

Appendix B-1.1

Federal Highways WIST Needs Template

**Federal Highway Activities
(Same as Roadway Sector Activities in Appendix B-1)**

Road maintenance. This activity is generally where the requirements of the state transportation departments are compiled. It includes road surface treatment for snow and ice control in the winter, as well as road and infrastructure maintenance year-round to repair damage.

Truck operations. The primary example for this activity is commercial trucking operations, both local and long haul.

Fleet utility and transport vehicle operations. This activity includes small to medium size fleets of utility vehicles, such as those maintained by telephone or cable television companies, as well as the large, nationwide fleets of mail and parcel delivery vehicles.

Bus operations. This activity is intended to cover primarily long-haul bus operations, such as interstate travel, rather than school buses or local transit system buses, both of which are covered by the Rural and Urban Transit Operations sector.

Private vehicle operations. Private vehicle operators, daily commuters, long-distance travelers, and local drivers, as well as rental car operators, are included in this activity.

State/local emergency managers. This activity encompasses emergency managers at state and local levels.

State police. Although state police and highway patrol entities provided the input on WIST needs for this activity, the information is generally valid for law enforcement and public safety officials anywhere with roadway traffic safety responsibilities.

Forest Service. The roadway operations of the U.S. Forest Service role are limited to unimproved roads under its jurisdiction within national forests and grasslands. But the ways in which the weather affects these roads has major impact on all the uses of these areas.

Special Groups

NASA spacecraft and equipment transport. NASA's principal concern with roadways is in transporting spacecraft and components by land routes between its various centers and the launch facilities.

Power generating operations. The WIST needs of the power marketing associations (see Section 3.1.2) are limited to road conditions that affect the ability of repair crews in utility vehicles to reach transmission lines and facilities.

Manufactured home transport. This specialized activity has WIST needs that represent the general class of high-profile vehicles, which have special sensitivities to wind and other weather elements, such as those that affect tire traction.

Weather Needs for Federal Highway Operations

<u>Weather Element</u>	<u>Threshold</u>	<u>Forecast/Observation</u>	<u>Impacts</u>	<u>Action</u>	<u>Lead Time</u>
Freezing Precipitation (ice)	Any	Forecast	Safety risk to maintenance personnel and motorists, travel delays, loss of visibility, loss of traction, loss of stability/maneuverability, lane obstruction, impaired mobility, road damage, loss of life, property damage, loss of communications/power, slope instability (avalanche risk), operational delays (increased workload)	Predict threatened area, select treatment strategy, advise operators, begin preparation procedures.	24-48 hours (starting time of event is critical to DOT operations)
				Prepare, deploy and track treatment assets. Apply treatment chemicals/abrasives. Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types). Remove debris, repair damage.	3-6 hours
Structure Ice Accumulation (inches)	Any	Observation	Loss of communications/power, property and structural damage, safety risk	Predict threatened area, select treatment strategy. Remove debris, repair damage.	Current observation
Pavement Ice Accumulation (inches)	Any	Observation	Safety risk, impaired mobility, loss of stability/maneuverability, loss of traction, pavement damage, pavement temperature, effects on snow removal/ice treatment operations	Predict threatened area, select treatment strategy. Remove debris, repair damage.	Current observation
Frozen Precipitation (snow, inches)	Any to <2 inches	Forecast	Safety risk to maintenance personnel and motorists, travel delays, loss of visibility, loss of traction, loss of stability/maneuverability, lane obstruction, impaired mobility, road damage, loss of life, property damage, slope instability (avalanche risk)	Predict threatened area, select treatment strategy, advise operators. Begin preparation procedures for equipment, crew planning, shift changes, geographic reassignment and deployment.	24-48 hours (starting time of event is critical to DOT operations)
			Operational delays (increased workload)	Prepare, deploy, and track treatment assets. Plow snow, apply treatment chemicals/abrasives. Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types).	3-6 hours
	≥2 to <8 inches	Forecast	Safety risk to maintenance personnel and motorists, travel delays, loss of visibility, loss of traction, loss of stability/maneuverability, lane obstruction, impaired mobility, road damage, loss of life, property damage, slope instability (avalanche risk)	Predict threatened area, select treatment strategy, advise operators. Disseminate warning information to travelers (press releases, dynamic message signs, roadside highway advisory radio, transmitters, the Internet etc.). Begin preparation procedures for equipment, crew planning, shift changes, geographic reassignment and deployment.	24-48 hours (starting time of event is critical to DOT operations)
				Prepare, deploy, and track treatment assets. Plow snow, apply treatment chemicals/abrasives. Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types).	3-6 hours

