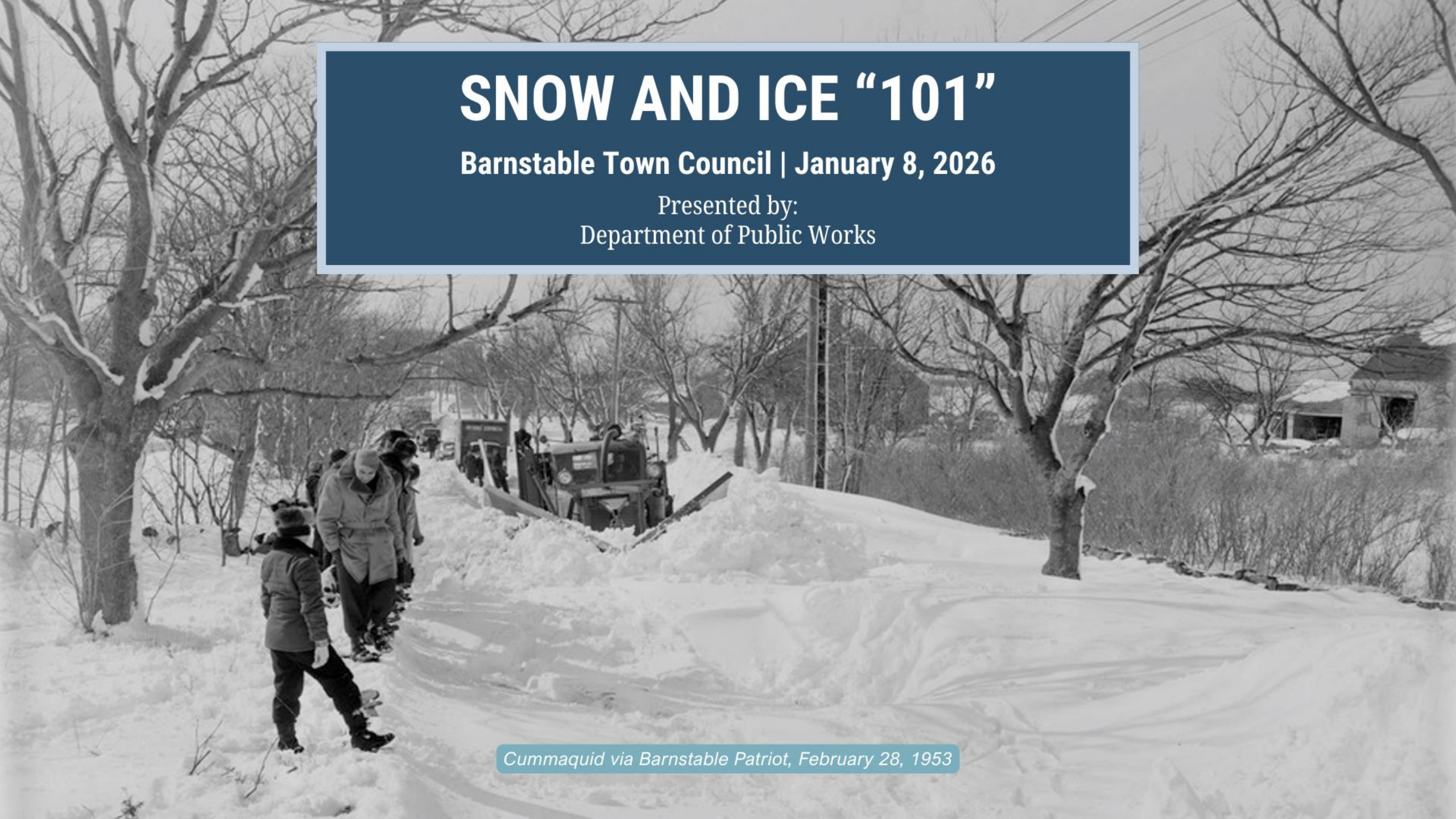
SNOW AND ICE “101”

Barnstable Town Council | January 8, 2026

Presented by:
Department of Public Works



Cummaquid via Barnstable Patriot, February 28, 1953

Outline

- → **Mission & Goals**
- → **Responsibilites**
- → **Approaches & Philosophy**
- → **Resources**
  - Staff / Contractors
  - Costs
- → **Discussion**

Winter 2015

Winter 2015

DPW's mission

During a Snow and Ice event, the mission of the Department of Public Works is to remove the accumulated snow and ice from town, county, and most private roads; municipal parking areas and some town sidewalks/bike paths as rapidly and efficiently as possible. The safety and mobility of the community is of the utmost importance.

