USING HIGHWAYS DURING EVACUATION OPERATIONS FOR EVENTS WITH ADVANCE NOTICE

Routes to Effective Evacuation Planning Primer Series

U.S. Department of Transportation
Federal Highway Administration

Produced in collaboration with Intelligent Transportation Systems Joint Program Office (ITS JPO)

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FOREWARD

Evacuations may involve hundreds or hundreds of thousands of people. Regardless of the numbers, in every instance, the transportation network plays a key role in evacuating people out of harm's way. Over the past two decades, the transportation community's ability to manage and operate the transportation network has improved considerably. Recognizing the unique challenges posed by the disaster environment on mobility and the safe and secure movement of people and goods, the U.S. Department of Transportation's Federal Highway Administration (FHWA) seeks to improve evacuation planning and implementation by bringing new ways of better utilizing the transportation network, before and during evacuations, to the emergency management community,.

This document constitutes the first of a primer series titled "Routes to Effective Evacuation Planning" and covers the use of the highway system during evacuation operations when advance planning is possible. The primer series, as a whole, captures and catalogues transportation management and operations advancements that can improve evacuation planning and operations. As experience in conducting evacuations increases and the concept of disaster support evolves, these primers may undergo adjustment based on new information, findings, lessons learned, best practices, and tools that local jurisdictions and States use and share.

Evacuation operations are conducted under the authority of, and based on decisions by, local and State authorities. This primer is intended as a tool to aid local and State planners in maximizing the use of the highway network in the development and execution of evacuation plans for their communities, States, or regions. We encourage readers to contact FHWA's Office of Operations to comment on this document, to share experiences, and to offer suggestions to improve this primer and its companions.

The ***Routes to Effective Evacuation Planning Primer Series*** will include:

TITLE	CONTENT
Overview: Routes to Effective Evacuation Planning	This is an executive-level summary that covers the five evacuation primers. The summary focuses on the need to include transportation professionals in planning for evacuations; the importance of regional and corridor planning; the integration of transportation in mass care; health and medical, security, and other emergency support function coordination. It also highlights best practices that have emerged from actual evacuations and tools available to local and State authorities in planning for and executing evacuations.

TITLE	CONTENT
Using Highways during Evacuation Operations for Events with Advance Notice	This is a basic-level guide on conducting planning activities for evacuations that are primarily road-based, when advanced notice of the need to evacuate is available. The guide is more detailed than the overview and includes transportation elements that should be considered by local, State, and regional planning groups.
Integrating Multiple Modes into Evacuation Transportation Planning for Events with Advanced Notice	This guide introduces effective ways to integrate rail, air, and waterway transport into evacuation planning. The guide assumes that the populations are evacuating in advance of a known event.
Using Highways during Evacuation Operations for Events with No Notice	This guide covers spontaneous or no notice evacuations that are primarily road-based. It considers the security environment that comes into play during a biological, chemical, terrorist, or malevolent event, as well as no notice natural events such as earthquakes or tornadoes. This guide also addresses evacuation considerations versus shelter-in-place orders.
Integrating Multiple Modes into Evacuation Transportation Planning for Events with No Notice	This guide introduces effective ways to integrate rail, air, and waterway transport into evacuation planning when there is no notice of the event.
Evacuating Populations with Special Mobility Requirements	This primer summarizes information in the other primers that touches on moving populations with special needs. It provides findings, lessons learned, and best practices that aid in developing evacuation plans for people with special movement requirements, including the elderly, those with medical conditions, and transit-dependent populations.

Inquiries, information, suggested improvements, and requests for additional copies are encouraged and should be directed in writing to the U.S. Department of Transportation, Federal Highway Administration, Office of Operations, Emergency Transportation Operations Team, 400 7th Street, SW, Washington, DC 20590, or via

email to ETO@dot.gov For an electronic version of this document or other evacuation planning tools, please visit the Evacuation Planning Knowledge Management Center at the Emergency Transportation Operations website: www.ops.fhwa.dot.gov/opssecurity and the DHS Lessons Learned Information System Content Specific page on Mass Evacuations at www.LLIS.gov.

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December 2006

The U.S. Department of Transportation, Federal Highway Administration (FHWA) has four levels of operational guidance for use by local, State, and Federal planners to develop evacuation plans for personnel involved in conducting or supporting disaster operations. This document corresponds to Level 1.

Level 1	**Overview and Primers**	**A brief concept summary of a function, team, or capability.**
Level 2	Standard Operating Procedure (SOP) or Operations Manual	A complete reference document, detailing the procedures for performing a single function (SOP), or a number of interdependent functions (Operations Manual).
Level 3	Field Operations Guide (FOG) or Handbook	A durable pocket or desk guide, containing essential nuts-and-bolts information needed to perform specific assignments or functions.
Level 4	Job Aid	A checklist or other aid for job performance or job training.

This document is consistent with and supports the Emergency Support Function #1/Transportation doctrine developed to support the National Response Plan for implementation of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. § 5121, et seq., as well as Homeland Security Presidential Directive 8, Domestic Incident Management.

The most current copy of this document, including any change pages, is available through the FHWA Emergency Transportation Operations Evacuation Planning Knowledge Management Center webpage at www.ops.fhwa.dot.gov/opssecurity.

DODGE RAM

INTRODUCTION

Disasters can come in infinite varieties and can happen anywhere at any time, often without warning. Regardless of where in the spectrum the disaster falls, transportation is critical to evacuation operations, bringing responders to the scene, and transporting the ill and injured to medical facilities. To achieve an efficient emergency management response, transportation assets must be effectively utilized.

A 2003 report issued by the U.S. Nuclear Regulatory Commission (NRC) provided selected case studies on evacuations that occurred across the country from January 1, 1990, through June 30, 2003. The NRC observed that a large-scale evacuation involving 1,000 or more people occurs approximately every three weeks. The leading cause of evacuations was natural disasters (58 percent), with wildfires accounting for 23 percent of these evacuations. Technological disasters accounted for 36 percent of evacuations. These causes included hazardous material releases, train derailments, and traffic incidents. Malevolent acts, including terrorist attacks, accounted for six percent of evacuations. Due to the frequency of events leading to localized evacuations, local and State agencies, particularly in larger metropolitan areas, have become familiar with evacuation planning and its related issues and areas of concern such as transportation-disadvantaged and vulnerable populations, identification of decision makers, and the effects of an evacuation order.

Local and State agencies routinely handle evacuations from wildfires, floods, tornadoes, hazardous material accidents, or significant transportation crashes. The 2003 NRC study found that only 17 of the 230 evacuations over the past 12½ years involved 100,000 people or more. Fifteen of these evacuations were from hurricanes and two were from the 1993 and 2001 attacks on the World Trade Center in New York City. The successes of routine evacuations are often forgotten, while the images of suffering from these large-scale events endure for lifetimes.

The Federal Highway Administration (FHWA) studied several emergencies, including the 9/11 terrorist attacks and natural disasters such as Hurricane Floyd. The following common themes emerged.

- All types of security incidents have a transportation impact.
- Traffic impacts occur outside of the incident scene and can become a separate "incident".
- State, local, and regional emergency management plans do not fully integrate transportation agencies in their emergency planning.
- Traffic impacts during recovery may be more significant than during response.

POTENTIAL EVACUATION TRIGGERS: NOTICE AND NO NOTICE EVENTS

- Earthquake
- Flood
- Hazardous material release
- Hurricane
- Technological event
- Terrorist event
- Tornado
- Train derailment
- Tsunami
- Wildfire

ALL TYPES OF SECURITY INCIDENTS HAVE A TRANSPORTATION IMPACT.

The 9/11 attacks affected public transit, commuter rail, commercial vehicles, and ferries and resulted in significant road repairs.

Suspicious incidents near transportation facilities can result in closures or restrictions.

Efforts to catch the "D.C. sniper" resulted in massive queues on Maryland, Washington, D.C., and Virginia interstates.

STATE, LOCAL, AND REGIONAL EMERGENCY MANAGEMENT PLANS DO NOT FULLY INTEGRATE TRANSPORTATION AGENCIES IN THEIR EMERGENCY PLANNING.

Fewer than 50 percent include details on media coordination, traveler information, and asset protection.

Only 10 percent address transportation coordination with the EOC.

Fewer than 50 percent specify evacuation routes.

Only 2/3 of the State and 1/3 of the municipal plans include transportation contacts.

Intelligent Transportation Systems (ITS) applications are generally not discussed in emergency management plans.

- Transportation responders are often not:
  - Linked fully with emergency managers
  - Trained to work with other responders under the Incident Command System (ICS)
  - Prepared with equipment and knowledge to deal with terrorist threats.

PURPOSE

This primer provides ideas and considerations for ***transportation officials and emergency managers*** that are applicable across the scale of evacuation events. The contents are based on the findings from numerous studies following major or catastrophic events where evacuations were ordered. The primer identifies best practices and lessons learned from these studies and captures proven formulas for successful use of the transportation network during emergency operations. It also identifies transportation technologies and tools available to aid evacuation planners and operations staff in their attempts to make maximum use of the transportation network during emergencies. In addition, the primer demonstrates ways to develop better evacuation plans through integration of transportation professionals in the process. Concepts identified in the primer series are applicable when dealing with small and large evacuation events. The primer should be one of many aids that officials use to build the best evacuation strategy possible for their community.

It is important to understand that developing a plan is only one step in an extensive process that leads to a successful outcome. Gathering together partners and stakeholders is a critical part of developing the plan and is essential to considering all factors specific to an individual community. This planning process should aid communities in bringing the right partners—including the right members of the transportation community—to the table. This primer emphasizes the follow-through process that is necessary to ensure that the plan is well coordinated and updated on a regular basis—recognizing that to be effective, the contents of the plan must be internalized and understood by the responders when an event happens. In turn, the plan developed for the community should serve as a foundation for training and exercising those who manage an evacuation and for evaluating the plan following an evacuation operation. Only after development of an evacuation plan and through these follow up activities can authorities trust that when evacuation orders need to be issued, all of the pieces will fall into place.

SCOPE

Highways and secondary roads are the most frequently used means to evacuate populations. As such, this guide focuses on planning and coordination associated with evacuating populations using highways and roads when there is advance notice of an event. The third and fifth primers in the series offer considerations on how to use other modes—air, railways, and waterways—to complement road-based evacuations during notice and no notice evacuations.

EVACUATION STAKEHOLDERS' ROLES AND RESPONSIBILITIES

Evacuations occur to safeguard lives and property and reduce personal suffering. A successful evacuation relies on human, material, financial, technological, and equipment resources being available at the right time, at the right place, and in the right quantity. Success also depends upon information, communication, coordination, and knowledge to make the process work. The personnel involved must know what to do and when to do it, and must have the information, materials, and equipment available to execute their responsibilities. These resources may vary depending upon the role that the individuals play in the evacuation response.

Effective evacuation planning requires a partnership among all stakeholders. Evacuees are the most important stakeholders in any evacuation operation. In addition, many government and non-government personnel may be involved in the planning process and eventual execution of an evacuation operation. Evacuation planning at the local, regional, and State levels should involve representatives of all departments and organizations that have a role in an evacuation. This includes the potential evacuees (people from high-risk areas) as well as non-traditional partners, such as transportation and transit organizations, public schools, city planners, the Chamber of Commerce, and adjacent communities who may be impacted by an evacuation.

The State or local emergency management agency usually leads the evacuation planning process. ***Emergency managers must include transportation agencies—particularly the right mix of subject matter experts and those with appropriate authorities—in the evacuation planning process as key stakeholders*** since most people use the highways to evacuate whether they are traveling in their own vehicle, or on a bus, or using the roadway to access a train or plane. Transportation professionals can provide a wealth of information to support evacuation planning such as traffic counts, roadway capacity, planned highway construction, maps, and other such data necessary to develop a good plan and can access a wide variety of tools to facilitate the evacuations along roadways. Transportation officials should work with traditional disaster planners or operations staff, including those that:

TRAFFIC IMPACTS OCCUR OUTSIDE OF THE INCIDENT SCENE AND CAN BECOME A SEPARATE "INCIDENT."

These take additional scarce resources to manage.

They can have a major effect in the region and can create additional hazards.

TRAFFIC IMPACTS DURING RECOVERY MAY BE MORE SIGNIFICANT THAN DURING RESPONSE. IN NEW YORK CITY FOLLOWING 9/11:

It took 3.5 hours to travel a common 22-mile commuter route in the first week following 9/11.

On September 26, there was a four mile queue to enter Manhattan.

There were 40 subway service changes in three days.

Ferry ridership increased by 91 percent.

TRANSPORTATION ORGANIZATIONS THAT MAY BE NEEDED TO SUPPORT EVACUATIONS

- Departments of Transportation
- Transit Agencies
- Traffic Engineers
- Highway Incident Response Teams
- Public Works
- Public School Officials (for providing buses for moving evacuees, mass care and feeding)
- Highway Contractors
- Metropolitan Planning Organizations
- Towing Industry
- Trucking Industry

- Make decisions
- Generate, collect, and/or analyze information
- Design strategic, operational, and contingency plans
- Manage operations and resources for the response
- Execute emergency (including evacuation) orders and response operations.

Table 1 summarizes some of the key stakeholders in evacuation operations and their potential roles in evacuation planning.

Table 1. Key Stakeholders in Evacuation Operations

CATEGORY	DESCRIPTION	LOCATION OF OPERATION	ROLE DURING EVACUATION OPERATIONS
On-Scene Operational and Tactical Response Resources			
Emergency Managers & ESF Lead and Supports, including Transportation (ESF # 1)	Local and State professional staff	Emergency Operations Centers (EOCs)	Gather key players. Collect and analyze information. Recommend actions. Order and provide resources for emergency operations.
Transportation Officials	Local Departments of Transportation (DOTs)	DOT offices; Traffic Management Center/Traffic Operations Center (TMCs/TOCs); Local EOC	Collect analyze and report traffic information. Provide evacuation route plans. Conduct traffic incident management with first responders and local law enforcement. Order and provide traffic operations resources to support evacuation and other movement coordination operations. Provide information to the Public Information Officer (PIO) at the EOC or Joint Information Center (JIC).
Decision Makers	Mayors, County Commissioners etc. and their staffs; Governors for State assistance	City Hall; County; Commission Chambers; EOC	Collect information and expert recommendations about whether to order an evacuation, what type, when to do it, and how large the area is to be evacuated. Order evacuations. Request assistance from neighbors, and State and Federal governments through mutual-aid agreements or other prescribed methods.

EVACUATION PLANNING PARTNERS

- Emergency Management Agency
- Law Enforcement
- Emergency Medical Services
- Fire Department
- Transportation
- Public Works
- Traffic Engineering
- Transit Agency
- Health Department
- Human Service Agencies
- Agriculture Department
- Environmental Department
- National Guard
- Department of Defense

First Responders	Police, Fire, Rescue, Emergency Medical, Evacuation Operations Team (EOT)	Incident Command Post; On-scene	First line of response. May coordinate volunteers. Provide knowledge of local area. Provide on-ground damage information & identification of needed resources. Provide security for homes/ businesses once evacuees leave.
Volunteer Organizations (including Federal capabilities that serve as local assets during disasters [*])	American Red Cross, Salvation Army, Local charities, AmeriCorps,* Citizens Corps*	Shelters; Comfort stations; Mobile feeding units; On-scene	Provide relief services. Provide support services to those evacuating along highways, including comfort stations. Open and staff shelters.
Private Sector Partners	Highway contractors, trucking industry, towing industry, gasoline suppliers, traffic engineers, medical facilities, Hotel/motel associations	Various locations including EOCs and business locations; On-scene	Provide personnel, technical assistance, equipment and supplies. Provide information on available transportation units, gas, food, or other commodities they can provide. Provide private health and medical care facilities. Can assess and detail facility capabilities and whether they need additional assistance in evacuating patients.
State Operational and Support Response Resources			
Transportation Officials	State DOTs	State EOC; State DOT offices; TMCs/TOCs	Collect analyze and report traffic information. Provide evacuation route plans. Conduct traffic incident management with first responders and local law enforcement. Order and provide traffic operations resources to support evacuation and other movement coordination operations. Provide information to the Public Information Officer (PIO) at the EOC or JIC. Provide information to FHWA and other impacted State DOTs as necessary.
First Responder Support	National Guard	On-scene	Supplements first responders. Supply transportation services, people, food, temporary sheltering, communications, medical services, clerical services, security, etc.
Volunteer Organizations	Animal shelters Humane Society	Shelters; On-scene	Coordinate the transportation and sheltering of animals

EVACUATION PLANNING PARTNERS (CONT'D)

- Public School Districts
- City Planning Authorities
- People from Vulnerable Areas
- Red Cross
- Salvation Army
- Citizen Corps
- Power Companies
- Humane Society/ American Society to Prevent Cruelty to Animals
- Chamber of Commerce
- Hotel/Motel Association

Federal Support Response Resources			
Volunteer Support	National Voluntary Organizations Active in Disasters (NVOAD)	National office in Washington, DC	Provide referral services to volunteer organizations around the country and can provide support. A consortium of volunteer organizations that can support relief efforts depending on the type of disaster.
National First Response Teams	Urban Search and Rescue teams; DMATs; Debris Removal	On-scene in affected jurisdiction	Provides support to local organizations
National Support Capabilities	Evacuation Liaison Team	At FEMA Atlanta office	Provides technical advice on organizing, conducting, and managing evacuations

ON-SCENE OPERATIONAL AND TACTICAL RESPONSE RESOURCES

When an evacuation order is issued, the hub of information gathering and decision making related to an evacuation occurs at an Emergency Operations Center (EOC). The Department of Transportation (DOT)—at the local, State, or National levels—should send a representative to the appropriate EOC. For transportation agencies with Intelligent Transportation Systems (ITS), their Traffic Management Center (TMC) or Traffic Operations Center (TOC) may serve as a transportation-specific operations center and provide valuable services in aiding evacuation operations. In some cases, the TMC and the EOC are co-located; while, in most others, they are separate. Linking them electronically enables the EOC staff to view the same information as the TMC staff.

Benefits of Including Transportation Professionals as Support to the Operations and Tactical Responders

In addition to participating at the EOC, the transportation disciplines should have representation on the Evacuation Operations Team (EOT). The EOT comprises personnel from a variety of disciplines, including (but not limited to) Traffic Incident Management (TIM) teams, public safety officers (police, fire, rescue, and emergency medical services), road maintenance workers, debris clearance personnel, utility repre sentatives, and mass care specialists.

To support emergency operations activities, transportation organizations can supply information, personnel, equipment, and supplies on the scene to aid in an evacuation.

The transportation personnel should work with the Incident Commander and the EOT to provide the necessary resources to support the evacuation. Transportation agencies have their own radio communications systems that can be used to request additional resources and coordinate among the various teams they may have on-scene. They can provide critical data for the evacuation including traffic counts, and information on congestion status, incidents requiring emergency response, contraflow operations, the availability of transportation human resources, ITS equipment, the status of work zones on the roadway, and transit resources for evacuees including those with special needs.

Transportation agencies can provide experts in planning, transit, traffic engineering, highway construction, and maintenance. For example, maintenance personnel or contractors can provide supplies for rest areas or assist with debris removal, and construction staff or contractors can assist with securing work zones or repairing roadway damage. Traffic engineering staff can assist with ITS resources, timing traffic signals, and providing traffic control devices such as cones, barriers, and signs, to assist in directing traffic during the evacuation.

PRIVATE SECTOR AND NON-GOVERNMENTAL ORGANIZATION SUPPORT

Private sector groups also have a stake in evacuation plans, decisions, or operations, including transportation, food, health and medical (e.g., nursing homes, children's hospitals, and institutions), private schools, and other organizations. Moreover, the local government may support its evacuation operations with assistance from locally based private sector resources and private-volunteer agencies.

Benefits of Including Transportation-Related Private Sector and Private Volunteer Organizations

Private sector transportation resources may supply vehicles, transportation main tenance crews, and assets to aid motorists during an evacuation. Often, the private sector wants to be involved, and locally based companies often have out-of-area reach-back to their parent companies for additional support. One example is how the utility industry often deploys utility crews from around the country to disaster-stricken areas to restore power lines. Similarly, State and local DOTs and Public Works departments generally have access to a number of private sector compa nies that can provide evacuation support services through existing or emergency contracts including:

GOOD PRACTICE

Know/Use Regional and Metropolitan Planning Organizations (MPOs) and Mutual-Aid

An example of a regional planning agency is Houston TranStar which is a partnership between Texas DOT, Metropolitan Transit Authority of Harris County, the City of Houston, and Harris County that coordinates regional transportation and emergency management in the Houston metropolitan area. TranStar also works cooperatively with its local MPO and other local organizations. Similar organizations operate in other regions of the country and they can play a major role in evacuation planning and execution.

