

Using AVL/GPS Telematics to Optimize Snowplowing

Report #2024RIC01
mdl.mndot.gov/items/2024RIC01



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Minnesota's cities and counties continue to use data to improve operations and are leveraging newer technologies to work smarter. Use of telematics – activating communication systems to share real time information – is transforming local agencies opportunity for continuous optimization with Automatic Vehicle Location (AVL) systems using Global Positioning Systems (GPS).

Several agencies have deployed AVL systems with varying levels of data collection. Costs vary depending on data points collected, frequency of data collection, and level of analysis desired by the users. Minnesota's local agencies reported \$20-\$30 per month per unit as typical fees. Some systems like Motorola StreetTrek or TRBOne Enterprise utilize existing Motorola two way radio systems eliminating monthly per unit fees. A system can be deployed for \$1,200 per year.

[Motorola Streettrek](#)

[Motorola TRBOne](#)

[PreCise](#)

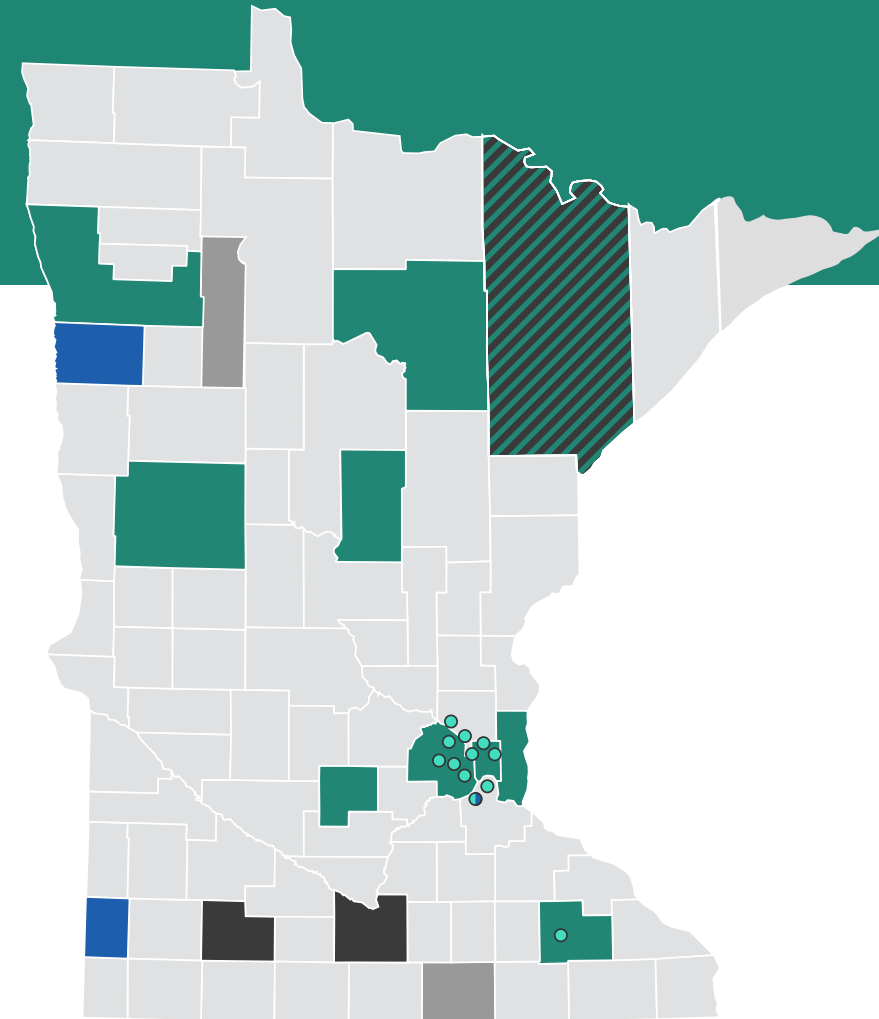
[Samsara](#)

[JD Link](#)

[Verizon Connect](#)

[Utilimarc](#)

[Razor](#)



