

Appendix G: Chloride Technical Report

APPENDIX A: NHDOT BMP IMPLEMENTATION SUMMARY



THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION



Victoria F. Sheehan
Commissioner

William Cass, P.E.
Assistant Commissioner

March 13, 2018

Derry-Londonderry, 13065
I-93, Exit 4A Study
[Water Quality BMP-Based Approach]

Christopher R. Bean, PE
Executive Vice President/Division Leader
CLD/Fuss & O'Neill, Inc.
540 Commercial St (South Entry)
Manchester, NH 03101

Dear Chris;

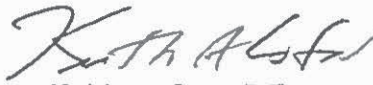
As the Exit 4A team works toward the draft Exit 4A NEPA document this spring of 2018, the Department's recommendation for our project's approach in addressing chlorides is to be consistent with TMDL Implementation plans for affected waterbodies in the Project Area (i.e.: Beaver Brook). In doing so, the qualitative analysis will need to take the following into account for the Exit 4A NEPA documentation:

1. Calculate a proposed increase in salt load for the activity, list the BMPs that can be used to mitigate the increase in salt usage, and provide project commitment to the continued employment of the BMPs in the TMDL Implementation Plans, as published, for the watershed;
2. Identify the BMPs to be included in the design and operation of the project, explain how these measures meet the requirements of the current TMDL Implementation Plans for the watershed (recommend using the narratives provided in the Implementation Plans for removal efficiencies);
3. Under Exit 4A existing conditions will need to include the operation of the I-93 fourth lane. The Department remains in compliance with the Beaver Brook TMDL Implementation Plan for chloride through the use of the following updated BMP-based approach;
 - a. Consistent with the adaptive management strategy in the I-93 ROD to the EIS, the Department has continuously and diligently worked with DES to identify and adopt various chloride reduction measures to reduce salt use in the project corridor from both DOT operations, and others. DOT has met the terms and conditions of the I-93 Water Quality Certificate (WQC) and, subsequently, the Implementation Plan developed by DES following completion of the TMDL studies;
 - b. Consistent with the I-93 WQC, Department has met all conditions, including specific chloride-related stipulations;
 - i. Condition E-6 (chloride monitoring) – performed the requested monitoring in six non-TMDL watersheds with data reports submitted to DES through FY 2012;

- ii. Condition E-7 (TMDL studies) – assisted in the development of the TMDL studies by providing funding to cover DES costs, among other efforts;
 - iii. Condition E-8 (implementation plan development) – assisted in testing chloride reduction measures that were later included in the Implementation Plans (see table below);
 - iv. Condition E-9 (implement chloride reductions in the Implementation Plans) - upgraded the Division of Operation’s winter maintenance equipment for the I-93 corridor and other State-operated roads, and implemented all the various chloride reduction measures as outlined in DES’ Chloride Reduction Implementation Plans (see table below).
 - v. Condition E-10 (DOT to implement adaptive management outlined in the I-93 ROD) - The Department contribution to additional chloride loads beyond those based on existing management practices is actually lower with anticipated reductions in the average annual road salt usage in excessive of 20% on a per lane-mile basis. This is due directly to the implementation of the suite of BMPs described in the I-93 ROD and outlined in Table 1 below.
4. With respect to the I-93 MOA, the DOT has met all the conditions specified. Consistent with the I-93 ROD and WQC, the MOA included a mechanism to fund the TMDL studies, DOT agreed to comply with the Implementation Plans, and to assist the municipalities and private sectors in complying with the Implementation Plans.

In summary, it is the Department’s recommended approach for the Exit 4A NEPA document to take a qualitative approach versus quantifying the specific salt reductions (i.e.: “counting grains of salt”). As you can see from the process noted above, our maintenance commitments and activities is best addressed through the expanded use of the BMPs identified in the DES Implementation Plan for the Beaver Brook watershed. By following these DES accepted practices, the chloride reduction goals will be achieved for the Exit 4A project.

Should you have any questions, please feel free to contact me. Thanks.


