

ORBP Number OR10-026



RESEARCH FINDINGS AND MANUAL

BEST PRACTICES FOR EMERGENCY REROUTING



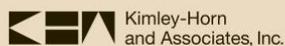
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INTRODUCTION

Michigan is a geographically diverse state with some metropolitan or urban centers and vast rural areas that attract recreational and tourist activities. Each of the State’s seven MDOT regions present unique incident management challenges as well as a broad range of impacts to traffic flow during planned and unplanned events. In an effort to provide a framework that can address these traffic flow challenges during freeway road closures the Michigan Department of Transportation (MDOT) identified the need for a manual to document a consistent statewide strategy for emergency rerouting identification for reference by all regions in Michigan. A few MDOT regions currently have emergency rerouting plans in place; however, some of the existing plans have not been reviewed or revised since they were originally developed. There are few standard processes for defining and documenting emergency alternate routes. A statewide manual would help support regions in updating or establishing a documented set of practices for maintaining emergency rerouting plans.

MDOT identified a desire to research different practices other states are using for emergency reroute planning to identify strong examples for reference. The research effort was intended to combine feedback from Michigan stakeholders with the key findings, lessons learned, and experiences from other states to create a standard, statewide practice for developing emergency reroutes. The manual is a tool summarizing recommendations that stakeholders can take forward during the development and implementation of emergency reroutes on a regional level. With the diversity of Michigan’s regions, it was recognized that a “one size fits all” approach would not be feasible; rather, regions would need to adapt emergency rerouting plans to the specific agencies, partnerships, and roadway networks within their respective regions.

It is important for the user to understand the assumptions surrounding the use of this document. The following summarizes the understanding of the intent behind the development of this manual.

The manual is intended to:

- Serve as a reference that summarizes best practices from other states
- Provide information stakeholders should consider when developing emergency reroutes
- Be a guide on how to evaluate the effectiveness of reroutes
- Present recommendations on signage for the developed routes
- Be updated periodically as technology changes, lessons learned are revealed, or other supporting information is identified as beneficial to include

The manual is not intended to:

- Describe how to handle incident management
- Provide or document specific emergency rerouting plans
- Specify when and how to implement emergency rerouting plans
- Require specific signage for all reroutes implemented
- Remain a static unchanging document



The project was completed with a three-step approach. The first step was identifying and documenting the different practices across the country for developing emergency rerouting plans. This step included three parts: a literature review, state survey, and interviews with specific states. The second step involved the feedback from Michigan stakeholders. This was collected during a series of workshops and a conference call. The workshops were half-day sessions that included break-out sessions to review operational scenarios of regional specific rerouting. The conference call was intended for stakeholders that were unable to attend the workshop, and was only an hour in length. As such, it was harder to discuss scenarios, so it was geared towards an assessment of what worked and what did not work within their region. The third step took the information heard and documented from the previous steps and consolidated it into a guidance manual. This document, or manual, was developed to serve as a tool for MDOT and stakeholders to collaborate on the development of emergency rerouting plans.

Figure 1 depicts a graphical representation of the process the project took to develop the manual.

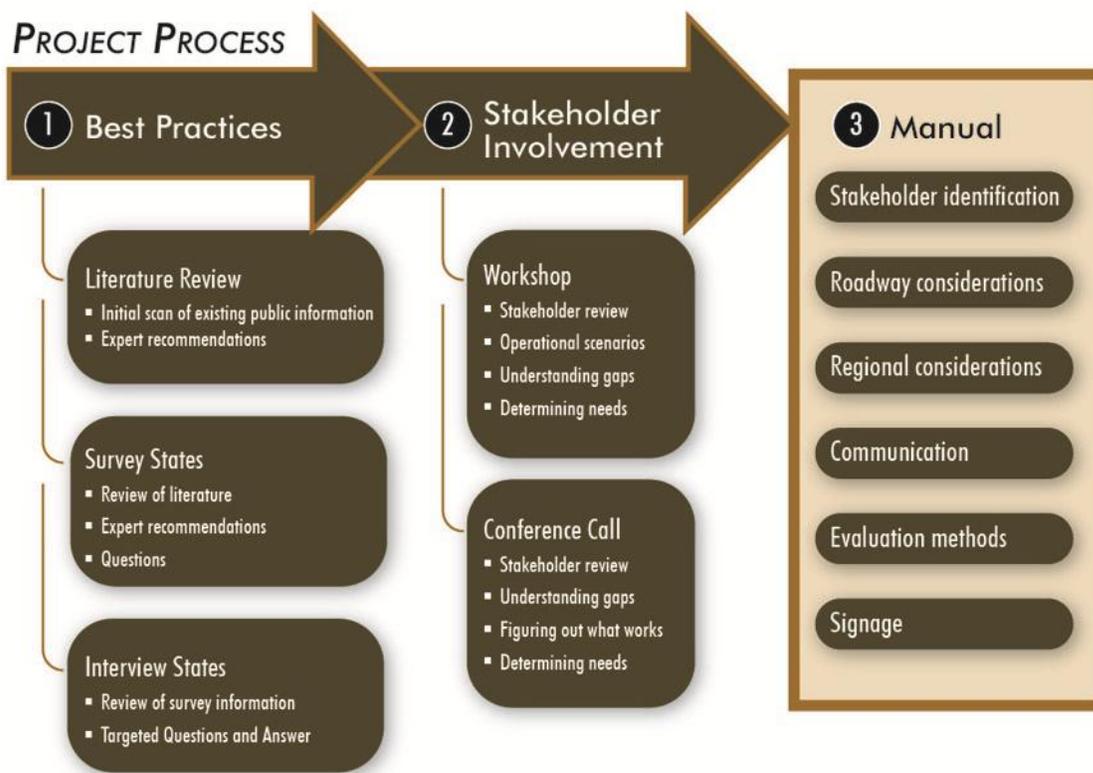


Figure 1. Project Process



RESEARCH FINDINGS

A two-pronged approach was used. First, state agency practices for emergency rerouting were researched and documented. Sources included publically-available documents as well as practices from other states. The information from other states provided perspectives on the development process of their own emergency rerouting plans as well as the application of the plan, identification of key partners involved in the process, and reported benefits. The analysis includes both the survey of programs within states and in-depth interviews with selected candidate states.

Methodology

The method of researching different state practices involved three steps: literature review, survey of states, and focused interviews with specific states that were identified to have programs that could benefit Michigan. Each step resulted with additional detail of information that was used to support the development of materials for the stakeholder workshop and later into recommendations in the manual. The steps are further laid out below and additional detailed information about each is provided in the **Appendix A** and **B**.

LITERATURE REVIEW: A literature review was performed as an initial step. This review was based solely on the publically-available information from each state. There are several states with known programs, however only a few of those states have documentation of their programs available externally. As a result, information from only seven states, shown in **Figure 2**, was researched during this step. The Literature Review memo, which provides the details of this research effort, is located in **Appendix A** (Literature Review Memorandum).

STATE SURVEY: The second step was to identify states from the literature review, as well as other states with known programs with similarities to Michigan, and complete a survey. To collect information relative to Michigan, similarities in the states and programs were identified as comparable winter weather conditions, contracted maintenance operations with counties and local agencies, or a geographic cross-section that mirrors the urban and rural mix found in Michigan. Eleven states (noted in **Figure 2**) successfully completed the survey. Questions and answers to the survey are located in **Appendix B** (State Survey Technical Memorandum).

INTERVIEW: Based on the information collected through the first two steps, specific states were identified for interviews as part of the final step. The interview questions were developed to expand on information collected to date and obtain additional details of their programs. Interview states also are shown in **Figure 2**. **Appendix B** includes the questions and summaries of the interviews. Per feedback from the RAP Team, subsequent conversations were conducted with specific states. Through these conference calls, additional detail was captured in key areas and is documented as part of **Appendix C** (Strategy Development Workshop Minutes).

Urban versus Rural

Urban areas typically experience a larger population, higher traffic volumes, and higher network density that includes frequent access to interstates.

Rural areas typically experience a lower population, lower traffic volumes, and a lower network density creating a lower number of alternate routes available to the traveler.