Snow Removal Goal

“The Department's goal during a storm is to remove snow to sufficient width and depth to allow the public to travel at reduced speeds throughout the town.”

Responsibilites

DPW has responsibility for

- **700** Public Roads
- **1,100** private roads
- **53** Municipal Parking Lots
- **90** miles of town sidewalks
- **4** miles of bike path

Of the roads...

- **30% are treated as main or collector roads**
  - Bigger equipment
  - Treated salt or straight salt
- **70% as secondary roads**
  - Smaller equipment
  - Treated salt or straight salt, much less frequently

Terminology: Road Types

Main Roads - 145 miles

- The primary roads in Town
- Examples: West Main Street, Cedar Street, Putnam Avenue
- Divided into 19 routes
  - Multiple trucks per route

Secondary Roads - 290 miles

- Neighborhood streets
- Examples: Woodside Road, Rolling Hitch Road, Poponesset Road
- Divided into 56 Maps
  - 1 truck per map

Collector Roads - 68 roads

- Bigger secondary roads that connect to Main Roads
- Examples: Elliot Road, Old East Osterville Road, Carriage Lane

Snow and Ice is a Balancing Act

Types of Things to Consider

Forecast

- Snow Accumulations
- Intensity
- Winds
- Temperatures
  - Before, during the storm, and 24-48 hours after the storm

Time of Year, Sun Angle

Day of the Week

- Schools the next day?

Timing of the storm

Crew rest and “24-hour window”

Contractor and Staff availability

Salt and equipment availability

Public’s/Leadership’s reaction to past storms

- Desired level of service

Types of Response

Ice Watch

Ice Calls

- Salting of main roads and collector roads

Main Road Scraping

- Salting main roads and collector roads
- Includes scraping main roads

Full Plowing Event (Focus of This Talk)

- DPW Emergency Response Center (ERC) activated
- Main road plows
- Secondary road plows
- Parking lots
- Sidewalks and bike paths *after* the event

Categories of Plowable Storms

(3) Three Categories of Storms

- Prescribes actions
- Defines expected outcomes
- Not a “one size fits all” philosophy

Categorized based on

- Snow accumulation
- Snowfall rate

Circumstances that separate categories

- When secondary plow trucks were no longer effective (~18 inches)
- When 6-wheelers were no longer effective (~24 inches)
- Snowfall rates > 1” per hour for extended time

Categories of Plowable Storms

Category A - “Normal” Storm

- 2" to 18“ of snow spread over 24 hours
- Snowfalls <= 1-inch per hour

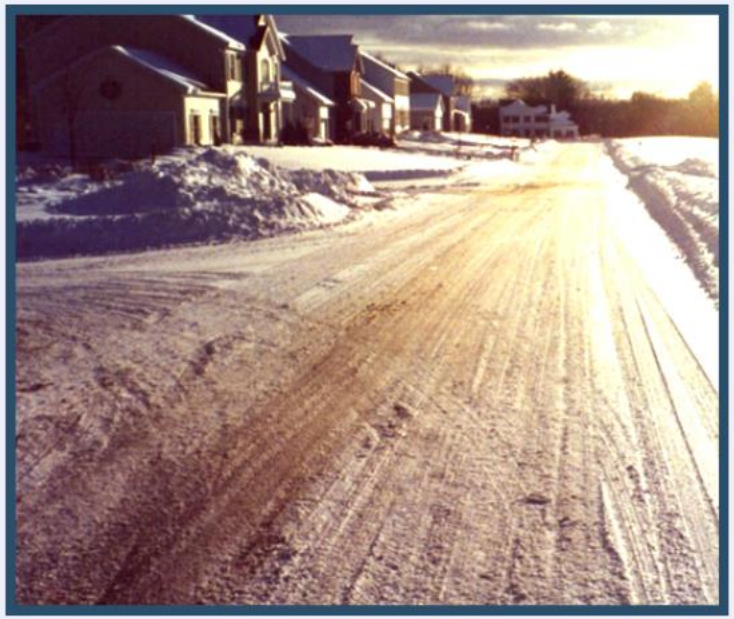
Category B - Main Roads are the focus

- 18" to 24“ of snow spread over 24 hours,
- Snowfalls <= 1-inch per hour

Category C - Life safety and hospital routes are the focus

- > 24“ of snow, spread over 24 hours or longer
- **OR**, less total accumulations, but with extended periods of snowfalls >1 in/hr
  - Extended white out conditions plowing will be extremely slow and may seem futile as wind drifts snow back into the roads

