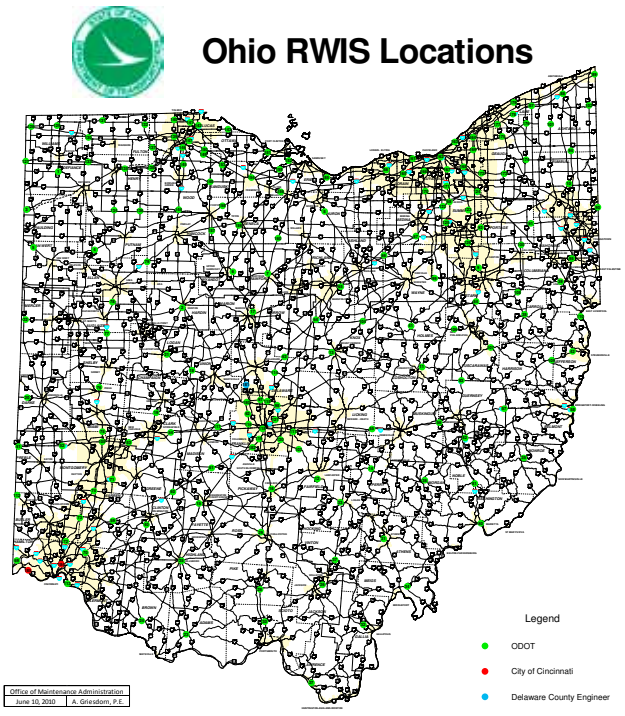
Custom Solution RWIS Grid across Ohio

A network of 173 RWIS stations across the state of Ohio help make intelligent operational decisions for winter road maintenance.

In the beginning, the RWIS was concentrated around Columbus, Cleveland and Toledo while most rural areas remained underserved.

The Ohio Department of Transportation's (ODOT) Road Weather Information System (RWIS) grew from a handful of RWIS stations around one city in the early 1990s to 66 stations in three cities by 2002. But even after proving its effectiveness for better road winter maintenance at lower costs by shifting to anti-icing operations that prevent or delay ice formation instead of traditional de-icing operations that remove ice, the RWIS was still concentrated in three of Ohio's urban areas. The rest of the state, including most rural areas, remained underserved.



Ohio's Road Weather Information System (RWIS) grew from a handful of stations around one city to a network of 173 RWIS stations across the state. Map courtesy of the Ohio Department of Transportation.

"RWIS contributed to intelligent operational decisions for anti-icing in the Columbus, Cleveland, and Toledo areas only," said Abner Johnson, ODOT RWIS Coordinator.

To extend the system to rural areas, ODOT faced four significant barriers, three having to do with cost. First was the cost of the stations themselves; RWIS stations can be expensive purchases especially if deployed in large quantities. Second was the high cost of supplying conventional power along the interstates in some rural areas. Third, using traditional landline phone carriers with long distance service can become very expensive for some sites.

Before a statewide RWIS deployment could take place, ODOT needed to address these costs by finding a solutions-oriented supplier willing to work with them on each of these barriers while still meeting ODOT's specifications.

Expansion to Rural Ohio

The need for expansion was supported by a comprehensive study, "Evaluation of ODOT Roadway/ Weather Sensor Systems for Snow and Ice Removal Operations", by Ohio University. The study estimated that by enabling preventative anti-icing techniques instead of reactive de-icing techniques, benefits outweighed costs by factor of 5 to 1, primarily from reductions in labor and materials required for winter maintenance.

Anecdotal evidence on the benefits of improved safety by reducing accidents made an even stronger case for expanding RWIS. The report recommended expansion with an implementation plan.

Breakthroughs to move forward came in technology, economics, and a supplier willing to innovate and focus on the customer's application. Commercially available cellular technology and solar power could reduce infrastructure costs making remote stations feasible. As opportunities to reduce costs looked bright, the need to achieve a more cost-effective solution was pushed forward by truck snow plow costs that significantly increased along with increasing salt prices and ongoing budget cuts.

