Alternate Route Handbook

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16. Abstract

This report describes and defines what alternate route traffic routes are and how traffic and highway agencies can implement them. The need for, planning, and execution of alternate routes with stakeholder agencies is addressed. Highway and traffic agencies, public safety agencies, and State, county and local municipalities are the target audience.

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ALTERNATE ROUTES

An alternate route provides additional capacity to service primary route traffic. Alternate routes begin from one point on the primary route and terminate at another point on the primary route. The terminal point of an alternate route must be downstream of the congested area. The congestion may result from some event that causes either a significant or total roadway capacity reduction or excessive, sustained traffic demand. These events may include a traffic incident, natural disaster, or emergency. These events may render a roadway facility impassable. Diverting traffic to a parallel roadway specified in a carefully planned alternate route plan provides an effective, temporary response to facilitating increased mobility and improved travel time reliability in the corridor.

Figure 1-1. Example of traffic diversion. *(Source: Washington State DOT)*

Alternate routes may accommodate local and/or regional traffic. A local alternate route involves diverting primary route traffic a short distance, typically from one point (e.g., interchange or major intersection) to the next downstream point using a roadway located adjacent to the primary route. A regional alternate route typically represents a high-speed, high-capacity facility that services a primary route through traffic, destined for some location (e.g., city) far downstream of the bottleneck location, over an extended distance. The purpose of a regional alternate route is to minimize travel time and delay anticipated on the primary route or local alternate route.

The function and operation of alternate routes differ considerably from that of evacuation routes. When implemented, alternate routes must accommodate both the traffic diverted from another facility and day-to-day background traffic on the alternate route. However, evacuation routes are typically required to move large numbers of people away from a particular location. Therefore, traffic flow on evacuation routes is typically unidirectional; often, officials use uncommon traffic management strategies, such as contraflow lanes, to maximize traffic flow in one mandated travel direction. During an evacuation, officials may find it necessary to utilize parallel alternate routes to accommodate as much traffic as possible away from a particular location.

PROBLEM STATEMENT

The public has become increasingly sensitive to the impact congestion has on *quality of life*, citing delays caused by traffic congestion as its top community transportation concern in a recent national survey.[1] The *2005 Urban Mobility Report* reported road users in 85 U.S. urban areas incurred $63 billion in congestion costs in 2003, resulting in 2.3 billion gallons of wasted fuel and 3.7 billion hours of lost productivity.[2] Congestion equates to decreased performance and, in turn, economic loss for businesses and trucking companies. Congestion either causes late deliveries or forces truckers to include additional travel time into their itineraries, particularly when making *just-in-time* deliveries. According to a recent Federal Highway Administration (FHWA) report, approximately 55 percent of all delays are caused

by non-recurring congestion (e.g., traffic incidents, work zones, bad weather, and special events).[3] The report attributes the remaining 45 percent of all delays to recurring congestion, caused by physical capacity constraints (e.g., bottlenecks) and poor signal timing. Mitigating traffic congestion involves stakeholders applying a toolbox of operations strategies and resources for managing day-to-day and event-specific (planned or unplanned) transportation operations. However, few tools represent a proactive response to mitigating nearly all sources of congestion affecting a particular roadway facility segment, without requiring significant modification between applications, than alternate route plans. Use of these plans support an underlying goal of highway system operators, to maintain travel time reliability for all system users—commuters, truckers, and bus transit.

The implementation of an alternate route plan marks a key traffic management strategy for minimizing the effect of a non-recurring congestion-causing event on traffic flow. It serves to reduce demand upstream of an event site or bottleneck through the diversion of traffic from the mainline. The location and time of such events may be known in advance, or the event may happen at random with very little or no warning. These events are commonly termed *planned* and *unplanned* events, respectively. Congestion-causing events, whether planned or unplanned, result in a reduction in roadway capacity and/or an increase in traffic demand. Table 1-1 shows the effects that both planned and unplanned events have on capacity.

Table 1-1. Congestion impacts of planned and unplanned events

	EVENT TYPE	EFFECT ON ROAD CAPACITY
Planned Event	Major roadway construction and maintenance	· Closes travel lane(s) or road segments. · Creates side friction, reducing traffic speed and capacity.
	Planned special event	· Closes travel lane(s) or road segments to stage event (typically street use events).
Unplanned Event	Traffic incident (e.g., crash, disablement, spilled load, debris)	· Blocks travel lane(s) or road segments.
	Emergency road work	· Blocks travel lane(s) or road segments.
	Adverse weather (e.g., snow, ice, fog, heavy rain, sun glare)	· Reduces vehicle operating speeds and increases headways, thus reducing capacity.
	Emergency (e.g., severe weather, natural disaster, human-caused incident)	· Renders road segments impassable (potentially).

The following major cases of planned or unplanned event occurrences may necessitate the use of an alternate route plan:

- *Traffic incidents*, such as serious crashes or cargo spills that possibly include a hazardous material release, causing multi-lane or total road closure.
- *Non-traffic incidents*, such as major fires, industrial accidents, and bridge collapses, rendering sections of a roadway impassable.
- *Emergencies*, such as a severe weather event, acts of violence, or other major catastrophes, causing road closure and/or inducing a surge of traffic demand on evacuation routes that creates bottlenecks at capacity-restrained locations.
- *Planned special events*, such as a sporting/concert event or parade/festival, which creates an increase in travel demand and may require road closures to stage the event.
- *Major roadway construction and maintenance*, which may close or restrict a section of roadway.

The common result of each of these events is the reduction in capacity of a roadway, and possibly an increase in demand, thus necessitating the consideration of alternate route implementation. Both planned and unplanned events require the same planning process to develop viable alternate route plans. A few specific examples where alternate routes proved valuable include:

- After the 1994 Northridge earthquake in California, a portion of the Santa Monica Freeway (I-10), one of the world's busiest freeways, was closed. Alternate routes

handled traffic that normally traversed the closed section for a 3-month period. The majority of the alternate routes represented streets located adjacent and parallel to the freeway.[4]

- On Memorial Day weekend in 2002, an Interstate 40 (I-40) bridge spanning the Arkansas River in Oklahoma was hit by a barge and collapsed, which closed the State's major east-west freeway on one of the busiest travel weekends of the year. When traffic was backed up for miles on both sides of the river, officials used geographic information systems (GIS) to identify alternate routes that provided suitable access to I-40 downstream of the closed bridge.[5]
- During a major reconstruction of Interstate 95 (I-95) in southeast Florida, capacity was significantly reduced. Even with six lanes open, side friction caused by construction activities significantly reduced traffic speed and capacity. In order to maintain traffic flow in the construction zone, alternate routes were used during peak traffic hours to divert traffic volume from/to I-95 and around the bottleneck location.[6]
- Alternate route plans are also useful in the case of a planned special event, where traffic not destined for the event can avoid it, while traffic destined to the event can utilize the least congested route to the venue. In Atlanta, GA, an alternate route, known as the "Blue Loop," is used to divert non-attendee, background traffic away from Peachtree Street in downtown Atlanta when it is restricted due to a special event.[7]
- A Chemical Stockpile Emergency Preparedness Program was developed for the Umatilla Chemical Depot in Oregon to provide alternate routes in a case where the highway is closed due to an accident involving hazardous chemicals, thus requiring traffic to be diverted around the incident site.[8]
- A Hazardous Materials Response Plan was developed for the Myrtle Creek area of Oregon to prevent hazardous materials from entering the South Umpqua River due to an incident at a particular location on Interstate 5 (I-5). This plan includes alternate routes that may be implemented when certain sections of I-5 are closed.[9]
- In April 2004, a man abandoned his car on the San Francisco/Oakland Bay Bridge and threatened to jump. Police activity resulted in the bridge being closed for several hours, necessitating the need for alternate routes to service bridge traffic.[10]

PURPOSE

The occurrence of a traffic incident or other emergency that disrupts the normal flow of traffic places a premium on the optimal use of existing facilities. Advance planning and preparation of alternate route plans enhances the on-scene traffic management capability of interagency incident responders. Alternate route implementation affects improved safety and efficiency of highway operations under prolonged capacity restrictions and without undue impact on the surrounding community.

The development of alternate route plans has become an increasingly important component of traffic incident and emergency management programs nationwide. Agencies acknowledge a need to develop alternate route plans for the following reasons: (1) as a result of the high occurrence of serious traffic incidents such as crashes and cargo spills, (2) as a result of a major catastrophe that closed a roadway section, and (3) to be prepared for any future event. Alternate route plans represent an all-over-ops initiative applicable to multiple highway system management program areas. The same framework for selecting alternate routes and developing alternate route plans apply regardless of the motivation or anticipated application (e.g., accommodate increased travel demand, respond to sudden loss of capacity,

or mitigate effects of a recurring bottleneck) of the alternate route plans for target facility segments. Alternate route plan development typically involves a transportation agency assuming a lead role with support and/or plan review solicited from affected stakeholders, such as public safety agencies, and area residents. Specifications contained in the end product must meet Federal and State standards, as applicable, for the maintenance and protection of traffic. It must also provide guidance to response personnel on when and how to deploy an alternate route and notify affected motorists.

In light of the negative effects that nonrecurring congestion has on traffic operations and the need for alternate route plans, a comprehensive information source is needed by transportation engineers, law enforcement personnel, emergency management personnel, and other stakeholders charged with identifying alternate routes and preparing alternate route plans.

These alternate route plans can address the following issues:

- Contingency planning for future traffic incidents at locations with a high occurrence of crashes.
- Major catastrophes closing a key component of a region's highway infrastructure (e.g., high-capacity bridge, freeway-to-freeway ramp). Major catastrophes include a flood, snowstorm, earthquake, bridge collapse, act of violence, or other non-traffic incident.
- Planned construction and maintenance activities.
- Future planned special events.

Benefits of alternate route plan implementation include decreases in:

- Secondary incidents
- Vehicle fuel consumption
- Vehicle emissions
- Response time to traffic incidents and other emergencies
- Motorist stress levels
- Aggressive driving behavior
- Impact on the movement of freight in the region
- Impact on the regional economy

APPROACH

Various agencies utilize different criteria and guidelines in selecting alternate routes and include different information on associated alternate route plans. Often, these differences are due to different route types and the area that these routes traverse. Despite these differences, alternate routes and associated alternate route plans can be divided into four general categories:

- *Metropolitan—Freeway*: An alternate route consisting of a freeway facility and traversing a metropolitan area. A metropolitan area is defined as an urban area with a population exceeding 1 million.
- *Metropolitan—Street*: An alternate route consisting of a street facility (e.g., arterial or collector roadway) and traversing a metropolitan area.
- *Urban/Rural—Freeway*: An alternate route consisting of a freeway facility and traversing an urban or rural area. These areas are either sparsely populated rural areas, or urban areas with a population of less than 1 million.
- *Urban/Rural—Street*: An alternate route consisting of a street facility (e.g., arterial or collector roadway) and traversing an urban or rural area.

The alternate route planning process involves the following three phases:

- *Alternate Route Selection:* Choosing candidate alternate routes and evaluating each route to determine the optimal alternate route choice.
- *Alternate Route Plan Development:* Developing information to include in the alternate route plan, including information on alternate route implementation.
- *Traffic Management Planning:* Planning for information to be disseminated to motorists during implementation and for traffic control, including capacity enhancements needed to accommodate traffic to/from and on the alternate route.

This handbook will identify minimum and ideal criteria for each phase in the alternate route planning process. Agencies that have limited resources, or that are located in urban/rural areas (characteristic of lower congestion levels and limited alternate route alternatives), may choose to follow the minimum actions. If additional resources are available, agencies, particularly in metropolitan areas with higher congestion levels and numerous candidate alternate routes, may follow the ideal actions presented in this handbook.

The literature indicates that the vast majority of alternate route plans involve diverting traffic from a freeway to a street. For this reason, the main focus of this handbook is on street alternate route plans. However, most actions that apply to the development of street alternate route plans also apply to freeway alternate route plans. In addition, actions key to developing freeway alternate route plans are also included.

ORGANIZATION

This handbook is organized into seven chapters. The following denotes a brief description of each chapter:

- *Chapter 1: Introduction:* Introduction to the concept of alternate routes and why they are needed.
- *Chapter 2: Background:* Literature review and specific alternate route applications, including homeland security. Also includes information about and the results of the state-of-the-practice survey.
- *Chapter 3: Overview of Alternate Route Planning Process:* A description of each of the three phases of the alternate route planning process.
- *Chapter 4: Alternate Route Selection:* A detailed description of phase one of the alternate route planning process: Alternate Route Selection. Each step in the process includes a table describing the role of stakeholders involved and a detailed description of minimum and ideal actions.
- *Chapter 5: Alternate Route Plan Development:* A detailed description of phase two of the alternate route planning process: Alternate Route Plan Development. Each step in the process includes a table describing the role of stakeholders involved and a detailed description of minimum and ideal actions.
- *Chapter 6: Traffic Management Planning:* A detailed description of phase three of the alternate route planning process: Traffic Management Planning. Each step in the process includes a table describing the role of stakeholders involved and a detailed description of minimum and ideal actions.
- *Chapter 7: Implementation:* A detailed description of decision criteria and responder activities that take place when an alternate route plan must be implemented. This chapter includes information on how to evaluate the performance of an alternate route during its operation.

INTENDED AUDIENCE

The successful implementation of an alternate route plan requires the coordination of a diverse group of stakeholders, each with their own knowledge and authority. This handbook is intended to familiarize the reader with the processes, barriers, and technologies associated with alternate route plan development and implementation. It is anticipated that the findings of this handbook will provide guidance for each of the stakeholders that may be involved in one or multiple phases of the alternate route planning process. In chapters four through seven, each section begins with a table detailing the roles and responsibilities of each stakeholder. Potential stakeholders include:

- Transportation/public works agency
- Law enforcement
- Fire department
- Emergency medical service
- Emergency management agency
- Homeland security agency
- Transit agency
- Turnpike/toll authority
- Private towing companies
- Elected officials
- Planning organizations
- Individuals and community groups
- Major incident response team
- Freeway service patrol
- Media

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LITERATURE REVIEW

A review of the literature and an Internet search yielded limited information relating to alternate route planning. The literature revealed that most alternate route information had been developed in the context of incident, emergency, and work zone management. However, there is very little information that provides guidance on alternate route selection and plan development. Details of the documents reviewed are discussed in this chapter of the handbook.

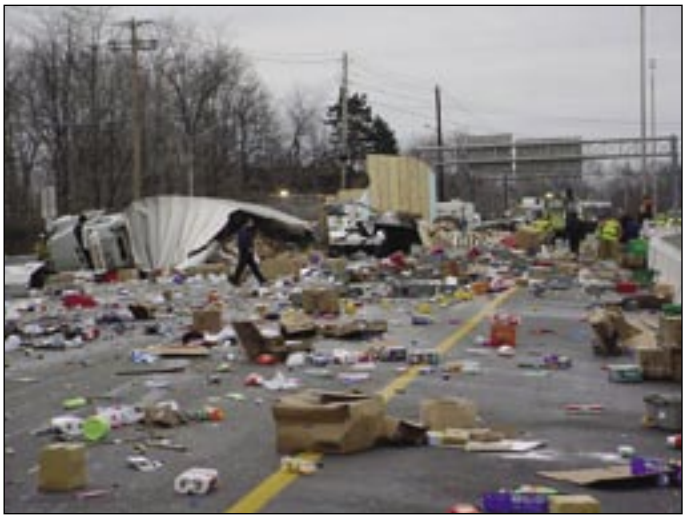


Figure 2-1. Example of an incident requiring the use of an alternate route. *(Source: New Jersey DOT)*

Alternate Route Selection

One notable document relating to alternate route selection was from *Geospatial Solutions.*[1] This document discussed the use of GIS in planning alternate routes when a bridge on I-40 in Oklahoma collapsed. This source presented GIS and traffic simulation as useful techniques in the alternate route selection and evaluation process.

Traffic Management Planning

Most available information regarding specific alternate route plans focuses on the traffic management planning aspect of alternate route plans. A search of the Institute of Transportation Engineers (ITE) journals yielded information regarding alternate route planning. Notable examples included information on alternate routes during the reconstruction of Interstate 95 (I-95) in Florida; the DIVERT system in St. Paul, Minnesota; and the CHART system in Maryland. These examples are discussed in the following:

I-95 Reconstruction: A System Maintenance of Traffic Approach[2] discussed the use of traffic simulation in developing a freeway-to-street alternate route plan, as well as traffic control measures to accommodate traffic along the street alternate route. Traffic control measures included computer-controlled traffic signals, regional signage, encouragement to use public transit, a public information/rideshare service, a freeway incident management program, and visual barriers to reduce rubbernecking. The document highlights the advance planning that is needed to ensure efficient traffic flow and user satisfaction during a major reconstruction project.

DIVERT: DIVERT[3] is an acronym for During Incidents, Vehicles Exit to Reduce Travel Time. This system centers on a single, highly congested interchange in downtown St. Paul, Minnesota, and involves implementing alternate routes to divert traffic away from the interchange and through the city during a freeway incident. The methods used to divert traffic to the alternate route include changeable message signs (CMSs), blankout signs, and trailblazer signs. The freeway is monitored using closed-circuit television (CCTV) cameras and loop detectors to detect incidents. Loop detectors are also used on the alternate routes to adjust traffic signal timing to accommodate diverted traffic. The traffic management methods used in DIVERT are significant Intelligent Transportation Systems (ITS) applications that are used in many modern alternate route plans.

CHART: CHART[4] is an acronym for Coordinated Highways Action Response Team. CHART started with the "Reach the Beach" program, which involved using ITS to help motorists find the best route from the Baltimore-Washington metropolitan area to ocean beaches. A key component of the program's success involved achieving coordination and collaboration between various program stakeholders. Techniques used to determine the best routes and manage traffic in real-time include:

- Incentives to travel during off-peak periods.
- Traffic surveillance, including loop detectors, aerial surveillance, and motorcycle patrols.
- Information dissemination, including highway advisory radio (HAR), commercial radio feeds from a transportation management center (TMC), CMSs, telephone hotline, and sound trucks patrolling the rear-of-traffic queues.
- Incident management initiatives.

Alternate Route Implementation During Catastrophic Events

The FHWA document *Effects of Catastrophic Events on Transportation System Management and Operations* contains a cross-cutting study, as well as a series of documents for specific incidents, including the events of 9/11, the Howard Street rail tunnel fire in Baltimore, MD, and the Northridge earthquake in California. The cross-cutting study[5] and the documents about the rail tunnel fire[6] and the earthquake[7] are available online. In both the rail fire and the earthquake, alternate routes represented a key response strategy needed to manage traffic in the affected areas.

Review of Guidance and Best Practices

FHWA Traffic Incident Management Handbook: The FHWA *Traffic Incident Management Handbook*[8] suggests the use of alternate routes for handling traffic demand during an incident. The handbook stresses the need for coordination between stakeholders. Information is provided on alternate route selection criteria and evaluation and traffic management planning along the alternate route. The traffic management planning techniques suggested include the use of CMSs and HAR to notify motorists of the alternate route, and modifying the timing of traffic signals and ramp meters to accommodate the alternate route traffic. The *Traffic Incident Management Handbook* refers readers to National Cooperative Highway Research Program (NCHRP) Synthesis 279[9] for guidance on alternate route planning.

NCHRP Synthesis 279: *NCHRP Synthesis 279, Roadway Incident Diversion Practices*,[9] provides information on state-of-the-practice alternate route planning and implementation, based on a selected survey of transportation agencies that have developed and implemented alternate route plans. The synthesis provides profiles of individual successful roadway incident diversion practices and addresses the following topics:

- Type of diversion scenarios used in metropolitan and rural areas.
- Planning process used to develop an alternate route plan.
- Criteria used to select an alternate route during the planning process.
- Methods used to detect and verify incidents.
- Criteria considered in the decision to implement an alternate route plan.
- Resources used to inform motorists to divert.
- Resources used to guide motorists along the alternate route and back to the original roadway.
- Methods used to accommodate diverted traffic along the alternate route.

- Perceived and measured benefits of alternate route plans and any reported barriers to plan development and implementation.

Historical Perspective: District 7 of the California Department of Transportation (Caltrans) pioneered the development and implementation of alternate route plans for responding to the occurrence of major incidents.[9] In 1971, the District initiated the process of developing 2,500 alternate route maps, covering 764 km (475 mi) of freeway. Each map identified several components vital to the alternate route implementation process, including identification of problem location, primary and secondary alternate routes, implementation guidelines, manpower requirements and locations, required signing, necessary closures, responsible parties and associated phone numbers, and special notes unique to the incident area. Caltrans found it essential to coordinate all agencies involved in the development process and cited a good working relationship throughout the planning stage, with local agency traffic personnel having jurisdiction over the proposed alternate routes.[9]

ALTERNATE ROUTE APPLICATIONS

The use of alternate routes represents a key traffic management strategy for an impact to normal highway operations that results from any type of planned or unplanned event, from traffic incidents and emergencies to planned special events. The same alternate route selection and plan development process applies regardless of the circumstances surrounding the intended implementation of the planned alternate route. This section presents an overview of alternate route plan applications in the context of different types of planned and unplanned events.

Figure 2-2. Buckling of I-95 due to tanker fire.
(Source: Hartford Courant[11])

Major Traffic Incidents

In March 2004, an accident involving a tanker truck destroyed a section of I-95 in Bridgeport, CT.[10] This section of roadway, located on the northern edge of the New York metropolitan area, is one of the busiest in the Nation and part of the primary East Coast Interstate highway. Due to the severity of the damage and the high traffic volumes in the area, implementation of alternate routes was especially important in this situation. Figure 2-2 shows a picture of I-95 in Bridgeport, CT, after it buckled following the tanker crash.

In order to separate the various types of traffic that use I-95, three levels of alternate routes were planned:

- A regional alternate route was designed for through traffic destined to the next major metropolitan area. The regional alternate route consisted of a freeway facility that provided considerable savings in travel time, versus local alternate routes, to traffic traveling through the region. Moreover, the regional alternate route reduced unnecessary traffic demand on local alternate routes, thus optimizing network operations.
- An in-State alternate route was designed for regional traffic that required access to I-95 downstream of Bridgeport. Because the

main in-State alternate route, the Merritt Parkway, is not open to trucks, separate in-State alternate routes were needed to service truck traffic.

- A local alternate route was designed for local traffic destined to the immediate Bridgeport area, using a network of local city streets as the alternate route. A local freeway alternate route was designed for trucks.

Figure 2-3. Damaged freeway-to-freeway ramp after Northridge earthquake. *(Source: U.S. Department of Transportation[7])*

In addition to the alternate routes, other measures were taken to reduce traffic demand in the corridor, as follows:

- Encouraging travelers to use mass transit instead of driving.
- Increasing mass transit schedules.
- Encouraging travelers to carpool, and advertising services to set up carpools.
- Restricting vehicles with oversize/overweight permits to certain roadways, and closing certain State border crossings to these vehicles.

Emergencies

Alternate route plans prove valuable when a natural disaster renders a transportation facility unusable for an extended period. The Northridge earthquake in January 1994 destroyed many freeway sections in the greater Los Angeles, CA, area.[7] Because the Los Angeles area is already one of the most congested in the Nation, and is heavily dependent on automobile transportation, this disaster was very costly to the region. The following freeways incurred major damage:

- I-5: The Golden State Freeway
- SR 14: The Antelope Valley Freeway
- I-10: The Santa Monica Freeway
- SR 118: The Simi Valley Freeway

Transportation planning required multi-jurisdiction and multidisciplinary coordination that involved numerous agencies, including Caltrans, the Los Angeles Department of Transportation, and the California Highway Patrol. Alternate routes, consisting of city streets, were developed for all closed sections of freeways. As traffic conditions changed due to increased traffic volume and changed travel patterns, alternate routes were modified. Traffic signal timing plans along alternate routes were modified to accommodate diverted traffic.

Figure 2-4. Damaged freeway mainline section after earthquake. *(Source: U.S. Department of Transportation[7])*

Figure 2-5. Alternate routes after Northridge earthquake. *(Source: U.S. Department of Transportation[7])*

Figures 2-3 and 2-4 show damaged freeways following the earthquake. Figure 2-5 shows a map of some alternate routes used in response to the catastrophe.

Homeland Security

Alternate route plans mark an integral component of traffic management plans contained within transportation agency emergency response plans. In fact, agencies may implement an alternate route plan as a means to protect critical infrastructure and key assets from potential acts of violence. As such, alternate route plans represent a key *homeland security* initiative to be prepared for any future incidents. The FHWA/American Association of State Highway and Transportation Officials (AASHTO) Blue Ribbon Panel on Bridge and Tunnel Security recommended "procedures for restoring service and establishing alternate routes" as a component to a recommended countermeasure, planning and coordination, for bridge and tunnel owners and operators for their use in planning and implementing more effective security practices.[12] This national panel of bridge and highway engineers convened for the purpose of developing short- and long-term strategies for improving the safety and security of the Nation's bridges and tunnels and providing guidance to highway infrastructure owners/operators.

Alternate route plans have the ability to reduce the severity of impact on transportation system operations that may result from a disaster affecting the highway infrastructure. Major bridges and tunnels are common bottleneck points in a regional transportation system and also potential targets for acts of violence. An incident that renders a major bridge or tunnel unusable can have a disastrous effect on traffic flow within the affected corridor and across the region. Alternate route plans are an important tool to help an area cope with the loss of a major bridge or tunnel. For example, as shown in figure 2-6, Federal authorities prohibit commercial trucks and buses from traversing U.S. 93, a North American Free Trade Agreement truck route, across the Hoover Dam. In response to this order, transportation agencies

Figure 2-6. Commercial vehicle restriction sign.

Figure 2-7. Truck detour route trailblazer.

installed special trailblazer signs (see figure 2-7) and maintain an intensive information campaign using roadside traveler information devices and other information dissemination methods.

During an emergency, the use of alternate routes and evacuation routes may often overlap. Mass evacuation may require the use of alternate routes when the primary evacuation route becomes too congested. Alternate routes are also needed in order to divert traffic away from the area that is being evacuated due to the incident.

A Guide to Updating Highway Emergency Response Plans to Terrorist Incidents[13] includes recommendations for State transportation agencies to update emergency response plans in the post-9/11 world. The guide lists alternate route plans as a useful technique in any emergency response plan.

The ITS and traveler information resources typically used for the ideal implementation of an alternate route plan could be used to both implement the plan and monitor the highway infrastructure for signs of any secondary attack. Any secondary attacks that render roadways impassable can be addressed through alternate route strategies. Under these conditions, promoting the smooth flow of traffic to clear the highway as soon as possible is of the utmost importance in resuming any semblance of normality. Panic and uncontrolled flight are always a possibility; therefore, these plans must be prepared in advance and rapidly implemented when conditions warrant. Many devices used to support alternate route implementation and monitoring are also useful for homeland security. Surveillance cameras are frequently used to monitor traffic conditions along an alternate route, and are also used to detect incidents that may necessitate the use of an alternate route. Cameras are also useful to detect suspicious activity. If an act of violence does occur, traveler information dissemination devices are useful to notify motorists of the situation and to divert traffic away from the incident and away from transportation facilities that are closed. These devices may mitigate the severity of a human-caused incident.

Planned Special Events

An alternate route plan represents a contingency plan for operating high-capacity freeway/arterial facilities serving a planned special event venue. It serves to reduce demand in response to congestion caused by event-generated traffic demand or a capacity-restricting traffic incident. In other instances, an alternate route plan becomes a critical component of the overall event traffic management plan when roadway or bridge construction activities limit the capacity of mainline corridor flow routes. Transportation system operators should also promote travel choice alternatives, such as using other travel modes, as an option to driving alternate routes.