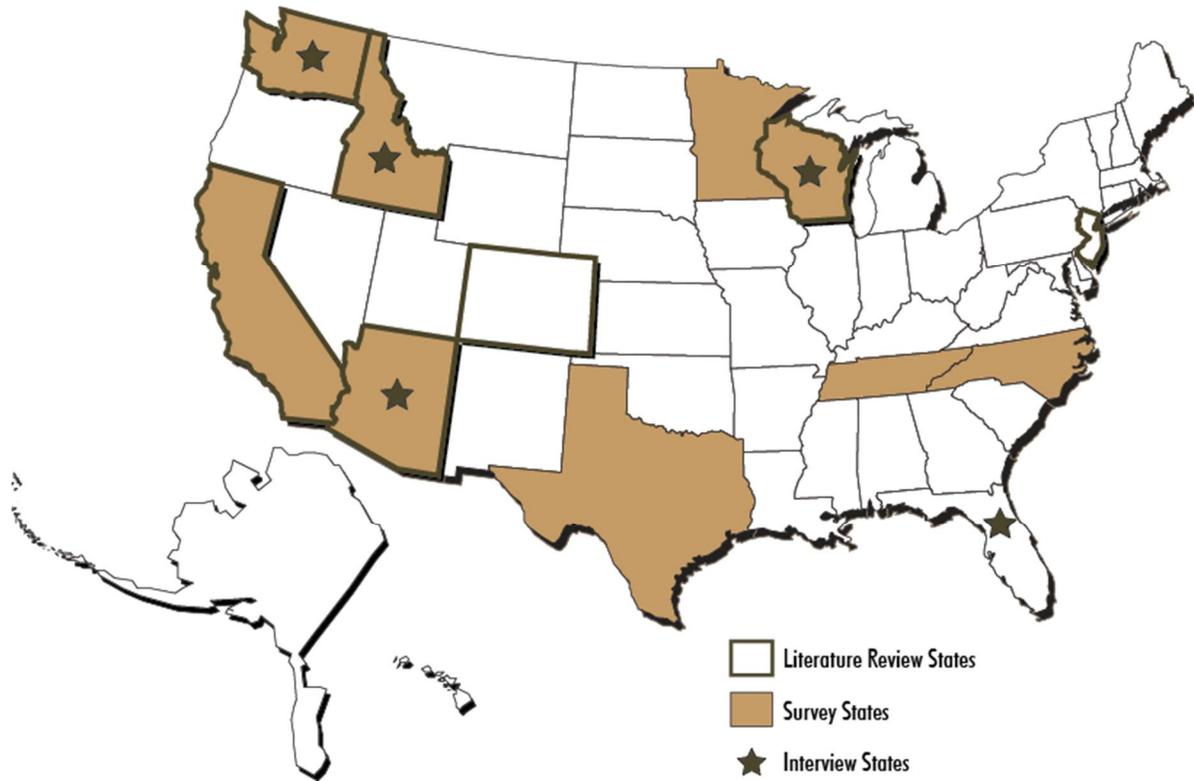


Figure 2. States Identified During the Documentation of Practices



Best Practices

The candidate states researched provided learning experiences of what should and should not be involved in the development of emergency rerouting plans. As previously stated, the results of the research efforts are presented in the Appendices, but this section provides a high level summary of the areas of commonality, divergence, and challenges documented from the subject states' programs. The need for emergency reroutes often was driven by a significant event. Agencies were able to identify the opportunity and reach out to involve partners that were affected by the event. All of the states researched understood the importance of involving local agencies with the process. The resulting partnership that was established to develop and implement the routes could vary from a multi-agency structure led by a single organization to a more evenly distributed coalition of partners. It is important that the structure of the interagency team and the meeting schedule reflect the availability of the stakeholders and the needs of the area.

The consideration of certain characteristics also was consistent across many of the states. Roadway geometry of the primary route as well as the reroute was one of the most important considerations. In addition, reroutes that pass schools, major community facilities, and at-grade rail crossings were identified as routes that should be minimized or avoided.

Most states have established a central method of maintaining or storing the rerouting data in a central repository, often at a transportation operations center (TOC) or transportation management center (TMC), 911 central dispatch center, or local DOT office. To increase the access and availability of the information, states recommended that plans be electronically based to allow for a dynamic, interactive approach for rerouting data. Hard copy plans, while helpful, are at risk of being outdated, lost, or not utilized as new partners are brought in to the process.

Stakeholder Feedback

A series of half-day workshops were convened for state, county, and local stakeholders from multiple types of agencies to discuss current practices on emergency rerouting within Michigan. They were held in Kalamazoo (Southwest and University regions), Saginaw (Bay and Metro regions), and Gaylord (North and Superior regions). The only region not accounted for was the Grand region, as they are embarking on developing emergency rerouting plans and wanted to take another approach. The turnout for each of the stakeholders was well received.

For each workshop, an initial "base-setting" briefing was given. Stakeholders were then divided into two or three break-out groups, based on the total attendance of the respective workshop. Each break-out group was provided descriptions of two hypothetical incidents to consider. Each group was allowed to explore

Areas of Commonality

- Initial development driven by significant event
- Representatives from all stakeholder agencies
- Considerations for roadway characteristics is important
- Considerations for weather impacts during reroute
- Maintenance and central storage of plans

Areas of Divergence

- Evaluation process
- Types of signage used
- Consideration around use of signage (permanent / temporary)
- Structure of interagency relationship to develop plans
- Structure of interagency team meetings (scheduled / ad hoc)

Challenges

- Format of plans
- Investment from partner agencies

Process Recommendations

- Integration of signal timing and activation of timing plans from central facility
- Electronic web based sharing of rerouting plans



the topics in a manner of their choosing, and emphasize strategies and/or challenges as appropriate. Their dynamic interactions at each of the workshops highlighted their participation with each other as well as their frustrations. Workshop minutes are located in **Appendix C**.

Transportation stakeholders outnumbered public safety agencies in a couple of locations. Therefore, a subsequent teleconference was led for those stakeholders unable to attend any of the workshops. Due to the nature of the teleconference format, the incident breakout groups were not utilized. Instead, a more general discussion of key issues identified in the workshops was facilitated.

Existing Reroutes

The number of existing reroutes defined within Michigan varies among the regions. For example, the Superior, Southwest, University, and Bay regions have developed reroutes for most of the Interstate, US, or State highways. The North region only has defined reroutes prescribed for I-75 and portions of US-131. The Metro region has developed reroutes for a portion of I-75. Lastly, the Grand Region is in the process of implementing signage of their emergency rerouting plans for Interstate and US Routes.

Concerns regarding the existing rerouting plans in Michigan...

- Consider the adequacy of the reroute – is the capacity of the route capable of handling the increase in traffic volume?
- Consider the safety and efficiency of accommodating the additional traffic volume. Most of the regions select routes in close proximity to the freeway to minimize the length and complexity of the detour, but in rural areas, this is more difficult to accomplish.
- Document the details of the reroute using either an individual highway detour plan or within a larger regional incident management plan. The plan breaks down the different types of closure considerations, the responsibility and procedures of participating agencies, and references several agreements and manuals. Several of these plans include communication phone lists along with their detour plans.
- Are not revisited during construction projects.
- Have not been updated since their first implementation

In the event of inclement weather, snow plows will plow the snow on the reroutes prior to other arterial roadways. The idea is to ensure the reroutes are accessible during an incident or if the emergency operations center is activated.

Existing Signage

Since alternate routes take users off the roadway they initially intended to travel, signage for emergency rerouting must be very clear and consistent. As such, all traffic control devices used for alternate routing need to comply with the current edition of the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). MDOT and the Michigan State Police (MSP) are responsible for developing the MMUTCD, which is based on the National MUTCD.

The MMUTCD contains information regarding the use of traffic control devices on roads open to public travel. There are eight parts to the MUTCD that cover items such as signs,

Lessons Learned

At least one state uses a color-coded system for pre-posting signs for alternate routes in areas where alternate routing is occasionally needed. DMS are used to notify road users of the appropriate color route to use during events requiring rerouting. This option could be considered in areas where the need for rerouting is predictable and pre-defined routes can be identified.



pavement markings, traffic signals, temporary traffic control, school areas, railroad and light rail transit grade crossings, and bicycles. While all of the parts are applicable, Part 6 – Temporary Traffic Control contains pertinent information related to controlling traffic through various types of temporary conditions. Activities in these areas include the use of traffic regulators and temporary traffic control devices (such as signs, arrow boards, channelizing devices, cones, and drums) as well as controlling traffic through incident management areas.

Sign color, shape, and size are all discussed in the MMUTCD. In general, signs used for temporary traffic control have an orange (or fluorescent orange) background with a black legend. Signs can be post-mounted or roll-up signs mounted on temporary stands. Fluorescent pink recently was added as an optional background color that may be used for warning and guide signs for temporary traffic control in traffic incident management situations. **Figure 3** presents examples of incident management signs from the MUTCD that could be used with the fluorescent pink sheeting.

Currently, per feedback from multiple representatives, vendor manufacturers of fluorescent pink sheeting are not producing signs for permanent installations; but are making it available for use on roll-up signs. **As a result, consideration should be given to using the fluorescent pink signs only for short-term emergency rerouting situations based on the MMUTCD.**

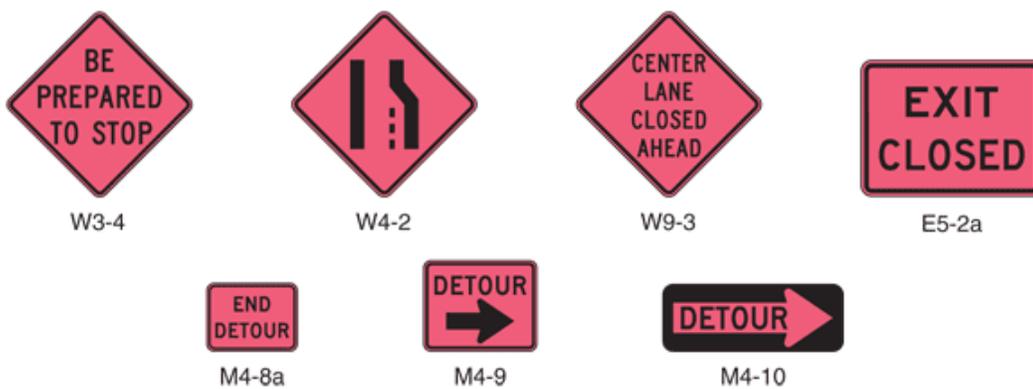


Figure 3. MUTCD Incident Management Example Signs



Signage varies both by region and available technology. Most of the interstates in the Southwest and Grand regions have permanently signed designated reroutes. **Figure 4** displays current MDOT emergency rerouting signs in place in the Grand Region. Superior and University have installed permanent signing on a small number of their emergency reroutes. The North, Bay and Metro reroutes are not signed. Within the Metro region and urbanized areas of the Bay region, there are several alternatives available to travelers during an incident, so the need for signage typically is evaluated on a case-by-case basis. Some regions have permanent dynamic message signs (DMS) while some counties have portable changeable message boards (PCMB) that can be used during an incident to inform the public. This research effort is intended to provide a consistent approach for when permanent signing should be installed on an emergency reroute.