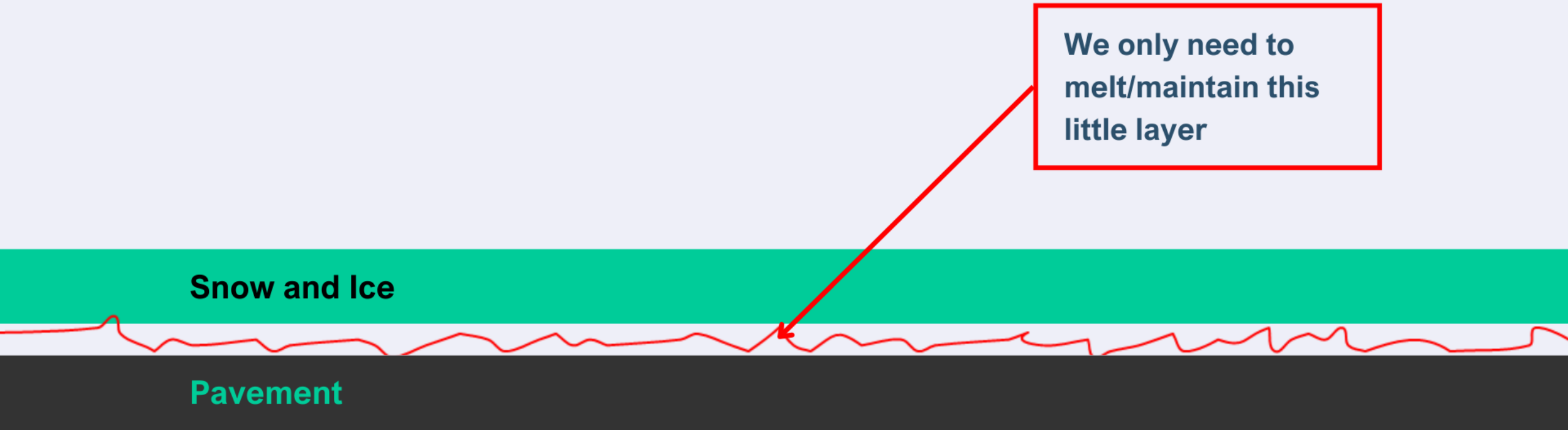
Plowing Possible Levels of Service



Main Road Plowing Techniques

Salt

- Lowers the freezing point of water
- Creates a brine
- Prevents snow from bonding to the pavement
- Effective to 15^0 - 20^0 F
- The lower the temperature the more salt is needed to melt ice



Main Road Plowing Treatment Techniques

If snow doesn’t bond to the pavement, plows can scape it up.

If it does bond, “hardpack” results

- 10 times more work and 4 times more chemical to melt hardpack top down vs preventing it forming

Snow and Ice

Pavement

Main Roads: Approach & Philosophy

Establish a brine layer at the start of storms

- Mains and collectors only, not secondary roads

Every few passes, if/when drivers notice snow starting to stick to pavement, reapply salt to reestablish and/or maintain the brine layer

Keep road open, push back corners at end after snow stops

Pre-stage

Secondary Roads: Approach & Philosophy

Establish the edges, leave windrow in middle

- Snow stakes help!

Just get roads open, clean up at end

Takes 6-8 hours to make 1 pass through secondary roads

If high intensity forecast, pre-stage

- If less intensity, can wait for 2 inches to be on ground before start

If wet, and subsequent freezing temps, discuss salting secondary roads

Communications: Approach & Philosophy

Real-time, high-visibility communication

- Frequent posts, including short-form video, allow the Town to share immediate updates on road conditions, plowing progress, and safety reminders as conditions change throughout the storm.

Blending information with approachability

- Incorporating brief, engaging visuals (e.g., POV-style footage from a plow truck or behind-the-scenes operations) helps make municipal work more relatable while still delivering clear, actionable information.

Transparency and trust-building

- Showing snow operations in progress provides residents with a visible understanding of the scale, timing, and complexity of DPW response efforts, reinforcing confidence in Town services. Also leveraging NWS (Boston) content to communicate forecasts.