Stakeholders may also develop alternate route plans for the purpose of accommodating background traffic not destined for the event venue during planned special events. For instance, to accommodate regional through traffic, TMC operators can implement freeway-to-freeway diversion through control of permanent CMSs and HAR. Arterial-to-arterial diversion is needed to accommodate background traffic during planned special events occurring in city downtown or commercial areas, where arterials and local streets adjacent to the event venue serve a significant volume of background traffic. In turn, the addition of event-generated traffic causes congestion and impacts commercial businesses (e.g., restaurants, hotels, retail stores). This strategy involves (1) restricting commercial street access to businesses employees, customers, emergency vehicles, taxis, and transit buses, and (2) implementing an alternate route to direct background through traffic and event-generated traffic around the restricted street.[14]

STATE-OF-THE-PRACTICE SURVEY

As part of this study, agencies throughout the United States and Canada were surveyed about various aspects of their alternate route plans, in addition to the process involved in developing such plans. A brief questionnaire was prepared for distribution to national stakeholder groups in order to obtain the most current state-of-the-practice information on roadway incident diversion practices in addition to case study examples. This questionnaire was aimed at State departments of transportation (DOTs) and other transportation agencies involved in alternate route planning and implementation. It consisted of three sections that collectively addressed alternate route planning processes, alternate route selection and plan development, and traffic management planning and associated strategies.

A total of 26 survey responses were received from agencies throughout the United States and Canada. The surveyed agencies represent 17 States and one Canadian province. Six of the States and the province submitted responses from multiple districts. Of these respondents, 19 were from State DOTs, 2 were from metropolitan planning organizations, 2 were from county transportation departments, and 3 were from Canadian transportation agencies. The survey respondents addressed the development and implementation of alternate route plans on a Statewide, district, or local level encompassing one or multiple facilities.

The following questions were specifically related to the three phases of alternate route planning:

- *Which of the following stakeholders were involved in selecting candidate alternate routes?* The results are shown in figure 2-8.
- *Which of the following stakeholders were involved in developing alternate route plans?* The results are shown in figure 2-9.
- *Which of the following barriers did stakeholders in your jurisdiction encounter when considering the need to develop an alternate route plan?* The results are shown in figure 2-10.
- *Which of the following criteria were considered in selecting alternate routes?* The results are shown in figure 2-11.
- *Indicate the resources used to inform motorists to divert to an alternate route.* The results are shown in figure 2-12.
- *Indicate the methods used to accommodate diverted traffic along an alternate route.* The results are shown in figure 2-13.
- *Indicate the resources used to guide motorists along an alternate route and back to the mainline.* The results are shown in figure 2-14.

In addition to the general survey questions, there was also a question on what criteria agencies use for implementing or terminating an alternate route plan. Generally, the criteria for implementing an alternate route require that all or a substantial portion of the primary route capacity be reduced (e.g., two or more travel lanes blocked) before an alternate route is deployed. Some agencies do not have any specific criteria, and the decision to implement the alternate route plan is left up to ranking incident responders at the time of the incident. Table 2-1 indicates examples of decision criteria that various agencies use to determine the need for alternate route implementation.

The survey revealed that several agencies have specific criteria for determining when an alternate route is no longer required. For most agencies, however, the decision to terminate the alternate route plan is based on a judgment call made by ranking incident responders involved in alternate route implementation. Table 2-2 indicates criteria that some agencies use in determining when to terminate use of an alternate route.

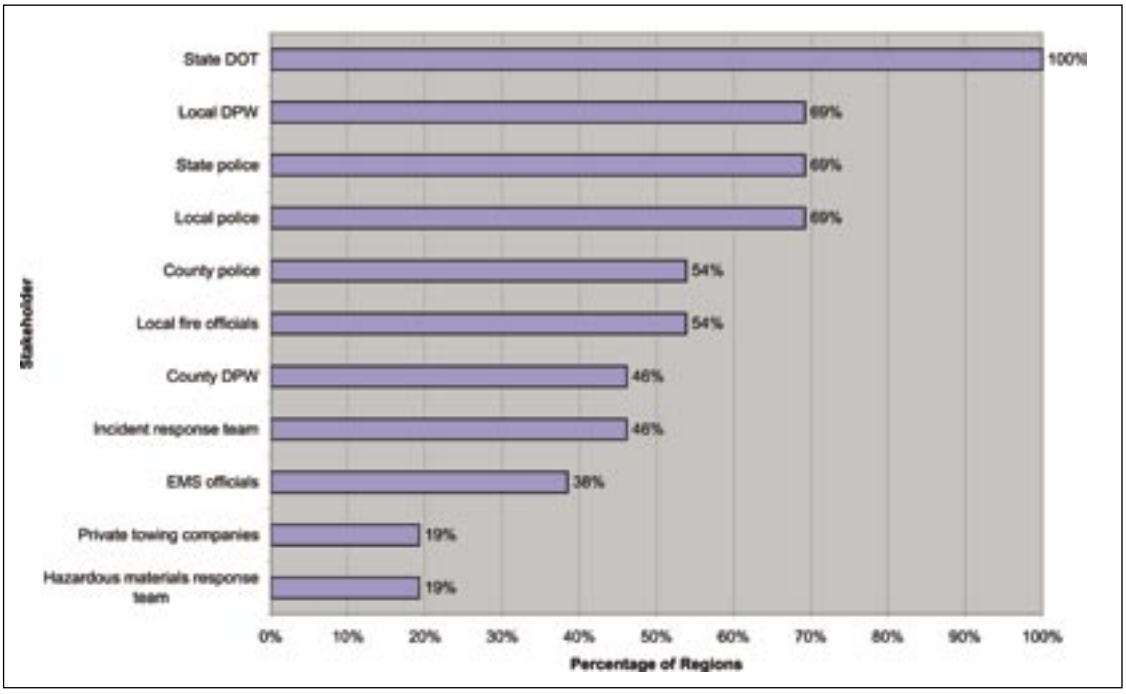


Figure 2-8. Stakeholders involved in selecting candidate alternate routes.

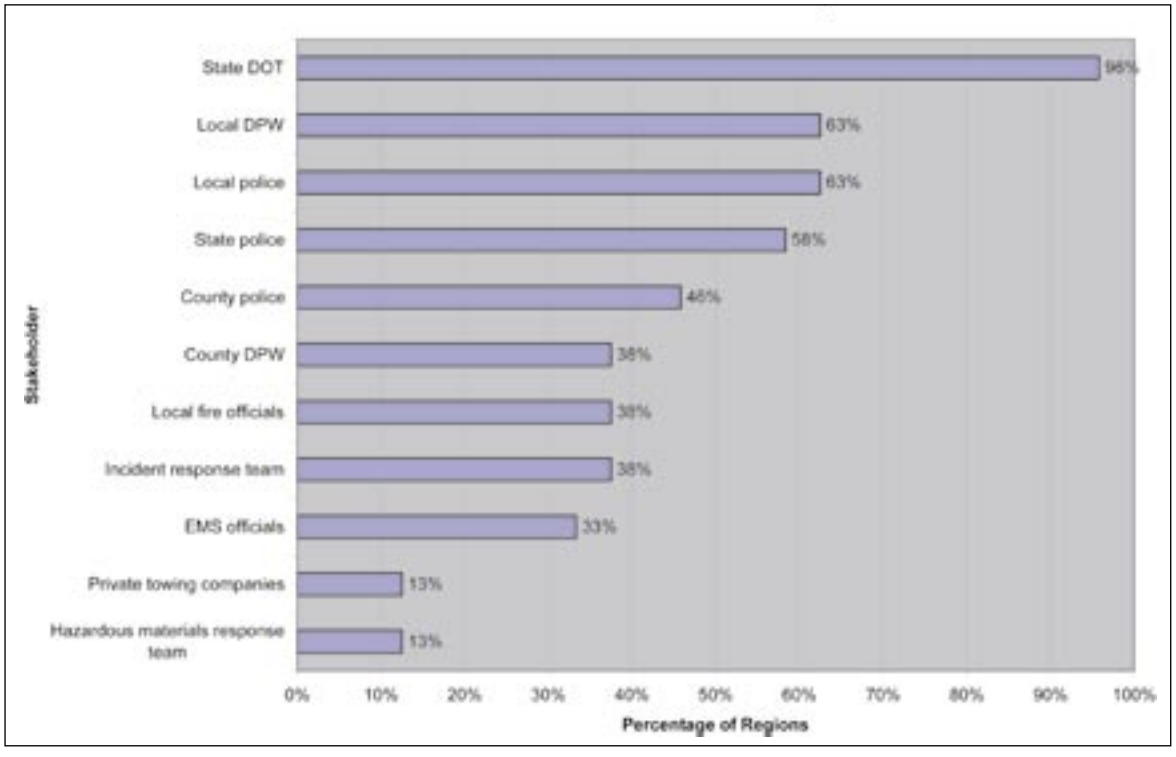
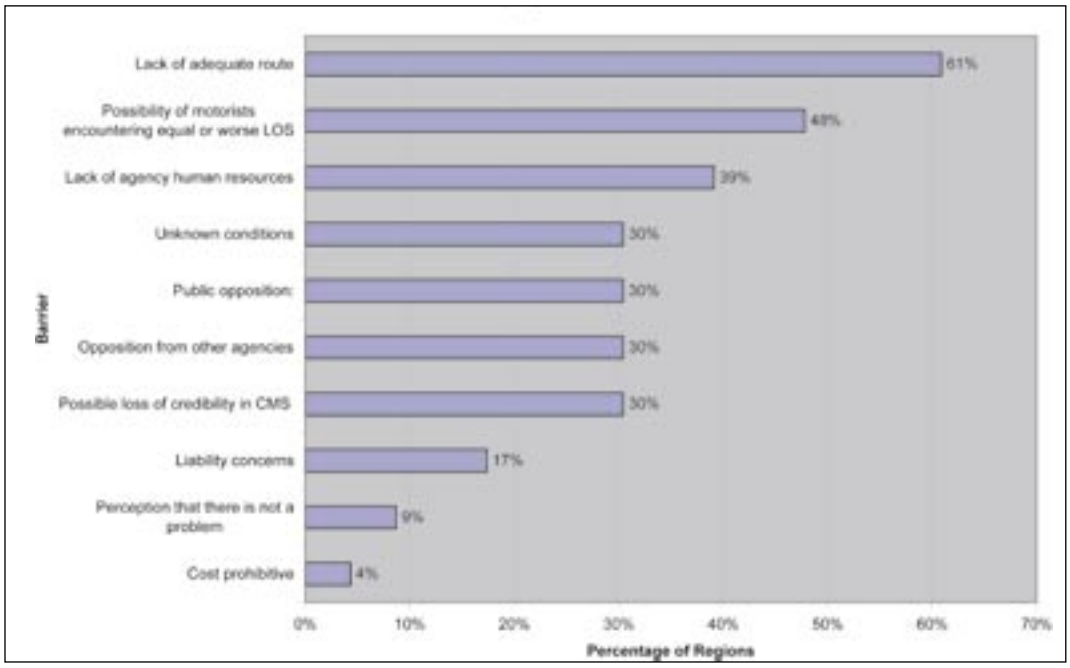
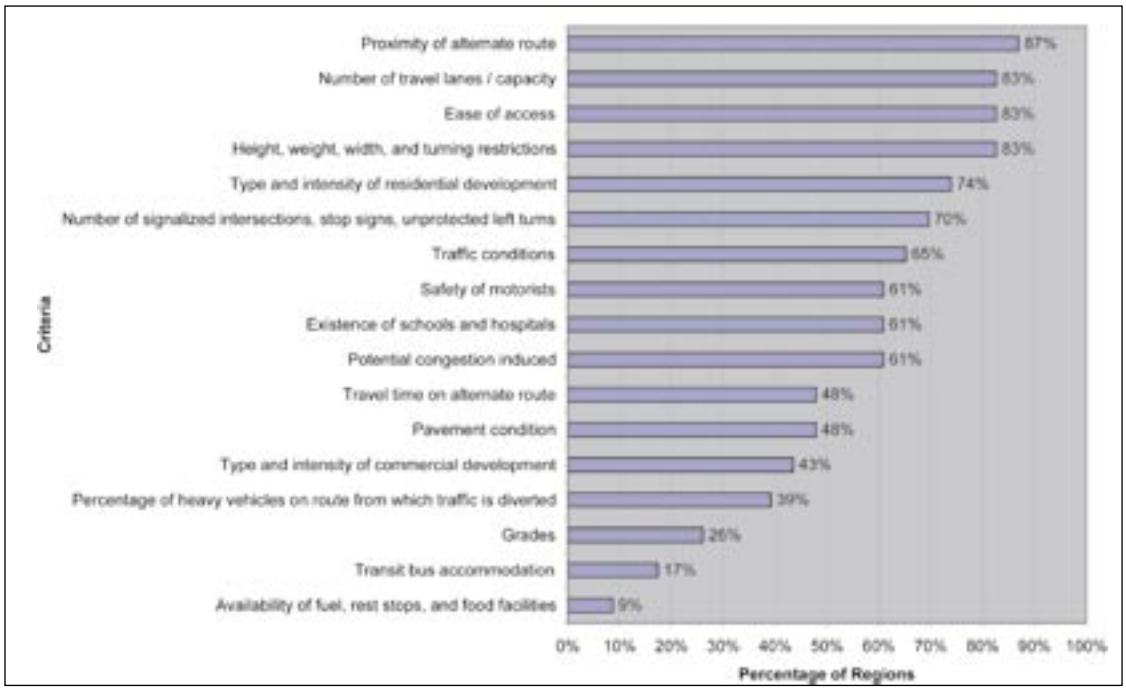


Figure 2-9. Stakeholders involved in alternate route plan development.



Note: One agency reported as a barrier that municipalities require financial compensation for the use of municipal streets as an alternate route.

Figure 2-10. Barriers to developing alternate route plans.



Note: One agency stated that the ownership of the roadway (State vs. local) could be used as a selection criterion.

Figure 2-11. Criteria for selecting candidate alternate routes.

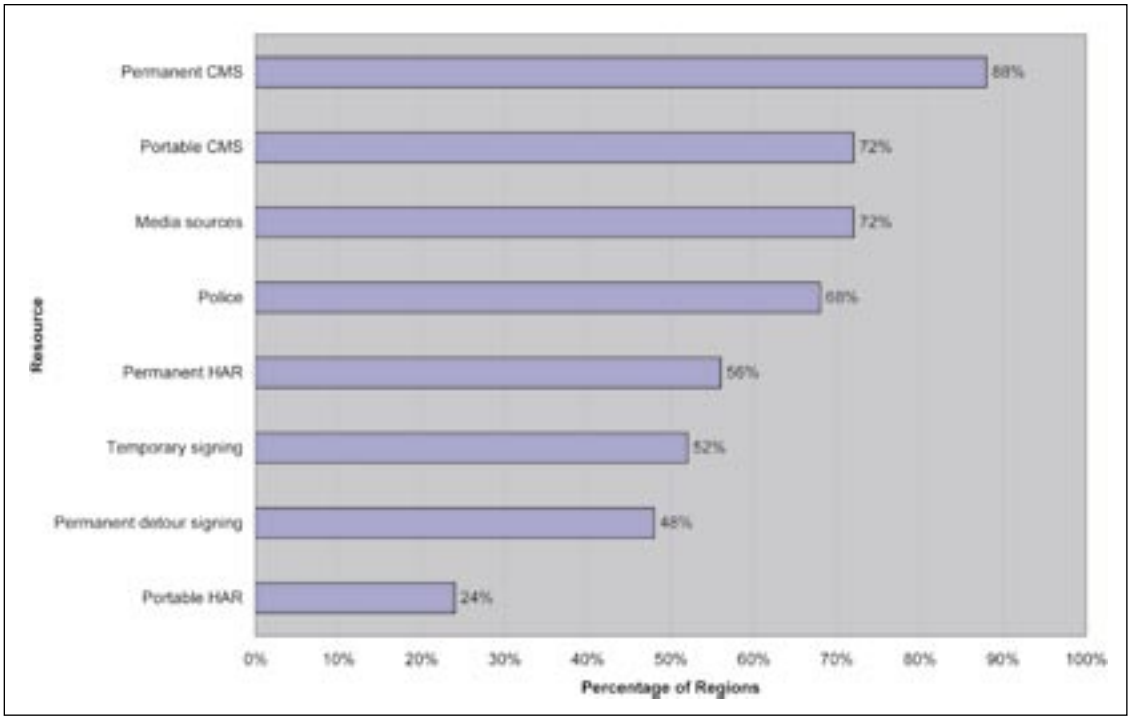


Figure 2-12. Resources used to inform motorists to divert to an alternate route.

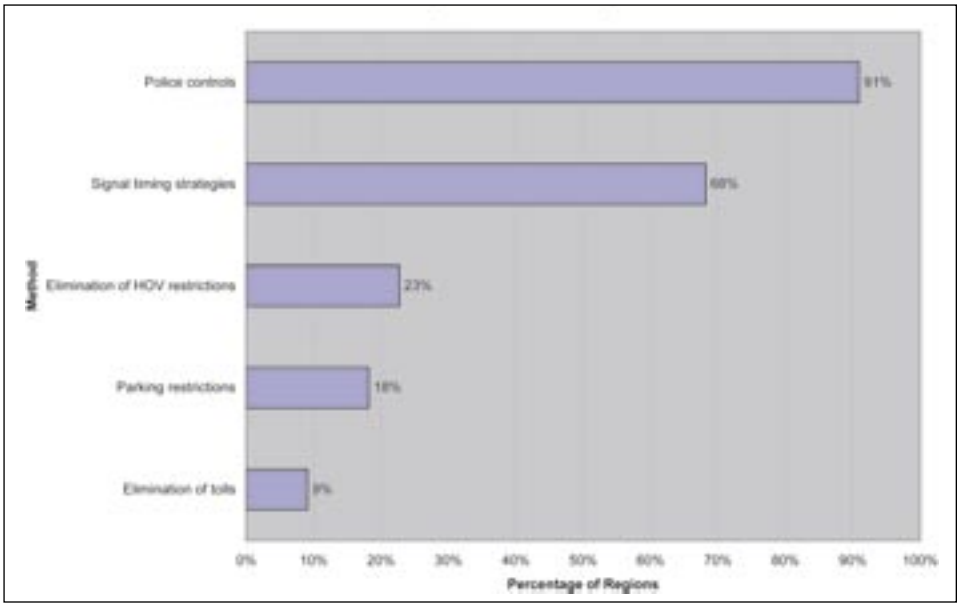


Figure 2-13. Methods of accommodating diverted traffic along an alternate route.

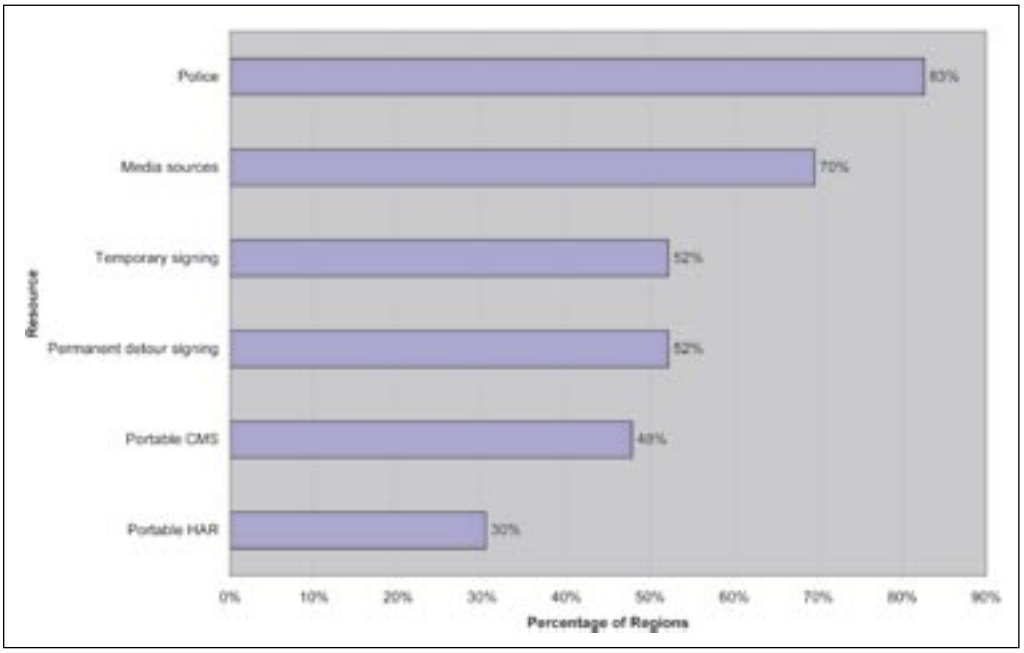


Figure 2-14. Methods of guiding drivers along an alternate route.

Table 2-1. Criteria for implementing alternate route plans

AGENCY	CRITERIA
North Carolina DOT – main office	• A complete closure of the highway in either direction is anticipated for 15 minutes or longer.
North Carolina DOT – Charlotte regional office	• No action or discussion occurs until 15 minutes after the incident. After 15 minutes, an alternate route plan is deployed only if the highway is completely closed (all lanes closed, including the shoulder) and expected to last longer than an additional 15 minutes (30 minutes total).
New Jersey DOT	• Level 1: Lane closures on a State highway, expected to have prolonged duration and impact on traffic. • Level 2: Complete closure of highway, anticipated to last more than 90 minutes.
Ministry of Transportation, Ontario, Canada	• An incident results in the full closure of traffic lanes in either one or both directions of the highway; and • The duration of the closure is anticipated to extend beyond a short-term closure.
Regional Municipality of Halton, Ontario, Canada	• An incident results in the closure of traffic lanes (all or partial) in either one or both directions; and • The duration of the closure is anticipated to result in severe traffic congestion on the surrounding road system for an extended period of time.
Oregon DOT	• Incident with two or more lanes blocked, or • Incident with one lane blocked and expected to last more than 20 minutes.
New York State DOT Region 1	• Implemented only when the highway is completely closed. • Will not be implemented if at least one lane (or even the shoulder) is open.
Florida DOT District IV	• Two or more lanes blocked for at least 2 hours.
ARTIMIS (Ohio/Kentucky)	• This plan has a detailed table with four different levels, based on criteria. The following represents a summary: - During the morning and afternoon peak hours, an advisory alternate route is deployed in the event of a two-lane closure for more than 2 hours, or a closure of more than two lanes for less than 30 minutes. - Mandatory alternate routes are deployed during the peak hours when more than two lanes are closed for at least 30 minutes.
Ada County, Idaho	• This plan specifies different levels of severity, including: - Levels C and D require implementation of a diversion route. - Level C is an incident taking 30-120 minutes from detection to fully restored traffic flow. - Level D is an incident taking over 2 hours from detection to fully restored traffic flow (including full freeway closure in one or both directions).
Wisconsin DOT (Blue Route)	• Incident causes delays that will exceed 30 minutes.

Table 2-2. Criteria for terminating alternate route plans

AGENCY	CRITERIA
Ministry of Transportation, Ontario, Canada	• Once it is determined that a partial or full opening of traffic lanes on the highway is acceptable and that traffic flow on the diversion routes have returned to relatively normal levels, the alternate route plan will be terminated.
Regional Municipality of Halton, Ontario, Canada	• The termination of the RCAP (road closure action plan) is typically made by members of the Halton Regional Police Service or Ontario Provincial Police (in consultation with other agencies when appropriate) when both of the following are satisfied: - The need for the road closure is no longer prevalent. This may consist of a partial opening when some or all of the lanes and/or shoulder are reopened, and - Traffic flow on the diversion routes has returned to relatively normal levels. RCAP signal priority plans, messages on freeway CMSs, and media updates of traffic conditions on diversion routes should not be terminated until such time. • Note: Not all traffic lanes need to be reopened for the RCAP to be terminated.
North Carolina DOT – Charlotte regional office	• Alternate route plan terminated when at least one lane on the highway reopens.
New Jersey DOT	• Alternate route plan terminated when at least one lane of traffic is reopened on the main route.

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3. Alternate Route Planning Process

Figure 3-1. Stakeholder meeting.

INTRODUCTION

The alternate route planning process involves the following three phases:

- *Alternate route selection*: choosing preliminary alternate routes and evaluating each route to determine the optimal choice.
- *Alternate route plan development*: developing information to incorporate in the alternate route plan, including information on alternate route implementation.
- *Traffic management planning*: planning for information to be disseminated to motorists during implementation and for traffic control, including capacity enhancements needed to accommodate traffic to, from, and on the alternate route.

Figure 3-2 illustrates the three phases and summarizes key steps in the alternate route planning process.

ALTERNATE ROUTE PLANNING PROCESS

In the early stages of alternate route planning, the lead agency must decide which stakeholders will be involved. A straw (baseline) objective must first be defined by the lead agency. This will aid in the identification of the stakeholders. The scope and scenarios associated with the straw objective will drive the identification of and motivation for stakeholders to become involved in the alternate route planning process.

An inter-jurisdictional, multidisciplinary team ideally provides expertise in key areas necessary to facilitate successful development of an alternate route plan. For example, a transportation agency may know the capacity of each candidate route, while a law enforcement agency may have familiarity with safety and operations problems on each route. If an agency does not have access to a particular planning or operations resource, it may be able to collaborate with another agency that can share the desired resource. For example, a transportation agency may not have access to a GIS database but can collaborate with the agency that maintains the GIS for the region. For these reasons, it is critical that various stakeholders collaborate as a team.

Depending on the characteristics of a local highway system and the quantity and scope of resources available to stakeholders, several actions may apply to a particular step in the process of selecting an alternate route and

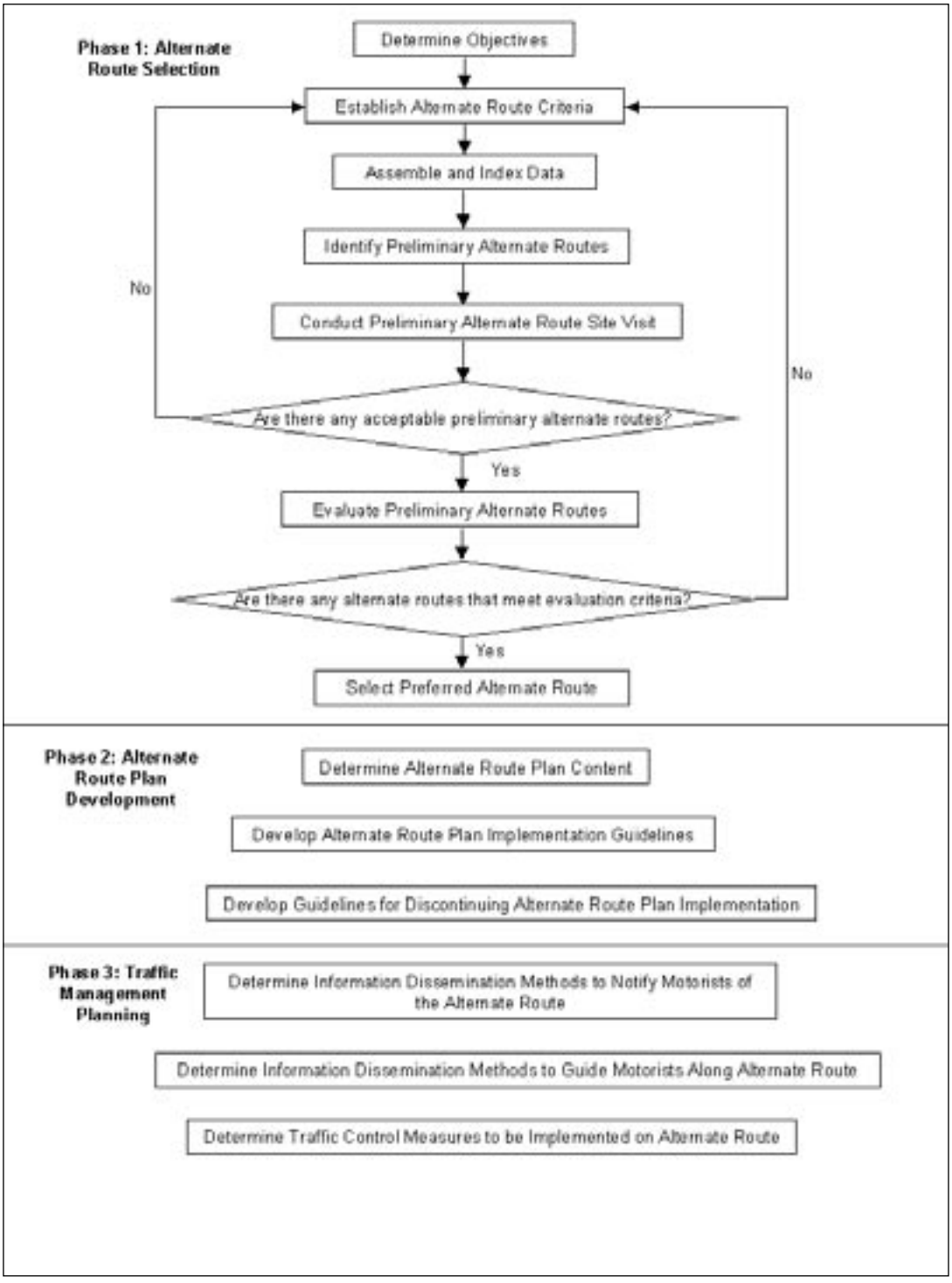

Figure 3-2. Alternate route planning process.

developing an alternate route plan. Individual actions are presented as either "minimum" or "ideal." Minimum actions are potentially suited to rural jurisdictions. These areas may not have traffic conditions or a dense highway network that warrants the development of an alternate route plan per recommended ideal actions. Involved agencies may also have less equipment and personnel resources available for alternate route planning and plan implementation. Agencies that have additional resources available may follow the ideal actions. Ideal actions allow for the most detailed, scenario-based alternate route plans. These actions are useful for urban/metropolitan jurisdictions with heavy traffic demand, dense highway networks, and expanded resources to dedicate to alternate route planning and implementation. Ideal actions do not represent a "luxury level" of planning and preparation, but instead facilitate a more detailed and expanded planning process.

