3.8   **Weather-Enabled Decision Support Systems used in Business Applications**

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1.0   ABSTRACT

A new generation of weather dependent Decision Support Systems are now being used by businesses to manage weather related risk, increase safety for their employees, improve operating efficiencies, and provide enhanced customer service. The combination of appropriate meteorological data sets with advanced Geographical Information System (GIS) spatial analysis tools provides effective methods to automatically monitor multiple weather parameters and aide in operational decision support.

2.0 INTRODUCTION

Meteorlogix supports a comprehensive suite of high-quality, commercial-grade weather information, from worldwide sources, available in GIS format, making it possible to immediately integrate "real-time" weather information into GIS-based applications. This integration allows all of the information in a GIS database to become 'weather-aware', and creates a powerful tool for decision-making and analysis.

Established in October 2001 through the merger of three weather service leaders — business-to-business provider DTN Weather Services, broadcast and aviation weather forecaster Kavouras, and long-range forecaster and climate predictor Weather Services Corporation — Meteorlogix represents more than half a century of experience and weather information acumen. The company now serves more than 22,000 customers with a focus on the energy, public safety, broadcast media, transportation, and aviation industries.

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3.0 WEATHER-ENABLED DECISION SUPPORT TOOLS

Many businesses and government agencies use GIS systems to manage their assets, no matter whether those assets are fixed objects like roads and power lines, or moving assets like trucks or trains. A GIS system not only knows where an asset is at any point in time, but it also knows what it is, and what its specific characteristics are. Therefore, an asset like a truck has characteristics such as its cargo, its destination, its route, and the time it needs to be delivered by. By combining weather with these asset characteristics, decisions can be made that might affect the route taken, or the time promised for delivery.

There are as many applications for this decision support as there are industries. Meteorlogix has deployed several automated decision support systems serving needs in different industries, including energy, highways, railways, and river systems. All systems utilize advanced GIS-based technology, combined with real-time meteorological information, to provide state of the art monitoring and alerting of potential weather-related hazards.

3.1 ENERGY

The MxInsight EnergyWatch™ is a suite of real-time GIS weather data and integration services that provides decision-support tools for dispatch and transmission/distribution managers of utility companies. Real-time weather data is collected from a variety of sources, converted to GIS format, and delivered to the energy customer network, allowing them to integrate the data with their own assets, such as transmission lines and substations. The MxInsight EnergyWatch™ system has the ability to allow customers to enter in how wide a buffer they want between their assets and any severe weather. Then, if lightning, ice, heavy rains, or high winds enter that area, an

automated alert notification will be generated. The user-defined buffer allows the customer to define the interval between alert and event, which may be different for different operating rules.
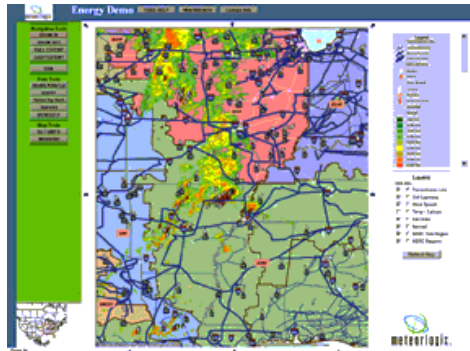

Figure 3.1
Real-time weather, combined with transmission lines and substations, can be accessed via the Internet in an interactive mode using Meteorlogix EnergyWatch.

For more information, please refer to
http://www.meteorlogix.com/products/mxinsight/GIS/energywatch.cfm

3.2 SURFACE TRANSPORTATION - RAIL

MxInsight RailWatch™ is a GIS-based weather-enabled decision support system that monitors the vast areas over which a railroad operates. Using radar, real-time surface observations from more than 1,300 weather stations in the United States, and other weather information, MxInsight RailWatch™ constantly monitors tracks for potentially serious weather conditions.