- *Highway contractors* – Can secure roadway work zones to maximize safety and roadway capacity for evacuees; and provide personnel, heavy equipment, and materials through contracts to support an evacuation.
- *Bus companies* – Can provide over-the-road coaches and drivers to evacuate people including those with special needs or to transport responders
- *Traffic control contractors* – Can provide personnel and traffic control devices such as portable Variable Message Signs (VMS), arrow boards, traffic signs, traffic signals, and light towers to support an evacuation
- *Towing industry* – Can provide personnel and tow trucks to remove disabled vehicles from an evacuation route
- *Trucking industry* – Can provide trucks and drivers to deliver supplies and equipment to support an evacuation
- *Service patrols* – Can provide motorist assistance including vehicle repairs in the field, fuel, and traffic control.

STATE AND REGIONAL COORDINATION RESOURCES

Local jurisdictions often establish mutual-aid agreements with surrounding jurisdictions or may participate in regional planning organizations as a means to tackle disaster planning and operations. These should be the first source of aid and coordination for any evacuation operation that exhausts local resources. When these resources are not enough, the local jurisdiction may reach out to its State for personnel, materiel, assets, technical assistance, and funding. Requests should be channeled from the local EOC to the State EOC,[1] consistent with State protocols, usually following the National Response Plan (NRP) guidelines or the National Incident Management System (NIMS). This aid may also take the form of direct State support of the evacuation operation when an event overwhelms or exhausts local resources. The State may be able to coordinate evacuation plans, information, and needs with potentially impacted areas or shelters established outside of a jurisdictional boundary, as well as, coordinate with surrounding States that may be impacted by the evacuation. The State may be able to supplement personnel for the EOT. As part of evacuation plan development, local jurisdictions should identify any existing regional working groups, organizations,

[1] States maintain an EOC at some level of alert 24 hours a day, 365 days a year. State EOCs serve as the State Warning Point as part of the National Warning System (NAWAS). The NAWAS is a national, interconnected telephone system that can be used to warn areas of impending emergencies, which is one of many means by which local jurisdictions may learn of events with notice that may require execution of evacuation plans.

or geographic designations in which their jurisdiction is a part. One resource that may be available to State officials is the Emergency Management Assistance Compact (EMAC) managed by the National Emergency Management Association (NEMA). Through EMAC, State officials may request specific additional assistance for personnel and equipment, including assistance from State DOTs and all 50 participating States. These requests are made at the State level to ensure that priorities are set to address the overall situation in the State, without localities competing with each other for resources. Local planners should work with their counterparts at the State level to understand the process for making requests to EMAC and others for assistance. In 2006, NEMA published the *EMAC 2005 Hurricane Season Response After-Action Report* which contains a wealth of information about EMAC, how it works, and recommen dations for improving it. A link to that report is included in the "Other Information Resources" section of this primer.

Benefits of Including Transportation-Related State and Regional Coordinating Entities

As noted above, local jurisdictions may be able to call upon State and regional trans portation organizations to assist in evacuation planning and execution. One potential source of assistance is the area's Metropolitan Planning Organization (MPO), which provides comprehensive transportation planning for the region. Federal regulations require each urbanized area with a population over 50,000 to establish an MPO. In cooperation with the State and other transportation providers, the MPO is respon sible for carrying out the metropolitan transportation planning requirements. The MPOs have a wealth of information that is useful for evacuation planning including demographic data, roadway capacity data, planned roadway improvements, traffic count data, and transportation modeling capabilities to predict traffic congestion. Some MPOs may also have responsibility to support the DOT, local government, and/ or emergency management agency in evacuation modeling. In addition, some MPOs are also operational organizations and may oversee or operate the area's TMC, coor dinate transit services, and have other resources to assist in evacuations.

Many areas also have Regional Planning Councils, Councils of Government, Local Emergency Planning Committees, and other such organizations. These organizations can generally provide transportation and other demographic data on a regional basis that may be useful to local emergency planners. In the Mid Atlantic region, a multi-state volunteer organization has formed to focus on emergency readiness, response, and recovery. The group, the Mid Atlantic All Hazards Forum, includes a variety of public and private organizations that must work together in an emergency.

One of the benefits of EMAC is that it provides assistance between member States and requests for assistance can be made in advance of an event such as a hurri cane. The agreement allows for the sharing of personnel, resources, and equipment, including transportation resources, across State lines in times of disaster. The deploy-

EMAC TRANSPORTATION RESOURCES USED FOR HURRICANES KATRINA AND RITA

- Portable VMS
- Traffic signal heads
- Cones
- Barricades
- Tire changing equipment
- Traffic control devices
- Helicopters
- Buses
- Bridge Recovery Team
- Construction equipment
- Highway/ Transportation personnel (121 people)

ment of resources through EMAC is done in coordination with NRP resources. When a Governor declares a state of emergency, that State contacts the EMAC National Coordinating Group. They have a team that works with the State to determine its needs and the cost and availability of those resources. The State then completes requisitions for assistance and negotiates the cost, and the resources are sent to the State. The State later reimburses the cost to the responding States. EMAC can provide a variety of support including to EOCs. For transportation-related resources, EMAC can provide personnel, equipment and materials to perform damage assessments, debris removal, roadway repair, hazard mitigation, aviation support, communications, construction, and even mobile kitchens that can be used to support field personnel.

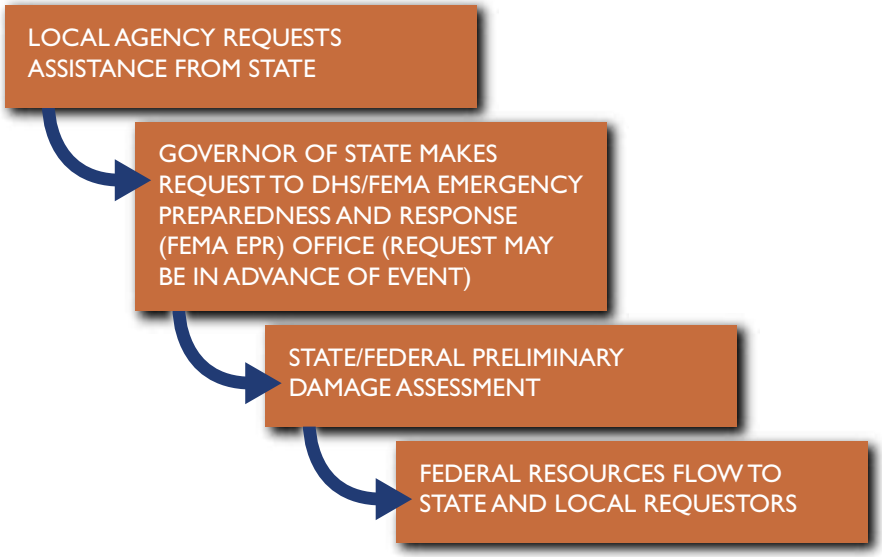
FEDERAL SUPPORT CAPABILITIES AND TECHNICAL ASSISTANCE

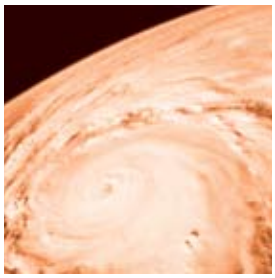
A fundamental premise of the NRP is that most incidents are handled at the lowest jurisdictional level. Local authorities must assess the situation and request assistance as required at the State level. After the situation is assessed, the Governor may declare a State of Emergency and request assistance from the Federal government, through the U.S. Department of Homeland Security (DHS). A joint assessment is made to determine whether sufficient damage has occurred to justify a request for a Presidential declaration of a major disaster. However, higher risk areas should coordi nate their projected need for Federal resources in advance through State authorities. One comprehensive source for information on Federal assistance noted in the "Other Information Resources" section of this primer is www.disasterhelp.gov.

Evacuation operations often occur prior to an event, which would require special arrangements to obtain Federal resources in advance of a Presidential declaration. There are ways for the Federal government to establish stand-by contracts based on jurisdiction-projected need or to declare an emergency prior to an event, which would open avenues for potential reimbursement and the immediate pre-event staging and delivery of resources. For example, as a part of preparations prior to the start of the 2006 hurricane season, the U.S. DOT worked with the State of Louisiana, the city of New Orleans, and the DHS to establish stand-by contracts for buses to aid in evacuating New Orleans, if needed. The local jurisdiction should work to identify potential needs for evacuation support as a part of the planning process to ensure rapid support from both State and Federal sources of aid.[2] Figure 1 illustrates the flow of requests for assistance.

[2] Appendix 5 of the National Response Plan provides an overview of initial Federal involvement under the Stafford Act. The process to request Federal Assistance is laid out in the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act).

Figure 1. Request for Federal Assistance





Benefits of Including Transportation-Related Federal Support Efforts

The Federal government has access to many transportation resources through either standing or emergency contracts. For Hurricane Katrina, the Federal government was able to contract for buses, airplanes, AMTRAK passenger service, and boats, all of which were valuable transportation assets. In addition, the government can arrange for the use of trucks to deliver needed supplies.

The U.S. DOT agencies have significant expertise in all modes of transportation and can be an important technical resource to local and State agencies. They can assist prior to an evacuation as well as with recovering vital transportation services after an incident.

The National-level Evacuation Liaison Team (ELT) is another transportation Federal support capability designed specifically to aid State and local authorities in managing evacuation operations. The FHWA participates as a member of the ELT which also includes members from the Federal Emergency Management Agency (FEMA), and the U.S. Army Corps of Engineers. The ELT serves as the focal point for coordination and communication among States during an evacuation. The Federal government will automatically activate the ELT for Category 3 or higher hurricanes that may necessitate multi-State evacuations. When activated, ELT activities are coordinated from the FEMA Regional Operations Center in Atlanta. This organization is a tool for obtaining information and advice on the severity and direction of a storm and actions taken by neighboring jurisdictions.

EXIT 40
EXIT

EVACUATION PLANNING AND PREPAREDNESS PROCESS FROM THE TRANSPORTATION PERSPECTIVE

Preparedness for evacuations occurs continuously and involves many partner departments and agencies at the local, regional, and State levels. The demographics of an area may change over time so it is important to review and adjust evacuation plans and support tools (such as call-down lists) at least annually. It is also important to review and adjust plans based on training and exercises as well as actual evacuations. Since each evacuation or training event may have unique circumstances, capturing lessons learned and best practices and applying them to improve evacuation plans is critical.

Evacuation preparedness involves a range of deliberate, critical tasks and activities necessary to build, sustain, and improve the operational capability to execute and support evacuation operations. It involves efforts at all levels of government, as well as between government and private sector and nongovernmental organizations, to identify threats, determine vulnerabilities, and identify required resources.[3] Essential resources should be identified during the planning phase. Projected needs should be coordinated in advance, including the necessary process to acquire these assets when needed. Activities during this phase include inventorying both private and public sector resources that may aid the evacuation process. Training and exercise activities are essential during this phase to ensure that EOT and EOC staff know their roles and responsibilities by rote when activated. The "Components of an Effective Evacuation Plan" section of this primer provides a list of questions that should be considered when developing an evacuation plan.

Developing the Evacuation Plan

The most important activity to ensure successful evacuations is development of an evacuation plan that complements a jurisdiction's emergency response plans. While the end product might be a document that publishes the jurisdiction's intended plan of action, the process and the maintenance of the plan are just as important. Key plan preparation activities include:

- Convening the appropriate stakeholders to develop a plan
- Identifying tools that may need to be acquired or developed to execute the plan
- Building capacity and training/exercising the EOT
- Acquiring or pre-identifying key equipment and supplies
- Establishing agreements for supplemental support (e.g., mutual-aid agreements)
- Coordinating plans with regional, corridor, and State stakeholders

[3] Adapted from the National Response Plan definition. P. 71.

GOOD PRACTICE

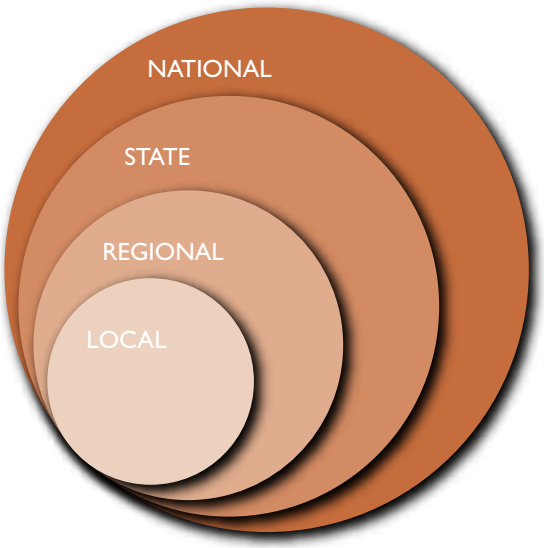
Establish a multi-disciplinary Evacuation Operations Team (EOT) to be called up to organize and execute tactical evacuation operations. This team will include police, fire and emergency medical personnel, highway workers, public information specialists, emergency managers, mass care specialists, political decision makers, and others as appropriate. The EOT will collect and maintain 24/7-contact information, and periodically train and exercise the team. Team members may be from public, private, or volunteer sectors.

- Establishing a process to continually review and update plan contents and changes with stakeholders, and adjust preparedness activities as appropriate
- Developing the evacuation plan.

Each evacuation plan should be locally relevant meeting the specific needs of a community. Yet it should be flexible enough to fit within the network of plans of neighboring jurisdictions, and States, and at the National level. This may include coor dinating highway corridor-specific plans that transcend political jurisdictions and come under a multi-organizational group. Such groups include the I-95 Corridor Coalition along the east coast and the Metropolitan Council of Governments in the National Capital Region, both of which played a vital role in the evacuations on September 11, 2001.

The use of the highway system should be one of the constant factors in any evacu ation plan and may be key to any successful evacuation operation. Most evacuations occur within a jurisdiction and do not require external support. However, as illus trated in Figure 2, while the decision to evacuate usually originates at the local level, it often has a ripple effect that extends many miles beyond a town's borders. A decision to evacuate one jurisdiction will place additional burdens on the resources of adjacent jurisdictions. Emergency preparedness planning in these areas must be as robust and synchronized as those in the area evacuated. By its very nature, the highway system is a shared resource of multiple cities, States, and regions of the country.

Figure 2. Areas Affected by Evacuation Plans



USING AN EVACUATION CONCEPT OF OPERATIONS (CONOPS) AS A FOUNDATION

In planning for evacuation operations, emergency managers, transportation officials, and other stakeholders should use a common CONOPS as an organizational frame work that clarifies stakeholder roles, coordination processes, and common actions or considerations in various operational phases. The evacuation CONOPS should complement the one used by the emergency management community to plan for multi-functional responses to disasters and emergencies. The use of the CONOPS aids evacuation planners in developing plans and coordinating all evacuation plan ning and operations with multiple stakeholders at various levels, including emergency management, public safety, and other readiness and response operations personnel.

In its simplest form, a CONOPS is a "who, what, where, when, how, and why" document.

- Who will perform the task?
- What task will be performed?
- Where will the task be performed?
- When will the task be performed?
- How will the task be performed?
- Why does the task need to be performed?

Many different players from diverse organizations—depending upon authorities, assets, and knowledge—will represent the transportation function in designing the CONOPS. In short, the CONOPS should lay the foundation for any complex plan ning process, including the development of the response and evacuation plans.

To develop a CONOPS for evacuation planning, the highest political authority over a local government, region, or State should designate an agency to lead the plan ning effort and convene a panel of the heads of other local or statewide agencies including transportation to develop a strategic plan. Participants should identify all activities that must occur and the resources needed by each agency to accomplish their assigned tasks. A clear statement of the responsibilities and authority of the roles of each primary and supporting agency should be identified. Throughout this process, information collection, analysis, coordination, and dissemination are vital as strategic and contingency evacuation planning occurs.

It is impossible to prescribe a standard process to develop an evacuation CONOPs since no two jurisdictions have the same political structure. For instance, in one state (e.g., in Maryland), the DOT may have licensing agencies and transit authorities within

GOOD PRACTICE

Perform an annual joint field review (transportation and law enforcement personnel) of all evacuation routes to check:

- Roadway and cross-over condition
- Condition of pavement markings
- Evacuation route and shelter signs posted
- Condition of flip-down signs
- Condition of ramp gates
- Condition of drainage facilities
- Status of roadway construction
- Condition of traffic signals
- Condition of ITS including VMS and HAR
- Condition of rest areas

its organization. In another State these agencies may be housed outside of the DOT (e.g., in Florida). A State DOT may have access to its own debris removal equipment, but more importantly, may have contractual agreements with private entities to perform such work. The statewide DOT will likely have VMS under its control, but also may have contractual agreements with private companies that can supply additional VMS for rural routes. The identification and availability of buses for mass transit and the identification of transportation-dependent individuals all may lie within multiple agencies. Individual agency operations and how they should accomplish assigned tasks, the day-to-day specificity natural to any discipline, will often be contained within annexes to the CONOPS.

The Importance of Continuity of Operations (COOP) and Continuity of Government (COG) Planning to Evacuations

In addition to the CONOPS, each State should maintain and update its contingency plans, particularly its COOP and COG, to ensure that essential services continue to be provided following an event. A catastrophic event may cause considerable damage to a government's infrastructure and disrupt operations, including transportation services. Redundant systems must exist to allow any operation to continue should the designated EOC or TMC be uninhabitable. The transfer of authority, leadership, resources, and information should be seamless and planned for well in advance of a major event. A jurisdiction's and agency's laws and regulations should include an order of succession. By making all stakeholders aware of these orders of succession, leadership can continue unimpeded during the event. It is critical that the transportation community be involved in COOP and COG planning, since a failure to plan for continuing transportation and traffic management services following a catastrophic event would impact a jurisdiction's ability to perform evacuation operations.

Evacuation Route Planning

Although specific evacuation routes cannot be finalized until the geographic scope of a natural or man-made disaster is determined, the use of evacuation routes can be planned in advance and analyzed for continued viability during the operation. Planners should identify routes that have a high probability and feasibility of use considering their survivability, ease of restoration, functional service, and strategic location. Planners should also analyze potential bottlenecks, barriers, scheduled work zones, and other potential problems in advance to determine an evacuation route. Control points can be planned, ensuring sufficient staging capacity for emergency services, crossovers and turnarounds for contraflow, and ingress to affected areas. Planners must determine highway capacity—or the number of vehicles that can pass a certain point on the highway in a specified period of time under prevailing road and traffic conditions. Planners must also consider transit vehicles evacuating those with special

needs. Planners must use accurate census data combined with vehicle ownership data to provide an approximation of the number of road users during the evacua tion. However, planners cannot simply determine the number of people and vehicles to be moved, divide by the highway capacity, and determine the amount of time needed to evacuate an area. Planners must produce spatial and temporal distribution models, plan for traffic incidents, and take into account human nature. For example, many people may be away from their homes and need to commute against traffic to reach home and gather their families and belongings before they begin to evacuate. Conversely, "shadow evacuations" occur when people decide to evacuate prior to notification or choose to evacuate even when they are not in harm's way. Rather than providing a benefit to planners by significantly reducing the number of people that need to be moved at the time of notification, this group may reduce the antici pated carrying capacity of the highway system in advance of the notification.

Disaster preparedness is an exercise in behavior modification, for the public as well as governmental agencies. People evacuating tend to use the routes most familiar to them, and have a preconceived notion of how long it takes to negotiate the route. Many transportation agencies have conducted travel-time reliability studies for existing infrastructure. In other words, people know, "on average," how long it should take to drive a given route at a given time. Planners should take into account human nature when dispelling these preconceived notions during a time of crisis and communicating changes frequently and by a variety of means available to the trav eler in all stages of their movements. Alternate routing and associated travel times must be well communicated continually during preparedness exercises. Early road planners built systems to provide easy access to a centralized hub. Many provided a beltway around the city as a bypass route and connector to other major arterials. The purpose of an evacuation is to move people away from the incident or potential "danger" zone. However, planners may find that an initial movement towards the incident will serve as a means to access major arterials, and may be the most effective way to move large volumes of traffic. Modifying behavior may be the most difficult task facing emergency managers.