Keith A. Cota, P.E.
Chief Project Manager

KAC/kac

cc: Peter Stamnas, Director of Project Development
Kevin Nyhan, Administrator, Bureau of Environment

Table 1. Chloride Reduction BMPs Implemented by NHDOT along the I-93 Roadway

Chloride Reduction BMP	Description	Elements of the Record of Decision	Included in DES Implementation Plans
Salt Accounting	DOT meticulously monitors is salt stock in each patrol shed and reports that information annually to DES	X	X
Pre-wetting	DOT applies liquid deicer to dry salt at time of application		X
Anti-Icing	DOT applies brine directly to the pavement in advance of an oncoming storm when conditions allow	X	X
Underbelly Plows	DOT utilizes these plows that enhance snow scraping / removal capabilities	X	X
Ground-speed Spreader Controllers	All DOT trucks utilized out of Shed 528 ¹ have ground-speed, closed loop controllers		X
Mobile Pavement Temperature Sensors	All DOT trucks located in Shed 528 ¹ have mobile pavement temperature sensors. Several road weather stations have also been established along I-93 corridor	X	X
Equipment Calibration	DOT annually calibrates their spreader equipment prior to each season		X
Enhanced Training	DOT provides enhanced training tracks participation via an online accounting system. Hired equipment operators are encouraged to attend	X	X
Improved Storage Practices	DOT has just completed upgrading a depot shed in Salem which has increased indoor storage capacity		X
Snow and Ice Forecasting	DOT utilizes computer software that provides forecast for plowing and salting with information feed from it Roadside Weather Information System	X	X
Enhanced Plow Blade Technology	DOT utilizes flexible plow blades that provide better road contact and enhance snow scraping / removal capabilities		X

GPS/AVL technology	All DOT spreader trucks located in Shed 528 are equipped with GPS/AVL which helps track salt usage by specific trucks and areas of interest.		X
Variable Messaging Signs	VMS have been installed to warn drivers of impending or current weather and traffic conditions and set lower speed limits		X
Enhanced Material Reporting Relative to Winter Severity	DOT has been reporting post-implementation salt usage relative to pre-implementation usage while adjusting for winter weather severity.		X

Notes: Shed 528 in Derry performs winter maintenance activities along the southern I-93 corridor.

**APPENDIX B: TOWN OF DERRY, CHLORIDE REDUCTION PLAN
LETTER**



DEPARTMENT OF PUBLIC WORKS
MICHAEL A FOWLER, P.E., Director

PW20-296
September 9, 2019

Keith A. Cota, P. E. - Chief Project Manager
New Hampshire Department of Transportation
7 Hazen Drive
Concord, NH 03301

RE: Town of Derry's Chloride Reduction Plan

Dear Mr. Cota,

Beaver Brook has been identified as impaired by the New Hampshire Department of Environmental Services (NHDES) and the US Environmental Protection Agency (USEPA) for chloride concentrations that exceed state water quality standards. NHDES has completed a Total Maximum Daily Load (TMDL) analysis to quantify pollutant reductions needed to meet the state water quality standards for chlorides.

In order to meet water quality standards, significant reductions of chloride loading were required. The Town of Derry has agreed to work towards the reduction of the amount of chlorides applied during snow and ice removal operations while maintaining the Town's roadway system in accordance with the Town's Winter Maintenance and Snow and Ice Control Policy.

Since development of the TMDL and prior to development of Derry's Salt Reduction Plan, the Town had already started taking chloride reduction measures including construction of a new salt/sand storage facility and loading procedures, calibration of spreaders, preparation of draft outreach brochure targeted at the private/commercial sectors, and periodic conductivity monitoring of select tributaries to Beaver Brook.

To address the Beaver Brook Chlorides TMDL the Town of Derry developed a Salt Reduction Plan (SRP) in August 2011 (with subsequent updates through 2018) that was incorporated in the *2011 Chloride Reduction Implementation Plan for Beaver Brook* (NHDES 2011a). The Derry SRP identified a number of BMPs and implementation goals for reducing salt loads.

In the SRP, the Town committed to providing winter maintenance to ensure the designated level of service to roadways, parking lots and sidewalks is maintained according to applicable state and local legislation while striving to minimize adverse impacts to the environment. These commitments are to be met by:

- Adhering to the procedures contained within the Salt Reduction Plan;
- Committing to ongoing winter maintenance staff training and education;
- Reporting fiscal year salt use data to the NH DES
- Re-evaluating the effectiveness of the Salt Reduction Plan as needed to incorporate new cost-effective technologies or changes in procedures.

The SRP is meant to be dynamic to allow the Town to evaluate and phase-in any changes, new approaches and technologies in winter maintenance activities in a fiscally sound manner.