Wind speeds of 50 miles per hour are sufficient to blow over some rail cars. Righting cars that were stationary when they blew over costs less than $10,000. If the same car blows over when it is moving (the typical speed of a freight train is 69 mph), the cost can exceed $1,000,000. MxInsight RailWatch™ constantly monitors the thousands of miles of track for conditions that meet the criteria necessary to cause a blow-over. When such conditions are met on a specific segment of track, the system automatically notifies a predetermined list of recipients via an XML message. The recipients must acknowledge the warning within a specific interval of time, or the message is automatically escalated.

The MxInsight RailWatch™ system is configured to use the rules under which a railroad operates. As such, it provides the benefits of warnings for specific segments of track, while minimizing the costs of false alarms, over warning, or missed warnings. Because it is a configurable decision support system, it allows a railroad to adapt its own rules and regulations to its operation. Figure 3.2 shows a typical warning message.

Figure 3.2
Real-time automated alerts of specific storm cells intersecting with rail assets are part of the Meteorlogix RailWatch system.

For more information, please refer to
http://www.meteorlogix.com/products/mxinsight/GIS/railwatch.cfm

3.3 SURFACE TRANSPORTATION - HIGHWAY

MxInsight RouteWatch™ is a weather-enabled decision support system based on GIS technology that can monitor highway networks and street systems and pinpoint the precise locations of weather threats. Using the latest information from the NEXRAD radar network, combined with real-time surface observations, MxInsight RouteWatch™ constantly monitors road systems for potentially serious weather conditions. It's even possible to supplement the observation network with additional weather monitoring sensors along specific routes, at operations centers, and at other strategic locations.

The MxInsight RouteWatch™ system can be used by over the road trucking concerns, or by metro area fleet operations, such as delivery vehicles or installation and repair technicians. These

operations are primarily concerned with safety and logistics decisions.

Safety is very important factor in any transportation operation. MxInsight RouteWatch™ provides automatic monitoring and alerting of weather impacting the safety of thoroughfares, vehicles, and personnel. These include:

- Monitor roadways, railways, and waterways for severe weather conditions that may put life and property at risk
- Monitor vehicle locations high risk weather conditions
- Automatically alert dispatchers and/or drivers in real-time so that corrective action may be taken

Another important factor in surface transportation is logistics and management. MxInsight RouteWatch™ delivers road level forecasts and real-time weather monitoring to enable weather-aware scheduling and routing for local service fleets and long haul transport:

- Adjust schedules and routes to account for reduced travel speed due to poor weather conditions
- Avoid scheduling outdoor job types in dangerous weather conditions
- Alert dispatchers and drivers to severe conditions that may put vehicles at risk
- Improve customer services through better ability to meet schedule commitments

Finally, these same factors apply to other potential users of the MxInsight RouteWatch™ system, including DOT Road Maintenance and Snow Removal departments, and the emerging E511 programs.
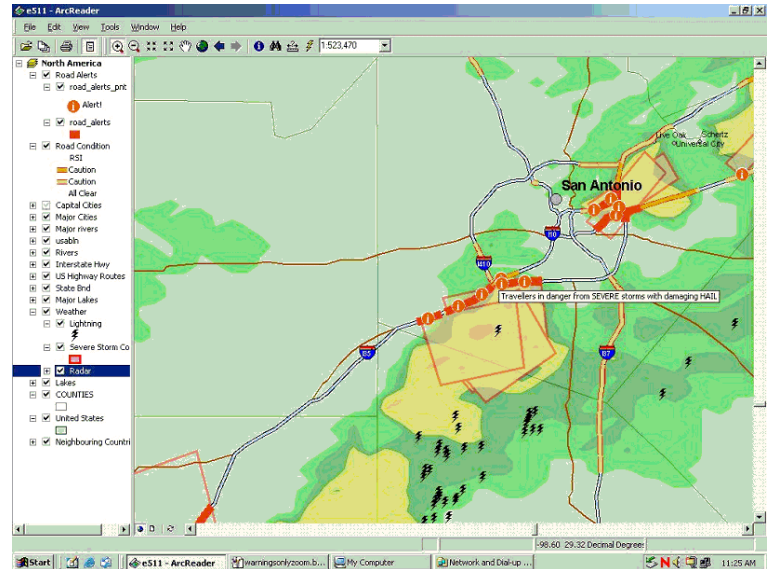

Figure 3.3
Specific weather threats are determined in real-time using the Meteorlogix RouteWatch system.