In July 2006, the Harvard School of Public Health conducted a High-Risk Area Hurricane Survey of 2,029 adults in Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Texas. The transportation-related questions and results are shown in the text box.

There were a number of reasons cited in the Harvard study of why people would not evacuate, and some were transportation related including people who do not have a car or know anyone who could give them a ride (12 percent), evacuating could be dangerous (36 percent), and roads too crowded to leave (54 percent).

HIGH-RISK AREA HURRICANE SURVEY RESULTS

If you had to evacuate because of a hurricane:

To where would you evacuate?

- Friends/family – 56%
- Hotel/motel – 18%
- Shelter – 12%
- Sleep in car/outdoors – 1%
- Don't know – 11%

How far would you go?

- > 10 miles – 6%
- 10-40 miles – 11%
- 50-100 miles – 15%
- 100-200 miles – 21%
- 200+ miles – 36%
- Don't know – 11%

How would you get where you were going?

- Your car – 91%
- Friend's car – 3%
- Public transit – 4%
- Walk,bike – 1%
- Don't know – 2%

SAMPLE PLANNING ACTIVITIES

- Developing and maintaining evacuation plans
- Identifying those who will be involved in the evacuation and developing 24-7 contact lists and protocols
- Coordinating in advance, acquiring tools to make rapid and appropriate evacuation decisions
- Equipping, training, and preparing those who will execute evacuations
- Developing pre-scripted public service announcements and informing the media on how to use them

ITS, described in detail in the "ITS Equipment to Aid Evacuation" section of this primer, should be used during planning efforts to identify vulnerabilities in the transportation system in order to adopt strategies as countermeasures to these vulnerabilities. ITS includes the set of technologies that are used on a day-to-day basis to collect and disseminate transportation-related information between vehicles, the roadway, the environment, transportation system managers, and system users. During the course of the event, ITS can be used to monitor the progress of the evacuation and as a tool to direct resources to problem areas. To achieve the maximum benefit from ITS tools, ITS must be extended throughout the evacuation route to the point of sheltering.

The use of modeling and analysis tools can provide planners with a means to apply different disaster-related scenarios to an event, thereby providing the opportunity to develop alternative means to evacuate. Although there are a number of modeling and analysis tools available, none are robust enough at this time to provide real time information during an event. Modeling tools are discussed in the "Evacuation, Weather, and Assessment Monitoring and Prediction Tools" section of this primer.

Once the evacuation plan is developed, it must be communicated to the public so that they know what to do when an evacuation order is given. They must know what to take with them when they evacuate, what highway routes to use for evacuation, the locations of nearby shelters, and alternate means of evacuating if they have no vehicle or have special transportation needs. It is not enough to just distribute the information; agencies need to ensure the information is well understood by the public. The City of New York published a new Coastal Storm Plan for hurricanes in August of 2006. The plan and a Geographic Information System (GIS) evacuation zone map were distributed to all residents in the designated hurricane evacuation zones, which are based on the likelihood of storm surge impact. The brochure "Ready New York: Hurricanes and New York City" explains the plan and is posted in 11 languages on the New York City Office of Emergency Management website and is also available in an audio format. However, despite the City's widespread outreach, many residents were unable to identify the evacuation zone they lived in or how to get to the evacuation center closest to their home according to a survey of 178 residents, both English and Spanish speakers, in the evacuation zones, conducted by the Mount Sinai School of Medicine. Many of the individuals surveyed have limited education and this must be taken into account when preparing and distributing information for the public on evacuations.

Coordinating Plans and Needs with Regional, Corridor, and State Partners

Local evacuation plans must be coordinated with neighboring jurisdictions since they may be impacted by any decision to evacuate an area. Jurisdictions need to mutually understand each other's plans and role and resource expectations to work together smoothly. Their assistance may be needed to execute the evacuation. Local plans also

should be shared with the State, as local government may need to request State resources to assist with an evacuation. Similarly, State plans should be coordinated with neighboring States, as evacuees may travel to another State to seek shelter or mutual-aid may be requested from another State.

In addition to the planning conducted by existing organizations and networks, some jurisdictions may consider establishing and activating EOTs to organize and execute tactical evacuation operations. Whether a stand-alone organization, or a subset of personnel from an existing working group, an EOT should work with transportation officials and emergency managers throughout the planning process on activities such as:

- Developing Standard Operating Procedures (SOPs) for communication among EOT members and the EOC during an evacuation event. This may include how the TMC should work with the EOC if located separately.
- Working with government and private sector representatives to pre-identify staging areas, points of departure for mass transit, evacuation routes, and reception areas.
- Reviewing existing evacuation and emergency management plans across agencies to identify gaps and opportunities for the EOT to assist.
- Participating in regular evacuation-related training and exercise activities.
- Adapting ITS and other transportation tools to handle specific evacuation operational functions.
- Identifying additional assets and partners to provide support during evacuations, and establishing mutual-aid agreements as needed.

ESTABLISHING AGREEMENTS FOR SUPPLEMENTAL SUPPORT

Supplemental support can take many forms, but the most well-known, local-to-local agreement is the mutual-aid agreement. Every jurisdiction should engage in a mutual-aid agreement with each jurisdiction from which they expect to receive or provide support during an incident. Jurisdictions might sign mutual-aid agreements with surrounding jurisdictions, as well as relevant private sector and non-governmental organizations. Additionally, States should look into creating interstate compacts that encompass all local jurisdictions.[4]

[4] NIMS. March 1, 2004. Pages 39-40.

TRAINING DEFINITIONS

Training: A process to learn a new skill or job. Training can be accomplished through classroom instruction, coursework, independent study, on-the-job training, and exercises.

Exercise: Practice situations to improve skills and procedures.

Tabletop Exercise: An exercise conducted in a seminar format that allows senior leaders and staff to examine and discuss issues in a controlled environment.

Full-Scale Exercise: An exercise that fully implements a plan or process.

ICS RESOURCES:

"ICS 100 Training," "ICS 200 Training," "Introduction to NIMS," and "Introduction to the NRP" are available at: http://training.fema.gov/EMIWeb

"Simplified Guide to the Incident Command System for Transportation Professionals" (FHWA/DOT) is available at: www.ops.fhwa.dot.gov/opssecurity/index.htm

Mutual-aid agreements should contain the following provisions:

- Definition of key terms used in the agreement
- Roles and responsibilities of individuals and contact information
- Procedures for requesting and providing assistance
- Procedures, authorities, and rules for payment, reimbursement, and allocation of costs
- Notification procedures
- Protocols for interoperable communications
- Relationships with other agreements among jurisdictions
- Workers' compensation
- Treatment of liability and immunity
- Recognition of qualifications and certifications
- Sharing agreements, as required.

Although traditional mutual-aid agreements have not covered transportation support, jurisdictions can look to their neighbors to provide facilities such as alternate TMCs, ITS equipment, highway technical assistance, support for motorist assistance or TIM programs, and transit vehicles including those for people with special needs.

The State may supplement intra-state mutual-aid from a nationwide system whereby States are provided needed support on a State-to-State basis through EMAC. All states participate in this compact, which evolved from the Southern Governor's Compact established as a corrective action following the Hurricane Andrew response operations in 1992. Advance coordination of potential evacuation support needs may be accomplished through EMAC via the State Emergency Management organization.

Training and Exercising

Effective response teams, particularly those that include members that do not work together on a day-to-day basis, must build an effective training and exercise program. Most individuals on an EOT should be familiar with the ICS, including its use as an organizational tool and its standardized terminology. However, others on the EOT—including transportation professionals, volunteer organizations, and private sector team members—may not be accustomed to the ICS tool. Since many on the EOT come from a variety of different organizations, they need a common framework and opportunities to train and/or exercise together. As a part of the orientation of all

TRAINING DEFINITIONS (CONT.)

- Computer-Assisted Exercise: Exercises designed to incorporate simulations and to train leaders without the manpower requirements of a full-scale exercise.
- Hot Wash: A facilitated discussion immediately after a training event or exercise in which training audience members discuss issues and lessons learned and begin the process of incorporating change.

EOT members, a lesson on ICS should be given as part of the preparedness phase, and should be integrated into evacuation planning. There are a variety of resources that EOT members may access to develop this knowledge as noted in the text box. Evacuation planners that conduct training and exercises as an established and regular part of the process, find that these events enable members of the EOT to learn to work together in a non-emergency environment, developing the knowledge and trust they need in one another to effectively operate as a team during an emergency.

Figure 3. Phases of Evacuation Operations

SAMPLE OPERATIONS ACTIVITIES

- Communicate evacuation order
- Communicate decision with regional and State stakeholders including sheltering organizations
- Implement the evacuation plan
- Provide transportation for those with special needs
- Coordinate efforts among multi-disciplinary staff
- Monitor real time traffic information and adjust evacuation operations as the environment changes
- Deactivate personnel at the conclusion of Tier I Operation, reactivate as needed for Tier II Operations

Evacuation Operations from the Transportation Perspective

This primer presents actions to take and transportation-specific considerations related to Evacuation Planning and Preparedness as well as each Evacuation Operational Phase. Due to the many activities occurring and the number of players involved in a well-orchestrated response, the activities associated with some phases may overlap depending on the situation of a particular evacuation.

Evacuation Operations Phases, shown in Figure 3, may be defined as follows:

Readiness: This phase of the evacuation operation occurs when information becomes available that an event may occur where evacuation—and the scope of the evacuation—must be considered. This could come days or hours before an event. Initial information alerts may include the issuance of a Hurricane Watch by the National Hurricane Center, or information about a wildfire that starts or moves closer to a population center.

STAKEHOLDERS AS INFORMATION PROVIDERS		
	Weather services and organizations monitoring threats (e.g., NOAA/NWS and local weather sources; USGS Planners with demographic and GIS data (e.g., U.S. Bureau of Census; Convention/Visitors Bureaus; Flood Zone Maps)	Risk analysts (e.g., flood insurers, those with plume model capabilities [local Fire Department or Environmental Department], schools, colleges, and universities) Local health departments Human service agencies Transit agencies

Activation: This phase of the evacuation operation involves activating those who should execute the plan and perform essential coordination with responders and impacted jurisdictions. Officials should declare a voluntary, recommended, or mandatory evacuation and specify the geographic areas to be evacuated. Officials should also determine whether the evacuation will be performed in phases. At this point, the public should receive initial information that an evacuation may be ordered.

Operations: This phase of the evacuation operation consists of the implementation of all actions required to safely remove individuals from harm's way, provide shelter and comfort, and return these same people to their point of origin. During this phase, government officials should issue evacuation orders and direct the EOT to execute the evacuation plan and provide support to those being evacuated. Generally, this phase encompasses two distinct types of operations with different objectives and at different times:

- Tier I Evacuation Operation - To safely evacuate people from a potentially unsafe environment. The first tier involves ensuring the orderly movement of evacuees to designated reception sites beyond harm's way, and usually occurs within 6 to 72 hours.
- Tier II Evacuation Operation - To support the return of evacuees to their point of origination once it is determined to be safe to re-enter the community. The second tier operations may be conducted over days or even months in the case of a mass evacuation for a catastrophic event. Public officials—including utilities, health and medical, and public safety officials—should analyze information and determine when communities may be permitted to return to their points of origin.

All stakeholders follow the evacuation plan at this point. Evacuation personnel work together on the ground with public safety, emergency management, and other responders, and coordinate with their liaison at the local EOC for information, support in handling unanticipated problems, and contingency plan implementation.

Return-to-Readiness: At the conclusion of the operation, evacuation personnel undertake actions to return personnel and systems that executed the evacuation to a point of readiness to conduct future evacuations. One key activity involves gathering planning partners and stakeholders to prepare an After-Action Report (AAR) to identify problems and successes that occurred during evacuation operations. Planners incorporate these lessons learned and best practices into the evacuation plan and share them with colleagues. Plans, agreements, and training are adjusted as appropriate based on these reviews.

STAKEHOLDERS AS INFORMATION PROVIDERS (CONT.)

- DOT (U.S., State, local)
- Traffic incident management entities
- Forest/park services for wildlife/urban interface issues and visitor data
- Hazardous materials responders
- Public school system
- Hotel/motel association

The following information discusses the general actions at each operational phase, as well as transportation-specific activities, considerations, and capabilities that may be used to contribute to successful evacuation operations.

OPERATIONS: READINESS PHASE

During the readiness phase, information becomes available that an incident has occurred or is anticipated that may require an evacuation. That information must be relayed as quickly as possible to the decision makers so that they can determine whether an evacuation should be ordered.

Stakeholders critically involved in the readiness phase may be viewed as:

- **Decision Makers** - Usually only one political authority with the power to make the ultimate decision to evacuate one or more areas
- **Decision Influencers** - Factions with a political, social, or economic stake in decisions to evacuate
- **Information Providers** - Those that have information that may ultimately be used to make a decision whether to evacuate.

It is important that these partners are identified and know their roles—and limitations—in the evacuation decision-making process.

As the event moves from theoretical planning and preparedness to this first opera tional phase, authorities rely on information—fast, reliable, and in usable form—for making decisions and designing operational and tactical response plans specific to the event. Information plays an especially critical role in evacuation readiness efforts. Transportation officials act as information providers to the decision makers. Information should be collected from official sources to ensure reliability. It should be readily available, interpreted, and continually collected during all phases of the evacuation operation. All event-specific plans should be updated as new information becomes available. The agencies listed in the box may be tapped for demographic data; meteorological data; geographic data; and transportation, transit, and traffic data, all of which can support the development of a good evacuation plan and evacuation decision-making. Modeling tools – including decision support tools – may be used to obtain information that can assist planners in providing the impact areas of some events such as hurricanes or airborne hazardous materials releases. Some of these tools are described in the "Evacuation, Weather, and Assessment Monitoring and Prediction Tools" section of this primer.

Reliable baseline data should have been collected and continually updated as a part of a jurisdiction's preparedness efforts. At this point in the operation, baseline data is essential to a good evacuation strategy. For example, decision makers and evacuation

SAMPLE READINESS ACTIVITIES

- Alert key personnel, resources, and reception sites by EOC or other watch staff monitoring the event
- Review plan and checklists
- Begin pre staging or deploying evacuation operations personnel and assets (e.g., fueling vehicles including buses or preparing VMS signs and 511 messages)
- Collect and analyze real time information including traffic data
- Confer with stakeholders
- Provide initial information to the public
- Put pre identified, multi disciplinary EOT on call

operations personnel need to know how many people must be evacuated from a specific geographic area and the highway routes available for their evacuation in order to calculate the time needed to execute an evacuation. Planners should consider that some people will decide to evacuate their families using multiple vehicles to prevent damage to vehicles if left at home. This behavior was observed during the evacuation for Hurricane Rita in 2005, and the additional vehicles contributed to the roadway congestion. Therefore, planners should consider not only the number of people to be evacuated, but also the number of vehicles.

Since many disaster-vulnerable areas are also tourist locations, elements of non-resi dent populations need to be factored into evacuation plans during the readiness phase. Public school management should also be involved so that if a disaster strikes when schools are open, the plan includes ensuring the safety of students as well as the school's role as local shelter, feeding site, and supplier of school buses for evacuation.

As emergency managers monitor emerging situations, certain points may be reached that should trigger the movement of decision makers and emergency team members to the EOC to facilitate coordination, information management, and decision making. At this juncture, the decision makers should receive information, options, and recom mendations based on the best-available information, and emergency managers should develop an evacuation tactical plan. In developing this evacuation strategy, organiza tions may use a step process and a "countdown" timeline to decide if and when they will evacuate an area based on collected information and what steps should be taken at critical times. This process also may be used for the recovery period after an event has occurred. At each key timeline point, the evacuation plan should address steps to take and agency assignments by task.

Many factors affect a decision to evacuate an area. Foremost is the potential danger to lives and property. Officials need to know about the severity of the potential danger so they can make informed decisions about whether or not to evacuate an area. Of course, the officials must have the legal authority to order and enforce an evacuation. While, ultimately, a single official is responsible for and has the authority to order an evacuation, that person seeks information and recommendations from many sources depending on the nature of the event causing the potential evacu ation. Emergency planners, first responders, transportation technical professionals, and others contribute information and recommendations about their readiness to support an evacuation. Among the recommendations provided to decision makers should be the type of evacuation the situations warrants. Evacuations are classified as one of three types:

- **Voluntary** - Targeted toward people most vulnerable to the threat including offshore workers, persons on coastal or barrier islands and other flood-prone areas, and other special populations having particularly long lead-time evacuation

requirements. This also includes people in harm's way from other events. No special traffic control or transportation measures are usually taken during voluntary evacuations, and people may remain if they so choose.

- **Recommended evacuations** - Issued when an event has a high probability of causing a threat to people located in at-risk areas. Again, decisions of whether or not to leave are left to individuals, and some special transportation arrangements are made.
- **Mandatory evacuations** – Issued when authorities put maximum emphasis on encouraging evacuation and limiting ingress to potentially impacted areas. This type also occurs when evacuation transportation plans go into effect. Mandatory evacuations are difficult to enforce as many people resist being ordered by government officials to leave their homes and property.

Ordering an evacuation is one of the hardest decisions that anyone can make. The decision could put people in harm's way from other events, cause emotional and physical distress to those at risk, cost the community considerable money, and open the evacuees to looters and other security issues. As a result, decision makers, deci sion influencers, and information providers collectively must deem the decision to evacuate outweighs other risks. To weigh this balance, the decision process should address the following items, at a minimum, to determine whether to evacuate, what areas to evacuate, when to evacuate, conditions of evacuation, resources needed to evacuate people, and how to evacuate.

✔	EVACUATION DECISION CONSIDERATIONS	INFORMATION SOURCE
	Probability of impact (depending on nature of event)	National Weather Service (NWS), DHS, local fire officials, etc. depending on nature of event
	Estimated effects – geographic area to be evacuated	Impact models
	Timing of event	EOC
	Lead time for an evacuation	Evacuation models and DOTs
	Timing of notifications/orders	EOC
	Weather conditions	NWS
	Economic impacts to government and private sector	Impact models and Chamber of Commerce
	Condition and availability of evacuation routes	DOTs

✔	EVACUATION DECISION CONSIDERATIONS	INFORMATION SOURCE
	Evacuation decision by neighboring jurisdiction	EOC
	Number of tourists to evacuate	Convention/Visitors Bureau
	Number of transit dependent to evacuate	Transit Agency and Human Service Agencies
	Number and type of people with special needs to evacuate	Transit Agency and Human Service Agencies
	Populations potentially impacted	Impact models
	Availability and safety of personnel to support an evacuation	Human Resource Departments
	Vulnerable transportation infrastructure or potential transportation targets identified	DOTs
	Selection of staging areas that may include transportation facilities	DOTs
	Ability to stage transportation assets for movement of those who cannot self-evacuate	DOTs, Transit Agencies and Human Service Agencies
	Ability to coordinate traffic control devices	DOTs
	Plan for shut down of highway work zones, non-essential commercial vehicle traffic including oversize loads, hazardous materials, etc.	DOTs
	Process to suspend toll collections on public and private toll roads	DOTs and Toll Road Operators
	Ability of TMCs/TOCs to move into evacuation readiness status	DOTs
	Ability to implement contraflow if required	DOTs and Highway Patrol
	How to evacuate while enabling incoming response personnel, equipment, and supplies	DOTs and Highway Patrol
	Transportation resources available to conduct evacuation and move evacuees, including availability of assets through State (e.g., National Guard), mutual-aid, or regional agreements	DOTs, Highway Patrol, and EOC

✔	EVACUATION DECISION CONSIDERATIONS	INFORMATION SOURCE
	Number of first responders in impact zone and whether they can move their families out of affected areas before reporting for duty	Human Resource Departments
	Location of shelters/reception sites	EOC
	Ability of planned shelters/reception sites to receive evacuees	EOC
	Potential for reimbursement of evacuation costs	State EMA and FEMA

OPERATIONS: ACTIVATION PHASE

In the Activation Phase, decisions should translate into action. Personnel should be mobilized and the field infrastructure should be established, with evacuation personnel making contact with and linking into the incident command infrastructure. Assets, including human resources, should report to staging areas to await the order to begin the evacuation operation. Equipment should be taken to pre-determined locations, including VMS, food and water for the evacuees, gasoline tankers, mechanic crews, and others that may be staged along the pre-designated evacuation route. Operations centers should become fully functional. All of this should be accomplished to prepare for the imminent evacuation operation.