**Automatic Vehicle Location Systems
Deployed Throughout Minnesota**

PRECISE: 22/34

JD LINK: 3/34

VERIZON: 3/34

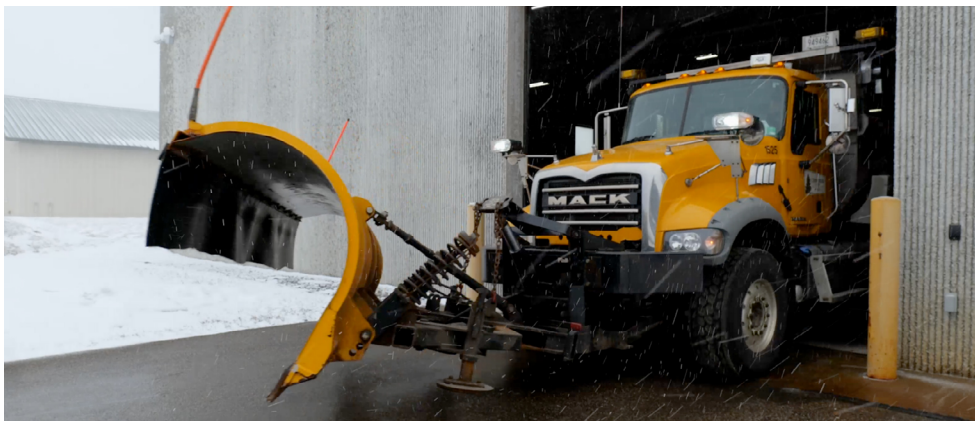
MOTOROLA: 2/34

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Understanding how your agency wants to use the data, what are the key performance measures important to managing your operation, and how often you need to retrieve data will help guide your decision on what system to select. Key considerations may include:

- Workforce introduction and integration
- Desired functionality - what drives your operational improvement
- Performance measures
 - » Route completion time
 - » Idling time
 - » Material management
 - » Harsh braking

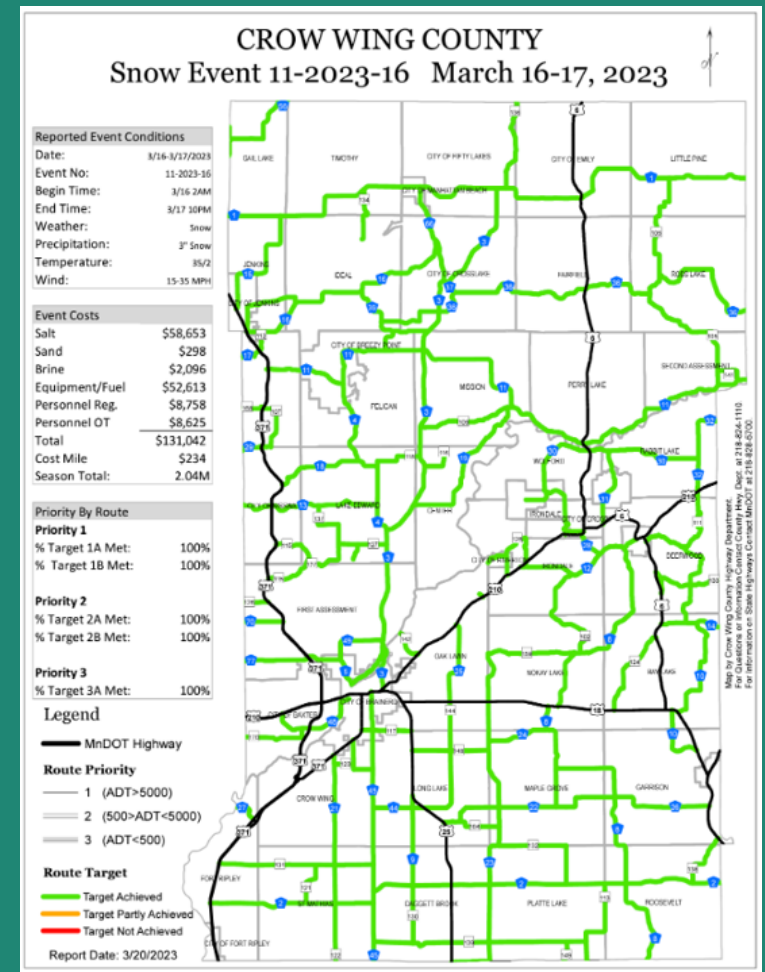


- Benefits
 - » Transparency/accountability
 - » Risk management - data safety
 - » Continuous optimization

St. Louis County noted that a 30% reduction in seasonal material usage in winter operations has been a key benefit. Other key benefits to consider:

- » Efficiency
- » Safety
- » Sustainability
- » Compliance
- » Security
- » Customer experience

Crow Wing County has created a user-friendly public facing application using telematics in optimizing their system performance. Crow Wing County's Maintenance team reports a snow event summary out to the public after each event. The County has also developed a ***'Where's my Plow'*** application that has built public trust with transparency.