As of July 2019, the following have been completed:

- Since 2007, the Town of Derry has been actively involved in the Salt Reduction Workgroup meetings, having hosted most of these meetings at the Derry Municipal Center.
- From 2011 through 2017, the Town has hosted, with no charge to the State or UNH-T2, at least 18 training workshops on salt reduction. Several of these workshop/training events were prior to formal adoption of the Green SnowPro Certification program with the remaining training workshops being held as formal Green SnowPro Certification Training for snow removal contractors.
- The Town of Derry was a strong advocate for the Salt Applicator Bill and obtained one of the sponsors of the bill. The Town also hosted public meetings with NHDES and NH State Representatives and senators to discuss the pending Salt Applicator Bill.
- In 2013, the Town took possession of 3 snow removal trucks equipped with groundspeed control, prewetting brine systems, and bottom scrapers.
- In 2014, the Town took possession of two additional trucks equipped with front and wing plows, stainless steel dump spreaders, groundspeed control, on-spot chains, and a 140-gallon brine tank with pre-wetting system.
- From 2011 through 2015, the Town of Derry Public Works and Cable TV Department produced four (4) cable TV shows on salt reduction. The first was a public service announcement titled *Reducing Road Salt Use, Protecting NH Waters* and was a collaboration with the Town of Londonderry, NHDES, and UNH-Technology Transfer Center (UNH-T2). Two additional shows, *DPW & NH Salt Reduction Initiative Winter 2014* and *Blizzard 2015: Keeping Our Roads Clear* focused on Derry's Salt Reduction initiative, best management practices, effects of salt on the environment, the state's Green SnowPro Program and tips for homeowners and business owners on more efficient deicing practices. The fourth show produced in 2015 by the Town of Derry, *Improving our Environment: Green SnowPro Program* featured NHDES Salt Reduction Coordinator and UNH Technology Transfer Center.
- Since implementation of the chloride TMDL, the Town installed 5600 linear feet of pervious pavement sidewalk in a commercial area within the watershed. In addition, pervious pavement on private commercial developments was also approved and subsequently installed at a bank and medical office park.

- The Town of Derry already constructed a salt shed for properly storing salt under cover and adopted BMPs at the salt storage facility.
- All Derry Municipal operators are required to be trained in the Green SnowPro Program offered by UNH-T2.
- Spreader calibration is performed each year prior to the start of the winter season.
- In 2014, Derry's Superintendent of Operations was publicly recognized and given an award by NHDES for "outstanding leadership in addressing salt reduction" and identified as one of the reasons the salt reduction program partners have had success so far by reaching out to private applicators in Derry and surrounding towns, and to legislators, and making substantial improvements in the Town's operations, resulting in significant decreases in salt use.

The Town will continue its outreach to commercial property owners and businesses with 10 or more parking spaces to promote salt reduction and the Green SnowPro Program.

The Town will continue implementing BMPs for chloride reduction and to review salt reduction plans every 5 years. The Town is currently in the process of updating our salt reduction plan to meet requirement of the 2017 NH MS4GP.

Very truly yours,



Michael Fowler, DPW Director

**APPENDIX C: TOWN OF LONDONDERRY, CHLORIDE
REDUCTION PLAN LETTER**



Town of Londonderry
PUBLIC WORKS & ENGINEERING DEPARTMENT
268 B Mammoth Road
Londonderry, NH 03053
Phone: (603) 432-1100 ext. 193, Fax: (603) 432-1128

September 3, 2019

Keith A. Cota, P.E.
Chief Project Manager
NH Department of Transportation
Concord, NH

Re: Town of Londonderry's Chloride Reduction Plan

Dear Keith:

Beaver Brook has been identified as impaired by the New Hampshire Department of Environmental Services (NHDES) and the US Environmental Protection Agency (EPA) for chloride concentrations that exceed state water quality standards. NHDES has completed a Total Maximum Daily Load (TMDL) analysis to quantify pollutant reductions needed to meet the state water quality standards for chlorides.

In order to meet water quality standards, significant reductions of chloride loading were required. The Town of Londonderry has agreed to work towards the reduction of the amount of chlorides applied during snow and ice removal operations while maintaining the town's roadway system in accordance with the Town's Winter Maintenance Snow and Ice Control Policy.