Weather Needs for Federal Highway Operations

<u>Weather Element</u>	<u>Threshold</u>	<u>Forecast/Observation</u>	<u>Impacts</u>	<u>Action</u>	<u>Lead Time</u>
	≥ 8 inches	Forecast	Safety risk to maintenance personnel and motorists, travel delays, loss of visibility, loss of traction, loss of stability/maneuverability, lane obstruction, impaired mobility, road damage, loss of life, property damage, slope instability (avalanche risk)	Advise operators. Disseminate warning information to travelers (press releases, dynamic message signs, roadside highway advisory radio, transmitters, the Internet, etc.). Begin preparation procedures for equipment, crew planning, shift changes, geographical reassignment and deployment.	24-48 hours (starting time of event is critical to DOT operations)
				Plow snow, apply treatment chemicals/abrasives, implement tire chain control operations. Prepare, deploy and track treatment assets. Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, restrict access to designated vehicle types).	3-6 hours
Drifting Snow (inches)	Any to <8 inches	Forecast	Safety risk to maintenance personnel and motorists, travel delays, impaired plowing, lane obstruction, loss of visibility, loss of traction, impaired mobility, effects on snow removal/ice treatment operations (Winds greater than 15 mph can lead to blowing snow and drifting in some areas. The amount of snow already on the ground may not be the determining factor. If snow storage areas are full, even a few inches can cause drifting problems. Drifting snow requires continuous and prolonged clearing operations, which strains manpower resources.)	Predict threatened area, select treatment strategy, consider road closures. Disseminate warning information to travelers (press releases, dynamic message signs, roadside highway advisory radio, transmitters, the Internet, etc.). Begin preparation procedures for equipment, crew planning, shift changes, geographical reassignment and deployment. Construct and place living and structural snow fences.	24-48 hours
	≥ 8 inches			Select treatment strategy. Prepare, deploy, and track treatment assets, Manage snow removal/ice treatment operations (plow snow, treat/clear roadways). Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire chain controls, restrict access to designated vehicle types).	24-48 hours 3-6 hours
Snow Accumulation (inches)	Any	Observation	Drifting snow, impaired mobility, impaired plowing, lane obstruction, loss of stability and maneuverability, loss of traction, pavement temperature effects, slope instability (avalanche risk)	Prepare, deploy, and track treatment assets. Plow snow, apply treatment chemicals/abrasives, remove debris, repair damage. Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types).	Current observation
Snow Drift Levels (inches)	Any	Observation	Impaired plowing, lane obstruction	Predict threatened area, select treatment strategy.	Current observation
Roadway Snow Depth (inches)	Any	Observation	Loss of traction, impaired mobility, effects on snow removal/ice treatment operations	Select treatment strategy.	Current observation
Roadway Snow Pack Depth (inches)	Any	Observation	Loss of traction, impaired mobility, effects on snow removal/ice treatment operations	Select treatment strategy.	Current observation