Figure 4. MDOT Grand Region Emergency Rerouting Signs

Many stakeholders felt that local motorists generally are aware of the best possible reroutes. If motorists are unfamiliar with the area, they are likely to use portable navigation systems to identify alternate routes; however according to recent research per the Quick Clearance project, most people within Michigan do not own a portable system. Several of the stakeholders asserted that signing would crowd the roadway and confuse the non-local motorist rather than provide valuable information. Overall, stakeholders felt as though the decision of *whether* and *how* to sign reroutes should remain a case-by-case decision and will be dependent on the characteristics of the specific location where the reroute is planned. A page from the sign design plans for the Grand Region is included in **Figure 5**. This page shows additional layouts for emergency rerouting signs.

<u>Regions and Level of Existing Reroutes That are Signed</u>	
Bay	none
Grand	most
Metro	none
North	considering
Southwest	most
Superior	some
University	some

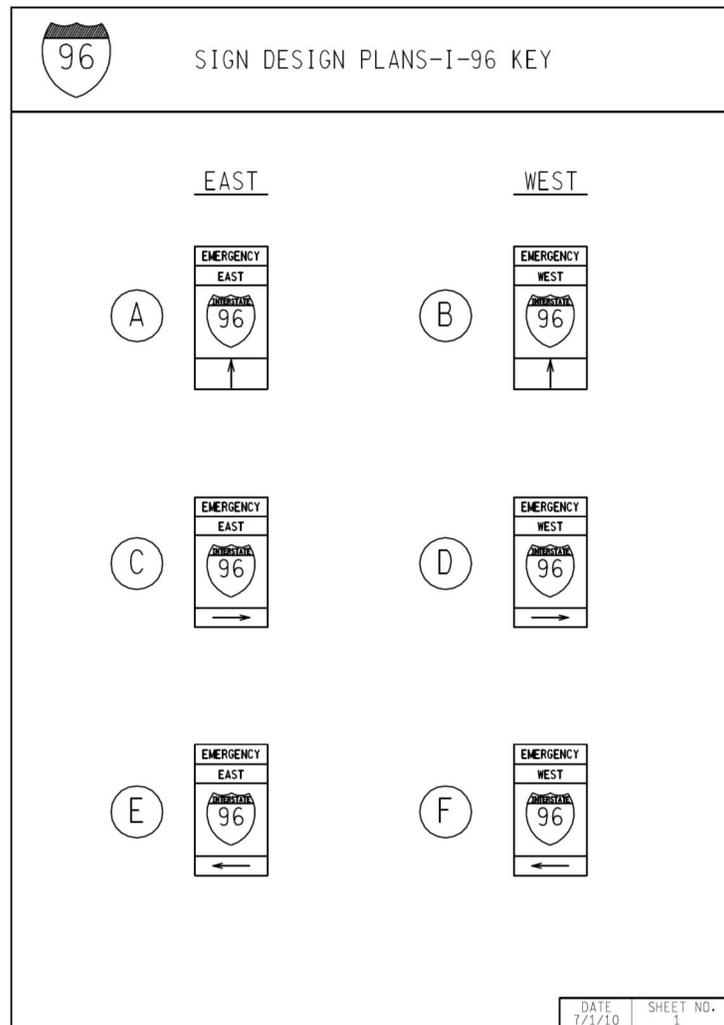


Figure 5. Design Sheet (pg1) for Planned Signs in the Grand Region

Signing Guidance

Based on conversations with the states researched, no one had established a clear checklist for when permanent signing should be installed on an emergency reroute. Consideration is given to the urban versus rural environment of the route, length of route, and make-up of the drivers. Even though there are no documented approaches available, here are some general guidelines for when to install permanent signing. It also is important to consider that the installation of permanent signing should be determined on a corridor basis first and not each individual segment.

- Urban areas.
 - Characteristics:
 - Freeway is often supported by a grid network of surface streets.
 - Interchanges are more closely spaced.
 - Large number of alternate route options available to the travelers.



- Higher percentage of commuter traffic that is familiar with alternate routes.
- Primary decision factors for permanent signing:
 - Permanent limitations on the surface streets (height restrictions, weight restrictions, complex to navigate, etc.)
 - Frequency of recurring incidents on the freeway (how often is an emergency reroute implemented that requires the installation of temporary signs?)
- Suburban areas.
 - Characteristics:
 - Surface street grid pattern is larger and alternate routes are not as obvious.
 - Interchanges are farther apart.
 - Feasible alternate routes are fewer.
 - Higher variance between peak and off-peak traffic volumes.
 - Primary decision factors for permanent signing:
 - Route is greater than 2-3 miles in length.
 - Routes including more than 2 to 3 turns.
 - Route does not have existing trailblazing signs
 - Permanent limitations on the surface streets (height restrictions, weight restrictions, complex to navigate, etc.)
- Rural areas.
 - Alternate routes are longer and unfamiliar to most drivers.
 - Cross-section includes a higher percentage of long distance travelers that are unfamiliar with non-freeway routes.
 - Volumes and incident frequency are the primary decision factors installing permanent signs.
 - Primary decision factors for permanent signing:
 - Route is greater than 5-6 miles in length.
 - Route includes more than 4 turns
 - Route does not have existing trailblazing signs
 - Higher volumes on primary route

A recommended sign design for permanently signing an emergency route is presented in **Figure 6**. This does not affect guidance for the use of temporary traffic control (TTC) as presented in the MMUTCD, but instead applies the rules for the design of a permanent installation.

The design uses a green background with an emergency route panel. This design is intended to be permanently installed in the field without being covered. This type of sign represents a guide sign with a route for a temporary emergency situation, but also one that can be used as an alternative route at any time.

An option that was considered was using an orange background as in **Figure 7**. If an emergency reroute sign with all-orange backgrounds is used, it should be covered when not in use. This type of sign would more closely resemble a temporary sign used in TTC situations, and TTC signs must be covered or removed when no longer appropriate (MMUTCD 6B.01). This option is not recommended because of the additional maintenance and man power required and deployment time to uncover them during an emergency situation.



Figure 6. Recommended Sign Design
(Permanent Signage)



Figure 7. Non-Recommended Sign
Design (Permanent Signage)

Additional information regarding the design includes:

- The “Emergency” auxiliary sign or plaque should be a black legend on an orange sign. (2A.10).
- Interstate and U.S. Highway Route Marker shields used on emergency route signs should remain the same color and format as normal route markers.(2E.27)
- Interstate and U.S. Highway Route Marker shields should be a minimum of 24” x 24” for route numbers with one or two digits, and a minimum of 30” x 24” for route numbers with three digits.(2D.11)
- Route signs and any auxiliary signs may be combined on a guide sign. This guide sign should be green and generally follow the same design principles as other guide signs. (2D.12)

Also if an incident occurs, there are three TOCs across the state that would monitor the incident and place pertinent messages as needed on available DMS to inform the public. The TOCs include the West Michigan Transportation Operations Center (WMTOC) in Grand Rapids for the Grand region coverage, the 24-hour Southeastern Michigan Transportation Operations Center (SEMTOC) located in Detroit for the Metro region coverage, and the 24-hour Statewide Transportation Operations Center (STOC) in Lansing. In addition to statewide coverage, the STOC assumes coverage of the WMTOC area outside their operating hours.

Signage Placement and Density Recommendation

Once the decision to permanently sign an emergency reroute has been made, the next step is to determine where to place them. This needs to be determined from two perspectives: the density along the corridor, and the sign placement with respect to an individual intersection. Intersection placement can be complicated, especially if there are several existing and proposed directional route signs. It is recommended that the emergency rerouting sign be placed in advance (near side) of an intersection. If there is a turn in the route, then an emergency rerouting sign should be placed after (far side) the



intersection as well. The distance from the advance sign to the intersection varies depending on the speed of the roadway. The distance between the intersection and the emergency rerouting sign placed after an intersection should be between 25 and 200 feet.

In agreement with the MMUTCD, emergency rerouting signs should be installed after the intersection if a straight ahead confirmation is necessary at that particular intersection. For example if the intersection has multiple cross streets with many existing directional route signs that may impact the driver’s decisions, the emergency rerouting signs after the intersection will let the driver know that they are heading in the correct direction. Also, emergency rerouting signs should be placed at a density of approximately 5 miles between signs. Routes that have multiple cross streets can impact a driver’s confidence. Therefore, if the area is rural and the route includes multiple turns, it is important to consider spacing the signs at a higher density to mitigate driver confusion.

Figure 8 presents an example signing layout based on the guidance outlined above. Prior to installation of permanent signing along an emergency reroute, the temporary signing locations identified in the rerouting plan should be reviewed against this guidance and requirements outlined within the MMUTCD.

Distance between Sign and Intersection for Advance Route Turn

Low Speed Areas

- Placed between 200 and 300 feet in advance of the intersection
- Should be within the block preceding the intersection

High Speed Areas

- Placed at least 300 feet in advance of the intersection

Roles and Responsibilities

Several current incident management plans within Michigan include a responsibility and procedure process. This information details who to contact when and who has the authority to initiate a reroute in response to an incident. Most of the coordination for implementing a reroute largely occurs between MDOT and the Michigan State Police (MSP); however the planning efforts should include many more stakeholders. Recommendations on who to include in these efforts are provided in the **Manual** section.