To address the Beaver Brook Chlorides TMDL the Town of Londonderry developed a Salt Reduction plan in 2011 (with subsequent updates in July 2019) that was incorporated into the *2011 Chloride Reduction Implementation Plan for Beaver Brook* (NHDES, 2011a). The Londonderry salt reduction plan identified a number of BMP's and implementation goals for reducing salt loads. As of July 2019 the following steps have been completed:

- Purchase of five dump trucks with underbody discharge spreaders

- New trucks include salt pre-wetting, groundspeed controls, and in-cab air/pavement temperature sensors
- Spreader control units on new trucks allow adaptive road treatment
- Spreader calibration policies were developed and implemented to ensure accurate application rates. Spreader equipment are annually calibrated prior to each season.
- Salt tracking policies were developed and implemented. Salt usage data is recorded after each winter storm event and annually reported to NHDES.
- All Londonderry municipal operators have been trained in the Green Snow Pro Program offered by the University of New Hampshire (UNH) Technology Transfer Center.
- The local weather forecast service was upgraded to aid the road maintenance decision making process.

Since development of the Salt Reduction Plan of 2011 and implementation of BMPs for reducing chlorides, the Town of Londonderry successfully achieved significant reduction of chloride imports to the Beaver Brook watershed by as much as 37% on average from 2011 – 2019.

The Town is committed to continue implementing BMPs for chloride reduction and to review salt reduction plans every 5 years and improve as necessary.

Within the Upper Beaver Brook watershed, MS4 permittees are subject to the requirements of the 2017 NH MS4 permit including the requirements to “reduce chloride discharges to support achievement of WLA included in the applicable approved TMDL.” Therefore, any future development in the Upper Beaver Brook watershed would be subject to the MS4 requirement. This will require implementing salt reducing BMPs to assure that the Beaver Brook chloride TMDL can be achieved.

The Town of Londonderry is currently going through the Public Hearing process of adopting zoning and stormwater regulations that addresses future developments implementation of BMP strategies under the local town approvals. Proposed Stormwater Zoning requires that winter maintenance operators for all private parking lots with 10 or more parking spaced within the chloride impaired watershed which include the Exit 4A project obtain Green Snow Pro certification and to report annually salt usage within the watershed boundaries to UNH Technology Transfer Center.

In 2020, the Town is planning to develop an outreach program (newsletters, factsheets, web base postings, etc.) for encouraging business with 10 or more parking spaces and currently does not flow into the town's MS4 permit area that is impaired for chlorides to obtain Green Snow Pro Certification and also to adopt site plan regulations that require Green Snow Pro Certifications.

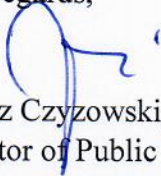
The Town of Londonderry already constructed two salt sheds for properly storing salt under cover and adopted BMPs at the salt storage facilities.

Using trucks with a salt pre-wetting spreader has already produced a substantial reduction in salt usage, however the town will still examine the possible implementation of pre-treating or anti-icing within the watershed of impaired waters. Snow fencing will be installed in locations as the need arises.

Installation of automatic vehicle location systems (AVL) is still under consideration. The additional reduction of driving speed limits on local municipal roads is not necessarily needed since the drivers are already driving at a reduced speed due to winter conditions.

The Town is also periodically reviewing its formal Winter Maintenance Snow and Ice Control Policy for implementation of BMPs for chloride reduction. The town also reviews level of service (LOS) pre and post each winter storm event.

Best regards,



Janusz Czyzowski, P.E.
Director of Public Works & Engineering
Town of Londonderry, NH

**APPENDIX D: WOODMONT COMMONS PHASE I CHLORIDE
MANAGEMENT PLAN**



The State of New Hampshire
Department of Environmental Services

Clark B. Freise, Assistant Commissioner



February 15, 2017

Pillsbury Realty Development, LLC
Attn: Ari Pollack
214 North Main Street
Concord, New Hampshire 03301

RE: Woodmont Commons, Planned Unit Development
Garden Lane and Pillsbury Road
Tax Map 10, Block 41, 52, 54-1, Londonderry, NH

Permit: AoT-1213

Dear Applicant:

Based upon the plans and application, approved on February 15, 2017, we are hereby issuing RSA 485-A:17 Alteration of Terrain Permit AoT-1213. As part of the processing of this application, DES grants approval to waiving specific requirements of Rule Env-Wq 1507.04, *Groundwater Recharge Requirements*, finding that generally elevated groundwater elevations at the site preclude reasonable opportunities to recharge groundwater, and finding that some recharge will be achieved at proposed filtration basins. It was further determined that granting the waiver would not have an adverse impact on the environment, public health, public safety, or abutting properties, and that granting the request is consistent with the intent and purpose of the rule waived. Additional documentation relative to the waiver requested is contained within the file. This permit is subject to the following conditions