Phase 1: Alternate Route Selection

The first step in developing the alternate route plan concerns determining the *objectives* the alternate route must meet. The multi-stakeholder team must develop the system performance and community-based objectives that the preferred alternate route must satisfy before any further planning can take place. Examples of objectives are (1) whether the alternate route is planned as a local or regional route, and (2) whether the alternate route plan will cover a single highway facility, an entire metropolitan area, or an entire State. The Determining Objectives step allows stakeholders to establish collectively their priorities before making decisions that do not address operational and other community-sensitive impacts.

Once stakeholders identify the objectives, they can establish *criteria* governing selection of preliminary alternate routes. Examples of criteria include the acceptable travel time and proximity of the alternate route to the route from which traffic will be diverted. Following the establishment of alternate route selection criteria, stakeholders should *assemble and index available data* on potential alternate routes. This data, along with the alternate route selection criteria, allows stakeholders to *identify preliminary alternate routes* that warrant further consideration.

Once stakeholders select a preliminary set of alternate routes, the agency in charge of the planning effort may then *conduct a site visit*. The purpose of the site visit is (1) to corroborate the data collected on the candidate alternate routes, and (2) to identify obvious issues that may hinder selection of a particular alternate route. It is important that stakeholders perform the Phase 1 steps in the sequence presented herein to minimize the expenditure of resources for investigating alternate routes that do not meet the criteria for selection or are otherwise infeasible. The number of alternate routes that agencies consider may vary, depending on area type, as well as the characteristics of roadway facilities that connect to the primary route. A rural area may have only one or two potential routes, while a metropolitan area may have several feasible options for each roadway facility section.

After the site visit and any preliminary analysis, stakeholders will decide whether the candidate alternate routes are *acceptable* based on the established selection criteria. If screening yields no acceptable alternate routes, then stakeholders must return to the Establish Alternate Route Criteria step. The criteria may need to be changed if they are too restrictive. If acceptable alternate routes are identified, then the *evaluation* process can proceed. If the evaluation process does not produce a suitable alternate route, then stakeholders must again return to the Establish Alternate Route Criteria step. If the evaluation process produces one or more acceptable alternate routes, then stakeholders must *select* the preferred alternate route. Selection of a preferred alternate route completes the alternate route selection phase. If multiple alternate routes are deemed acceptable, the primary alternate route typically will represent the route having the shortest travel time and/or greatest reserve capacity to

Table 3-1. Checklist of minimum and ideal actions under alternate route selection planning phase

ACTION	TYPE	
	MINIMUM	IDEAL
Step 1: Determine Objectives		
• Determine performance and community-based objectives to guide planning activities and the alternate route selection process.	☑	☑
Step 2: Establish Alternate Route Criteria		
• Obtain stakeholder consensus on criteria for alternate route selection.	☑	
• Set detailed criteria for alternate route selection in addition to the relative priority of each criterion.		☑
Step 3: Assemble and Index Data		
• Use a paper or electronic map to determine the location of roads that may be used as alternate routes and to obtain information on these routes.	☑	
• Use a GIS map, if available, to obtain detailed information on available routes.		☑
• Consult planning organizations for access to travel demand models that can be used for obtaining data.		☑
• Consult transportation agencies for information on typical traffic volumes, roadway geometry, signage, and traffic control devices.		☑
• Consult law enforcement personnel and/or transit operators for information on traffic operations.		☑
• Consult freeway service patrol operators for information on traffic operations and incident frequency.		☑
Step 4: Identify Preliminary Alternate Routes		
• Obtain stakeholder consensus on at least one preliminary alternate route to be studied further.	☑	
• Use travel demand models to estimate the traffic volume that will use the potential alternate routes.		☑
• Obtain stakeholder consensus on multiple preliminary alternate routes to be studied further.		☑
Step 5: Conduct Alternate Route Site Visit		
• Conduct a site visit to observe how the candidate alternate routes perform in the "real world" and to determine if these routes meet the selection criteria.	☑	
• Videotape site visits in order to review the visits at a later time.		☑
Step 6: Evaluate Preliminary Alternate Routes		
• Conduct a capacity analysis of candidate alternate routes.	☑	
• Evaluate candidate alternate routes using traffic simulation software, and test a variety of scenarios.		☑
Step 7: Select Preferred Alternate Route		
• Obtain stakeholder consensus on the selection of the best available alternate route.	☑	
• Notify (by lead agency) all affected stakeholders about the alternate route selected.	☑	
• Choose at least two (preferably three) alternate routes, and obtain stakeholders' concurrence on the selection.		☑
• Review alternate routes to decide if they are still effective or if a new alternate route should be selected.		☑

Note: Ideal actions may be applied in addition to the minimum actions if conditions warrant and resources permit.

accommodate diverted traffic. In turn, candidate secondary and tertiary routes may have longer travel times and/or reduced capacity.

Table 3-1 shows a checklist of steps, categorized either as a minimum or ideal action, for completing the alternate route selection process.

Phase 2: Alternate Route Plan Development

The second phase is alternate route plan development. In this phase, stakeholders must (1) determine alternate route plan content, (2) develop alternate route plan implementation guidelines, and (3) develop guidelines for discontinuing alternate route plan implementation. Table 3-2 shows a checklist of steps, categorized either as a minimum or ideal action, for completing the alternate route plan development process. Adherence to the sequence of the steps in this phase is not as rigid as in phase 1, Alternate Route Selection. Therefore, the lead agency may choose the order that best suits the resources available to develop an alternate route plan.

Phase 3: Traffic Management Planning

The third phase is traffic management planning. In this phase, stakeholders must (1) determine information dissemination methods

Table 3-2. Checklist of minimum and ideal actions under alternate route plan development phase

ACTION	TYPE	
	MINIMUM	IDEAL
Step 1: Determine Alternate Route Plan Content		
• Use a paper or electronic map to illustrate the alternate route plan.	☑	
• Create detailed alternate route maps.		☑
• Include detailed information on the alternate route plans on how to implement the alternate route(s).		☑
• Include maps showing the location of all supporting ITS equipment.		☑
• Supplement alternate route plan maps with written directions.		☑
• Include a traffic signal timing plan.		☑
• Include a traveler information plan.		
Step 2: Develop Alternate Route Plan Implementation Guidelines		
• Set guidelines for deciding when to implement an alternate route plan. Consider factors such as number of lanes closed, anticipated incident duration, observed traffic conditions, and the time of day/day of week.	☑	
• Set guidelines for partial implementation of an alternate route plan.		☑
Step 3: Develop Guidelines for Discontinuing Alternate Route Plan Implementation		
• Determine at least one measurable criterion for deciding when to discontinue an alternate route plan, and base the decision on the available capacity on the mainline from where traffic was diverted and the operation of the alternate route.	☑	
• Determine detailed guidelines and scenario-based criteria for deciding when to discontinue an alternate route plan.		☑

Note: Ideal actions may be applied in addition to the minimum actions if conditions warrant and resources permit.

Table 3-3. Checklist of minimum and ideal actions under traffic management planning phase

ACTION	TYPE	
	MINIMUM	IDEAL
Step 1: Determine Information Dissemination Methods to Notify Motorists of the Alternate Route		
• Use traffic control officers and temporary signage on the primary route to notify motorists that the road is closed and that an alternate route exists.	☑	
• Use existing information dissemination sources (such as CMS, highway advisory radio, 511, media, and the Internet) to provide traffic information where appropriate.	☑	
• Use alternative information dissemination methods (e.g., en-route and pre-trip) to notify motorists of the alternate route in order to reach everyone affected.		☑
• If an alternate route is implemented for a long-term period, then consider disseminating information to encourage travelers to (1) switch to public transit as an alternative to driving, (2) modify their trip time or destination, or (3) carpool.		☑
Step 2: Determine Information Dissemination Methods to Guide Motorists Along the Alternate Route		
• Deploy temporary trailblazer signs along the alternate route to guide motorists along the route. Specify the location of these signs in the alternate route plan. Remove these signs upon discontinuing use of the alternate route.	☑	
• Install permanent infrastructure (such as route marker signs with electronic changeable arrows or blank-out trailblazer signs) to guide motorists along designated alternate routes.		☑
• Use temporary signs configured with a black legend on fluorescent pink background, as optionally assigned by the MUTCD for traffic incident management area signs.		☑
Step 3: Determine Traffic Control Measures to be Implemented on the Alternate Route		
• If congested conditions develop at signalized intersections, then manually override signal control or modify the existing traffic signal timing plan.	☑	
• Suspend roadway activities, if possible, along the alternate route to minimize the loss in capacity.	☑	
• Enforce parking restrictions along the alternate route.	☑	
• Control ramp operations at alternate route connection points with a freeway facility.	☑	
• If congested conditions develop at signalized intersections comprising a computer-based traffic signal control system, then implement special traffic signal timing plans from the traffic operations center to support field traffic control.		☑
• Use traffic optimization tools to determine the optimal traffic signal timing plans.		☑
• If any tolls exist along the alternate route, then suspend tolls during operation of the alternate route.		☑
• If the road that traffic is diverted to is a high occupancy vehicle (HOV) facility or has an HOV lane, then temporarily suspend HOV restrictions to allow all vehicles to use the alternate route.		☑
• Suspend or modify the timing of ramp meters to prevent excessive queues on the roadway upstream of the primary route. Many ramp metering algorithms have built-in queue adjustment or queue override functions.		☑
• If the alternate route has lane control signals, then modify signal indications to allow extra lanes in the direction that the alternate route is being used.		☑
• Evaluate the traffic control plan using computer traffic simulation.		☑

Note: Ideal actions may be applied in addition to the minimum actions.

Table 3-4. Stakeholder involvement in each phase of the alternate route planning and implementation process

Stakeholder	Alternate Route Selection	Alternate Route Plan Development	Traffic Management Planning	Implementation
Transportation/public works agency	•	•	•	•
Law enforcement	•	•	•	•
Fire department	•	•		•
Emergency medical service	•	•		
Emergency management agency/ Homeland security agency	•			•
Transit agency	•		•	•
Turnpike/toll authority	•	•	•	•
Private towing companies				•
Elected officials	•			
Planning organization	•	•		
Individuals and community groups	•			
Major incident response team	•			•
Freeway service patrol	•			•
Media				•

to notify motorists of the alternate route, (2) develop information dissemination methods to guide motorists to/from and along the alternate route, and (3) determine traffic control measures, where necessary, to increase the capacity of the alternate route and to improve its operating efficiency. Table 3-3 shows a checklist of steps, categorized either as a minimum or ideal action, for completing the traffic management planning process. Adherence to the sequence of the steps in this phase is not as rigid as in phase one, Alternate Route Selection. Therefore, the lead agency may choose the order that best suits the resources available to conduct traffic management planning.

STAKEHOLDER INVOLVEMENT

Each of the steps illustrated in figure 3-2 is discussed in more detail in later chapters of this handbook. Each section begins with a table, listing potential stakeholders and noting their likely participation in a specific phase of alternate route planning and implementation. Note that the same category of stakeholder might have different responsibilities, depending on which agency has the lead role. Therefore, stakeholder roles and responsibilities must be adapted to local needs and planning team organization.

Table 3-4 lists stakeholders that may be involved in the alternate route planning process and the corresponding planning phases that may warrant their participation. The table also indicates stakeholders that may assume an active role in alternate route plan implementation.

OVERCOMING BARRIERS TO DEVELOPING ALTERNATE ROUTE PLANS

There exist many barriers that may prohibit a planning team from developing an alternate route plan. Table 3-5 lists some common barriers and provides recommendations for overcoming each cited barrier.

Table 3-5. Overcoming barriers to developing alternate route plans

BARRIER	HOW TO OVERCOME BARRIER
Lack of an adequate alternate route (e.g., geometrics)	• If no suitable alternate route is available, then develop more stringent criteria for when to implement the alternate route, such as, only during a long-term closure.
Unknown conditions on the alternate route	• Conduct a site visit on candidate alternate routes before selecting a preliminary alternate route(s). Videotape the site visit so that stakeholders may further review it in the office or during future planning team meetings.
Lack of traffic monitoring equipment on alternate route	• Choose an alternate route with traffic monitoring equipment, if available. If no such route is available, then conduct alternate route planning in conjunction with the deployment of traffic monitoring equipment on selected roadways. • Alternatively, use field personnel, such as law enforcement officers or freeway service patrol operators, to monitor real-time traffic conditions on the alternate route. Manual traffic monitoring requires coordination and constant communication between on-site personnel and the command post or transportation management center.
Possibility of motorists encountering equal or worse level of service on the alternate route	• Use closed-circuit television (CCTV) cameras to monitor traffic performance on the alternate route. • When the alternate route is extremely congested, divert traffic onto a secondary alternate route. Also, revise traffic signal timings or implement other traffic control measures in order to improve traffic flow on a poorly performing alternate route. • If CCTV cameras are not available, then use manual traffic monitoring for this purpose.
Liability concerns if an accident or safety problems occur due to being directed to an alternate route	• Do not use a route with known safety problems as an alternate route. • Patrol all alternate routes to ensure that motorists are safe.
Public opposition from individuals and community groups	• Include community groups in the alternate route planning process. Perform community outreach to educate the public about the alternate route and its benefits. • If a community very strongly objects to a particular alternate route, then select another alternate route, if feasible.
Opposition from other agencies	• Examine the feasibility of designating a preferred alternate route that encompasses the same jurisdiction (State, county, local) as the main route in order to (1) minimize opposition from other agencies and (2) facilitate efficient operations and traveler information dissemination along the alternate route and at mainline connections. • If a preliminary alternate route crosses multiple jurisdictions, then involve other agencies (such as a county or local department of public works) in alternate route selection so that an alternate route agreeable to all stakeholders may be chosen.
Lack of agency human resources to develop alternate routes	• Follow the "minimum" actions described in this document if stakeholders do not have sufficient resources to follow the "ideal" actions. • Collaborate with other agencies, which may have sufficient funding and personnel.
Possible loss of credibility in CMS messages if an undesirable level of congestion arises on the alternate route	• Use CCTV cameras so that an operator can monitor traffic conditions on the alternate route. • If the alternate route becomes too congested, then divert traffic to a secondary alternate route or terminate the alternate route plan. • Use CMSs to warn motorists of observed congested conditions on the alternate route. • If CCTV cameras are not available, then use manual traffic monitoring for this purpose.
Agency perception that there is not a problem that requires diversion	• Conduct a study of past traffic incidents to identify the frequency and level of impact on traffic operations when an alternate route is not implemented. • Use computer traffic simulation to study traffic during various scenarios (e.g., by location, time of day) involving lane and total facility closure.
Cost prohibitive	• Follow the "minimum" action described in this document if stakeholders do not have sufficient funding to follow the "ideal" actions. • Collaborate with other stakeholders, who may have more available money, equipment, data, and personnel. For example, if a stakeholder does not have access to a GIS database, then they may collaborate with another stakeholder that does have access.

4. Alternate Route Selection

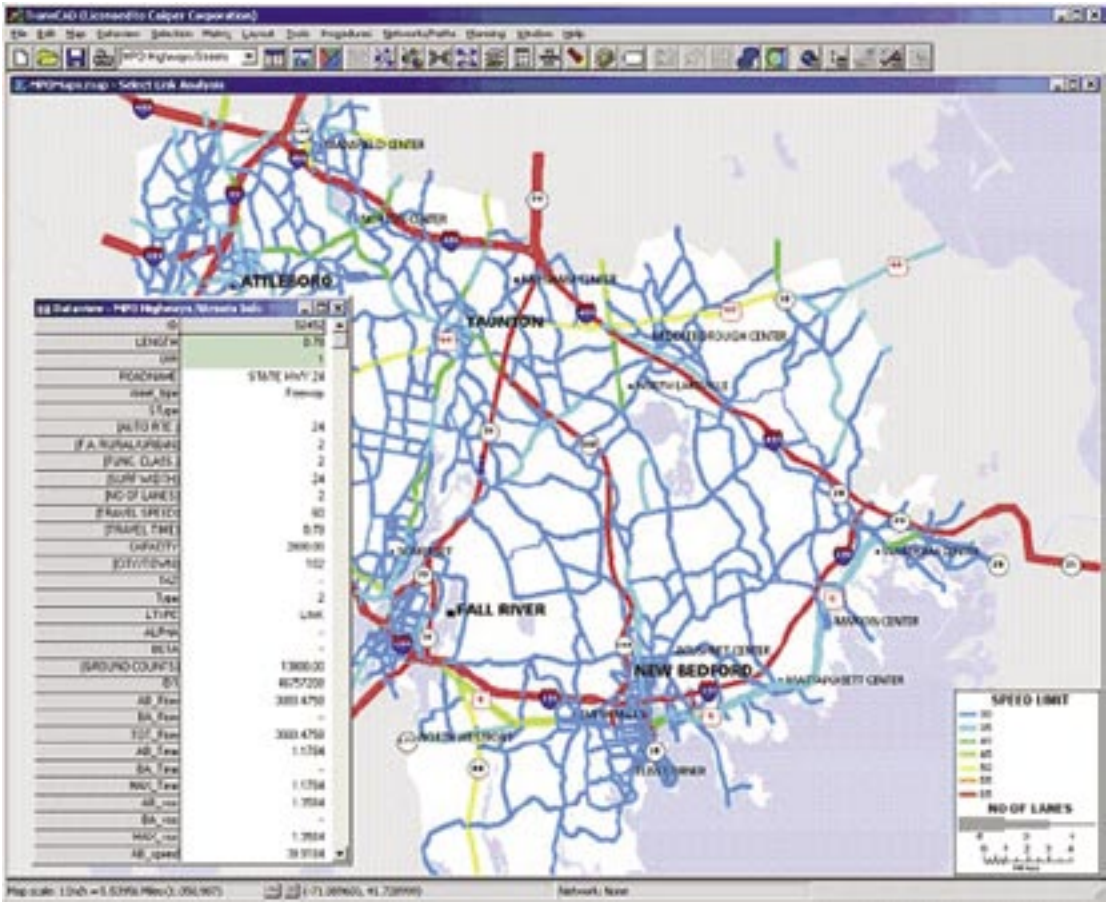

Figure 4-1. Using a demand model in alternate route selection.

INTRODUCTION

The first phase of alternate route planning is alternate route selection. Chapter 3 identified the following seven steps that must be completed in order to select alternate routes that facilitate improved corridor operations without creating undue impacts on the community:

- Determine objectives
- Establish alternate route criteria
- Assemble and index data
- Identify preliminary alternate routes
- Conduct preliminary alternate route site visit
- Evaluate preliminary alternate routes
- Select preferred alternate route

DETERMINE OBJECTIVES

The first step in the alternate route selection process is determining performance and community-based objectives to guide planning activities and the alternate route selection process. Stakeholders must agree on what objectives they want to meet in developing the alternate route plans. Considerations include:

- *Local or regional*
  - Should the alternate route be geared toward local travelers who likely travel short distances along the main route and want to remain as close to the main route as possible?
  - Should it be geared toward long-distance, regional travelers who desire an alternate route that provides the lowest travel time to the next major populated area or major

interchange (e.g., between two freeway facilities), regardless of its proximity to the main route or what cities the route passes through?

- Should separate alternate routes be set up for local and regional travelers?

- *Geographical area*
  - What geographical area should the alternate route plan cover?
  - Should it encompass a single freeway facility or only a single freeway segment?
  - Should it consist of a series of plans for multiple facilities across a metropolitan area?
  - Should it be a Statewide plan?
  - Should it be coordinated with adjacent States, particularly if a metropolitan area crosses State lines?

- *Alternate route facility types*
  - Should freeways, arterial streets, and/or multi-jurisdiction roadways be considered as preliminary alternate routes?

- *Interagency coordination*
  - To what extent should the lead agency coordinate with other stakeholders?
  - Should the lead agency coordinate with a State transportation/public works agency to use State roads or a local transportation/public works agency to use city streets as an alternate route?
  - Should the lead agency coordinate with both State and local transportation agencies throughout the selection process?

- *Frequency of alternate route implementation*
  - Will it be used only in the case of a complete closure of the primary route for a prolonged period?
  - Will it be used whenever a lane closure occurs on the primary route during specific days and times?

In some cases, the objectives may change during the alternate route planning process. For example, the lead agency may initially intend to work alone, without much coordination with other agencies. However, while selecting an alternate route, the lead agency may determine that acceptable routes are under the jurisdiction of other agencies, thus requiring coordination with these agencies to effect optimal alternate route operation during diversion. Also, different stakeholders have different areas of expertise that may be useful in alternate route planning. For example, a transportation/public works agency may be the most knowledgeable about traffic conditions, while a law enforcement agency may be the most knowledgeable about safety problems.

Stakeholders involved in the selection process must coordinate their work efforts to facilitate a seamless and successful selection process. In most jurisdictions, the State DOT acts as the lead agency in the selection of the candidate and, after evaluation, the preferred alternate routes. In some jurisdictions, the State police may take the lead, or the State police and State DOT may co-lead.

ESTABLISH ALTERNATE ROUTE CRITERIA

After stakeholders identify the objectives, they may begin establishing alternate route criteria. Stakeholders must agree on what criteria alternate routes must meet before they may select the alternate route. Table 4-1 shows the stakeholders typically involved in establishing alternate route criteria and the roles they are likely to perform.

Table 4-1. Stakeholder involvement in establishing alternate route criteria

STAKEHOLDER	ROLE
Transportation/public works agency	• Serve as the lead agency, since it is in charge of the road from which traffic is to be diverted.
	• Set up meetings where criteria may be determined.
	• Invite to meetings all transportation agencies in charge of roads that are being considered as alternate routes.
	• Apply knowledge about traffic-related criteria.
	• Establish criteria affecting the extent to which an alternate route may impact one of the roads under their jurisdiction. For example, some agencies may not want excessive traffic diverted onto their roadways.
Law enforcement	• Determine safety-related criteria. Safety-related criteria may relate to both traffic safety as well as the personal safety of motorists and pedestrians.
	• Set criteria affecting the extent to which their response time may be affected. For example, law enforcement may not allow the use of a roadway where police vehicles would be impeded from entering the roadway, since it may negatively impact response time.
Fire department	• Set criteria affecting the extent to which their response time may be affected by the alternate route. Heavy traffic on an alternate route adjacent to a firehouse may impede fire trucks from entering the roadway, leading to an increase in response time to the scene, in addition to emergencies unrelated to the incident causing the use of the alternate route.
Emergency medical service	• Set criteria affecting the extent to which their response time may be affected by the alternate route.
Transit agency	• Set criteria affecting the extent to which transit operations (e.g., transit routes) may be affected by the alternate route.
	• Advise the lead agency as to which routes have transit service and what the minimum criteria are for transit service to be able to operate along a route. For example, the transit agency may specify a maximum acceptable travel time.
Turnpike/toll authority	• Serve as the lead agency if the alternate route plan is for traffic diverted to or from a toll road.
	• Set up meetings where criteria may be determined.
	• May have many of the same responsibilities and expertise that a transportation/public works agency may have, when a toll road is involved in an alternate route plan.
	• Establish restrictions as to when tolls may be waived to accommodate alternate route traffic.
Elected officials	• Advocate criteria that minimize community impact.
Planning organization	• Apply knowledge about a region as a whole.
	• Serve as the lead agency and coordinate meetings where stakeholders establish alternate route criteria.
	• Set traffic-related criteria, as well as criteria affecting the extent to which roads within the region may be affected.
Individuals and community groups	• Advocate criteria that benefit both motorists and the community.

Minimum Actions for Establishing Alternate Route Criteria

The task of establishing alternate route criteria involves the following minimum action: *obtain stakeholder consensus on criteria for alternate route selection.* Associated considerations include:

- An important minimum criterion is that the geometrics of the alternate route must be able to accommodate all vehicle types. Commercial vehicle restrictions and limited available turning radii that cannot accommodate certain vehicles must be identified. If these restrictions arise, the alternate route plan must make accommodations for vehicles that cannot use the alternate route.
- An alternate route must be reasonably close to the primary route in order to be useful. If the alternate route is too far from the primary route, motorists who are unfamiliar with the area may not be comfortable navigating the alternate route. In rural areas, it may be necessary for the alternate route to be farther away from the primary route, since close parallel roads may not be available.

- The alternate route must have sufficient capacity to accommodate the traffic that is diverted. For example, if traffic is diverted from a 6-lane urban freeway, a 2-lane local street may not have adequate capacity to serve as an alternate route.

Ideal Actions for Establishing Alternate Route Criteria

In addition to obtaining stakeholder consensus on criteria for alternate route selection, consider the following ideal action: *set detailed criteria for alternate route selection in addition to the relative priority of each criterion.* Associated considerations include:

- Criteria should be chosen to benefit both motorists and the community at large.
- Stakeholders must agree on the relative importance of each criterion. For example, some stakeholders may choose travel time as the most important criterion, while others may prefer a route with a greater travel time that causes less community disruption.

Table 4-2 summarizes various criteria for selecting an alternate route.

Table 4-2. Criteria for alternate route selection

CRITERION	ENTITY IMPACTED	ACTION
Proximity of alternate route to closed roadway	Motorist	• Determine whether the alternate route is intended for local traffic or for regional traffic. - For local traffic, it should ideally be in close proximity to the primary route. - In a metropolitan area, the closest alternate route may be an adjacent parallel street or a freeway frontage road. - In rural areas, alternate routes may be farther away from the primary route.
		• Provide a time savings to motorists. - If an alternate route is too far away from the primary route, then travel time may be longer than that on the primary route in some instances. - For a regional alternate route, connecting successive cities or major interchanges served by the primary route, it is less important that the alternate route be in close proximity to the main route; however, the alternate route should not be significantly longer than the primary route.
Ease of access to/from alternate route	Motorist	• Select access points between the primary and alternate route that do not create bottleneck points in the corridor.
		• Consider alternate routes that provide high-capacity connections, or sufficient space and geometry to establish special traffic control during implementation, to/from the primary route.
Safety of motorists on alternate route	Motorist	• Select routes that are easy for motorists to navigate and provide a sense of comfort. - Long routes may be difficult for motorists to navigate - Motorists may be uncomfortable using alternate routes that take them through unfamiliar areas and/or offer few service stations. - Motorists may feel more comfortable driving on an alternate route where the primary roadway is visible, rather than driving through an unfamiliar area.
		• Do not use a street that has known safety problems, unless it is patrolled by law enforcement to ensure the safety of motorists.