At the workshops, many stakeholders discussed frustrations with coordination between agencies and felt there should be more participation during the planning and re-visitation of the rerouting plans. The goal for many stakeholders is to ensure the motorists keep moving and to minimize any inconveniences.

Figure 9 presents the main points provided by the stakeholders on the each agency’s responsibility with the rerouting plans.

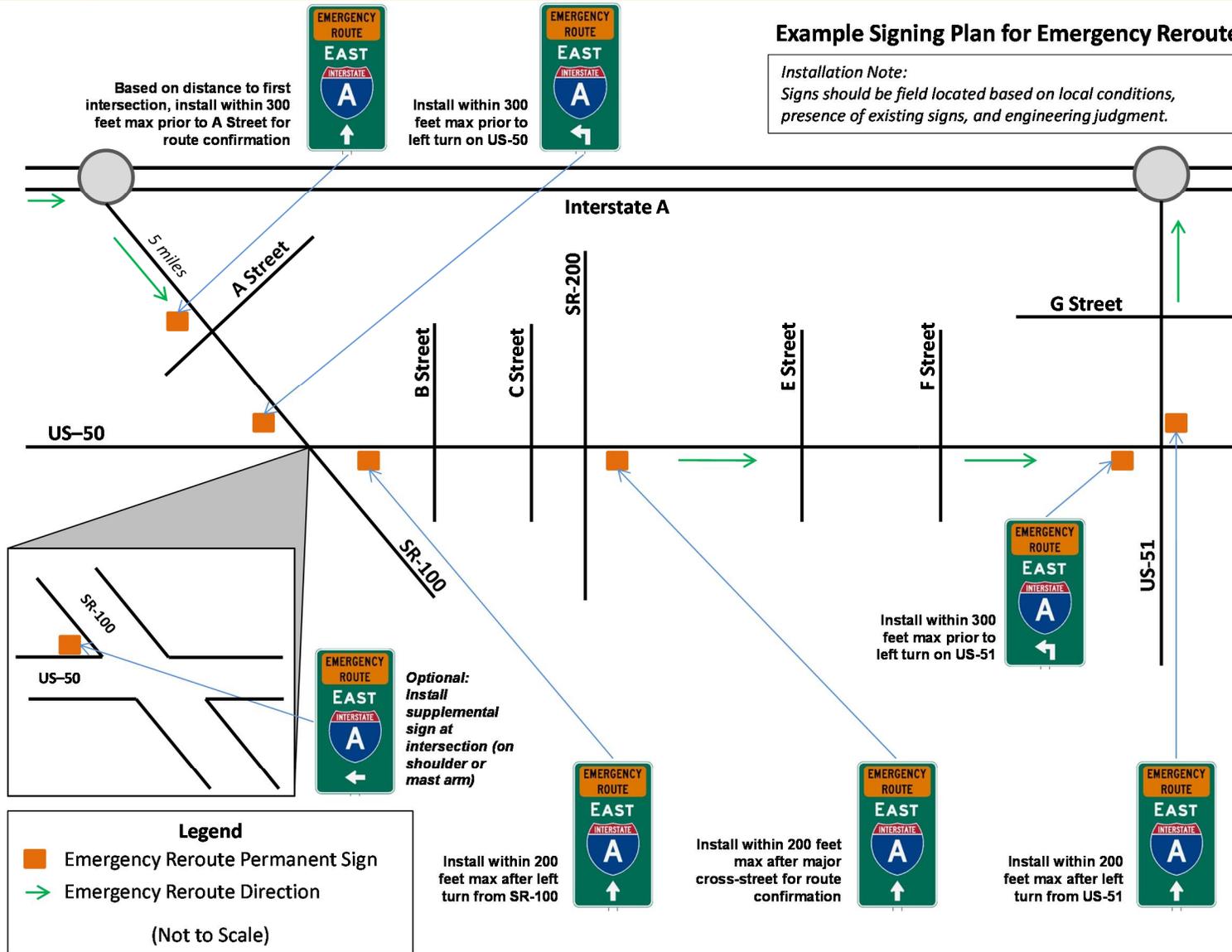


Figure 8. Example Signing Plan for Emergency Reroute



Point Control for Intersections

Each emergency reroute analyzed and finally selected will include the detoured traffic volume traveling through intersections that potentially were designed to carry much lower volumes. It is important for the stakeholders to analyze each intersection to determine traffic control measures that may be required. This will include the departure point from the primary route, midpoints along the emergency reroute, and the reentry point where it reconnects to the primary route. In addition, possible connections to the primary route that could allow new traffic onto the closed freeway should be analyzed. This includes onramps or loops after the exit ramp identified as the departure point.

Initially, the characteristics of each interchange should be documented. Capture the primary route name and cross-street for each intersection. Identify whether it is the departure point, a midpoint, or the reentry point for the emergency reroute. Note the physical characteristics at each intersection along the emergency reroute including the lane configuration and existing traffic control. For the lane configuration or route movement, this refers to a through, right, or left and the total number of lanes making the specific movement. For traffic control, this could be a stop control, four-way stop control, yield sign, roundabout, or traffic signal.

Once the existing conditions are documented, each intersection should be analyzed based on the anticipated traffic volume that is expected during the reroute. Supplemental traffic control measures, or point control for each intersection, should then be identified to address the impacts to the traffic volume. On ramps after the departure point would require a law enforcement vehicle or barrier to prevent vehicles from entering the closed portion of the freeway. Traffic signal coordination or timing adjustments could be warranted along the reroute. Personnel (law enforcement or maintenance staff) could be required at key junctures to maintain efficient movement of the queue.

The identified point control solution will be specific to each group of stakeholders and their evaluation of the local impacts of the additional traffic volumes. In some cases a reroute that requires significant personnel to implement could impact the decision on whether it is implemented or how quickly it can be implemented. In addition, these roles need to be captured in the roles and responsibilities of each reroute so the stakeholders are aware of the requirements on their personnel and equipment resources.

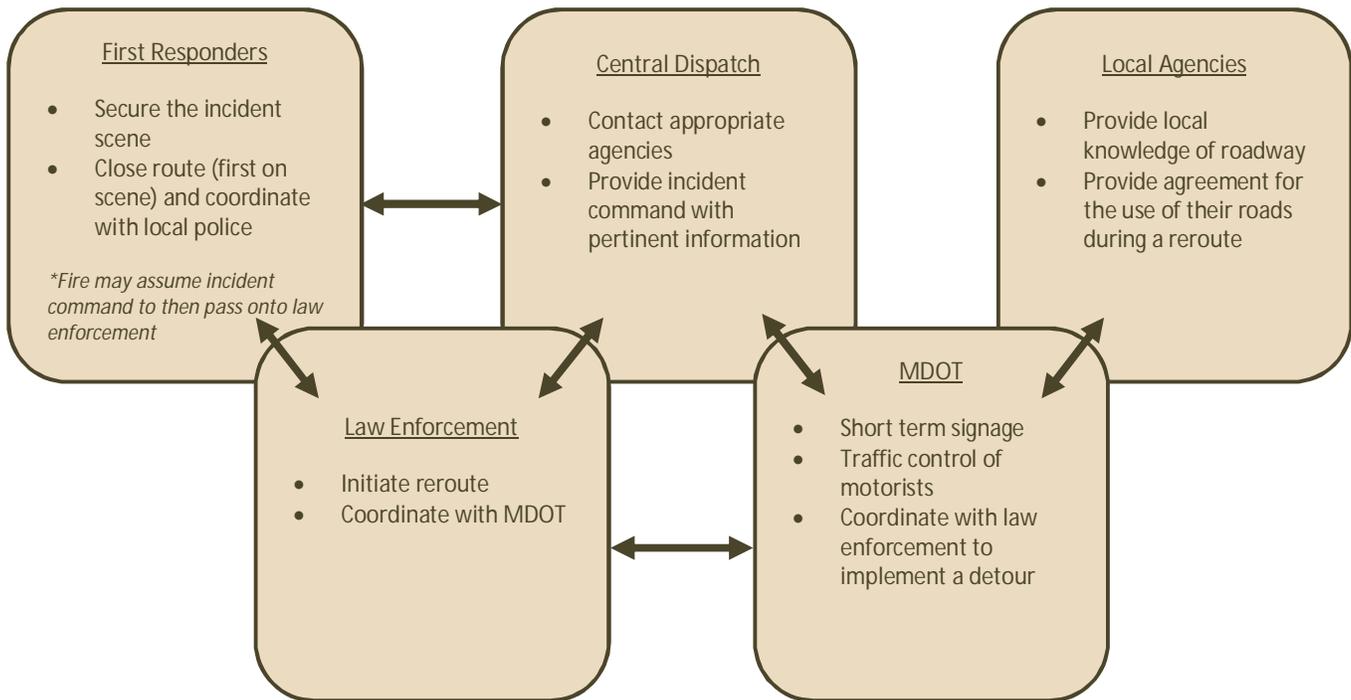


Figure 9. High Level Roles and Responsibilities Summary

The ability to respond to an incident can rely heavily on the geography of the area. The northern regions are typically longer, while in the southern portions is quicker. Stakeholders also mentioned they use a timeline to determine implementation of the reroutes. The practice of this timeline varies across the state, but the general trend is presented below. Please note that “T” represents the initial time that the incident occurs.