1. Activities shall not cause or contribute to any violations of the surface water quality standards established in Administrative Rule Env-Wq 1700.
2. You must submit revised plans for permit amendment prior to any changes in construction details or sequences. You must notify the Department in writing within ten days of a change in ownership.
3. You must notify the Department in writing prior to the start of construction and upon completion of construction. Forms are available at: <http://des.nh.gov/organization/divisions/water/aot/categories/forms.htm>. **If any underground detention systems, infiltration systems, or filtering systems are installed, a letter must be provided, signed by a qualified engineer, stating that the individual observed such system(s) prior to such system(s) being backfilled, and that in his or her professional opinion, such system(s) conform to the approved plans and specifications.**
4. The plans, latest revision dated February 13, 2017, and supporting documentation in the permit file are a part of this approval.
5. **This permit expires on February 15, 2022.** No earth moving activities shall occur on the project after this expiration date unless the permit has been extended by the Department. If requesting an extension, the request must be received by the department **before the permit expires**. The Amendment Request form is available at: <http://des.nh.gov/organization/divisions/water/aot/categories/forms.htm>
6. This permit does not relieve the applicant from the obligation to obtain other local, state or federal permits that may be required (e.g., from US EPA, US Army Corps of Engineers, etc.). Projects disturbing over 1 acre may require a federal stormwater permit from EPA. Information regarding this


www.des.nh.gov

29 Hazen Drive • PO Box 95 • Concord, NH 03302-0095
(603) 271-3503 • TDD Access: Relay NH 1-800-735-2964

permitting process can be obtained at:
<http://des.nh.gov/organization/divisions/water/stormwater/construction.htm>.

7. **All stormwater practices shall be inspected and maintained in accordance with Env-Wq 1507.08 and the project Inspection and Maintenance (I&M) Manual.** All record keeping required by the I&M Manual shall be maintained by the identified responsible party, and be made available to the department upon request.
8. Winter snow and ice management activities shall be in accordance with the Chloride Management Plan, Woodmont Commons – Planned Unit Development, Londonderry, New Hampshire, received by the Department on October 18, 2016.
9. If applicable, no activity shall occur in wetland areas until a Wetlands Permit is obtained from the Department. Issuance of this permit does not obligate the Department to approve a Wetlands Permit for this project.

Sincerely,



Ridgely Mauck, P.E.
Alteration of Terrain Bureau

cc: Londonderry Planning Board

ec: TFMoran, Inc.

WOODMONT COMMONS – PLANNED UNIT DEVELOPMENT LONDONDERRY, NEW HAMPSHIRE

Chloride Management Plan

Winter Operational Guidelines

The following Chloride Management Plan is for the Woodmont Commons Planned Unit Development in Londonderry, New Hampshire. The Plan includes road salt source reduction methodologies in the categories of: road salt equipment specifications, certification requirements, stormwater management efforts, public awareness efforts, and road salt usage and monitoring requirements. Due to the evolving nature of chloride management efforts, the Chlorides Management Plan will be periodically reviewed to reflect the current management standards.

1.0 Background Information

The Woodmont Commons live-work-play development is mostly located within the Beaver Brook Watershed in Londonderry and Derry, New Hampshire. In 2006, the New Hampshire Department of Environmental Services (NHDES) and the US Environmental Protection Agency (EPA) designated the Beaver Brook Watershed, and three additional watersheds along the I-93 corridor, as impaired watersheds due to locational chloride concentrations that exceed the Total Maximum Daily Load (TMDL) in portions of each watershed. Further studies within these watersheds identified the sources of chloride loading as winter operational use of de-icing, anti-icing and pretreatment materials applied for the removal of snow and surface maintenance. These studies further attributed the primary sources of chloride loading to three major user groups. Within the I-93 corridor, approximately 10-15% of the overall chloride load was attributed to winter operational activities on State roads. Public and private sector user groups, the additional two groups identified, equally accounted for the remaining portion of the chloride load.

In an attempt to reduce chloride loading derived from the use of de-icing, anti-icing and pretreatment materials applied for the removal of snow and surface maintenance within the Beaver Brook Watershed, the Towns of Londonderry, Auburn, Chester, and Derry, in conjunction with the New Hampshire Department of Transportation, have developed salt reduction plans for each of the four towns within the Beaver Brook Watershed. According to the Salt Reduction Plan for the Town of Londonderry, and the additional supporting documents used to develop the plan, source reduction is identified as the most effective method for reducing chloride loading in the Beaver Brook Watershed. The primary source reduction methodologies outlined in the Salt Reduction Plan focus on increased education opportunities for municipal employees and private contractors involved with winter operational activities, more accurately calibrated application methods, enhanced forecasting, improved surface monitoring technologies, and public outreach efforts that include measures to ensure that the private sector entities located within the Beaver Brook Watershed continually adhere to the current standards.