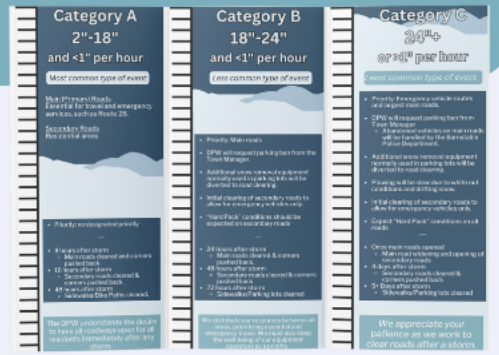
Communications: Tool & Channels

Website Storm Update Banner

Banner published when Emergency Response Center (ERC) is activated. Storm updates posted to Town of Barnstable website homepage as conditions dictate.

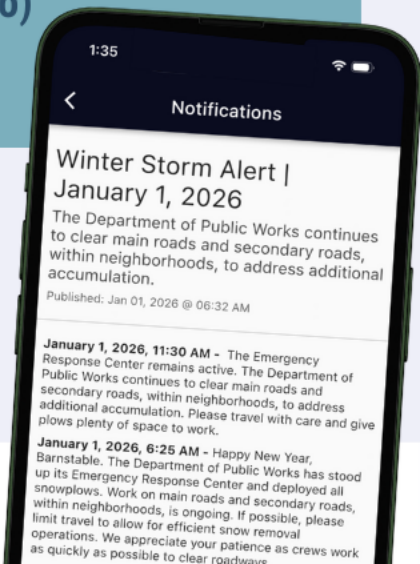
Traditional Tools

- Standards of Service Brochure
- Town Storm Line (Call-In Message)
- E-mail Updates
- Reverse 911
- Barnstable Government Access
- Radio



Digital/Social Tools

- Snow Plow Tracker (GPS Powered Real-Time Viewing)
- MyBarnstable Mobile App
- Social Media (Static Posts & Short-Form Video)



Communications: Real-Time Social Media Updates

Over the last month (Dec 9 - Jan 7)
Town of Barnstable Instagram metrics include:

+34.k Views
+273% Increase in Accounts Reached
+215% Increase in Profile Visits
+75 New Followers

Why Social Media?

Meeting residents where they are:

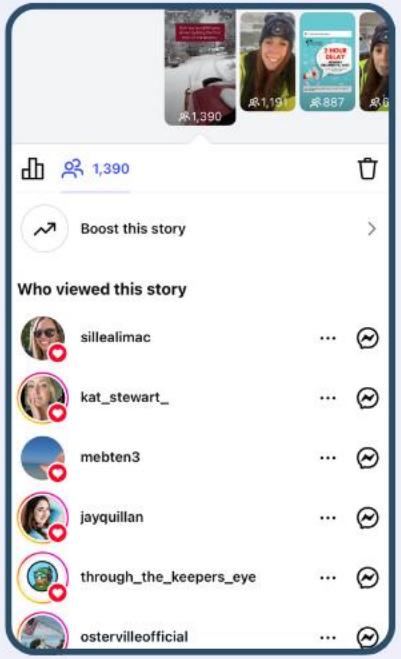
During snow events, residents are often home and actively engaging on and scrolling through social media. Utilizing Town social media platforms ensures timely updates reach people where they are already spending time.

Short-form video increases reach and retention:

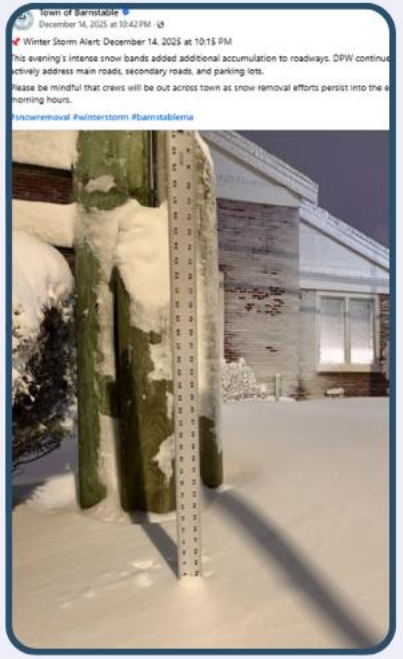
Platforms prioritize video content such as Reels and Stories, enabling important public safety information to reach a wider audience more quickly than static posts alone.

