brook, Policy Brook, and Unnamed Tributary to Harris Brook Watersheds

The New Hampshire Department of Transportation, the Town of Salem, and private road and parking lot owners have different winter maintenance policies as described below.

### New Hampshire Department of Transportation (NHDOT)

The following documents reflect NHDOT policies on snow and ice management in New Hampshire:

- *Winter Maintenance Snow Removal and Ice Control Policy*, October 15, 2001 (<https://www.nh.gov/dot/org/operations/highwaymaintenance/documents/WinterMaintSnowandIcePolicy.pdf>). The level of service and operating procedures to maintain state roadways are defined, but environmentally sensitive areas or anti-icing and/or other best management practices are not discussed.
- *Implementation Plan to Increase the Efficiency and Effectiveness of Road Salt Use To Meet Total Maximum Daily Load For Chloride in Water Bodies Along the I-93 Corridor from Salem to Manchester*, September 2009 ([http://www.windhamnewhampshire.com/sites/default/files/2015MasterPlan\\_RegionalPerspectives\\_PH\\_8July2015.pdf](http://www.windhamnewhampshire.com/sites/default/files/2015MasterPlan_RegionalPerspectives_PH_8July2015.pdf)). This plan accounts for road salt needs and the estimated achievable chloride reductions.
- *New Hampshire DOT Salt Management Plan June 2019. Appendix K. of Stormwater Management Plan EPA NPDES Permit Number: NHR043000.*

### Town of Salem

The Town continues to focus on optimizing their winter operations at the DPW Facility and throughout Town through implementation of Best Management Practices focused on salt reduction and improved salt storage. The Town practices the following winter road maintenance BMPs:

- Cleaning and removing as much salt as possible from vehicles and equipment in the salt shed before washing;
- Using minimal water during cleaning and washing operations;
- Washing vehicles and equipment thoroughly so wash water is infiltrated in the designated wash down leaching basin and does not run off the site;
- Utilizing the sweeper on the trackless machine to clean up the salt/sand loading area and the area around the salt/sand pile to minimize the potential for salt to enter Policy Brook; and
- Keeping salt under cover as much as possible.

The Town also calibrates their salt spreaders on a regular basis. Seven of the 15 salt trucks owned by the Town are currently equipped with ground control spreaders. Road salt at the DPW Facility is stored within an enclosed salt shed. There are storage bunkers located adjacent to the shed, where sand and sand/salt mixtures are stored. The Town tries to keep these storage bunkers covered. Mixing of salt and sand does occur outside on the pavement in front of these bunkers, but the Town sweeps this area regularly to prevent sand/salt from reaching the drainage system. The 2017 MS4 Permit requires all piles containing salt to be enclosed or covered within two years of the permit effective date or by June 30, 2020.

The Town is also required to complete the following for all municipally owned surfaces within the catchment area:

1. Track the amount of salt applied to all municipally owned and maintained surfaces, and report to EPA the amounts used using the UNH Technology Transfer Online Tool.
2. Develop a comprehensive list of other planned activities for salt reduction on municipally owned and maintained surfaces. Suggested activities include:
  - Operational changes such as pre-wetting, pre-treating the salt stockpile, increasing plowing prior to de-icing, monitoring of road surface temperature, etc.;
  - Implementation of new or modified equipment providing pre-wetting capability, better calibration rates, or other capability for minimizing salt use;
  - Training for municipal staff and/or contractors engaged in winter maintenance activities;
  - Adoption of guidelines for application rates for roads and parking lots;
  - Regular calibration of spreading equipment;
  - Designation of no-salt and/or low-salt zones;
  - Public education regarding impacts of salt use, methods to reduce salt use on private property, modifications to driving behavior in winter weather, etc.; and

- Measures to prevent exposure of salt stockpiles (if any) to precipitation and runoff
3. Provide an estimate of total tonnage of salt reduction from each activity.
  4. Provide a schedule for plan implementation with full implementation by the end of the permit term.

#### Private Sector Owners and Maintainers

The parking lot and private driveway owners and/or maintainers typically do not have snow and ice removal policies. Each parking lot or road is managed differently, based on the property owner's objectives. Currently there is no commitment from private parking lot owners or maintainers to reduce salt used in impaired watersheds.

However, there is a new law in the State of New Hampshire, RSA 489-C, which states that any business owner who contracts for snowplowing and deicing with a "certified" salt applicator has liability protection from damages arising from hazards caused solely by snow or ice. The "certified" applicator is a snow removal contractor who has undertaken specialized training through the University of New Hampshire "Green SnowPro Program" in the "how to's" of efficient application of road salt (sodium chloride). In addition to providing limited liability protection, hiring a Green SnowPro certified contractor will:

- Increase the efficiency of removing snow and ice while ultimately decreasing the amount of road salt that is applied to the parking areas that they care for;
- Potentially save the business owner money through reduced salt use;
- Reduce impacts to the surrounding environment by protecting our ground water and nearby streams, ponds, and lakes from potential chloride contamination from runoff that often originates from parking lot areas;
- Minimize the salt and sand that is often tracked into the lobbies and offices at one's facility; and
- Protect the landscape plantings (the trees, shrubs, and grass) and soil that often surround a parking area.

### 3.0 REGULATORY AUTHORITY AND ENFORCEMENT

#### 3.1 Federal Regulatory Authority

The United States Environmental Protection Agency (EPA) regulates stormwater through the National Pollutant Discharge Elimination System (NPDES) program, which is authorized by the Clean Water Act. The NPDES program requires permitting of stormwater discharges from separate municipal storm sewer systems (MS4s) in urbanized areas and from industrial and construction activities. Ninety-eight and four tenths percent (98.4%) of the Policy-Porcupine Brook Watershed is covered by the MS4 program.

EPA has residual designation authority under Section 402(p)(2)(E) of the Clean Water Act to designate pollution sources for issuance of individual stormwater permits in order to achieve compliance with water quality standards.

Section 303(d)(1)(c) of the Clean Water Act provides that Total Maximum Daily Load (TMDL) studies must be completed when a water body is not meeting water quality standards. The TMDL must identify the amount of pollutant(s) allowable in order to meet the state water quality standard.

Section 401 of the Clean Water Act requires that the state water quality agency (NHDES) certify that any federally permitted activity which may result in a discharge will not violate water quality standards. A 401 water quality certificate can contain conditions and monitoring requirements to ensure that the permitted activity will meet the load reductions in the TMDL.

#### 3.2 State Regulatory Authority

RSA 485-A:12.II provides that “If, after adoption of a classification of any stream, lake, pond, or tidal water, or section of such water, including those classified by RSA 485-A:11, it is found that there is a source or sources of pollution which lower the quality of the waters in question below the minimum requirements of the classification so established, the person or persons responsible for the discharging of such pollution shall be required to abate such pollution within a time to be fixed by the department...”

State law also grants municipalities the authority to regulate “the collection, removal and destruction of garbage, snow and other waste materials” under RSA 39:31.I (f). The “removal and destruction of snow” includes practices that utilize chlorides and other deicing agents. Additionally, RSA 149-I:1 authorizes municipalities to adopt bylaws addressing stormwater if they have adopted stormwater utilities.

Existing and new salt storage facilities that are located or operate on a permeable surface, or that infiltrate brine from runoff to the ground or groundwater need to register with DES under the Groundwater Discharge Permit and Registration Rules, Env-Wq 402. This is a free registration and is a method of tracking potential contaminant sources. If there are sensitive receptors nearby, some sites may be required to monitor drinking water wells and/or the groundwater.

#### 3.3 Town Governance and Structure

The Town of Salem’s government consists of a Board of Selectmen and a Town Manager. The Municipal Services Department is responsible for maintaining town roads, facilities and infrastructure. Various

entities within the town have the responsibility for overseeing implementation of the Chloride Reduction Plan including the following:

- Roy Sorenson, Municipal Services Director
- Public Works Deputy Director (Vacant)

### 3.4 Regulatory Framework Applicable to Policy Brook

The 401 Water Quality Certificate issued May 2, 2006 by NHDES to NHDOT for the I-93 widening project states:

After EPA approval of the TMDL reports and publication of the TMDL implementation plan, the Applicant shall implement the chloride load reductions and all other requirements of the implementation plan that apply to the Activity and to other state roads included in the implementation plans.

The water quality certificate also requires that if the TMDL load reductions are not met, that NHDOT shall incrementally implement the project by paving and operating only three lanes in each direction until there is full implementation of the TMDLs for state roads in the impaired watersheds.

A Memorandum of Agreement between NHDES and NHDOT executed on June 21, 2006 further defines that “full implementation of chloride load reductions means load reductions have already been achieved.”

Actual allowed salt use will be adjusted for annual weather conditions by the Weather Severity Index (WSI), which shows a correlation between salt use and weather severity with greater than 95 percent confidence. A rolling ten-year average of WSI-adjusted salt use will be used to determine compliance with the TMDL.

### 3.5 Water Quality Monitoring and Violations

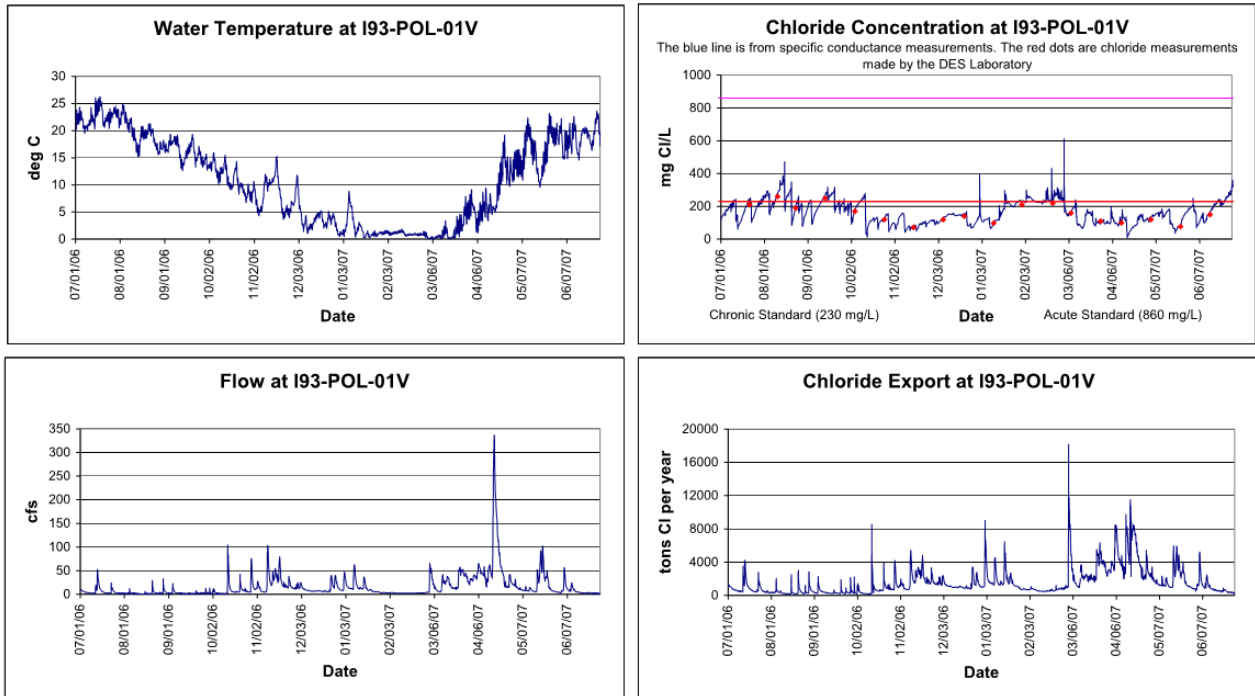
In the winters ending in 2003, 2004, 2005 and 2006, the NHDES, the EPA, and the NHDOT monitored chloride in watersheds in the vicinity of I-93 in southern New Hampshire. Chloride concentrations were primarily measured in winter with near continuous specific conductance readings by data loggers, which are devices that can be programed to read and store values from sensors deployed in the field at a set frequency. For this study, data loggers were used to record water temperature and specific conductance every 15 minutes. NHDES placed the assessment unit NHRIV700061102-18 for Policy-Porcupine Brook on New Hampshire’s 2006 Section 303(d) list because measurements of chloride concentrations through 2005 demonstrated exceedances of state surface water quality standards. The assessment unit is also impaired for aquatic life use support due to pH, benthic macroinvertebrate assessment and benthic habitat assessment. This assessment unit, along with all rivers and lakes in the state, was listed as impaired for the fish consumption designated use due to the state-wide fish consumption advisory for mercury.

For this TMDL study, NHDES, EPA and NHDOT developed a monitoring program to collect a comprehensive and standardized dataset for chloride, stream flow, and chloride imports to and exports



from the watershed (NHDES, 2006). The monitoring plan was implemented between July 1, 2006 and June 30, 2007. Data from this monitoring program has been summarized in a Data Quality Audit (NHDES 2007a) and a Data Report (NHDES 2007b). The difference between the TMDL monitoring and the previous efforts is that data was collected at the same time at all stations to allow comparison between stations under similar conditions. Stream flow data were collected so that chloride flow duration curves and export calculations could be made. Figure 3-1 shows the near continuous measurements of temperature, chloride, stream flow, and chloride export (product of chloride concentration and stream flow) at the outlet station, I93-POL-01V, between July 1, 2006, and June 30, 2007. The average values for these parameters over the year were 10.75°C, 163.02 mg Cl/L, 15.72 cfs, and 1562.83 tons Cl/yr, respectively. For perspective, typical concentrations of chloride in New Hampshire rivers in 1920, before salt was used as a deicer, were 1.3 mg Cl/L (Hall, 1975).

**Figure 3-1. Time Series of Temperature, Chloride, Stream Flow and Chloride Export at Station I93-POL-01V**



Data Source: DES (2007b)

The Town-owned and regulated outfalls discharging to Policy Brook and the unnamed tributary to Harris Brook were inspected during dry weather outfall screening and sampling, and were all observed to have no flow. The Town does not have any additional water quality monitoring data regarding this watershed.

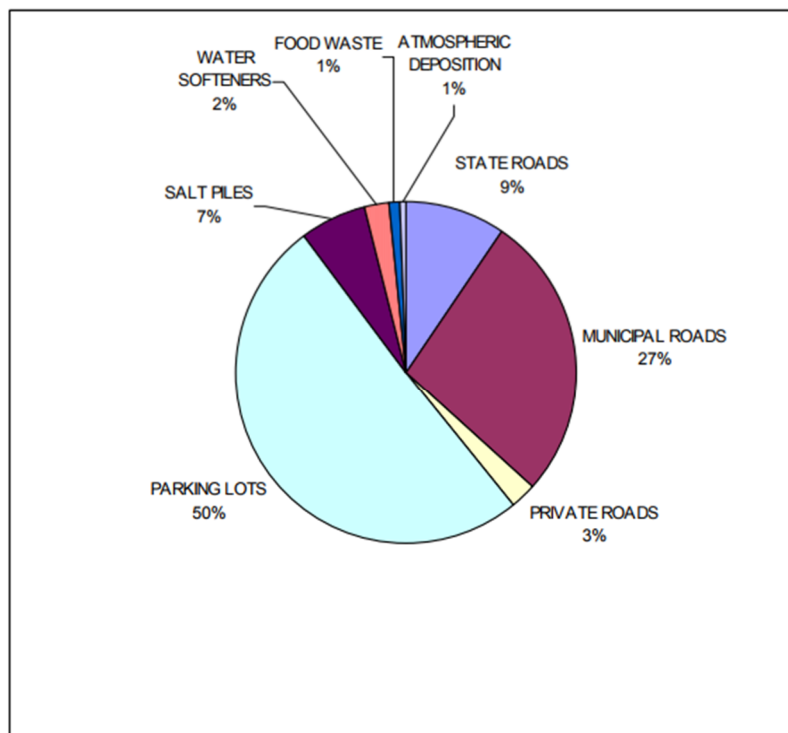


## 4.0 SALT ALLOCATIONS AND USE

### 4.1 Sector Allocations

Each source of salt and its relative contribution to the total salt imports for the Policy-Porcupine Brook Watershed is shown in Figure 4-1. Fifty-three percent (53%) of the salt is from parking lot and private road maintenance and deicing (“the private sector”), while twenty-seven percent (27%) is from Salem roads (“the town sector”), and nine percent (9%) of the salt comes from NHDOT-maintained state roads (“the state sector”).

*Figure 4-1. Relative Contribution of Each Source to the Total Salt Imports to the Watershed, NHDES Chloride TMDL 2008*



*Data Source: DES (2007b)*

The TMDL concludes that to meet water quality criteria, annual salt imports to the watershed should be less than 3,635 tons of salt per year to attain water quality standards.

NHDOT and NHDES established an interagency Salt Reduction Workgroup in 2006, the purpose of which was to advise NHDES and NHDOT on this TMDL and all other chloride TMDL studies in the I-93 corridor until these studies are completed, and then to advise and assist with implementation of required salt load reductions. The workgroup includes representatives from the following: NHDES; NHDOT; EPA; the Federal Highway Administration (FHWA); the selectmen's office of each town with area in a TMDL watershed; the public works department of each town with area in the TMDL watershed; the University of New Hampshire Technology Transfer (T2) Center; private winter road and parking lot maintenance companies; motorist associations; the State Police; the Southern New Hampshire Regional Planning

Commission; the Nashua Regional Planning Commission; and the Rockingham Planning Commission. Representatives from pertinent watershed organizations and state-wide environmental organizations were invited to join the workgroup in 2008.

## 4.2 Identification of Key Issues with Salt Use

It is important to first understand how and why chloride is over applied to roadways and parking lots in order to develop best management practices to manage chloride application. The following five key issues summarize the primary reasons behind over application of road salt.

1. Not knowing when there is a situation that warrants low- or no-salt application. Certain situations include:
  - Times when pavement or ambient temperatures are warm enough or rising to suggest that snow and ice will not accumulate in the parking lot.
  - Extreme cold, where the application of road salt would not aid in melting the snow. Furthermore, it is suggested that application of road salt at 15°F is not recommended because it could cause brief melting and then refreezing, resulting in an icy road.
2. Not knowing and/or tracking how much material is being applied. It is important to understand that each vehicle or piece of equipment can apply different amounts of deicer. There are a multitude of variables that can affect the amount of salt applied. A salt tracking program developed by the University of New Hampshire is discussed in Section 5.2 of this document.
3. Applying more salt than is necessary to achieve desired results. It is important that managers and drivers are educated on how much material is needed to obtain the desired results. Gaining an understanding of how deicers work under a variety of weather conditions and pavement temperatures is key to reducing the amount of salt applied. Determine and record appropriate application rates.
4. Potential liability is a concern when handling snow and ice removal, which can sometimes lead to over application of chloride. Privately owned commercial parking lots and driveways contribute significantly to salt loading in impaired waters. RSA 489-C can alleviate this concern for private owners of commercial parking lots and driveways. According to the law, any business owner who contracts for snowplowing and deicing with a “certified” salt applicator has liability protection from damages arising from hazards caused solely by snow or ice.
5. Decisions are often made without knowledge of new technologies and practices. Ongoing training is important for all managers, supervisors, operational staff and hired contractors so that they remain aware of the latest technologies, and how they can best limit salt use for snow and ice management tasks. Training saves time and money and increases knowledge and safety. T2 offers a multitude of training opportunities that cover the types of snow and ice removal methods, types of material, how much material is needed and the right place and time for application, as well as many other topics.