Weather Needs for Federal Highway Operations

<u>Weather Element</u>	<u>Threshold</u>	<u>Forecast/Observation</u>	<u>Impacts</u>	<u>Action</u>	<u>Lead Time</u>
Adjacent Snow Depth (inches)	Any	Observation	Drifting snow, roadway snow depth	Select treatment strategy.	Current observation
Snow/Ice Bonding (inches)	Any	Observation	Effects on snow removal/ice treatment operations	Select treatment strategy.	Current observation
Liquid Precipitation (inches)	Any	Forecast	Impaired mobility, loss of visibility, loss of traction, loss of stability/maneuverability, lane obstruction/submersion, road damage, treatment chemical dispersion, toxicity and environmental damage, slope instability (landslide risk)	Predict threatened area, advise operators, disseminate warning information to travelers. Start preparation procedures and planning activities.	12-24 hours
				Manage traffic flow, operate outflow devices and induce drainage, finalize decisions.	3-6 hours
Precipitable Water Vapor (inches)	Any	Observation (by satellite imagery interpretation)	Precipitation patterns and rates	Predict threatened area, select treatment strategy.	Current observation
Flooding	Any	Forecast	Safety risks, road submersion, loss of life and property, road damage, bridge damage, travel delays	Begin preparation procedures, plan detour routes.	1-2 weeks
				Review/revise contingency plans, issue alerts.	12-24 hours
				Disseminate warning information to travelers. Implement local mobilization, response actions. Manage traffic flow (close roadways and bridges), prepare to monitor/induce drainage.	6-12 hours
Thunderstorms with Lightning (proximity to route or operational area in miles)	≤ 5 miles	Forecast and observation	Safety risks, loss of life, property damage, loss of communications/power, operational delays	Predict threatened area, advise operators, cease refueling, restrict/suspend operations.	6-12 hours and current observation
Thunderstorms with Hail (hail size, proximity to route or operational area in miles)	Any size, ≤5 miles	Forecast and observation	Safety risk to maintenance personnel and motorists, travel delays, loss of visibility, loss of traction, loss of stability/maneuverability, lane obstruction, impaired mobility, road damage, loss of life, property damage, loss of communications/power, operational delays	Predict threatened area, advise operators, cease refueling, restrict/suspend operations. Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types).	6-12 hours and current observation
	>1/4 inch, ≤5 miles	Forecast and observation			3 hours
Thunderstorms with Tornado or Waterspout (proximity to route or operational area in miles)	≤10 miles	Forecast and observation	Loss of visibility, loss of traction, impaired mobility, lane obstruction/submersion, loss of life, property damage, loss of communications/power	Predict threatened area, select treatment strategy, develop warning and evacuation plans, mobilize maintenance forces.	3-6 hours and current observation
	≤5 miles	Forecast and observation	Loss of visibility, loss of traction, impaired mobility, lane obstruction/submersion, loss of life, property damage, loss of communications/power	Issue evacuation orders. Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types). Operate outflow devices, remove debris, repair damage.	1-3 hours and current observation

Weather Needs for Federal Highway Operations

<u>Weather Element</u>	<u>Threshold</u>	<u>Forecast/Observation</u>	<u>Impacts</u>	<u>Action</u>	<u>Lead Time</u>
Severe Storm Cell Track—Location, Direction, Speed, Severity (proximity to route or operational area in miles, based on radar observation)	≤20 miles	Forecast and observation	Credibility of evacuation orders, loss of visibility, loss of traction, impaired mobility, lane obstruction/submersion, loss of life, property damage, loss of communications/power, flood risk, road damage	Predict threatened area, develop warning and evacuation plans, issue evacuation orders, select treatment strategy. Mobilize maintenance personnel. Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types). Operate outflow devices, remove debris, repair damage.	1-6 hours and current observation
Major Storms					
Blizzard—35 mph Sustained Winds, Visibility <1/4 mile, Blowing Snow (proximity to route or operational area in miles)	≤50 miles	Forecast and observation	Safety risks, loss of life, property damage, road damage, loss of visibility, loss of traction, impaired mobility, evacuation route delays, lane obstruction, loss of communications/power	Predict threatened area, disseminate warning information to operators and travelers, select treatment strategy. Suspend outdoor operations, implement evacuation plans, mobilize maintenance forces, repair damage.	48-96 hours and current observation
Hurricane Force Winds (wind speed in mph and proximity to route or operational area in miles)	≥74 mph, ≤50 miles	Forecast and observation	Safety risks, loss of life, loss of visibility, loss of traction, impaired mobility, evacuation route delays, lane obstruction/submersion, loss of communications/power, property damage, road damage	Predict threatened area, disseminate warning information to operators and travelers. Suspend outdoor operations, implement evacuation plans, mobilize maintenance forces, repair damage.	48-96 hours and current observation
Tropical Storm Force Winds (wind speed in mph and proximity to route or operational area in miles)	≥39 mph but <74 mph, ≤50 miles	Forecast and observation	Safety risk, potential loss of life, loss of visibility, loss of traction, impaired mobility, evacuation route delays, lane obstruction/submersion, loss of communications/power, property damage, road damage	Predict threatened area, disseminate warning information to operators and travelers. Suspend outdoor operations, implement evacuation plans, mobilize maintenance forces, repair damage.	48-96 hours and current observation
Hurricane Storm Surge	Any	Forecast and observation	Safety risks, flood risk, loss of life, loss of traction, impaired mobility, evacuation route delays, lane obstruction/submersion, loss of communications/power, property damage, road damage	Predict threatened area, disseminate warning information to operators and travelers. Suspend outdoor operations, implement evacuation plans, mobilize maintenance forces, repair damage.	12-24 hours and current observation
General Weather/Environmental Parameters					
Air Temperature including Maximum and Minimum (degrees F)	Variable, based on impact criteria	Forecast and observation	Air quality, loss of communications/power, precipitation type, pavement temperature, slope stability (avalanche risk), effects on snow removal/ice treatment operations	Advise operators, monitor surface moisture, modify operations.	12-24 hours and current observation
Air Temperature Relative to Freezing and Trend (degrees F and rising or falling trend)	Decrease to less than 32° or increase to exceed 32°, with moisture	Forecast	Precipitation type, pavement temperature, loss of communications/power, slope instability (avalanche risk), effects on snow removal/ice treatment operations, road damage	Disseminate early warning information to travelers and operators, monitor surface moisture, modify operations.	12-24 hours
Air Temperature (degrees F)	>85°	Forecast	Health and safety risks, engine/equipment heat stress	Advise operators, monitor personnel and equipment stress, take prescribed and precautionary measures.	6-12 hours
	>110°	Forecast	Severe and immediate health and safety danger to personnel and heat stress risk to equipment	Conduct immediate risk assessment, advise operators and supervisors to ensure continuous monitoring of personnel and equipment. Cease activities.	6-12 hours
Dew Point Temperature (degrees F)	Variable, based on temperature and impact criteria	Forecast and observation	Air quality, precipitation type, fog formation	Predict threatened area, select treatment strategy.	12-24 hours and current observation