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Table 4-2 continued from previous page

CRITERION	ENTITY IMPACTED	ACTION
Height, weight, width, and turning restrictions on alternate route	Motorist	• Consider roadways without physical constraints limiting the height, weight, and width of vehicles along the alternate route.
		• Be aware that constraints may render an alternate route impassable for commercial vehicles.
		• Choose an alternate route that is usable by all vehicles. - If commercial vehicles cannot be accommodated on what is otherwise the best alternate route, then an additional route should be selected for commercial vehicles.
		• Review operations of intersections that do not allow vehicles to make certain turns, especially left turns that may be required during alternate route operation. - A turn that is normally banned may be allowed on the alternate route, using special law enforcement control and signage.
Number of travel lanes/capacity of alternate route	Motorist	• Require sufficient capacity to accommodate the vehicles diverted while carrying day-to-day background traffic. - For example, if traffic from a busy six-lane urban freeway is diverted to a two-lane local street, there may not be enough extra capacity on the street to accommodate the diverted traffic.
		• Assure that diverted traffic does not encounter an even worse level of service than it would encounter on the primary route.
Congestion induced on alternate route	Motorist	• Avoid routes where motorists do not realize a travel time savings because of demand-induced congestion on the alternate route.
Traffic conditions on alternate route	Motorist	• Assure that an alternate route is not already operating near capacity, and does not have sufficient extra capacity to accommodate the diverted traffic. The diverted traffic should not encounter an even worse level of service than on the primary route.
Number of signalized intersections, stop signs, and unprotected left turns on alternate route	Motorist	• Assure that signalized intersections, stop signs, and unprotected left turns do not cause substantial delay to motorists along an alternate route. - An unprotected left turn or a left turn from a stop sign may also cause safety problems under heavy traffic conditions.
Travel time on alternate route	Motorist	• Assure that the alternate route is free-flowing and is not excessively long relative to travel distance on the primary route, so that motorists can save time. - Likewise, motorists may not save any time if travel time is long due to congested traffic, even if the alternate route has a shorter travel distance than that on the primary route.
Pavement conditions on alternate route	Motorist	• Assure that good pavement conditions exist. - Pavement conditions may be uncomfortable to motorists, cause safety problems, and even cause damage to vehicles. - If pavement condition is already poor, then diverted truck traffic not normally serviced on an alternate route may further damage the pavement.
Type and intensity of residential development on alternate route	Community	• Do not divert traffic to residential or mixed-residential streets, if possible. - Residential streets are generally low capacity and are often not designed as through-streets. - It is usually best to avoid the use of residential streets as alternate routes.
Existence of schools and hospitals on alternate route	Community	• Consider impact on local driveway access. - One side effect of alternate routes is that the increased traffic may increase the difficulty of local driveway access. For this reason, it is usually best to avoid the use of streets that serve schools and hospitals as alternate routes because it is important that easy access be maintained for these facilities.
		• Consider impact of heavy traffic that may negatively affect ambulance access to hospitals.
		• Consider the impacts of heavy traffic that may increase pedestrian/vehicular conflicts.

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Table 4-2 continued from previous page

CRITERION	ENTITY IMPACTED	ACTION
Percentage of heavy vehicles (e.g., trucks, buses, RVs) on route from which traffic is to be diverted	Motorist	• Examine high volume of heavy vehicles that will significantly reduce available remaining capacity on the alternate route. - The acceleration and operating characteristics of trucks may constrain traffic flow on the alternate route.
Grades on alternate route	Motorist	• Examine impact of steep upgrades or downgrades that may cause safety problems, especially in bad weather. - A steep upgrade can significantly reduce capacity on a roadway carrying a high volume of commercial vehicles because upgrades limit their speed.
Type and intensity of commercial development on alternate route	Community	• Examine capacity constraints at heavy commercial developments, such as a shopping mall. - If a large traffic generator is located adjacent to a candidate alternate route, then it may generate traffic demand that approaches or even exceeds available roadway capacity, thus making the roadway undesirable for use as an alternate route. - Streets in commercial areas usually have a large number of unsignalized driveways, which cause both traffic and safety problems when volume is heavy.
Availability of fuel, rest stops, and food facilities along alternate route	Motorist	• Consider that motorists may feel more comfortable using a route on which these facilities are available. - On an extended or regional alternate route, motorists may wish to stop and eat, rest, and/or to refuel their vehicles.
Noise pollution	Community	• Consider the impact of increased traffic that may significantly increase the amount of noise pollution along a route. - A significant increase in noise level during alternate route implementation may cause unacceptable disturbance to affected areas of the community.
Transit bus accommodation	Motorist	• Examine potential impacts on transit vehicle station stops due to increased volumes of diverted traffic.
Air quality	Community	• Examine impact of increased traffic that may significantly increase pollution and decrease air quality. • Remember, the goal of alternate route deployment is improving mobility and system operations.
Ability to control timing of traffic signals on alternate route	Motorist	• Identify possible modification to day-to-day traffic signal timing plans in order to accommodate the additional diverted traffic. • Choose an alternate route that allows an operator to modify remotely the timing of traffic signals upon alternate route deployment.
Ownership of road	Motorist/ Agency	• Coordinate efforts among agencies responsible for operations on the primary route and the alternate route. - If traffic is being diverted from a State road, it is desirable to divert traffic to another State road. The State can modify the traffic signal timing on a State road, whereas it may not be allowed to modify traffic signal timing on a county or local road. - Diverting from one State road to another State road avoids jurisdictional difficulties.
Availability of ITS surveillance equipment on alternate route	Motorist	• Consider the benefits of an alternate route having an ITS instrumented system. - ITS surveillance equipment, such as CCTV cameras, allows an operator to monitor traffic conditions on an alternate route during plan implementation.
Availability of ITS information dissemination equipment on alternate route	Motorist	• Utilize ITS information dissemination equipment, such as CMSs or HAR, to give motorists information on how to access the alternate route as well as traffic information required to navigate the alternate route and reach a downstream connection with the primary route.

ASSEMBLE AND INDEX DATA

After alternate route criteria are established, stakeholders may begin assembling and indexing data. If any of the agencies involved have access to a GIS database with pertinent information on roadway characteristics, it would be very useful for this step.

Stakeholders should review all the data available to ensure that the necessary data has been acquired to evaluate potential alternate routes on the basis of the selection criteria. Table 4-3 describes roles that different stakeholders may perform in the process of assembling and indexing data. It should be noted that roles may vary depending on the region and the ownership of roads that are involved in the alternate route.

Minimum Actions for Assembling and Indexing Data

The task of assembling and indexing data involves the following minimum action: *use a paper or electronic map to determine the location of roads that may be used as alternate routes and to obtain information on these routes.* Associated considerations include:

- Stakeholders can use a commercially available paper or electronic map and locate all roadways that are near the route from which traffic is to be diverted. Stakeholders should also check access to and from these roadways to ensure that they connect to each other.
- Information that may be available includes roadway classification, pavement type, geometric information, traffic volumes, development density, and accident data.

Table 4-3. Stakeholder involvement in assembling and indexing data

STAKEHOLDER	ROLE
Transportation/public works agency	• As lead agency, schedule meetings to determine what type of data to assemble and index.
	• Use agency personnel to obtain the data.
	• Provide maps and databases available with information on its roads.
	• Utilize GIS database or demand model to help support this step.
Law enforcement	• Provide available safety-related data to determine which sections of roadway are the highest priority for alternate route planning as well as to determine the safety of potential alternate routes.
Fire department	• Provide locations of all firehouses and the routes they typically use for response. This will help avoid alternate routes that negatively impact response time.
Emergency medical service	• Provide locations of all hospitals and dispatch facilities and the routes they typically use for response. This will help avoid alternate routes that negatively impact response time.
Transit agency	• Provide information on bus routes and bus stations in addition to specific alternate routes that may be suitable or not suitable for transit.
Turnpike/toll authority	• Serve as the lead agency if the alternate route plan diverts traffic from a toll road. If a toll road is being considered as an alternate route, provide maps, databases, and other available information.
Planning organization	• May serve as lead agency.
	• Coordinate meetings where stakeholders determine what type of data to index and assemble.
	• Provide access to resources, such as a GIS database and demand models, which other agencies may not have in-house.
	• Provide information about major roads throughout a region.
Freeway service patrol	• Provide firsthand information on sections of freeway that have the most safety problems as well as overall traffic conditions on the freeways.

Ideal Actions for Assembling and Indexing Data

The following ideal actions may be applied in addition to the minimum action:

- *Use a GIS map, if available, to obtain detailed information on available routes.* Associated considerations include:
  - GIS databases contain a variety of useful information on roads and other features. These features are shown graphically on an electronic map. Here, different features (layers) can be turned on or off as necessary, and symbols may be changed.
  - GIS maps, as shown for example in figure 4-2, are ideal for obtaining information on primary routes and candidate alternate routes.
  - GIS databases can save time in planning an alternate route by allowing the planners to obtain basic information about the candidate routes, which would otherwise be available only with a field study or through cumbersome research of paper maps and files.
  - Information that may be available through a GIS includes roadway classification, pavement type, geometric information, traffic volumes, development density, and accident data.
  - If a GIS database shows traffic incident locations, then it can be used to identify a high incident location for which an alternate route should be planned.
  - While the lead agency may not have access to GIS, it is possible that other agencies have access to GIS, which can

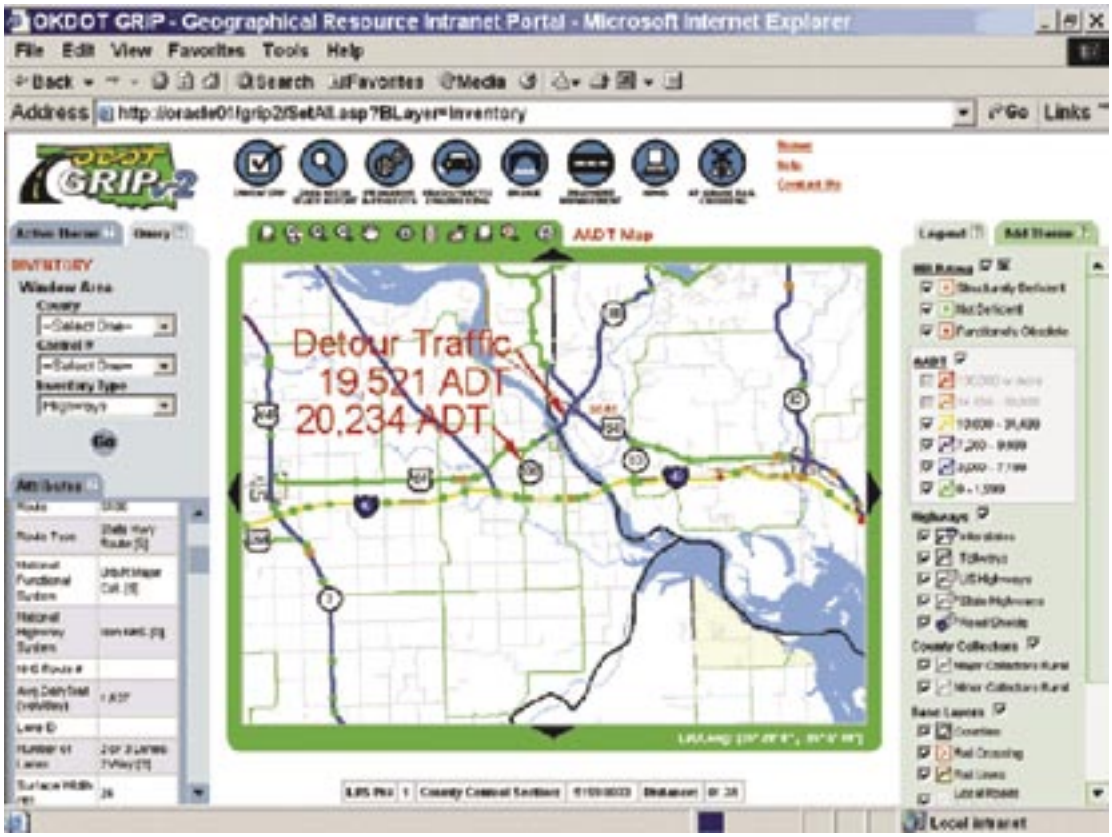


Figure 4-2. GIS map for alternate route planning in Oklahoma. *(Source: Geospatial Solutions)*

be used in the alternate route planning process. Examples of such agencies include rural or metropolitan planning organizations, municipal or county planning departments, and utilities. If the lead agency does not have access to a GIS database, then they should ask other stakeholders if such databases exist and if they may use them to develop the alternate route plan.

- Because no single database can include all information about every aspect of a roadway network, it is necessary to consult other sources, such as a traffic study, to obtain certain data.

- *Consult planning organizations for access to travel demand models that can be used for obtaining data.* Associated considerations include:

  - All travel demand models have a highway network; some larger planning organizations may also have demand models that include transit networks. The networks typically contain information for each link, such as number of lanes, capacity, length, speed limit, functional category (freeway, arterial), and area type (metropolitan, urban/rural). When available, many links will include traffic volume information. Transit links will include information such as route number, headway times, capacity, and fare structure.

  - Sometimes travel demand model networks may be even more readily available than GIS databases and may provide extensive roadway information. The demand model systems used by planning organizations have the capability of displaying the roadway networks in a layout similar to GIS. Some software transportation planning packages combine the capabilities of a GIS with travel demand models. These tools provide a quick and powerful way for the user to identify and display capacity, lanes, and speeds as part of the alternate route planning process for assembling and indexing data.

- *Consult transportation agencies for information on typical traffic volumes, roadway geometry, signage, and traffic control devices.* Transportation agencies may have detailed information on the roadways being investigated as potential alternate routes. This data will assist in applying the selection criteria to candidate alternate routes during the selection process.

- *Consult law enforcement personnel and/or transit operators for information on traffic operations.* Law enforcement personnel and transit operators may have firsthand knowledge of typical traffic conditions from policing and traveling the alternate route on a daily basis. Law enforcement may have records of travel speeds and incident data. Transit agencies may log travel times during different times of the day along portions of candidate alternate routes from scheduled monitoring activities. This data should complement data provided by the transportation/public works agency.

- *Consult freeway service patrols operators for information on traffic operations and incident frequency.* Freeway service patrols, namely its administering agency, may have records of incident occurrence, type, and duration. Also, since freeway service patrols travel a particular route on a daily basis, operators may have firsthand knowledge of typical traffic conditions at different times of the day and days of the week.

IDENTIFY PRELIMINARY ALTERNATE ROUTES

After stakeholders assemble and index data, they may then use the data to identify a set of preliminary alternate routes. Because more detailed analysis can have a significant cost in terms of both time and money, it is important that care be taken in the selection of preliminary alternate routes and that only feasible routes are selected. Table 4-4 shows possible roles of potential stakeholders for this step.

Minimum Actions for Identifying Preliminary Alternate Routes

The task of identifying preliminary alternate routes involves the following minimum action: *obtain stakeholder consensus on at least one preliminary alternate route to be studied further.* Stakeholders should choose one or more preliminary alternate routes that warrant further study. The alternate route must meet all criteria set in the previous step. Selecting multiple routes in this step will allow additional routes to be investigated in the next step if the site visit eliminates the primary route as a viable candidate.

Ideal Actions for Identifying Preliminary Alternate Routes

The following ideal actions may be applied in addition to the minimum action:

- *Use travel demand models to estimate the traffic volume that will use the potential alternate routes.* Associated considerations include:
  - For major route disruptions, travel demand models will create new trip tables that reflect changes in the traffic flow. By removing a key highway link, the demand model will change the network times and generate new traffic flow patterns. The revised network flow pattern should then be used as input to a traffic simulation model in order to better estimate how the highway closure affects operations after accounting for changes in travel demand.
  - Shortest (time or distance) alternative routes can be identified using the traffic assignment module in demand models. In the demand model's traffic assignment process, the mathematical algorithms are based on finding the shortest paths between two points. Given sufficient

Table 4-4. Stakeholder involvement in identifying preliminary alternate routes

STAKEHOLDER	ROLE
Transportation/public works agency	• As the lead agency, schedule meetings where stakeholders involved can meet and determine which alternate routes to identify for further consideration.
Law enforcement	• Advise the lead agency to eliminate any routes from consideration that may involve safety issues or that would drastically affect response time.
Fire department	• Advise the lead agency to eliminate any routes from consideration that would drastically affect response time.
Emergency medical service	• Advise the lead agency to eliminate any routes from consideration that would drastically affect response time.
Transit agency	• Help the lead agency consider alternate routes that would be beneficial to existing transit service routes.
	• Identify separate preliminary alternate routes for use by transit operators if the primary alternate route is not suitable for transit route operations.
Turnpike/toll authority	• Serve as lead agency if the alternate route is for a toll road.
	• Determine whether the toll road is feasible as an alternate route.
	• Determine the feasibility of waiving tolls, which can influence whether or not the toll road may be used as an alternate route.
Planning organization	• May serve as the lead agency.
	• Provide prior performed studies that may be useful in determining the feasibility of an alternate route.
	• Provide knowledge about an entire area, rather than just a single jurisdiction.

data, GIS software can accomplish this step as well.

- For a typical application in identifying preliminary alternate routes, the roadway segment that will be closed or blocked is eliminated from the model network, and the assignment module is run. The modeler then identifies the alternate routes that best meet the selection criteria, including the routes with the shortest travel distance, the shortest time, or the highest capacity.
- Travel demand models can also identify alternate routes that will have the minimum impact on emergency response services. The location of emergency services is identified on the network, and travel time runs using the assignment module could determine the potential change in response times to the community service area.

• *Obtain stakeholder consensus on multiple preliminary alternate routes to be studied further.* Stakeholders should choose multiple preliminary alternate routes that warrant further study, and must meet all criteria set in the previous step. Selecting multiple routes will allow additional routes to be investigated in the following step if the site visit eliminates the primary route as a viable candidate.

CONDUCT ALTERNATE ROUTE SITE VISIT

Although maps and databases may contain useful information, no map or database can capture how a route operates on a day-to-day basis. Detailed information on roadside development and traffic patterns is rarely available through a map or database. In addition, maps or databases may have errors or could be misleading: a street labeled as a major arterial on a map may be considered as an alternate route, but the street may actually be a narrow, unpaved road that is not feasible as an alternate route. A site visit would generally be the responsibility of the lead agency. However, the agency responsible for the roadway being considered should participate in the site visit.

After stakeholders conduct the site visit, they are in a much better position to determine the feasibility of the alternate routes that have been proposed. If none of the routes that were chosen meet the alternate route selection criteria, then stakeholders must return to the Assemble and Index Data step in order to identify another set of preliminary alternate routes. Table 4-5 shows possible stakeholder roles for conducting the site visit.

Table 4-5. Stakeholder involvement in conducting alternate route site visit

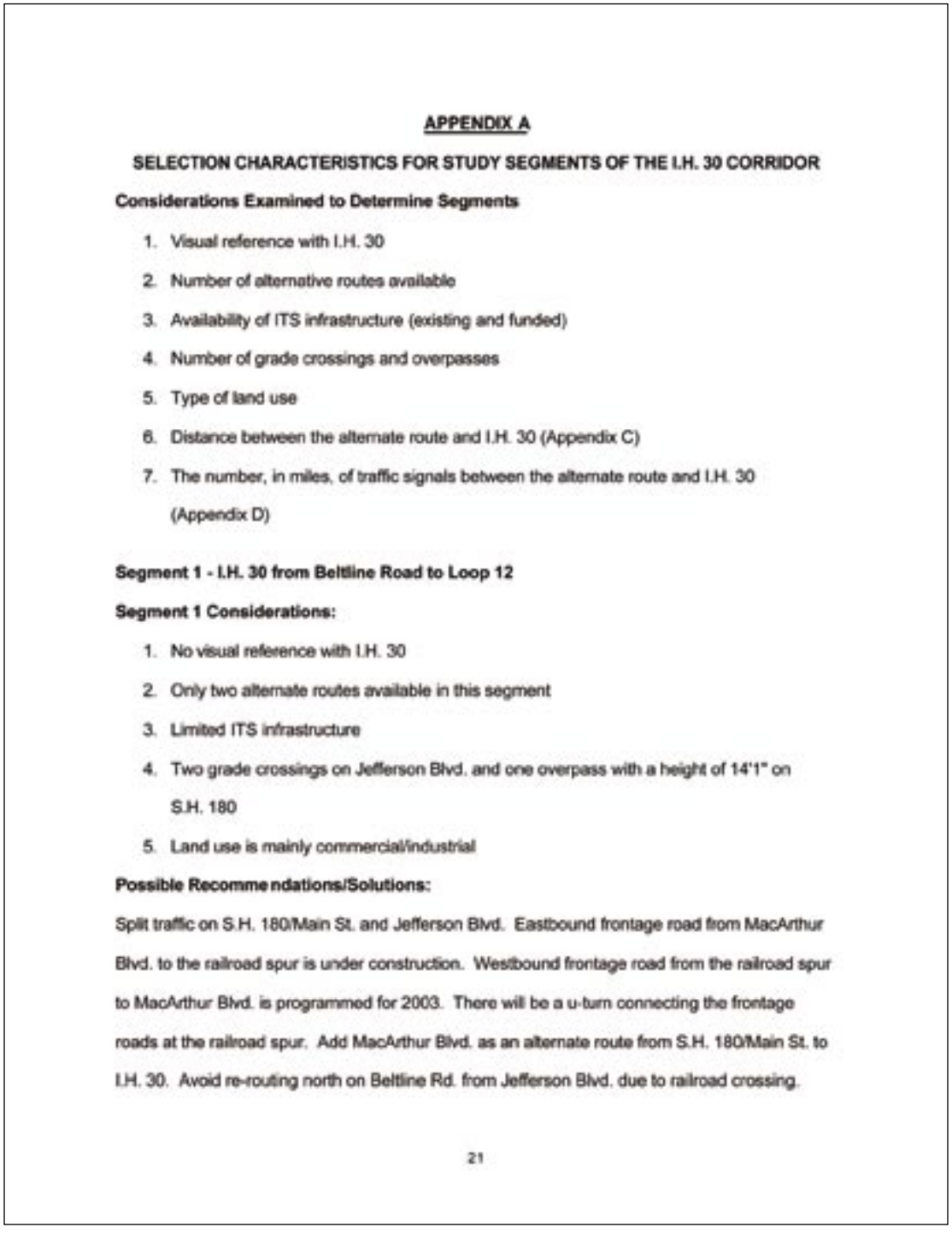
STAKEHOLDER	ROLE
Transportation/public works agency	• As the lead agency, send personnel into the field to conduct the site visit.
Law enforcement	• Obtain safety-related information through the site visit.
Fire department	• Provide input on response times depending on which alternate route is selected.
Emergency medical service	• Provide input on response times depending on which alternate route is selected.
Turnpike/toll authority	• Participate in a site visit of a toll road designated as a candidate alternate route.
Freeway service patrol	• Patrol the freeway system.
	• Obtain information on locations with safety problems as well as information on the general operation of the freeway.

Minimum Actions for Conducting an Alternate Route Site Visit

The task of conducting an alternate route site visit involves the following minimum action: *conduct a site visit to observe how the candidate alternate routes perform in the "real world" and to determine if these routes meet the selection criteria.* Associated considerations include:

- Stakeholders should visit and drive each of the alternate routes to identify features that do not appear on a map or in any database. It is especially important to ensure that all roads comprising the route are physically connected and that traffic flow is possible in the direction required by the alternate route. For example, two roads may appear to cross each other on a map, although there may be an impassable median that blocks the turn needed for the alternate route.
- The stakeholder performing the site visit should ensure that the geometry of the alternate route is able to accommodate all vehicle types. Features to look for include low overpasses, narrow bridges, bridges with weight limits, and tight ramps that may be restrictive to commercial vehicles.
- The stakeholder performing the site visit should check that the alternate route has adequate capacity to accommodate diverted traffic volume. The stakeholder should locate potential problem areas, such as an unsignalized left turn onto a heavily traveled street or against heavy oncoming traffic. The stakeholder must determine if these chokepoints can accommodate diverted and background traffic demand or if additional transportation management planning is required at these locations to affect a temporary capacity increase during alternate route implementation.
- Railroad grade crossings should be located. Trains that traverse the grade crossing on a regular basis could make the alternate route unviable.
- Major traffic generators (such as a large shopping center) should be located. Heavy traffic volumes near these major traffic generators could significantly reduce the level of service at varied times. The type and intensity of roadside development represents another important factor. Alternate routes with schools and hospitals should be avoided or only considered during specific periods.
- Stakeholders should schedule site visits during morning and evening peak periods, as well as during midday and nighttime hours, to gain an accurate understanding of how the alternate route may function during different times of day.
- Other stakeholders may assist with the site visit as part of their daily routine. Freeway service patrols, law enforcement, and transit operators may drive the portions of candidate alternate routes each day and may be able to take special notice of conditions and features that affect the feasibility of implementing a candidate alternate route. Transit operators may provide input as to whether or not an alternate route is feasible from the perspective of potential impact on transit operations. Public safety agencies may also visit the site to determine whether the use of any potential alternate route will negatively impact response times.
- *Freeway Alternate Routes Only*: Typical bottlenecks on a freeway alternate route include ramp connectors and weaving areas. The stakeholder performing the site visit should check the geometry and operation of ramp connectors and weaving areas to ensure that these points have adequate capacity to accommodate the traffic.

Figure 4-3 shows an example of an analysis that may be performed after the site visit to determine whether or not any acceptable alternate route exists.



APPENDIX A

SELECTION CHARACTERISTICS FOR STUDY SEGMENTS OF THE I.H. 30 CORRIDOR

Considerations Examined to Determine Segments

1. Visual reference with I.H. 30
2. Number of alternative routes available
3. Availability of ITS infrastructure (existing and funded)
4. Number of grade crossings and overpasses
5. Type of land use
6. Distance between the alternate route and I.H. 30 (Appendix C)
7. The number, in miles, of traffic signals between the alternate route and I.H. 30 (Appendix D)

Segment 1 - I.H. 30 from Beltline Road to Loop 12

Segment 1 Considerations:

1. No visual reference with I.H. 30
2. Only two alternate routes available in this segment
3. Limited ITS infrastructure
4. Two grade crossings on Jefferson Blvd. and one overpass with a height of 14'1" on S.H. 180
5. Land use is mainly commercial/industrial

Possible Recommendations/Solutions:

Split traffic on S.H. 180/Main St. and Jefferson Blvd. Eastbound frontage road from MacArthur Blvd. to the railroad spur is under construction. Westbound frontage road from the railroad spur to MacArthur Blvd. is programmed for 2003. There will be a u-turn connecting the frontage roads at the railroad spur. Add MacArthur Blvd. as an alternate route from S.H. 180/Main St. to I.H. 30. Avoid re-routing north on Beltline Rd. from Jefferson Blvd. due to railroad crossing.

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Figure 4-3. Alternate route analysis and recommendations.
(Source: North-Central Texas Council of Governments)

Ideal Actions for Conducting an Alternate Route Site Visit

In addition to conducting a site visit, consider the following ideal action: *videotape site visits in order to review the visits at a later time.* Ideally, the stakeholders performing the site visit should videotape the site visit so that other stakeholders may review the site. The videotape proves useful for presentation at future stakeholder planning meetings to select alternate routes, and should show conditions during both peak and off-peak periods.