## 5.0 CHLORIDE REDUCTION BMPS AND ACHIEVABILITY

This section discusses recommendations for chloride reduction that are designed to maintain current safe levels of service while meeting the TMDL allocation. The chloride reduction achieved by each sector is dependent on many variables, including degree of implementation, level of operational training, tracking salt use, type of equipment used and proper equipment maintenance and calibration.

Adopting the best management practices (BMPs) specified in this plan will require well-managed operations. Initially, equipment may need to be retrofitted and/or purchased to fully implement BMPs. It is understood that each sector has different operational budgets and equipment types; therefore, the most practical BMPs have been used for this plan which will yield the greatest outcome of salt reduction.

It should be noted that the NHDOT has identified the use of ground-oriented salt spreaders, onboard pre-wetting equipment and pre-storm brine applications as the most effective practices to reduce the amount of salt released to the environment and still maintain adequate levels of service on the State highway system. As required by the CWA, the NHDOT has begun to deploy these BMPs in the watershed where TMDL studies have been completed and will continue to monitor their effectiveness. (NHDOT, 2019)

NHDOT has also developed twenty (20) salt reduction BMPs in their 2019 Salt Management Plan that Salem will review and assess for implementation by the Town. Many of these BMPs pertain only to state-level equipment operation and maintenance, however Salem could find valuable procedures in these BMPs that they could incorporate into their ongoing program to reduce salt usage. Specifically, BMPs related to salt accounting, pre-wetting and pre-storm brine applications may be most useful to Salem as they seek to reduce salt usage.

NHDES has prepared several chloride reduction fact sheets that can be found <https://www.des.nh.gov/organization/divisions/water/wmb/was/salt-reduction-initiative/index.htm>.

### 5.1 Recordkeeping and Salt Accounting Systems

Record keeping is critical to the successful implementation of best management practices. Important areas of winter operations that should be documented include salt accounting, equipment calibration, training records, and storm logs that include weather, plowing activities, treatment time and location. It is important that all sectors track chloride use to measure progress toward meeting the TMDL.

The Department of Transportation has traditionally accounted for salt loading in the Policy-Porcupine Brook Watershed, Policy Brook watershed, and the unnamed tributary to Harris Brook Watershed by calculating the amount of salt used from the salt shed inventory. Although the overall volume of salt applied was known, variations in application rates were not known. To address this concern, NHDOT received a grant to install global positioning systems (GPS) computer controllers in several of their trucks. By using this system of data collection, it automatically records where and how much salt is being applied.

The University of New Hampshire has developed a program that can be used by the State, municipal, and private sectors in order to track and report salt use. Beginning in Permit Year Two (July 1, 2019 to June 30, 2020), all salt application, whether it be by the municipality or private sector, will be tracked and reported using the UNH Technology Transfer Center Online Tool (<http://www.roadsalt.unh/Salt/>). Salem will use the most recent and accessible online reporting tool for tracking salt usage.

## 5.2 Training

Altering the approach to winter operations will require training and changes in knowledge and behavior of road managers, supervisors and operators. Training should be centered on the balance between environmental awareness and level of service to the public.

Training should be presented in the following areas:

- Interpretation of weather and pavement conditions when making decisions;
- Best management practices, including how to correctly calibrate equipment;
- Location of and treatment in environmentally sensitive areas;
- When and how to apply chemicals;
- Use of liquid chemicals for pre-wetting and anti-icing; and
- Record keeping.

The NHDOT goal is to train field crews in winter maintenance operations annually. Currently all employees receive eight hours of classroom training to review snow and ice control procedures. NHDOT also offers this course to private contractors that assist in winter operations. Employees are provided additional opportunities to attend courses presented by the University of New Hampshire Technology Transfer Center (UNH T2).

The UNH T2 in cooperation with NHDES, NHDOT, FHWA, and USEPA has established training programs in winter maintenance for state, municipal, and private sector operators. The T2 provides workshops, newsletters, technical assistance, a road Scholarship Program, and links to additional on-line information at [www.t2.unh.edu](http://www.t2.unh.edu). Certificates are provided to those who attend training courses.

In addition to training supervisors and staff that directly deal with snow and ice management tasks, it is also important to provide training to police officers and emergency responders. There has been a direct correlation between not being able to “see” deicing materials on the roadway with the assumption that the roadway has not been treated. Often the roadway has already been treated, but the deicing material applied may not have had a chance to begin working.

It is suggested that yearly pre-winter meetings be held with the New Hampshire Department of Safety, police officers and other emergency responders that are working together to keep roadways safe during the winter season. Pre-winter meetings can be an opportunity to provide information about the level of service and the methods used to manage snow and ice removal on various types of roads.

### 5.3 Municipally Maintained Surfaces

Specific measures must be taken by the Town of Salem in order to reduce their chloride application on municipal roads and facilities.

Knowing current and expected conditions is essential for planning snow and ice control operations. Weather and road conditions change constantly and must be monitored. Temperature and weather changes, pavement temperatures, traffic and road surfaces can all affect road conditions. The decision to initiate treatment can only be made if accurate information is available. Treatment options chosen should be modified as necessary to address road conditions as they develop.

#### 5.3.1 Operation

The following operational changes will aid in chloride reduction on municipal roads and facilities.

Increasing mechanical removal is one of the best ways to limit salt use. Mechanical removal should begin with the onset of the storm and continue throughout the storm. If de-icing chemicals are to be used, the primary goal is to remove as much snow or loose ice before applying chemicals. This maintains the chemical's effectiveness without concern for excessive dilution. Most snow removal policies in New Hampshire call for plowing to begin if there has been at least a 4-inch accumulation of snow on the road surface. Revisions should be made to incorporate more aggressive mechanical removal so accumulation on roads and parking lots does not occur. Anti-icing prior to the storm event should also be accompanied with mechanical removal to be most effective.

Pre-wetting is a term referring to a liquid deicer (brine or proprietary chemical) that is applied to a solid-based deicer in order to create a quicker reaction time for the solid deicer to begin melting snow and ice. Salt does not work until it is in solution, so it is recommended that all dry salt be pre-wetted regardless of the temperature. By introducing moisture into salt prior to application, the results are a quicker melting action, reduced bounce and scatter of material, and a reduced application rate. Pre-wetting is typically done by adapting spreader trucks with saddle tanks and spray nozzles which apply approximately 8-10 gallons/ton of a liquid to solid deicer.

Pre-treating of dry salt can be done before, during, or after it has been loaded into the truck. Pre-treatment is done by applying salt brine or proprietary chemical to dry salt.

Anti-icing is a preventative or proactive strategy which involves placing snow and ice control chemicals on the roadway up to 48 hours in advance of the onset of a storm. Application of an anti-icing material is designed to prevent and/or weaken the precipitation's bond to the pavement, making removal of snow or ice easier than with traditional deicing methods, and buys critical response time. The applied chemical remains on the pavement surface and activates when precipitation begins.

#### 5.3.2 Equipment

There are various types of spreaders, spreader control units, and other equipment that can reduce the amount of deicing materials applied while improving the level of service.

### Sensors: Truck Mounted or Hand-Held

Knowing the pavement temperature is essential to making the right decision for treatment options. Most weather stations measure conditions thirty feet in the air which can differ significantly from the surface of the roadway. The two most common types of sensors are Mobile Freeze Point/Salinity Sensors and Mobile Pavement Temperature Sensors.

Hand-held infrared temperature sensors can only be used when the vehicle is stopped or moving slowly, and the truck-mounted temperature sensors take measurements while the truck is moving. A hand-held temperature sensor can be purchased for as little as \$100 from an auto parts store and is an inexpensive addition to the decision-making toolbox. Salometers are used to determine the percent salinity of brine mixtures and are critical to have while operating a pre-wetting/anti-icing program.

### Automated Vehicle Location (AVL)

AVL collects real time data and equipment location through GPS receivers, transmitters and software. Data is used to track salt use, rationalize the number of trucks being used and to demonstrate prudent usage.

### Plowing Capabilities

Proper plowing of the road is essential to controlling the road conditions. Snow plowing with the proper blade needs to remove as much snow as possible prior to the application of chemicals. Snow and ice that is left on the pavement will only work to dilute the chemical that has been applied and decrease the effectiveness. Additional applied chemical will have little benefit if the snow is not adhering to the pavement surface, when plowing is the appropriate operation.

There are a multitude of plow types, including one-way front plows, reversible plows, deformable moldboard plows, underbody plows, side winds, expandable plows, and plows specifically designed for slush removal. Plows are hydraulically controlled and can have quick-change buffer systems allowing for a fairly short time to mount or dismount. Manufacturers have also developed plows that are hydraulically extendable. These extendable plows allow for width adjustment from 9-12 feet depending on lane width. Underbody plows are highly recommended since they can be used in conjunction with one-way front plows, side wing plows, and rear wing plows. They provide downward pressure and can scrape the roadway clean for the best snow removal results.

### Ground Speed Operation

There are three factors in determining a truck's salt application rate: gate opening, speed of the spreader belt, and the travelling speed. Ground speed-oriented spreaders keep application rates constant because the belt speed in the spreader corresponds to truck speed. Incorporating ground speed controls is one of the most critical changes that can be made to achieve salt reduction. Calibration and monitoring of the spreader control is important for the accuracy of your application rates.

### Spreaders

The total amount of deicing chemical used for winter maintenance is a significant influence on the type of spreader equipment needed. Accurate spreader controls are needed to account for material being applied and should be consistent based on a full or near empty load. The spreader needs to be able to

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operate in a variety of conditions including very low temperatures, high moisture, and be resistant to corrosion. Hoppers should be constructed so that excess salt can be removed from the spreader and so that they can be removed during the off season so the vehicle can be used for other purposes. Spreaders designed with discharge at the rear can allow for a slide-in capability that can be mounted and dismounted. Various types of spreaders include hopper spreaders, tailgate spreaders, reverse dumping spreaders, and spreaders that are variations of these. Slide-in spreaders tend to be the most cost effective with a longer use life and are easy to maintain and clean away salt residue. They use a conveyor chain and chute system for material applications either with a spinner or direct drop to the road surface. Slide-in spreaders also can handle a pre-wetting system.

Zero Velocity Spreaders (ZVS) can optimize the use of deicing material by controlled distribution. Material is dispensed the same velocity as the forward motion of the truck; the two velocity components essentially cancel each other out causing the salt to drop on the road as if the vehicle was standing still. This helps reduce bounce and scatter and reduces the required volume of deicing material. ZVS also have the capability to pre-wet. There have been some mechanical complications while pre-wetting under certain conditions.

#### Pre-Wetting Spreaders

Pre-wetting is typically done by adapting spreader trucks with saddle tanks and spray nozzles which apply approximately 8-10 gallons/ton of a liquid to solid deicer. It is most common for salt brine at 23% concentration to be sprayed onto solid salt as it passes through the spreader chute. Plow and spreader trucks looking to add pre-wet capabilities require investment to purchase the saddle tanks, pumps and nozzles that can apply a liquid at the spreader's spinner. As with any chemical application, calibration is critical to controlling the amount applied to the roadway.

Some of the most common types of liquid spreaders are spinner type, distribution bar with nozzles, chassis-mounted, slip-in, and tow-behind. During the initial start-up programs, modifications of existing equipment may be the most economical approach. Some highway agencies have been successful in modifying asphalt distribution trucks, liquid fertilizer spreaders and spreaders used for weed control. Brine has been made available for this purpose and can be purchased by municipalities from NHDOT.

#### *5.3.3 Calibration*

During winter operations, changes may occur in mechanical linkages, hydraulic systems and other components of equipment. Yearly calibration of equipment allows for better control of application rates for various gate height/openings. Gate height or gate openings should be adjusted to spread the desired chemical application rate for each set of unique conditions. Recalibration should be done if any changes are made to the equipment or if a different deicing material is used. In addition to manufacturer specifications, see Appendix B for Hydraulic-Run Spreader Calibration and Appendix C for Pony Motor-Run Spreader Calibration. A record should be kept of the calibration results with the vehicle and referred to for the application settings recommended for various weather conditions.



#### 5.3.4 *Storage and Site Maintenance*

In addition to managing how salt is applied to parking lots and roadways, it is also important to manage how dry salt, pre-wet salt, salt brine, salt/sand mixtures, and snow piles are stored and handled. This section was adapted from NHDES Fact Sheet WD-DWGB-22-30.

Chloride storage facilities can contribute to both surface and ground water contamination. The location of a storage facility should not be in an area that is environmentally sensitive. Avoid areas where there are wells, reservoirs, or within the footprint of stratified drift aquifers.

Ideally deicing material storage facilities should be completely enclosed, with storage and working areas on impervious surfaces such as asphalt or coated concrete. Buildings should have concrete foundations and can be designed using dome, barn, or fabric style structures.

There should be stormwater drainage controls to prevent runoff water and snow melt from contacting or running through loading and material storage areas. Overhead cover to protect material from exposure to snow and rain should be installed to minimize runoff and inventory loss. A fixed roof is preferred over a tarp, because it is difficult to keep storage piles completely covered with tarps during winter months and storm events.

As a general practice, site drainage should direct clean storm water away from the operations and storage areas in order to keep the stockpiles as dry as possible. In new facilities or facilities that are being retrofitted drainage that is contaminated with salt should be directed to a wastewater treatment facility (subject to municipal approval), collected for use in pre-wetting activities or sent for proper disposal.

#### Salt Storage Structures

- All salt and sand/salt mixtures should be stored on pads of impermeable asphalt or concrete. Storage and loading areas should have an impermeable floor constructed of asphalt, concrete or other suitable material that extends around the buildings and work area exterior. The area should be sloped away from the structure to prevent stormwater from entering the loading areas or structure.
- Concrete pads and walls should be treated to prevent concrete deterioration.
- Structure hardware should be galvanized, and concrete block buildings should be waterproofed inside.
- If using a three-sided building, the exposed salt at the open end should be covered.
- Storm water and snowmelt runoff should be properly controlled. Building floors and storage pads should be sloped to prevent ponding and allow any water to drain away from the storage piles.

#### Onsite Management: Delivery/Handling/Loading

- All sand and sand/salt mixtures temporarily out in the open should be covered to prevent salt from being washed or blown from the pile.



- If a permanent covered work area is not possible, then storage and handling activities should be conducted on impermeable (bituminous) pads. Any deicing materials left outdoors should be completely covered with waterproof tarpaulins.
- All surplus materials must be removed from the site when winter activity is finished.
- Working areas should be bermed and sloped to allow snow melt and stormwater to drain away from the area. In some cases, it may be necessary to channel water to a collection point, such as a sump, holding tank, or lined basin for collection.
- Storage and distribution should only be conducted during the fall/winter season.
- Spreaders should not be overloaded such that material spills off the vehicle. A plan for loading operations to prevent overfilling vehicles and eliminating material spillage during transportation should be developed and implemented.
- Salt spilled at the storage yard and loading areas should be collected and returned to the storage pile.
- Annual inspection and repairs should be carried out prior to the start of each season.
- Ongoing inspection of storage structures, work areas, and deicing liquid storage tanks should be carried out during the season.
- Solid bagged materials should be stored securely, indoors if possible.
- Spreaders should only be washed at a location where the wash water is properly managed. Please refer to Appendix D for the NHDES fact sheet on managing wastewater discharges from vehicle washing.
- Liquid storage tanks should be designed such that a plumbing failure will not result in release of the contents. Backflow prevention may be necessary on some plumbing applications.

### Snow Storage and Disposal

The environmental impacts of snow disposal result from high levels of sodium chloride, sand, debris and contaminants from automobile exhaust. It is the debris contained in plowed snow that makes it illegal to dump snow directly in water bodies. RSA 485-A:13, I(a) prohibits discharging wastes to surface waters without a permit. Groundwater is sensitive to snow dumping due to the high levels of sodium chloride in plowed snow. RSA 485-C:12 prohibits the siting or operation of snow dumps within classified wellhead protection areas.

The following guidelines are adapted from the NHDES WBE-3 Snow Disposal Guidelines. Snow Disposal is necessary but we must select safe places to dump plowed snow. Snow dumps are kept out of water bodies due to the litter and debris content. Litter and debris do not belong on the land surface either; after the snow melts, all litter and debris must be collected and disposed of properly.

- Disposed snow should be stored near flowing surface waters, but at least 25 feet from the high-water mark of the surface water.
- A silt fence or equivalent barrier should be securely placed between the snow storage area and the high-water mark.
- The snow storage area should be at least 75 feet from any private water supply wells, at least 200 feet from any community water supply wells, and at least 400 feet from any municipal wells. (Note: Snow storage areas are prohibited in wellhead protection areas [class GAA groundwater].)

- All debris in the snow storage area should be cleared from the site prior to snow storage.
- All debris in the snow storage area should be cleared from the site and properly disposed of no later than May 15 of each year the area is used for snow storage.

#### Brine Storage and Management

In recent years brine has been used on roads prior to storms as an effective ice preventative, reducing the amount of deicing materials needed during a storm event. The water that runs off storage and loading areas can be collected into watertight tanks or lined basin(s) and reused. Any brine storage should be designed with inert materials that are compatible with salt.

Brine stored in holding tanks must be managed so that there are no releases to drains, groundwater or surface waters. If there is a floor drain in a building where brine is stored, it must be connected to a municipal sewer, routed to a registered holding tank or permanently sealed. For the NHDES fact sheet on protecting groundwater from floor drains and other typical discharges refer to Appendix E.

Storage ponds or collection basins used for brine storage must be lined and must not receive runoff from areas other than the storage and operations areas. The basin itself must be impermeable to prevent infiltration of the collected water into the ground. The basin may need a roof or cover to reduce the accumulation of snow and rainwater. The collection of this runoff water would only be necessary during the winter maintenance months (November through March). During the remaining seven months of the year, the non-brine stormwater can be redirected from the brine storage to a natural discharge point.

The preferred management option for any brine collected is for use as a pre-wetting agent for roads prior to winter storms. The release of this collected water to the ground, groundwater, or a stormwater system during operation or at season's end is not permissible and as a consequence, this type of runoff management may require disposal of the brine by one of the following methods:

1. Discharge directly to a publicly owned treatment works (POTW) with local approval;
2. Pumping and transporting the saltwater to a POTW system by tank truck;
3. Evaporation; or
4. Treatment to remove salt and onsite discharge under a Nondomestic Wastewater Registration.

All liquid storage tanks should be protected from impacts from vehicles moving about the yard and be located such that spilled material can be contained and retrieved in the event of a tank or piping failure. Secondary containment should be provided around large liquid storage tanks.

#### *5.3.5 Designation of Low- or No-Salt Zones*

It is important that the Town of Salem defines all wellhead protection areas, as well as wetlands or other water bodies as low or no-salt zones. These are all sensitive areas, where raised concentrations can negatively affect the health of aquatic plants, animals, and organisms. In addition, the salt can get into the drinking water, causing a salty taste. It is important to develop a mitigation plan which includes defining protection areas, and then restricting the use of salt in these areas by either designating these areas as low salt or no salt areas.

In addition, the NHDOT will evaluate the feasibility of establishing low or no salt sections on selected low volume roadways following a written request from the local governing body. To facilitate this program, two additional highway types are specified as follows:

- Type 4 – Highways on the State highway system carrying less than 2,500 vehicles daily for which all municipal officials, including all selectmen, the police chief, the fire chief, the chief of ambulance service, and the superintendent of schools or the school board, have signed and submitted a written request to establish low (minimum) salt sections on existing Type 2 highways (orange routes) shown on the winter maintenance system map.
- Type 5 – Highways on the State highway system carrying less than 1,000 vehicles daily for which all municipal officials, including all selectmen, the police chief, the fire chief, the chief of ambulance service, and the superintendent of schools or the school board, have signed and submitted a written request to establish no salt sections on existing Type 3 highways (red routes) on the winter maintenance system map.