44,084 Views
5h 38m 7s Watch Time
204 Likes
15 Comments
9 Shares

33,587 Views
2h 24m 15s Watch Time
116 Likes
4 Comments
1 Share



1,390 Story Views
584 Accounts Reached
27 Interactions



108 Likes
13 Comments
8 Shares

Resources: Personnel

Town Employees = 1,417

- Schools = 899
- Town = 518

Of the 518

- 147 are Department of Public Works

Of the 147

- 29 are in Enterprise Funded Sections
- 20 are custodians
- 6 are administrative
- 3 are held out for building issues if they arise
- **89 are available for snow and ice**
  - **Highway, Structures & Grounds, Admin Technical & CWMP**

Resources: Idealized Personnel Response

Organization Composition

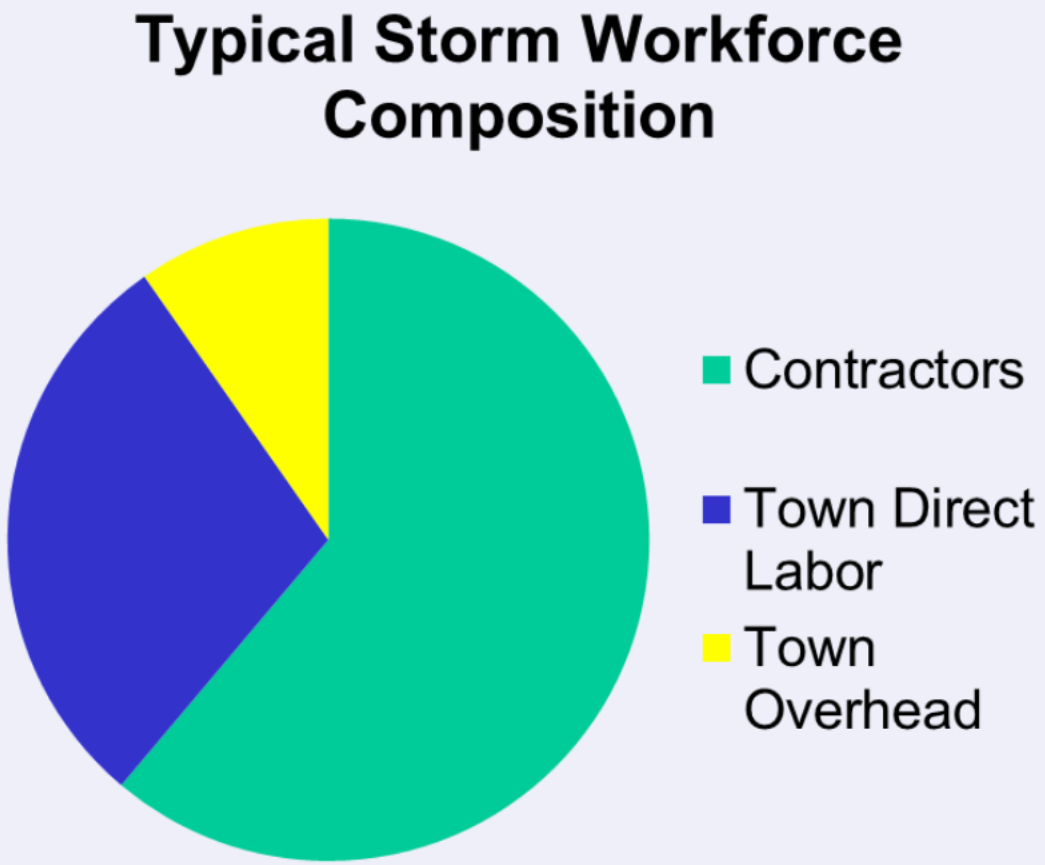
- 125 Contracted Equipment
- 50 Town Direct Labor
  - Plow Drivers
  - Machine Operators
  - Fleet maintenance