To see full reports from Crow Wing County go to www.crowwing.gov/999/Snow-Plow-Events

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Minnesota's local agencies who have deployed AVL systems summarized the key advantages in their operations:

- Route completion time
- Route equity or balance (time and miles)
- Playback of events can identify deadhead or duplication miles and be used for staff training.
- Improved safety and emergency response time by knowing where all units are in real time.
- Improved public response with data verification of speed of the units and when routes were plowed.

The screenshot displays a software interface for AVL/GPS Telematics. On the left, a sidebar lists 'Online Dispatchers (1)' (Dan) and 'Online, Indoor' (3-Ken, 23-Shane). Below that, 'Online, GPS Fixed (2)' (3-Ken, 23-Shane) and 'Offline (35)' (1-Kevin, 2-Dwight, 11, 14, 15, 20-Jeff, 24-Matt, 29-Trent, 30-Travis, 31-Travis, 32-Jeff, 33-Shane, 35-Brian) are listed. The main area is a map showing several routes (Route #2 to Route #9) and units (36-Matt, 30-Travis, 35-Brian, 1-Kevin, 31-Travis, 38-, 40-Trent, 33-Shane). A 'Playback Route' window is open, showing a table of route data and playback controls.

Radio	Date	Δ	GPS Data	Speed	Events
38-	2/21/2023 6:00:18 AM		Latitude: 47°31'23.02" N; Longitude: 95°2...	22.9 mi/h	0
33-Shane	2/21/2023 6:00:20 AM		Latitude: 47°35'39.71" N; Longitude: 95°1...	24.6 mi/h	0
1-Kevin	2/21/2023 6:00:30 AM		Latitude: 47°23'51.79" N; Longitude: 95°2...	14.8 mi/h	0
32-Jeff	2/21/2023 6:00:36 AM		Latitude: 47°46'51.98" N; Longitude: 95°3...	37.0 mi/h	0
35-Brian	2/21/2023 6:00:39 AM		Latitude: 47°30'02.68" N; Longitude: 95°1...	27.0 mi/h	0
40-Trent	2/21/2023 6:00:40 AM		Latitude: 47°23'33.09" N; Longitude: 95°3...	28.0 mi/h	0
31-Travis	2/21/2023 6:00:42 AM		Latitude: 47°38'42.84" N; Longitude: 95°2...	29.1 mi/h	0

Playback controls include: Total: 7386, Export, Load, From: 2/21/2023 12:00 AM, To: 2/22/2023 12:00 AM, Optimize Route (group all nearest points), Automatic error correction, Show Events (telemetry, alarms, etc.), Show CanLog Events.

At the bottom, a table shows recent calls/events:

Date	System	Sender	Destination	Description	Details
10/18/2023 8:40:48 AM	Voice Master	29-Trent	ALL	Group Call: '29-Trent' called 'ALL' (00:04)	Talkers: 29-Trent
10/18/2023 8:40:29 AM	Voice Master	23-Shane	ALL	Group Call: '23-Shane' called 'ALL' (00:04)	Talkers: 23-Shane
10/18/2023 8:36:56 AM	Voice Master	Radio 999	ALL	Group Call: 'Radio 999' called 'ALL' (00:05)	Talkers: Radio 999

ACKNOWLEDGEMENTS

Technical Advisory Panel

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The biggest lesson learned through this study was that the **local agencies and their dedicated maintenance staff know and understand their system the best.** Telematics provides key data points aligned with performance objectives that allow for continuous optimization of key operations to best benefit the public.

For other great resources,
please check out [LRRB.org](https://www.lrrb.org).