Table 5-1 provides the recommended snow and ice treatment per highway type.

Table 5-1. Recommended Snow & Ice Treatment per Lane Mile for Reduced Winter Maintenance Areas			
Condition	Temperature	Type 4	Type 5
Sleet & Freezing Rain	Variable	Salt 250 lbs. per lane mile and/or abrasives as needed	Abrasives only
Snow	20 degrees Fahrenheit	Salt 250 lbs. per lane at beginning and/or end of storm only	Abrasives only
Snow	Below 20 degrees Fahrenheit	Abrasives only except salt 250 lbs per lane mile at end of storm	Abrasives only

#### 5.4 Privately Maintained Surfaces

Approximately one-half of the salt that ends up in the Policy-Porcupine Brook Watershed comes from privately maintained parking lots. Measures must be taken by private lot owners in order to reduce their chloride application.

##### 5.4.1 Chloride Reduction Regulatory Requirements

For discharges to water quality limited water bodies where chloride is the cause of the impairment, the Town is required to include in their stormwater regulations, a requirement for private parking lot owners and operators and private street owners and operators that (1) any commercial salt applicators used for applications of salt to their parking lots or streets be trained and certified in accordance with Env-Wq 2203, and (2) to report annual salt usage within the municipal boundaries using the UNH Technology Transfer Center online tool (<http://www.roadsalt.unh.edu/Salt/>) or report salt usage directly to the Town, in which case this information should be reported in the Town's Annual Report to EPA. In addition, the

regulatory mechanism shall include requirements for new development and redevelopment to minimize salt usage, and to track and report amounts used using the UNH Technology Transfer Center online tool (<http://www.roadsalt.unh.edu/Salt/>).

#### 5.4.2 *Training*

In addition to providing training, UNH T2 also offers a certification that salt applicators can obtain which gives business owners liability protection from damages arising from hazards caused solely by snow or ice, according to RSA 489-C. The concern about potential liability is often a contributing factor when it comes to the amount of salt being applied to a private parking lot. RSA 489-C can alleviate that concern.

#### 5.4.3 *Operation*

The following operational changes will aid in chloride reduction on private lots.

As discussed in Section 5.3.1, it is recommended that all dry salt be pre-wetted regardless of the temperature prior to use as it works best in solution. Introducing moisture prior to application results in a quicker melting action, reduced bounce and scatter of material, and a reduced application rate. Pre-wetting is typically done by adapting spreader trucks with saddle tanks and spray nozzles which apply approximately 8-10 gallons/ton of a liquid to solid deicer. Pre-treating of dry salt can be done before, during, or after it has been loaded into the truck. Pre-treatment is done by applying salt brine or proprietary chemical to dry salt.

As stated in Section 5.3.1, application of an anti-icing material is designed to prevent and/or weaken the precipitation's bond to the pavement, making removal of snow or ice easier than with traditional deicing methods, and buys critical response time.

A sand/salt mix is also appropriate for parking areas where there is no fast-moving traffic. The salt will aid in the melting of the snow/ice, and the sand will give vehicles traction and prevent slippage. A common practice in sand/salt application is to add a small amount of salt to keep it in a workable and spreadable condition. Using standard uncompacted densities for salt (2,000 lb/yd<sup>3</sup>) and sand (2,700 lbs/yd<sup>3</sup>), the recommended ratio of salt to sand is about 0.4 percent, or 100 pounds of salt to one cubic yard of sand. In extreme cold conditions these rates may be increased if the sand pile freezes or if alternatives such as calcium chloride or other deicer with a lower freezing point can be used.

Table 5-2 provides application rates for deicing.

Table 5-2. Application Rates for Deicing

Pavement Temp. (°F) and Trend (↑↓)	Weather Condition	Maintenance Action	Application Rates in lbs/1000 square foot area			
			Salt Pre-wetted/Pretreated with Salt Brine	Salt Pre-wetted/P re-Treated with Other Blends	Dry Salt	Winter Sand (abrasives)
>30° ↑	Snow	Plow, treat intersections only	0.75	0.5	0.75	Not recommended
>30° ↑	Freezing Rain	Apply chemical	1.25	1.0	1.5	Not recommended
30° ↓	Snow	Plow & apply chemical	1.25	1.0	1.5	Not recommended
30° ↓	Freezing Rain	Apply chemical	1.5	1.25	1.75	Not recommended
25-30° ↑	Snow	Plow & apply chemical	1.25	1.0	1.5	Not recommended
25-30° ↑	Freezing Rain	Apply chemical	1.5	1.25	1.75	Not recommended
25-30° ↓	Snow	Plow & apply chemical	1.25	1.0	1.5	Not recommended
25-30° ↓	Freezing Rain	Apply chemical	1.75	1.5	2.25	3.25
20-25° ↑	Snow or Freezing Rain	Plow & apply chemical	1.75	1.5	2.25	3.25 for freezing rain
20-25° ↓	Snow	Plow & apply chemical	2.0	2.0	2.75	Not recommended
20-25° ↓	Freezing Rain	Apply chemical	2.5	2.0	3.0	3.25
15-20° ↑	Snow	Plow & apply chemical	2.0	2.0	2.75	Not recommended
15-20° ↑	Freezing Rain	Apply chemical	2.5	2.0	3.0	3.25
15-20° ↓	Snow or Freezing Rain	Plow & apply chemical	2.5	2.0	3.0	3.25 for freezing rain
0-15° ↑ ↓	Snow	Plow, treat with blends, sand hazardous areas	Not recommended	3.0	Not recommended	5.0 spot treatment
<0°	Snow	Plow, treat with blends, sand hazardous areas	Not recommended	4.5	Not recommended	5.0 spot treatment as needed

#### 5.4.4 Equipment and Calibration

There are various types of spreaders, spreader control units, and other equipment that can reduce the amount of deicing materials applied while improving the level of service. The different types of equipment are listed in detail in section 5.3.2 of this Plan.

During winter operations, changes may occur in mechanical linkages, hydraulic systems and other components. Yearly calibration of equipment allows for better control of application rates for various gate height/openings. Gate height or gate openings should be adjusted to spread the desired chemical application rate for each set of unique conditions. Recalibration should be done if any changes are made to the equipment or if a different deicing material is used.

Since many private lot owners do not conduct their own snow removal and chemical application, it is the responsibility of the salt applicator to be aware of how they can make their equipment and salt application the most efficient.

#### 5.5 Estimated Percent Chloride Reduction Potential by BMP type

Estimated percent reductions outlined in the matrix below are dependent on many factors. Weather severity, road surface condition, equipment type, proper calibration of equipment, operator skill and training level all contribute to the success of efficiently and effectively using chlorides within impaired watersheds.

Table 5-3 outlines recommended practices in which information is most readily available for achievable reductions without decreasing the level of service. Estimated reduction percentages were derived by the New Hampshire Department of Environmental Services from a combination of literature review, information provided by equipment manufacturers, and other states' experience implementing reduction programs.

Table 5-3. Recommended Chloride BMPs		
Chloride Reduction BMPs	Definition	Potential % Chloride Reduction
Pre-Wetting	Application of salt brine or proprietary chemical to dry salt as it is being applied to the roadway	20% - 30%
Pre-Treating	Application of salt brine or proprietary chemical to dry salt either before, during, or after it has been loaded into the truck	10% - 30%
Anti-Icing	Application of salt brine or proprietary chemical up to 48 hours in advance of onset storm.	10% - 30%
Zero-Velocity Spreaders	Spreader ejects salt particles at the same velocity of the forward motion of the truck's travelling speed; allowing salt to drop as if the spreading vehicle was standing still.	10% - 50%
Groundspeed Oriented Spreader Controls	Allows accurate dispensation of prescribed salt application rates irrespective of vehicle speed. Controls can be integrated to automatically vary application rate with ground temperature. Controller units can integrate GIS and wirelessly download application rate data for review.	10% - 30%*

Table 5-3. Recommended Chloride BMPs

Chloride Reduction BMPs	Definition	Potential % Chloride Reduction
Equipment Calibration	Ensures equipment application of chloride is accurate	5-20%
In-Cab Air/Ground Temp. Sensor	Installation of pavement and air temperature sensors with in-cab readout	1% - 10%*
Training, Improved Storage and Handling Practices	Training staff about various best management practices, improving storage and handling practices for loading and unloading salt	10% - 25%*

*Note % reduction assumed does not take into account existing practices.*

\* Highly dependent on existing procedures and level of adoption.

## 5.6 Public Education

A common concern expressed by highway maintainers and public safety officials is that drivers have an unrealistic expectation of clear roads at all times during the winter. This expectation leads to unsafe driving behavior, where drivers are moving too fast for road conditions and do not allow time for public works crews to do their jobs.

The I-93 Salt Reduction Work Group expressed a desire to allocate some of the federal funds available for salt reduction to the regional need to address driver behavior. As a result, \$200,000 was set aside for the purpose of community based social marketing. Community based social marketing starts by identifying the barriers to behavior, developing a program to address the barriers, implementing the program, and then evaluating the success.

The goals of the public engagement related to the Chloride Reduction Plan include:

- Altering existing public expectations and demand for state and local road and public and private parking lot winter maintenance including changing the perception that bare pavement is necessary during storm events and educating the driving public about the issues surrounding excessive salt use and the environment.
- Building support for and implementation of behavior change programs to assist with voluntary and mandatory approaches for the driving public including decreased snow speed limits, possible decreased winter speed limits, and incorporating winter driving expectations and safety into public and commercial driver education programs.

Salem will continue to participate in the I-93 Salt Reduction Work Group and also the NH Stormwater Coalition meetings to exchange information on chloride reduction and apply approaches learned from other NH municipalities.



## 6.0 IMPLEMENTATION SCHEDULE & ASSESSMENT OF PROGRESS

The private sector parking lot owners, Town of Salem and NHDOT are responsible for tracking and reporting salt usage within the Policy-Porcupine Brook watershed, Policy Brook watershed and the unnamed tributary to Harris Brook watershed to NHDES for each fiscal year for their operation. NHDES will annually track the salt imports to the watershed, the percent reduction goal and the number of violations until the water quality standards for chloride have been met at station I93-POL-01V.

Data will be analyzed by NHDES for violations of the acute and chronic water quality standards and percent reduction for critical conditions following the procedures used in this report. The number of violations, the percent reduction goals during critical conditions, and the salt imports to the watershed will be tracked each year. NHDES will evaluate changes in these values using multivariate linear or logistical regression with climate variables (e.g., the NHDOT Winter Severity Index, flow) as covariates. A trend will be considered significant at the  $p < 0.05$  level. A minimum of five years of data (and most likely 10 years) will be needed before trend analysis can be performed. When chloride concentrations at I93-POL-01V meet water quality standards, data should be collected at all sites in the watershed where standard violations have been detected to verify that standards are met at all locations and under conditions in the assessment unit. Biomonitoring conducted by NHDES should be completed after water quality standards for chloride have been met at station I93-POL-01V to verify that there are no additional impacts to aquatic life from chlorides or other contaminants.

The matrix presented in Table 6-1 outlines objectives of the Chloride Reduction Implementation Plan as well as completion dates for these objectives and the agencies responsible.



Table 6-1. Chloride Reduction Plan Completion Dates and Responsible Agencies

Objective: Creation of Educational Manuals, Training Programs and Procedural/Operational Strategies		Completion Date
1	Training and Certification Program for Municipal Staff	2020 and ongoing
2	Develop training for inexperienced drivers, such as high school students	2020 and ongoing
3	Reduce driving speed limits during inclement weather conditions	2020 and ongoing
4	Develop and adopt a formal snow and ice removal policy	2020 and ongoing
5	Revise site plan review process to include designs and/or management strategies that may decrease chloride use	2020
6	Participate in The NHDES Salt Reduction Working Group	Ongoing
7	Require mandatory training for employees and contracted staff that deal with winter maintenance	2020 and ongoing
8	Review and update Winter Emergency Operation Plans every 5 years	2019, 2023
9	Report Annually Salt Usage using UNH Technology Transfer Online Tool	2019 and ongoing
10	Operational changes such as pre-wetting, pre-treating the salt stockpile, increasing plowing prior to de-icing, monitoring of road surface temperature, etc.	2019 and ongoing
11	Provide an estimate of total tonnage of salt reduction from each activity.	2020 and annually in MS4 Annual Report

### 6.1 Prioritization

It is important to prioritize the areas as well as the BMPs that will have the greatest impact in chloride load reduction in the watershed. The highest priority areas for the Town are the roadway and parking surfaces closest to Policy-Porcupine Brook, Policy Brook, and the unnamed tributary to Harris Brook. The Town should begin implementing BMPs in these areas first. The areas nearest the brook will have the most acute impact on water quality and the amount of chloride in the brook because of the short attenuation time.

### 6.2 Assessment of Progress

Five years after the publication of this Implementation Plan, the NHDES will review the water quality and salt usage data to document what progress towards meeting the TMDL has been achieved. If the progress is insufficient, DES will reconvene the stakeholders and change the Implementation Plan.

Appendix F of the 2017 NH Small MS4 General Permit contains the Requirements of Approved Total Maximum Daily Loads. Section I.1.c. of Appendix F reviews the conditions under which the permittee may be relieved of additional requirements, and the actions that the permittee should take when the criteria in Appendix F are met:

.....

At any time during the permit term the permittee may be relieved of additional requirements in Appendix F part I.1.a-b. as follows.

- i. The permittee is relieved of its additional requirements as of the date when the following conditions are met:
  - 1. The applicable TMDL has been modified or revised and EPA has approved a new TMDL applicable for the receiving water that indicates that no additional stormwater controls for the control of chloride are necessary for the permittee's discharge based on waste load allocations in the newly approved TMDL.
- ii. When the criteria in Appendix F part I.1.c.i. are met, the permittee shall document the date of the approved TMDL in its SWMP and is relieved of any remaining requirements of Appendix F part I.1.a.-b. as of that date and the permittee shall comply with the following:
  - 1. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix F part I.1.a-b. to date to reduce chloride in their discharges including implementation schedules for non-structural BMPs and maintenance for structural BMPs
  - 2. The permittee shall continue to implement all requirements of Appendix F part I.a.-b. required to be implemented prior to the date of the newly approved TMDL, including ongoing implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications.

For Policy Brook and the unnamed tributary to Harris Brook, which require the development of a TMDL, Section IV.5 of Appendix H reviews the conditions under which the permittee may be relieved of additional requirements, and the actions that the permittee should take when the criteria in Appendix H are met:

- a. The permittee is relieved of its additional requirements as of the date when one of the following criteria are met:
  - i. The receiving water is determined to be no longer impaired due to chloride by MassDEP and EPA concurs with such determination.
  - ii. An EPA approved TMDL for the receiving water indicates that no additional stormwater controls are necessary for the control of chloride from the permittee's discharge based on wasteload allocations as part of the approved TMDL.
  - iii. The permittee's discharge is determined to be meet applicable water quality standards and EPA agrees with such determination. The permittee shall submit data to EPA that accurately characterizes the concentration of chloride in their discharge during the deicing season (November – March). The characterization shall include water quality and flow data sufficient to accurately assess the concentration of chloride in the deicing season during storm events of multiple

sizes and for the duration of the storm events including the first flush, peak storm flow and return to baseflow and include samples collected during deicing activities.

- b. In such a case, the permittee shall document the date of the determination, date of approved TMDL or date of EPA concurrence that the discharge meets water quality standards in its SWMP and is relieved of any additional requirements of Appendix H part IV as of that date and the permittee shall comply with the following:
  - i. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix H part IV to date to reduce chloride in its discharges, including implementation schedules for non-structural BMPs.
  - ii. The permittee shall continue to implement all requirements of Appendix H part IV required to be done by the date of determination date, date of approved TMDL, or date of EPA concurrence that the discharge meets water quality standards, including ongoing implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications.

## 7.0 REFERENCES

- Jeffrey H. Taylor & Associates and The Center for the Environment, Plymouth State University. 2008. Potential Solutions for Reducing Road Salt Use in New Hampshire.
- NHDES 2015. WMB-3. Snow Disposal Guidelines Fact Sheet.
- NHDES 2011. WD-WMB 4. Road Salt and Water Quality Fact Sheet.
- NHDES 2011 WD-DWGB-22-30 Storage and Management of Deicing Materials Fact Sheet.
- NHDES 2020. Winter Maintenance – 500 Foot Salt Buffer Zone Maps.
- Salem, NH Winter Emergency Operation Plan 2018-2019.
- Sassan, D. and S. Kahl. 2007. Beaver Brook/ Policy Brook I-93 Chloride TMDL: Salt Loading Due to Private Winter Maintenance Practices. Plymouth State University and Partnership for a New Regional Perspective.
- State of New Hampshire Department of Environmental Services. 2011. Chloride Reduction Implementation Plan for Dinsmore Brook Watershed Windham, NH. Watershed Management Bureau.
- Town of Derry, Town of Londonderry New Hampshire Department of Transportation. 2018. Chloride Loading in the Upper Beaver Brook Watershed – Current and Future Conditions. Prepared by Normandeau Associates, Fuss & O'Neill, Inc. and Louis Berger Group.
- State of New Hampshire Department of Environmental Services. 2008. Total Maximum Daily Load (TMDL) Study For Waterbodies in the Vicinity of the I-93 Corridor from Massachusetts to Manchester, NH: Policy-Porcupine Brook in Salem and Windham, NH. Prepared by Phil Trowbridge, PE. Watershed Management Bureau.
- State of New Hampshire Department of Transportation, 2019. Stormwater Management Plan. Appendix K, Salt Management Plan.
- US Environmental Protection Agency. 2017. General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems.
- Williams, E. 2012. Salt Reduction: An Outcome from Interstate 93 Widening. Presentation an NEIWPPC NPS Conference.