10 Town in Reserve

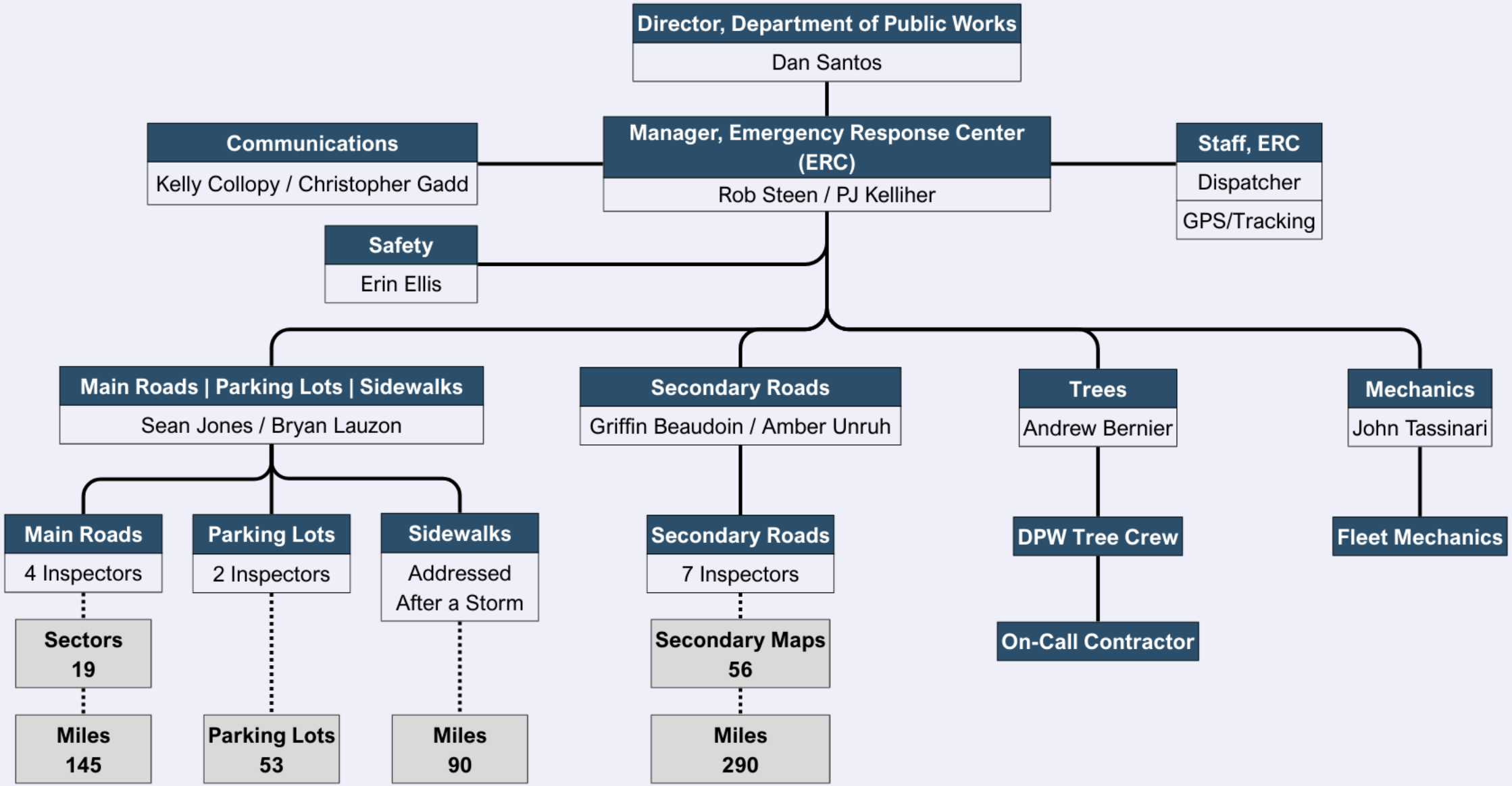
- Tend to lose 8+ secondary contractors per storm

20 Town Overhead

- 13 Inspectors
- 5 Emergency Response Center Staff
- 1 Safety
- 1 Communicator



Department of Public Works
Snow & Ice Organizational Chart



Resources: Costs 2025/2026

Storm 1

- 32 Hours
- 5.5” snow
- $564,433

Storm 2

- 4 hours
- Ice Event
- $34,016

Storm 3

- 15 hours
- 5” snow
- ~$200,000

Storm 4

- 4 hours
- Ice Event
- ~$35,000

Storm 5

- 4 hours
- Ice Event
- ~$30,000

Storm 6

- 17 hours
- 4” snow
- ~$265,000

Take Aways

- **Average Ice Event is ~$35,000 per event**
- **Plowing events cost are more about time vs snow depth**
- **Plowing events are at a minimum $60,000**
  - **Average Plow Event costs ~ $15,000 per hour**
  - **4-hour minimum contracts**
- **Normal time to make 1 pass through Secondary Roads is ~6-8 hours in lighter snow**

Takeaways

Over 13 years Town has become less tolerant of accumulated snow and hardpack. As a result:

- More salt, no sand
- Go out earlier
- Plow secondary roads at 2 inches
- Remain until snow ends, even if only 1 inch left to fall
- Salt in secondary roads

Program is highly dependent on contractors

Contractors are becoming difficult to secure

- They are having a difficult time finding drivers
- More Town employees in the game

> ~ 24-hr duration is one of the DPWs biggest vulnerabilities

Questions?