ODOT identified pavement sensors as the single RWIS component that could provide the most added value. Pavement sensors are critical since they provide site-specific, surface-level information not provided in standard weather reports

from government or commercial weather forecasting services.

Customizing the Right Solution

M.H. Corbin, a supplier that specializes in integrated traffic system and highway safety products, won the bid to expand the system by 100 stations. M.H. Corbin partnered with Vaisala (then NuMetrics and SSI, divisions of QTT) to provide a custom solution to meet ODOT's budget and operational requirements.

The Permanent Wireless Traffic Analyzer was selected to monitor road surface temperature, wet/dry conditions, vehicle count, speed, and vehicle classification.

"The sensor didn't require trenching or re-trenching during paving or repair work, which reduced ODOT's road construction and maintenance costs and added valuable traffic data," said Johnson. The self-contained sensor collects data without any external sensors, loops or tubes and uses vehicle magnetic imaging technology to detect vehicle count, speed and classification.

Next, the suppliers engineered a custom solution by adapting the Remote Processing Units (RPUs) to cellular technology and lowering power consumption to 230 watts so each station could be operated entirely by solar panels, eliminating the need for fixed wire communications and power utility service to the stations. This reduced installation and operational cost barriers for the stations.

The Wireless Pavement sensor, wireless communications, and solar power meant the stations could be self-contained and lower their total operational cost. ODOT was also able to reduce station cost by focusing sensing accuracy on two parameters, precipitation on the ground and pavement temperature, and was willing to compromise sensor accuracy on the other parameters. By customizing the system to meet their operational requirements and budget, ODOT was able to expand RWIS statewide on an approximately 30-mile grid.

Vaisala Permanent Traffic Analyzers are installed with each RWIS wireless station. Photo courtesy of the Ohio Department of Transportation.

Implementing the New Standard Statewide

In 2005, M.H. Corbin also won the bid to retrofit the original 66 stations to bring all stations to the new standard with wireless pavement sensors, wireless RPUs, and solar panels, along with wind turbines as a supplemental power source, having determined that Ohio has inconsistent and inefficient solar energy during the winter months.

Along with the technology, training of maintenance organizations across the state was important to successful implementation.

"The key to training is teaching folks how to turn data into information. ODOT's winter maintenance goal is to provide a safe and passable highway system. Helping front line managers understand how RWIS could help them make intelligent decisions on resource management and scheduling, allowed ODOT to overcome the fourth significant challenge to a statewide system: user resistance," Abner Johnson said.

Data Valuable to Multiple Users

The RWIS data is shared and monitored by maintenance operations in all of Ohio's 88 counties. Typical winter storm conditions can change in as little as 30 miles and move at 30 to 35 miles per hour. Maintenance garages across the state have access to RWIS' near real-time conditions, as well as ODOT contracted weather forecasts and reports, alerts, and blogs through its internally developed buckeyetraffic.org website. These tools help managers monitor storm conditions and plan their anti-icing operations accordingly.

ODOT's RWIS has gained support from other government agencies and departments and has increased its value as a year-round resource. Resurfacing and road repair operations check pavement temperatures as part of their chip sealing, mill and fill and overlay efforts. Wind direction and wind speed are important factors in maintenance operations such as herbicidal spraying, bridge painting and highway striping.

The Ohio Emergency Management Agency includes RWIS in response planning for severe weather such as tornados and blizzards and planning related to Ohio's two nuclear power plants. ODOT's Office of Innovation uses vehicle counts from RWIS stations as a supplement to their array of automated traffic recorders for traffic data required for federal funding.

The system has also created a valuable link between ODOT and partnering governmental agencies. By lowering costs, being innovative, and working for support and cooperation, ODOT now has a snow and ice optimization process that helps it efficiently reach its goal of safe and passable roads statewide.