Weather Needs for Federal Highway Operations

<u>Weather Element</u>	<u>Threshold</u>	<u>Forecast/Observation</u>	<u>Impacts</u>	<u>Action</u>	<u>Lead Time</u>
Air Temperature Change Rate (degrees F per 24 hours)	Approx. 60° in 24 hours	Forecast and observation	Precipitation type, pavement temperature, road damage (pavement buckling damage due to rapid expansion and contraction)	Predict threatened area, select treatment strategy, repair damage.	12-24 hours and current observation
Time and Air Temperature Integrals (heating/cooling degree days)	24 hour	Forecast and observation	Road damage, property damage (risk under extreme heating degree days or cooling degree days)	Determine stockpile or needed resources, repair damage.	12-24 hours and actual tally
Wet Bulb Temperature (degrees F)	Variable, based on temperature and impact criteria	Forecast and observation	Air temperature, fog dispersal effectiveness	Predict threatened area, select treatment strategy, disperse fog (cold fog).	12-24 hours and current observation
Relative Humidity (percent)	Variable, based on impact criteria	Forecast and observation	Precipitation type, loss of visibility	Predict threatened area, select treatment strategy.	12-24 hours and current observation
Air Stability	Stable/unstable	Forecast and observation	Air quality (Stable atmosphere inhibits dispersion of pollutants.)	Modify operations, manage traffic flow.	12-24 hours and current observation
Air Quality	Code orange or red	Forecast	Health and safety risk, operational delays	Disseminate warning information to operators and travelers, modify operations in urban areas. Modify operations.	12-24 hours 3-6 hours
Subsurface Temperature (degrees F)	Variable, based on contributing factors such as wind, shade, sun	Forecast and observation	Pavement temperature	Predict threatened area, select treatment strategy.	12-24 hours and current observation
Pavement Temperature (degrees F)	>85-90°	Forecast	Health and safety risks, engine/equipment heat stress, pavement "blow-ups" (Subsurface temperature affects pavement temperature, but other factors such as wind, insolation, and shade also contribute.)	Disseminate early warning information to operators, monitor equipment/personnel heat stress, modify operations. Take prescribed health/safety and repair actions.	12-24 hours 3 hours
Pavement Freeze Point Temperature with Dew Point Temperature (degrees F)	<32° with moisture (observation and forecast)	Forecast and observation	Loss of traction, safety risk to operations personnel and motorists, effects on snow/ice removal operations. (Some treatment operations can be completed in one shift, others require two shifts.)	Select treatment strategy, advise operators, begin preparation procedures. At 12 hours prior to projected roadway treatment start time, prepare chemical-handling equipment for application (e.g., fill liquid chemical tanks or hoppers for salt application).	12-48 hours and current observation
Pavement Temperature (degrees F)	>15-18° but ≤32°	Forecast	Impaired mobility, snow/ice bonding, effects on snow removal/ice treatment operations, loss of traction	Predict threatened area, select treatment strategy. Prepare, deploy, and track treatment assets. Apply treatment chemicals/abrasives.	12-24 hours
	<15-18°	Forecast	Impaired mobility, snow/ice bonding, effects on snow removal/ice treatment operations, loss of traction, effect on treatment chemical effectiveness	Predict threatened area, select treatment strategy. Prepare, deploy, and track treatment assets. Plow snow, apply abrasives.	12-24 hours
	Variable, based on impact criteria	Observation	Impaired mobility, snow/ice bonding, effects on snow removal/ice treatment operations, loss of traction, effect on treatment chemical effectiveness, melting	Predict threatened area, select treatment strategy. Prepare, deploy, and track treatment assets. Plow snow, apply treatment chemicals/abrasives.	Current observation