Included in the Salt Reduction Plan for the Town of Londonderry is the NHDES Watershed Management Bureau, 2010 Draft TMDL Implementation Plan Considerations document. In this document is a table for how the TMDL allocations are broken down in each of the four impaired watersheds. For the Beaver Brook Watershed, the ten year rolling average TMDL of 5,863.4 tons/year is distributed between NHDOT I-93, NHDOT other roads, Londonderry Municipal, Derry Municipal, Chester & Auburn, Londonderry Private, Derry Private, Londonderry Future, and Derry Future. The Plan further identifies that within the Beaver Brook Watershed the Town's objective is to reduce chloride imports by 5% annually to achieve the ten year rolling average TMDL allocation.

In keeping with these expectations, the Town of Londonderry worked closely with the Woodmont Commons Management Team to ensure that the Master Plan reflected the objectives outlined in the Salt Reduction Plan for the Town of Londonderry.

2.0 Operational Guidelines – Chloride Management

All Woodmont Commons Team Managers are responsible for assisting in meeting compliance for the following protocols. It is important to note that portions of the Woodmont Commons Property is NOT located in the portion of the Beaver Brook Watershed that is impaired, runoff water leaving the property does pass through the impaired portion of the watershed. Woodmont Commons Team Managers are expected to minimize the effects of the use of de-icing, anti-icing and pretreatment materials by adhering to the strict guidelines outlined below.

The Woodmont Commons winter operational de-icing, anti-icing and pretreatment materials will adhere to the following protocols:

2.1 Private Maintenance Contracting Equipment Requirements and Training

Woodmont Commons serves as a model for private sector participation by committing to contract with snow removal maintenance providers who have been trained and are knowledgeable of the Best Management Practices (BMPs) for snow removal under reduced salt applications. Each Woodmont Commons Team Manager is responsible to know and be up to date on the current standards for snow removal under reduced salt applications. These practices are published and updated by the UNH Technology Transfer (T2) program.

All Woodmont Commons Team Managers directly involved with winter operational activities, and all private contractors engaged at the Woodmont Commons premises for the purposes of winter operational snow removal and surface maintenance, must be current UNHT2 Green SnowPro Certified operators or equivalent, and will use only pre-approved methods for spreading abrasives on private roadways and parking lots. When a salt aggregate or brining solution is applied for the purposes of snow removal or surface maintenance, it will adhere to the current BMP standard, including pre-treatment and ground speed-controlled spreaders as outlined in the NHDES August 2011 Salt Reduction Implementation Plan for the Beaver Brook Watershed.

2.1.1 Minimum Specification Requirements for De-icing, Anti-icing and Pretreatment Equipment

All private contractors engaged at the Woodmont Commons premises for the purposes of winter operational snow removal and surface maintenance, must be current UNHT2 Green SnowPro Certified operators or equivalent. All equipment utilized on the Woodmont Commons premises for the purpose of winter operational snow removal and surface maintenance will conform to the following specifications.

2.1.1.1 Material Spreader Control Unit

All equipment utilized for the application of road salt aggregate shall be equipped with a spreader control unit with the ability to calibrate and accurately dispense aggregate materials at a uniform density and frequency based on the forward rate of the vehicle or equivalent spreader carrier unit. At a minimum, acceptable spreader control units will include the capacity to control salt aggregates, pre-wetting equipment, ground speed orientation, and air/ground surface temperature data. The unit will also allow Woodmont Commons Operational Management password access to confirm and set calibration limits which will automatically adjust to the vehicle/carrier speed and ground surface temperature.

2.1.1.2 Brining Equipment Control Unit

All equipment utilized for the application of brining and pre-wetting solution shall be equipped

with a spreader control unit with the ability to calibrate and accurately dispense brining and pre-wetting solution at a uniform density and frequency based on the forward rate of the vehicle or equivalent carrier unit. At a minimum, acceptable spreader control units will include the capacity to directly interface with salt aggregate equipment, pre-wetting equipment, ground speed orientation, and air/ground surface temperature data. The unit will also allow Woodmont Commons Operational Management password access to confirm and set calibration limits which will automatically adjust to the vehicle/carrier speed and ground surface temperature.