EVALUATE PRELIMINARY ALTERNATE ROUTES

After stakeholders conduct the site visit, they must evaluate the performance of each remaining candidate alternate route. The level of analysis that is possible depends on the availability of funding and personnel to conduct this step. The more traffic operations data available on the route, the easier it is to apply a suitable analysis technique to evaluate the operation of the route under implementation conditions.

After stakeholders evaluate the candidate alternate routes, they must decide whether an acceptable alternate route is available based on previously established criteria. If none of the alternate routes studied are acceptable, then stakeholders must return to the Assemble and Index Data step in order to identify a new set of possible alternate routes. Because of the level of effort and funding required in subsequent planning steps, stakeholders should exercise care in evaluating preliminary alternate routes to avoid having to repeat this process more than once.

Table 4-6 describes possible roles for stakeholders involved in this step.

Minimum Actions for Evaluating Preliminary Alternate Routes

The task of evaluating preliminary alternate routes involves the following minimum action: *conduct a capacity analysis of candidate alternate routes.* Associated considerations include:

- Stakeholders should conduct capacity analyses for different times of the day using applications based on *Highway Capacity Manual* (HCM) methodologies.[1]
- For a freeway, locations to analyze include ramp junctions, weaving segments, and general freeway sections in order to identify the location with minimum capacity (bottleneck location capacity).
- For a street, both the street as a whole should be analyzed (using the analysis method for arterials) as well as individual intersections.
- At a minimum, these analyses will require traffic volume data and roadway configuration data.

Ideal Actions for Evaluating Preliminary Alternate Routes

In addition to conducting capacity analyses, consider the following ideal action: *evaluate candidate alternate routes using traffic simulation software, and test a variety of scenarios.* Associated considerations include:

- Traffic simulation is a useful tool for studying how candidate alternate routes can accommodate traffic diverted from the primary route. Because field studies are usually not feasible for this purpose, traffic simulation represents the best available tool. Network or corridor simulation can be used to identify bottleneck locations, and HCM-based or other software can be used to further study bottleneck operations.

Table 4-6. Stakeholder involvement in evaluating preliminary alternate routes

STAKEHOLDER	ROLE
Transportation/public works agency	• As lead agency, perform capacity analysis and/or computer traffic simulation to evaluate the traffic conditions on alternate routes during diversion.
	• Provide an estimate of traffic diverted by time of day and day of week.
Law enforcement	• Evaluate the safety of alternate routes when used.
	• Evaluate both traffic safety and personal safety of motorists.
Fire department	• Evaluate their response time when the alternate route plan is in effect.
	• Consider both their response time to the incident, as well as response time to other emergencies that may occur at the same time in different locations.
Emergency medical service	• Evaluate their response time when the alternate route plan is in effect.
	• Consider both their response time to the incident, as well as response time to other emergencies that may occur at the same time in different locations.
Transit agency	• Evaluate transit performance along the alternate route.
	• Provide information on transit schedules to the lead agency so that transit can be included in alternate route evaluation activities.
Turnpike/toll authority	• Provide traffic data on the toll road to the lead agency.
	• Evaluate how much revenue will be lost if tolls are waived.
	• Determine the feasibility of waiving tolls.
Elected officials	• Help the lead agency choose an alternate route that, when implemented, creates a negligible impact on community quality of life.
Planning organization	• Examine prior performed studies, which may be useful for evaluating alternate routes.
	• Use travel demand models to evaluate alternate routes.
Individuals and community groups	• Advocate beneficial alternate routes, both from the point of view of motorists and as members of the community.
	• Provide firsthand knowledge of the alternate routes that is useful for the lead agency.
Freeway service patrol	• Patrol the freeway system.
	• Provide safety data on the freeway under consideration as an alternate route.
	• Provide general information on the operating characteristics of the freeway.

- Stakeholders should conduct route capacity analysis for different times of the day and days of the week using traffic simulation models.
- Stakeholders should model both mainline and alternate routes at the same time as a network. The bottleneck location may likely reside at junction points between the alternate route and the primary route.

The FHWA *Traffic Analysis Tools Primer*[2] provides guidance in the selection and application of the following types of computer traffic simulation models to various scenarios, including (1) macroscopic simulation models, (2) mesoscopic simulation models, and (3) microscopic simulation models.

Macroscopic simulation models are based on deterministic relationships of flow, speed, and density of the traffic stream. Macroscopic models simulate traffic on a section-by-section basis, rather than tracking individual vehicles. Macroscopic models produce less detailed results than mesoscopic or microscopic models but require the least amount of storage space, computing requirements, and simulation time. Examples include TRAF-CORFLO and FREQ.

Mesoscopic simulation models combine properties of both macroscopic simulation

models and microscopic simulation models. Mesoscopic models simulate individual vehicles, but vehicle speed is determined by the average speed of the link.

Microscopic simulation models simulate movement of individual vehicles, based on theories of car-following and lane-changing. Microscopic simulation models require more storage space, computing requirements, and simulation time than macroscopic or mesoscopic models but produce the most detailed results. Examples include CORSIM and VISSIM.

SELECT PREFERRED ALTERNATE ROUTE

After stakeholders evaluate the candidate alternate routes, they can select the preferred alternate route from among remaining feasible routes. If possible, stakeholders should choose a secondary and tertiary alternate route in addition to the primary alternate route. In cases where the primary alternate route is unavailable or impeded, the secondary and tertiary alternate routes could be used to augment use of the primary alternate route. All stakeholders should be informed of the decision, even if their approval is not required.

Table 4-7 describes possible roles for stakeholders involved in this step.

Minimum Actions for Selecting a Preferred Alternate Route

Minimum actions for selecting a preferred alternate route include:

- *Obtain stakeholder consensus on the selection of the best available alternate route.* After stakeholders evaluate the potential alternate routes, they should select the best available alternate route that meets established selection criteria and provides satisfactory level of service under implementation conditions.
- *Notify (by lead agency) all affected stakeholders about the alternate route selected.* Even if a stakeholder's concurrence is not required for the alternate route selection process, the lead agency should notify that stakeholder of the alternate route that has been chosen. All of the stakeholders listed in table 4-7 should be notified, particularly the following groups that may not have participated in the route selection process:
  - Agencies from adjacent jurisdictions that may experience impacts from diverted traffic.

Table 4-7. Stakeholder involvement in selecting preferred alternate route

STAKEHOLDER	ROLE
• Transportation/public works agency	• Set up stakeholder meetings where stakeholders may select the preferred alternate routes. • Assure that all transportation agencies involved sign off on the selected alternate routes and subsequent alternate route plans.
• Law enforcement • Fire department • Emergency medical service • Emergency management agency/Homeland security agency • Transit agency • Turnpike/toll authority • Elected officials • Planning organization • Individuals and community groups • Major incident response team	• Participate at meetings where stakeholders select preferred alternate routes. • Sign off on the selected routes and subsequent alternate route plans.

- Major businesses along the alternate route.
- Emergency services from adjacent jurisdictions that may use the alternate route.
- Media.

Ideal Actions for Selecting a Preferred Alternate Route

The following ideal actions may be applied in addition to the minimum actions:

- *Choose at least two (preferably three) alternate routes, and obtain stakeholders' concurrence on the selection.* Associated considerations include:
  - Ideally, stakeholders should choose at least two alternate routes: a primary and secondary alternate route as shown in figure 4-4.
  - If possible, stakeholders may choose three alternate routes. This is useful in the event that the volume of diverted traffic creates an unacceptable level of service on the primary alternate route, and additional routes are needed during implementation to alleviate demand on the primary alternate route.
  - Secondary and tertiary alternate routes also prove valuable if a concurrent event, such as an incident, construction, or flooding, affects available capacity on the primary alternate route.
- *Review alternate routes to decide if they are still effective or if a new alternate route should be selected.* Associated considerations include:
  - Stakeholders should consider an alternate route plan as a living document, given that the best alternate route

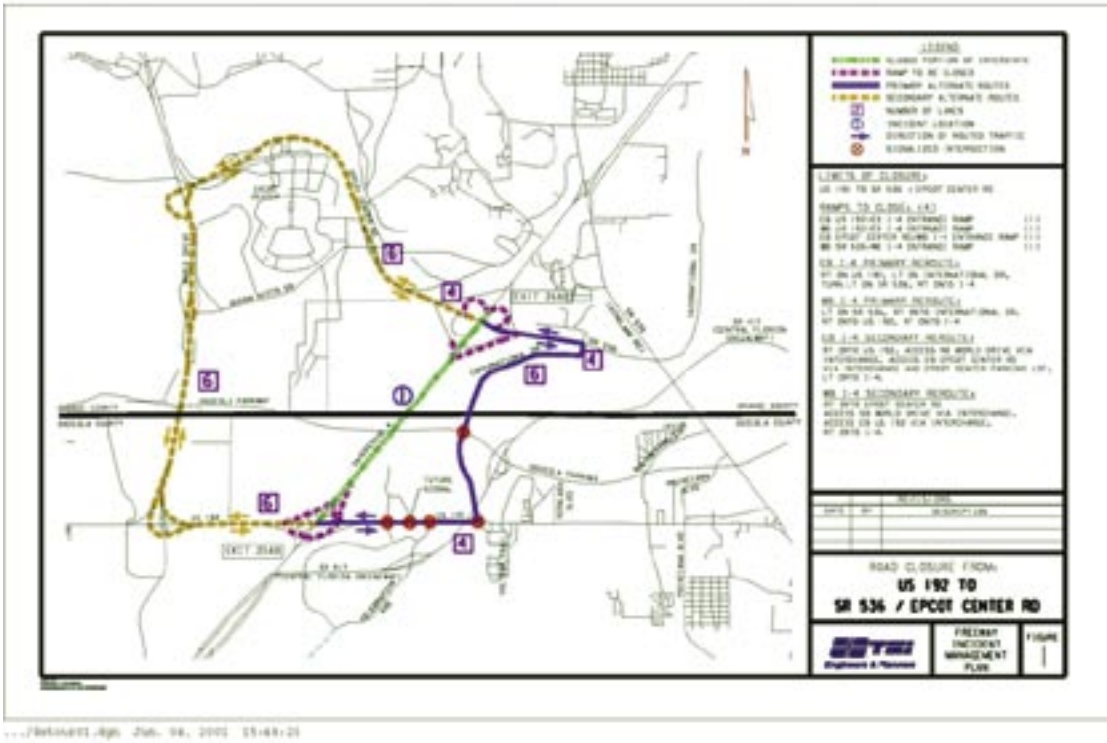


Figure 4-4. Alternate route plan showing a primary and secondary alternate route.
(Source: Florida DOT)

may change over time as a result of roadway infrastructure improvements or deteriorating day-to-day operation of the designated alternate route.

- Stakeholders should meet regularly to review alternate routes and make revisions, if necessary. A few situations that may require selection of a new route include:
  - Community opposition to the current alternate route.
  - Increased traffic volume on the alternate route.
  - Construction activities that temporarily reduce capacity on the alternate route.
  - Construction of a new road that could represent a better alternative to the selected alternate route.
  - New development along the alternate route.
  - Security issues.

REFERENCES

1. *Highway Capacity Manual*, 2000 edition, Transportation Research Board, Washington, DC, 2000.

2. *Traffic Analysis Tools Primer*, Federal Highway Administration, Washington, DC, January 2003.

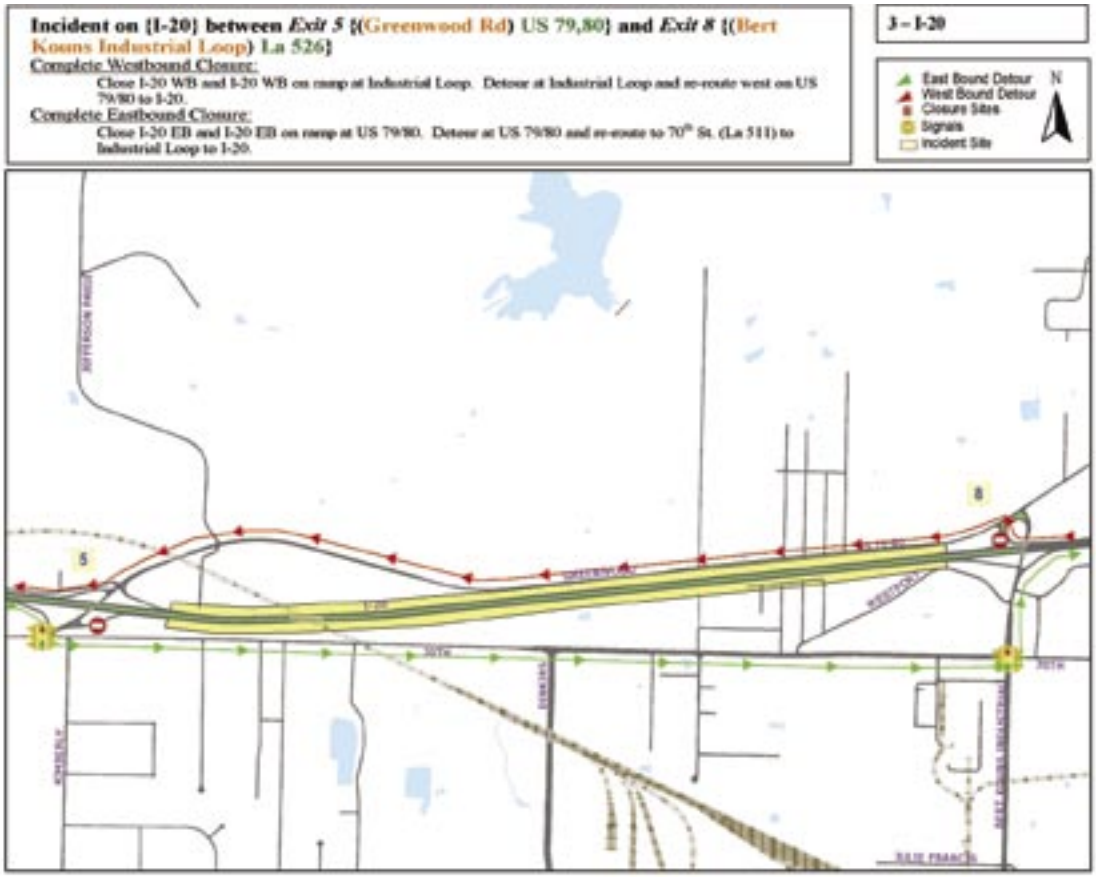


Figure 5-1. Sample alternate route plan. *(Source: Northwest Louisiana Council of Governments)*

INTRODUCTION

The second phase in the alternate route planning process involves alternate route plan development. The following three steps facilitate plan development:

- Determine alternate route plan content.
- Develop alternate route plan implementation guidelines.
- Develop guidelines for discontinuing alternate route plan implementation.

DETERMINE ALTERNATE ROUTE PLAN CONTENT

After stakeholders select the alternate route, they must determine the information to include in the alternate route plan. The area type and scope of the alternate route plan influences the level of information to be included on the alternate route plan. Table 5-1 describes the possible roles of each stakeholder involved in determining alternate route plan content.

Minimum Actions for Determining Alternate Route Plan Content

The task of determining alternate route plan content involves the following minimum action: *use a paper or electronic map to illustrate the alternate route plan*. Associated considerations include:

- Some agencies, rather than creating original maps, use an existing map (either a paper map or an electronic map) to indicate (either with ink or electronically) the selected alternate route. Text describing the alternate routes should also be included. Concurrence should be sought to ensure that adequate information, to effect rapid plan implementation, is provided in the alternate route plan.

- The alternate route maps must clearly illustrate the selected alternate route and direction of travel. In addition, it should include the location of mainline closure on the primary route.
- If color-coded routes are used on the map, then there should be some other feature (such as line weight) used to differentiate the routes. Since alternate route plans will often be photocopied, for use in the field, it is important that the routes can be clearly deciphered when shown in black-and-white.

Ideal Actions for Determining Alternate Route Plan Content

The following ideal actions may be applied in addition to the minimum action:

- *Create detailed alternate route maps.* Associated considerations include:
  - If available, GIS software is ideal for creating alternate route plans. A separate layer may be created for each feature. GIS software generally provides the capability of assigning a specific line weight or line pattern, in addition to color, for various features. Because a map with too much information can become cluttered, GIS allows response maps specific to each agency to be created, showing only the information that is needed by that agency. Also, different levels of implementation (e.g., long-term versus short-term) can be indicated on different layers.
  - Composite maps should be printed on paper and saved in an easily accessible format (such as a portable document format file) for quick reference. Concurrence should be sought to ensure that adequate information, to effect rapid

Table 5-1. Stakeholder involvement in determining alternate route plan content

STAKEHOLDER	ROLE
Transportation/public works agency	• As the lead agency, set up meetings for the alternate route planning process.
	• Provide most of the traffic-related information for roads that traffic is diverted from in addition to roads that are used as alternate routes.
	• Develop alternate route plans.
	• Provide responder (dispatch) contact information for inclusion in the alternate route plan.
Law enforcement	• Provide input regarding its duties and responsibilities during alternate route implementation.
	• Outline implementation activities, including equipment and personnel deployment, in the alternate route plan as agreed to by all participating stakeholders before the plan is finalized.
	• Provide decision criteria for ranking law enforcement officials that may serve as the Incident Commander at the scene.
	• Provide responder (dispatch) contact information for inclusion in the alternate route plan.
Fire department	• Provide input regarding when alternate route implementation will occur relative to critical response actions (e.g., incident stabilization, treatment of injured persons) that must take place at the incident scene upon responder arrival.
	• Provide decision criteria for ranking fire officials that may serve as the Incident Commander at the scene.
	• Review and approve the alternate route plan before the plan is finalized. The fire department should provide responder (dispatch) contact information for inclusion in the alternate route plan.
Emergency medical service	• Provide input regarding when alternate route implementation will occur relative to critical response actions (e.g., treatment and transport of injured persons) that must take place at the incident scene upon responder arrival.
	• Review and approve the alternate route plan before the plan is finalized.
Turnpike/toll authority	• Provide most of the traffic-related and operations information for toll roads shown on the alternate route plan.
	• Develop alternate route plans for toll road facilities.
	• Provide responder (dispatch) contact information for inclusion in the alternate route plan.
Planning organization	• Share knowledge about an area as a whole that could help provide valuable information in an alternate route plan.

plan implementation, is provided in the alternate route plan. Information that should be included on an alternate route plan map is:

- Limits of closure on main road.
- Alternate route, including arrows showing direction of traffic if the route is used one-way only.
- Location of all traffic signals and associated jurisdiction (State, county, local), as shown in figure 5-2.
- Location of other traffic control devices, such as ramp meters and lane control signals, supporting alternate route operations.
- Location of CMS and permanent/ temporary trailblazer signage supporting alternate route operations.
- Stationing locations of law enforcement and other personnel involved in providing traffic control during plan implementation. Figure 5-3 shows an alternate route plan that specifies locations where law enforcement must provide traffic control.
- Roads and ramps (e.g., freeway entrance ramps upstream of the incident site) that are closed, including the location of primary route closure for which the alternate route applies.
- Number of lanes on alternate route.
- Geometric information (e.g., turning radius and length of curves and ramps), as shown in figure 5-4.
- Speed limits.
- Ownership of roads.
- Roadway pavement type, as shown in figure 5-5.
- Background traffic volumes.

Figure 5-2. Specification of traffic signal jurisdiction on an alternate route plan. *(Source: New Jersey DOT)*

- Background vehicle composition (e.g., percent heavy vehicles, buses).
- Parking prohibitions.
- Height and weight restrictions.
- Locations of police stations, firehouses, hospitals, schools, major traffic-generators.
- Photos or drawings of trailblazer signs to be used during implementation, as shown in figure 5-6.

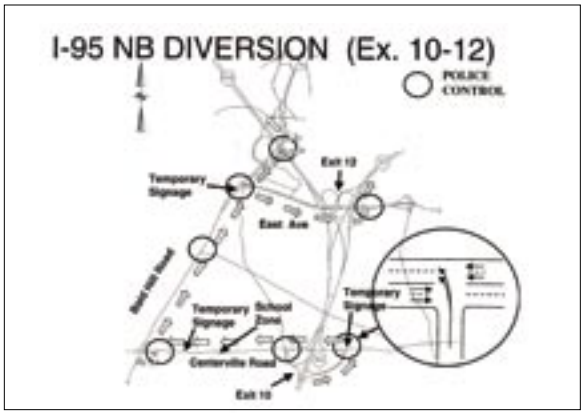


Figure 5-3. Alternate route plan showing law enforcement traffic control locations. *(Source: Rhode Island DOT)*

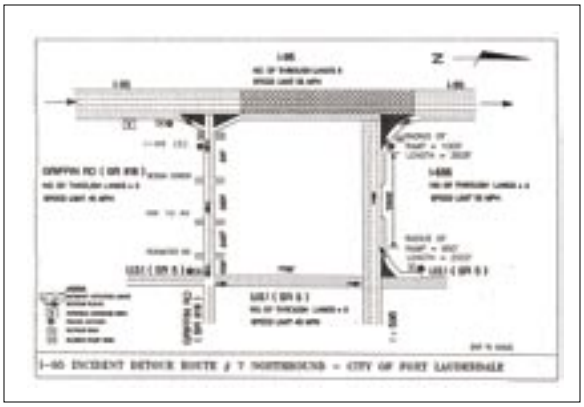


Figure 5-4. Alternate route plan showing interchange and intersection details. *(Source: Florida DOT District IV)*

- Figure 5-7 shows a detailed alternate route plan for an urban area. Figure 5-8 shows a detailed alternate route plan for a rural area. Figure 5-9 shows a detailed alternate route plan that includes both freeway and street alternate routes. Note that not all alternate route plans will necessarily include all of the above-listed information.
- Each map should be assigned an index number. An index map makes it easy for responding personnel to find the appropriate alternate route plan map based on the location of primary route closure. It should show the limits of primary route closure for each alternate route plan map in the set. In order to facilitate creation of the index map, it is important to assign an index number to each plan in the set.

- *Include detailed information on the alternate route plans on how to implement the alternate route.* Associated considerations include:
  - Alternate route plans should include detailed information on the duties of each stakeholder involved prior to, during, and after the implementation of the alternate route. Flowcharts and tables are ideal for this purpose. In addition, contact information should be included for pertinent response personnel. Figure 5-10 shows an example flowchart for implementing special traffic signal timing plans during alternate route operation.
  - An alternate route checklist should be incorporated so that appropriate signage, including CMS message sets and traffic control devices, are deployed when the alternate route plan is implemented. Figure 5-11 shows an example of an alternate route checklist.
  - Contact information for all agencies, within the area covered by the plan, that may participate in plan implementation should also be included in the alternate route plan. Contact information should include both office and off-hours (remote) contacts. Figure 5-12 shows an example of an agency contact matrix.

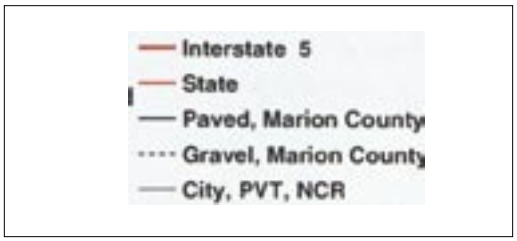


Figure 5-5. Legend showing ownership and roadway pavement type. *(Source: Marion County, OR, Department of Public Works)*

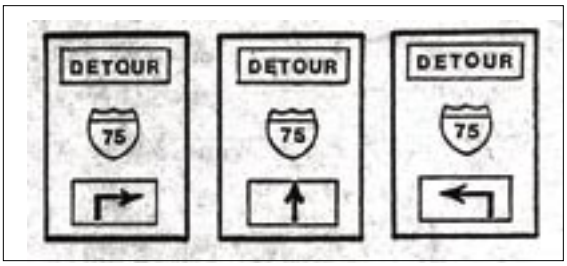


Figure 5-6. Graphic of trailblazers included in an alternate route plan. *(Source: City of Dayton, OH, Police Department)*

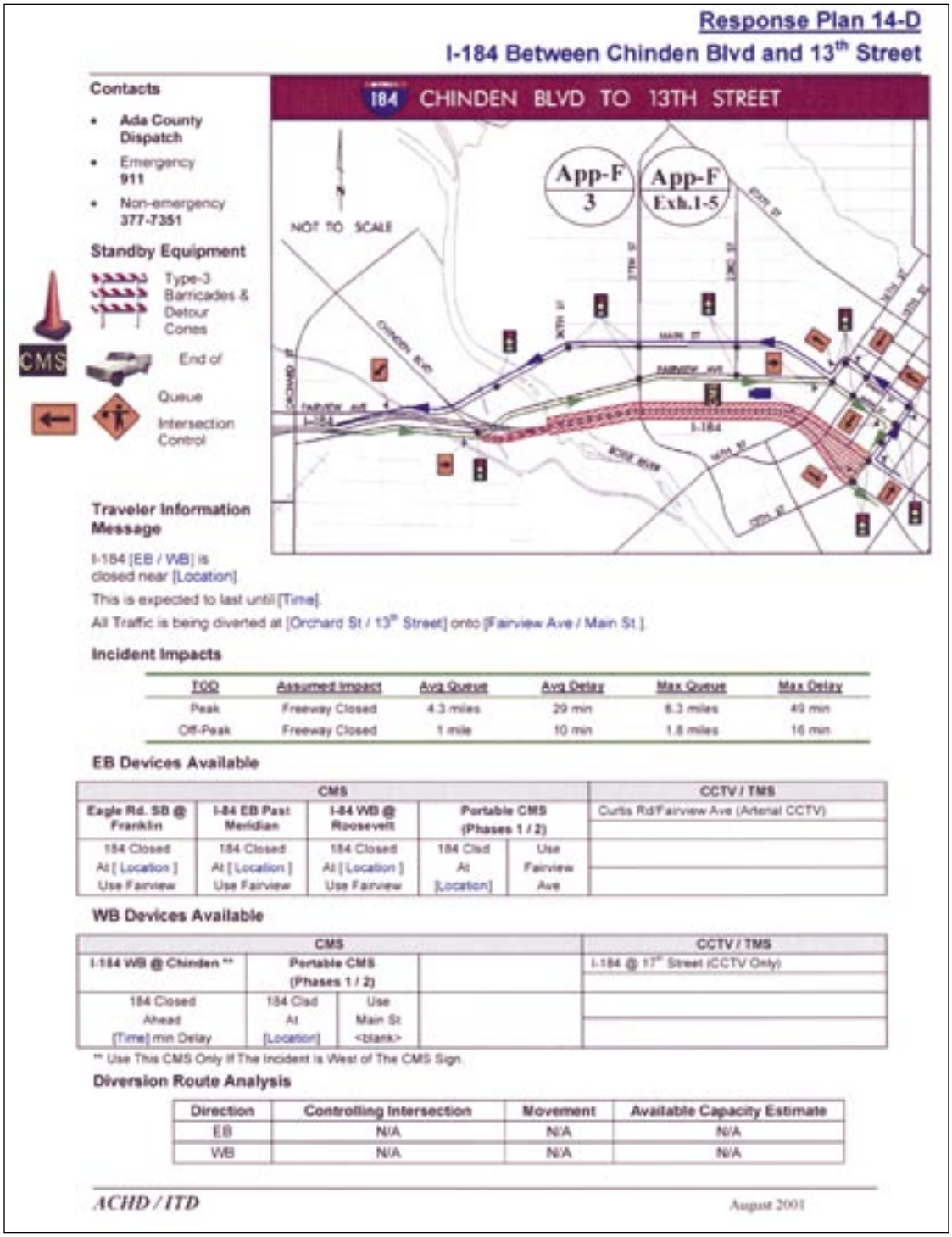


Figure 5-7. Detailed alternate route plan in urban area. *(Source: Idaho Transportation Department)*