Once the decision to evacuate has been made, emphasis should switch to activities conducted and monitored at Incident Command Posts. This stage involves:

- Activating EOTs and support organizations
- Establishing field capabilities (including establishing a unified command structure at the incident command post or TMC, pre-staging equipment and personnel)
- Coordinating plans and needs with regional, corridor, and State partners
- Activating reception plans, sites, and support capabilities with volunteer or public organizations
- Activating evacuee return resources if the duration of the evacuation is expected to be short.

SAMPLE ACTIVATION ACTIVITIES

Activating EOT

Identifying specifics of evacuation plans, including:

What areas will be activated?

What type of order will be issued?

Will evacuation be phased?

When public will be notified?

What ITS resources can be used?

Communicating decision with public safety officials, EOT, and sheltering organizations

NOTE: REMEMBER THE TECHNICAL SPECIALISTS!

Technical Specialist may come from the following fields of expertise:

- Meteorology
- Environmental impact
- Resource cost
- Flood control
- Water use
- Explosives
- Structural engineering
- Firefighting
- Health care
- Pharmaceutical

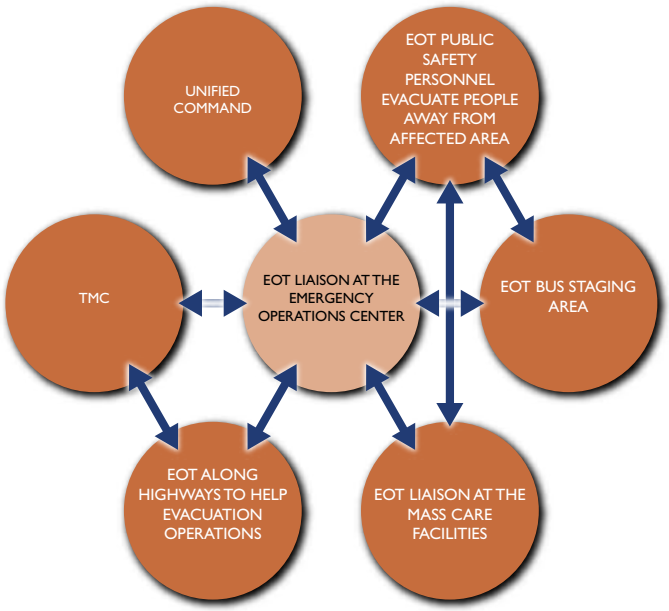
METHODS OF ALERTING AND ACTIVATING EVACUATION PERSONNEL

- Telephone tree or call down list to notify all agency personnel (contains phone numbers for office, home, pagers, cell, and fax, and e-mail address)
- REVERSE 911® call system to notify police, firefighters, etc.
- Blackberry, two-way Nextel phones and mobile text messages
- E-mail alerts
- Notifications through parent organizations' call centers
- Agency radio systems to reach those who may be in the field
- Media announcements to report to EOC or other assigned work location

Redundancy Gets Results!

Figure 4 depicts the complexity of the communications necessary during an evacuation. The Incident Commander retains the overall responsibility for the evacuation, but other EOT personnel in the EOC and in the field need to coordinate and communicate to ensure the safety and efficiency of the evacuation process.

Figure 4. Evacuation Communications and Coordination



ACTIVATING EVACUATION PERSONNEL

As a part of the planning process, jurisdictions should establish an activation team that can coordinate evacuation orders and operations. Local emergency managers should develop and maintain a 24-hour contact list for these personnel at the EOCs. As local emergency managers monitor an impending situation and provide information to the decision makers, they also must keep the evacuation team informed of the status of the impending event and decisions being made related to potential evacuation orders – before they are communicated with the public. When a decision is made to activate personnel in advance of an event, the necessary transportation personnel must be alerted and given time to communicate whether they can assume their station (e.g., if their family is in the path of the storm or will be among the evacuees). When evacuation team members, and their families, are the subjects of an evacuation order, it may be necessary to rely upon mutual-aid agreements to provide additional team support from unaffected areas.

Veterinarian

Agriculture

Toxic substances

Radiation

Intelligence

Infectious disease

Biological, chemical, or radiological decontamination

Law enforcement

Legal

Industrial hygiene

Transportation

NOTE: REMEMBER THE TECHNICAL SPECIALISTS! (CONT.)

There are a variety of ways to notify evacuation personnel, from the basic phone trees to more technology-based methods. The key is to build redundancy into the system so that multiple communications methods are used to ensure rapid results.

Activated personnel need information to respond appropriately. An agency's SOPs should provide basic information. However, depending on the nature of the inci dent, personnel may need more detailed, specific information (e.g., to report to an alternate work location, to bring clothing if they are to be away from home for an extended period of time, and the supplies and equipment they need to bring, as well as other information to ensure they are properly prepared).

Some scenarios require deployment of ***technical specialists***, personnel with special ized skills or specific certifications or degrees who are called upon in situations where required capabilities are beyond those of standard evacuation personnel. Specialists may serve anywhere within the ICS—the board rooms of the political executives; the local, State or regional EOC; the Incident Command Post; the TMCs—and typically perform tasks similar to those of their daily jobs.

Establishing Field Capabilities

After activation, the experts should report to various locations. Those who collect and analyze information or develop contingency, strategic, or operational plans should report to the local EOC. Those who develop incident action plans or execute the evacuation should report to a variety of field sites. While EOT members usually are not responsible for establishing the field operations infrastructure, they should be aware of what it is, who sets it up and manages it, and the role it plays in a consoli dated response operation.

First responders use the ICS as a standardized, on-scene, emergency management tool. The system provides an organizational structure that integrates many different disciplines and activities (including the evacuation operation) depending upon the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. ICS involves the combination of facilities, equipment, personnel, procedures, and communications that should be applied to an incident. Within the ICS structure, local incident commanders may fold State and Federal resources into the response. Transportation personnel should operate within the ICS structure during an evacuation.

Some incidents, particularly those with very complex operations, call for a Unified Command, which is established in response to a multi-jurisdictional incident – when more than one agency has incident jurisdiction or when an incident crosses multiple jurisdictions. Unified Command (UC) "allows agencies with different legal, geographic, and functional authorities and responsibilities to work together effectively without

EMERGENCY MANAGERS SUPPORT THE EVACUATION BY:

- Collecting, analyzing, and disseminating information on the evacuation operations
- Coordinating EOT incident action plans and needs with other stakeholders, including neighboring jurisdictions, the State, other transportation planners, and mass care providers
- Integrating EOT plans into other response plans and activities
- Communicating the evacuation order to the public
- Supporting the evacuation process

GOOD PRACTICE

Advantages of Using Unified Command

- Develops a single set of objectives for the entire incident
- Uses a collective approach to develop strategies to achieve incident objectives
- Improves inter jurisdictional and inter agency information flow and coordination
- Ensures that all responsible agencies understand joint priorities and restrictions
- Won't compromise or neglect any agency's legal authority
- Optimizes combined agency efforts under a single Incident Action Plan

affecting individual agency authority, responsibility or accountability."[5] Evacuation team members will likely encounter a Unified Command structure when response operations and the evacuation cross jurisdictional lines and are executed in anticipation of or response to a major or catastrophic event that impacts thousands. A Unified Command structure for an EOT may include a leader from the law enforcement, transportation, mass care, fire and rescue, and emergency medical services areas.

Once the field organization is established (either at an incident command post or at a local EOC), the EOT Leader should review tactical plans with the assembled team including:

- Ensuring information reaches the target group
- Enforcing the evacuation
- Identifying evacuation route plans, including the routes that should be designated for ingress traffic
- Pre-staging equipment and personnel along the evacuation routes
- Identifying the location of shelters including shelters for those with special needs, pets, etc
- Designating pick-up locations for the transportation-dependent
- Coordinating procedures with surrounding jurisdictions.

After development of the tactical plan, the EOT should make resource allocation decisions. These may include:

- Teams to notify residents and ensure their evacuation
- Contracting teams to secure conveyances for transit-dependent or special needs populations; animal handling teams
- Road crews with VMS and maintenance equipment
- Vehicle maintenance teams with gasoline tankers and vehicle maintenance tools and parts staged along the major egress route
- Emergency medical staff and first aid, Basic Life Support and Advanced Life Support equipment staged along the evacuation routes or attached to those working with special needs populations
- Debris removal crews to rapidly clear blocked highways

[5] NIMS. March 1, 2004. Page 12.

- Sanitation crews with mobile comfort stations (e.g., portable toilets, wash area)
- Volunteer agency personnel with food, water, other life support items, and information on shelter availability to aid evacuees as well as those supporting the evacuation

Personnel deployed to various staging areas receive information on the date, time, and place of departure; mode of transportation to the incident; estimated date and time of arrival; reporting location; anticipated assignment; anticipated duration of deployment; resource order number; incident number; and applicable cost and funding codes. Once at the incident, personnel must check in, starting the on-scene in-processing. Notification that the resource has arrived is looped back through the system.

Developing Event-Specific Evacuation Incident Action Plans and Coordinating Plans and Needs with Partners

Developing and Coordinating Evacuation and Other Incident Action Plans (IAPs)

It is critical to coordinate local evacuation IAPs with the designated incident commander in the field and the EOC. They, in turn should coordinate the evacuation IAPs with neighboring jurisdictions and the State since they may be impacted by any decision to evacuate an area. The State should share consolidated evacuation plans with neighboring States as evacuees may travel to other States to seek shelter, or mutual-aid may be requested from another State. The neighboring jurisdictions need to understand local plans and their expected role and resources in supporting them. Their assistance may also be necessary to execute the evacuation.

The evacuation IAP should factor in information on evacuee reception plans, shel ters, and the location of other support capabilities, such as motorist assistance teams and comfort stations. These should be shared with the Incident Commander, the EOC and volunteer or other organizations supporting the evacuees. The EOT is not responsible for establishing and operating shelters, but must know where they are located and where evacuees are being accepted. The EOT should obtain updated information frequently and communicate this information to the evacuees throughout the evacuation process.

Evacuees must be able to access shelter locations that serve basic human needs such as food, water, sanitation, and lodging. The EOT should obtain information on those shelters established to address those with medical needs and/or pets as well as those with limited English proficiency. Most EOC operations have a person responsible for shelter data. The EOT can access shelter information through that source or a mass-care liaison at the Incident Command Post. Field personnel conducting the evacuation must have up-to-date shelter information to direct evacuees to the correct locations.

SAMPLE OPERATIONS ACTIVITIES

- Activation of required personnel
- Activation of EOC and TMC
- Notification of evacuation to regional and State stakeholders including sheltering organizations
- Deployment of personnel, equipment, and supplies to designated locations to support evacuation
- Communication of evacuation order to the public and the media and posting on agency websites
- Acquisition and deployment of transit resources to aid in evacuation
- Acquisition and deployment of other transport modes if needed
- Accommodation of special needs evacuees
- Accommodation of pets on transport vehicles and in shelters

Organizations establishing shelters often establish a disaster welfare inquiry system. Many locations use a 211 or 311 telephone number for such shelter information to prevent overburdening the 911 system and ensure its availablity for true emergencies.

OPERATIONS: OPERATIONS PHASE

Once a decision to execute an evacuation has been made and the EOT has been given orders to proceed, public officials must turn to the emergency management infrastructure to provide support to the EOT. Decision makers should continue to monitor the environment and the evacuation operations throughout and adjust orders based on up-to-date information.

The Operations phase involves two separate components. The first is aiding evacuees in their exodus of an area. The second is helping to facilitate their re-entry, allowing them to return to their homes and work as quickly as possible. The elapsed time between when the evacuation is ordered and when re-entry is authorized may be hours, days, weeks or even months depending upon the damage caused by the event and the degree of impacts.

TIER 1 OPERATIONS: EVACUATING PEOPLE FROM HARM'S WAY

This phase involves a concentrated effort in a very short timeframe and may require a coordinated team effort with many human and material resources applied to the operation. The EOT should engage public safety officials in going door-to-door to ensure residents know of an evacuation order and are complying, serving in a TIM capacity and aiding along highways, providing information to residents under the evacuation order, coordinating with stakeholders, and relieving congestion.

Once an evacuation order is issued, it must be communicated to those who need to evacuate. In addition, if the evacuation may impact neighboring jurisdictions, EOC personnel must maintain close coordination with a variety of groups that may be impacted by the flow of people from an area. Finally, the personnel, equipment, and supplies to execute the evacuation must be in place.

Accurate information pertaining to evacuation orders should be disseminated in a clear fashion and timely manner to avoid "shadow" or unnecessary evacuations. Shadow evacuations occur when people near threatened areas evacuate their homes and businesses even though they are not necessarily in danger. People who hear mandatory evacuation orders are the most likely to evacuate while recommended evacuation orders are met with less urgency.

Using the highway system as a primary means of evacuation requires the condi tion of the roadways be known before, during, and after the evacuation. Evacuation routes should be given priority over other road repair projects. If an evacuation will be ordered, transportation agencies should take steps to maximize the roadway system's capacity before the evacuation begins such as suspending toll collection, suspending highway construction and opening as many lanes under construction that can be done safely, securing roadway construction sites, clearing roadways of debris, ensuring drainage systems are open and flowing freely, ensuring rest areas are operating and are fully stocked, and other such pre-evacuation activities. Many State DOTs use private contractors for highway maintenance and construction activi ties. Those contracts should contain requirements for the contractor to respond to DOT requests to assist with pre-evacuation activities. These activities may be eligible for FHWA or FEMA reimbursement, so adequate contract provisions and accurate recordkeeping is critical. During the evacuation, it is important to monitor the condi tions of the roadway (e.g., for debris or flooding) so that evacuees can be prepared and re-routed if necessary. In addition, incidents such as vehicle crashes may occur and will need to be responded to and cleared quickly to avoid hindering the evacuation.

Coordinating Information

In this phase, information collection, analysis, coordination, and dissemination is critical. Real time data is a must. Information should be shared with a variety of target audiences, including:

- The public
- The media, National and State Congressional representatives, local political authorities, and other groups
- Local jurisdictions
- Reception sites and other field locations
- Stakeholders, including transportation entities.

Communicating with the Public: Communication to the public about the evacuation must be planned to ensure provision of complete and accurate information. Most government agencies have a Public Information Officer (PIO) to assist with such planning and communications. The public needs information such as the reason for the evacuation, the time the evacuation should begin, the type of evacuation (e.g., voluntary, recommended, or mandatory), the expected duration of the evacuation, the highway evacuation routes to be used, how to receive assistance with transpor tation if they cannot self-evacuate, and the location of shelter. The information must be communicated through as many methods as are available and repeated often.

SAMPLE OPERATIONS ACTIVITIES (CONT'D)

- Activation of ITS resources to provide real time traffic information and monitoring
- Implementation of contraflow if required
- Staffing of information hotlines
- Placement of en route services along evacuation routes
- Opening of evacuation routes to maximize throughput (toll suspension, work zone closure, debris removed, etc.)
- Reporting of traffic count data to TMC, EOC, and other jurisdictions
- Activation of mutual-aid agreements as required
- Deactivation of personnel at end of Tier I Operations, reactivation as needed for Tier II Operations

SELECT METHODS OF COMMUNICATING EVACUATION AND RE-ENTRY ORDERS TO THE PUBLIC

- Door-to-door notification
- Radio and television announcements
- Press releases to print media
- Permanent and portable VMS
- Public Service Announcements
- Emergency Alert System
- Webpage bulletins
- Hotline number
- Intelligent Transportation Systems (ITS)
- Highway Advisory Radio (HAR)
- 511
- REVERSE 911®

COMMUNICATION STRATEGIES FOR REACHING EVACUEES AND RETURNEES

- Media outreach plan
- Designated spokespersons
- Regular public and media briefings
- Schedule for media interviews
- Timely, accurate, and consistent message

Preparation and delivery of the message must be followed through to ensure the public receives and understands the intended message. This is especially important when informing people with limited English proficiency. Grass roots organizations can help reach vast audiences. Coordination with smaller media outlets and amateur radios networks must also be considered. Examples of information tools are discussed in the "Tools for Effective Highway Evacuation Operations" section of this primer.

Coordinating Information with the Media, National and State Representatives, Local Political Authorities, and Other Groups: Regular media briefings must be held to inform the media about evacuation routes, traffic and road conditions, shelter locations, and other pertinent information to communicate to the public in a timely manner. Additionally, National, State, and local authorities as well as agency personnel (such as transit and health agencies) should be briefed at regular intervals to ensure that all parties with management or oversight responsibilities are provided with accurate, timely, and comprehensive information to enable informed decisions to be made. A jurisdiction may establish Joint Information Centers (JICs) to ensure that everyone receives the same true and accurate information. The ability to quickly dispel rumors and correct inaccurate information is paramount during an evacuation. It should be regularly reinforced, both internally and externally, that persons involved in any way with the evacuation must direct all but the most basic inquiries to the JIC.

Coordinating with Local Jurisdictions: Local jurisdictions that may be impacted by evacuees transiting through or sheltering in the area must be kept informed of decisions, changes in operations, and ambient changes. They may be invited to send a representative to the local EOC for coordination purposes or may be included on dissemination lists for situation reports and updates. Any decision that impacts the jurisdiction—such as the need to adjust traffic signal timing on an evacuation route—must be communicated and coordinated by an official at an appropriate level immediately.

Coordinating Among the Emergency Response Team: Personnel working on the evacuation must maintain effective communications at all times to coordinate movements, share real time information, and track deployments. The EOT should include staff both at the EOC and in the field, who must communicate to keep key players informed and up-to-date on the status of the evacuation, to ensure quick resolution of issues that arise. Field personnel will likely be located at an Incident Command Post that has a mobile communications vehicle or may simply have radios in their vehicles or hand-held radios. It is critical to have redundant communications because the event may damage normal communications equipment options. Frequent communication is necessary to maintain the command and control structure to ensure the evacuation is managed effectively.

SELECT METHODS OF COMMUNICATING EVACUATION AND RE-ENTRY ORDERS TO THE PUBLIC (CONT.)

- In-vehicle navigation systems (GPS)
- Radio traffic reporting companies
- Government and non-government agency websites
- Evacuee shelters
- Welcome centers, weigh stations, and rest area bulletin boards and handouts
- Ham radios
- American Automobile Association, American Trucking Association
- CB Wizard Alert System

Transportation emergency personnel must be prepared to manage incomplete staffing situations. Operations leaders must have built-in redundancies to ensure that key personnel positions are filled with capable staff at all times. Operations leaders must also anticipate that during an emergency situation, personnel (including transit operators) will need to take breaks, sleep, and eat to ensure that they are functioning at full capacity—so built-in rotation schedules are needed. Systems must also be in place to ensure that personnel rotating in and out during an incident are briefed and debriefed so all personnel are operating and responding as a cohesive group.

Communicating with Reception Sites, Shelters and Other Field Locations: A sheltering plan is an important part of the evacuation plan. The transportation staff supporting the evacuation must work through the EOC to obtain up-to-date information on shelter locations, remaining capacity, etc. to ensure proper direction of evacuees to those locations.

In some communities, an intermediate reception site for evacuees is established. These sites may be used as a central location to gather large numbers of evacuees prior to evacuation to specific shelters. The sites may also be used as gathering locations to transfer evacuees from local transit and school buses to over-the-road coaches for long-distance transport to their final shelter location.

According to the High-Risk Area Hurricane Survey conducted by Harvard in July 2006, 35% of respondents said they were very worried about the conditions and their safety in an evacuation shelter—so monitoring security and communicating security information to evacuees is important.

Emergency managers must also stay in contact with shelter providers to ensure awareness of the shelters' capacity, and needs for security, supplies, staffing, etc. The EOC must know the status of the shelters to relay that information to the public and decide whether to open additional shelters if the shelter is near full capacity. If additional shelters are opened or some have reached capacity, the transportation staff supporting the evacuation may need to update VMS, 511 messages, and field staff who are providing information to evacuees.