2.1.1.3 Air/Ground Surface Temperature Monitors

All vehicle/carriers utilized for the application of road salt aggregate or brining and pre-wetting solution shall be equipped with an annually calibrated and operational air/ground surface temperature monitor capable of providing in-cab operator displays and automatic interface with a compatible spreader control unit. At a minimum, acceptable air/ground surface temperature monitor units will include the capacity to interface with spreader control units and be compatible with salt aggregate equipment, pre-wetting equipment, and air/ground speed orientation data. The unit will also allow Woodmont Commons Operational Management access to confirm and/or calibrate limits to ensure accurate interface with the vehicle/carrier speed and ground surface temperature function.

2.1.1.4 Electronically Controlled Hydraulic Valve Unit

All equipment utilized for the application of road salt aggregate or brining and pre-wetting solution shall be equipped with an electronically controlled hydraulic valve unit capable of providing in-cab operator displays and automatic interface with a functional spreader control unit. At a minimum, an acceptable electronically controlled hydraulic valve unit will include the capacity to interface with a vehicle/carrier spreader control unit that automatically adjusts salt aggregates, pre-wetting equipment, ground speed orientation, and ground surface temperature data. The unit will also allow Woodmont Commons Operational Management access to confirm and/or calibrate limits to ensure accurate interface with the vehicle/carrier spreader control interface.

2.1.2 Equipment Calibration Requirements

All equipment utilized on the Woodmont Commons premises for the purpose of winter operational snow removal and surface maintenance will conform to the following calibration requirements.

2.1.2.1 Annual Calibration Requirements

All private contractors engaged at the Woodmont Commons premises for the purpose of winter operational snow removal and surface maintenance shall provide two copies of the annual calibration report for each piece of equipment utilized on the Woodmont Commons premises. Each calibration report shall include the vehicle/carrier VIN number and the serial numbers for each component including, but not limited to, spreader control units, salt aggregate spreader equipment, brining/pre-wetting equipment, ground speed orientation unit, and air/ground surface temperature monitor. Annual calibration reports will be available on file in the Woodmont Commons Property Management Building and be present in the vehicle/carrier at all times. Prior to each use, each vehicle/carrier operator will perform a systems check to verify that unit settings remain within the guidelines established by the Woodmont Commons Management Team in order to accurately dispense material. All private contractors engaged at the Woodmont Commons premises for the purpose of winter operational snow removal and surface maintenance will be subject to spot inspections by members of the Woodmont Commons Management Team to ensure that each vehicle/carrier is operating in a manner consistent with the guidelines set herein or State and Municipal regulations. All units will be recalibrated and the updated calibration reports will be provided each time repairs or maintenance procedures affect the hydraulic system

of the vehicle/carrier.

2.1.3 Winter Operator Certification Requirements

All private contractors engaged at the Woodmont Commons premises for the purpose of winter operational snow removal and surface maintenance must be current UNHT2 Green SnowPro Certified operators or equivalent, and will use only pre-approved methods for spreading abrasives on private roadways and parking lots. All private contractors engaged at the Woodmont Commons premises for the purpose of winter operational snow removal and surface maintenance shall provide to Woodmont Commons management two copies of the annual UNHT2 Green SnowPro certificate or equivalent for each operator utilized on the Woodmont Commons premises. The annual UNHT2 Green SnowPro certificate or equivalent for each operator will be available on file in the Woodmont Commons Property Management Building and be present in the vehicle/carrier at all times.

2.2 Improved Weather Monitoring

Woodmont Commons will coordinate weather information for use by winter maintenance contractors. This information in conjunction with site specific air/ground surface temperature monitoring will ensure that private contractors engaged at the Woodmont Commons premises for the purpose of winter operational snow removal and surface maintenance will make more informed decisions as to when and to what extent de-icing, anti-icing and pretreatment materials are applied to private roadways, sidewalks, and parking lots.

2.3 Increased Mechanical Removal Capabilities

Woodmont Commons will endeavor to use mechanical removal means on a more frequent basis for roadways, parking lots and sidewalks. Dedicating more manpower and equipment to increase snow removal frequencies prevents the buildup of snow and the corresponding need for de-icing, anti-icing and pretreatment materials. Shortened maintenance routes, with shorter service intervals, will be used to stay ahead of snowfall. Minimized snow and ice packing will reduce the need for abrasives, salt aggregates, and/or brining solution to restore surfaces back to bare surface states after winter precipitation events.

After storm events the Woodmont Commons management team will be responsible for having the streets swept to recapture unmelting de-icing materials, when practical.

2.4 Public Awareness Campaign

Woodmont Commons will inform all future developers, grantees, and tenants at the Woodmont Commons development of the need to reduce the use of de-icing, anti-icing and pretreatment materials on roadways, parking lots, and sidewalks.