## APPENDIX A

Map and List of Public and Private Parking Lots  
with Greater Than 10 Parking Spaces in Salem, NH







**Table A-1. Private Parking Lots with 10 or More Spaces**

<b>Label</b>	<b>Location</b>	<b>Sq. Feet</b>	<b>Label</b>	<b>Location</b>	<b>Sq. Feet</b>
P-1	1 CROSS ST	18,111	P-46	136 CLUFF CROSSING RD	26,699
P-2	1 DELAWARE DR	49,838	P-47	136 S POLICY ST	92,828
P-3	1 KEEWAYDIN DR	105,405	P-48	137 BROOKDALE RD	10,817
P-4	1 MALL RD	1,606,259	P-49	14 CROSS ST	4,317
P-5	1 MANOR PKY	12,708	P-50	14 KEEWAYDIN DR	57,158
P-6	1 N BROADWAY	11,576	P-51	14 MANOR PKY	48,885
P-7	1 NORTHEASTERN BLVD	59,568	P-52	14 S BROADWAY	4,817
P-8	1 NORTHWESTERN DR	28,977	P-53	141 MAIN ST	12,543
P-9	10 MANOR PKY	82,739	P-54	142 MAIN ST	109,615
P-10	10 DELAWARE DR	38,865	P-55	15 INDUSTRIAL WAY	45,710
P-11	10 INDUSTRIAL WAY	35,309	P-56	15 RED ROOF LN	51,810
P-12	101 MAIN ST	5,939	P-57	151 MAIN ST	9,495
P-13	101 S POLICY ST	6,739	P-58	153 MAIN ST	7,126
P-14	101 SCHOOL ST	73,429	P-59	153 S BROADWAY	405,618
P-15	103 CLUFF CROSSING RD	176,939	P-60	154 MAIN ST	45,786
P-16	103 S BROADWAY	23,274	P-61	155 MAIN ST	5,677
P-17	103 STILES RD	20,116	P-62	155 N BROADWAY	18,616
P-18	107 MAIN ST	22,539	P-63	157 MAIN ST	7,142
P-19	108 CLUFF CROSSING RD	5,460	P-64	158 N BROADWAY	23,884
P-20	109 S BROADWAY	48,697	P-65	159 MAIN ST	3,770
P-21	11 KEEWAYDIN DR	30,112	P-66	159 N BROADWAY	19,457
P-22	11 MANOR PKY	66,480	P-67	16 DELAWARE DR	26,187
P-23	11 NORTHEASTERN BLVD	146,058	P-68	16 INDUSTRIAL WAY	36,052
P-24	113 CLUFF CROSSING RD	64,134	P-69	16 MANOR PKY	47,906
P-25	113 N BROADWAY	17,318	P-70	16 NORTHWESTERN DR	50,796
P-26	115 MAIN ST	23,047	P-71	16 PELHAM RD	106,348
P-27	12 BROOK RD	21,797	P-72	160 MAIN ST	20,557
P-28	12 BUS RD	191,063	P-73	161 MAIN ST	8,056
P-29	12 INDUSTRIAL WAY	87,861	P-74	163 MAIN ST	9,491
P-30	12 MANOR PKY	60,426	P-75	164 MAIN ST	17,189
P-31	12 STILES RD	34,299	P-76	166 N BROADWAY	11,832
P-32	120 PLEASANT ST	22,726	P-77	167 N BROADWAY	12,075
P-33	125 S BROADWAY	82,855	P-78	169 MAIN ST	4,240
P-34	126 MAIN ST	33,042	P-79	17 NORTHWESTERN DR	130,949
P-35	127 LOWELL RD	16,022	P-80	17 S BROADWAY	13,815
P-36	127 MAIN ST	28,502	P-81	173 BRADY AVE	5,770
P-37	128 N BROADWAY	17,388	P-82	176 MAIN ST	6,171
P-38	13-21 KEEWAYDIN DR	196,408	P-83	179 MAIN ST	56,551
P-39	13 DELAWARE DR	27,178	P-84	179 S BROADWAY	36,293
P-40	13 INDUSTRIAL WAY	38,505	P-85	18 CROSS ST	21,477
P-41	13 S BROADWAY	15,123	P-86	18 PELHAM RD	22,081
P-42	131 N BROADWAY	40,019	P-87	182 MAIN ST	7,230
P-43	133 LOWELL RD	13,157	P-88	184 N BROADWAY	4,663
P-44	133 S BROADWAY	45,828	P-89	189 S BROADWAY	41,867
P-45	134 N BROADWAY	33,915	P-90	19 MAIN ST	14,260



**Table A-1. Private Parking Lots with 10 or More Spaces**

<b>Label</b>	<b>Location</b>	<b>Sq. Feet</b>	<b>Label</b>	<b>Location</b>	<b>Sq. Feet</b>
P-91	19 PLAY CAMP RD	18,751	P-136	28 MAIN ST	8,087
P-92	19 S BROADWAY	15,498	P-137	29-31 NORTHWESTERN DR	35,169
P-93	193 S BROADWAY	22,771	P-138	29 N BROADWAY	18,276
P-94	194 N BROADWAY	6,219	P-139	29 PLEASANT ST	3,378
P-95	196 MAIN ST	8,529	P-140	29 STILES RD	52,337
P-96	198 MAIN ST	7,437	P-141	3 INDUSTRIAL WAY	31,631
P-97	199 S BROADWAY	15,296	P-142	3 MANOR PKY	5,286
P-98	2 INDUSTRIAL WAY	31,421	P-143	3 MEISNER CIR	3,989
P-99	2 DYER AVE	5,368	P-144	3 OLD ROCKINGHAM RD	52,781
P-100	2 KEEWAYDIN DR	44,405	P-145	3 S BROADWAY	59,808
P-101	2 MAIN ST	4,121	P-146	30 N POLICY ST	4,354
P-102	2 MANOR PKY	17,580	P-147	31 MAIN ST	6,443
P-103	2 MEISNER CIR	5,860	P-148	31 PELHAM RD	39,521
P-104	2 N BROADWAY	11,832	P-149	31 STILES RD	91,330
P-105	2 NORTHWESTERN DR	32,265	P-150	32 LOWELL RD	20,718
P-106	2 PLEASANT ST	3,115	P-151	32 NORTHWESTERN DR	51,296
P-107	20 CROSS ST	4,917	P-152	32 STILES RD	48,534
P-108	20 N BROADWAY	25,050	P-153	33 MAIN ST	7,374
P-109	200 MAIN ST	34,892	P-154	33 NORTHWESTERN DR	25,167
P-110	202 N BROADWAY	29,717	P-155	34 LOWELL RD	5,694
P-111	203 S BROADWAY	306,007	P-156	34 PELHAM RD	98,939
P-112	205 MAIN ST	22,410	P-157	34 PLEASANT ST	17,960
P-113	21 NORTHWESTERN DR	109,495	P-158	36 LOWELL RD	17,935
P-114	214 MAIN ST	21,964	P-159	36 MAIN ST	75,823
P-115	215 MAIN ST	12,265	P-160	36 PELHAM RD	19,093
P-116	22 MAIN ST	15,542	P-161	37 LAKE ST	96,462
P-117	22 NORTHWESTERN DR	46,436	P-162	37 LOWELL RD	128,917
P-118	22 S BROADWAY	9,393	P-163	37 MAIN ST	8,407
P-119	22 TROLLEY LN	16,045	P-164	37 NORTHWESTERN DR	20,346
P-120	220 N BROADWAY	26,109	P-165	37 S BROADWAY	29,759
P-121	224 N BROADWAY	75,294	P-166	38 MILLVILLE ST	6,793
P-122	227 N BROADWAY	36,910	P-167	39 N BROADWAY	11,741
P-123	23 S BROADWAY	108,192	P-168	4 COMMERCIAL DR	45,650
P-124	23 STILES RD	66,561	P-169	4 MEISNER CIR	2,394
P-125	232 N BROADWAY	58,050	P-170	4 NORTHEASTERN BLVD	100,541
P-126	234-240 N BROADWAY	108,745	P-171	4 RAYMOND AVE	40,928
P-127	236 N BROADWAY	120,486	P-172	4 S BROADWAY	5,474
P-128	24 KEEWAYDIN DR	27,000	P-173	40 LOWELL RD	104,423
P-129	25 MAIN ST	4,937	P-174	41 S BROADWAY	47,638
P-130	25 PELHAM RD	90,549	P-175	42 MAIN ST	13,959
P-131	254 N BROADWAY	61,887	P-176	42 N BROADWAY	27,618
P-132	26 KEEWAYDIN DR	45,400	P-177	43 NORTHWESTERN DR	69,091
P-133	26 LOWELL RD	130,307	P-178	43 PELHAM RD	40,630
P-134	26 MAIN ST	8,761	P-179	44 MILLVILLE ST	33,814
P-135	27 NORTHWESTERN DR	111,429	P-180	44 STILES RD	15,010

**Table A-1. Private Parking Lots with 10 or More Spaces**

<b>Label</b>	<b>Location</b>	<b>Sq. Feet</b>	<b>Label</b>	<b>Location</b>	<b>Sq. Feet</b>
P-181	45-51 NORTHWESTERN DR	98,828	P-226	7 INDUSTRIAL WAY	92,557
P-182	45 PELHAM RD	5,524	P-227	7 MANOR PKY	49,356
P-183	45 S BROADWAY	19,823	P-228	7 OLD ROCKINGHAM RD	10,559
P-184	45 STILES RD	40,725	P-229	7 RAYMOND AVE	289,319
P-185	46 MAIN ST	10,040	P-230	7 RED ROOF LN	17,228
P-186	47 LOWELL RD	71,558	P-231	7 STILES RD	99,970
P-187	47 PELHAM RD	9,505	P-232	70 N BROADWAY	3,245
P-188	48-56 STILES RD	65,859	P-233	71 LOWELL RD	42,573
P-189	49 N BROADWAY	10,460	P-234	71 ROCKINGHAM PARK BLVD	1,465,557
P-190	49 PELHAM RD	13,294	P-235	72 BRADY AVE	21,095
P-191	4B RAYMOND AVE	80,792	P-236	72 S BROADWAY	12,295
P-192	5 DELAWARE DR	39,937	P-237	73 BRADY AVE	37,724
P-193	5 INDUSTRIAL WAY	93,254	P-238	75 BRADY AVE	13,916
P-194	5 MANOR PKY	10,994	P-239	75 LOWELL RD	463,245
P-195	5 MEISNER CIR	8,362	P-240	75 N POLICY ST	24,710
P-196	5 NORTHEASTERN BLVD	38,763	P-241	75 S POLICY ST	4,917
P-197	50 NORTHWESTERN DR	102,956	P-242	77-81 BRADY AVE	76,163
P-198	51 S BROADWAY	68,886	P-243	78 N BROADWAY	10,728
P-199	51A PELHAM RD	111,504	P-244	78 SCHOOL ST	9,123
P-200	52 LOWELL RD	25,220	P-245	79 N POLICY ST	58,467
P-201	53-59 STILES RD	62,189	P-246	8 BRADY AVE	15,738
P-202	53 PELHAM RD	72,193	P-247	8 INDUSTRIAL WAY	275,009
P-203	53 S BROADWAY	40,797	P-248	8 KEEWAYDIN DR	40,635
P-204	54 N BROADWAY	7,417	P-249	8 LOWELL RD	16,575
P-205	55 PARK AVE	36,289	P-250	8 PUMPING STATION RD	10,184
P-206	55 PELHAM RD	21,963	P-251	8 RAYMOND AVE	13,423
P-207	55 S BROADWAY	7,864	P-252	8 S BROADWAY	5,572
P-208	59 N BROADWAY	26,785	P-253	8 STILES RD	22,353
P-209	59 S BROADWAY	23,450	P-254	8 SULLIVAN CT	12,781
P-210	6 DELAWARE DR	36,330	P-255	8 WILLOW ST	136,210
P-211	6 MANOR PKY	53,022	P-256	80 N POLICY ST	5,689
P-212	6 MEISNER CIR	8,162	P-257	83 N BROADWAY	18,030
P-213	6 PLEASANT ST	35,010	P-258	83 S BROADWAY	10,087
P-214	6 RAYMOND AVE	37,647	P-259	84 S BROADWAY	4,851
P-215	6 WILLOW ST	5,355	P-260	85 LOWELL RD	41,053
P-216	60 LOWELL RD	208,920	P-261	85 N POLICY ST	671,507
P-217	62-64 N BROADWAY	6,050	P-262	85 STILES RD	51,826
P-218	62 BRADY AVE	9,055	P-263	86 N POLICY ST	8,274
P-219	65 S BROADWAY	15,784	P-264	88 N BROADWAY	12,973
P-220	66 N BROADWAY	4,557	P-265	88 STILES RD	22,757
P-221	67 MAIN ST	136,425	P-266	89 LOWELL RD	227,815
P-222	68 MILLVILLE ST	8,922	P-267	9-13 RED ROOF LN	42,588
P-223	68 STILES RD	64,994	P-268	9 CENTRAL ST	7,146
P-224	69 LOWELL RD	200,466	P-269	9 DELAWARE DR	37,617
P-225	69 S BROADWAY	15,787	P-270	9 LOWELL RD	95,396

**Table A-1. Private Parking Lots with 10 or More Spaces**

<b>Label</b>	<b>Location</b>	<b>Sq. Feet</b>			
P-271	9 MANOR PKY	12,413			
P-272	9 NORTHEASTERN BLVD	992,055			
P-273	9 NORTHWESTERN DR	54,925			
P-274	90 LOWELL RD	33,918			
P-275	91 S BROADWAY	16,638			
P-276	92 CLUFF CROSSING RD	804,832			
P-277	93 S BROADWAY	7,185			
P-278	93 STILES RD	31,420			
P-279	98 N BROADWAY	17,840			
P-280	99 CLUFF CROSSING RD	30,632			
P-281	99 S BROADWAY	6,852			
P-282	CENTRAL ST	22,709			
P-283	INDUSTRIAL WAY	78,810			
P-284	LANCELOT CT	143,530			
P-285	MAIN ST	7,910			
P-286	TIFFANY RD	99,550			
P-287	51 SALEM ST	14,748			

**Table A-2. Municipal Parking Lots**

<b>Label</b>	<b>Location</b>	<b>Sq. Feet</b>			
1	14 MAIN ST	62,017			
2	150 MAIN ST	27,762			
3	161 N POLICY ST	39,510			
4	173 S POLICY ST	66,470			
5	19 CROSS ST	156,405			
6	206 MAIN ST	66,133			
7	209 MAIN ST	31,911			
8	44 GEREMONTY DR	102,827			
9	53 LOWELL RD	18,833			
10	54 MILLVILLE ST	42,786			
11	70 MAIN ST	18,981			

APPENDIX B

Hydraulic-Run Spreader Calibration



# Hydraulic-Run Spreader Calibration

NH Best Management Practices

## WHY CALIBRATE?

You can't reduce your salt use if you don't know how much salt you actually use! The goal of calibrating is to know how much material you are putting down on a roadway or parking lot for every setting on your truck that you use. This is why calibrating your equipment is the first step to reducing salt use and saving money!

## REMEMBER:

Each truck must be independently calibrated for each material it will be used to spread (the salt calibration chart *will* be different than the sand calibration chart).

Calibrations should be performed annually, or after a spreader is serviced.

## CALCULATIONS:

There are a few simple calculations you must perform in order to complete the calibration.

Once all of the necessary data is recorded, head back inside and warm up! Refer to the reverse side of this fact sheet for calculation instructions.



## Step 1: Load the Truck

Partially load the truck. Half of a full load should be more than adequate for calibration purposes.



## Step 2: Set Your Controls

**Gate Height:** Set the gate height to its lowest practical setting (~ 2"). This should be kept constant throughout the calibration process. If you find that not enough material is dispensed with this setting, try 2.5" to 3".

**Engine Speed:** Warm the truck up and run the engine at the typical rate seen during spreading (approximately 2000 rpm).



## Step 3: Measure Spread Width

Measure the width that the material covers during spreading. Do this for each conveyor/auger setting you are calibrating. Round your numbers to the nearest half foot and record them in column "W" of the calibration chart (see reverse side).



## Step 4: Collect & Weigh Material

You will need either a sheet of canvas, a tarp, or a bucket to collect the material that is dispensed from the spreader, as well as a scale. Weight the object you are using to collect the material in, and record that value in the purple box above the discharge rate column. Collect material for 1 minute. Weigh the collected material and subtract the weight of the tarp/canvas/bucket. Record this value in the first purple column of the calibration chart. Do this 3 times for each conveyor/auger setting that is typically used. Average these three values together and record in the orange column in the calibration chart.

## Step 5: Perform Calculations

Go inside and calculate your discharge rate using the calibration chart for each truck speed and conveyor/auger setting you normally use. Refer to the reverse side of this fact sheet for calculation instructions. The formula you will be using is shown below:

$$D = \frac{B \times C}{A}$$

## Step 6: Distribute Completed Calibration Cards!

Put a copy of the calibration chart in the truck you just calibrated. Also, leave a copy of the calibration chart in the office so you have a copy incase the original is damaged.

Produced in partnership with:



# Calibration Chart (Hydraulic Type)

Material: \_\_\_\_\_ Truck/Spreader ID: \_\_\_\_\_

Date: \_\_\_\_\_ Performed by: \_\_\_\_\_

Tarp/Canvas/Bucket Weight: \_\_\_\_\_

Conveyor or Auger Setting	W Spread Width (ft.)	A 5.28 × W 73.92	Discharge Rate (lb/min.)			B Average Discharge Rate ((Run1 + Run2 + Run3)/3)	D Pounds of Material Discharged per 1000 square ft. (D = B × C ÷ A)					
			Run 1	Run 2	Run 3		5 mph (C = 12)	10 mph (C = 6)	15 mph (C = 4)	20 mph (C = 3)	25 mph (C = 2.4)	30 mph (C = 2)
1												
2												
3												
4												
5												
EX	14	5.28 × 14 = 73.92	87	92	93	(87+92+93)÷3 = 90.67	12 × 90.67 ÷ 73.92 = 14.72	6 × 90.67 ÷ 73.92 = 7.36	4 × 90.67 ÷ 73.92 = 4.91	3 × 90.67 ÷ 73.92 = 3.68	2.4 × 90.67 ÷ 73.92 = 2.94	2 × 90.67 ÷ 73.92 = 2.45

Calculation Instructions: Multiply the spread width from column **W** by **5.28** and record the answer in column **A**. For each conveyor/auger setting, add **Run 1**, **Run 2**, and **Run 3** together. Divide the result by **3** and record in column **B** to get the average discharge rate. To find the pounds of material discharge per 1000 square feet, you must know the number of minutes it takes to travel one mile at every truck speed you intend to calibrate for. These numbers are designated as variable “**C**”. The “**C**” value for each travel speed is shown in red under that given speed. Multiply column **B** by the “**C**” value for that speed and divide by the **A** column to find the number of pounds of material discharged per 1000 square feet for the given speed. Record these numbers in the **D** columns. The full equation is shown here:

$$D = \frac{B \times C}{A}$$

## APPENDIX C

### Pony Motor-Run Spreader Calibration





# Pony Motor-Run Spreader Calibration

NH Best Management Practices

## WHY CALIBRATE?

You can't reduce your salt use if you don't know how much salt you actually use! The goal of calibrating is to know how much material you are putting down on a roadway or parking lot for every setting on your truck that you use. This is why calibrating your equipment is the first step to reducing salt use and saving money!

## REMEMBER:

Each truck must be independently calibrated for each material it will be used to spread (the salt calibration card *will* be different than the sand calibration card).

Calibrations should be performed annually, or after a spreader is serviced.

## CALCULATIONS:

There are a few simple calculations you must perform in order to complete the calibration.

Once all of the necessary data is recorded, head back inside and warm up! Refer to the reverse side of this fact sheet for calculation instructions.



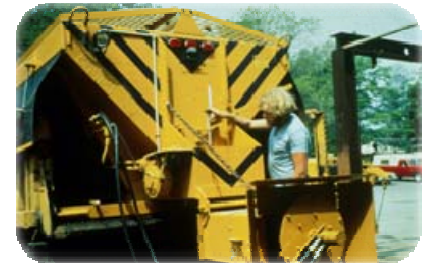
## Step 1: Load the Truck

Partially load the truck. Half of a full load should be more than adequate for calibration purposes.

## Step 2: Set Your Controls

**Gate Height:** Set the gate height to its lowest practical setting to start (approximately 1" to 1.5"). After the truck is calibrated for the lowest gate setting, calibrate for each 1/2" increment greater than the lowest setting. Continue until all gate settings you use are calibrated.

**Engine Speed:** Set the pony motor speed to the maximum setting, or to the setting you would normally use.



## Step 3: Measure Spread Width

Measure the width that the material covers during spreading. Do this for each gate setting you are calibrating. Round your numbers to the nearest half foot and record them in column "W" of the calibration chart (see reverse side).