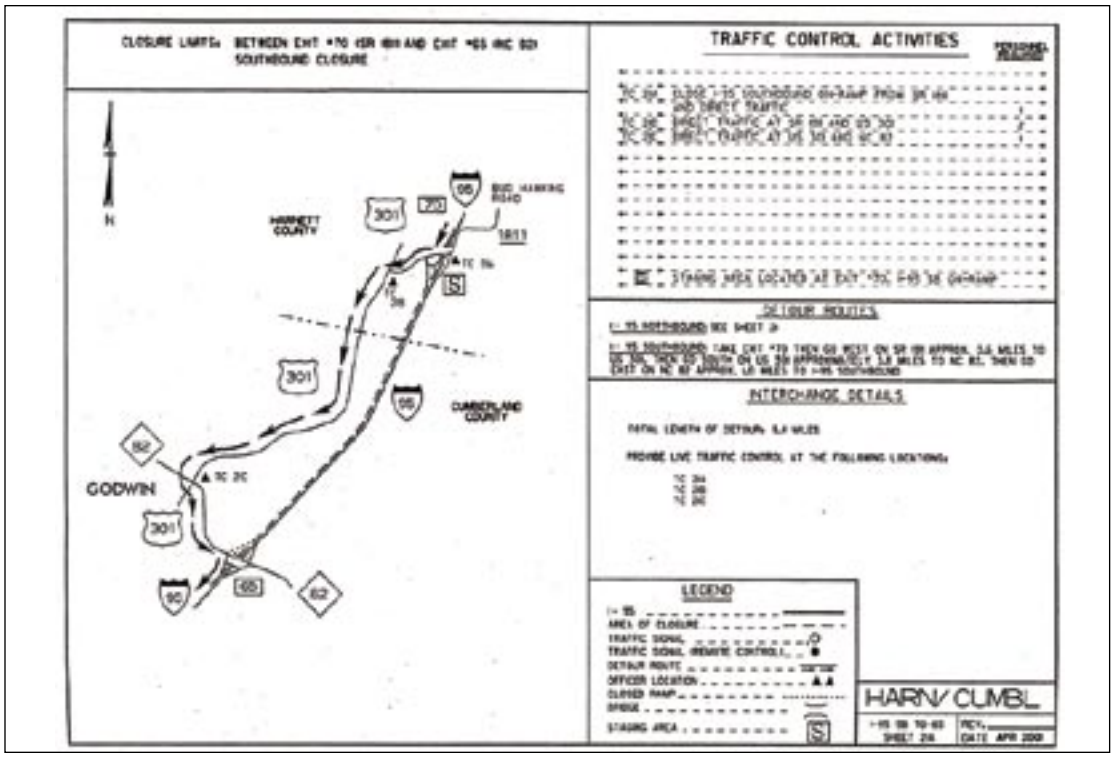


Figure 5-8. Detailed alternate route plan in rural area. *(Source: North Carolina DOT)*

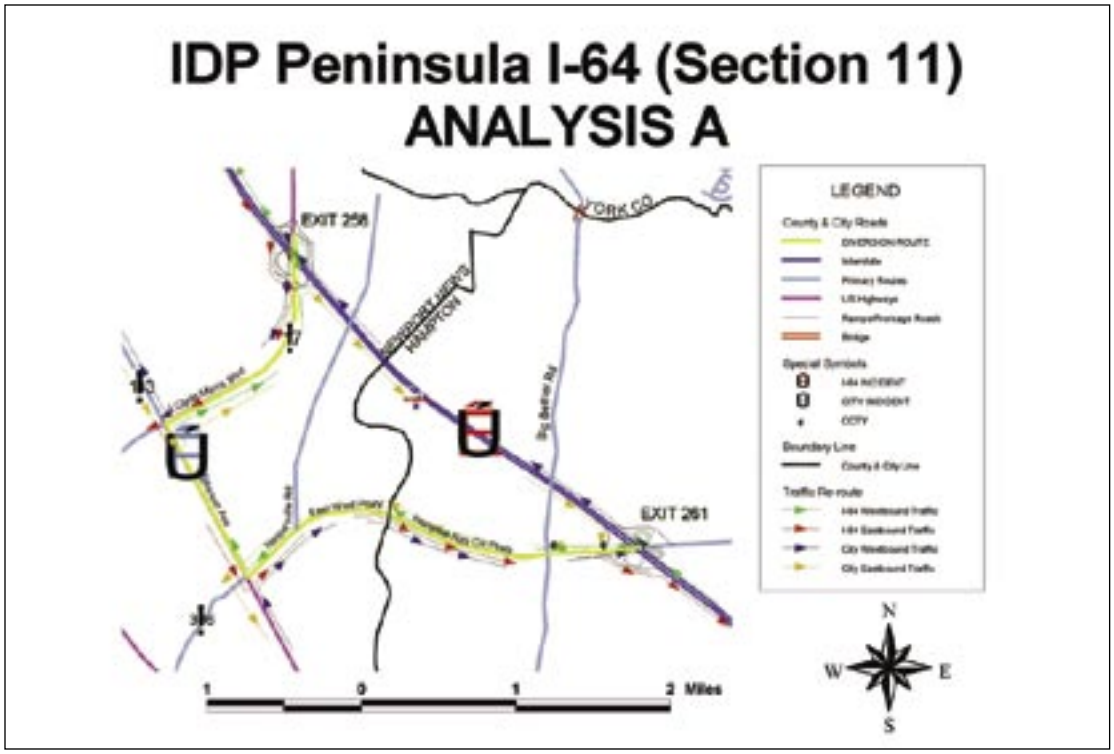


Figure 5-9. Alternate route plan showing freeway and street alternate routes. *(Source: Virginia DOT)*

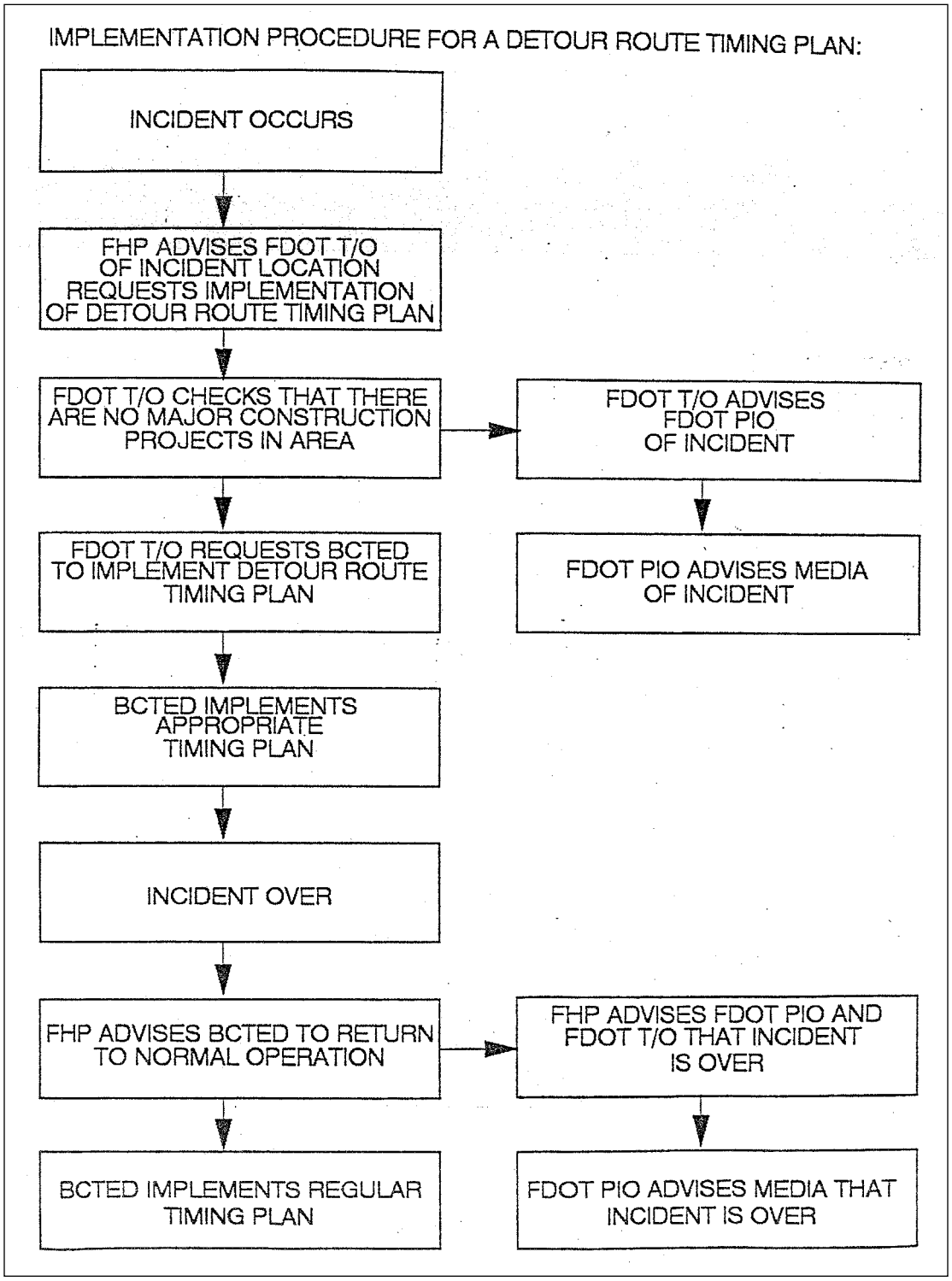
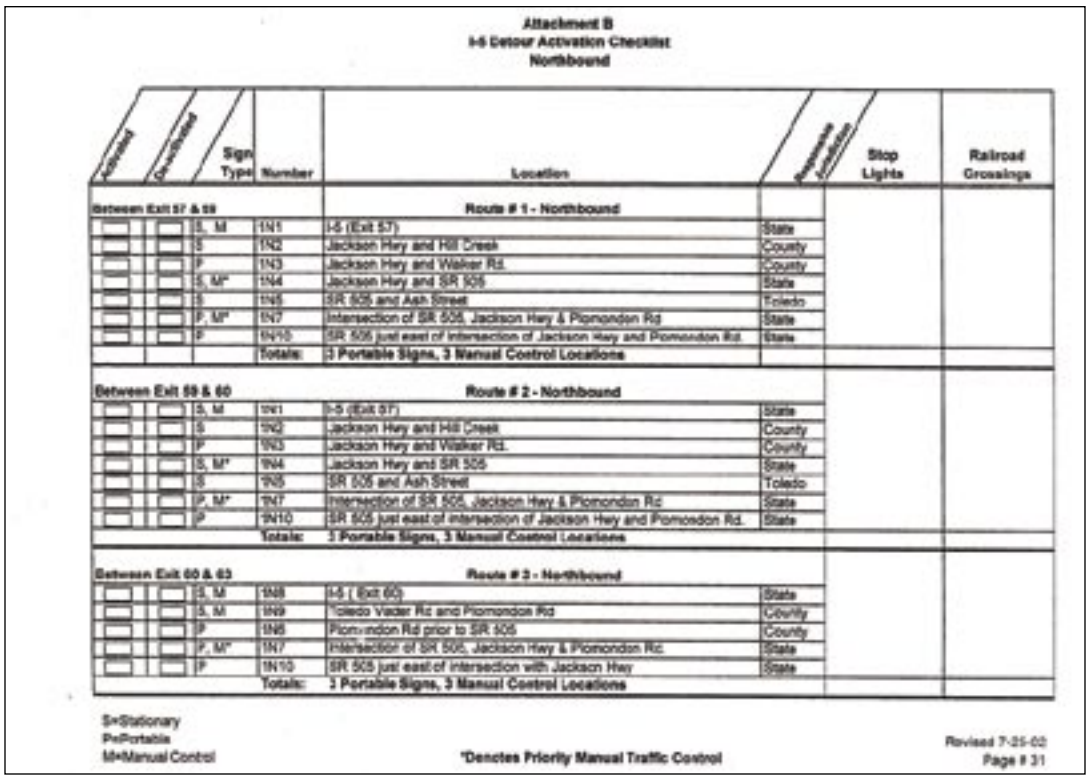


Figure 5-10. Implementation flowchart. *(Source: Florida DOT)*



Attachment B
I-5 Detour Activation Checklist
Northbound

Activated	De-activated	Sign Type	Number	Location	Responsible Jurisdiction	Stop Lights	Railroad Crossings
Between Exit 57 & 59				Route # 1 - Northbound			
		S, M	1N1	I-5 (Exit 57)	State		
		S	1N2	Jackson Hwy and Hill Creek	County		
		P	1N3	Jackson Hwy and Walker Rd.	County		
		S, M*	1N4	Jackson Hwy and SR 505	State		
		S	1N5	SR 505 and Ash Street	Toledo		
		P, M*	1N7	Intersection of SR 505, Jackson Hwy & Plomondon Rd	State		
		P	1N10	SR 505 just east of intersection of Jackson Hwy and Plomondon Rd.	State		
		Totals:		3 Portable Signs, 3 Manual Control Locations			
Between Exit 59 & 60				Route # 2 - Northbound			
		S, M	1N1	I-5 (Exit 57)	State		
		S	1N2	Jackson Hwy and Hill Creek	County		
		P	1N3	Jackson Hwy and Walker Rd.	County		
		S, M*	1N4	Jackson Hwy and SR 505	State		
		S	1N5	SR 505 and Ash Street	Toledo		
		P, M*	1N7	Intersection of SR 505, Jackson Hwy & Plomondon Rd	State		
		P	1N10	SR 505 just east of intersection of Jackson Hwy and Plomondon Rd.	State		
		Totals:		3 Portable Signs, 3 Manual Control Locations			
Between Exit 60 & 63				Route # 2 - Northbound			
		S, M	1N8	I-5 (Exit 63)	State		
		S, M	1N9	Toledo Vader Rd and Plomondon Rd	County		
		P	1N6	Plomondon Rd prior to SR 505	County		
		P, M*	1N7	Intersection of SR 505, Jackson Hwy & Plomondon Rd.	State		
		P	1N10	SR 505 just east of intersection with Jackson Hwy	State		
		Totals:		3 Portable Signs, 3 Manual Control Locations			

S=Stationary
P=Portable
M=Manual Control

*Denotes Priority Manual Traffic Control

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Figure 5-11. Alternate route activation checklist. *(Source: Washington State DOT)*

- All stakeholders involved in alternate route plan implementation should review the plans to ensure that (1) the information presented is accurate, (2) they understand their roles and responsibilities, and (3) they have sufficient resources to fulfill their roles and responsibilities.

- *Include maps showing the location of all supporting ITS equipment.* In addition to alternate route plan maps, it is often useful to include a map showing the location of permanent ITS equipment (see figure 5-13). Pertinent ITS equipment shown includes (1) information dissemination equipment, such as CMSs or HARs, (2) surveillance equipment, such as detectors or closed-circuit television cameras, and (3) traffic control equipment, such as ramp meters. These maps are useful both for planning alternate routes as well as for reference when the alternate route is being implemented.

- *Supplement alternate route plan maps with written directions.* At times, written directions confirm map specifications and may be easier to follow than graphic instructions included on a map, particularly if the plan has been photocopied or faxed.

- *Include a traffic signal timing plan.* The alternate route plan should include the modification of the traffic signal timing to accommodate the additional traffic volume (see figure 5-14). The plans should clearly indicate for each intersection the cycle length and the green time split assigned to the alternate route.

- *Include a traveler information plan*. Associated considerations include:

  - If traveler information devices, such as CMS or HAR are used, a plan showing sample message sets should be included. Ideally, messages should be planned for all scenarios covered in the plan set. Figure 5-15 shows an example of a CMS plan, and figure 5-16 shows an example of a HAR plan.

- The plan should include protocol for media outreach, both for peak periods and off-peak periods. Broadcasters may routinely include traffic reports during morning and afternoon peak travel periods, but special announcements may have to be made during off-peak periods.

DEVELOP ALTERNATE ROUTE PLAN IMPLEMENTATION GUIDELINES

After selecting the alternate routes, stakeholders must determine decision criteria to achieve a consensus and determine when to implement an alternate route plan, after an incident has occurred. Some agency incident responders or Incident Commanders may choose to implement the alternate route plan whenever there is at least one lane closed, while others may only implement the alternate route plan when the entire roadway is closed. The choice of when to implement the alternate route plan typically represents a function of traffic capacity lost on the mainline due to roadway closure and the traffic capacity available on the alternate route. Table 5-2 describes the roles of stakeholders involved in the development of alternate route plan implementation guidelines.

Incident Location (Section)						Regional Contact	Phone	Fax	Alt. Phone	Alt. Fax
1	2	3	4	5	6					
□*	□	□	□	□*	•	Connecticut Bridgeport TOC	(203) 696-2690	(203) 696-2680		
•	•	•	•	•	•	Connecticut Newington TOC	(860) 594-3447	(860) 594-3476		
□*	□	□	□	□*	•	Connecticut DOT	(860) 594-3450	(860) 594-3476		
□*	□	□	□	□*	•	Connecticut State Police	(860) 685-8090			
•	•	•	•	•	•	I-95 NEC	(410) 825-5414	(410) 825-5415		
						Maine DOT Maintenance	(207) 287-2661	(207) 623-2526		
						Maine State Police	(207) 657-3030	(207) 657-5748	(207) 287-3775	
						Maine Turnpike Authority	(207) 871-7701	(207) 828-5808		
•	•	•	•	•	•	Massachusetts Turnpike Maintenance	(617) 946-3150	(617) 946-3169		
•	•	•	•	•	•	Massachusetts Turnpike, Troop E	(617) 431-5050			
•	•	•	•	□	□	Massachusetts Highway Department	(617) 482-1135	(617) 357-9043		
•	•	•	•	□	□	Massachusetts State Police	(508) 820-2121	(508) 820-2150		
•	•	•	•	□	□	Massachusetts Highway Department Emergency Management	(617) 973-7050	(617) 973-8037		
						New Hampshire DOT Maintenance	(603)485-5767	(603) 485-9825	(603) 485-3806	(603) 485-2107
						New Hampshire Turnpike Authority	(603) 485-3806	(603) 485-2107		
						New Hampshire State Police	(603) 271-3636	(603) 271-6214	(603) 271-2693	(603) 271-6084
□*	•			•		New York State DOT	(518) 457-2384	(518) 457-1780		
□*	•			•		New York State Police	(518) 457-3258			
				□*	•	Rhode Island DOT Community Affairs	(401) 277-1362 Ext. 4011	(401) 272-0303		
				□*	•	Rhode Island DOT Maintenance	(401) 277-2378	(401) 277-2693		
				□*		Rhode Island State Police	(401) 444-1000	(401) 444-1141		
•	•	•	•	•	•	TRANSCOM	(800) TRAFFIC	(201) 963-7488	(201) 963-4390	
						Vermont Agency of Transportation	(802) 828-3441	(802) 828-3983		
						Vermont State Police	(802) 244-7345			

□ Incident Agency
• Non-Incident Agency Impacted by the Incident
(blank) Non-Incident Agency Unimpacted by the Incident
* Incident Agency varies with location of incident

Figure 5-12. Contact matrix for a regional freeway alternate route plan.
(Source: New England Region I-95 Corridor Coalition)

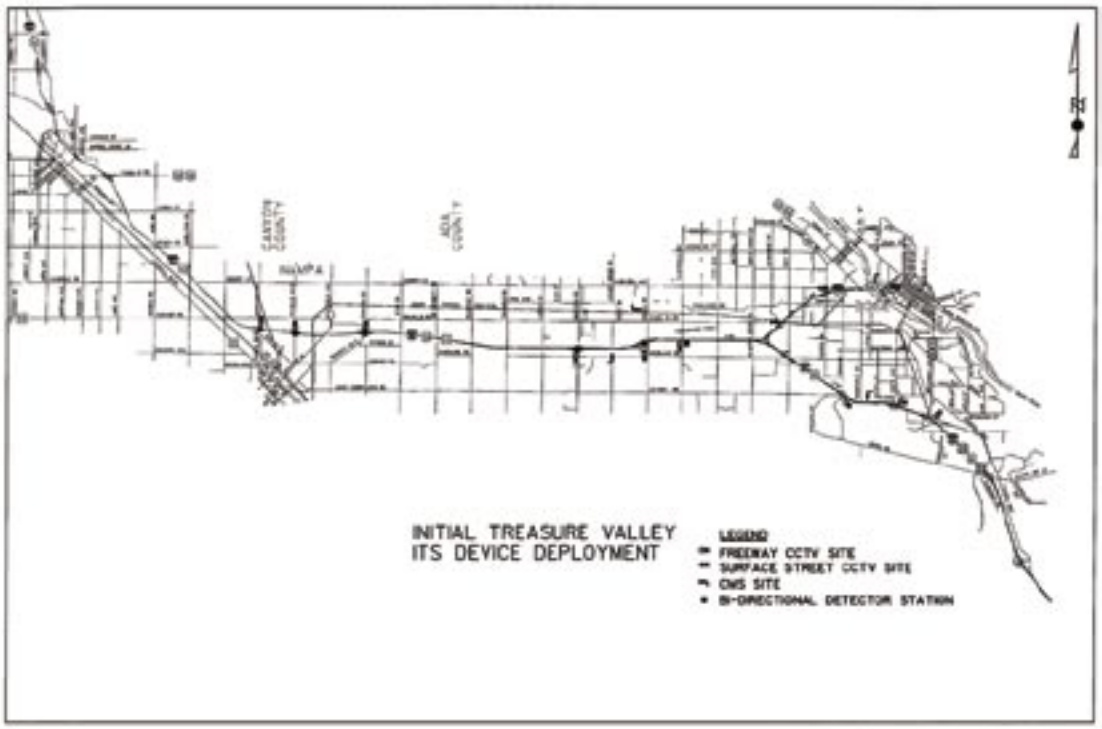

Figure 5-13. ITS equipment location map. *(Source: Idaho Transportation Department)*

Table A1. Incident Signal Timing Plans for Barbur Boulevard Between Hamilton Street and 64th Avenue

Plan No.	Incident Location		Traffic Signals Affected	Cycle Length (sec)	Intent, Assumptions, and Signal Timing Notes	When to Use Plan
	Segment	Description				
Northbound Plans						
10	NB Segment 7	North of Terwilliger Curves (North of Bertha Blvd/Terwilliger Blvd On-Ramp Gore)	Plan 10: Barbur Blvd from 60th Ave to Miles St, Capitol Hwy/Huber St Max II: Barbur Blvd/Hamilton St Free: Terwilliger Blvd/I-5 NB Off-Ramp	100	Intent • Favor NB Progression from 60th Ave to Hamilton St Assumptions • Assumes NB Bertha Blvd/Terwilliger Blvd On-Ramps are closed • Traffic will get back to I-5 via Naito Pkwy Signal Timing Notes • Designate I-5 NB Off-Ramp (phase 4) at 60th Ave as the coordinated phase	Peak or Off-Peak Period Full NB Closure Two-Lane NB Closure
11	NB Segment 6	Terwilliger Curves (Between Terwilliger Blvd Off-Ramp and Bertha Blvd/Terwilliger Blvd On-Ramp Gore)	Plan 11: Barbur Blvd from 60th Ave to Miles St, Capitol Hwy/Huber St, Terwilliger Blvd/I-5 NB Off-Ramp Max II: Barbur Blvd/Hamilton St	100	Intent • Favor NB Progression from 60th Ave to Hamilton St Assumptions • Assumes NB Bertha Blvd/Terwilliger Blvd On-Ramps are open • Assumes NB Capitol Hwy/Huber St On-Ramp is closed • Traffic will get back to I-5 via Bertha Blvd On-Ramp and Naito Pkwy Signal Timing Notes • Designate I-5 NB Off-Ramp (phase 4) at 60th Ave as the coordinated phase • Designate EB thru and left (phase 4) at I-5 NB Off-Ramp/Terwilliger Blvd as the coordinated phase • Decrease NB thru (phase 4) at Barbur Blvd/Terwilliger Blvd as the coordinated phase for NB right turns onto Barbur Blvd	Peak or Off-Peak Period Full NB Closure Two-Lane NB Closure
12	NB Segments 4, 5 and 6	Between 60th Ave and South of Terwilliger Curves	Plan 10: Barbur Blvd from 60th Ave to Miles St, Capitol Hwy/Huber St Max II: Barbur Blvd/Hamilton St Free: Terwilliger Blvd/I-5 NB Off-Ramp	100	Intent • Favor NB Progression from 60th Ave to Hamilton St Assumptions • Assumes NB Bertha Blvd/Terwilliger Blvd On-Ramps are open and NB Capitol Hwy On-Ramp is open Signal Timing Notes • Designate I-5 NB Off-Ramp (phase 4) at 60th Ave as the coordinated phase	Peak Period Full NB Closure Two-Lane NB Closure
13	NB Segments 4, 5 and 6	Between 60th Ave and South of Terwilliger Curves	Plan 10: Barbur Blvd from 60th Ave to Miles St, Capitol Hwy/Huber St Max II: Barbur Blvd/Hamilton St Free: Terwilliger Blvd/I-5 NB Off-Ramp	140	Intent • Favor NB Progression from 60th Ave to Hamilton St Assumptions • Assumes NB Bertha Blvd/Terwilliger Blvd On-Ramps are open and NB Capitol Hwy On-Ramp is open Signal Timing Notes • Designate I-5 NB Off-Ramp (phase 4) at 60th Ave as the coordinated phase	Off-Peak Period Full NB Closure Two-Lane NB Closure

Figure 5-14. Alternate route traffic signal timing plan. *(Source: Oregon DOT)*

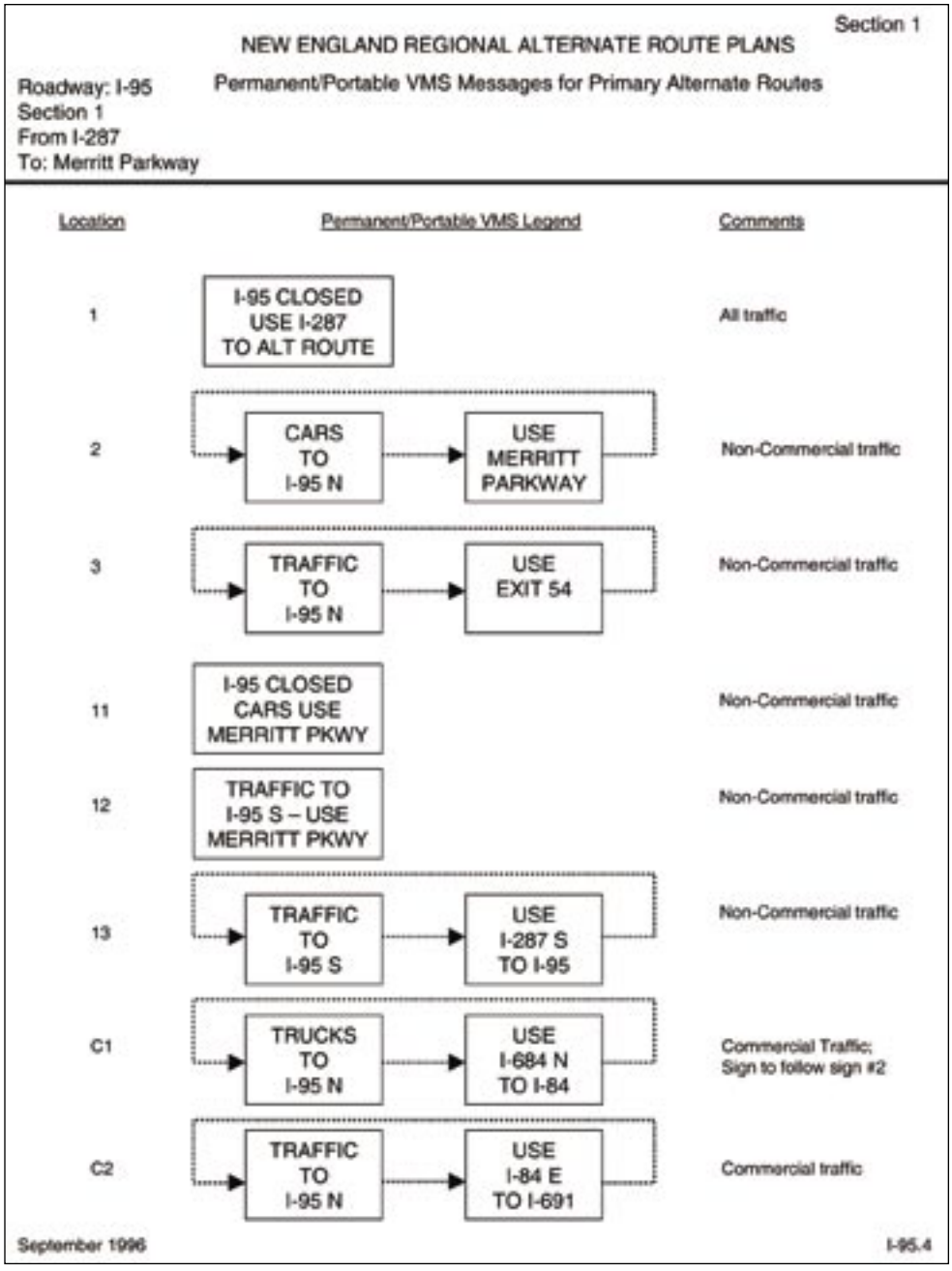

Figure 5-15. CMS message plan. *(Source: New England Region I-95 Corridor Coalition)*

Minimum Actions for Implementing Alternate Route Plans

The task of implementing alternate route plans involves the following minimum action: *set guidelines for deciding when to implement an alternate route plan*. Consider factors such as number of lanes closed, anticipated incident duration, observed traffic conditions, and the time of day/day of week. Associated considerations include:

- The major factors that most agencies consider include:
  - Incident duration

- Number of lanes blocked
- Observed traffic conditions
- Time of day
- Day of week

- The capacity of the proposed alternate route should also be a consideration when making the decision to divert traffic to the alternate route. If the alternate route has a very low capacity (yet represented the only viable alternate route during the selection phase), then it should only be used as an alternate route when absolutely necessary, such as during a long-term complete closure of the mainline (e.g., bridge collapse) or when no other alternative is available.
- The implementation of an alternate route plan requires resources that are usually provided by multiple stakeholders. Stakeholders involved in the alternate route plan implementation should provide input as to how frequently they will be able to implement the alternate route plan given potential resource constraints at certain times.