2.5 Summary

The above-described methodologies are incorporated into the Woodmont Commons Operational Manual and are to be used to qualify and retain all private contractors engaged at the Woodmont Commons premises for the purpose of winter operational snow removal and surface maintenance. This section of the Manual, as with the Town of Londonderry's Salt Reduction Plan, is intended to be an adaptive management document that is modified as required based on experience gained from past practices and technological advancements that reflect chloride BMP standards. Each member of the Woodmont Commons Management Team is required to review this document and the current standard Best Management Practices published by the UNH Technology Transfer (T2) program annually. Each member of the Woodmont Commons Management Team directly involved with winter operational guidelines is required to be certified as a UNHT2 Green SnowPro or equivalent and undergo the necessary requirements to maintain this certification annually.

3.0 Stormwater Management

Wherever applicable, stormwater in locations subject to winter operational de-icing, anti-icing and pretreatment materials will be directed to the Woodmont Commons Tiered Stormwater Management System. The Woodmont Commons Stormwater Management System is designed using a comprehensive stormwater management philosophy designed to retain and treat stormwater based on land use. Stormwater volumes and pollutant signatures vary based on land use. By identifying the potential stormwater characteristics based on the land use, stormwater management efforts may be designed to remediate stormwater pollutants at the source level prior to conveying the stormwater down gradient for additional treatment.

3.1 Woodmont Commons Tiered Stormwater Management System Overview

The Tiered Stormwater Management Plan for the Woodmont Commons Planned Unit Development (PUD) is a multifaceted proposal composed of stormwater systems at the **Site Level** and **Area Level**. These stormwater land-use goals can layer with additional land-use goals such as landscaping requirements, greenspace, greenway, active recreational, and passive open space components as defined in sections 2.4.6 PUD Site Plan Landscape Requirements and 2.3.6 Conserved Green Space and Shared Open Space Standards of the Woodmont Commons PUD Master Plan accepted by the Town of Londonderry on September 11, 2013.

Site Level stormwater management systems will focus on removal of total suspended solids (TSS), and if/where soil conditions are suitable, bio-remediation will be implemented to capture excess nutrient loads and other contaminants typically found in residential stormwater runoff.

Area Level systems will be spaced and sized to receive the stormwater from the Site Level systems, while extending the treatment processes and residence period of the stormwater treatment.

The **Area Level** systems will detain and release the treated stormwater outside of the PUD area consistent with the rates of discharge prior to the project. The **Area Level** systems will provide additional filtration and macro nutrient removal as the base rate of flow is slowed. The plants and microbial species selected will promote long-term nutrients entrainment and incorporate elements of vegetation to maintain optimum wildlife values, and bacterial and mycoremediation rates.

Much of the stormwater from the PUD on the west side of I-93 will discharge to Duck Pond in the southwest corner of the Woodmont Commons' property. The Duck Pond impoundment will be enhanced consistent with the Master Plan to promote recreational opportunities for the surrounding communities in a successional trajectory that is best suited to sustain the resource into the future.

4.0 Salt Usage Evaluation and Monitoring

The Woodmont Commons Management Team is committed to an ongoing Chloride Management Plan to aid the Town of Londonderry in its efforts towards reducing chloride imports into the Beaver Brook Watershed. All private contractors engaged at the Woodmont Commons premises for the purpose of winter operational snow removal and surface maintenance shall provide two copies of the standardized Storm Report, which includes detailed information regarding treatment areas and the use of de-icing, anti-icing and pretreatment materials applied for the removal of snow and surface maintenance on the Woodmont Commons premises. Each spring, Woodmont Commons will submit a Summary Document, including copies of the Storm Reports, operator certifications, equipment used for roadway and sidewalk winter maintenance, calibration reports and amount of de-icing materials used, to the Town of Londonderry Department of Public Works for their use in documenting the chloride usage in the Beaver Brook Watershed.

5.0 Chloride Management Plan Summary

The Woodmont Commons Management Team is committed to maintaining written documentation and adaptive management solutions for the Town of Londonderry to supplement in its efforts towards reducing chloride imports into the Beaver Brook Watershed. These efforts include minimizing chloride imports into unimpacted portions of the watershed by the implementation and enforcement of the BMP standards outlined above in section 2.0 Operational Guidelines – Chloride Management; implementation and maintenance of the efforts outlined above in section 3.0 Stormwater Management; and the adherence and adaptive management efforts outlined above in section 4.0 Salt Usage Evaluation and Monitoring.