## Step 4: Collect & Weigh Material

You will need either a sheet of canvas, a tarp, or a bucket to collect the material that is dispensed from the spreader, as well as a scale. Weight the object you are using to collect the material in, and record that value in the purple box above the discharge rate column. Collect material for 1 minute. Weigh the collected material and subtract the weight of the tarp/canvas/bucket. Record this value in the first purple column of the calibration chart. Do this 3 times for each gate opening that is typically used. Average these three values together and record in the orange column in the calibration chart.



## Step 5: Perform Calculations

Go inside and calculate your discharge rate using the calibration chart for each truck speed and gate setting you normally use. Refer to the reverse side of this fact sheet for calculation instructions. The formula you will be using is shown below:

$$D = \frac{B \times C}{A}$$

## Step 6: Distribute Completed Calibration Cards

Put a copy of the calibration card in the truck you just calibrated. Also, leave a copy of the calibration card in the office so you have a copy in case the original is damaged.

Produced in partnership with:



# Calibration Chart (Pony Motor Type)

Material: \_\_\_\_\_ Truck/Spreader ID: \_\_\_\_\_

Date: \_\_\_\_\_ Performed by: \_\_\_\_\_

Tarp/Canvas/Bucket Weight:												
Gate Opening	W	A	Discharge Rate (lb/min.)			B Average Discharge Rate ((Run1 + Run2 + Run3)/3)	D Pounds of Material Discharged per 1000 square ft. (D = B × C ÷ A)					
			Run 1	Run 2	Run 3		5 mph (C = 12)	10 mph (C = 6)	15 mph (C = 4)	20 mph (C = 3)	25 mph (C = 2.4)	30 mph (C = 2)
1"												
1.5"												
2"												
2.5"												
3"												
EX	14	5.28 × 14= 73.92	87	92	93	(87+92+93)÷3= 90.67	12 × 90.67 ÷ 73.92= 14.72	6 × 90.67 ÷ 73.92= 7.36	4 × 90.67 ÷ 73.92= 4.91	3 × 90.67 ÷ 73.92= 3.68	2.4 × 90.67 ÷ 73.92= 2.94	2 × 90.67 ÷ 73.92= 2.45

Calculation Instructions: Multiply the spread width from column **W** by **5.28** and record the answer in column **A**. For each gate setting, add **Run 1**, **Run 2**, and **Run 3** together. Divide the result by **3** and record in column **B** to get the average discharge rate. To find the pounds of material discharge per 1000 square feet, you must know the number of minutes it takes to travel one mile at every truck speed you intend to calibrate for. These numbers are designated as variable "**C**". The "**C**" value for each travel speed is shown in red under that given speed. Multiply column **B** by the "**C**" value for that speed and divide by the **A** column to find the number of pounds of material discharged per 1000 square feet for the given speed. Record these numbers in the **D** columns. The full equation is shown here:

$$D = \frac{B \times C}{A}$$

**APPENDIX D**

NHDES Fact Sheet on Wastewater Discharges from Vehicle Washing

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# ENVIRONMENTAL Fact Sheet

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29 Hazen Drive, Concord, New Hampshire 03301 • (603) 271-3503 • [www.des.nh.gov](http://www.des.nh.gov)

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WD-DWGB-22-9

2010

## Protecting Groundwater from Floor Drains and Other Typical Discharges

### Why the Concern About Floor Drains and Other Discharges?

The main concern is for the protection of human health. There have been instances of drinking water contamination from improper disposal of wastewater, solvents, oils and various industrial wastes onto or into the ground in New Hampshire. The N.H. Department of Environmental Services wants to ensure that the use of floor drains and the discharge of wastewater onto or into the ground do not cause the contamination of groundwater, which is the state's main source of drinking water. Preventing groundwater contamination is also the property owner's concern, because the owner is responsible for preventing—and cleaning up—contamination. When groundwater does become contaminated, cleanup costs can easily run into tens or hundreds of thousands of dollars.

### Do I Have to Let DES Know About Discharges?

Any regular discharge of non-domestic wastewater to the ground must be registered with, and in some cases requires a permit from, the DES Water Division.

### Can I Continue to Discharge to the Ground?

While the state does allow some groundwater discharges as long as they are properly registered or permitted (see table of examples on following page), state rules prohibit any discharge to the ground of non-domestic wastewater containing a regulated contaminant (see box at right) without treatment with best available technology. Your first step is to determine whether your wastewater contains regulated contaminants or whether you store or use regulated contaminants in the area served by a floor drain. If the answer is no, you may continue the discharge by registering it with DES using the "Registration and Notification Form for Floor Drains and Discharges to Groundwater" located at

[www.des.nh.gov](http://www.des.nh.gov); click on "A to Z List," scroll to "Groundwater Discharges" and click on "Forms/Applications."

#### What Is A Regulated Contaminant?

State law (RSA 485-C:2 XIII) defines a regulated contaminant as "any physical, chemical, biological, radiological substance or other matter, other than naturally occurring substances at naturally occurring levels, in water which adversely affects human health or the environment." Consult the material safety data sheets (MSDS) for the products you use; see the disposal information in the "Spills or Leaks" section of the MSDS.

### What Are My Options?

If the wastewater or the area served by the floor drain does contain regulated contaminants, you must choose one of the following five options:

1. Eliminate the discharge; permanently seal the drain to prevent releases to groundwater.
2. Eliminate regulated contaminants from the wastewater or, if a floor drain, eliminate regulated

contaminants from the area served by the floor drain and register the discharge with DES.

3. Connect the drain or discharge line to a municipal sanitary sewer in accordance with DES and local regulations.
4. Connect the drain or discharge to a registered holding tank that meets DES requirements.
5. Obtain a groundwater discharge permit. This is allowed only if the wastewater receives best available treatment and meets ambient groundwater quality standards.

If you choose options # 1-4, you must file the “Registration and Notification Form for Floor Drains and Discharges to Groundwater” (located at the address referenced above) with DES.

<b>Discharges Generally Allowed with Registration</b>	<b>Discharges Requiring a Permit</b>	<b>Discharges That Are Not Allowed</b>
<ul style="list-style-type: none"><li>• Beauty salon wastewater</li><li>• Kennel wastewater</li><li>• Bathroom floor drains</li><li>• Non-contact cooling water</li></ul>	<ul style="list-style-type: none"><li>• Car washes</li><li>• Non-domestic wastewater from industry or commercial business</li></ul>	<ul style="list-style-type: none"><li>• Floor drains where regulated substances are stored</li><li>• Laboratory sinks</li><li>• Manufacturing process water</li><li>• Floor drains at automotive facilities</li></ul>

If you intend to continue the discharge as is (option #5), contact DES for a groundwater discharge permit application.

### **How Do I Seal My Floor Drain?**

First, you need to be certain that no contaminants have been released to groundwater. If you are not familiar with the property’s history, or if it is possible that regulated contaminants have been released to the ground through the drain, you should contact an environmental consultant to investigate (contact DES for a list of consultants). If you are positive that no regulated contaminants were ever discharged to the floor drain, you must fill out the “Discharge Well & Floor Drain Pre-Closure Notification Form” (located at the address referenced above) and submit it to DES at least 30 days prior to sealing the floor drain(s) with concrete. However, this does not remove any future liability associated with the drain. It is customary when property is to be sold or refinanced to perform an environmental assessment (sampling) of floor drains as well as other locations where contaminants may have been released.

### **What About Connecting to a Municipal Sanitary Sewer?**

Connections to your municipal sanitary sewer are controlled by the local sewer authority. Contact the local authority regarding restrictions. Some local sewer authorities do not allow connection of floor drains, while others allow connection only with adequate pretreatment (e.g., oil/grit separator) or other controls. If you connect a floor drain to a municipal sanitary sewer, you still need to notify DES using the attached notification form.

### **What Are the Requirements for Holding Tanks?**

DES has design standards for holding tanks. For more information please review fact sheet WD-DWGB-22-8 “Holding Tanks for Floor Drains” at the fact sheets website referenced below.

### **For Additional Information**

For additional information, please call (603) 271-2858 or visit <http://des.nh.gov/index.htm>, click on A to Z List and choose Groundwater Discharges. The forms mentioned in this fact sheet can also be found on this page. All of the Drinking Water and Groundwater Bureau’s fact sheets can be found on-line at <http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm>.

Note: This fact sheet is accurate as of June 2010. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.

## APPENDIX E

NHDES Fact Sheet on Protecting Groundwater from Floor Drains and Other Typical Discharges

# ENVIRONMENTAL Fact Sheet



29 Hazen Drive, Concord, New Hampshire 03301 • (603) 271-3503 • [www.des.nh.gov](http://www.des.nh.gov)

WD-DWGB-22-10

2015

## Wastewater Discharges from Vehicle Washing

Water used in washing cars, trucks, and other vehicles may contain a wide range of contaminants. These contaminants can include oil, fuels and other hydrocarbons, metals, detergents, road salt and grit. Discharged into surface waters, these contaminants can degrade water quality and harm aquatic life. Discharged into groundwater, they can make water unfit for drinking. To avoid these problems and the legal consequences that may result, the following guidelines apply to facilities where vehicles are washed on a regular basis and the wash water is collected by a conveyance such as a drain, catch basin, ditch or swale and infiltrated to the ground or groundwater\*. Owners of facilities that conduct washing activities have four options for their wastewater discharges:

1. Operate a closed system with wastewater recycling (no discharge of wastewater).
2. Discharge to a municipal sanitary sewer.
3. Obtain a groundwater discharge permit.
4. Obtain registration to wash fewer than 30 vehicles per week and discharge to the ground *surface only*.

### 1. Closed System with No Discharge

This does not require a permit. However, it may require a “Holding Tank Registration” if the treatment system has a grit and oil tank that is pumped out. The water and sludge that are pumped from the tank must be collected and disposed of at an approved disposal facility, i.e., a wastewater treatment plant or hazardous waste disposal facility, depending on the nature of the material.

### 2. Discharge to Municipal Sanitary Sewer

Connections to your municipal sanitary sewer are controlled by the local sewer authority. Contact the local authority regarding restrictions. Some local sewer authorities do not allow connection of floor drains, while others allow connection only with adequate pretreatment, e.g., an oil/grit separator, or other controls. If you connect an existing floor drain to a municipal sanitary sewer, you still need to notify NHDES.

\* These restrictions do not apply to occasional vehicle washing, such as at residences or occasional events such as fundraising car washes. For more information on community car washes and water quality see fact sheet WD-WMB-14 “Community Car Washes and Water Quality” at <http://des.nh.gov/organization/commissioner/pip/factsheets/wmb/documents/wmb-14.pdf>.



### 3. Obtain a Groundwater Discharge Permit

You may discharge vehicle wash water directly to the ground if both of the following are true:

- a. A groundwater discharge permit is obtained in accordance with Env-Wq 402.11; and
- b. The wash water is treated to ambient groundwater quality standards (Env-Or 600, Table 600-1) using best available technology (typically granular activated carbon).

### 4. Wash Fewer than 30 Vehicles per Week

If you wash fewer than 30 vehicles per week, you may be able to discharge indirectly to groundwater without obtaining a groundwater discharge permit. However, you need to follow Env-Wq, 401 Best Management Practices for Groundwater Protection to avoid contamination of your wash water with regulated substances. You also need to register your discharge and floor drain, if any. To avoid having to obtain a groundwater discharge permit, you must meet *all* of the following conditions:

- a. Best Management Practices for Groundwater Protection are followed.
- b. The floor drain is *not* in an area where regulated contaminants are used or stored.
- c. The wastewater:
  - Is *not* from power washing, steam cleaning, engine cleaning or undercarriage cleaning.
  - Is *not* from a chemical or acid wash.
  - Does *not* contain soaps or other products that contain regulated contaminants.
  - Does *not* result in a surface water discharge.
  - Discharges to the ground surface.
  - Contains only approved detergents.
  - Leads to an oil/water separator or other pretreatment method prior to infiltration.
  - Is registered with NHDES in accordance with Env-Wq 402.33.

Owners of facilities with these discharges are responsible for ensuring that regulated contaminants are not discharged and that groundwater is suitable for drinking without treatment. NHDES reserves the right to verify compliance by requiring the collection and analysis of soil samples from the discharge area(s) under Env-Wq 402.33.

### Surface Water Discharges

In order to adequately protect the quality of surface water in New Hampshire, direct discharges of wastewater derived from car washing into surface water is **prohibited**. For more information about permitting of discharges to surface water, contact the NHDES Wastewater Engineering Bureau at (603) 271-3908.

### For Additional Information

For more information about groundwater discharges, holding tank registration, floor drain registrations, and rules, please call (603) 271-2858 or visit NHDES' Groundwater Discharge Permitting & Registration webpage at: [http://des.nh.gov/organization/divisions/water/dwgb/dwspp/gw\\_discharge/index.htm](http://des.nh.gov/organization/divisions/water/dwgb/dwspp/gw_discharge/index.htm).

For additional information, please contact the Drinking Water and Groundwater Bureau at (603) 271-2513 or [dwgbinfo@des.nh.gov](mailto:dwgbinfo@des.nh.gov), or visit <http://des.nh.gov/organization/divisions/water/dwgb/index.htm>.

*Note: This fact sheet is accurate as of January 2015. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.*

**APPENDIX F**

Salem, NH Winter Emergency Operation Plan 2018-2019

**TOWN OF SALEM**  
**NEW HAMPSHIRE**

**DIVISION OF PUBLIC WORKS**

**2018-2019**  
**WINTER EMERGENCY OPERATION PLAN**



**Roy Sorenson**  
**Municipal Services Director**

**Dave Wholley**  
**DPW Director**

**Joe Feole**  
**Highway Division Foreman**

**Geoff Benson**  
**Highway Division Foreman**

**Ryan Pike**  
**Chief Mechanic**

**James Pacheco**  
**Parks & Properties Foreman**

**Dave Cantor**  
**Transfer Station Foreman**

**Maureen Sullivan**  
**Administrative Assistant**

# 2018 – 2019 SNOW PLAN STATISTICS

## TOWN EQUIPMENT

1	Grader	w/ plow & wing
2	Backhoe	w/ plow
4	Loader	w/ plow
14	6-Wheeler	w/ plow, wing & salter
1	6-Wheeler	w/ salter
6	1-Ton	Dump body w/ plow
9	1-Ton	Utility body w/ plow
2	1-Ton	Pick Ups w/ plow
4	Trackless	Sidewalk plows w/ blowers
<b>43</b>	<b>Pieces of snow fighting equipment</b>	
<b>25</b>	<b><i>Available personnel</i></b>	

## CONTRACTED EQUIPMENT

1	10-Wheeler	w/plow & salter
2	10-Wheeler	w/ plow
1	10-Wheeler	w/plow & salter & wing
2	Sm Loaders	w/ plow
3	Lg Loaders	w/ plow
5	Sm 6-Wheeler	w/ plow
2	Sm 6-Wheeler	w/plow & salter
0	Lg 6-Wheeler	w/ plow
3	Lg 6-Wheeler	w/ plow and salter
1	Lg 6-Wheeler	w/ plow, wing & salter
0	<sup>3</sup> / <sub>4</sub> -Ton	Pick Ups w/ plow
17	1-Ton	Pick Ups w/ plow
3	Tri-Axle	
<b>40</b>	<b>Pieces of snow fighting equipment</b>	
<b>40</b>	<b><i>Available personnel</i></b>	

## ROADS MAINTAINED

<b>358.1</b>	Lane miles of paved roads		
<b>30</b>	Lane miles of unpaved roads		
<b>388.1</b>	Lane Miles of roads, comprised of:	36	Plow routes
		16	Primary routes
		17	Secondary routes

## SIDEWALKS MAINTAINED

<b>35</b>	Miles of sidewalks	4	Plow routes
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## **BUILDINGS MAINTAINED**

*(Plowing, Shoveling, Salting & Sanding)*

- 13 Town Hall, Police Department, Court House, Ingram Senior Citizen Center, Public Works, Museum, Hose House, #5 School, Palmer School, Transfer Station, Dog Kennel, Kelly Library, Depot Train Station

## **PARKS AND PARKING LOTS MAINTAINED**

*(Plowing, Salting & Sanding)*

- 8 Municipal Lot, Field of Dreams, Centerville Ave School District Lot (*no plowing*), Town Forest Parking Lot, Central Fire (*no plowing*), North Fire (*no plowing*), Old North Fire (*no plowing*), South Fire (*no plowing*).

## **MISCELLANEOUS AREAS**

*(Salting & Sanding)*

- 7 High School, Woodbury Middle School, Fisk School, Soule School, North Salem School, Barron School, Lancaster School (Bus Ports only).

- 2 Millville Arms Salem Housing Authority & Telfer Circle Assisted Living

- 
- 30 ***Buildings & Parking Areas***

## **WATER DEPARTMENT AREAS**

*(Plowing, Shoveling, Salting & Sanding)*

- 8 Canobie Lake Water Treatment Plant, Wheeler Dam Pumping Station, Manor Parkway Booster Station, Nirvana Booster Station, Lawrence Road Water Tower, Howard Street Water Tower, Spicket Hill Water Tower, Commercial Dr Fire Booster Station

- 2 Route 97 Emergency Water Tie-in & Salem Street Emergency Water Tie-in.

## **SEWER DEPARTMENT LIFT STATIONS**

*(Plowing & Shoveling)*

- 10 South Policy Street, Keewaydin Drive, Commercial Drive, Stiles Road, Twinbrook Avenue, Brookdale Road, Butler Street, Haigh Avenue, Copper Beech & Freedom Drive.

- 
- 20 ***Water and Sewer Department Areas.***

## **SUMMARY**

- 83 Pieces of snow fighting equipment  
65 Available personnel  
35 Miles of sidewalk  
36 Plow routes (Covering 388.10 Lane Miles)  
16 Primary routes (Consisting of 199.46 Lane Miles)  
17 Secondary routes (Consisting of 188.64 Lane Miles)  
4 Sidewalk routes  
30 Buildings & parking areas  
20 Water & Sewer Department areas

## **PLAN I - SALTING AND SANDING OPERATIONS**

**NOTIFICATION:** The Town of Salem, Police Department notifies the Public Works on call Foreman immediately when snow has begun or that icing has been reported in Town. (The Public Works Operations Manager makes the decision during normal working hours, Monday through Friday 7:00AM to 3:30PM)

**GOALS AND OBJECTIVES:** The goal of this plan is to place an initial application of salt and or salt/sand to all Main Arteries (Primary Routes) within three (3) hours of when slippery or icing conditions have occurred. Secondary roads (Secondary Routes) will be treated as conditions require. DPW crews may respond and treat main roads in the evening allowing secondary roads to be treated when crews report for work in the AM. Conditions that do not fall into that of "Normal Winter Conditions" will be handled in the appropriate manner.

**OPERATION:** Up to Seventeen (17) Salt/Sand spreader trucks may be assigned to (17) predetermined routes, of which the drivers are provided a complete listing of all predetermined salt and salt/sand routes. Application of the salt and/or sand will be made at 500 to 900 pounds per mile, at the determination of the supervisor in charge. All routes are designed in sequence to treat the most traveled roads first.