- T + ½ hour: secure the incident by diverting motorists on surrounding roads;
- T + 1 to 1 ½ hours: if portable message signs are available from a public safety agency, they are deployed almost immediately after notification. MDOT maintenance would be contacted, but sometimes could take a little longer to provide temporary signs.
- T + 2 hours: MDOT is notified and will provide temporary signs as well as updates to the public about the scene – the TOCs also would be notified and will monitor the incident.

MDOT typically will not use temporary signing for a reroute for incidents lasting less than four hours, although in some parts of the state they will implement short-term routes. An example of strong communication between agencies does occur in the Superior region and many stakeholders thought there should be a similar cohesive plan in place for other regions. It is understood that each region may adjust the parameters, but the guidelines used by Superior region are:

- If the incident will take less than 30 minutes, the motorists will stay put;
- If over an hour, law enforcement and MDOT will work together to implement a reroute in the field based on the existing plans and rerouting strategies; and
- If greater than four hours, MDOT will reroute motorists on trunk lines only.



Format of Rerouting Plans

The group agreed the format of the rerouting plans should include a series of integrated checklists designated by role of first responder's agency. A list of key elements each role would need to be mindful towards was suggested, as well as key personnel to contact. An online version was not necessarily agreed upon since it assumes first responders would have mobile access. Stakeholders felt a hard copy should be the primary format with online as a secondary option.

The plans should capture not only viable routes, but also non-viable routes and document elements in the area so a different reroute could be implemented, if required. It does appear the group prefers the unified command, but would like a checklist on establishing a notification process. This should be created during the debriefing of the reroutes as part of the incident management process.

Stakeholders expressed concern that a statewide approach may not reflect the challenges and demeanor of the local regions. The rerouting plans should be developed with a regional perspective in mind so local demographics can be effectively reflected.

During the workshops and follow-up conference calls with Michigan stakeholders, a few challenges were discussed. These included regional acceptance of a statewide approach to emergency rerouting and a consistent approach to include local agencies participation in the development and evaluation of the routes. It is important that these are acknowledged as MDOT selects a path forward.

Format Recommendations

- Hard copy version – primary
- Web/electronic version – secondary
- Integrated checklists
- Key elements identified with contact information
- Rerouting plans capture viable and non-viable options
- Notification process checklist per role

Challenges

Feedback from the workshops provided some valuable insight into the relationships and current status of rerouting in Michigan, but also identified potential challenges.

Differences in Network Density Yield Differences in Need

In general, the plan development and incident reroute coordination processes were more codified in the areas of Michigan with lower network densities. Regions with more urban areas typically had less defined reroute plans. Stakeholders identified the high number of potential alternatives that were available as a reason why reroutes generally were not defined. With the higher number of alternate routes, a proactive plan development may not be cost effective.

Limited vs. General Access Highways

Many stakeholders felt strongly that reroute plans could only be effective on limited access highways. For general access facilities, the inevitability of drivers trying to find their own way and the proliferation of portable navigation equipment made reroute plans less effective. Some stakeholders asserted that rerouting plans for general access facilities would be effective as long as they were maintained in more of a checklist format, where the details of the plan could be established and refined by the incident command. The general structure of what the plan would contain and how it would be determined and implemented would be developed in advance by mutual consent.



Communication Issues with Involvement of MDOT, 911 Central Dispatch Centers, and Public Safety

Stakeholders from several regions identified a communication disconnect with MDOT. Notification and level of information varies depending on which dispatch receives the call. Several agencies felt that they were not communicated to when decisions are made. If there is a local agreement, many of these local agencies still wanted to be contacted in case there were any issues.

Commercial Vehicles and Other Long-Distance Travel

Most workshop stakeholders considered the effects on commercial traffic a secondary issue behind the diversion of passenger vehicles. The off-Interstate locations identified were in places where the shortest detours for passenger vehicles were not established truck routes. The diversion of commercial traffic was more strongly considered on Interstate detours.

The consensus among stakeholders was that truck traffic between the incident and the nearest major arterial in each direction may need to be held in place for at least 90 minutes—only then would consideration be given to rerouting commercial vehicles. Additionally, the consensus presented that full-length commercial vehicles stopped inside the closest arterial would likely have to stay in place for the duration of the incident.

The amount of time to leave a truck in place is going to depend both on the geometry of the highway on which the incident occurs, and the length of the preferred reroute. (The latter point means that it will differ between urban and rural). In a rural setting if the delay is less than 90 minutes and the reroute is long, the driver of a commercial vehicle may simply stay put. The drivers will consider whether they are approaching their hours of service limit, if they have a critical delivery time, and/or whether they are able to refuel. By staying place, the driver can consider it an hour of “rest time” for hours of service calculations. In an urban setting, however, if the driver is able to get to an alternate truck route, they'll probably just go ahead and take it regardless of if anybody formally informs them of a reroute.

For oversize/overweight loads, it depends on the type of permit. If they have a trip permit, they are not allowed to move, they have to wait. If it's exceptionally severe (for example, a bridge was destroyed), the carrier would have to call MDOT and get a new permit from that point. If they have a blanket permit which allows multiple trips over a period of time on a wider route network (typically all state, US, and interstate highways), they're allowed to move as long as the new route is on state permitted highways.

Stakeholders identified that temporary signage or PCMB could be placed at the appropriate exits or interchanges to alert traffic of potential delays. In addition, messages identifying an alternate path would be of value. Concerns were raised about coordination for long-distance travel, such as long-haul commercial vehicles. The appropriate location for placing such signs and messages to proactively divert traffic could easily be one to two counties away.

The general consensus relative to specialized commercial vehicles—such as vehicles with hazardous materials or those requiring truck permits for overdimensional or overweight loads—was that those vehicles would have to hold in place for the duration of the incident.



EVALUATION METHODS

A key step when implementing any process is to evaluate its effectiveness. A good evaluation should provide insight into areas where the process works well and areas for process improvement. There are many facets that might be evaluated when reviewing the effectiveness of an emergency rerouting plan. One such facet is the impact of rerouting on traffic operations, both on the original facility and on the facility to which traffic was rerouted. This data can be difficult to capture on all routes, so the stakeholders must determine possible data sources and confirm the most effective metrics to use specific to each route and region.

Common evaluation metrics from a traffic operations standpoint are **travel time** and **delay**. These go hand-in-hand and should be evaluated on the corridor that experiences the incident as well as the corridor or corridors to which traffic is rerouted. One key metric related to travel time and delay would be a comparison of the travel time for a vehicle which remains on the original corridor versus the travel time for a vehicle which chooses the alternate route. It also would be beneficial to compare the travel time on the alternate route during an incident in which traffic is rerouted versus the typical travel time. This analysis would provide insight on the degree to which traffic that typically travels on the alternate route would be inconvenienced by the rerouting. A route might be deemed a successful alternate route if the cumulative delay savings for rerouted vehicles is greater than the cumulative delay increase for vehicles typically traveling on the alternate route.

Evaluation Metrics

- Travel time
- Delay
- Queuing

With a goal of reducing overall travel time and delay in mind, alternate routes should have as much spare capacity as possible. Existing choke points or constraints need to be identified and mitigation strategies employed to reduce the impact of additional vehicles at those locations. Ideally, any traffic signals on the route would need the capability to be commanded remotely to run emergency plans that would push through as much traffic as possible during the incident. Access points where vehicles would exit the original corridor for the alternate route and then re-enter the original corridor are of particular concern.

Another key metric related to traffic operations is **queuing**. Again, this metric would apply both to the impacted corridor and to the corridor or corridors selected as alternate routes. The queue length on the original corridor during the incident as well as the duration of time to clear that queue once the incident is over are commonly collected and are useful data points. Queuing on alternate routes, however, also is important to note in evaluating any rerouting strategy. If queuing from ramps, traffic signals, or other intersections blocks the alternate route, the route will undoubtedly be ineffective. With this in mind, ideal alternate routes will have few closely spaced intersections, and turn bays at intersections should be sufficiently long enough to handle turning movements. On corridors that are under traffic signal control, coordinated timing plans can be implemented to store traffic where there is sufficient queue storage space and push through traffic where queue storage space is sparse.

Alternate routes also should be identified with an eye for the safest option—both for those being diverted and those already using the alternate route. Diverting traffic will typically involve adding miles onto their trip, increasing the exposure time of the vehicle to a possible collision. Therefore, it is important to identify alternate routes built to a high design standard. Additionally, large increases of vehicular volumes in residential areas or near schools can be hazardous to pedestrian and bicycle traffic.



Evaluation of the emergency rerouting plans should be considered under two separate approaches:

Feasibility Evaluation – This evaluation is made to determine if road geometry, freight limitations, congestion levels, or other factors have changed such that the pre-determined route is no longer the most feasible reroute.

Effectiveness Evaluation – This evaluation should be made after a reroute has been used to determine the effectiveness of the route during the detour, and to identify potential changes that may improve the reroute operation.



LETTER OF AGREEMENT (LOA)

During the process of developing emergency rerouting plans, it is reasonable for MDOT and partner agencies to identify a non-trunkline roadway that is a viable option for inclusion. In this case, MDOT and the affected agency will need to establish an understanding for shared usage of the identified roads. The agreement between the two agencies should be documented and signed as part of a Letter of Agreement (LOA).