Once an evacuation is underway, there is a constant need for monitoring and infor mation sharing to adjust the evacuation to meet changing conditions. For example, the decision to evacuate may be driven by weather conditions, so monitoring updates from NOAA, the National Hurricane Center, and other agencies is neces sary. Likewise, deteriorating weather conditions during an evacuation may impact the speed of the evacuation and potentially endanger evacuees and agency staff who are conducting the evacuation. Personnel in the field can provide valuable information about the conditions during the evacuation including weather and congestion. Some TMCs have also integrated weather information monitoring into their TMC opera-

tions such as in Salt Lake City, UT. where they have a partnership with a weather service provider or in Houston, TX., where the TranStar system is tied into a flood gauge map and alarm system. More information on integrating weather into TMCs may be found in the FHWA report *Integration of Emergency and Weather Elements into Transportation Management Centers*. A link to the report is included in the "Other Information Resources" section of this primer.

Coordinating with Transportation Officials from Other Transportation Modes: Many people cannot self-evacuate for various reasons. Friends, family, or volunteers may evacuate some of these people, but most need help. When a large number of such evacuees must be evacuated in a very compressed timeframe, personal vehicles will be insufficient. In those cases, government agencies must organize and execute an evacuation using other modes with the highway system serving as the backbone for the evacuation.

The most common mode is large-capacity conveyances, such as school buses, transit buses, and paratransit vehicles for special needs evacuees. While these vehicles are sufficient for a short-distance evacuation, they may be insufficient to transport evacuees for longer distances—so over-the-road coaches, commuter trains, or other passenger trains such as AMTRAK may be required. If the time to evacuate is short and the number of special needs evacuees is large, evacuation by air may be required. This may be a combination of commercial, military, and private aircraft, as well as an orchestrated effort using buses and motor coaches to transport evacuees from designated points to and from the airfield. In addition, medical patients sometimes must be moved by helicopter due to the nature of their medical needs. Many public and private organizations are capable of providing helicopter services. Depending on location, evacuation by water may be an option such as the ferry services and tour boats that were used to evacuate lower Manhattan on September 11, 2001. Evacuees who are to be moved by bus, train, air, or waterway will likely have to be transported to and from those modes over the highway network.

Such a large-scale, multimodal evacuation may require significant coordination among the many agencies that are supplying personnel and equipment to support it. It is unlikely that a local government has such vast resources at its disposal. Thus, the local government may require the use of a mutual-aid agreement with other agencies and even the assistance of the Federal government. There should be pre-designated loca tions for staging the equipment and the operators and for gathering and transporting the evacuees. It is also important to track the destination of these evacuees to notify friends and family of their location and to develop a plan to return the evacuees to their original locations once the area has been deemed safe for re-entry. The state of Texas developed a plan to give a tracking bracelet to every person who used state

provided transportation for evacuation. Local, State, and Federal DOTs should be able to aid in coordinating multi-modal movements and in acquiring transportation assets to support an evacuation operation. It is important to monitor the number of evacuees moved by means other than personal vehicles to ensure that additional equipment and operators (such as buses and drivers or helicopters and pilots) are requested and supplied quickly if needed. This information should also aid in devel oping the re-entry plan, as the same transportation resources will likely be required for that operation.

During the evacuation, it will be important to know where transportation assets are located. Many transit agencies have installed Global Positioning Systems (GPS) to automatically locate their transit vehicles including buses and trains. As an example, Corpus Christi, TX. and surrounding Nueces County have teamed together, along with several privately operated refinery fire brigades, to equip the majority of their vehicles with GPS systems for Automatic Vehicle Location (AVL). In this application, all police, fire, emergency medical, sheriff, local fixed-route transit, and paratransit vehi cles (Corpus Christi Regional Transportation Authority) are equipped. Map displays in the EOC allow command and control of all AVL-equipped vehicles. The San Antonio bus fleet (VIA), located about 140 miles away, is also similarly equipped, and with radio reprogramming is capable of augmenting the evacuation fleet of vehicles already in operation in the Corpus Christi area.

Identifying and Coping with Communications Interoperability Issues: During an evacu ation, those operating in the field may find that their communications equipment cannot communicate with the EOC, first responders, or other important personnel, including transportation, involved during the evacuation. When developing evacuation plans, communications equipment and support systems for all agencies involved in the evacuation should be thoroughly developed and tested to identify and address these issues before an evacuation.

Protecting Human and Physical Resources: Protection of EOT members and evacuees is critical to the success of any operation. To protect responders and evacuees, jurisdictions must have sufficient resources available to support the evacuation. It is important to know when to end the evacuation so that the field personnel can move themselves and their equipment to a safe location. If field personnel are not able to reach their primary destination, they need to know where the closest shelter location is to move out of harm's way. It is important to know where the field personnel are located at all times, those who have returned to their operations base and those still out on the roadways. Should normal voice communications be affected, many portable radios, cell phones, and vehicles are equipped with GPS or AVL.

SAMPLE TRAFFIC CONTROL RESPONSIBILITIES

- Traffic signal timing adjustments
- Ramp metering adjustments
- Ramp openings and closures
- Timing of draw bridge openings and lock downs
- Programming VMS (permanent and portable)
- Programming Highway Advisory Radio (HAR)
- Programming 511 systems
- Signage adjustments (flipping down signs, etc.)
- Setting up contraflow operations
- Monitoring traffic counters
- Monitoring traffic cameras
- Relaying traffic conditions information to EOC
- Posting traffic information on agency web site

Traffic Control and Traffic Incident Management

Controlling the traffic and responding to traffic incidents should be a joint effort among transportation, law enforcement, and emergency medical personnel. Additional support may be needed from highway service patrols and the towing industry to respond to and clear highway incidents as quickly and safely as possible. Highway contractors should secure highway construction work zones, and toll agencies may need to suspend toll collection operations.

The evacuation may occur on a variety of roadways from neighborhood streets to collector streets to major arterials and interstates. These roadways are under the control of various jurisdictions, so coordination is a must. Each jurisdiction must know the evacuation plan, their roles and responsibilities in conducting the evacuation, and the personnel and equipment resources necessary to support the evacuation. There are many traffic control-related activities that must occur before, during, and after an evacuation. A description of traffic control tools is included in the "Tools for Effective Highway Evacuation Operations" section of this primer.

FHWA has several tools and programs that are used to manage day-to-day traffic operations but can also be used in evacuation planning and execution. One of these programs is the ***Arterial Management Program***, which covers three major focus areas: arterial management, traffic signal timing, and access management. The Arterial Management Program promotes the efficient and effective movement of people and goods and improves the safety of the traveling public and the environment. The proper application of arterial management tools can assist a jurisdiction in evacua tion planning and execution. During an evacuation event, the major highways may be operating at or over design capacity. Therefore, it is important to make use of major arterials to assist in the flow of traffic.

Traffic Signal Timing: It is estimated that over 75 percent of the country's 330,000 traffic control signals could be improved by updating the equipment or by simply adjusting the timing. Traffic signal improvements include updating equipment, updating timing plans, and interconnecting signals. Poorly timed signals account for five percent of the total congestion on U.S. roads. Advanced traffic signal control involves coordi nating groups of signals, operating signal control systems that respond and adapt to traffic needs, or installing a priority control system. A major arterial that connects to a major interstate evacuation route could be equipped with advanced traffic signal control, could be operated from a central location, and could provide a constant movement of vehicles onto the major roadway. Traffic monitoring on arterials can include incident detection with appropriate follow-up action to remove incidents, intersection surveillance and monitoring using loop detectors and video, and area-wide traffic surveillance. In an evacuation, pre-set traffic signal timing patterns can be implemented to assist in moving the highway traffic more effectively. To provide

information on traffic signal timing for evacuations for State and local agencies, FHWA published *Traffic Signal Timing for Urban Evacuation* which will be available online in late 2006.

Access Management: Access management is a set of techniques that State and local governments can use to control access to highways, major arterials, and other roadways. The benefits of access management include improved movement of traffic, reduced crashes, and fewer vehicle conflicts. Access spacing increases the distance between traffic signals, thereby improving the flow of traffic on major arterials and reducing congestion. Dedicated left- and right-turn lanes, indirect left-turns and U-turns, and roundabouts keep through-traffic flowing. Roundabouts represent a poten tial solution for intersections with many conflict points. Two-way, left-turn lanes and non-traversable, raised medians are examples of some of the most effective means to regulate access and reduce accidents. These practices can increase the roadways' capacity, which is important in an evacuation.

When congested traffic conditions occur on one roadway, travelers typically respond by shifting to another route, selecting a different type of roadway (freeway versus arterial), delaying their time of departure, or remaining on their current route thereby encountering significant delays. FHWA has developed ***Corridor Management Programs*** that encourage neighboring jurisdictions to work collaboratively to alle viate congestion issues. Examples of near-term opportunities agencies may pursue include:

- Establishing formal agreements and documenting operational policies
- Developing protocols, procedures, operational strategies, and control plans
- Deploying traffic control systems, establishing and maintaining interfaces between systems, and implementing ITS technologies to control traffic and share information
- Coordinating traffic control at all traffic signals and between freeway interchanges with urban corridors
- Deploying traffic management centers
- Using managed-lane operational and access control strategies within corridors.

These basic concepts for everyday traffic congestion mitigation also prove invaluable during a disaster that affects adjoining jurisdictions, especially one requiring an evacuation.

The ***Freeway Management Program*** includes initiatives that increase agencies' awareness of benefits, encourage regional collaboration and sharing of resources,

SAMPLE TRAFFIC CONTROL RESPONSIBILITIES (CONT'D)

Coordinating with emergency responder dispatch for incidents

Use of law enforcement for traffic control and direction

Assembling, transporting and installing cones, barricades, arrow boards, etc.

PLANNING CONSIDERATIONS FOR THE CONTRAFLOW OPERATION:

- Median openings on highways
- Work zones
- Exit/entrance ramp openings and closures
- Night contraflow operations
- Sign placements
- Personnel availability
- Routes for emergency vehicles, including entry for incoming response resources (for pre-staging)
- Use of aerial assets for assessments (e.g., law enforcement or traffic helicopters)
- Condition of lanes designated for outbound vehicles
- Impact of contraflow on other roadways, including parallel routes

develop capabilities, utilize operational strategies, and deploy TMCs and ITS to continuously improve the efficiency and effectiveness of how agencies proactively manage and control freeway facilities. Freeway operations and traffic management, and managed-lanes initiatives coordinated through interconnected TMCs, can provide the regional cooperative approach needed to manage far-reaching disasters including evacuations.

Contraflow or Lane Reversal as an Evacuation Operations Tool: When moving a large number of residents from an area becomes a necessity, public officials consider whether to execute contraflow, or lane reversal, plans. Contraflow operations usually occur during mass evacuation scenarios and on major, controlled-access highways to reduce the duration of the evacuation by opening up all lanes in one direction. Several States have used this practice with much success. These contraflow operations proved to significantly reduce evacuation times of the general population. However, if an evac uation can be safely accomplished without implementing contraflow, that choice may be preferable to reduce the costs and personnel and equipment resources needed to support the evacuation. Successful contraflow operations require:

- Planning that includes notification protocols and the inclusion of all surrounding jurisdictions that may be affected by the operation
- Basic human needs for both evacuees and responders, including availability of fuel, food, water, changes of clothing, and lavatory facilities, depending on the length of time for the contraflow operation
- Advance information, including when the contraflow operations should start and end, by time and location. VMS and other equipment must clearly direct drivers to the correct lanes during contraflow, especially when crossing over the median.
- Information regarding restrictions on the types of vehicles that will and will not be allowed in the contraflow lanes, whether or not toll collection will be suspended, if applicable, etc. For example, wide-load vehicles should not be allowed on a highway during a contraflow operation, as they may slow down the operation.

During contraflow operations, it is important to monitor the operations to ensure that traffic is flowing as safely and efficiently as possible. Some States use law enforce ment helicopters to monitor the contraflow operations to quickly identify any incidents that need response. They are supported by law enforcement vehicles on the routes to respond to any incidents that occur such as traffic accidents, medical emergencies, and stalled vehicles. Many States operate incident response teams with roving trucks that carry fuel and can provide minor vehicle repairs such as changing flat tires. Such services can help contraflow operations run more smoothly. States

and local agencies often monitor their permanent traffic counter locations from their TMCs to determine the speed at which the contraflow traffic is moving, and can use that information to determine how long they need to continue to operate in contraflow and to share that information with other communities that may be receiving the contraflow traffic.

Ideally, if contraflow is incorporated as a component of an evacuation plan, it should be tested and exercised, including full set up and break down of equipment and materials. This helps officials get baseline data on how long it may take to establish contraflow during a real time event. Some locations need two hours to set up, while others need six hours. Time variations may be based upon already pre-positioned barricades and equipment along contraflow routes or on how easy it is to gather the necessary personnel and equipment to support the operation.

Sample time-consuming tasks include ensuring that flip down signage is properly flipped down, reflective buttons are removed or placed depending on purpose, cones are placed across median crossover lanes, and gates are placed at closed ramps. All of these details must be planned ahead of time, and also exercised to ensure that those responsible during contraflow know their roles and responsibilities, ensuring a smooth operation. One example of defining responsibilities is an agreement between the States of Mississippi and Louisiana that addresses two specific evacuation routes that may be put into contraflow operations from Louisiana into Mississippi, as happened during Hurricane Katrina in 2005. The agreements provide details on which agencies are responsible for what actions and on what timeline.

During an incident of significance where evacuation is likely, emergency vehicles may transport people to and from locations during all phases of an event. Law enforcement and other public safety personnel and their vehicles must be able to move around the community to attend to the situation and ensure that those under evacuation orders take immediate action. Inbound vehicles may also transport supplies and equipment to reduce the response time after the event. All of these access issues must be incorporated into any evacuation plan including considerations to use contraflow as an evacuation tool.

In February 2006, the Florida DOT along with the U.S. DOT, the American Association of State Highway and Transportation Officials, and the I-95 Corridor Coalition sponsored a multi-state contraflow workshop to share experiences and best practices. The "Other Information Resources" section of this primer provides a link to the materials from that workshop.

ITS Equipment to Aid Evacuation

ITS may be used during an evacuation to collect data and as a tool to communicate

GOOD PRACTICE

Use of High Occupancy Vehicle (HOV) lanes and frontage roads

Some States have HOV lanes and frontage roads. During times of contraflow, the HOV lanes are often designated for emergency vehicles only. In other instances, the shoulders can be used to move emergency vehicles against traffic if necessary. The movement of emergency vehicles and inbound supplies and equipment must be addressed in any contraflow plan.

TYPES OF EQUIPMENT AND FACILITIES USED DURING CONTRAFLOW OPERATIONS

- Barriers
- Drums
- Cones
- Gates
- VMS
- Arrow Boards
- Fuel
- Trailers
- Fold-down Signage
- Reflective Buttons
- Traffic Counters
- Light Towers
- TMC

and coordinate with evacuees, evacuation operations personnel, partners, and other stakeholders. ITS encompasses a broad range of wireless and wire-line communications-based information and electronics technologies. These systems are generally managed through a TMC that may be separate from or part of an EOC. If separate, there are often communications between the TMC and the EOC that allow those in the EOC to see the same camera video feed as seen in the TMC such as in Houston and Austin, TX., as well as the Atlanta and Baltimore EOCs and TMCs. ITS is made up of both intelligent infrastructure systems and intelligent vehicle systems. One lesson learned from previous disasters is that a redundant power source is needed for many ITS systems so they can still function if the primary power source is impacted by the disaster.

FHWA is developing a Real Time System Management Information Program to monitor, in real time, the traffic and travel conditions on the major highways in the U.S. As States and local governments develop or update their ITS, they will explicitly address real time highway and transit information needs and the systems to meet those needs.

During an evacuation, emergency personnel must be able to coordinate and commu nicate with evacuees, whether in transit or upon arrival at reception sites and shelters. While many people may have received their information to evacuate by television or a REVERSE 911® system, those options are no longer available once the evacuees are in their personal vehicles. So, it is important to use radio, HAR, VMS, 511, and other such communications devices to reach evacuees while en route.

The following examples of ITS resources may have application for evacuations.

VMS – These signs are also referred to as Changeable Message Signs (CMS) or Dynamic Message Signs (DMS). The signs can be pre-programmed or programmed in real time to provide information to highway travelers. The signs can be permanently mounted along major roadways as in many urban areas or on trailers so they can be moved to any location as necessary. The signs provide great flexibility in the information they can provide such as travel times, locations of traffic incidents, or the location of shelters for evacuees.

Traveler Information-Dial 511 – Many States have robust 511 or other telephone traveler information systems. As of late 2006, these systems reach about 35 percent of the U.S. population. A number of other States are deploying 511 and these systems should bring the coverage up to about 54 percent of the U.S. population in the next few years. These systems may be used to aid those evacuating who have access to landline or cellular telephones prior to or during their evacuation. Most of the 511 systems provide route-specific traffic conditions and weather information, in addition to area-wide alert information. Also, most of them have the capability to

provide an alert message (sometimes referred to as a "floodgate" message since it is "flooded" out to all callers at the beginning of the call) that all callers must listen to and could contain evacuation information. Southeast Florida, Central Florida, and the Tampa, Florida regions under the Florida DOT have implemented robust 511 systems where motorists can obtain information about congestion, travel times, and road closures. A separate hotline provides information on hurricane shelters. These systems experienced no failures or down time during the four hurricanes that impacted Florida in 2004.

Advanced Traveler Information Systems (ATIS) – ATIS are designed to enhance personal mobility, safety, and productivity of transportation through a system that monitors traffic and road conditions and transfers the information to a TMC and back out to users. ATIS can play a role in reducing traffic congestion during evacu ations by providing en route traveler information about traffic conditions, route guidance, and other pertinent information. FHWA has recently published the report *Communicating with the Public Using ATIS During Disasters – Concept of Operations* which may be useful to both transportation and emergency planners. A link to this report is included in the "Other Information Resources" section of this primer.

Highway Advisory Radio (HAR) – HAR can be used to broadcast information to motorists in a localized area and provide more information than can often be communicated with a VMS. Its broadcast range usually falls within one to six miles of the radio transmitter, and nearly all HAR systems use the AM radio band. Signs are generally posted in the broadcast area to inform motorists of which radio station to tune into to receive information. Transportation and emergency managers should keep a map of the location of signs and broadcast towers so that they can target messages during an evacuation, and be able to quickly assess any damage to these assets after the event. Following the 2005 hurricane season, the Florida DOT identified 13 new critical locations in the State at which to install HAR to assist with evacuations. Additional mobile HARs will be deployed in Florida as needed to get the best signal coverage.

In-Vehicle Systems – There are a number of in-vehicle information systems that can be purchased as part of a new vehicle or added as an after-market device. These systems can provide a wide array of information to a motorist via a video display inside the vehicle. Subscribers to these services can receive routine traveler informa tion as well as emergency information; some services are even linked to the National Oceanic and Atmospheric Administration (NOAA) All-Hazards Radio System. In general, these systems provide information they receive from official government channels in emergency situations. Emergency managers and transportation officials

GOOD PRACTICE: USE THE TOOLS

Transportation technology can be used to your advantage. Examples of "Intelligent Transportation Systems"—or ITS—that have helped others during evacuations include:

- Variable Message Signs
- 511
- Advanced Traveler Information Systems (ATIS)
- Highway Information Radio
- In-Vehicle Systems
- CCTV

may also consider partnering with satellite radio providers to broadcast information to truckers carrying essential recovery materials regarding any temporary changes to commercial vehicle restrictions. One example includes a new service being commer cially provided by NAVTEQ™, that uses the Radio Data System (RDS) protocol designed into all car radios installed since 1995, which provides traffic alert systems to subscribers in multiple metropolitan areas around the U.S. NAVTEQ™ maintains a control center staffed 24/7 to provide the alert notifications, and currently uses commercial as well as government ITS system data that is publicly available. It may be possible to augment their system for evacuation text and audio messaging, or mirror this system with a publicly sponsored system.

Cameras – Cameras are another type of traffic surveillance system capable of moni toring speed and flows that can be used for evacuation management. One commonly used system is closed circuit television (CCTV). CCTV cameras have an advantage over loop detection in that they can provide direct visual confirmation of traffic and weather conditions at remote locations. They can also be used for detecting incidents and verifying their removal. Another application is to use CCTV as a secure means of linking the centers in operation during an evacuation, including EOCs, TMCs, public safety, fire, and shelters.