## **PLAN II - SALTING AND PLOWING OPERATION**

**NOTIFICATION:** The Town of Salem Police Department notifies the Public Works on call Foreman immediately when snow has begun or icing has been reported in Town. (The Public Works Operations Manager makes this decision during normal working hours Monday through Friday 7:00AM to 3:30PM)

**GOALS AND OBJECTIVES:** The goal of this plan is to keep the Main Arteries (Primary Routes) within the Town salted during the early stages of a storm or during the hours of high traffic volume. Plowing may commence when there has been between (1) inch to three (3) inches of snow fall and also depending on the intensity, duration and timing of the storm. DPW vehicles and personnel will keep roads clear and call in contracted equipment as needed for assistance. All primary and secondary roads will be treated after completion of the plowing operation if determined to be necessary.

**OPERATION:** Up to Twenty seven (27) snow fighting vehicles may be assigned to predetermined routes and areas. All routes are designed to keep main streets plowed and/or salted in sequence of the most traveled roads first.

### **PLAN III - SALTING AND SANDING OPERATION** (Severe Weather Conditions)

**NOTIFICATION:** The Town of Salem Police Department notifies the Public Works On Call Foreman immediately when snow has begun or that icing has been reported in Town. (The Public Works Operations Manager makes this decision during normal working hours Monday through Friday 7:00AM to 3:30PM)

**GOALS AND OBJECTIVES:** The goal of this plan is to place an initial application of salt during severe weather conditions on the primary routes before and after the storm has stopped. Plan III decreases the time for putting down abrasives and expands the number of streets to which treatment is given during commuting periods, during the early intensity of an approaching storm, and during severe weather conditions (sleet, freezing rain). With sleet and freezing rain it may become necessary to treat secondary routes in order to provide traction for plow vehicles. Even though it doesn't appear to make sense to put down salt prior to plowing it is critical to prevent the snow from hard packing onto the pavement making it difficult and in some cases impossible to scrape down without using several times the normal amount of chemicals prior to attempting to scrape down.

The second goal of this plan is to apply salt and salt/sand to the primary and secondary routes to remove any residual snow.

**OPERATION:** Up to Seventeen (17) Salt/Sand spreader trucks may be assigned to predetermined routes, of which the drivers are provided a complete listing of all predetermined streets. Application of abrasives will be at 500 to 900 pounds per mile at the determination of the Supervisory in charge. All routes are designed in sequence to treat the most traveled roads first.

### **PLAN IV - PLOWING OPERATION** (Minor Storm)

**GOALS AND OBJECTIVES:** The goal of this plan is to plow all streets in Town once a storm of one (1) to three (3) inches is completed, or continue plowing of any storm predicted of greater than three (3) inches. In order to keep all streets serviceable throughout the winter, all streets must be plowed curb to curb, or to the turf line once the snow has stopped.

**OPERATION:** Up to Fifty nine (59) snow fighting vehicles may be assigned to thirty six (36) predetermined routes, of which the drivers are provided a complete listing of all predetermined plow routes. The amount of equipment in operation will be determined by the Supervisor on duty; all routes are in sequence to carry out the plowing operation in an effective and controlled fashion.



#### **PLAN V - PLOWING OPERATION (Major Snow Storm)**

**GOALS AND OBJECTIVES:** The goal of this plan is to keep all the streets in Town plowed and open during major snow storms. Plan V will be implemented after three (3) inches of snow has fallen with the prediction of several more inches of accumulation before the storms end. From time to time during winter months, a storm of strong intensity may hit the town. During this period the Town will implement all available pieces of snow fighting equipment, which includes Contract assistance, with our goal being to continually plow routes without sacrificing service to secondary streets. All streets are to be kept open with a minimum of one pass each direction until the storm has almost stopped this will permit emergency vehicle access thru the entire storm. Once the snow has stopped; all streets will be pushed back curb to curb with the intersections cleaned up last.

**OPERATION:** Up to Fifty nine (59) pieces of snow fighting equipment may be assigned to thirty six (36) predetermined routes of which the drivers are provided a complete listing of all streets.

#### **PLAN VI - CLEAN UP**

**GOALS AND OBJECTIVES:** The goal of this plan is for the Town to patrol for drifting snow and icing conditions several days following a storm. Normal response to such problem areas is upon request of the Police Department or residents of the Town.

**OPERATION:** Dispatch one (1) or more snow plows and/or salters as needed to the specific areas being reported.

#### **PLAN VII - SNOW REMOVAL**

**GOALS AND OBJECTIVES:** The goal of this plan is for the Town to remove snow banks from the Center of Town, School Zone areas, and where snow banks create a hazard for sight distance.

**OPERATION:** Several loaders, dump trucks, street plows and sidewalk plows will be dispatched to these defined areas. The work may involve removing snow banks on each side of the street as well as at intersections and school zones for safety.

### **PLAN VIII 4AM - 4PM - COMMUTER SAFETY**

GOALS AND OBJECTIVES: The goal of this plan is to apply salt to primary routes during peak commuter time. At 4AM or 4PM when the weather conditions favor an icing situation (BLACK ICE) the Town will dispatch three (3) salt trucks to priority salt routes. These routes are a scaled down version of our primary salting plan and represent only the absolute essential routes to be treated, to allow traffic to travel in and out of Town safely during these icing conditions. Additional equipment and personnel will be utilized should the conditions call for it.

OPERATION: Up to Three (3) salting vehicles may be dispatched to predetermined routes. Application of abrasives will be made at 500 to 900 pounds per mile at the determination of the Supervisor in charge.

### **PLAN IX: SIDEWALKS**

GOALS AND OBJECTIVES: The goal of this plan is to plow the snow from the thirty five (35) miles of sidewalks following a snowstorm. Four (4) sidewalk routes have been developed using the same criteria used for streets. In key areas of Town called “special maintenance areas” we prioritize a level of service to accommodate the needs of school children and the elderly. In many ways the maintenance of sidewalks is much more difficult than streets due to many more potential hazards such as utility poles, steps to houses, landscape timbers, trees, shrubs and stone walls, etc. Along with many hazards comes poor visibility which increases the difficulty of the task.

OPERATION: Upon completion of the snowstorm the three (3) sidewalk plows will be dispatched to designated routes, of which the operators are provided a complete listing of all predetermined sidewalk routes, beginning with the high maintenance areas. The sidewalk plows will complete the PRIORITY routes first before starting the others in order to accommodate the school pedestrian traffic.

### **SUMMARY**

In summary each of the preceding plans implemented by the management team is made after reviewing numerous considerations. No two storms are alike. The variables include traffic, time of day, temperature, storm duration, intensity of the storm, predicted snowfall, equipment breakdowns, and weather following the storm. The management team’s professional judgment and experience play a key role in this decision process. Plans may be modified to specifically address a storm’s individual characteristics.

A careful, thought-out decision can save thousands of dollars. For example, every time a decision is made to salt, we are using **\$8,415 in materials alone.**

When the decision is made to call in the contracted plows to supplement the town’s work force it costs an additional **\$3110.00/hr.**

The Town of Salem, NH has invested approximately **\$3,000,000 in snow removal equipment** and with everyone’s cooperation we can make it a safer winter for all.



## **Salem Division of Public Works**

### **WINTER ROAD REGULATIONS**

Winter Parking ban is in effect from November 15 to April 15, during which time no operator shall leave an unattended vehicle on any street, except in the case of an emergency, between the hours of 12 Midnight and 6 AM or at any time during a declared snow emergency.

Any vehicle found parking in violation will be moved at the expense of the operator or owner and by or under the direction of a police officer of the Town of Salem.

No vehicle shall be left unattended on any street when new snowfall has accumulated to a depth of 3 inches, except in case of an emergency. Any vehicle found in violation will be moved at the expense of the operator.

No person shall shovel, plow or in any way move or cause snow to be moved from private property to a street or sidewalk per Town Ordinances §466-10 and §466-15, and subject to a maximum fine of \$25.00.



# **Salem Division of Public Works**

## **MAILBOX REPAIR POLICY**

The Town of Salem, New Hampshire's Mailbox Repair Policy for the repair of mailboxes and/or posts that are damaged from the Town's snow removal effort is as follows:

- A. DPW, after notification by the resident, will immediately initiate a work order to investigate the complaint.
- B. DPW will, as soon as practical, dispatch an employee to assess and, if determined to be caused by Town operations, authorized the necessary repairs.
- C. If, in the opinion of the DPW, the existing box/post is beyond repair to accept normal delivery it will be replaced with a standard white or black mailbox and a 4X4 wood pressure treated post supplied by the Town. Should it be impossible, due to ground conditions, to install a new ground post at this time, a temporary repair will be attempted so as the residence will be able to receive mail until spring. A DPW tag with a note will be attached to the temporary repair that explains that we will be back at a later date to make the permanent repairs.

This policy in no way is meant that the Town of Salem, NH accepts responsibility for damage within its ROW as stated in RSA 231:92-a nor does it imply that the Town accepts responsibility for interruption in mail service for any length of time until a repair temporary or permanent can be made.

This policy outlines the Department's intent to maintain good public relations with the residents in the community even though state RSA exempts the Town for damage within their ROW's.

## **PLOW ROUTES 2018-2019**

<b>RTE</b>	<b>DRIVER</b>	<b>VEHICLE</b>	<b>AREA</b>
<b>1</b>	<b>Joe Feole</b> <b>Eric Becker</b> Matthes Landscaping Matthes Landscaping Advantage Trucking Dellmedco Construction Belko Landscaping Haggar Building Haggar Building	<b>P7</b> <b>G40</b> 10 Wheeler w/wing&salter 10 Wheeler Tri-Axle Tri-Axle Tri-Axle 10 Wheeler w/salter Large 6 Wheeler w/salter	N. Broadway S. Broadway Veteran's Geremonty
<b>2</b>	<b>Billy Simone</b>	<b>S15</b>	Main St., Granite, Lincoln
<b>3</b>	Matthes Landscaping Matthes Landscaping	Small Loader Small 6 Wheeler	Howard, Taylor, A Ave. Crescent, Bradford
<b>4</b>	Advantage Trucking Advantage Trucking	1 Ton 1 Ton	Dyer Ave, Dwight, Belair
<b>5</b>	<b>John Hackett</b>	<b>S23</b>	Bluff St., Artemis, Matthew Hummingbird Way
<b>6</b>	Merrill Construction	Large Loader	Townsend, Dawson, Highland Ave
<b>7</b>	Stacey Tree Service	1 Ton	Captains, Riverdale, Oak
<b>8</b>	<b>Rick Lessard</b>	<b>S22</b>	Shannon, N. Main St, Hitching Post, Duston
<b>9</b>	<b>Peter Parrino</b> <b>Tom Donahue</b>	<b>D13</b> <b>P70</b>	Liberty, Hooker Farm, Lansing, Hawkins
<b>10</b>	<b>Rusty Gosselin</b>	<b>L33</b>	Millville Circle, Scotland Thomas Drive
<b>11</b>	Kelleher Construction	Large Loader	Meisner, Centerville, Jana
<b>12</b>	Haggar Building Haggar Building	Small 6 Wheeler/salter 1 Ton	Glenn Rd, Ball Ave, Arlington Shore Drive
<b>13</b>	<b>Dave Hyatt (Temp. Driver)</b>	<b>D18</b>	Old Farm, Old Derry, Haverhill Road
<b>14</b>	<b>Andy Ramos</b>	<b>D12</b>	Corinthian, Chappy, Parker, Tilton
<b>15</b>	Haggar Building Haggar Building Haggar Building	1 Ton 1 Ton Large 6 Wheeler w/salter	Arlington Lake
<b>16</b>	All Pro Landscaping All Pro Landscaping	Small 6 Wheeler Small 6 Wheeler	S. Shore, Webster, Gail Rd
<b>17</b>	Haggar Construction	Small 6 Wheeler w/salter	Sylvan, High, Hitty, Union
<b>18</b>	Advantage Trucking Advantage Trucking	Large 6 Wheeler w/salter 1 Ton	Zacharys, Hawk, Lady, Emer Road
<b>19</b>	<b>Jacque Sander</b> <b>Jeff Young</b>	<b>D19</b> <b>P77</b>	Marianna, Veronica, Clinton, Old Rockingham, St. Mary's
<b>20</b>	<b>Matt Waldron</b>	<b>D21</b>	Kelly Road, S. Policy, N. Policy, Mall Rd, Trolley
<b>21</b>	<b>Ryan Pike</b> Stacey Tree Service	<b>S28</b> 1 Ton	Pelham Rd, Sycamore, Brady (N), Harley
<b>22</b>	<b>Darrell Bible</b>	<b>S16</b>	Manor Parkway, Industrial, Brookdale Road
<b>23</b>	<b>Kyle Fox</b>	<b>D17</b>	Brady Ave. South, Golden Oaks, Silverbrook

24	Delmedco Delmedco	1 Ton Small Loader	Green Acre, Valeska Weinhold, Lois Ln
25	Chris Medugno Haggar Construction	1 Ton 1 Ton	Checker boards, Hillcrest Kennell
<b>26</b>	<b>Greg Minnon</b>	<b>L32</b>	Chatham, Waldron, Meridith, Haigh
27	Dave Giroux Dave Giroux	Small 6 Wheeler 1 Ton	Carol Ave, Budron, Sandhill, Pond St.
<b>28</b>	<b>Kelly Demers</b>	<b>S24</b>	Lawrence Rd, Cluff, Cross Braemoor Woods
29	Advantage Trucking Advantage Trucking Advantage Trucking	6 Wheeler w/wing & salter 1 Ton 1 Ton	Sherwood, Becky, Stanwood
<b>30</b>	<b>Curt DiGiovanni</b> Advantage Trucking Advantage Trucking	<b>D14</b> 1 Ton 1 Ton	Old Coach Road, Remington, Birchill Rd, Wesley, Cole, Garrison, Ivan Gile
31	Dave Giroux Dave Giroux	Larger Loader Sm 6 Wheeler	Linwood Ave, Blue Fox Run
32	Haggar Construction	1 Ton	Senior Ctr, Brown, Ewins
33	John Peters John Peters	1 Ton 1 Ton	Town Hall, Library, Maple PD, Fairmont, Pt. A Rd
34	Kelleher Construction	10-Wheeler	Zion Hill, E. Bdwy, N. Main
<b>35</b>	<b>Scott Witkowski</b>	<b>S25</b>	Bridge, School, Lake Wheeler, Tyler, Butler
<b>36</b>	<b>James Pacheco</b> <b>Willard Rock</b> <b>Hector Rivera</b>	<b>P8</b> <b>D85</b>	Pine Grove, Buildings all Walkways
<b>Yard</b>	<b>Mike Stickney</b>	<b>L30</b>	DPW Load/Plow
<b>T.S.</b>	<b>Dave Cantor</b>	<b>L29</b>	Transfer Station
<b>Stations</b>	<b>Fred Wallace</b>	<b>P71</b>	WTP, lift stations, pump stations, dams, water towers, etc.
		<b>As of 12/17/18</b>	<b>***Bold indicates town equipment/employee</b>



### **PLOW ROUTE 1**

SOUTH BROADWAY  
GEREMONTY DRIVE (AND EXT.)

NORTH BROADWAY  
GEREMONTY DRIVE

VETERANS PARKWAY  
MEISNER CIRCLE

#### **DRIVERS**

Joe Feole  
Eric Becker  
Advantage Trucking  
Dellmedco Const.  
Belko Landscaping  
Haggar Building  
Haggar Building  
Matthes Landscaping  
Matthes Landscaping

#### **EQUIPMENT**

P7  
G40  
Tri-Axle  
Tri-Axle  
Tri-Axle  
10 Wheeler w/salter  
Large 6 Wheeler w/salter  
10 Wheeler w/wing & salter  
10 Wheeler

### **PLOW ROUTE 2**

MAIN STREET (Pelham Rd to N Main)  
BELMONT STREET  
PARKVIEW AVENUE  
DUNBAR TERRACE  
LINCOLN TERRACE

GRANITE AVENUE  
PARK AVENUE  
LOREN ROAD  
NORTHEASTERN BLVD  
SCOTT TERRACE

WESTCHESTER ST  
PINE STREET  
BERNICE AVENUE  
CANTERBURY COURT

#### **DRIVER**

Bill Simone

#### **EQUIPMENT**

S15

### **PLOW ROUTE 3**

MILLVILLE STREET (Main St to School)  
TAYLOR STREET  
HOWARD STREET  
A AVE  
ASBURY STREET  
CRESCENT STREET  
WILLOW STREET

IRVING STREET  
FRANCIS STREET  
CHURCH AVE  
CORLISS STREET  
CHARLES STREET  
CRESCENT CIRCLE

FRANKLIN STREET  
EARL STREET  
SPRING STREET  
HILL STREET  
BRADFORD DRIVE  
LEE JOY LANE

#### **DRIVER**

Matthes Landscaping  
Matthes Landscaping

#### **EQUIPMENT**

Small Loader  
Small 6 Wheeler

### **PLOW ROUTE 4**

DYER AVE  
SUMMER STREET  
BEVERLY AVE  
GARDNER AVENUE  
SCOLLAY CIRCLE  
DANDRIDGE AVE

MORRISON AVE  
HENRY STREET  
DEWEY STREET  
CLIFTON AVE  
WOOD LANE  
CONNELL DRIVE

DWIGHT AVE  
ALEXANDER AVE  
ALMA AVENUE  
BELAIR LANE  
BRIAN AVENUE  
EASY STREET

#### **DRIVER**

Advantage Trucking  
Advantage Trucking

#### **EQUIPMENT**

1 Ton  
1 Ton



### **PLOW ROUTE 5**

BLUFF STREET  
AQUA WAY  
TUDOR DRIVE  
COVENTRY LANE  
DELANEY WAY  
JONATHAN HEIGHTS  
HUMMINGBIRD LANE

KAREN LANE  
ARCADIA LANE  
MATTHEW DRIVE  
GORDAN AVE  
DIANNA DRIVE  
ZION HILL RD (E. Broadway-Shadow Lake Road)  
PUTNAM FARM RD

ARTEMIS ROAD  
APOLLO LANE  
BRIARWOOD DRIVE  
ELIZABETH LANE  
KASHMIR DRIVE

**DRIVER**  
**John Hackett**

**EQUIPMENT**  
**S23**

### **PLOW ROUTE 6**

HIGHLAND AVE EXT  
GLEN DENIN DRIVE  
EMERSON WAY  
OLIVE AVE  
DAWSON AVE  
GENERAL PULASKI DRIVE

LOU AVE  
ROBERT AVE  
LEMAY ROAD  
TOWNSEND AVE  
JOHNSON AVE

KYLE DRIVE  
ELLSMERE AVE  
BANNISTER ROAD  
COTE RD  
JUSTIN AVE

**DRIVER**  
**Merrill Const.**

**EQUIPMENT**  
**Large Loader**

### **PLOW ROUTE 7**

WELLS ROAD  
JENNINGS ROAD  
CAPTAINS DRIVE  
WELLS AVE  
CLAY AVENUE  
McLAUGHLIN AVE  
TOWN FARM RD (North Main to Bluff St Ext.)

