NCDOT Hurricane Helene Response

By North Carolina Department of Transportation

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Benefits Statement

During Hurricane Helene, the North Carolina Department of Transportation's (NCDOT) TSMO Unit implemented a proactive, multi-faceted, and dynamic response which saved lives, mitigated further loss, and expedited recovery efforts. The TSMO Unit served as a central coordination point for NCDOT's field response and were the primary source of transportation intelligence that local, state, and Federal partners needed for action. Despite hundreds of road closures and the uncertainty of the road network at-large, NCDOT's TSMO Unit assisted with maintaining mobility throughout Western North Carolina, while prioritizing travel for responders and preserving limited resources for storm victims. These efforts not only protected the community but also laid the foundation for more efficient, cost-effective responses in future disasters.

In this case study you will learn:

1. How NCDOT's TSMO Unit mitigated Hurricane Helene's devastation by employing a proactive, all-hazards approach to emergency operations which had been continuously refined by over a decade of disasters and major events.
2. How numerous technologies and innovative strategies were deployed, and essential services maintained, despite a near total loss of communications and critical infrastructure.
3. How partnerships and collaborative problem-solving were leveraged throughout the event to overcome extreme and novel challenges.

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BACKGROUND

In September 2024, Hurricane Helene devastated Western North Carolina (WNC), killing 106 people and causing $60 billion in damages, making it the costliest and deadliest disaster in state history. Thousands of homes were destroyed and communities such as Swannanoa and Chimney Rock were wiped away by immense floods and landslides. In its wake, Helene left over one million storm victims without power or running water. This humanitarian crisis was exacerbated by widespread road damage and over 1,400 closures which delayed rescue efforts and prevented responders from delivering critical supplies. Helene also knocked out phone, internet, and radio communications, causing confusion and fear as responders struggled to coordinate and citizens worried over the fate of loved ones.

The historic destruction of Helene prompted an unprecedented response from the North Carolina Department of Transportation (NCDOT) whose Transportation Systems Management and Operations (TSMO) Unit executed a structured, proactive approach to emergency operations that had been refined through numerous major events including Hurricane Florence and the COVID-19 pandemic. Though the phrase, "worst case scenario" is tragically insufficient to describe Helene, the TSMO Unit's response proved successful at mitigating further loss, expediting recovery, and overcoming extreme and novel challenges.

TSMO PLANNING, STRATEGIES AND DEPLOYMENT

In the decade before Helene, the TSMO Unit matured their emergency operations approach. The Unit leveraged new tools and strategies to address a wider range of disasters; established relationships with partners possessing unique resources and expertise; developed remote operations capabilities to enhance interoperability and resiliency; and conducted multi-disciplinary rehearsals to spread proficiency across the organization.

The foundation of this approach is the central planning unit of statewide and regional leaders who synchronize efforts across TSMO programs:

- Traffic Incident Management (TIM) and Incident Management Assistance Patrol (IMAP)
- Traffic Management Centers (TMC) and Statewide Transportation Operations Center (STOC)
- Intelligent Transportation Systems (ITS)
- Traveler Information
- Signal System Timing Operations and Traffic Signal Management

Throughout Helene, the TSMO Unit implemented strategies proven through previous disasters:

TMC Evacuation. Staff at NCDOT's Mountain TMC were determined to operate as long as possible, even as they watched roads become rivers, sweeping away the familiar places that made

Asheville, home. Before being evacuated by boat, TMC staff transitioned operations to the STOC in Raleigh. This was possible due to network and technology upgrades allowing statewide access to all ITS devices and surge staffing mechanisms which add staff as workloads increase. The hand-off was seamless due to the remote operations protocols perfected during the COVID-19 pandemic and regular TMC shutdown drills.

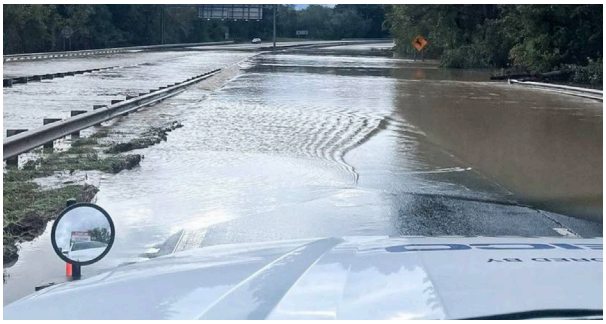
Routing Room. First deployed for Hurricane Florence, the Routing Room was activated to help responders navigate the devastated WNC region. Desperate calls poured into the Routing Room but road conditions had become a complete unknown when Helene knocked out communications. Without real-time intel, the Routing Room used drones, aerial photography, reports from the State Highway Patrol, and thousands of Survey123 inspections to identify a network of traversable roads for responders to resupply isolated WNC communities and start rebuilding.