One of the limitations of CCTV is that it typically requires direct power and commu nication connections. This is often difficult in remote locations along evacuation routes. Newer CCTV and ITS applications such as the Des Moines, Iowa, ITS system covering I-80, I-35, and I-235 in the metropolitan area include sensors with solar power and battery backup and wireless communications between the sensors and the TMC using WiFi and WiMax technologies.

Providing Medical Services During the Evacuation

When managing an evacuation the care and treatment of people injured during the event must be considered. Additional medical and support staff from adjoining areas must be properly licensed to permit their usage, if required, in the affected area. Transport vehicles and emergency supplies must be acquired. Administrative support must also be provided to account for and track the injured.

The highway system will likely be the primary means of transporting those with medical needs. The evacuation plan must consider accommodation of the emergency vehicles for ingress and egress, especially if contraflow operations are in progress.

MANAGING EVACUATION OF SPECIAL NEEDS POPULATIONS

Hospitals, nursing homes, prisons, and other institutions generally are responsible for developing their own evacuation plans and deciding when to evacuate their residents.

They face unique issues such as whether the risks of not evacuating outweigh the risks of moving seriously ill individuals. Comparable facilities must be identified in advance of the evacuation to ensure these evacuees receive necessary services. It is important to ensure that responsible individuals have access to the latest information about an incident and that institutions' evacuation plans work in the event of a mass evacuation of the entire population of an area.

Evacuating those with special needs who are not in institutions also presents prob lems such as locating where these individuals live, despite attempts by local agencies to maintain lists of persons with various special needs. Some cities, like New Orleans, are establishing a 311 information hotline to register residents with special needs for evacuations. Other areas have similar registration programs, but those programs depend upon the willingness of persons to register. Privacy interests and some indi viduals' reluctance to identify themselves as having special needs are considerations that must be addressed in establishing a comprehensive registry.

Persons who use wheelchairs, those who rely on special medical equipment, those with hearing or visual impairments, the elderly, limited English proficiency, and other groups have unique communication, transportation, and sheltering needs that must be planned for in advance. This includes ensuring that all forms of temporary housing (e.g., shelters, trailers) meet Americans with Disabilities Act (ADA) guidelines. Providing these specialized services in the course of a mass evacuation may present particular challenges.

Another group that may have special needs is children. They can become separated from family or caregivers which may cause stress for the children. Children should be included in the emergency plans that families prepare so they know what to do if they become separated from their family during an evacuation. Children may also have special shelter needs as their family may have difficulty coping with the demands of the emergency situation. So child care may be necessary to allow the family to deal with the emergency situation itself as well as to provide stability and comfort to the children.

Emergency responders must consider the unique requirements of managing special needs populations while conducting an evacuation. Thus it is important to consider the following:

- Multiple Methods of Communication: Emergency response personnel should be equipped to communicate evacuation messages to special needs populations in as many formats and languages as the situation warrants (e.g., having non-English language materials available, brochures printed in Braille, or text messages sent to

GOOD PRACTICE

Build plans that address support for those that need transportation assistance, including those who:

- Do not own a personal vehicle or have one vehicle that may be at work
- Are transit-dependent
- Do not have economic means
- Are not physically able to transport themselves
- Are a tourist without a vehicle

those with hearing impairments).

- Special Needs Transportation Equipment: Emergency coordinators should consider the transportation needs of those with special needs, such as wheelchair accessible vehicles to evacuate those with physical disabilities and equipment such as oxygen tanks and insulin for those who have other medical needs. Still other special needs evacuees may need assistance from a service animal or a caregiver, and space must be made available to accommodate these companion travelers. These evacuees may also have specific needs for water, food, medical services, etc. while being transported, and those must be planned for in advance.
- Special Needs Shelter Considerations: As noted above, those with special needs may require specialized transportation equipment and also may need specialized shelters. All shelters must comply with ADA for accessibility and may need specialized bedding as the standard shelter cots may not be feasible for use. There may be a need for medical care beyond the normal first aid that would be supplied. The ability to communicate with those in shelters in more than one language, including sign language, may be necessary as well.

The National Consortium on the Coordination of Human Service Transportation published a Transportation and Emergency Preparedness Checklist to be used in the planning phase as a guide to those who must transport persons requiring mobility assistance in an emergency. Information on how to access this Checklist is contained in the "Other Information Resources" section of this primer.

TIER II OPERATIONS: EVACUEE RE-ENTRY

Local jurisdictions must support the re-entry of evacuees. Many of the same agencies may be involved in the Tier II Operation, retaining many of the same roles and responsibilities as they had for the evacuation. In addition, personnel, supplies, and equipment similar to that used for the evacuation may be needed for the re-entry.

During this phase, the environment is much less certain, safe, or secure. Decisions on when to permit re-entry may affect the health and welfare of the returnees, may be critically watched by the media, may require the same type of personal support (transportation, food, shelter) as the evacuees found at or en route to the shelters, and may have great political and economic ramifications if not done properly. Re-entry may take a matter of hours for events that occurred and did not cause major damage to physical property and the infrastructure. However, return operations following a catastrophic incident may take days, weeks, and even months.

The transportation sector plays a role in supporting the return of evacuees. It can contribute to making the roadways safe for return travel by aiding in damage assess-

ments of the roads, clearing debris, and reestablishing services. It is useful to maintain a database of critical transportation assets to aid in damage assessments and recovery. Due to the importance of restoring the highway system immediately following an event, emergency managers should place a priority on activities and securing critical assets to conduct damage assessment, debris removal, hazardous materials disposal, repair of the roads, and restoration of transportation facilities to enable them to receive evacuees when it is safe to do so. Planners should use performance metrics for these activities to ensure the highway reopens quickly. For example, one such metric could be that all roads, except those with severe damage, reopen within 24 hours of the event. Transportation personnel at public works agencies can also assist with debris removal. To quickly reopen roads, transportation agencies should consider "cut and toss" contracts. Such a contract allows trees and other debris to be cut and pushed off the roadway to quickly and safely reopen the road, with the complete removal of the debris occurring later when time is less critical.

In the best-case scenario, the projected event will not have caused major damage to the local community, so after a damage assessment has been made and the all-clear has been given by public safety officials, a message may be sent via the media that it is safe to return. Those who self-evacuated using their personal vehicles should be able to return on their own. If the jurisdiction organized movement for transit-dependent or special needs populations, the jurisdiction may have to organize a return trip for those evacuees.

Transportation agencies that provide data to support the operations and information to the public from local TMCs, also may be providing personnel and equipment such as barricades and signs, and may provide the use of their motorist assistance teams to support the re-entry. Close coordination between transportation and law enforce ment is a must for a successful re-entry.

DETERMINING WHEN TO PERMIT RE-ENTRY

The decision to re-enter an area that has been evacuated is based on public safety factors. Decision makers must be assured that the impacted area is safe for the return of residents and business owners. That requires government agencies to inspect the area and aid any victims who did not evacuate, perform an initial assessment of damage to homes and businesses, move debris to open roadways, handle downed power lines, and other such actions to ensure public safety.

Some of these factors are particularly critical for special needs evacuees who may need power to run medical equipment or the elderly who need air conditioning to avoid heat-related medical problems. There may be other health concerns, particularly if the evacuation was due to a hazardous materials release or if there is standing

INFORMATION TO BE COMMUNICATED TO RETURNING EVACUEES

- Re-entry plan
- Start time/end time
- Day (s) of week
- Geographic area covered
- ID required to re-enter
- Security checkpoints in place
- Available routes
- Maps
- Vehicle restrictions (e.g., no oversize trucks)
- Available services (e.g., grocery, bank, medical, fuel)

water that may breed insects that could pose a threat.

It is likely that the level of damage will vary within the affected area. That means the re-entry process may happen in phases, as each geographic area is deemed safe for evacuees' return. For example, after Hurricane Rita in 2005, Texas implemented a phased re-entry plan. They determined which geographic areas were safe for return and set a timetable during which each area could be re-entered. The re-entry phases were well reported by the media. This phased approach worked well in avoiding the major traffic jams that occurred during the evacuation for the same hurricane.

Part of any re-entry plan must address those people who were unable to evacuate themselves. There must be a clear strategy on how, when, and to where these evacuees should be transported and how they may reach their final destination. Such a plan may need to include notice to family members or other caregivers to ensure that evacuees are cared for upon their return. Transporting the evacuees back to their original locations may require buses and other motor vehicles, and some may require air travel due to medical needs.

Once developed, the plan must be communicated to evacuees. Methods and tools to communicate with evacuees are discussed in the "Tools for Effective Highway Evacuation Operations" section of this primer.

Communicating Re-entry to Evacuees: Before implementing the re-entry plan, govern ment agencies must know how they can communicate with evacuees, who may be scattered among shelters, families' homes, and other areas outside of the immediate jurisdiction. The communication with evacuees should describe how the re-entry should work. The adjacent text box describes some of the types of information to communicate to the pubic to support re-entry.

Those evacuees who are returning must know what to expect upon their return. Information must include the routes to use, the utilities expected to be functional, and the services likely to be available. This is especially important for the special needs population who may require additional basic services prior to re-entry to the affected area. Because many evacuees may be located well outside the immediate impacted area, an extensive public and media outreach campaign should be in place well in advance of the start of re-entry to allow evacuees to plan ahead for their return.

Executing Re-Entry Transportation of Evacuees to Origination Points

The considerations used in the evacuation are applicable in the re-entry phase. Once a decision is made on when and how to execute re-entry of evacuees, there must be a plan to return evacuees who did not self-evacuate to their origination points. In some cases, medical patients were evacuated by ambulance or air depending on their condition. Those patients will likely require the same means of transport to return

to the medical facility from which they were evacuated. Likewise, people who were evacuated by bus or train will have to be returned to their origination point. However, if the rail lines are damaged or the transit system is not operating, other transporta tion resources may be needed to support their re-entry. In some cases, staging areas again may be used as an interim stop before transporting individuals back to their primary destination. Executing this plan may require both equipment and personnel for the transportation, staging of vehicles and evacuees, boarding of vehicles, provision of water, etc. The re-entry plan must be coordinated with transportation and public safety officials to ensure that they adequately staff highway routes. Likewise, traveler services, such as fuel, food, water and medical care, should be available along the highway routes as they were during the evacuation. Officials may use ITS equipment to support re-entry operations. VMS, HAR, and 511 systems can all provide valu able information to evacuees during re-entry. TMCs can help monitor the re-entry through cameras and traffic counters, identify areas where incident response may be required, and provide overall information about travel times for re-entry. Agencies may have pre-scripted messages that can easily be placed on VMS, both permanent and portable, as well as pre-scripted messages for the 511 system. Such pre-scripted messages save time and ensure consistent information is provided across geographic boundaries as evacuees travel back from far away locations. Also, some vehicle manu facturers provide on-board vehicle information systems so that information can be transmitted directly to an in-vehicle information screen. Some agencies may choose to explore a partnership with such companies to provide information directly to returning evacuees.

Communication among and between jurisdictions may also be needed. State DOTs, for example, can share information on traffic conditions and also post messages on ITS systems well beyond the re-entry area to assist evacuees. As noted previously, government agencies must have a solid communication plan to prepare and execute re-entry.

OPERATIONS: RETURN-TO-READINESS PHASE

Once the evacuation re-entry is completed, government agencies must prepare for the next event that may require evacuation operations. Actions taken in this phase should transition the system from an operations cycle back to a state of planning and preparedness.

Funding the Evacuation

The collection of costs and reimbursement of expenditures constitutes one of the activities in the Return-to-Readiness phase of an evacuation. Services may include rehabilitation of equipment, restocking of expendable supplies, and transportation to original storage or usage locations. In many cases, the costs may be reimbursed by the State. In cases where the event resulted in a Presidential declaration of disaster, a State will consolidate local and State expenditures associated with the disaster and seek reimbursement from the Federal government.

Usually, actions taken to safeguard the public and protect property, including evacuation efforts, will be fully covered by the Federal government. Governmental agencies may request and be reimbursed for many of the costs associated with an evacuation. Reimbursement may come from their insurance companies, State and Federal agencies such as FEMA and the FHWA Emergency Relief (ER) and Emergency Relief for Federally Owned Lands programs. To be reimbursed for these costs, agencies must complete a variety of reports and forms to document the expenses incurred. All agencies must have a system in place to record personnel, supplies, and equipment costs to meet the requirements of the reimbursing agencies.

Officials should check with FEMA and FHWA to determine whether various costs associated with evacuating the public would be covered, preferably as a planning and preparedness activity. Examples of reimbursable expenses may include overtime costs for public safety and transportation officials, materials used in support of the evacuation, rehabilitation or replacement of equipment used during the evacuation, and contract labor and equipment (through existing contracts or emergency contracts). As a planning activity, jurisdictions should inventory the contract labor and equipment they may need and which companies can provide those resources, and should put emergency contracts or contracting procedures in place to quickly acquire the necessary resources.

In some situations, there may be a need to back fill for personnel who are involved in the immediate evacuation response. Some of the back-fill labor may come from agency personnel in other departments not involved in the immediate evacuation, from agency personnel in another location outside of the impacted area, or through inter-local or mutual-aid agreements with other jurisdictions who have available personnel resources to meet the need.

Another potential cost is from the provision of support for volunteers or agency personnel from out of the area who need food, water, shelter, restrooms, and shower facilities to rest and prepare for their next work shift.

During the Return-to-Readiness Phase, the jurisdiction will collect documentation of expenses, complete appropriate forms requesting reimbursement, and submit the

information through the State to the appropriate organization. Agencies should work with FEMA and FHWA to ensure they provide the proper documentation before submitting their reimbursement requests. The Florida DOT has contracted with a company to prepare all of their Public Assistance Grant Program Project worksheets for FEMA reimbursement. This contract allows their transportation staff to more quickly return to their normal duties after an event. A link to the FHWA Emergency Relief and Emergency Relief for Federally Owned Lands programs, is included in the "Other Information Resources" section of this primer.

AARs and Best Practices and Lessons Learned Reports

An important step is for agencies to conduct an honest review of how the evacuation was executed and determine how they can better prepare for and execute the next evacuation. Each agency should review its actions. When multiple agencies are involved in an evacuation, it is useful to conduct a joint after-action review to address how well agencies worked together and what improvements can be made in future joint operations. Each review should include an AAR that can be shared with decision makers and agency personnel. The AAR should include recommendations for improvements, and it is important for decision makers and agency personnel to consider and implement those recommendations quickly. One means to develop the report and to finalize the operations is the "Hot Wash", a formal meeting where groups participating in the operation will meet to assess actions, determine follow-up items, and develop recommendations for improving future operations. The results of the Hot Wash and individually submitted AARs should be combined for a jurisdiction's or agency's final report.

As a transitional activity from the operations cycle back to day-to-day planning and preparedness activities, agency personnel should review the AAR, evaluate findings (including lessons learned and best practices) and recommendations for improvement, and determine whether changes need to be made to their emergency plans and procedures. Such changes may require revision to agency plans, changes in processes, redefinition of roles and responsibilities, updating checklists and contact lists, and other such actions to improve agency performance.

COMPONENTS OF AN EFFECTIVE EVACUATION PLAN

Creating the perfect plan for the community is a very complex endeavor. Throughout this primer, there are several themes including:

- Include transportation planners in the plan development and decision-making process, and on the EOT
- Ensure that the evacuation plans include the resources necessary to evacuate those with special needs
- Use the various transportation tools to collect planning factors (such as work zones); to collect real time information (TMCs and CCTVs) for dissemination to the public and along routes for evacuees (VMS, 511 system); to contract for labor and materials; to coordinate with other jurisdictions, government officials, and the media; and to ensure the effective and safe movement of evacuees.

A good plan should answer the following questions, for each phase of the evacuation. The answers to these questions should help in developing a robust plan to support very limited evacuations as well those evacuations in advance of a catastrophic event:

✔	PLANNING AND PREPAREDNESS
	Have all agencies with evacuation responsibility been involved in the evacuation plan's development?
	Has the ultimate decision maker been identified?
	Has the one key individual, the Incident Commander, been identified?
	Have those with authority and responsibility for evacuation been identified, and have their tasks been pre-defined?
	What additional training and resources does the community need to support an evacuation?
	Does the plan include provisions for notification of evacuation personnel?
	Does the plan require the routine updating of contact lists for evacuation personnel?
	How does the evacuation plan fit into the larger emergency management plan?
	Does the plan address COOP and COG?
	Does the plan address shelter-in-place provisions if full evacuation is not feasible?
	How is the community informed of what steps they should take to be prepared for an evacuation, whether a person is located in an evacuation zone, what evacuation routes they should use, and the locations of nearby shelters?
	Have plans been coordinated with potentially impacted neighboring communities or receiving organizations, including associations, volunteers, and the private sector?
	Have all available, or readily available, local resources been identified?
	How does the plan address training personnel?
	Has the plan been exercised and revised as needed?

✔	PLANNING AND PREPAREDNESS
	Does the plan identify organizations and individuals (by position) responsible for directing resources to execute evacuation orders?
	Does the plan identify roles and responsibilities of different levels of government, and how these government agencies coordinate their efforts with each other?
	Does the plan document mutual-aid agreements?
	Does the plan identify specific roles of the State and local transportation and law enforcement agencies in evacuation operations?
	Does the plan identify variation(s) in direction and control for different types of catastrophic events that require evacuation?
	Does the plan include demographic data to identify the location of senior citizen, low-income, transit-dependent, and other populations that may need transport?
	Does the plan contain provisions to identify the number of evacuees that will require transportation assistance?
	Does the plan contain a strategy for special needs populations?
	Does the plan address the catastrophic hazards that would cause a large-scale evacuation?
	Based on the catastrophic hazards, does the plan identify and prioritize the communities that should be evacuated?
	Based on the catastrophic hazards, does the plan identify the number of people and vehicles to be evacuated?
	Based on the catastrophic hazards, does the plan identify decision points/triggers for implementation of evacuation?
	Based on the catastrophic hazards, does the plan identify the estimated time needed to complete the evacuation, and is this coordinated with highway, law enforcement, and transit agencies?
	Based on the catastrophic hazards, does the plan identify the distance evacuees must travel to ensure their safety?
	Based on the catastrophic hazards, does the plan identify the estimated time public sheltered evacuees will need support?
	Does the plan require tasked organizations to identify, obtain, and maintain resources and equipment required to support all aspects of the evacuation (e.g., evacuating people that do not have their own means of transport, evacuating special needs populations, communicating information to the public, and managing traffic flow)?
	Does the plan include evacuee host communities in disaster declarations?
	Does the plan require organizations to prepare SOPs that contain the detailed instructions that responsible individuals must follow to accomplish assigned tasks?
	Does the plan contain provisions for determining evacuation routes?
	Does the plan contain provisions to manage timely communication of evacuation instructions to prepare people in advance of the order to evacuate?

✔	PLANNING AND PREPAREDNESS
	Does the plan identify contingency plans for use if normal means of public communications are unavailable?
	Does the plan provide for communicating with people that have limited English proficiency?
	Does the plan include provisions for communicating with special needs evacuees (e.g., people with hearing, vision, and physical impairments) and the means to communicate?
	Is there a designated spokesperson to provide information to the media and the public?
	Does the plan provide for keeping the public informed of the estimated travel times to safe haven under current conditions?
	Does the plan address the communication of alternative routes and/or transportation modes?
	Does the plan contain sample/pre-scripted messages for use?
	Does the plan include provisions for movement of required assist devices such as wheelchairs, life support systems, service animals, and communication equipment?
	Does the plan identify special needs populations in the community by geographic location (e.g., hospitals, nursing homes, and assisted care facilities)?
	Does the plan contain provisions for coordination with the most appropriate community outreach agencies to transport special needs populations?
	Does the plan contain a policy with respect to bringing service animals and pets to shelters or on board transit vehicles, planes, helicopters, etc.?
	Does the plan include provision for sheltering those evacuees with pets?
	Does the plan make provisions for evacuating schools and day care centers?
	Does the plan make provisions for evacuating mobile home parks and campgrounds?
	Does the plan make provisions for evacuating incarcerated residents (e.g., those in prisons, jails, juvenile facilities, and drug treatment centers)?
	Does the plan make provisions for evacuating transient populations (e.g., tourists, seasonal workers, and homeless)?
	Does the plan include the use of public transit vehicles, school buses, and paratransit vehicles?
	Does the plan include the use of non-government agency vehicles (e.g., church buses and volunteer group vehicles) as a contingency?
	Does the plan identify accommodations for the transport of luggage, etc., and how evacuees are informed about any restrictions or limitations?
	Does the plan address provisions made to transport evacuees to pick-up points/ staging areas?
	Does the plan require evacuation routes to be designated, marked, and communicated to the public?