MACMILLAN ROAD  
AUDREY AVE  
SPICKET LANE  
PLAISTEAD CIRCLE  
KENTHILL ROAD  
WESTERDALE AVE

UNNAMED ROAD  
CAPTAINS ROAD  
MAHONEY AVE  
OAK AVENUE  
KIMBALL AVE  
RIVERDALE AVE

**DRIVERS**  
**Stacey Tree Service**

**EQUIPMENT**  
**1 Ton**

### **PLOW ROUTE 8**

HAMPSTEAD ROAD  
ATKINSON ROAD  
N. MAIN ST (Main St to Atkinson Rd)  
EYSSI DRIVE

SHANNON ROAD  
HITCHING POST LANE  
MEADOW LANE  
DUSTON ROAD

PROVIDENCE HILL RD  
WEST SIDE DRIVE  
BALLARD LANE  
WHITENECK WAY

**DRIVER**  
**Rick Lessard**

**EQUIPMENT**  
**S22**

### **PLOW ROUTE 9**

GALWAY LANE	HOOKER FARM ROAD	CARRIAGE LANE
OLDE VILLAGE ROAD	OLDE WOODE ROAD	STONEY BROOK LANE
FIELDSTONE LANE	LANSING DRIVE	DON ROULSTON RD
DUBLIN WAY	EMILEO LANE	LIBERTY STREET
ERIN LANE	MEGHAN CIRCLE	GANLEY DRIVE
TOWN FARM RD (Bluff Ext. to Shannon)	HAWKINS GLEN DRIVE	HAWKINS POND LANE
GLENCREST DRIVE	SORENSEN RD	TIMOTHY LANE
COLLEEN DRIVE	BROOKHOLLOW DRIVE	CAMELOT COURT
BLUFF ST. EXT		

#### **DRIVER**

**Pete Parrino**  
**Tom Donahue**

#### **EQUIPMENT**

**D12**  
**P70**

### **PLOW ROUTE 10**

GROVE AVE	FIELD AVE	WALTER PALMER LN
WESTWOOD ROAD	SHADY LANE	WINDWARD TERRACE
MILLVILLE ST (School St to Zion Hill Rd)	WOODLAND AVE	LYNDALE AVENUE
CAR MAR LANE	MILLVILLE CIRCLE	MILLVILLE TERRACE
SCOTLAND AVE	HARMONY LANE	MILLVILLE LAKE DR
THOMAS DRIVE		

#### **DRIVER**

**Rusty Gosselin**

#### **EQUIPMENT**

**L33**

### **PLOW ROUTE 11**

TERRIAULT AVE	JANA ROAD	STONEPOST ROAD
HIGHLAND AVE	MERRILL AVE	WEBB STREET
KIM ROAD	WOODMEADOW LANE	CENTERVILLE DRIVE
BRIAR AVENUE	ALTA AVENUE	HENDERSON CIRCLE
ROYAL CIRCLE	MAYBERRY AVE	MEISNER ROAD
KURT ROAD	WOODED KNOLL DRIVE	

#### **DRIVER**

**Kelleher Construction**

#### **EQUIPMENT**

**Large Loader**

### **PLOW ROUTE 12**

ARLINGTON SHORE DRIVE	JULIE AVE	MARYS LANE
AULSON ROAD	KENYON ROAD	CLARE LANE
PEAK AVENUE	BLAKE ROAD	GLENN ROAD
EVERGREEN ROAD	SANDY BEACH ROAD	FIRST STREET
SECOND STREET	THIRD STREET	FOURTH STREET
ALFRED DRIVE	LOU AL LANE	FRANZ ROAD
DANIEL LANE	ARLINGTON POND COURT	BETTY LANE
AURORA STREET	SUNSET ROAD	GILLIS TERRACE
NOWELL COURT	BALL AVE	

#### **DRIVERS**

**Haggar Building**  
**Haggar Building**

#### **EQUIPMENT**

**Small 6 wheeler w/salter**  
**1 Ton**

### **PLOW ROUTE 13**

HAVERHILL ROAD  
CHRISTINE LANE  
FOX RUN LANE  
WILDFLOWER LANE  
OLD FARM ROAD

OLD DERRY ROAD  
NOTTINGHAM LANE  
STONEGATE LANE  
SMALL BROOK LANE  
KLEIN DRIVE

NORWOOD ROAD  
THEODORE AVE  
CLOVER COURT  
EMERALD DRIVE

**DRIVER**  
Dave Hyatt

**EQUIPMENT**  
D18

### **PLOW ROUTE 14**

N. MAIN ST. (Mill Pond Rd-Haverhill Rd)  
PACHECO DRIVE  
CORINTHIAN DRIVE  
TILTON TERRACE  
DAMASCUS DRIVE  
PARKER CIRCLE  
EAST BROADWAY (Jamil Lane-N. Main)

BEAVER BROOK LANE  
LISETTE DRIVE  
JAMIL LANE  
JERICHO LANE  
TEAGUE DRIVE  
SETTLERS LANE

CHAPPY LANE  
PAWTUCKET LANE  
INDEPENDENCE DR  
LAZARUS WAY  
IRON WOOD DRIVE

**DRIVER**  
Andy Ramos

**EQUIPMENT**  
D12

### **PLOW ROUTE 15**

WHEELER DAM ROAD  
BONNANO ROAD  
WRECK AVENUE  
DEXTER TERRACE  
DIORIO ROAD  
ANDERSON AVENUE  
CHERYL ROAD  
BANKS AVENUE  
HOYT STREET  
JAMES STREET  
CHASE STREET  
PALMER STREET  
FRARY STREET

SHORE DRIVE  
COVE ROAD  
CLARK AVENUE  
PALM ROAD  
ISLAND ROAD  
MARY ANN AVENUE  
ELSIE AVENUE  
REID AVENUE  
BOGLE AVENUE  
GRIFFIN STREET  
COBURN STREET  
WILSON STREET  
HENRY TAYLOR STREET

HAMILTON LANE  
COVE ROAD EXT.  
HURNEY AVE  
FORD AVENUE  
WARREN AVENUE  
GRAHAM AVENUE  
CUSHING ROAD  
GULLIVER AVENUE  
ROLFE STREET  
HUNT STREET  
KING STREET  
EDWARDS STREET

**DRIVERS**  
Haggar Building  
Haggar Building  
Haggar Building

**EQUIPMENT**  
Lg 6 Wheeler w/salter  
1 Ton  
1 Ton

### **PLOW ROUTE 16**

PUMPING STATION ROAD  
GAIL ROAD  
COMMUNITY STREET  
QUEEN ANNE LANE  
WEST DUSTON ROAD  
LAKESHORE ROAD  
EMERY STREET  
WEBSTER STREET

BIRCH ROAD  
McGRATH STREET  
ORCHARD TERRACE  
SMITH STREET  
CANOBIE AVENUE  
GOODRIDGE AVENUE  
BURNS ROAD

JILL ROAD  
LAKEVIEW STREET  
SUNSET CIRCLE  
SUMMIT STREET  
SOUTH SHORE ROAD  
TREY CIRCLE  
LAKESIDE STREET

#### **DRIVER**

All Pro Landscaping  
All Pro Landscaping

#### **EQUIPMENT**

Small 6 Wheeler  
Small 6 Wheeler

### **PLOW ROUTE 17**

UNION STREET  
HARRIS ROAD  
LONDON ROAD  
MOUNTAIN ROAD  
SYLVAN DRIVE EXT.

GREENWOOD STREET  
HITTY ROAD  
DENNISON AVENUE  
WEST LANE  
Town Forest Parking Lot

WITCH HAZEL ROAD  
HAZELWOOD DRIVE  
HIGH STREET  
SYLVAN DRIVE

#### **DRIVER**

Haggar Building

#### **EQUIPMENT**

Small 6 Wheeler w/salter

### **PLOW ROUTE 18**

ZACHARYS CROSSING  
LADY LANE  
GREEN HAVEN ROAD  
DEERFIELD STREET

NATHANS WAY  
ERMER ROAD  
HAWK DRIVE

AUTUMN WOODS RD  
PARTRIDGE CIRCLE  
ASPEN STREET

#### **DRIVER**

Advantage Trucking  
Advantage Trucking

#### **EQUIPMENT**

Large 6 Wheeler w/salter  
1 Ton

### **PLOW ROUTE 19**

CLINTON STREET  
VERONICA AVENUE  
LONGWOOD ROAD  
WILDWOOD ROAD  
DYSON DRIVE  
MASON DRIVE  
RENA AVENUE  
TRINA ROAD  
OLD ROCKINGHAM ROAD

SULLIVAN AVENUE  
PEGGY LANE  
LUCILLE AVENUE  
SULLIVAN COURT (To 1<sup>st</sup> drive on right)  
HIDDEN ROAD  
GLORIA ROAD  
DARRYL LANE  
JOSEPH ROAD  
JOANNA ROAD

MARIANNA ROAD  
MARIANNA ROAD EXT  
BETTY LEE TERRACE  
ST. MARY'S LANE  
CATHERINE RD  
DENNIS DRIVE  
HELEN ROAD  
THERESE ROAD

#### **DRIVER**

Jacque Sander  
Jeff Young

#### **EQUIPMENT**

D19  
P77

### **PLOW ROUTE 20**

CORNWELL COURT  
SOUTH POLICY STREET  
ENTERPRISE DRIVE  
WOODLAND TERRACE

MALL ROAD  
KELLY ROAD  
DELAWARE DRIVE  
TROLLEY LANE

NORTH POLICY ST  
PLEASANT STREET  
RAYMOND AVE

**DRIVER**  
**Matt Waldron**

**EQUIPMENT**  
**D21**

### **PLOW ROUTE 21**

PELHAM ROAD (Brookdale to West St)  
HALL ROAD  
SYCAMORE AVENUE  
MCCORMICK WAY  
BRADY AVENUE (Rte. 38-Brookdale Rd)  
LANCASTER FARM ROAD

WEST STREET  
HARLEY STREET  
LEONARD LANE  
CASSIDY AVENUE  
MCKINSTRY CIRCLE  
QUILL LANE

ABBAY ROAD  
CINDY AVENUE  
MORONAS DRIVE  
STANLEY BROOK DR  
LANCASTER X-ING  
PORCUPINE CIRCLE

**DRIVER**  
**Ryan Pike**  
**Stacey Tree Service**

**EQUIPMENT**  
**S28**  
**1 Ton**

### **PLOW ROUTE 22**

PELHAM ROAD (N. Policy-Brookdale Rd)  
STILES ROAD  
COMMERCIAL DRIVE  
KEEWAYDIN DRIVE

BROOKDALE ROAD  
MAY LANE  
NORTHWESTERN DRIVE  
BAILEY ROAD

INDUSTRIAL WAY  
JEWEL ROAD  
MANOR PARKWAY

**DRIVER**  
**Darrell Bible**

**EQUIPMENT**  
**S16**

### **PLOW ROUTE 23**

BRADY AVENUE (Cross St-Rte 38)  
SLEEPY HOLLOW DRIVE  
CORTLAND DRIVE  
SILVERTHORNE DRIVE  
SILVER BROOK ROAD  
BEECHWOOD ROAD

SALEM STREET  
CONCORD COACH DRIVE  
WILLISTON ROAD  
RABBIT RUN LANE  
CANDLESTICK LANE

GOLDEN OAKS DRIVE  
LAMPLIGHTER LANE  
TICKLE FANCY LANE  
SURREY LANE  
NUGGET HILL RD

**DRIVER**  
**Kyle Fox**

**EQUIPMENT**  
**D17**

GREEN ACRE DRIVE CRESTWOOD CIRCLE LEESIDE DRIVE LOIS LANE	<b><u>PLOW ROUTE 24</u></b>	MARIE AVENUE SUNRISE DRIVE VALESKA LANE WEINHOLD CIRCLE	DAVID TERRACE MERIDIAN DRIVE
	<b><u>DRIVER</u></b>	<b><u>EQUIPMENT</u></b>	
	Dellmedco Construction Dellmedco Construction	1 Ton Small Loader	
PATTEE ROAD BENNING AVENUE ROSEWOOD AVENUE BALDWIN STREET WENDY AVENUE	<b><u>PLOW ROUTE 25</u></b>	SEED STREET EATON STREET MESSER AVENUE ANSEL STREET DOG KENNEL	ANN AVENUE OTIS STREET SENER STREET HILLCREST AVENUE
	<b><u>DRIVER</u></b>	<b><u>EQUIPMENT</u></b>	
	Dellmedco Construction Haggar Construction	1 Ton 1 Ton	
HAIGH AVENUE GREEN AVENUE JOYCE HEARD AVENUE SPENCER AVENUE CHATHAM CIRCLE HEMLOCK ROAD MACGREGOR AVENUE	<b><u>PLOW ROUTE 26</u></b>	AZARIAN ROAD BARRON AVENUE HANSON AVENUE SILLEN DRIVE WALDRON ROAD MACLARNON ROAD PLAYCAMP ROAD	FIELDER AVENUE BAGNELL AVENUE STREETER AVENUE MEREDITH ROAD CHESTNUT ROAD MACFARLAND ROAD
	<b><u>DRIVER</u></b>	<b><u>EQUIPMENT</u></b>	
	Greg Minnon	L32	
HAMPSHIRE ROAD POND STREET CAROL AVENUE TWINBROOK AVENUE GARABEDIAN DRIVE	<b><u>PLOW ROUTE 27</u></b>	HAMPSHIRE STREET OAKRIDGE AVENUE BRENTWOOD AVENUE GIBNEY CIRCLE	SANDHILL ROAD BUDRON AVENUE RIDGEVIEW AVENUE COPPER BEECH ROAD
	<b><u>DRIVERS</u></b>	<b><u>EQUIPMENT</u></b>	
	Dave Giroux Dave Giroux	Small 6 Wheeler 1 Ton	
CLUFF ROAD RIVERSEDGE ROAD EAGLE NEST RIDGE	<b><u>PLOW ROUTE 28</u></b>	CLUFF CROSSING ROAD BRAEMOOR WOODS RD CROSS STREET	LAWRENCE ROAD CASTLE RIDGE RD
	<b><u>DRIVER</u></b>	<b><u>EQUIPMENT</u></b>	

Kelly Demers

S24

**PLOW ROUTE 29**

MARSH AVENUE  
MAGNOLIA AVENUE  
TAMMY STREET  
ADAM COURT  
DAWN STREET  
WOODBURY STREET  
PARADISE PLACE

BODWELL AVENUE  
DOUGLAS DRIVE  
STANWOOD ROAD  
KAYLA AVENUE  
MATTHIAS STREET  
PRIMROSE LANE

ELMWOOD AVENUE  
SHERWOOD CIRCLE  
BECKY DRIVE  
MELISSA AVENUE  
ROBERTSON STREET  
NIRVANA DRIVE

**DRIVER**

Advantage Trucking  
Advantage Trucking  
Advantage Trucking

**EQUIPMENT**

Large 6 Wheeler w/wing & salter  
1 Ton  
1 Ton

**PLOW ROUTE 30**

ACKERMAN STREET  
PALOMINO ROAD  
APPALOSSA ROAD  
GARRISON ROAD  
FRASER DRIVE  
DEAN AVENUE  
DANA ROAD  
HICKORY LANE  
REMINGTON ROAD  
FLINTLOCK DRIVE  
FLORAL AVENUE  
IRIS AVENUE  
HAWTHORNE AVENUE

FIR STREET  
SHETLAND CIRCLE  
COLE STREET  
IVAN GILE ROAD  
OLD COACH ROAD  
MORGAN CIRCLE  
COLONIAL DRIVE  
EQUESTRIAN ROAD  
BRIDAL PATH LANE  
WESLEY LANE  
BIRCHWOOD ROAD  
BIRCH HILL ROAD  
ASHWOOD AVENUE

WILLIAMS STREET  
CLYDESDALE ROAD  
SHEPARD AVENUE  
DEBI LANE  
SHORT STREET  
WELSH CIRCLE  
JUNIPER ROAD  
BRIMSTONE LANE  
MARC STREET  
HUTCH ROAD  
PINWOOD ROAD  
RED WOOD ROAD

**DRIVERS**

Curt DiGiovanni  
Advantage Trucking  
Advantage Trucking

**EQUIPMENT**

D14  
1 Ton  
1 Ton

**PLOW ROUTE 31**

LINWOOD AVE  
CYPRESS STREET  
BARBARA AVENUE  
RUTH STREET  
THERESA AVENUE  
NANCY AVENUE  
HUNTERS RUN

MULLBERRY ROAD  
LINDA STREET  
POPLAR ROAD  
MILDRED STREET  
EVELYN ROAD  
FLORENCE AVENUE  
BLUE FOX ROAD

APPLEWOOD LANE  
GUY STREET  
ELEANOR STREET  
MULLBERRY TERR.  
DIAMOND AVENUE  
BOUNTY COURT  
OSHAUGHNESSY LN

**DRIVER**

Dave Giroux  
Dave Giroux

**EQUIPMENT**

Large Loader  
Small 6 Wheeler

**PLOW ROUTE 32**

GEORGE AVENUE  
EWINS LANE  
SALLY SWEETS WAY  
Senior Citizen Center Parking Lot

BROWN STREET  
DOMINIC DRIVE  
DURHAM STREET  
FREEDOM DRIVE

DEXTER ROAD  
EDMUNDS CIRCLE  
MCMANN COURT

**DRIVER**

**EQUIPMENT**

**Haggar Building**

**1 Ton**

**FLOW ROUTE 33**

TOWN HALL  
POLICE STATION  
MUNICIPAL LOT (small only)  
POINT A ROAD

DISTRICT COURT  
MAPLE PLACE  
FIELD OF DREAMS  
MUSE TERRACE

KELLY LIBRARY  
CENTRAL STREET  
FAIRMONT ROAD  
MARTIN AVENUE

**DRIVER**

**John Peters  
John Peters**

**EQUIPMENT**

**1 Ton  
1 Ton**

**FLOW ROUTE 34**

WALNUT TERRACE  
EAST BROADWAY (Millpond-Zion Hill)  
NORTH MAIN STREET (Millpond-Atkinson Road)  
MILLVILLE STREET (Main St-Zion Hill overlap w/Rte 3 and 8)

MILLPOND ROAD  
ZION HILL ROAD

**DRIVER**

**Kelleher Construction**

**EQUIPMENT**

**10 Wheeler**

**FLOW ROUTE 35**

BRIDGE STREET  
BUTLER STREET  
PENOBSCOTT AVE  
KIOWA ROAD

WHEELER AVENUE  
LAKE STREET  
SAMOSET DRIVE

SCHOOL STREET  
TYLER AVENUE  
MASCOMA ROAD

**DRIVER**

**Scott Witkowski**

**EQUIPMENT**

**S25**

**FLOW ROUTE 36**

MUSEUM  
PARKS BUILDING  
**Shovel and treat Walks and Stairs at all town buildings (TH, PD, Court, DPW, Senior Ctr, etc.)**

PINE GROVE CEMETERY  
MT. PLEASANT CEMETERY  
PALMER SCHOOL  
HOSE HOUSE

**DRIVERS**

**James Pacheco  
Willard Rock  
Hector Rivera**

**EQUIPMENT**

**P8  
D85**



## **SIDEWALK PLOW ROUTES 2018-2019**

### **ROUTE #1 (Soule School)**

Cluff Crossing Road (1000' Priority Buffer)  
 Kelly Road (1000' Priority Buffer)  
 South Policy Street (1000' Priority Buffer)  
 Cross Street  
 Meredith Road  
 Waldron Road

### **ROUTE #1 (Barron School)**

Butler Street (1000' Priority Buffer)  
 Fraser Drive (To #17 only)  
 Main Street (Common to Cemetery)  
 Bridge Street  
 Becky Drive  
 Adam Court  
 Melissa Ave  
 Elmwood Ave  
 Kayla Ave

### **ROUTE #2 (Lancaster School)**

Millville Street (1000' Priority Buffer)  
 Lake Street (To #9)

### **ROUTE #2 (Fisk School)**

Main Street (1000' Priority Buffer)  
 Sullivan Ave (to Sullivan Court)  
 N. Policy St. (to Clinton Street)  
 Pleasant St  
 Pelham Rd  
 Stiles Rd  
 Old Rockingham Road

### **ROUTE #3 (High School)**

Main Street (1000' Priority Buffer)  
 Geremonty Drive (Vet's to Main St)  
 Veteran's Memorial Pky  
 Sally Sweet's Way  
 Freedom Drive  
 Rte 28 (Vet's to Depot Nbd)

### **ROUTE #3 (Haigh School)**

School Street (Common to Banister)  
 Woodmeadow Dr  
 Stone Post Rd  
 Meisner Road  
 Kim Road  
 Geremonty Drive Ext.