The letter should state the agency affected, the routes identified, and the conditions under which they can be used. The usage of these routes has been defined to support the expedience of safely rerouting travelers around an incident on the original primary route. Each agency affected along a route should establish a unique LOA with MDOT. This could result in multiple LOAs for a single reroute. However, it is reasonable to an agency to establish a single LOA to cover multiple routes impacted within their jurisdiction. For example, a county road commission could establish a single LOA of their routes identified within emergency reroutes to support operations along a single corridor, such as I-75. Whenever a reroute is modified, it is important to revisit the LOA to confirm the modified reroute does not impact what was defined in the LOA.

Figure 10 displays a high level flow chart on the process stakeholder should follow to develop an LOA and obtain approval for signature and execution. A sample draft letter is attached for additional guidance and to serve as a starting point for partnering agencies to use when developing their LOA.

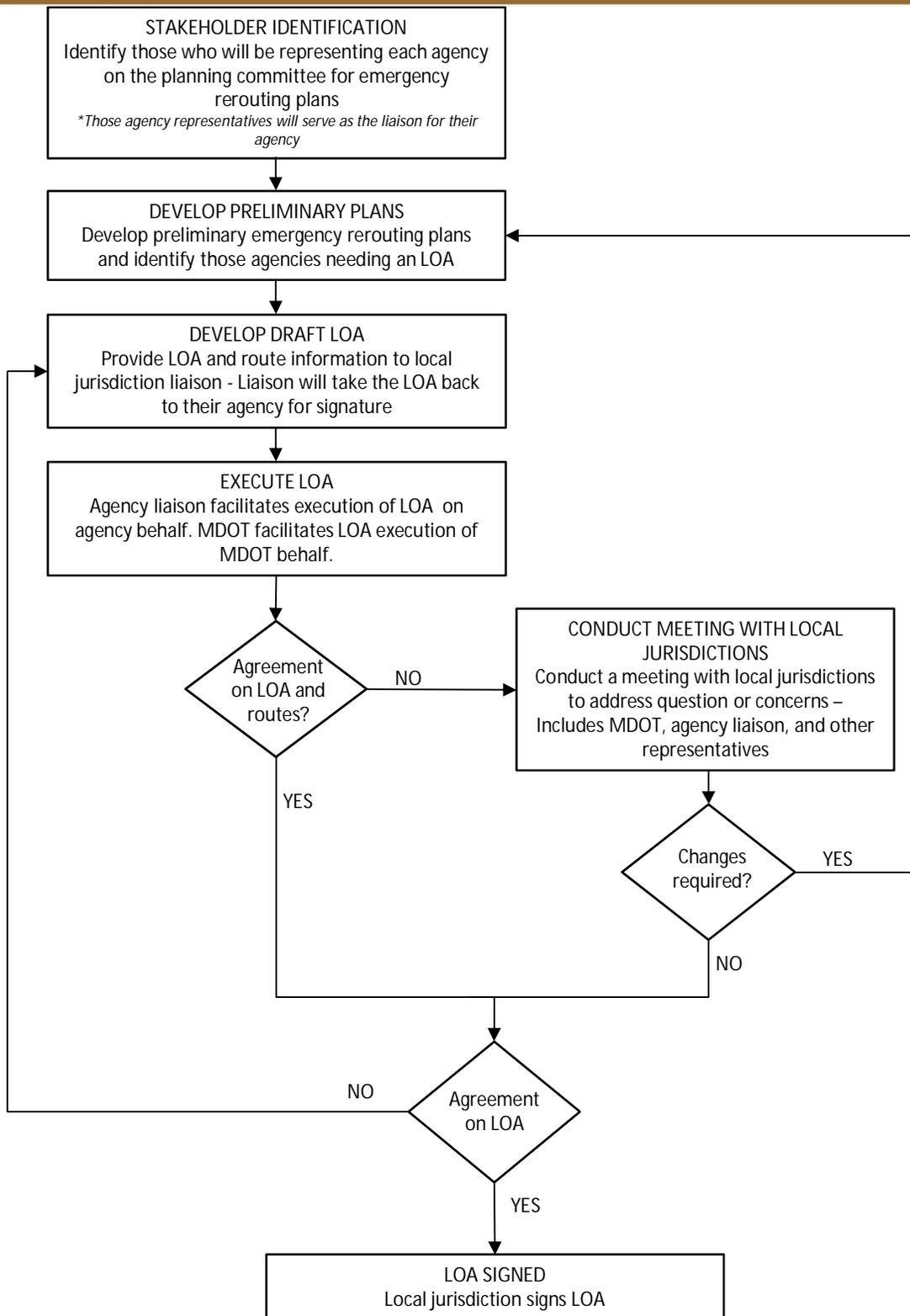


Figure 10. Emergency Rerouting Letter of Agreement Flow Chart

DRAFT Sample Letter of Agreement

Dear Name ,

The Michigan Department of Transportation (MDOT) is in the process of updating previous versions of the region's emergency reroutes. The final goal is to establish permanent emergency reroutes to optimize traffic movements, and to have a complete, concise, easy to use network of pre-planned routes for use during incidents.

Multiple benefits can be realized as a result of advanced planning. Some of the benefits are:

- Improve response time
- Enhance coordination of incident responders
- Minimize motorists confusion
- Reduce secondary incidents
- Optimize the safety of on-scene personnel and approaching motorists

The following description outlines the proposed routing of Route Name between Route Terminus and Route Terminus in County Name County.

Add Description of Emergency Incident Emergency Reroutes

The above emergency reroutes will be used for rerouting of motorists onto the arterial roadway network to ensure traffic continues to move.

In the event of an emergency, MDOT will be responsible for maintaining the approved emergency reroutes. Maintenance may include snow removal or the removal of downed trees if the need arises. MDOT also will be responsible for the erection and maintenance of all permanently placed emergency reroute signs. The signs will be installed and maintained in accord with MDOT standards. Outside of these responsibilities and their associated capital and recurring expenses, MDOT will provide no additional financial consideration for maintenance and use of the emergency reroutes. Permanent signing plans will be developed and distributed in the future, and further discussions will be necessary prior to installation of any permanent signs on local roadways. Once completed, this agreement will be amended to include the finalized routing and signing plans.

Upon acceptance of this letter of agreement, both parties agree that the designated detour routes are approved for emergency rerouting of trunkline traffic (commercial and non-commercial) until such time that either party requests a change to the detour routes.

The MDOT contact person for this agreement shall be: [NAME], [TITLE] who may be contacted by phone at Phone Number or by email at Email .

The contact person for this agreement for [AGENCY] shall be: [NAME], [TITLE] who may be contacted by phone at Phone Number or by email at Email .

Please indicate your approval of this letter in the space provided and return to my office. Once the letter has been signed by both parties, a finalized copy will be sent to you.

Sincerely,

Name
Title

Enclosure

APPROVED:

APPROVED:

Name
Agency Title

MDOT Name
MDOT Title



CASE STUDY

The following Case Study is an example of how to apply the processes and checklists that are presented in this Manual. The Manual establishes common procedures for stakeholders to define and document emergency rerouting plans.

The Case Study is a step-by-step process to guide the stakeholder through the development of emergency rerouting plans. It shows how each checklist can be applied, what information stakeholders should consider, and an example of what the plans could look like once completed. The Case Study is not based on any specific county, city, or state; rather it is a representation of a possible area that demonstrates some of the same challenges MDOT may face during their development.

The Case Study is considering the details of each possible emergency rerouting in the eastbound direction. It is recommended to review the details by direction rather than the entire route. Another review would be done in the westbound direction.

Location

Interstate X1's initial layout includes 11 individual segments as shown in **Figure 11**. The Case Study location has been identified as Segment 5 in the northwestern corner of the map. Segment 5 includes access to state route Y1 and Y3 as well as US Z4. Winding River separates the two counties and runs perpendicular to X1 in the vicinity of segment 5. In addition to the roadway and surrounding characteristics, these are some of the physical and geographic conditions that should be considered when developing the emergency rerouting plan.