✔	PLANNING AND PREPAREDNESS
	Does the plan address the safety of routes to be used for evacuation (e.g., roads, bridges, railways, waterways, and airstrips)?
	Does the plan indicate whether the agreements provide for sufficient space to house the worst-case estimate for the number of evacuees needing shelter?
	Does the plan address provisions for identifying and evacuating animals (e.g., animals in farms, kennels, veterinary hospitals, zoos, theme parks, pet stores, and university laboratories)?

✔	READINESS
	What may cause an evacuation within the jurisdiction?
	How are key officials alerted of the possible need to evacuate?
	Does the plan document the decision criteria to be monitored and evaluated before issuing an evacuation order?
	How large is the area to be evacuated and how many people are affected?
	Does the plan identify organizations and individuals (by position) responsible for providing data to support the evacuation decision?
	Does the plan identify when evacuation personnel are to be advised of a possible evacuation prior to its execution?
	Does the plan identify checklists of actions for evacuation personnel prior to issuance of an evacuation order?

✔	ACTIVATION
	Who issues an evacuation order?
	How and when is an evacuation order communicated to the public?
	Does the plan identify what agencies report to the EOC and how they are notified to report?
	Does the plan address activation of the TMC if it is not already operational?
	How long does it take to have field personnel and equipment in place to support the evacuation?
	Does the plan define specific criteria for issuing voluntary, recommended, or mandatory evacuation orders?
	Does the plan contain pre-approved drafts of executive orders for evacuations?
	Does the plan address amending or revising the evacuation orders?
	Does the plan describe time phasing of evacuation execution (i.e., sequential and concurrent activities) for different levels of evacuation response?
	Does the plan contain provisions to announce closings of schools and businesses in the risk area?

✔	ACTIVATION
	Does the plan identify a system for notifying and coordinating with neighboring jurisdictions about what evacuation routes should be used and when?
	Does the plan include provisions for notification and coordination with host communities, non-governmental organizations, and other risk communities to address shelter activation and operations?

These questions are divided among General, Tier 1, and Tier 2 phases of the evacuation.

✔	GENERAL FOR BOTH TIERS
	Does the plan include monitoring evacuation/re-entry operations of motorized transport, rail, air, water, and other modes of transportation to determine the adequacy of available resources?
	Does the plan identify the provisions made to monitor traffic conditions on the evacuation/re-entry routes and make operational adjustments as appropriate to maximize throughput?

✔	TIER 1 OPERATIONS: EVACUATING PEOPLE FROM HARM'S WAY
	Who manages an evacuation's operations?
	What highway evacuation routes should be used?
	What tools should be used (e.g., communication tools and traffic control devices including ITS)?
	What methods of communication will likely be most effective within the existing constraints?
	What barriers to effective communication are likely to be encountered?
	Does transport need to be provided and if so, for how many people?
	How are transport resources obtained, managed, and coordinated?
	How is special needs transport provided?
	What information is available on potential users of special needs transport?
	Who needs to be informed to open a shelter(s)?
	How is the event that triggered the evacuation progressing, and is there any change to earlier predictions of effects?
	Does the plan identify specific contingency plans that can be used if conditions change during the course of an evacuation?
	Does the plan contain a strategy for securing and restricting access to evacuated areas?
	Does the plan address informing evacuees of available transportation modes, how to access them, and any restrictions on what evacuees may carry with them?
	Does the plan address informing evacuees about when transportation assistance should begin and end and the frequency of departure at designated pick-up locations?

✔	TIER 1 OPERATIONS: EVACUATING PEOPLE FROM HARM'S WAY
	Does the plan establish times for public officials to provide updates, and does the plan address informing the public on when to expect such updates?
	Does the plan address informing evacuees of their destination before boarding public transport?
	Does the plan address informing the public and/or family members of evacuee destination?
	Does the plan address providing the public with information about available services along evacuation routes and at shelters?
	Does the plan identify established web sites, hotlines, etc. where people can get answers to their questions/concerns?
	Does the plan address communicating security measures to the public so they are not concerned about possessions left behind?
	Does the plan identify support services that are available for those with special needs?
	Does the plan indicate that highway conditions are reported on emergency radio announcements for travelers en route?
	Does the plan address contingency plans in place if normal means of communication are unavailable?
	Does the plan address contingency plans for obtaining additional evacuee transport vehicles, if needed?
	Does the plan provide coordination to prevent over-tasking of transportation resources where neighboring jurisdictions also require support from the same resource provider?
	Does the plan address coordination with the next higher level of government (local to State, and State to Federal) to ensure unmet transportation resource needs are identified and requested to support evacuations?
	Does the plan address the use of standby contracts with motor coach companies, paratransit providers, ambulance companies, railroads, air carriers, etc., to obtain operators and equipment to fill identified transportation shortfalls?
	Does the plan require critical operational changes to be communicated to the EOC and the public?
	Does the plan identify provisions to control access to evacuation routes and manage traffic flow?
	Does the plan address strategies and responsibilities for maintaining evacuation route capacity, especially with regard to work zones, toll collection, vehicle incidents, etc.?
	Does the plan address strategies and responsibilities for providing food, water, restrooms, fueling stations, and rest stations for evacuees along the evacuation routes, including those for special needs populations?
	Does the plan include resource lists to support evacuation routes (including all resource needs identified above)?
	Does the plan contain specific contraflow plans that have been developed, tested, and coordinated with all affected parties?

✔	TIER 1 OPERATIONS: EVACUATING PEOPLE FROM HARM'S WAY
	Does the plan address strategies for emergency responders, transit vehicles, and other essential equipment to move inbound against the predominant outbound flow?
	Does the plan address communicating information with the public on the contraflow plans and the beginning and ending times for contraflow operations?
	Does the plan identify a system for communicating and coordinating contraflow operations with neighboring jurisdictions?
	Does the plan contain a system for keeping shelter information current during the evacuation?
	Does the plan contain a system for acquiring and communicating information to evacuees on the availability of non-public shelters such as hotels?
	Does the plan include provisions for keeping shelter operators informed on the location and status of alternate shelters?
	Does the plan require travel routes to the shelters and the shelters to be marked?
	Does the plan provide for trained personnel to support the evacuation route (food, first aid, information, etc.)?

✔	TIER 2 OPERATIONS: EVACUEE RE-ENTRY
	Who should make the decision to return?
	What factors should influence a re-entry decision?
	What is the damage to the areas where evacuees will return?
	Are businesses operating; can basic goods and food be obtained?
	Is there an outbreak of disease or any other health or medical issue that should be addressed prior to issuing an "all-clear?"
	Have any hazardous material spills been cleaned up?
	Are utilities functioning (e.g., water running to the homes/businesses, available electricity)?
	Are evacuation routes clear of debris and safe to travel upon?
	Are public transit systems operational?
	Are there any populations that should not be allowed to return due to health and medical or public safety concerns?
	Have injured or deceased persons and animals been attended to and recovered from the area?
	How should re-entry be communicated to the public?
	Should mutual-aid re-entry be done in phases?
	Does the plan include provisions for transporting evacuees who did not self-evacuate back to their place of residence?

GOOD PRACTICE: USE THE TOOLS

- Traveler information—511
- Loudspeakers
- Handouts
- REVERSE 911®
- Roadside information
- VMS
- Media
- PA and E-mail systems
- Telephone
- Call centers
- Traffic control tools
- TIM capabilities and assets
- Traffic counting devices
- Traffic signals and signal timing and pre-emption plans
- Ramp meters and gates
- Traffic signs
- Pavement markers
- HOV and reversible lanes
- TMCs
- Evacuation models, including OREMS, MASSEVAC, HURREVAC, Evacuation Travel Demand Forecasting System
- Plume modeling
- Clarus

✔	TIER 2 OPERATIONS: EVACUEE RE ENTRY
	Does the plan identify personnel resources and equipment required to support re-entry?
	Does the plan include provisions for assisting evacuees who did not self-evacuate in reuniting with family members?

✔	RETURN TO READINESS
	How should mutual-aid partners be reimbursed for their costs expended for the evacuation?
	Does the plan explain how expenditures are to be documented for reimbursement?
	What is the policy of the evacuation team members' home organization regarding recovery time and time to participate in AAR and other return-to-readiness activities?
	Who is responsible for conducting an AAR and ensuring necessary changes are made to plans and SOPs and communicated to staff?
	What equipment and supplies need to be restocked?
	What new information needs to be communicated to the public to maintain their awareness to be prepared?
	Does the plan indicate that the contraflow plans have been tested in an exercise or drill, or in a real evacuation?
	Does the plan require periodic reviews and updates of the plan, exercises, and AARs as part of the planning process?
	Does the plan provide for updating mutual-aid agreements?

TOOLS FOR EFFECTIVE HIGHWAY EVACUATION OPERATIONS

There are many tools available to support highway evacuations, and they fall into three broad categories: communications; traffic control; and evacuation, weather, and assessment monitoring and prediction as described in the following sections.

COMMUNICATION TOOLS

With technology changing rapidly, there are many more tools available to successfully execute an evacuation. But it is also important to use some "tried and true" methods that may not be considered "high tech" but that serve a useful purpose depending on the circumstances of the evacuation. For example, if there are widespread power outages some tools may not be available for communications with the public and among the emergency response teams. Perhaps the most important message is that governments need a variety of tools at their disposal and the ability to choose which to use in an evacuation.

The following provides a list of potential communication tools available for this purpose:

Traveler Information-Dial 511 – As previously noted, many States have robust 511 or other telephone traveler information systems. These systems may be used to aid evacuees who have access to landline or cellular telephones prior to or during the evacuation.

Loud Speakers – Many communities have loud speakers mounted on posts in the community that can be used to broadcast information. Likewise, many public service vehicles, like police cars, can broadcast information over a loud speaker as they move through an area. Both can be valuable tools depending on whether providing informa tion in a specific geographic area (post-mounted speakers) or in a larger area where information needs to be provided quickly (a roving vehicle with a speaker).

Siren Systems – Some communities, particularly those areas that are prone to tornados or tsunamis, have siren systems, which can be used to alert people to take immediate action to ensure their safety.

Handouts – Handouts take many forms such as flyers distributed at a highway rest area or on a transit vehicle, information posted on bulletin boards, or informational pamphlets with preparedness tips such as those often provided by public agencies at the start of hurricane season. The goal is to provide the public with the information that governments want to share, whether it is in preparation for a hurricane, or as part of an evacuation to provide information about alternate highway routes or where to find food and shelter. Handouts should be provided in a variety of languages in accordance with the demographics of the area.

REVERSE 911® – This system allows government agencies with this technology to place thousands of telephone calls simultaneously to residents with local phone service. These calls can be used as a public warning system to alert residents of the need to act in an emergency. These systems are designed to send thousands of calls within 30 minutes. Depending on system capabilities, officials can target messages to residents in specific geographic areas affected by varying levels of evacuation. When using these systems, special arrangements need to be made for the hearing impaired (Telephone Device for the Deaf is an optional feature), those unable to understand the contents of messages, and those properties without telephones.

Roadside Information Locations – There are many locations where motorists may receive information during an evacuation, including rest stops, welcome centers, turnpike service plazas, toll facilities, visitor information centers, hotels, restaurants, and gas stations. Information can also be provided to truckers at weigh stations, truck stops, and agricultural inspection stations as well as through trucking associations.

VMS – These include those already on the highway and portable signs that can be pre-staged and moved to routes along the highway. VMS can broadcast evacuation route and shelter information.

Media – The media can play a critical role in an evacuation due to their ability to reach large numbers of people simultaneously. The media may be television, radio, and newspaper including the Emergency Alert System (EAS) as well as media outlet's websites. It is important for the government to provide timely and accurate information to the media so that they can share it as soon as possible with their audience. It is also important for the media to know when regular updates of information should occur to ensure they are prepared to share it when available. A cross-section of media is also important. For example, some radio stations cater to different age groups or people who speak other languages, so a wider selection of media, increases the opportunity to reach a wider audience. It is also important on the television broadcast media to provide the information through a person who provides sign language interpretation as well as closed captioned information for the hearing impaired.

EAS – The EAS enables the President with the capability to provide immediate communications and information to the general public at the National, State, and local levels The EAS may be used to provide heads of State and local governments or their designated representatives with a means of emergency communication with the public in their State or local area. The EAS overseen by the Federal Communications Commission (FCC), includes certain AM, FM, Low-power FM and TV broadcast stations; Class A television stations; Low-power TV stations; cable systems; wireless cable systems; and other entities as agreed to by the FCC.

Public Access Cable Television – Many local governments operate cable channels and can use such channels to broadcast information to the public.

Television Text Services and the Internet – This tool is not for emergency alerts, but is useful for posting detailed information that would be communicable by emergency calls or broadcasts.

Organizational Public Address and E-mail Systems - Messages can reach a large number of staff quickly.

Cell Phones – Today's cell phone technology allows information to be broadcast directly to many cell phone users based upon their subscription to a specific service, or allows the users to provide information both verbally and through photos to emergency responders, as happened with the London subway bombing in 2005. Examples range from some transit systems sending information on when the next bus should be arriving at a given location to several companies providing real time traffic

information to their subscribers. This real time information could be very useful during an evacuation. In addition, some companies are exploring the use of GPS to pinpoint drivers and provide specific information, such as an evacuation route, directly to their cell phone in an emergency situation. Cell phone alerts, voice and text, can also be used to notify government emergency management staff and elected officials of the need to respond to an impending emergency situation.

Call Centers – Many agencies provide a toll-free hotline for people to call during an emergency to receive information. The hotline may be used to provide evacuation route information, shelter locations, or other information important to evacuees. Often these numbers are the same as the agency's general information number, but the agency increases the number of staff available to respond to inquiries during times of emergency. The call centers should also be equipped to respond to the needs of the hearing impaired with the appropriate devices such as Telecommunications Device for the Deaf (TDD).

TRAFFIC CONTROL TOOLS

Traffic control tools range from the traditional tools such as signs and traffic signals to ITS tools as discussed earlier in this primer. Where available, both types of traffic control tools should be used. Since ITS has already been discussed, this section focuses on the more traditional means of controlling traffic and how they might be used in an evacuation. A complete listing of traffic control devices applicable to incident and emergency management may be found in the Manual on Uniform Traffic Control Devices (MUTCD). A link to the MUTCD is included in the "Other Information Resources" section of this primer.

TIM Assets – Many States and localities have TIM programs. TIM allows for collabo ration across government and the private sector, including between transportation and public safety, to ensure that response to incidents is quick to minimize disruptions to the flow of traffic. Good TIM during an evacuation is especially important as even a minor accident could delay the clearance of an area by several hours. Personnel and assets assigned to TIM programs such as motorist assistance teams may form the base of an EOT or provide operational support to an EOT during an evacuation. TIM personnel are usually trained in ICS.

Traffic Counting Devices – Most State and local transportation agencies have a routine traffic counting program that enables them to record the number of vehicles, types of vehicles, travel direction of vehicles, and the time of day of vehicle travel. Personnel in the field may do these counts manually, by portable counting tubes placed across the roadway, or by permanent sensors placed in the roadway pavement.

The value of this data in an evacuation is providing information about the progress of the evacuation, the number of vehicles evacuating and their destination, so that those executing the evacuation and those receiving the evacuees can be better prepared.

Traffic Signals - Traffic signals at intersections may be stand-alone devices or inter connected through a computerized signal system. When computerized, the timing of the traffic signal cycles can be easily modified for an evacuation, changing the signal timing to give longer "green time" in the direction of the evacuation and on evacuation routes assisting in moving more vehicles in a shorter amount of time. The signal timing must take into account other travel needs such as the ingress of emergency vehicles and equipment. Some traffic signals may be placed in "flash mode" to allow more through travel or may be operated manually by a law enforcement officer at an intersection. Traffic signal timing adjustments may also be needed to support re-entry operations. Some communities have installed an uninterruptible power supply (UPS) on their traffic signal system or have equipped key intersections with generators to ensure the traffic signals continue to operate if power is lost in the area.

Traffic Signal Timing Plans – Many locations plan in advance for the modification of their traffic signal timing for an evacuation. This allows signal timing to be changed quickly and law enforcement to know what to expect in terms of changing traffic patterns. Signal timings are often developed in advance for detour routes that may also be needed in the event of an emergency. This information should be incorporated into evacuation plans and SOPs.

Traffic Signal Pre-emption – Some locations have installed pre-emption devices on some traffic signals. These pre-emption devices allow an approaching emergency vehicle to change the traffic signal timing pattern to allow them to proceed unimpeded through the intersection.

Ramp Meters – Some locations have ramp meters, which are traffic signals on freeway entrance ramps that stop traffic at certain intervals to allow for the timed entry of vehicles on the ramp into the main flow of traffic.

Ramp Gates – A few locations have installed gates at freeway entrance and exit ramps that can be used to prevent traffic from entering and exiting the freeway at certain locations. These may be especially useful if contraflow is being used for an evacuation.

Traffic Signs – All highways have some form of traffic control signs to control speed and provide other regulatory information. Signs are also used to provide information to motorists. In an evacuation, these signs may be used to designate an evacuation route or show the location of shelters, or perhaps contraflow traffic patterns. In some locations, flip down signs have been installed that can be flipped down to provide

emergency information and flipped up when an evacuation is not underway. Some locations have installed signs on the back of other traffic signs that can only be seen during contraflow operations.

Pavement Markings – All highways have some type of pavement markings to designate travel lanes, emergency lanes, High Occupancy Vehicle (HOV) lanes, merge locations, etc. Some locations use pavement markings to show that the road is an evacuation route or that emergency lanes can be used as travel lanes in an evacua tion, or have mileage markers or exit numbers allowing those doing aerial monitoring of an evacuation to pinpoint specific locations.

HOV Lanes – Some cities have designated HOV lanes that are usually used to speed rush-hour traffic for those willing to share the ride. In emergencies, some locations use the HOV lanes as an extra lane for evacuation or as an ingress lane for emergency vehicles and supplies.

Frontage Roads – Some cities have frontage roads along limited or controlled access roadways. These frontage roads can provide a means to circulate emergency vehicles during an evacuation.

Reversible Lanes – In some locations, highways and bridges have been built with reversible lanes both on freeways and arterials. These lanes can be modified to switch the direction of travel during peak hours to accommodate rush-hour traffic. Reversible lanes could also be employed in an evacuation as necessary.

TMCs – The mission of TMCs is to facilitate the safe movement of people and goods, with minimal delay, throughout the roadway system. TMCs achieve their mission by: (a) maximizing the available capacity of the area-wide roadway system; (b) minimizing the impact of roadway incidents (accidents, stalled vehicles, and debris); (c) contributing to the regulation of demand; (d) assisting in the provision of emergency services; and (e) creating and maintaining public confidence in the TMC.

EVACUATION, WEATHER, AND ASSESSMENT MONITORING AND PREDICTION TOOLS

The following are transportation, weather, and assessment monitoring and prediction tools that can support an evacuation.

Clarus - This is a system that helps predict weather conditions. For those evacuating in advance of a severe storm, weather information plays a key role in their safety. Tropical storms and hurricanes may spawn tornados well in advance of the front and may inundate an area very rapidly. Many victims of storms actually perish due to resultant flooding or secondary tornados. Travelers must be aware of the weather and their environment at all times when evacuating an area. Clarus and other modeling tools that are available through the National Weather Center are vital to assessing

dangers to evacuees while traveling along the evacuation route.

Consequence Assessment Tool Set/Joint Assessment of Catastrophic Events (CATS/JACE)- This model was developed under the guidance of FEMA and the Defense Threat Reduction Agency. The CATS/JACE software provides disaster analysis in real time with an array of information integrated from a variety of sources. The software is deployable for actual emergencies with capabilities including contingency and logistical planning as well as consequence management. The CATS program integrates hazard prediction, consequence assessment, and emergency management tools with critical population and infrastructure data. It uses tools and data that predict the hazard areas caused by manmade events and natural disasters including earthquakes and hurricanes. CATS assists with estimating collateral damage to facilities, resources, and infrastructure, and creates mitigation strategies for responders.