### **ROUTE #4 (Route 28)**

North Broadway	From Dyer to Depot
South Broadway	From Cluff Rd to Seed St
South Broadway	From Seed St to State Line

# PRIMARY ROUTES 2018-2019

DATE: \_\_\_\_\_

FOREMAN: \_\_\_\_\_

TIME: \_\_\_\_\_

TEMP: \_\_\_\_\_

With Salt \_\_\_\_\_

With Sand \_\_\_\_\_

CALLED	TIME IN	RTE #	DRIVER ASSIGNED	TRK	SUBSTITUTE	PRIMARY	SECONDARY
		#1	Advantage Trucking	Dave			
		#1	Haggar Building	Rob			
		#1	Haggar Building	Grant			
		#2	Bill Simone	S15			
		#3	Matt Waldron	D21			
		#4	Eric Becker	S24			
		#5	Curt DiGiovanni	D14			
		#6	Rick Lessard	S22			
		#7		D18			
		#8	Greg Minnon	S23			
		#9		S28			
		#10	Darrell Bible	S16			
		#11		D17			
		#12		D13			
		#13	Andy Ramos	D12			
		#14	Willard Rock	OWN			
		#15	Haggar Building	Isias			
		#15	Haggar Building	Tony			
		#16	Haggar Building	Bob			
		Yard	Mike Stickney	L30			
				D19	SPARE		
				S25	SPARE		
					<u>SUBSTITUTES</u>		
					Scott Witkowski		
					Pete Parrino		
					John Hackett		
					Kyle Fox		
					Jacque Sander		
			As of 12/17/18		Dave Hyatt		

<b>PRIMARY ROUTE #1</b>	<b>Advantage Trucking &amp; Haggard Building</b>	<b>OWN</b>
<b>South Broadway (Depot to Mass line)</b>		

<b>PRIMARY ROUTE #2</b>	<b>Bill Simone</b>	<b>S15</b>
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<b>North Broadway (Depot to Old Rockingham Rd)</b>	
Main Street	Old Rockingham Rd
Westchester Street	Pumping Station Road
Granite Ave	Birch Road
Jill Road	
<b><u>Buildings:</u> Central Fire, Woodbury School, Library, Cemetery main entrance</b>	

<b>PRIMARY ROUTE #3</b>	<b>Matt Waldron</b>	<b>D21</b>
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Pleasant Street	Veterans Parkway
Cornwell Ct	Geremonty Drive
Mall Road	Freedom Drive
	Sally Sweets Way
<b><u>Buildings:</u> Police Dept, Town Hall, Courthouse, High School (Bus Port and Entrance Road)</b>	
<b>Ingram Senior Center, Telfer Circle Assisted Living</b>	

<b>PRIMARY ROUTE #4</b>	<b>Eric Becker</b>	<b>S24</b>
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Cross Street	Lawrence Rd (Rt 28, to Cluff Road)
Garabedian Drive	Pattee, Messer and Senter (Cut thru Part)
Hampshire Road	Cluff Crossing
Hampshire Street	Kelly Road
Oakridge Avenue	Bagnell Ave
Sandhill Rd	Duffy Avenue
Pond Street	
<b><u>Buildings:</u> South Fire Station, Foss School</b>	

<b>PRIMARY ROUTE #5</b>	<b>Curt DiGiovanni</b>	<b>D14</b>
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Cluff Road	Old Coach Rd (to Apaloosa)
Lawrence Rd (Cluff Rd to Main St)	Ackerman Street
Bridge Street (Main to Mass Line)	Williams Street (Ackerman to Lawrence Rd)
Douglas Drive	Tyler Street
Sherwood Circle	Butler Street
Tammy Street	Wheeler Avenue
Dawn Street	Paradise Place
Stanwood Road	
<b><u>Buildings:</u> Barron School</b>	

<b>PRIMARY ROUTE #6</b>	<b>Rick Lessard</b>	<b>S22</b>
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North Main Street	Settler's Lane
Arlington Shore Drive	Millpond Rd
Atkinson Rd (N. Main to Duston Rd)	Ermer Rd
Duston Rd	
<b><u>Buildings:</u> North Fire Station</b>	

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**PRIMARY ROUTE #7****D18**

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Lansing Drive	Hampstead Rd
Hooker Farm Rd	Klein Dr
Providence Hill Rd	Atkinson Rd ( <b>Duston to Shannon</b> )
Providence Hill Rd Ext	Haverhill Rd
Westside Drive	Shannon Rd
North main ( <b>Haverhill Rd to Ermer Rd</b> )	
<b><u>Buildings:</u> Transfer Station</b>	

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**PRIMARY ROUTE #8****Greg Minnon** **S23**

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Lake Street (From Bluff St. – School St.)	
Merrill Avenue	Highland Ave.
School Street	Meisner Drive
Centerville Dr	Geremonty Dr Ext.
Bannister Rd	Liberty St.
Lou Avenue	Bluff St Ext.
Townsend Ave	Town Farm Road
<b><u>Buildings:</u> Haigh School</b>	

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**PRIMARY ROUTE #9****S28**

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Millville St	Charles St
Howard St	Irving St
Spring St	Summer St
Taylor St	Francis St
A Ave	Earl St
Corliss St	Dyer Ave
Hill St	Franklin St
Asbury St	Scotland Ave
Bluff St.	
<b><u>Buildings:</u> Lancaster School, Millville Arms</b>	

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**PRIMARY ROUTE #10****Darrell Bible** **S16**

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Pelham Rd	Industrial Dr
Stiles Rd	Commercial Dr
Keewaydin Dr	Northwestern Dr
Manor Parkway	Bailey Rd
West Street	
<b><u>Buildings:</u> Soule School, Fisk School</b>	

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**PRIMARY ROUTE #11****D17**

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South Policy	North Policy (Brookdale to Main)
Salem St	Brookdale Rd
Brady Ave	Courtland Ave
Golden Oaks (To Rabbit Run)	

**PRIMARY ROUTE #12****D13**

Sullivan Ave	Peggy Lane	Therese Rd
Gloria Rd	Marianna Rd	Joanna Rd
Clinton St	Longwood Rd	Dennis Dr
Veronica Ave	Wildwood Rd	St. Mary's Lane
Lucille Ave	Dyson Dr	Rena Ave
Betty Lee Terr.	Joseph Rd	Darryl Lane
Trina Rd	Helen Rd	Catherine Rd
Lake Street (Rte 28-Bluff St)		Samoset Drive (top hill)

**PRIMARY ROUTE #13****Andy Ramos****D12**

Independence Dr	TeagueDr	Tilton Terr
Pawtucket Ln	Damascus Dr	Corinthian Dr
Parker Circle	Jerico Lane Rd	Ironwood Dr
Lazarus Way	East Broadway	Zion Hill Rd (to Rte 111)

**Buildings: North Salem School, Palmer School, Old North Fire Station****PRIMARY ROUTE #14****Willard Rock****S27**

Canobie Ave	West Duston Rd	Maylane Dr
Lake Shore Rd	McGrath St	Jewell Dr
South Shore Rd	Lakeside St	Delaware Drive
Goodridge Ave	Lakeview St	Northeastern Blvd (To turn around)
Trey Circle	Community St	Raymond Ave
Emery Rd	N. Policy St	
Burns Rd		

**PRIMARY ROUTE #15****Haggar Building****OWN**

Hitty Rd	High St	Gordon Ave
West Lane	Hillside Ave	Elizabeth Lane
London Rd	Mountain Ave	Zachary's Crossing Rd
Dennison Ave	Union St	Autumn Woods Rd (To Hawk Dr)
Sylvan Dr	Greenwood St	Hawk Dr
Sylvan Dr Ext.	Witch Hazel Rd	
Hazelwood Dr		

**PRIMARY ROUTE #16****Haggar Building****OWN**

Wheeler Dam Rd (To Shore Dr)
Shore Dr
Hoyt St.

## Secondary Routes 2018-2019

DATE: \_\_\_\_\_  
 TIME: \_\_\_\_\_  
 TEMP: \_\_\_\_\_

FOREMAN ON CALL:  
 \_\_\_\_\_

With Salt \_\_\_\_\_

With Sand \_\_\_\_\_

Time In	Rte #	Truck	Assigned Driver	Substitute Driver	Sub Trk #
	#1	S27	Willard Rock		
	#2	S15	Bill Simone		
	#3	S23	Greg Minnon		
	#4	OWN	Haggar Building		
	#5	Dave	Advantage Trucking		
	#6	S22	Rick Lessard		
	#7	D18			
	#8	S28			
	#9	S24	Eric Becker		
	#10	S16	Darrell Bible		
	#11	D17			
	#12	OWN	Haggar Building		
	#13	D12	Andy Ramos		
	#14	D21	Matt Waldron		
	#15	D14	Curt DiGiovanni		
	#16	OWN	Haggar Building		
	#17	OWN	Haggar Building		
	#17	OWN	Haggar Building		
	Load	L30	Mike Stickney		
		D13	SPARE		
		D19	SPARE		
		S25	SPARE	As of 12/17/18	

**SECONDARY ROUTE #1** **Willard Rock** **S27**

Riverdale Ave	Ganley Dr	Camelot Court	Jennings Rd
Kimball St	Hawkins Glen Dr	Don Roulston Dr	Audrey Ave
Clay Ave	Hawkins Pond Ln	Dublin Way	Wells Rd
Kenthill Rd	Glencrest Dr	Galway Ln	Spicket Ln
Wells Ave	Sorenson Rd		“ No Name Rd”
Mahoney Ave	Timothy Ln		
Oak Ave	Colleen Dr		
Westerdale Ave	Brookhollow Dr		
Macmillan Rd			

**Buildings: Transfer Station**

**SECONDARY ROUTE #2** **Bill Simone** **S15**

Belmont St	Stone Post Rd	Briar Ave	Emerson Way
Park Ave	Jana Rd	Alta Ave	Lemay Rd
Pine St	Woodmeadow Dr	Royal Circle	General Pulaski Dr
Martin Ave	Dawson Ave	Henderson Cir	Kyle Dr
Parkview Ave	Robertson Ave	Mayberry St	Glen Denin Dr
Loren Rd	Highland Ave Ext	Kim Rd	Townsend Ave
Bernice Ave	Ellsmere Ave	Meisner Circle	Cote Rd
Dunbar Terrace	Johnson Ave	Kurt Rd	Justin Ave
	Olive Ave	Therault Ave	Wooded Knoll Dr
	Lou Ave	Webb St	Canterbury Ct

**Buildings: Police Station, District Court, Field of Dreams, Salem High School & Town Hall**

**SECONDARY ROUTE #3** **Greg Minnon** **S23**

Play Camp Rd	Duffy Ave	Valeska Ln	Chestnut Drive
MacGregor Ave	Barron Ave	Hanson Ave	Hemlock Lane
MacFarland Rd	Azarian Rd	Marie Ave	Meredith Rd
MacLarnon Rd	Green Ave	Green Acre Drive	Waldron Rd
Lois Ln	Fielder Ave	Crestwood Circle	Chatham Circle
Weinhold Circle	Haigh Ave	Leeside Dr	Sillen Dr
	Joyce Heard Ave	Sunrise Circle	
		Meridian Dr	
		David Terrace	

**Buildings: Soule School**

**SECONDARY ROUTE #4** **Haggar Building** **OWN**

Seed Street	Rosewood Ave	Carol Ave	Copper Beach
Ann Ave	Messer Ave	Budron Ave	Hillcrest Rd
Benning St	Senter St	Brentwood Ave	
Eaton St	Baldwin St	Twinwood Ave	
Otis Ave	Ansel St	Gibney Circle	
		Ridgeview Ave	
		Oak Ridge Ave	

**Buildings: Dog Kennel**

<b>SECONDARY ROUTE #5</b>		<b>Advantage Trucking</b>	<b>OWN</b>
Birch Hill Rd	Becky Drive	McMann Ct	Castle Ridge Rd
Redwood Rd	Kayla Ave	George Ave	Eagle Nest Ridge
Pinewood Rd	Melissa Ave	Brown Ave	Braemoor Woods Rd
Ashwood Ave	Elmwood Ave	Dexter Rd	
Birchwood Rd	Adam Ct	Ewing Ln	
Hawthorne Ave	Marsh Ave	Riversedge Rd	
Iris Ave	Magnolia Ave	Dominic Dr	
Hutch Rd	Bodwell Ave	Edmunds Circle	
Wesley St	Floral Ave	Primrose Ln	
<b><u>Buildings:</u> Ingram Senior Center</b>			

<b>SECONDARY ROUTE #6</b>		<b>Rick Lessard</b>	<b>S22</b>
Walnut Terr	Evergreen Rd	Lou-Al Lane	Clare Ln
Arlington Shore Dr	First St	Arlington Pond Court	Aurora St
Aulson Rd	Second St	Franz Rd	Sunset Rd
Julie Ave	Third St	Mary's Lane	Gillis Terrace
Nolet Ave	Fourth St		Nowell Court
Blake Rd	Sandy Beach Rd		Ball Ave
Peak Ave	Alfred Dr		Whiteneck Way
Glen Rd	Daniel Lane		
Kenyon Rd	Betty Lane		
<b><u>Buildings:</u> North Fire Station</b>			

<b>SECONDARY ROUTE #7</b>		<b>D18</b>	
Eyssi Dr	Christine Lane	Chappy Lane	
Old Farm Rd	Theodore Ave	Lisette Dr	
Small Brook Rd	Stone Gate Lane	Jamil Ln	
Fox Run Lane	Old Derry Rd	Pacheco Dr	
Clover Court	Beaver Brook Lane	Nathan's Way	
Wildflower Lane			
Norwood Rd			
Nottingham Ln			
Emerald Dr			

<b>SECONDARY ROUTE #8</b>		<b>S28</b>	
Lancaster Crossing	McKinstry Circle	Sycamore Ave	
Lancaster Farm Rd	Cindy Ave	Maronos Dr	
Abbey Rd	McCormick Rd	Leonard Lane	
Harley Ln	Cassidy Ave	Stanley Brook Rd	
Hall Ave			

<b>SECONDARY ROUTE #9</b>		<b>Eric Becker</b>	<b>S24</b>
Karen Ln		Millville Circle	
Easy St		Westwood Rd	
Bradford Dr		Car-Mar Ln	
Crescent Dr		Walter Palmer Ln	
Crescent Circle		Grove Ave	
Windward Terrace		Woodland Ave	
Shady Ln		Field Ave	
Harmony Ln		Lyndale Ave	



<b>SECONDARY ROUTE #10</b>	<b>Darrell Bible</b>	<b>S16</b>
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Kashmir Dr	Tudor Dr	Lady Lane
Delaney Way	Matthew Dr	Green Haven Rd
Diana Dr	Briarwood Rd	Deerfield St
Jonathan Heights	Coventry Ln	Aspen St
Arcadia Ln		Autumn Wood Rd
Apollo Way		Partridge Circle
Aqua Way		
Artemis Rd		

**Buildings:** North Salem School

<b>SECONDARY ROUTE #11</b>		<b>D17</b>
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Williston Rd	Tickel Fancy Ln	Silverbrook Rd
Concord CoachDr	Lamplighter Ln	Candlestick Lane
Golden Oaks Dr	Surrey Lane	Nugget Hill Rd
Rabbit Run	Quill Ln	
Sleepy Hollow	Porcupine Circle	

<b>SECONDARY ROUTE #12</b>	<b>Haggar Building</b>	<b>OWN</b>
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Trolley Ln	Pumping Station Rd	Henry Ave	Alma Ave
Woodlawn Terrace	Jill Rd	Alexander Ave	Gardner Ave
Muse Terrace	Gail Rd	Beverly Ave	Wood Ln
Point A Rd	Queen Anne Ln	Morrison St	Connell Dr
Fairmont Rd	Enterprise Drive	Clifton Ave	Belair Ln
Webster St	Maple Place	Brian Ave	Scollay Circle
Smith St	Central St	Dwight Ave	Danridge Ave
Summit St	Church St	Dewey St	Samoset Rd
Orchard Terr	Willow St	Lee Joy Lane	Penobscott Ave
Sunset Cir	Hidden Rd	Mason Rd	Mascoma Drive
			Kiowa Rd

**Buildings:** Parks Building, Fisk School, Municipal Parking Lot, Central Fire, Woodbury School, Kelly Library, Lancaster School

<b>SECONDARY ROUTE #13</b>	<b>Andy Ramos</b>	<b>D12</b>
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Lincoln Terrace	Olde Woode Rd
Scott Terrace	Stoneybrook Ln
Hitching Post Ln	Carriage Ln
Ballard Ln	Fieldstone Ln
Meadow Ln	Olde Village Rd
Erin Lane	Plaisted Circle
Meghan Circle	
Captains Rd	
Captains Dr	
Emileo Ln	

**Buildings:** Museum, Pine Grove Cemetery

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<b>SECONDARY ROUTE #14</b>	<b>Matt Waldron</b>	<b>D21</b>
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Durham St	Wendy Ave
Linwood Ave	Nancy Ave
Eleanor St	Diamond Ave
Linda St	Hunters Run
Ruth St	Bounty Court
Guy St	Theresa Ave
Mildred St	Evelyn Rd
Barbara St	Blue Fox Rd
Mulberry Rd	Applewood Lane
Poplar Rd	Oshaughnessy Lane

**Buildings: South Fire Station, Barron School**

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<b>SECONDARY ROUTE #15</b>	<b>Curt DiGiovanni</b>	<b>D14</b>
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Cole St	Colonial Dr	Old Coach Rd	Nirvana Drive
Dean Ave	Remington Rd	Welch Circle	
Garrison Rd	Short St	Brimstone Rd	
Shepard Ave	Juniper Rd	Equestrian Rd	
Williams St	Hickory Ln	Flintlock Rd	
Fir St	Dana Rd	Woodbury St	
Debi Lane	Palomino Rd	Mathias St	
Marc St	Shetland Circle	Robertson St	
Ivan Gile St	Clydesdale Rd	Morgan Circle	
Fraser Dr	Apaloosa Rd		

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<b>SECONDARY ROUTE #16</b>	<b>Haggar Building</b>	<b>OWN</b>
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Wheeler Dam Rd	Ford Ave
Hamilton Lane	Diorio Rd
Bonanno Rd	Island Rd
Cove Rd	Warren Ave
Cove Rd Ext.	Anderson Ave
Wreck Ave	Maryann Ave
Hurney Ave	Graham Ave
Clark Ave	Cheryl Rd
Dexter Terrace	Elsie St
Palm Rd	Cushing Rd
	Banks Ave

**Buildings: Pump Station**

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<b>SECONDARY ROUTE #17</b>	<b>Haggar Building</b>	<b>OWN</b>
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Frary St	Hunt St
Edwards St	James St
Henry Taylor St	Griffin St
Wilson St	Shore Dr ( <b>Lakeside</b> )
Palmer St	Rolfe St
King St	Bogle Ave
Coburn St.	Gulliver Ave
Chase St	Reid Ave

**Buildings: Palmer School**