ITS HIGHWAY ADVISORY RADIO MESSAGES
1. Welcome to the S.C. Highway Advisory Radio broadcast.
2. Use alternate routes.
3. Heavy congestion ahead. Expect delays.
4. Adverse weather conditions. Drive carefully.
5. Dial *HP for emergency assistance.
6. Expect no delays.
7. Accident at exit 90 Carowinds Blvd.
8. Accident at exit 88 Gold Hill Road south bound.
9. Accident at exit 85 S.C. 160 south bound.
10. Accident at exit 83 S.C. 49 south bound.
11. Accident at exit 82-A S.C. 161 south bound.
12. Accident at exit 82-B Cherry Road south bound.
13. Accident at exit 79 Dave Lyle Blvd. south bound.
14. Accident at exit 77 U.S. 21 & S.C. 5 south bound.
15. Accident at exit 75 Porter Road south bound.
16. Accident at exit 73 S.C. 901 south bound.
17. Accident at exit 90 Carowinds Blvd.
18. Accident at exit 88 Gold Hill Road north bound.
19. Accident at exit 85 S.C. 160 north bound.
20. Accident at exit 83 S.C. 49 north bound.
21. Accident at exit 82-A S.C. 161 north bound.
22. Accident at exit 82-B Cherry Road north bound.
23. Accident at exit 79 Dave Lyle Blvd. north bound.
24. Accident at exit 77 U.S. 21 & S.C. 5 north bound.
25. Accident at exit 75 Porter Road north bound.
26. Accident at exit 73 S.C. 901 north bound.
27. South bound lane closed for construction.
28. North bound lane closed for construction.

Figure 5-16. HAR message plan. *(Source: South Carolina DOT)*

Table 5-2. Stakeholder involvement in developing alternate route plan implementation guidelines

STAKEHOLDER	ROLE
Transportation/public works agency	• As lead agency, set alternate route plan implementation guidelines.
	• Set restrictions as to when their roads may be used as alternate routes.
Law enforcement	• Provide input as to when the plan should be implemented due to potential resource constraints at certain times.
Fire department	• Provide input as to when the plan should be implemented.
Turnpike/toll authority	• Determine when the tolls may be waived.

- The selected criteria must be clearly shown on the plans to ensure that the alternate route plan is implemented only when required. It is best to avoid an overly complex set of criteria. A decision matrix should be created and included in the alternate route plan.

Section 6I of the *2003 Manual on Uniform Traffic Control Devices (MUTCD)*[1] covers incident management. It presents the following definitions for incident levels:

- Major—expected duration of more than 2 hours.
- Intermediate—expected duration of 30 minutes to 2 hours.
- Minor—expected duration under 30 minutes.

According to the 2003 MUTCD, route diversion is usually needed for major incidents, but rarely used for intermediate or minor incidents. Different agencies, however, may choose to use different guidelines. Some agencies, especially in metropolitan areas, may use route diversion for intermediate incidents, especially if it involves complete closure during rush hour.

Ideal Actions for Implementing Alternate Route Plans

In addition to setting guidelines for deciding when to implement an alternate route plan, consider the following ideal action: *set guidelines for partial implementation of an alternate route plan.* Depending upon the criteria agreed to by the participating stakeholders, a plan may be partially implemented without the need for all elements. For example, not all traffic control techniques may be needed under certain circumstances. If this is the case, such information should be included in the plan with an explanation of each level of implementation and associated decision criteria for selecting each level. For example, partial implementation may be utilized during a single-lane closure versus complete implementation during a complete closure.

Figures 5-17 and 5-18 show examples of how an alternate route plan may be implemented in various stages. Figure 5-17 shows a response plan developed for an incident of intermediate duration. Figure 5-18 shows a response plan for an incident of extended duration as a result of a full freeway closure in one or both directions.

DEVELOP GUIDELINES FOR DISCONTINUING ALTERNATE ROUTE PLAN IMPLEMENTATION

Stakeholders should establish guidelines for discontinuing alternate route implementation to ensure that traffic conditions do not significantly deteriorate on the alternate route. In addition to terminating alternate route plans when the primary route is no longer restricted, stakeholders may also terminate alternate route plans when the alternate route is not performing adequately. If the latter occurs, stakehold-

ers should implement a secondary or tertiary alternate route. Table 5-3 describes the roles of stakeholders involved in this step.

Minimum Actions for Discontinuing Alternate Route Plan Implementation

The task of discontinuing alternate route plan implementation involves the following minimum action: *determine at least one measurable criterion for deciding when to discontinue an alternate route plan, and base the decision on the available capacity on the mainline from where traffic was diverted and the operation of the alternate route.* Associated considerations include:

- The diversion of traffic to the alternate route may be phased out when capacity is again restored on the primary route. For example, if an incident initially created a full closure on a roadway and one or two lanes are subsequently opened to traffic, then the restored capacity may be adequate to accommodate mainline traffic flow. As a result, use of the alternate route could be discontinued.
- The diversion of traffic to the alternate route may be discontinued if traffic conditions on the alternate route deteriorate due to a secondary incident or excessive traffic demand that exceeds the capacity of the alternate route. In both instances, it may be necessary to implement a secondary alternate route to accommodate traffic flow from the primary route.
- Most frequently, it may be best to discontinue the alternate route only after the mainline is completely reopened. Decision criteria for discontinuing an alternate route should be established during planning to facilitate a consensus and consistent decisionmaking during each implementation.

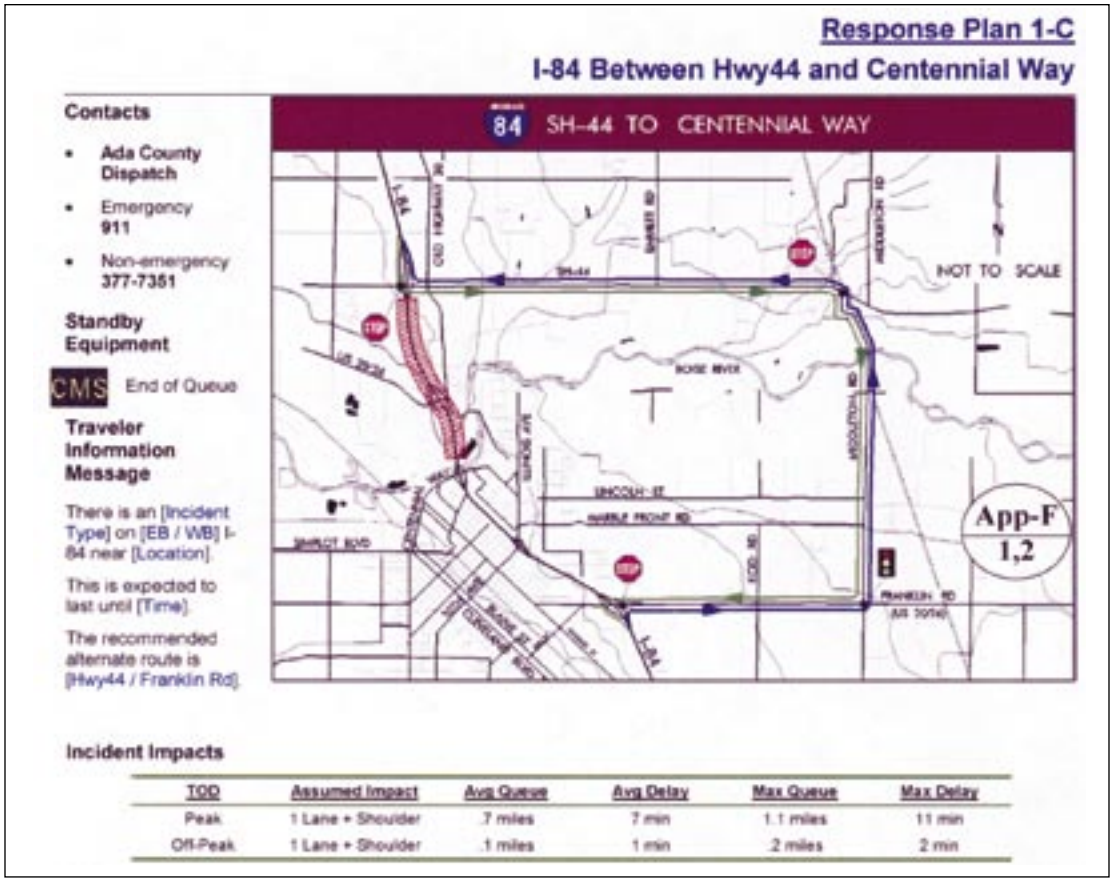

Figure 5-17. Response plan for incident of intermediate duration. *(Source: Idaho Transportation Department)*

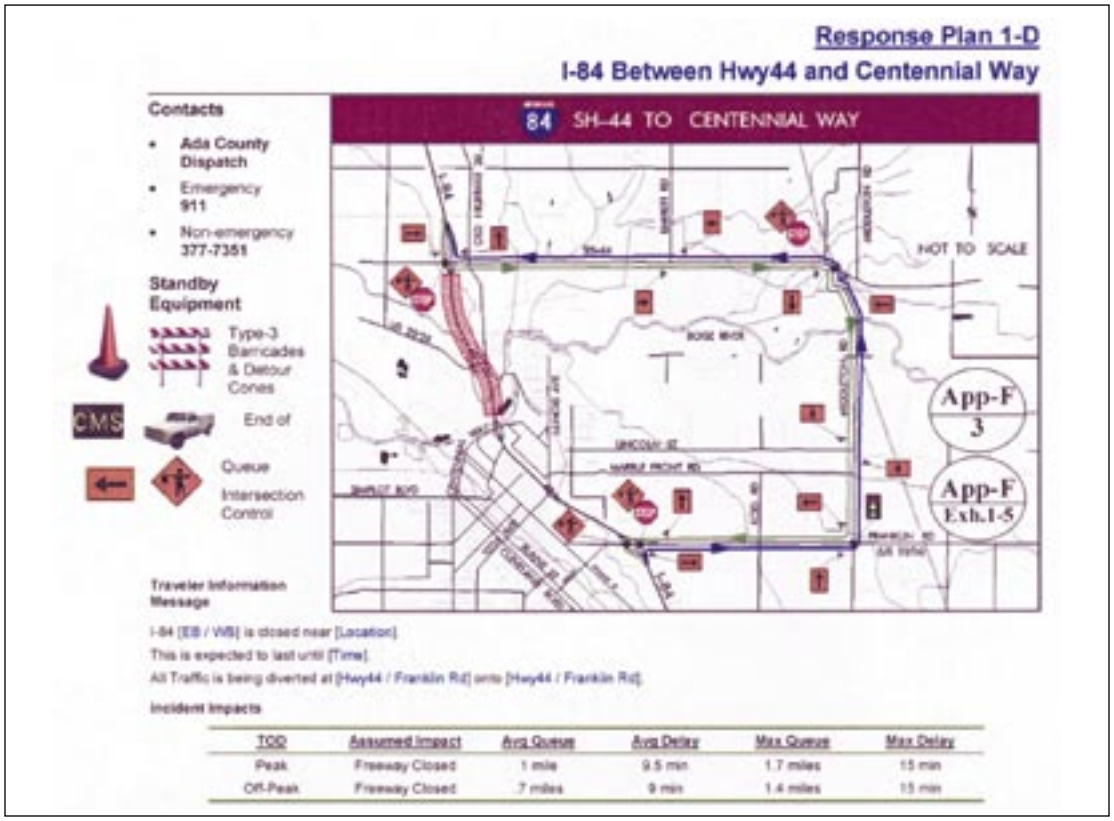

Figure 5-18. Response plan for incident of extended duration.
(Source: Idaho Transportation Department)

Ideal Actions for Discontinuing Alternate Route Plan Implementation

In addition to determining at least one criterion for discontinuing alternate route operations, consider the following ideal action: *determine detailed guidelines and scenario-based criteria for deciding when to discontinue an alternate route plan*. Associated considerations include:

- Decision criteria for discontinuing an alternate route should be clearly shown on the alternate route plans, and overly complex criteria should be avoided. In the same ways alternate route plans may be implemented at different levels, they may also be terminated in stages, and this should be noted. For example, an agency may wish to change the implementation level to a lower level when one lane is reopened, and completely terminate the plan when the entire roadway is reopened. For example, if an alternate signal timing plan is used on the alternate route, the signal timing plan may revert to the standard plan if conditions warrant, before the alternate route plan is terminated.
- Stakeholders should set a well-defined set of guidelines for terminating an alternate route plan. The alternate route plan should contain an alternate route operation evaluation plan for assessing whether to discontinue an alternate route and/or implement a secondary alternate route, based on traffic conditions on the alternate route. The primary factor in this decision may be observed travel time on the alternate route. When the travel time on the alternate route exceeds the travel time on the mainline (including remaining time needed for the incident to be cleared), the alternate route should be terminated.

Table 5-3. Stakeholder involvement for developing guidelines for discontinuing alternate route

STAKEHOLDER	ROLE
Transportation/ public works agency	• As lead agency, establish guidelines for discontinuing the implementation of alternate route plans.
	• Determine restrictions based on traffic conditions and time of day as to when the road may be used as the alternate route.
	• Terminate the alternate route plan when these conditions are no longer met.
Law enforcement	• Provide input as to how long the plan can be implemented based on specific traffic conditions or resource constraints that may arise.
Fire department	• Provide input on the determination of pertinent decision criteria.
Transit agency	• Determine when transit vehicles will cease using the alternate route.
Turnpike/toll authority	• Determine restrictions as to when the tolls may be waived.
	• Terminate the alternate route plan when tolls can no longer be waived.

- The plan should state which stakeholders (or Incident Commander) have the authority to make the decision to discontinue use of the alternate route, and under what circumstances, defined by decision criteria, they may make this decision.

REFERENCES

1. *Manual on Uniform Traffic Control Devices*, 2003 edition, Federal Highway Administration, Washington, DC, 2003 [Online]. Available: http://mutcd.fhwa.dot.gov/kno-2003.htm [December 31, 2003].

Figure 6-1. Color-coded alternate route trailblazer sign.

INTRODUCTION

The third phase in the alternate route planning process is traffic management planning. Three tasks associated with traffic management planning include:

- Determine information dissemination methods to notify motorists of the alternate route.
- Determine information dissemination methods to guide motorists along alternate route.
- Determine traffic control measures to be implemented on alternate route.

DETERMINE INFORMATION DISSEMINATION METHODS TO NOTIFY MOTORISTS OF THE ALTERNATE ROUTE

Motorists must be notified when a major incident occurs, and be provided information on available alternate routes a sufficient distance upstream of the diversion point. Although agencies establish different guidelines regarding what information should be disseminated, the three types of information to be disseminated include (1) a mandatory diversion message, (2) a voluntary diversion message, or (3) information on traffic conditions only, leaving motorists to determine whether to divert from the primary route to an alternate route.

An example of a mandatory message is "Major delays ahead, divert to alternate route." An example of a voluntary message is "Major delays ahead, minor delays on alternate route." The dissemination of a mandatory message when conditions on the alternate route have significantly deteriorated affects the credibility of future CMS announcements. Figure 6-2 shows examples of mandatory and voluntary messages. A traffic condition information method often indicates the number of lanes blocked by a traffic incident in order for motorists to gain a sense of the severity of the situation.

Three common sources of disseminating traveler information are CMSs, HAR, and media sources.

Figure 6-2. Mandatory and voluntary alternate route signage

- Changeable message signs are electronic signs located above or alongside the roadway, which allow multiple messages to be displayed to motorists. CMSs can be either permanent or portable. Portable CMSs are especially useful for traffic management during alternate route implementation. The *FHWA Portable Changeable Message Sign Handbook*[1] discusses guidelines for the use of portable CMSs under incident conditions. CMSs provide information to all passing motorists at a precise location. Figure 6-3 shows an example of using a CMS to notify passing motorists of a downstream freeway closure.
- Highway advisory radio represents another commonly used method for disseminating en-route information to motorists. HAR is useful for providing area-wide messages, rather than just at a single point. HAR messages can be more detailed than CMS messages. Both permanent and portable HAR are available.
- Other methods that are used, especially in areas where CMSs and HAR have not been implemented and portable devices are not available, include (1) positioning a traffic control officer at a diversion point in order to direct traffic to/from an alternate route,

Figure 6-3. CMS informing drivers of a freeway closure

Table 6-1. Methods of information dissemination

METHOD	PURPOSE	EXAMPLES
En-route – roadside	• Provide information at a specific location. • Provide information visible to all passing motorists, but only at a single point.	• Traffic control officer • CMSs, both portable and permanent • Temporary signing (multiple signs can cover multiple points and can also collectively serve as trailblazers)
En-route – in-vehicle	• Requires access using a device in the vehicle. • Provide information throughout a regional area, rather than just a single point.	• Telephone information system (511) via cell phone connection • HAR, both portable and permanent • Media sources (radio)
Pre-trip	• Provides useful information for pre-trip planning. • Provides information generally not available while driving. • May involve making the decision to take another route, postpone the trip, cancel the trip, modify the destination, or take another mode of transportation.	• Media sources (radio and television) • Traffic advisory services • Internet • Telephone information system (511)

(2) deployment of temporary static signs, and (3) media sources, such as television and radio, that can be used to provide both pre-trip and en-route traveler information.

Two general methods of information dissemination include en-route and pre-trip. Table 6-1 provides examples of each category.

In addition to en-route traveler information, it is also useful to provide motorists with pre-trip information on regional traffic conditions and alternate routes. In turn, this information influences the utility associated with choosing to travel via a particular mode and/or at a given time. Many agencies provide press releases to local broadcast media in real-time that describe new or ongoing road closures or restrictions and the alternate routes that are available. Radio and television traffic reports, as well as telephone information systems, also provide up-to-date traveler information. The radio represents a valuable source for traffic information, since it may be accessed either pre-trip or en-route.

In recent years, as Internet use has grown dramatically, many agencies provide Web sites with real-time traffic information. Public agency Web sites may include up-to-the-minute information on traffic conditions, incident characteristics, and recommended alternate routes.

Telephone information systems (e.g., 511) represent another information source that may be used for either pre-trip or en-route information. Information on the application and configuration of 511 for incident conditions is available in *511: America's Travel Information Number: Implementation and Operational Guidelines for 511 Services*.[2] The document includes guidelines and procedures for disseminating information on traffic conditions, public transit operations, and weather, and is applicable to both metropolitan areas and urban/rural areas.

Table 6-2 describes the role of stakeholders involved in disseminating traveler information.

Table 6-2. Stakeholder involvement for determining information dissemination methods for notifying motorists of an alternate route

STAKEHOLDER	ROLE
Transportation/public works agency	• Determine information dissemination method to use on roads under its control. • Generates traveler information messages and press releases.
Law enforcement	• Facilitate diverting traffic to an alternate route.
Transit agency	• Disseminate information to transit operators and passengers. • Develop an expanded schedule to accommodate the additional demand. • Disseminate information on the expended schedule to travelers.
Turnpike/toll authority	• Determine information dissemination methods to use to divert from a toll road. • Generate traveler information messages for display on toll road information devices.

Minimum Actions for Determining Information Dissemination Methods to Notify Motorists of the Alternate Route

Minimum actions for determining information dissemination methods to notify motorists of the alternate route include:

- *Use traffic control officers and temporary signage on the primary route to notify motorists that the road is closed and that an alternate route exists.* Associated considerations include:
  - In areas where little or no ITS infrastructure is in place or for short-term deployment, law enforcement officers may be used as the primary method of notifying motorists of the existence of an alternate route. Traffic control officers play a significant role in maximizing operating efficiency at primary route/alternate route connection points. By using positive traffic control, as illustrated in figure 6-4, officers guide motorists from the primary route to the alternate route. This minimizes headway between vehicles and reduces the potential for stop-and-go traffic due to driver confusion. Also, the active presence of the traffic control officer commands motorists' attention.
  - If an agency has portable signs (either portable static signs or portable CMSs), then the devices should be deployed in order to notify upstream motorists that the road is closed and the motorists must divert to a designated alternate route. Incident response teams should carry temporary portable signs in their trucks to be deployed in case an incident warrants.
  - The locations where temporary portable signs are to be deployed should be detailed in the alternate route plan.
- *Use existing information dissemination sources (such as CMSs, HAR, 511, media, and the Internet) to provide traffic information where appropriate.* Associated considerations include:
  - Information devices and other sources used in the day-to-day management of transportation system operations should be used to notify motorists of an incident and any designated alternate routes.
  - If portable CMSs are used, then consult the FHWA *Portable Changeable Message Sign Handbook*, which contains guidelines on the use of portable CMSs in incident conditions.[1]

Figure 6-4. Law enforcement diverting traffic.

- If permanent CMSs are used, then consult the FHWA *Guidelines for Changeable Message Sign Messages.*[3] The document contains guidelines for the development of CMS messages that support alternate route deployment. Stakeholders who plan to develop special CMS message sets for inclusion in an alternate route plan should consult this document.

Ideal Actions for Determining Information Dissemination Methods to Notify Motorists of the Alternate Route

The following ideal actions may be applied in addition to the minimum actions:

- *Use alternative information dissemination methods (e.g., en-route and pre-trip) to notify motorists of the alternate route in order to reach everyone affected.* If law enforcement provides information dissemination, then the law enforcement agency must understand and agree to their responsibilities and have adequate personnel to perform their tasks.
- *If an alternate route is implemented for a long-term period, then consider disseminating information to encourage travelers to (1) switch to public transit as an alternative to driving, (2) modify their trip time or destination, or (3) carpool.* A major incident, such as a bridge collapse, may require the use of a long-term alternate route plan. During this time, travelers should be encouraged to carpool or use alternative forms of transportation, if available and sensible, that reduce traffic volume in the corridor served by the alternate route. The media may be used to disseminate traffic demand management initiatives to a large audience.

DETERMINE INFORMATION DISSEMINATION METHODS TO GUIDE MOTORISTS ALONG THE ALTERNATE ROUTE

After diverting to an alternate route, motorists must be provided with adequate information in order to navigate the alternate route to the point where the alternate route connects to the primary route.

Typically, trailblazer signs guide motorists along the alternate route and back to the primary route, connecting at some point downstream of the incident site. Examples of types of signs and trailblazers include:

- Permanent trailblazers erected along an alternate route that is frequently used.

- Blank-out trailblazers or route marker signs with electronic changeable arrows.
- Permanently mounted flip signs (facing opposing traffic when not in use, flipped by traffic control officers to face traffic when in use).
- Fold-out signs.
- Color-coded trailblazers (i.e., "blue route").
- Permanent or portable CMSs.

Table 6-3 describes the role of stakeholders involved in disseminating traveler information.

Minimum Actions for Determining Information Dissemination Methods to Guide Motorists Along the Alternate Route

The task of determining information dissemination methods to guide motorists along the alternate route involves the following minimum actions: *(1) deploy temporary trailblazer signs along the alternate route to guide motorists along the route, (2) specify the location of these signs in the alternate route plan, and (3) remove these signs upon discontinuing use of the alternate route.* In areas with little or no ITS infrastructure, temporary static signs represent the main type of trailblazer sign used during alternate route implementation. In these areas, permanent trailblazers may be installed along planned alternate routes implemented on a frequent basis. If the trailblazers are used only when an incident occurs on the primary route, then the trailblazers should have the term "Detour" clearly labeled on each sign.

Ideal Actions for Determining Information Dissemination Methods to Guide Motorists Along the Alternate Route

The following ideal actions may be applied in addition to the minimum actions:

- *Install permanent infrastructure (such as route marker signs with electronic changeable arrows or blank-out trailblazer signs) to guide motorists along designated alternate routes.* Figures 6-5, 6-6, and 6-7 show examples of various types of signage along alternate routes. If two alternate routes overlap, then color-coded permanent trailblazers should be erected (see figure 6-8) to minimize confusion.
- *Use temporary signs configured with a black legend on fluorescent pink background, as optionally assigned by the 2003 Manual on Uniform Traffic Control Devices (MUTCD)[4] for traffic incident management area signs.* Because the general public is not yet well aware of traffic control signs with a black legend on fluorescent pink background, as shown in figure 6-9, education and outreach are needed to inform the public about the meaning of these traffic incident management area signs.

Table 6-3. Stakeholder involvement in determining information dissemination methods to guide motorists along alternate route

STAKEHOLDER	ROLE
Transportation/public works agency	• Determine information dissemination method to use along their roads. • Generate traveler information messages.
Law enforcement	• Station officers at specific decision points. • Direct traffic along the alternate route.
Turnpike/toll authority	• Determine information dissemination method to use to guide motorists along the toll route. • Generate traveler information messages for display on toll road information devices.

Figure 6-5. Trailblazers with changeable arrow. *(Source: Wisconsin DOT)*

Figure 6-6. Fold-out sign. *(Source: Dayton, OH, Police Department)*

DETERMINE TRAFFIC CONTROL MEASURES TO BE IMPLEMENTED ON THE ALTERNATE ROUTE

Agencies may implement specific traffic control measures along the alternate route to accommodate increased traffic demand during the implementation of an alternate route.