DISCUSSION

RESOURCES

Category A: “Normal” Storm

–2" to 18“ of snow spread over 24 hours

–Snowfalls <= 1-inch per hour

–Expectations:

- Main roads cleared and corners pushed back – 8 hours after precipitation ends.
- Secondary or residential streets cleared and corners pushed back - 16 hours after precipitation ends.
- Sidewalks/Bike paths cleared – this effort will begin within 48 hours of precipitation ending.
- Snow removal from business districts – as determined by Director of Public Works.

Category B: 1-ton and smaller trucks no longer effective

–18" to 24“ of snow spread over 24 hours,

– Snowfalls <= 1-inch per hour

– DPW will prioritize its efforts as follows:

- Main roads cleared and corners pushed back – 24 hours after precipitation ends.
- Snow removal equipment (loaders, backhoes, etc.) will be shifted from parking lots to the roads (main and secondary roads as needed).
- Parking lots will be left until after the storm ends.
- Secondary roads will be rough
  - The initial level of service for secondary roads will be to just get them open for emergency service vehicles.
  - Prioritized based on the number of people that live along the road or use the road as best we can.
  - Secondary roads will not be widened out with corners pushed back until at least 48 hours after precipitation ends.
  - “Hard pack” will be an issue
- The DPW will be requesting parking bans and travel restrictions.
- Snow removal from business districts – as determined by Director of Public Works.

Category C: 6 wheelers & smaller trucks will not be effective

– Greater than 24“ of snow, spread over 24 hours or longer, with snowfalls of 1-inch per hour or more.

– OR, less total accumulations, but with extended periods of snowfalls >1 inch per hr

– Due to extended white out conditions the plowing that can continue will likely be extremely slow and may seem futile as wind drifts snow back into the roads.

– DPW will prioritize its efforts as follows:

- Priority will be given to hospital routes, and with assisting Police and Fire services with life safety issues,
- For the remainder of the roads priority will be given to the largest/busiest of the main roads, until they are open and “stable” (remain open after plowing and are not continuously drifting back in).
- Snow removal equipment (loaders, backhoes, etc.) normally used in parking lots and sidewalks will be diverted to the main roads. Parking lots and sidewalks will be left until well after the storm ends.

Approach and Philosophy – Treatment Techniques

Dry vs. Pretreated Salt

- **Dry Salt**
  - A study by the Michigan Department of Transportation
    - 30% of the dry salt bounced off the roadway during initial application
  - Swiss and Germany studies found that for the amount that remained on the road
    - After 5 vehicles passed, only 30% of the dry salt remained on the road.
    - After 100 vehicles, only 20% of dry salt remained on the road
- **Pretreated Salt**
  - After 100 vehicles, 80 percent remained on the roadway surface