For more information, please refer to http://www.meteorlogix.com/products/mxinsight/GIS/routewatch.cfm

3.4 HOMELAND DEFENSE AND PUBLIC SAFETY

The 9-11 terrorist attack has changed life in America forever. The consequences of such attacks go far beyond the initial property damage or loss of life from an initial explosion or fire. Secondary effects of downwind toxic gases pose a difficult, albeit partially manageable situation where the combination of weather information and technology can play an important role to mitigate the associated risks to the population centers. Meteorlogix has developed MxInsight for Homeland Defense, built through a partnership with SAIC, using an integrated suite of proprietary weather decision support system components that work seamlessly with SAIC Consequence Assessment Tool Set (CATS) software.

A fast, informed response is crucial in cases of airborne toxins. MxInsight for Homeland Defense provides immediate analysis of biological and chemical threats via weather-enabled plume modeling. Plume modeling integrates the impact of weather conditions— such as wind speed and direction— into its accurate calculation of aerial

dispersal using real-time information from strategically placed weather stations throughout a metro area. In addition to highly localized weather information and plume modeling, this unique, easy-to-use software matches hazard areas against population data to determine locations of greatest impact. City agencies can then determine placement of roadblocks, closest medical facilities, and other components critical to a prepared response for complete consequence assessment and resource response analysis.

Figure 3.4
Forecast location of toxic plumes, based on real-time weather information input to a plume dispersion model, allows automated decision support including intersection roadblock recommendations.

Of course, public safety is affected by weather beyond catastrophic events. When it comes to protecting people, property and businesses, managers in the largest metropolitan areas face challenges and threats more complex than ever.

More often than not, weather is at the heart of any given emergency, and government officials need the best information possible —both to understand the impact of weather on current and emerging crises, and to support routine and long-term city planning issues. A fast, informed response is crucial. To serve this need, Meteorlogix developed MxInsight MetroWatch™ system, an advanced urban weather management system that integrates various real-time environmental data sets into a single decision support system.
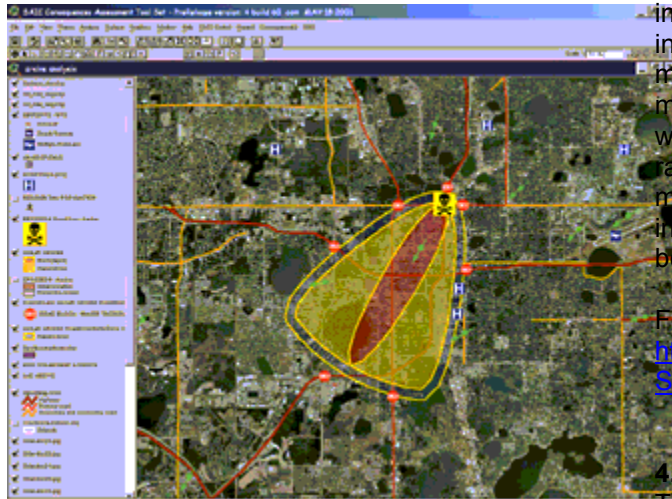
MxInsight MetroWatch™ provides the benefits of integrating current and archived weather information with the municipal assets that are mapped into a GIS. Typical applications include monitoring parks for nearby lightning and severe weather, and pumping and lift stations for heavy rains. These are the day-to-day problems facing metropolitan personnel that weather data integrated with their own data and assets can benefit.

For more general information please refer to http://www.meteorlogix.com/products/mxinsight/GIS/metrowatch.cfm

4.0 CONCLUSION
The merging of GIS technology with properly formatted near real-time weather data from Meteorlogix has made it possible to introduce a variety of sophisticated and effective automated decision support tools to help different industries solve problems and mitigate risks.

For more general information on the new GIS-based weather-enabled decision support tools, please refer to http://www.meteorlogix.com/products/mxinsight/GIS/