Typical traffic control techniques used on alternate routes to accommodate increased demand include:

- Law enforcement control.
- Modified traffic signal timings to provide additional green time to the alternate route.
- Ramp metering override to prevent long queues.
- Suspension of tolls.
- Suspension of HOV restrictions.
- Suspension of roadwork activities along the alternate route.
- Enforcement of parking restrictions along the alternate route.
- Alternative lane operations.

A basic form of traffic control involves having a law enforcement officer directing traffic. The officer controls traffic based on real-time roadway conditions. This is especially useful at signalized intersections where signal timing plans cannot be implemented in real-time to accommodate the additional diverted traffic. In addition, traffic control officers can facilitate protected alternate route turning movements (e.g., left turns) at intersections that otherwise function as low-capacity permitted turns.

One of the most effective and unintrusive methods of traffic control is modifying traffic signal timing plans. Most traffic signal controllers allow multiple programs to be set, and in some cases, timing may be set remotely from a transportation management center (TMC).

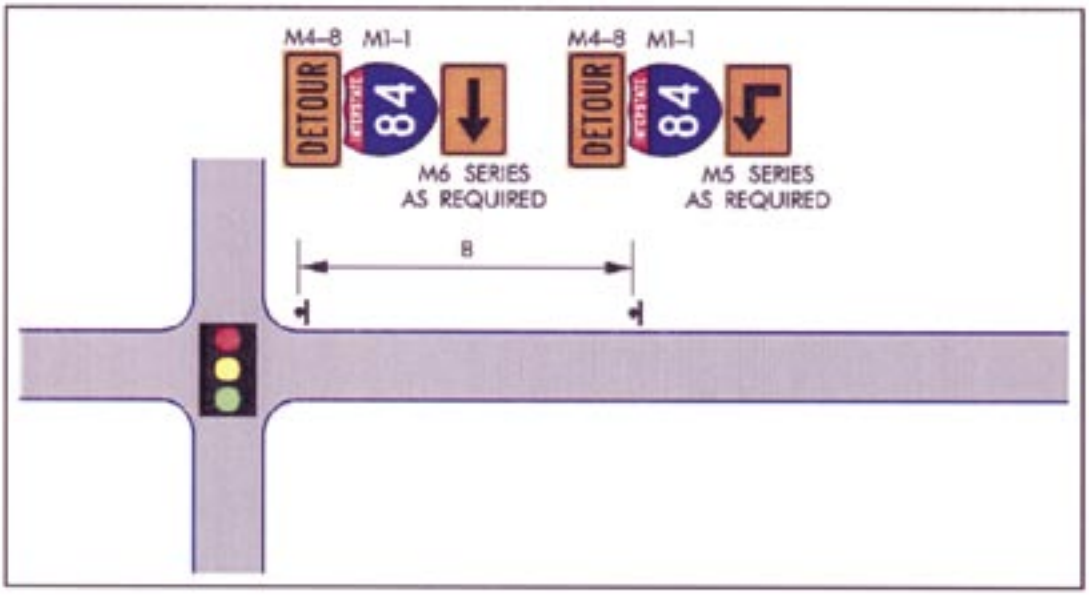

Figure 6-7. Trailblazer signage at signalized intersection along alternate route.
(Source: Idaho Transportation Department)

Stakeholders may create a special alternate route signal timing plan in conjunction with alternate route plan development. Most traffic signal controllers also allow an operator to override the normal program manually, and if the controller is linked to a central system, then manual control can occur from a remote location.

Figure 6-8. Color-coded alternate route trailblazer signs.

When large numbers of diverted vehicles attempt to merge onto a freeway, regular ramp meter timing may create long queues, which may spill back onto local streets. Most ramp metering controllers allow either queue override or queue adjustment to flush the queue and allow vehicles to enter the freeway. Queue override temporarily suspends ramp metering, while queue adjustment temporarily increases the metering rate to allow more vehicles to enter.

Toll plazas require motorists to stop to pay a toll and, in turn, may represent a major bottleneck location under heavy traffic demand conditions. This is less of a problem with electronic toll collection (ETC); however, many motorists do not have ETC tags. To alleviate this bottleneck, the toll agency may choose to waive tolls along an alternate route so that the toll plaza does not constrain traffic and cause congestion.

Freeways may have an HOV lane, while streets may have a bus-only lane. HOV lanes are typically open only to buses or cars with two or more occupants. It may be useful to suspend HOV or bus restrictions along an

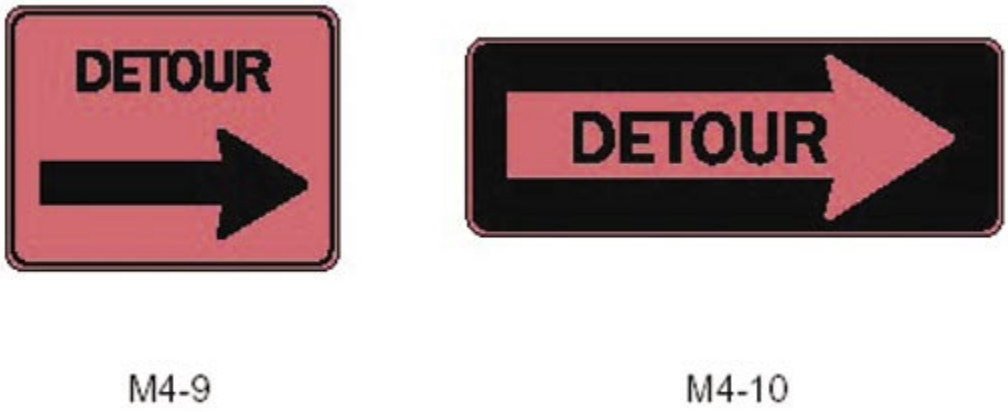

Figure 6-9. Incident management traffic control signs. *(Source: Federal Highway Administration[4])*

alternate route so that the additional capacity can accommodate additional traffic volume.

There are also a few simple initiatives that may be used to improve capacity along an alternate route. If any roadwork activities exist along the alternate route, then the work should be suspended, if possible, to minimize the loss in capacity due to this activity. If parking restrictions exist along an alternate route, then law enforcement should strictly enforce these parking restrictions.

Some roadways may have reversible lanes, to allow extra lanes in the peak travel direction. Alternative lane configurations may be used on these roads to allow extra lanes in the direction of the alternate route.

Table 6-4 describes the role of stakeholders involved in developing traffic control initiatives to increase the traffic handling capacity of an alternate route.

Minimum Actions for Determining Traffic Control Measures to be Implemented on the Alternate Route

Minimum actions for determining traffic control measures to be implemented on the alternate route include:

- *If congested conditions develop at signalized intersections, then manually override signal control or modify the existing traffic signal timing plan.* Associated considerations include:
  - Because the alternate route will carry more traffic than usual, congestion may develop at major intersections. Traffic signal timing at these intersections should be modified to favor traffic on the alternate route, if possible, while

Table 6-4. Stakeholder involvement in determining traffic control measures to implement on alternate route

STAKEHOLDER	ROLE
Transportation/public works agency	• Develop and implement the traffic control plan for alternate routes under its jurisdiction. • Evaluate the effectiveness of the traffic control plan during implementation.
Law enforcement	• Provide point traffic control along an alternate route during implementation.
Transit agency	• Provide input on what traffic control measures are necessary to facilitate improved transit operation during alternate route implementation.
Turnpike/toll authority	• Develop and implement the traffic control plan. • Decide whether to suspend tolls when the tollway is used as an alternate route and when traffic is being diverted from the tollway.

maintaining good coordination on the alternate route with adjacent signals.

- Traffic control officers may be required to direct traffic at a critical bottleneck point. Figure 6-10 shows an example of signage used when a flagger directs traffic along an alternate route. Figure 6-11 illustrates an example of a route narrative, describing the type of traffic control needed at key intersections along an alternate route during its implementation.
- Agencies may consider adding button-activated traffic signals along alternate routes to allow law enforcement personnel to control the traffic signal.

- *Suspend roadway activities, if possible, along the alternate route to minimize the loss in capacity.* Roadwork activities significantly reduce capacity on a roadway, due to closed or narrowed lanes, side friction, and capacity used by construction vehicles and personnel. If possible, any roadwork activity along the alternate route should be suspended to minimize any loss in capacity.
- *Enforce parking restrictions along the alternate route.* Parking may significantly reduce capacity on a street, due to the space taken by parked vehicles, side friction, and parking maneuvers. If any parking restrictions exist along an alternate route, law enforcement should strictly enforce these restrictions, including immediate towing of vehicles in violation, when the alternate route plan is implemented.
- *Control ramp operations at alternate route connection points with a freeway facility.* Regarding a freeway-to-freeway or a freeway-to-street alternate route, potential bottleneck points are often freeway exit and entrance ramps or a street segment connecting two freeways. If congested conditions develop at these bottlenecks, then law enforcement may control the ramps or streets to ensure efficient operation (e.g., minimize vehicle headways, provide additional ramp lanes, eliminate weaving areas).

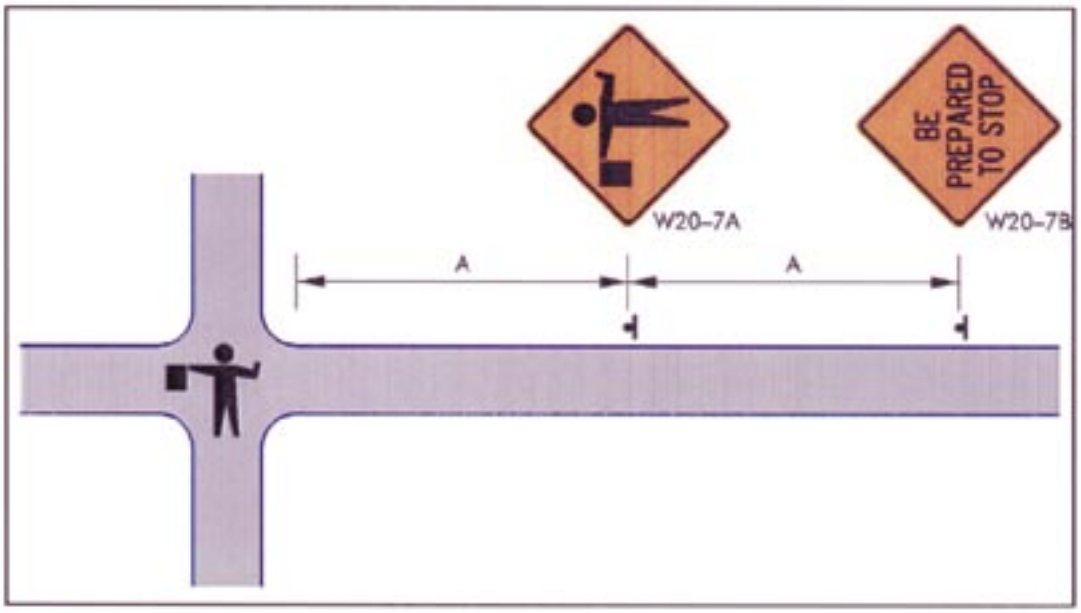

Figure 6-10. Standard signing plan for flagger-controlled intersection.
(Source: Idaho Transportation Department)

Attachment A
I-5 Detour Route Narrative - Southbound

Detour Number: 1	I-5 closure between exits 59 and 57	Map Plate # 1, 2 and 3

- Exit at 68.
- Turn right onto Avery Rd. W. and proceed westbound to Hwy 603.
- Turn left onto Hwy 603 and proceed southbound to Winlock.
- Continue through Winlock onto the Winlock Vader Hwy proceeding southbound to SR 506.
- Turn left on SR 506 proceeding eastbound through Vader.
- Turn right on West Side Hwy and continue southbound to the next on-ramp in Cowlitz County.

No.	Location	Sign	Portable Sign	Manual Traffic Control	*Agency	Notes
1S21	• I-5 (Exit 68) and Avery Rd. W.	_X_	____	___X__	State	Need to contact Cowlitz County on this part of plan where traffic is detoured south out of Lewis County on West Side Hwy into Cowlitz County.
1S22	• Avery Rd W and N Military	____	__X___	___X__	County	
1S23	• Avery Rd W and Hwy 603	____	__X___	___X*_	County	
2S24	• Kerron Ave. and SR 505	____	__X___	___X*_	Winlock	
1S25	• Milepost #3-Winlock-Vader Rd	____	__X___	_____	County	WSP/Winlock may elect to route vehicle traffic out SR 505 to Exit 63 and truck traffic down Winlock Vader Rd. and out SR 506 to Exit 59.
1S26	• Winlock Vader and SR 505	_X_	_____	___X__	State	
1S27	• SR 506 and West Side Hwy	_X_	_____	_____	State	Make secondary notifications. See Attachment B.
____	_____	____	_____	_____	_____	Railroad crossings at: Avery and Hwy 603, Kerron Ave. and SR 505, and SR 506 in Vader.
____	_____	____	_____	_____	_____	
____	_____	____	_____	_____	_____	
____	_____	____	_____	_____	_____	
____	_____	____	_____	_____	_____	
____	_____	____	_____	_____	_____	
____	_____	____	_____	_____	_____	
____	_____	____	_____	_____	_____	

*Denotes priority Manual Traffic Control
Manual Traffic Control locations require a Portable Sign to indicate detour direction.

**Agency = Responsible Jurisdiction

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Figure 6-11. Alternate route narrative. *(Source: Washington State DOT)*

Ideal Actions for Determining Traffic Control Measures to be Implemented on the Alternate Route

The following ideal actions may be applied in addition to the minimum actions.

- *If congested conditions develop at signalized intersections consisting of a computer-based traffic signal control system, then implement special traffic signal timing plans from the traffic operations center to support field traffic control.* Associated considerations include:
  - Existing traffic signal timing plans are often unable to accommodate the increase in traffic volume caused by diverted traffic. For this reason, it may be necessary to modify traffic signal and system timing to accommodate alternate route traffic volumes. Ideally, traffic signal timing should be controlled centrally from a TMC. At some intersections, law enforcement control may be needed for monitoring and intermittent manual timing control.
  - Techniques that may be used to improve traffic flow for an individual intersection movement that services alternate route traffic include:
    - Selecting an existing signal timing plan with a longer cycle length to increase the green time given to the phase that services alternate route traffic.
    - Implementing a custom timing plan that favors the alternate route movement.
    - Deploying a contingency "flush" plan, consisting of an extra long phase or cycle, to facilitate movement through the alternate route corridor.

    - Increasing green time for the alternate route movement through manual traffic signal system operator or on-site officer/technician control.

- *Use traffic optimization tools to determine the optimal traffic signal timing plans.* The *FHWA Traffic Analysis Tools Primer*[5] provides guidance as to which types of traffic analysis tools to use for developing new traffic signal timing plans. Traffic optimization tools are used to develop optimal signal phasings and timing plans for isolated intersections, arterial streets, and signal networks.
- *If any tolls exist along the alternate route, then suspend tolls during operation of the alternate route.* Motorists can incur substantial delay at tollbooths. Although this is less of a problem with ETC, not all motorists have an ETC tag. If the traffic is being diverted from a tollway and traffic is forced to exit, delays incurred at the tollbooth may counter the alternate route time savings. In this case, it is best to suspend tolls at the exit point. Also, if traffic is diverted onto a tollway from a no-cost facility, tolls should also be suspended.
- *If the road that traffic is diverted to is an HOV facility or has an HOV lane, then temporarily suspend HOV restrictions to allow all vehicles to use the alternate route.* Associated considerations include:
    - Some roadways may have an HOV lane open only to buses and carpools. If the HOV lane is not obstructed by the incident, then HOV restrictions can be lifted so that all traffic may use it as an alternate route. An alternate route consisting of an HOV lane(s) on or adjacent to a primary route represents the most efficient alternate route operation possible, provided that the alternate route offers sufficient capacity.
    - Some roadways may have a high occupancy/toll (HOT) lane. In a HOT lane, single occupancy vehicles (SOVs) must pay a toll, while HOVs may travel at no cost. In a HOT lane, the tolls for SOVs may be suspended.
    - The lifting of HOV restrictions should be communicated through CMSs, HAR, and the media. Law enforcement personnel should be stationed at alternate route entry points to facilitate diversion.
- *Suspend or modify the timing of ramp meters to prevent excessive queues on the roadway upstream of the primary route. Many ramp metering algorithms have built-in queue adjustment or queue override functions.* When pre-timed ramp metering is used, ramp meters can cause excessive backups because they are not timed to accommodate excessive traffic demand. Many ramp metering algorithms have a built-in queue adjustment algorithm (where more cars are allowed through) or queue override (where ramp metering is suspended until the queue dissipates) that would be automatically invoked in these situations. If ramp metering controllers do not have this feature, then ramp meters should either be modified or suspended.
- *If the alternate route has lane control signals, then modify signal indications to allow extra lanes in the direction that the alternate route is being used.* Some roads have signals that control lane use, and these signals typically, under day-to-day operation, allow an extra inbound lane during the morning peak and an extra outbound lane during the afternoon peak. When an incident blocks travel lanes on a road with lane control signals, the normal lane control pattern may be adjusted to allow extra lanes in the capacity-constrained direction. Lane control signals on freeways are usually accompanied by a moveable barrier that delineates the start/end of freeway express lanes. Express lane operation in the opposite direction would require termination before the barrier is moved.

- *Evaluate the traffic control plan using computer traffic simulation.* Simulation is a powerful tool for evaluating alternate routes when field studies are not feasible. In order to ensure that the traffic control plan actually improves traffic, stakeholders should use computer traffic simulation to evaluate the effectiveness of traffic control plan strategies prior to actual implementation in the field. Stakeholders should revise the traffic control plan, as necessary, based on simulation results.

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4. *Manual on Uniform Traffic Control Devices, 2003 edition*, Federal Highway Administration, Washington, DC, 2003 [Online]. Available: http://mutcd.fhwa.dot.gov/kno-2003.htm [December 31, 2003].

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Figure 7-1. Changeable message sign message diverting traffic to an alternate route.

INTRODUCTION

When a ranking incident responder or Incident Commander decides to implement an alternate route plan, all stakeholders should follow the implementation procedures contained in the alternate route plan. The alternate route plan must clearly identify the duties of all participating personnel and provide clear instruction regarding equipment deployment and personnel activity in the field to support the implementation of the alternate route. It is expected that each stakeholder will have conducted an advance briefing or training exercise for pertinent response personnel on alternate route implementation. Such training allows personnel to become familiar with the plan and associated traffic control initiatives that, in turn, facilitate rapid implementation in the field when an alternate route is required. Table 7-1 describes the role of stakeholders that may be involved in the implementation of an alternate route plan.

IMPLEMENTATION PROCESS

Once ranking officials have made a decision to divert to an alternate route, they must choose which alternate route to implement. Usually, the primary alternate route will be implemented. However, responders may instead choose to use the secondary alternate route under certain conditions. Reasons for implementing a secondary alternate route include (1) concurrent roadwork activities along the primary alternate route that cannot be terminated, (2) concurrent incidents along the primary alternate route, (3) unusually high background traffic volume on the primary alternate route, and (4) out-of-service traffic surveillance equipment or roadside traveler information devices along the primary alternate route. In addition, the availability of traffic management resources (e.g., staff, vehicles, equipment) may influence specific alternate route selection.

Interagency communication is essential to successful alternate route plan implementation. Communication between agencies is especially important when the alternate route plan spans multiple jurisdictions. The agency responsible for making the decision to implement an alternate route should confer with all involved stakeholders in order to verify available resources and obtain information that influences implementation decision criteria.

Before traffic is diverted from the primary route, the necessary portable signs, cones, barricades, and traffic control officers should be in place per plan protocol. Simply stated, the de-

Table 7-1. Stakeholder involvement in alternate route plan implementation

STAKEHOLDER	ROLE
Transportation/ public works agency	• Assist the incident responders in the collection and distribution of traffic condition information, on both the primary route and alternate route, for the purpose of deciding whether to implement the alternate route. • Provide traffic control equipment, as necessary, to facilitate traffic control and the provision of motorist information on the alternate route. • In accordance with implementation protocol, advise the Incident Commander on whether to implement an alternate route. • Monitor traffic conditions on the alternate route if surveillance equipment exists. • Modify traffic signal timing according to prevailing traffic conditions. • Disseminate traveler information messages, via several outlets and controlled devices, to support alternate route operation. • During implementation of an alternate route, maintain contact between agencies in charge of the roadways serving as the primary route and the alternate route.
Law enforcement	• May have the authority at the scene of an incident, as Incident Commander, to implement an alternate route. • Support alternate route operation, with numerous traffic control officers serving either in a traffic monitoring and/or traffic control role, in the field.
Fire department	• May have the authority at the scene of an incident, as Incident Commander, to implement an alternate route.
Emergency management agency/Homeland Security agency	• May have the authority at the scene of an incident, as Incident Commander, to implement an alternate route.
Transit agency	• Review and adjust scheduled operations affected by the primary route closure when an alternate route is implemented. • Consider operations modifications that include full or partial use of implemented alternate routes to service transit stations.
Turnpike/toll authority	• May have many of the same implementation responsibilities that a transportation/public works agency would typically have, if traffic is being diverted from a toll road. • Implement the plan to suspend tolls, if alternate route implementation protocol specifies the suspension of tolls. • Notify travelers, media, and law enforcement about the toll suspension.
Major incident response team	• Support, through traffic control equipment deployment, alternate route implementation.
Freeway service patrol	• Support traffic control and monitoring activities on an alternate route or at primary route connection points. • Patrol congested areas for the purpose of detecting and responding to any secondary incidents that may occur.
Media	• Disseminate to motorists alternate route information and other travel information obtained from transportation and law enforcement agencies.

ployment of adequate resources is key to the safe and efficient operation of the alternate route.

TMC operators may support alternate route implementation through monitoring, traveler information dissemination, and traffic signal system control. The alternate route plan may include CMS and HAR message sets in addition to traffic signal timing plans designed for alternate route operations. If traffic management strategies cannot be implemented remotely from the TMC, then technicians should be dispatched to implement the plan. Ideally, the TMC should serve as a central base location for all communication. TMC operators should maintain continuous communication with response personnel and coordinate updates on incident management activities and alternate route operation.

Regardless of what roadside methods are chosen for information dissemination, the media should be provided with up-to-the-minute updates on the situation so that they can disseminate the appropriate information to the public. In some jurisdictions, the transportation/public works agency may notify the media of the situation (or media may be present at a TMC); in other jurisdictions, law enforcement is responsible for notifying the media.

The operation of the alternate route should be monitored both (1) remotely from the TMC, if one exists, and (2) by transportation and law enforcement personnel stationed in the field. The TMC can monitor traffic flow and queue buildups, making adjustments to certain components of the alternate route traffic management plan as necessary. Field personnel should monitor traffic conditions and modify field traffic control as necessary. Transportation personnel may drive the alternate route and check that signs, cones, and/or barricades remain correctly placed. If traffic conditions on the alternate route begin to deteriorate, it may be necessary to modify the alternate route traffic control plan, implement a secondary alternate route, or meter traffic diverting to the primary alternate route, assuming that the incident on the primary route blocks only a portion of available travel lanes. Table 7-2 contains a checklist for developing an alternate route implementation plan.

Once the incident has been cleared, and the primary route has been reopened to traffic, all stakeholders should be notified. The TMC should continue to monitor traffic on the primary route and the alternate route and note when traffic has returned to pre-incident conditions. Transportation personnel should remove portable equipment and update CMS and HAR messages. Personnel may be asked to complete an incident log and participate in a future incident debriefing to discuss successes and lessons learned.

DEBRIEFING AND EVALUATION

Evaluation represents a key element in maintaining a successful roadway incident diversion practice and facilitating improved efficiency in alternate route implementation and operation during future event occurrences. Stakeholder debriefings on specific events involving use of an alternate route mark the most common evaluation activity. However, other evaluation techniques, such as public surveys, may yield key observations not apparent to incident responders charged with operating or monitoring an alternate route. Evaluation results may include recommendations for alternate route modification, procedural improvements, resource coordination, future training, or institutional support.

Stakeholder Debriefing

Stakeholders should conduct a debriefing session within 30 days of a major event that required use of alternate routes. The meeting will likely address all activities involved in managing the incident or event. With regard to

Table 7-2. Implementation plan checklist

APPLIES ☑	ACTION
	TMC Surveillance and Control
☐	• Indicate stakeholders staffing the TMC in addition to the stakeholders involved in incident management.
☐	• Specify equipment needs and setup.
☐	• Indicate procedures for coordinating with stakeholders.
	Operations Management
☐	• Indicate scenario-based criteria for implementing alternate route plan components.
☐	• Include a series of operations details for implementing the alternate route plan.
☐	• Indicate procedure for revising the alternate route plan.
☐	• Specify contingency plans if the alternate route plan must be prematurely terminated. Indicate available secondary and tertiary plans.
☐	• State protocol for terminating the alternate route plan.
	Contact Information
☐	• Provide contact information for individual team members. - Home phone, work phone, cell phone, pager number, fax number, e-mail address, unit/radio assignment, rank, detail assignment.
	Communications
☐	• Indicate guidelines and restrictions regarding use of various radio channels or talkgroups (e.g., field-to-field communications, field-to-central communications, non-incident communications).
	Response Team Organization
☐	• Identify stakeholder duties, responsibilities (e.g., traffic control, traffic signal operation, traveler information device operation), and jurisdiction.
☐	• Specify highest ranking stakeholder representative in addition to midlevel managers.
☐	• Summarize chain of command.
	Equipment and Infrastructure Management
☐	• Specify locations and quantities of traffic control and other support equipment (e.g., portable CMSs). Indicate equipment owner and, if applicable, power source.
☐	• Include equipment operating instructions (e.g., remote HAR programming).
☐	• Indicate locations of temporary static signs and descriptions for each alternate route plan.
☐	• Specify planned traveler information message sets (e.g., CMS and HAR).
☐	• Indicate protocol and personnel charged with monitoring and programming traveler information devices.
☐	• Indicate protocol and personnel charged with implementing different traffic signal timing plans as needed.
☐	• Indicate protocol and personnel charged with monitoring traffic surveillance equipment (e.g., CCTV).

assessing alternate route implementation and operation, the debriefing discussions should include the following:

- Recreate the chronology of implementing, operating, and discontinuing the alternate route, and note key decision criteria.
- Provide positive and negative aspects of the alternate route implementation and operation.
- Recommend possible improvements.
- Discuss various suggestions, and determine necessary alternate route plan and implementation protocol revisions.
- Terminate meeting on a positive note.

When a debriefing meeting takes place to discuss and evaluate alternate route operation during a past incident or event, the use of graphic aids (e.g., maps, photos, videos) proves very useful, particularly to illustrate actual conditions, such as traffic operations and traffic control measures. At a minimum, a map outlining the incident site and the alternate route should be provided at the meeting.

An after-action report may be prepared to document the minutes of a debriefing meeting in addition to the results of any quantitative evaluation and/or operational cost analysis conducted using data collected during the operation of an alternate route.

Public Survey

The Wisconsin DOT implemented a Web survey to evaluate their Blue Route alternate route in Madison. A sign posted on the alternate route directs travelers to a Web site, where they can answer questions about the effectiveness of the alternate route. Survey question topics include the following:

- Does the responder prefer to follow the alternate route or remain on the freeway (primary route)?
- Did the responder use the Blue Route?
- Does the responder believe that he/she saved time using the Blue Route?
- Why did the responder choose to use or not use the Blue Route?
- Does the responder believe that the information provided is reliable?
- Did the responder find the Blue Route to be congested?
- Did the responder find the Blue Route to be easy to use?
- Did the responder find the Blue Route signage to be adequate?
- Does the responder believe the Blue Route alternate route signage to be confusing during non-incident conditions?
- What was the origin-destination of the respondent's trip?

Because alternate routes are intended to serve the traveling public, a Web survey of travelers who traversed an alternate route is one of the most cost-effective methods of gaining feedback on alternate route implementation.

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