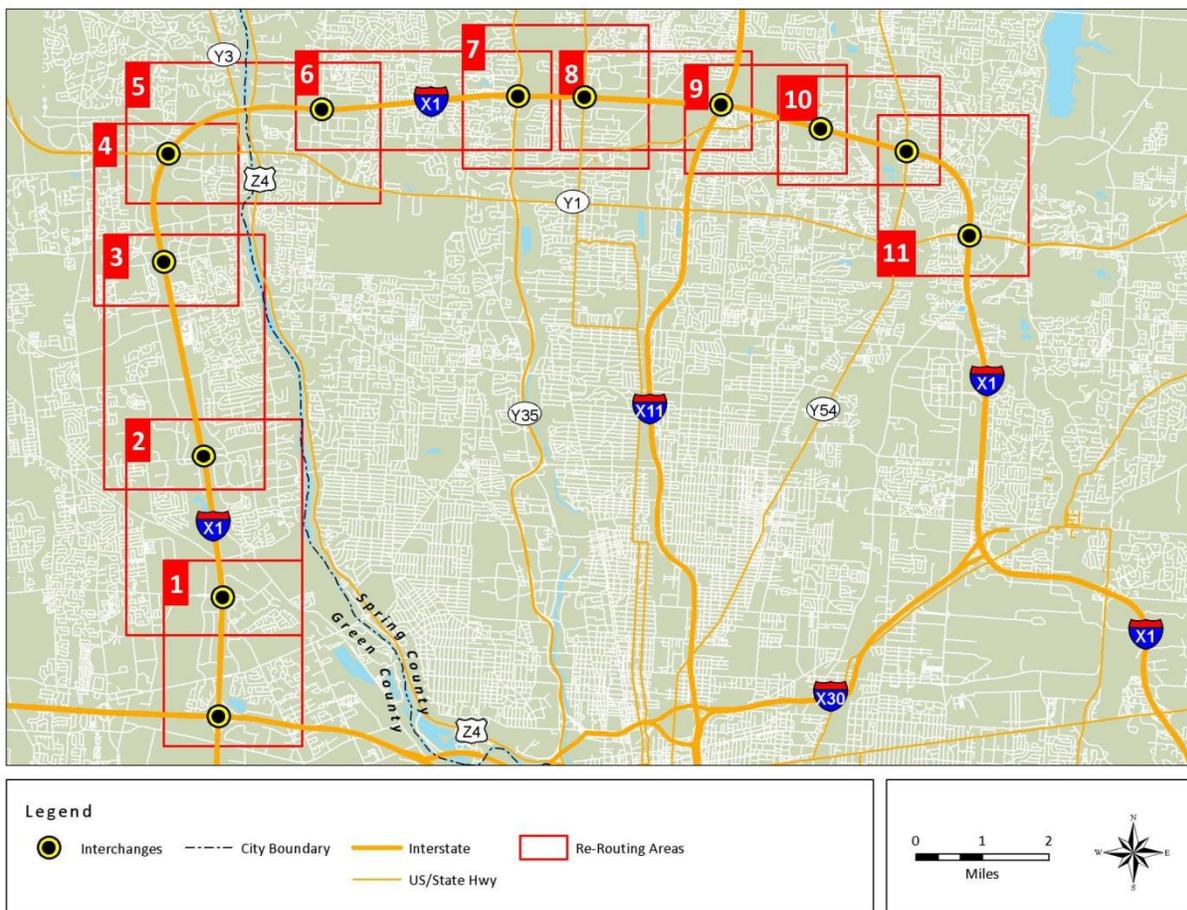


Figure 11. Case Study Location

Figure 12 zooms into Segment 5, identified in the previous figure. This portion of the X1 corridor includes two interchanges that bookend the segment. The figure also highlights two possible emergency rerouting options that could accommodate traffic in the event of a significant incident. The segment is located within the Cities of Springville (Spring County) and Greenville (Green County).



Figure 12. Segment 5 and Possible Emergency Reroutes



Checklist Application

The following sections will step through the checklists provided in this Manual to guide the stakeholders through the development of an Emergency Rerouting Plan for Segment 5.

Stakeholder Identification

Stakeholders include any jurisdiction/local agency that could be affected by or could have an investment in the emergency rerouting plan. As shown below, application of the *Stakeholder Identification Checklist* supports the identification of the agencies that should be contacted for involvement.



Emergency Rerouting Development Checklist – Stakeholder Identification

Road/Corridor Name: X1 from Y1 to Oak Road

Date: September 30, 2012

Timeframe: Initial planning step before discussions for developing of emergency rerouting plans.					
Involvement: Local and partner agencies impacted by the rerouting plans; varied based on location, type, and duration of the incident.					
Process: Identification of potential stakeholders should be the first step in the development process of emergency rerouting plans. Potential stakeholders include any local agency that would be affected by or would have an effect on the plans. For example, if rerouting plans include a detour onto an arterial street that includes access from a major university, the capacity of that specific street may be too much and would not provide the adequate free flow of traffic. Different stakeholders have considerations that others may not think of. All ideas are important and should be noted.					
Checklist: Evaluate the potential stakeholders listed below to determine if any of the following are affected by or would impact the route. Reference the next section for specific roles and responsibilities of those agencies that represent primary responders during an emergency reroute.					
<i>Check all that apply</i>		<i>Agency/Contact</i>	<i>Agency/Contact</i>	<i>Agency/Contact</i>	<i>Comments</i>
<input checked="" type="checkbox"/>	Michigan Department of Transportation (MDOT)	Name:			
		Email:			
		Phone:			
<input checked="" type="checkbox"/>	MDOT Transportation Operations Centers (SEMTOC, STOC, WMTOC)	Name:			
		Email:			
		Phone:			
<input checked="" type="checkbox"/>	MDOT Incident Management Engineer	Name:			
		Email:			
		Phone:			
<input checked="" type="checkbox"/>	MDOT Emergency Management Coordinator	Name:			
		Email:			
		Phone:			
<input checked="" type="checkbox"/>	MDOT Regional Office	Name:			
		Email:			
		Phone:			
<input checked="" type="checkbox"/>	MDOT Transportation Service Center (TSC)	Name:			
		Email:			
		Phone:			
<input checked="" type="checkbox"/>	MDOT Region Communication Representative	Name:			
		Email:			
		Phone:			
<input checked="" type="checkbox"/>	Mackinac, Blue Water, and/or International Bridge staff (if applicable)	Name:			
		Email:			
		Phone:			
<input checked="" type="checkbox"/>	Local municipal transportation agencies (traffic engineering departments, public works departments)	Name:	Tom Grant	Sandra Gallegar	Greenville, Springville
		Email:			
		Phone:	(111) 972-0012	(112) 473-6625	
<input checked="" type="checkbox"/>	County Road Commission(s)	Name:	Amy Lewis	Springville	
		Email:			
		Phone:	(111) 222-3425	(112) 6970	



As we see from the above checklist, we need to identify specific stakeholders for this segment. The information should include their name, phone number, and email. The specific stakeholders include:

- City of Springville – the segment is located within its boundaries
- City of Greenville – the segment is located within its boundaries
- Spring County – the segment is located within its boundaries
- Green County – the segment is located within its boundaries
- Spring Green Transit Agency – this Agency runs the transit route (Bus 37) through the possible alternate emergency routes (E1 and E2)
- Greenville Hospital – located at 3546 Wellington Pkwy near its intersection with SR Y3 along possible alternate emergency route E2.

The following list should be discussed in order to communicate with and achieve buy-in from the stakeholders regarding their specific roles and responsibilities. The Roles and Responsibility checklist focuses primarily on those agencies that will be the primary responders during an emergency reroute. However it is helpful for all stakeholders to understand who is responsible for what during the implementation and monitoring of an emergency reroute.



Emergency Rerouting Development Checklist – Roles and Responsibilities

Road/Corridor Name: X1 from Y1 to Oak Road

Date: September 30, 2012

The following list should be discussed in order to get buy in from the stakeholders on their specific roles and responsibilities.

MDOT Maintenance/County Road Commission/ Local Public Works	
<input checked="" type="checkbox"/>	Respond to requests from law enforcement, 911 central dispatch centers, or other sources of incident information to support the traffic control requirements for incidents or road impacts
<input checked="" type="checkbox"/>	Collaborate with the incident commander and others on scene to determine if emergency reroute is needed
<input checked="" type="checkbox"/>	Notify appropriate MDOT entities of status, impacts, and potential need to reroute (TSC, TOC, and other MDOT maintenance if affecting more than one region)
<input checked="" type="checkbox"/>	Initiate contact with other key partners (counties, local municipalities, other local agencies, and MDOT TSC) to determine and confirm emergency alternate route strategy
<input checked="" type="checkbox"/>	If warranted, implement signage for alternate route or coordinate with local entities to implement signage
<input checked="" type="checkbox"/>	Monitor status of alternate route through visual observations (either in the field or through closed circuit television (CCTV) cameras)
<input type="checkbox"/>	Coordinate signal adjustment
<input type="checkbox"/>	Other
MDOT TSC	
<input checked="" type="checkbox"/>	Initiate notifications to the appropriate TOC – dependent on time of day and region
<input checked="" type="checkbox"/>	Collaborate with MDOT Maintenance and MDOT TOC to determine alternate route feasibility or constraints
<input checked="" type="checkbox"/>	Coordinate with TOC when their support is needed after hours or on weekends
<input checked="" type="checkbox"/>	Issue “all clear” when alternate route is no longer needed (once the incident has been cleared)
<input type="checkbox"/>	Other
MDOT TOC [WMTOC (Grand Region; M-Th: 6a-8p, F: 6a-9p, S-S: 12p-8p), SEMTOC (Metro Region; 24/7), STOC (Statewide and other areas not covered by other TOC as well as WMTOC during off-hours; 24/7)]	
<input checked="" type="checkbox"/>	Collaborate with MDOT Maintenance and MDOT TSC to determine alternate route feasibility or constraints
<input checked="" type="checkbox"/>	Initiate notifications of the restriction to agencies through established email distribution list (includes media and other listserv subscribers)
<input checked="" type="checkbox"/>	Activate event response plan messages on the DMS (if available) to provide advanced warning to motorists about the closure and if a detour is in place
<input type="checkbox"/>	Coordinate the implementation of emergency traffic signal changes
<input checked="" type="checkbox"/>	Update MiDrive with information about the closure and if a detour is in place
<input checked="" type="checkbox"/>	Request updates from MDOT Regional Maintenance and issue updated agency notifications as needed
<input checked="" type="checkbox"/>	Issue “all clear” when alternate route is no longer needed (once the incident has been cleared)
<input checked="" type="checkbox"/>	Coordinate with TSC—or with multiple TSCs when closure and alternate route impacts more than one MDOT region
<input checked="" type="checkbox"/>	Dispatch MDOT freeway courtesy patrol (FCP) (if applicable)
<input type="checkbox"/>	Other
Law Enforcement	
<input checked="" type="checkbox"/>	If law enforcement is the incident commander, request support from MDOT Maintenance prior to establishing an alternate route
<input checked="" type="checkbox"/>	Provide on-scene support for temporary traffic control during alternate route mobilization
<input checked="" type="checkbox"/>	Notify MDOT Maintenance when officers have completed their investigation and leave the scene
<input type="checkbox"/>	Other
Fire/EMS	
<input checked="" type="checkbox"/>	If Fire/EMS is the incident commander request support from MDOT Maintenance prior to establishing an alternate route
<input checked="" type="checkbox"/>	Notify MDOT Maintenance when Fire/EMS have left the scene
<input type="checkbox"/>	Other



Road Network Considerations

All characteristics should be evaluated when deciding on possible emergency reroutes. Local jurisdiction input is very critical during this review. Local agencies may be able to pinpoint characteristics or constraints about a possible route that may not be easily identifiable through volumes, geography, etc. The example below presents the *Road Network Considerations Checklist* application for the eastbound section of Segment 5.