Multi-State Detour. When both I-26 and I-40 were destroyed by Helene, the TSMO Unit implemented a multi-state detour to restore east-west travel and divert traffic away from WNC. The TSMO Unit was able to execute this complex solution in only a few hours by modifying detour plans originally designed for rockslides on I-40. Pre-established coordination agreements expedited support from neighboring state DOTs who were also responding to Helene.

COMMUNICATIONS PLANNING AND EXECUTION

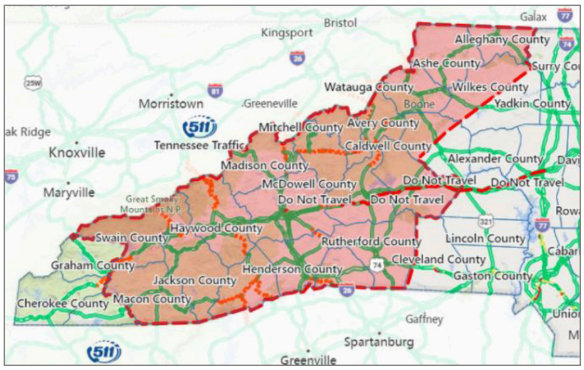
The TSMO Unit used communication and partnership to develop innovative solutions to Helene's unprecedented challenges:

Hydraulics Saves Lives. Before landfall, NCDOT Hydraulics used flood inundation software to predict flooding on I-26 and I-40 in locations that had never flooded before. Their predictions were met with skepticism, and precautionary measures were almost rejected. However, the local TSMO leader trusted Hydraulic's expertise and staged IMAP units at the predicted locations. Helene proved to be a 500-year rain event and, defying all past experience, inundated each location as predicted. Heeding Hydraulic's expertise allowed IMAP to clear the roadway before motorists were overtaken.



Restoring Communications. As Helene's destruction became clear, the communications blackout cast all responders into an eerie silence. TSMO staff in WNC repositioned to law enforcement and emergency management (EM) facilities to maintain stakeholder communication. In Raleigh, TSMO staff coordinated with state EM, AT&T, and Verizon to deploy mobile cell towers which provided much needed relief as unreachable colleagues in WNC were finally confirmed safe. Communications were restored when over 200 Starlink devices were contributed by numerous partners and delivered throughout WNC by a chain of IMAP drivers, known as the "IMAP Express."

Mobility in a Disaster Area. Essential Travel Only restrictions were issued to maintain mobility for responders and preserve limited resources for storm victims. This required the TSMO Unit to balance competing recovery and economic needs; continuously demonstrate progress towards a restored road network; and manage traffic despite Helene disabling conventional infrastructure. NCDOT's Geographic Information System (GIS) team created "Pink Zone" maps to communicate travel restrictions to the public.



Automated road closure reports and interactive dashboards provided situational awareness to NCDOT leaders. Wireless emergency alert (WEA) systems issued advisories to motorists in areas where dynamic message signs (DMS) were disabled, and portable traffic signals were deployed where existing signals were destroyed.

Truck Challenges. With larger corridors unavailable, commercial vehicles constantly became stuck on smaller roads, straining an already crippled network.

Several solutions were employed including implementing "Truck Closures" on NCDOT's traveler information website to identify truck-restricted roads; coordinating with navigation providers to advise users that their platforms were not meant for trucks; deploying hundreds of portable changeable message signs (CMS) procured from all NCDOT regions; issuing in-vehicle alerts via Drivewyze to trucks approaching restricted routes; establishing checkpoints where truckers received rerouting guidance via large QR-code signs; and installing traffic control "serpentines" to prevent oversized trucks from using restricted routes.

OUTCOME, BENEFITS AND LEARNINGS

Hurricane Helene reshaped the landscape of WNC, destroyed countless historic sites, and created memories that will never be forgotten. In concert with first responders, relief agencies, and volunteers, the efforts of NCDOT's TSMO Unit saved lives and provided a vast and vibrant community with the solid footing needed to rebuild.

From Helene, the TSMO Unit leaves with many lessons learned that will inform new strategies, ready for whatever the next "worst case scenario" might be:

Right people in the room. Subject matter experts from Hydraulics, Statewide Maintenance, Geotechnical Engineering, Information Technology, GIS, Oversize/Overweight, and many more added their voices to key decisions and their resources to critical solutions. It was essential that these relationships were established prior to the emergency and for representatives to operate in the same space as the TSMO Unit to exchange information and expedite response.

Control our own destiny. Though partnerships were leveraged to great effect, Helene highlighted that many mission-critical resources – portable signals and CMS, mobile cell towers, Starlink devices, etc. – were only accessible from external stakeholders. By maintaining their own inventory, the TSMO Unit could improve their responsiveness to urgent needs and coordinate stakeholder assets to augment response where needed.

Plan for flexibility. The TSMO Unit's approach to emergency operations did not establish a strict response plan for every possible outcome. Instead, it prioritized proficiency in core strategies applicable to any event (e.g., surge staffing, event coordination, etc.) and leveraged collaborative problem-solving to address challenges.