Dynamic Network Assignment-Simulation Model for Advanced Road Telematics (Planning version) – DYNASMART-P – FHWA supported the development of this model by the University of Maryland to support network planning and traffic operations decisions through the use of simulation-based dynamic traffic assignment. FHWA is examining the application of this model for emergency transportation management analysis.

Evacuation Traffic Information System (ETIS) - FHWA currently supports the ETIS, which is a web-based program that facilitates the sharing of evacuation and traffic information among coastal states in the Gulf Coast and southeast from Texas to Virginia. The ETIS supports decisions such as evacuation type (e.g., voluntary, mandatory, staged) and implementation of contraflow or lane-reversal operations. The ETIS was originally developed under U.S. Army Corps of Engineers auspices, but is now under FHWA sponsorship, and operated by its private developers.

Evacuation Travel Demand Forecasting System – This is a macro-level evacu ation modeling and analysis system that was developed in the aftermath of Hurricane Floyd to address the need to forecast and anticipate large, cross-state traffic volumes. This is a web-based travel demand forecast system that anticipates evacuation traffic congestion and cross-state travel flows for North Carolina, South Carolina, Georgia, and Florida. The Evacuation Travel Demand Forecasting System model was designed so emergency management officials can access the model on-line and input hurricane category, expected evacuation participation rate, tourist occupancy, and destination percentages for impacted counties. The output of the model includes the expected level of congestion on major highways and tables of vehicle volumes expected to cross state lines by direction.

Hazard U.S. – Multihazard (HAZUS-MH MR2) - Developed by FEMA, this

model is a loss estimation and risk assessment program covering earthquakes, hurri canes, and flooding. By modeling the physical world of buildings and structures and then subjecting it to the complex consequences of a hazard event, users can imple ment this tool to prepare for a natural disaster, respond to the threat, and analyze the potential loss of life, injuries, and property damage.

Hurricane and Evacuation (HURREVAC) - This is a program that uses GIS data to correlate demographic data with shelter locations and their proximity to evacuation routes to estimate the effect of strategic-level evacuation decisions.

MASS eVACuation (MASSVAC) – This is a macro-level model originally developed for the purpose of modeling nuclear power plant evacuations. More recently, it was applied to test operational strategies for hurricane evacuations in Virginia.

Network Emergency Evacuation (NETVAC) - NETVAC was developed as part of the reaction to the Three-Mile Island nuclear reactor incident in 1979. While strong in terms of a response to a Point-A-to-Point-B situation, it is limited in application to hurricane evacuation, which often includes multiple Points A and B. However, transportation and emergency managers may seek to use this model to analyze route selection, intersection controls, and lane management.

Oak Ridge Evacuation Modeling System (OREMS) – This is an evacuation analysis tool designed to simulate traffic flow during various defense-oriented emer gency evacuations. The model can be used to estimate clearance times and identify operational traffic characteristics and other information such as evacuation routes and times necessary to develop evacuation plans. It also allows users to experiment with alternate routes, destinations, traffic control and management strategies, and evacuees' response rates.

Plume Modeling Tools - These are models used to predict where a plume may travel from its release location. The plume may be created by a radiological release, chemical release, smoke from fires, or some other situation that causes airborne contaminants to travel across an area. There are many plume models in use and most are specific to the type of event and can be modified to accept site specific data such as wind speed, direction, and others factors affecting the spread of the plume. Such models are important in determining where a plume may spread and how fast it may travel, and in defining a geographic area that should be evacuated or an area for occupants to shelter-in-place.

Sea, Lake, and Overland Surges from Hurricanes (SLOSH) - The most widely applied flooding model for evacuation analysis is the SLOSH model. Developed by the NWS to predict hurricane storm surge for a given set of condi-

tions (e.g., hurricane strength, wind speed, direction of movement, and geography), it is also used to help plan evacuation routes and locate emergency shelters based on estimates of which geographic areas could be flooded under certain storm scenarios. The NHC, in coordination with Federal, State, and local organizations, has developed SLOSH models for over 38 water basins along the Atlantic and Pacific Ocean coastal areas with 14 "SLOSH Basins" covering the State of Florida

Traffic Estimation and Prediction System (TrEPS) - FHWA has been working on Dynamic Traffic Assignment research projects. The main objective of the research projects is to develop a deployable real time Traffic Estimation and Prediction System (TrEPS).

FUTURE DIRECTIONS

FHWA is working with transportation agencies and their partners to improve planning and the use of technology in emergency transportation operations. These areas cover:

- Better regional and transportation operations planning with training and exercises
- Transportation agencies' effective working relationships with other responders, including police, fire, emergency medical, public health, military, and intelligence agencies
- Use of smarter and more powerful tools to support updated evacuation models and prepare traffic response scenarios
- Transportation agencies' understanding and readiness to work with other responders at the incident scene through the use of the ICS
- Extension of TIM programs to evacuation procedures
- Agencies' identification of critical information technology resources, assessment of the risks, and identification and implementation of counter measures
- How to protect communications networks and TMCs
- Agencies' prioritization and implementation of intelligent infrastructure along critical evacuation routes
- Understanding and implementation of agency communications systems that are compatible with other modes and other responders.

OTHER INFORMATION RESOURCES

FHWA and other parts of the U.S. DOT stand ready to support local, regional, State, and Federal organizations as they engage in critical evacuation planning efforts. In this vein, we will continue to provide resource materials and information on best prac tices, lessons learned, and resources to help develop a better evacuation plan. To get started, the following is a preliminary list of resources on this topic. Please refer to www.ops.fhwa.dot.gov/opssecurity for new studies, resources, and materials that may aid in efforts to "build a better plan."

For more information on a specific topic, please visit the following online resources:

- Contraflow Evacuation Workshop materials available at http://www.teachamerica.com/contraflow/Index.html
- Emergency Alert System (EAS) available at http://www.fcc.gov/eb/eas
- Emergency Information Infrastructure Project (for professional development of emergency responders) available at http://emforum.org
- Emergency Management Assistance Compact (EMAC) available at www.emacweb.org
- Evacuation Liaison Team (ELT) available at http://ops.fhwa.dot.gov/weather/mitigating-impacts/programs-external
- Federal assistance information available at https://www.disasterhelp.gov/portal/jhtml/index.jhtml
- Florida Contraflow information available at www.onewayflorida.com
- FHWA Emergency Relief information and manual available at http>//www.fhwa.dot.gov/programadmin/erelief.html and http.//www.fhwa.dot.gov/reports/eem/index.htm
- FHWA Emergency Relief for Federally Owned Lands information available at http://www.fhwa.dot.gov/flh/erfo.htm
- Hazardous Materials Response CD-ROM (CHRIS+) available at no cost from the U.S. Coast Guard at 202-372-1421 or alan.l.schneider@uscg.mil
- Highway Capacity Manual available at http://trb.org
- Houston TranStar available at http://www.houstontranstar.org
- Intelligent Transportation Systems available at http://www.its.dot.gov/index.htm
- Lessons Learned Information Sharing available at www.LLIS.gov

- Mid Atlantic All Hazards Forum available at www.allhazardsforum.com
- National Voluntary Organizations Active in Disasters (NVOAD) available at htto://www.nvoad.org
- Real Time System Management Information Program available at www.fhwa.dot.gov/safetealu/factsheets/realtimesmi.htm and http://ops.fhwa.dot.gov/travelinfo
- Response & Recovery Library available at http://www.fema.gov/library/respandrecov.shtm
- Children in Emergencies available at http://www.savethechildren.org/emergencies/usa/gulf_coast_hurricane_shriver.asp
- Urban Search & Rescue available at http://www.fema.gov/emergency/usr/index.shtm
- National Weather Service Storm Ready available at http://www.nws.noaa.govhttp://www.nws.noaa.gov
- Road Weather Management available at http://ops.fhwa.dot.gov/weather/index.asp

The following documents have been referenced in this guide and contain further information on general principles of emergency planning.

- Citizen Corps Support for Hurricane Katrina Response and Recovery Efforts. Citizen Corps. Available at http://www.citizencorps.gov/doc/cc_Support_Katrina_1005.doc
- Communicating with the Public Using ATIS During Disasters Concept of Operations. Available at http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE//14262.htm
- Development of Evacuation Time Estimate Studies for Nuclear Power Plants (NUREG/CR-6863). Available at http://www.nrc.gov/reading-rm/doc collections/nuregs/contract/cr6863/index.html
- Effective Risk Communication (NUREG/BR-0318). Available at http://www.nrc.gov/reading-rm/doc-collections/nuregs/brochures/br0308/index.html
- EMAC 2005 Hurricane Season After-Action Report. Available at http://www.emacweb.org/?1455
- Guide For All-Hazard Emergency Operations Planning. Federal Emergency Management Agency, September 1996. Available at http://www.eh.doe.gov/feosh/SLG101.PDF

- High-Risk Area Hurricane Survey by the Harvard School of Public Health, July 2006. Available at http://www.hsph.harvard.edu/hurricane/topline.doc
- Identification and Analysis of Factors Affecting Emergency Evacuations - Main Report (NUREG/CR-6864, Vol. 1). Available at http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/cr6864/v1/
- Identification and Analysis of Factors Affecting Emergency Evacuations - Appendices (NUREG/CR-6864, Vol. 2) Available at http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/cr6864/v2/
- Integration of Emergency and Weather Elements into Transportation Management Centers, February 2006. Available at http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS-TE//14247.htm
- Manual on Uniform Traffic Control Devices (MUTCD). Available at https://mutcd.fhwa.gov
- National Incident Management System (NIMS). Department of Homeland Security. March 2004. Available at http://www.fema.gov/pdf/emergency/nims/nims_doc_full.pdf
- National Response Plan, Department of Homeland Security, December 2004. Available at http://www.dhs.gov/interweb/assetlibrary/NRPbaseplan.pdf
- Recommended Emergency Preparedness for Urban, Rural and Specialized Transit Systems, U.S. Department of Transportation, Research and Special Programs Administration Report. John A. Volpe National Transportation Systems Center. January 1991. Available at transit-safety.volpe.dot.gov/Publications
- Report to Congress on Catastrophic Hurricane Evacuation Plan Evaluation. Available at http://www.fhwa.dot.gov/reports/hurricaneevacuation/index.htm
- Simplified Guide to the Incident Command System for Transportation Professionals. US Department of Transportation. FHWA Office of Operations. February 2006 (FHWA-HOP-06-0004) Available at www.ops.fhwa.dot.gov/publications/ics_guide
- The Federal Response to Hurricane Katrina: Lessons Learned, February 2006. Available at http://www.whitehouse.gov/reports/katrina-lessons-learned.pdf
- Traffic Signal Timing for Urban Evacuation, August 2005. To be posted by FHWA in late 2006
- Transportation and Emergency Preparedness Checklist. Available at http://www.dotcr.ost.dot.gov/asp/emergencyprep.asp

GLOSSARY OF TERMS

Activated – Direction is provided to personnel to report to their assigned location to support an evacuation.

Advanced Traveler Information Systems (ATIS) – ATIS provide traffic information and travel recommendations and guidance to drivers to help them make better travel decisions.

After-Action Report (AAR) - A report consisting of a summary of lessons learned from an incident. The AAR should include recommendations for improve ments, and it is important for decision makers and agency personnel to consider and implement those recommendations quickly.

Agency Representative - An individual designated by an assisting agency for the purpose of making authoritative decisions on matters affecting the agency's participa tion at the incident.

Alerted – Notice is provided to personnel of their need to report to their assigned location to support an evacuation.

Contraflow – Contraflow or lane reversal is utilized during mass evacuations on major limited or controlled access highways to reduce the duration of an evacuation by opening up all lanes in one direction.

Emergency Event – An incident or occurrence that requires an immediate response to bring the situation under control and restore normality, and which can threaten the health or safety of those involved, responders, and people in the surrounding area.

Emergency Operations Center (EOC) – The EOC is an established location/ facility in which local and State staff and officials can receive information pertaining to an incident and from which they can provide direction, coordination, and support to emergency operations. This is where the decision makers and support agencies should report to manage an evacuation.

Emergency Support Function (ESF) Annexes – Found in the NRP, the ESFs detail the missions, policies, structures, and responsibilities of Federal agencies for coordinating resource and programmatic support to States, tribes, and other Federal agencies or other jurisdictions and entities during Incidents of National Significance. The introduction to the ESF annexes summarizes the functions of ESF coordinators and primary and support agencies.

Evacuation - The process by which people are moved away from a place where there is immediate or anticipated danger to a place of safety, offered appropriate temporary welfare facilities, and enabled to return to their normal accommodation and activities when the threat to safety has passed, or to make suitable alternative arrangements.

Evacuation Liaison Team (ELT) - The ELT is comprised of members from the FHWA, FEMA, and the U.S. Army Corps of Engineers. The ELT serves as the focal point for coordination and communication among States during an evacuation. The ELT is activated for Category 3 or higher hurricanes that may necessitate multi-State evacuations. When activated, ELT activities are coordinated from the FEMA Regional Operations Center in Atlanta, GA.

Evacuation Operations Team (EOT) - The EOT comprises personnel from a variety of disciplines including but not limited to TIM teams, public safety officers (police, fire, rescue, emergency medical services), road maintenance workers, debris clearance personnel, utility representatives, and transportation and transit planners to plan and manage the evacuation.

First Responder – This is the first responding unit to arrive at an incident scene. This term has traditionally been used to describe public safety emergency responders who have duties related to preservation of life and property. As transportation agen cies become more actively involved in traffic incident response and take active roles in Incident Command (as partners in Unified Command), they are becoming accepted as first responders for traffic incidents. For example, motorist assistance teams may be first on the scene of an incident and many are trained to provide traffic control to stabilize the scene and provide emergency first aid. Some service patrols are also permitted limited use of emergency lights and sirens to get to an incident.

Geographic Information System (GIS) – GIS is a system for creating, storing, analyzing, and managing spatial data and associated attributes. It is a computer system capable of integrating, storing, editing, analyzing, sharing, and displaying geographically referenced information.

Highway Advisory Radio (HAR) – HAR is used to broadcast information to motorists in a localized area and provide more information than can often be communicated with a VMS.

Incident Command System (ICS) – This is a systematic tool used for the command, control, and coordination of emergency response. ICS allows agencies to work together using common terminology and operating procedures to control personnel, facilities, equipment, and communications at a single incident scene. It facilitates a consistent response to any incident by employing a common organizational structure that can be expanded and contracted in a logical manner based on the level of required response.

Intelligent Transportation Systems (ITS) – ITS encompass a broad range of wireless and wire-line communications-based information and electronics technolo gies. One of the ways that transportation officials are responding to the need for information is through the application of ITS technologies.

In-Vehicle Systems – These systems can provide a wide array of information to a motorist via a video display inside the vehicle. Subscribers to these services can receive routine traveler information as well as emergency information.

Liaison Officer – This is a command staff position consisting of a single person who acts as the on-scene contact point for representatives of assisting agencies assigned to the incident. A liaison officer may designate one or more assistants from either the same or another assisting agency or jurisdiction.

Mandatory Evacuation – This is a situation where authorities put maximum emphasis on encouraging evacuation and limiting ingress to potentially impacted areas. These events also occur when evacuation transportation plans go into effect.

Mutual-Aid Agreement – This is a written agreement between agencies and/or jurisdictions to assist one another on request by furnishing personnel, equipment, and/or expertise in a specified manner.

National Incident Management System (NIMS) – This is a system mandated by Homeland Security Presidential Directive 5 that provides a consistent nationwide approach for governments, the private sector, and non-governmental organizations, to work effectively and efficiently together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity.

National Response Plan (NRP) – This is an all-discipline, all-hazards plan for the management of domestic incidents. Using the template established by the NIMS, the NRP provides the structure and mechanisms to coordinate and integrate incident management activities and emergency support functions across Federal, State, local, and tribal government entities; the private sector; and non-governmental organizations.

National Warning System (NAWAS) - The NAWAS is a national, intercon nected telephone system that can be used to warn areas of impending emergencies.

Preparedness – This is the range of deliberate, critical tasks and activities necessary to build, sustain, and improve the operational capability to prevent, protect against, respond to, and recover from domestic incidents.

Recommended Evacuation – This is an evacuation issued when an event has a high probability of causing a threat to people living in at-risk areas. Decisions of whether or not to leave are left to individuals and some special transportation arrangements are made.

Resource – Resources include personnel or equipment assigned to perform a specific tactical operation at an incident. Resources can be organized into task forces or strike teams.

Shadow Evacuation – These evacuations involve people who are not in the danger area but choose to evacuate, thereby increasing the time needed to evacuate an area.

Shelter – This is a location where people evacuated from a disaster area can go to receive appropriate care until they can return to the evacuated area or be otherwise accommodated.

Staging Area – This is a location established to enable positioning of and accounting for resources not immediately assigned. A staging area may include temporary feeding, fueling, and sanitation services as necessary.

Standard Operating Procedure (SOP) – This is a complete reference document detailing the procedures for performing a single function.

Traffic Data Recording System - This system is widely used by State DOTs for planning purposes to monitor and assess statewide traffic volume and speed char acteristics. While the design of individual systems vary, they typically use a remote sensing system (i.e., pavement loops) and a basic traffic data recorder.

Traffic Management Center (TMC) or Traffic Operations Center (TOC) - The TMC or TOC is the hub of a transportation management system, where information about the transportation network is collected and combined with other operational and control data to manage the transportation network and produce traveler information. It is the focal point for communicating transportation-related information to the media and the motoring public, and a place where agencies can coordinate their responses to transportation situations and conditions. The TMC links various elements of ITS such as VMS, closed circuit video equipment, and roadside count stations enabling decision makers to identify and react to an incident in a timely manner based on real time data.

Traffic Management Plan – This is a plan established to clearly direct and control the flow of traffic that has been interrupted with minimal disturbance to normal flow. The plan determines the placement of barricades, warning lights, or signs for the dura tion of the highway incident impeding normal traffic flow.

Unified Command (UC) – This is one of two methods of performing the command function that employs multiple ranking personnel. UC is used when an inci dent affects multiple political or legal jurisdictions and/or involves several responding agencies with contrasting functional responsibilities and missions.

Voluntary Evacuation – This type of evacuation is targeted toward people most vulnerable to the threat, including offshore workers, persons on coastal islands and other flood prone areas, and other special populations having particularly long lead-time evacuation requirements. This also includes people in harm's way from other events. No special traffic control or transportation measures are usually taken during voluntary evacuations, and people may remain if they so choose.

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15. Supplementary Notes

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16. Abstract

Evacuations may involve hundreds or hundreds of thousands of people. Regardless of the numbers, in each and every instance, the transportation network plays a key role in evacuating people out of harm's way. Recognizing the unique challenges posed by the disaster environment on mobility and the safe and secure movement of people and goods, the U. S. Department of Transportation's (DOT's) Federal Highway Administration (FHWA) seeks to improve evacuation planning and implementation by bringing to the emergency management community new ways of better using the transportation network before and during evacuations.

This document constitutes the first of a primer series entitled "Routes to Effective Evacuations." This primer is intended as a tool to aid local and state planners to maximize the use of the highway network in the development and execution of evacuation plans for their communities, states or regions.

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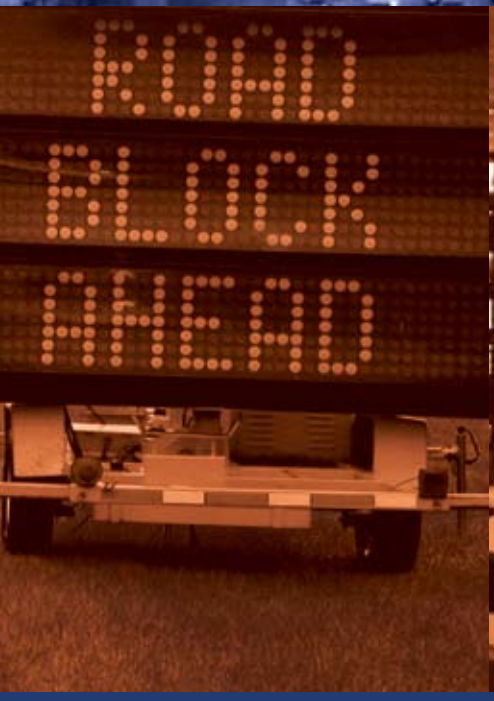

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