Weather Needs for Federal Highway Operations

<u>Weather Element</u>	<u>Threshold</u>	<u>Forecast/Observation</u>	<u>Impacts</u>	<u>Action</u>	<u>Lead Time</u>
Pavement Condition	Wet	Forecast and observation	Safety risks, impaired mobility, loss of traction, loss of stability/maneuverability	Predict threatened area. Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types).	12 hours and current observation
	Snow/slush	Forecast and observation	Safety risks, impaired mobility, loss of traction, loss of stability/maneuverability	Predict threatened area, select treatment strategy. Prepare, deploy, and track treatment assets. Plow snow. Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types).	12 hours and current observation
	Ice	Forecast and observation	Safety risks, impaired mobility, loss of traction, loss of stability/maneuverability	Predict threatened area, select treatment strategy. Prepare, deploy, and track treatment assets. Apply treatment chemicals/abrasives. Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types).	12 hours and current observation
Chemical Concentration	Variable, based on application, residue	Observation (sensor or mobile infrared)	Safety risks, effects on snow removal/ice treatment operations, snow/ice bonding	Select treatment strategy, apply treatment chemicals/abrasives, deploy and track treatment assets.	Current observation
Visibility (statute miles)	<1/4-1/2 mile	Forecast and observation	Safety risk, loss of visibility (due to fog, haze, dust, smoke), impaired mobility	Disseminate warning information to operators and travelers, modify operations, consider fog dispersal options (e.g., CO ₂ application).	6-12 hours and current observation
Glare	Any	Forecast and observation	Loss of visibility in glare quadrant of horizon	Advise operators, modify operations (reduce speed).	3 hours and current observation
Wind: Head, Cross, Tail (speed in miles per hour)	>30 mph but <50 mph	Forecast	Safety risk, drifting snow, loss of visibility, loss of stability/maneuverability, lane obstruction (debris), road damage, loss of life and property, treatment chemical dispersion, loss of communications/power, toxicity and environmental damage, pavement temperature	Predict threatened area, modify operations, select treatment strategy, develop warning and evacuation plans. Remove debris, repair damage. Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types).	12-24 hours
	≥50 mph	Forecast	Safety risk, drifting snow, loss of visibility, loss of stability/maneuverability, impaired mobility, lane obstruction (debris), road damage, loss of life and property, treatment chemical dispersion, loss of communications/power, toxicity and environmental damage, pavement temperature	Predict threatened area, select treatment strategy, restrict/suspend operations, develop warning and evacuation plans. Remove debris, repair damage. Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types).	12 hours
Surface Wind Direction	Any speed	Forecast and observation	Drifting snow, wild fire tracking, toxicity and environmental damage, pavement temperature	Predict threatened area, select treatment strategy. Remove debris, repair damage.	2 hours and current observation