Speed of Melting

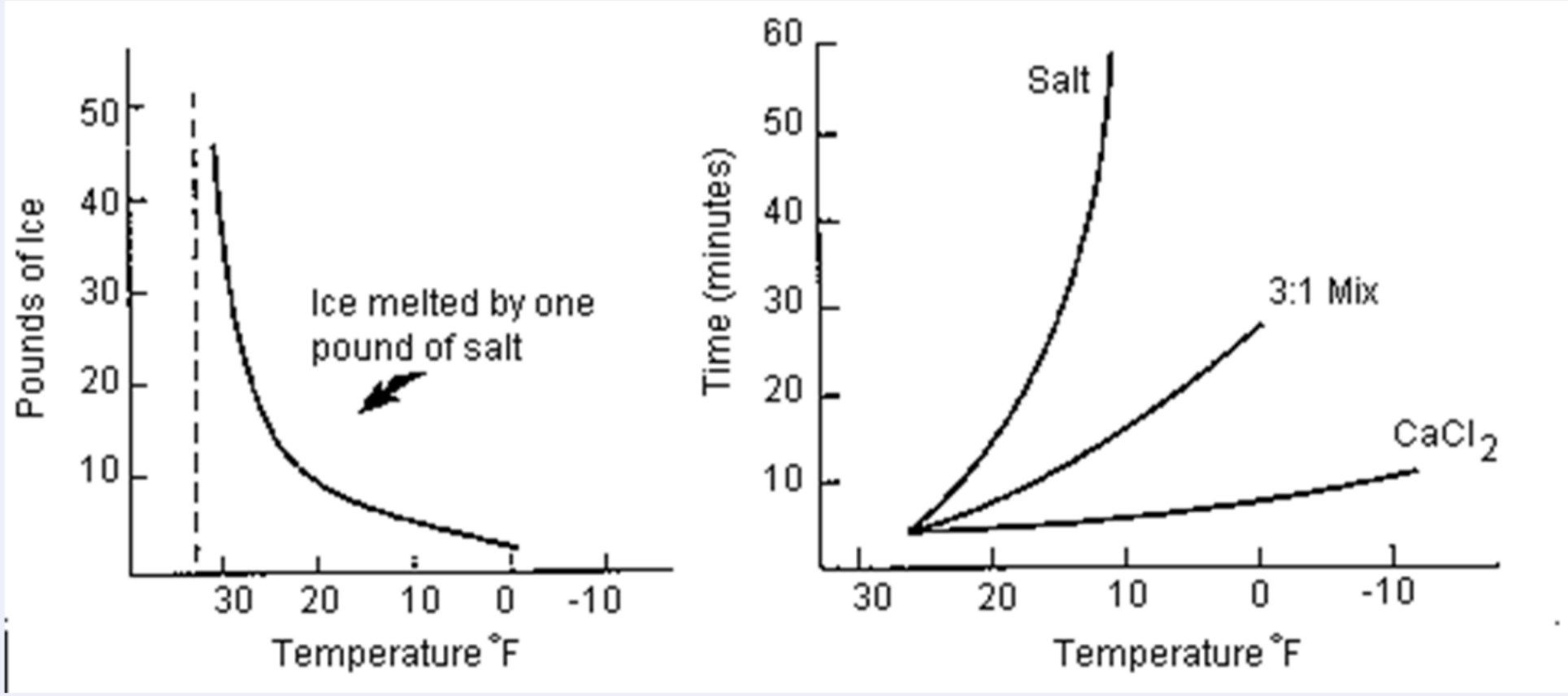
Pavement Temperature ° F	One Pound of Salt (NaCl) Melts	Melt Times
30	46.3 lbs of ice	5 min.
25	14.4 lbs of ice	10 min.
20	8.6 lbs of ice	20 min.
15	6.3 lbs of ice	1 hour
10	4.9 lbs of ice	Dry salt is ineffective and will blow away before it melts anything
5	4.1 lbs of ice	
0	3.7 lbs of ice	
-6	3.2 lbs of ice	

Agricultural Bi-Product

“De-Ice-It”

- **Agricultural bi-product combined with calcium chloride**
- **Calcium Chloride**
  - Lower effective temp (-25 F) than straight salt alone
  - Releases heat to help activate the salt
  - Attracts moisture to help salt’s melting action
  - Melts at a much lower temperature than salt
  - “Sticks” to pavement

Melting Tables



2002 Colorado DOT Study

2002 Colorado DOT study tested four different materials using mag chloride and sodium chloride, and using a couple different test procedures. The ability of mag chloride to re-hydrate showed the greatest cause for concern, and led to the conclusion that magnesium chloride is more corrosive than sodium chloride under humid environments, and sodium chloride is more corrosive under immersion and arid environments.

2015 Review Results

- **Creation of New Standards of Service**
  - Done
- **Creation of Private Road Maintenance Standard**
  - Under Review
- **Research, RFQ, Select and Recommend a GPS Program**
  - Done
- **Create Standards defining “Main” and “Secondary” Roads**
  - Reassign roads as appropriate
  - On-going
- **Reorganize and staff the DPW Emergency Response Center**
  - Done
- **“Beef up” size of Truck Fleet within existing budgets**
  - Snow Fighters – on going
  - Acquire/contract a few wing plows
- **Address Secondary Contractor Reliability**
  - Reorganized Contractors putting more on Mains so more of our people available for Secondary Roads.
  - Increased rates to attract more, and better, contractors. Hope is for choice.
- **Crew Rest Issues**
  - Not yet adequately addressed

2015 Review Results (Continued)

- **Completely Rewrite the Contractor Package, include**
  - Modified standards
  - Modified compensation expectations
  - Include no more than 24 hours continuous operations
  - GPS
  - Vehicle minimum standards
  - Done
- **Reorganize how “gangs” of plows work together on a road**
  - Done
- **Develop a list of “back-up” drivers to be available during storms**
  - Retirees, other Department Volunteers, Winter Seasonal Employees, etc.
  - Address drug testing challenges
- **Equipment**
  - Retaining our old loaders (vs. trade-in)
  - Increase number/use of snow blowers on sidewalks
  - Purchase a used pug-mill
  - Assign a contractor loader to each inspector’s area
- Create and Implement a Training Program
  - On-going
- **Address material storage issues as a barrier to proper application procedures**
  - Investigating outdoor storage – on-going

Material Storage Issues

- Lack of material storage prevents Best Practices on Roads
- Differential treatment between road types
- Expensive for fixed structure storage