Weather Needs for Federal Highway Operations

<u>Weather Element</u>	<u>Threshold</u>	<u>Forecast/Observation</u>	<u>Impacts</u>	<u>Action</u>	<u>Lead Time</u>
Upper Air Winds	Standard levels	Forecast	Air quality, storm cell tracking, toxicity and environmental damage, air stability	Predict threatened area, select treatment strategy. Remove debris, repair damage.	12 hours and most recent upper air data
High Winds	Variable, based on impact criteria	Observation	Safety risk, drifting snow, loss of visibility, loss of stability/maneuverability, impaired mobility, lane obstruction (debris), road damage, loss of life and property, treatment chemical dispersion, loss of communications/power, toxicity and environmental damage	Predict threatened area, select treatment strategy, modify operations, develop warning and evacuation plans. Remove debris, repair damage. Manage traffic flow (e.g. disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types).	Current observation
Wind Chill (degrees F)	≤20° to 32°	Forecast and observation	Safety risk (hypothermia, frost bite)	Advise operators, restrict or suspend operations.	3-6 hours and current observation
Heat Index (degrees F)	>105°	Forecast	Health and safety risk (heat exhaustion)	Disseminate warning information to operators and travelers.	12-24 hours
				Advise operators, modify/restrict operations.	3-6 hours
Space Weather (solar flares, etc.)	Any	Forecast and observation	Loss of communications/power, impaired GPS location/navigation	Advise operators, monitor communications outages.	12 hours and current observation
Total Sun (insolation)	Total hours	Forecast and observation	Air temperature, pavement temperature, toxicity and environmental damage, air quality	Modify operations.	12-24 hours and current observation
Cloud Cover	Scattered, broken, overcast	Forecast and observation	Air temperature, pavement temperature, toxicity and environmental damage	Modify operations.	12-24 hours and current observation
Water Course Flow Volume (cubic meters per second)	Variable, based on flood stage criteria	Forecast and observation	Flood risk, lane submersion, loss of life and property, road damage	Predict threatened area, select treatment strategy, develop warning and evacuation plans, operate outflow devices.	12-24 hours and current observation
Water Body Depth (feet)	Variable, based on flood stage criteria	Forecast and observation	Flood risk, lane submersion, loss of life and property, road damage	Predict threatened area, select treatment strategy, develop warning and evacuation plans, operate outflow devices.	12-24 hours and current observation
High Surf (wave height in feet)	>8 feet	Forecast and observation	Safety risk, property damage, road damage, evacuation route delays	Predict threatened area, disseminate warning information to operators and travelers. Repair damage.	12-24 hours and current observation
Avalanche Danger	High, moderate, low	Forecast and observation	Impaired mobility, loss of life and property, lane obstruction, effects on snow removal/ice treatment operations	Manage traffic flow (close roadways), modify operations, release avalanche, remove snow.	12-24 hours and current observation
Seismic Activity	Any seismic activity	Forecast and observation	Road damage, property damage, impaired mobility, loss of life and property	Manage traffic flow, modify operations, remove debris, repair damage.	12-24 hours and current observation

Weather Needs for Federal Highway Operations

<u>Weather Element</u>	<u>Threshold</u>	<u>Forecast/Observation</u>	<u>Impacts</u>	<u>Action</u>	<u>Lead Time</u>
Volcanism	Any volcanic activity	Forecast and observation	Road damage, property damage, impaired mobility, loss of life and property, air quality	Manage traffic flow, modify operations.	12-24 hours and current observation
Soil moisture	Saturated, unsaturated	Forecast and observation	Flood risk, road/pavement damage, pavement condition	Select treatment strategy.	12-24 hours and current observation
Fire	Any fire event or activity	Forecast and observation	Loss of visibility, loss of life and property, air quality	Manage traffic flow (e.g., disseminate traveler information, vary speed limit, modify lane configuration, modify signal timing/ramp metering, close roadways and bridges, implement tire controls, restrict access to designated vehicle types).	12-24 hours and current observation
Fair Weather	1 to 10 days (variable, based on impact criteria)	Forecast	Operations planning (Forecasts of good or bad weather aid managers in deploying road crews efficiently on short and long term weather-sensitive operations with specific time constraints. Crews work year round with no reserve personnel, and mobilization is required for some tasks. Work details vary day to day; undertaking tasks that require good weather depends on how much good weather is anticipated.)	Modify operations. Examples: (1) Ditching requires removing the sanders, mounting a truck box, and replacing the blower attachment on a loader with a bucket. These jobs would probably take 2 days. Such actions cannot be started without a forecast of 10 days of good (non-snow) weather because of the time needed to reconvert the equipment. (2) In urban areas, snow hauling is necessary following a storm. The same amount of work is needed to clean up after a 6-inch fall as a 12-inch one. If good weather is forecast following a 6" snow event, hauling might be started. If another snow event is forecast within several days, hauling may be delayed.	24-48 hrs
Nuclear, Biological, or Chemical Release	Any	Forecast and observation	Health and safety risk (potential severe threat to life), dispersion of hazardous materials	Close/detour roadways. Assist in Atmospheric Transport and Diffusion and HAZMAT response operations.	1-3 hours and current observation