Emergency Rerouting Development Checklist – Road Network Considerations

Road Name: X1 from Y1 to Oak Road

Date: September 30, 2012

Timeframe: During the development of emergency rerouting plans.
Involvement: State and local transportation agencies.
Process: Choices for rerouting traffic will depend on the length of the detour, available roadways for the detour and their characteristics, and connections to intersecting roadways along the detour. All potential characteristic should be considered when deciding on potential alternates. It is important for the estimated volume of detoured traffic to be evaluated against the capacity of the identified reroute. It is understood that the roadway likely will be over capacity, but this analysis will assist in planning effective traffic control measures in response to the projected traffic conditions. References for this include: local maps, ADT, weight restriction maps, and/or height restriction maps.
Checklist: Review the characteristics of the potential alternate routes and determine if they may impact the plans.

Characteristics		Alternate Emergency Route 1	Alternate Emergency Route 2	Alternate Emergency Route 3
<input type="checkbox"/> Identify segment of each alternative route (road name, and end points) <i>*Note: see intersection checklist for specific analysis of intersections.</i>	Segment 1			
	Segment 2			
	Segment 3			
	Segment 4			
	Segment 5			
	Segment 6			
	Segment 7			
	Segment 8			
	Segment 9			
<input type="checkbox"/> Length of roadway (mainline and alternative route)	Mainline:			
	Alternate:			
<input checked="" type="checkbox"/> Volume thresholds by time of day	Mainline: AM/PM	2800 / 3250	2800 / 3250	
	Diversion: AM/PM	900 / 1050	600 / 750	
<input checked="" type="checkbox"/> Capacity of roadway	Mainline:	3200	3200	
	Diversion:	1600	800	
<input checked="" type="checkbox"/> Background V/C levels of diversion roadway(s) by time of day	Mainline: AM/PM	0.88 / 1.02	0.88 / 1.02	
	Diversion: AM/PM	0.56 / 0.66	0.75 / 0.94	
<input checked="" type="checkbox"/> Queue length adequacy		yes	yes	
<input checked="" type="checkbox"/> Roadway geometry				
<input checked="" type="checkbox"/> Lane geometry		main=4, div=2	main=4, div=2	
<input checked="" type="checkbox"/> Horizontal curvature		simple curves	simple curves	
<input checked="" type="checkbox"/> Vertical curvature		NA	NA	



Figure 13. Factors Affecting Selection on Possible Emergency Reroute

As can be seen from the above checklist and **Figure 13** there are height and weight restrictions for commercial vehicles along alternate route EM 2. Also, traffic to and from Greenville Hospital would be affected by the choice of EM 2. In spite of capacity constraints for both alternate routes as is evidenced by the v/c ratios, it can be observed that EM 1 has a lower v/c ratio which allows it to accommodate a higher volume of detour traffic than EM 2.

Due to these reasons, it was found to be more feasible to designate EM 1 as the emergency reroute for this segment of the freeway.



Intersection Analysis

Now that E1 has been designated as the emergency reroute for this segment, the individual intersections along the route should be reviewed in order to assess and determine the need for effective point control measures, including barriers, personnel, or temporary signs to direct motorists along the route.

Emergency Rerouting Development Checklist – Intersection Analysis

Road/Corridor Name: X1 from Y1 to Oak Road

Date: September 30, 2012

Timeframe: During the development of emergency rerouting plans.

Involvement: State and local transportation agencies, law enforcement, maintenance personnel.

Process: Choices for rerouting traffic will depend on the intersections characteristics and capacity along the detour. Characteristics include the location of the intersection with respect to the corridor, route movement, existing control, and recommended traffic control. All characteristics of the intersections along the reroute should be evaluated. In addition, this analysis will identify equipment and personnel resource needs required to implement the road closure and emergency reroute. This analysis will assist in planning effective traffic control measures or point control in response to the projected impacts on traffic conditions.

Checklist: Analyze the characteristics of the intersections within the potential emergency reroutes and determine the point control requirements for implementation.

Primary Route	Cross Street	Location (departure, midpoint, re-entry)	Route Movement (left, through, right) (#of lanes)	Existing Control (stop sign, roundabout, yield, signal)	Recommended Traffic Control (barrier, point control, signal timing)	Comments
X1 off-ramp	Y1 EB			Personnel		
EB Y1 on ramp	X1 EB			Barriers/cones		
WB Y1 on ramp	X1 EB			Barrier/cones		
Top of ramp	Y1			Barrier/cones		
Y1	M Street			Temp signing		
Y1	Y3			Temp signing		
Y1	N Street			Temp signing		
Y1	Oak Road			Temp signing		
Oak Road	P Street			Temp signing		
Oak Road	On ramp X1			Temp signing		



Rural Area

Since this segment falls within a rural area we applied the *Regional Considerations – Rural* checklist. The data below displays information that is consistent with characteristics in a rural area (signal density). Another checklist would be used if this was an urban area.

It also is evidenced with the use of this checklist that height/weight restrictions, vehicle class limitations and a medical center will be impacted by the use of EM 2 as the alternate route choice. This furthers the case to use EM 1 as the alternate route choice for this segment.



Emergency Rerouting Development Checklist – Regional Considerations (Rural Areas)

Road/Corridor Name: X1 from Y1 to Oak Road

Date: September 30, 2012

Timeframe: During the development of the emergency rerouting plans.			
Involvement: All stakeholders involved during the development stage.			
<p>Process: Impacts of emergency rerouting are very large-scale in nature and can affect traffic beyond the municipality or county level. Therefore, it is important to consider the support of statewide resources and the impacts on all levels of operation from local to statewide.</p> <p>In rural areas of Michigan, there are likely to be fewer alternate route options for motorists, and any alternate routes implemented could be lengthy. The usage of the local roads should be reviewed to determine whether they are suitable to handle the freeway traffic.</p> <p>A review of potential impacts also should be completed. Local agreements should be in place prior to the implementation of emergency reroutes on to local roads. These formal approvals help to ensure there is no conflict between MDOT, local agencies, and public safety. In the rural areas, weather is an important factor; consider whether local agencies will be required to accelerate snow removal processes prior to implementing an emergency alternate route.</p> <p>For lengthy alternate routes, more than one County or MDOT Region could be affected. MDOT should have primary responsibility for coordinating with adjacent MDOT regions to determine alternate routing strategies and confirm communications and notifications processes. Also, the TOC should be notified by MDOT regional staff of the incident.</p>			
Checklist: Confirm the local area where the reroute is being planned is considered rural. If it is urban, switch to the Regional Considerations – Urban Area.			
Determine if any of the following resources are needed.			
It is very important to note that MDOT currently has a communications protocol and a chain of command in place and these should be followed.			
	Alternate Emergency Route 1	Alternate Emergency Route 2	Alternate Emergency Route 3
Alternate route selection should follow this priority:			
<input checked="" type="checkbox"/> State-owned trunkline (pre-designated or determined on-scene)	Yes (SR Y1)	Partial (US Z4)	
<input checked="" type="checkbox"/> Connector roadway facility to state-owned trunkline	No	No	
<input checked="" type="checkbox"/> County or local road	Yes - Partial	Yes - Partial	
Highlight potential impacts based on the following items:			
<input checked="" type="checkbox"/> What is the overall fitness of the road	Good	Good	
<input checked="" type="checkbox"/> Are there any height or weight restrictions	No	Yes (height and weight)	
<input checked="" type="checkbox"/> Are there additional road characteristics that should be considered	No	Greenville Hosp. impac	
<input checked="" type="checkbox"/> Are there any limitations to certain vehicle classes	No	Yes - commercial veh.	
<input checked="" type="checkbox"/> Are there any snow or ice restrictions	No	No	
<input checked="" type="checkbox"/> Are there any formal agreements in place	No	No	
Interagency Coordination Consideration:			
<input checked="" type="checkbox"/> Does the route cross county lines	Yes	Yes	
<input checked="" type="checkbox"/> Does the route cross regional lines	No?	No?	



Communications

Communicating emergency reroute information will be critical to maintaining a safe detour. It is important for affected agencies as well as the traveling public to know what routes have been established. The following was used and a check applied after following the steps within the checklist to establish effective communication with all the stakeholders.

Emergency Rerouting Development Checklist – Communications

Road/Corridor Name: X1 from Y1 to Oak Road

Date: September 30, 2012

Communicating emergency reroute information will be critical to maintaining a safe detour. It is important for affected agencies as well as the traveling public to know what routes have been established.

This section of the manual outlines recommended procedures for notifying agencies and the public.

Agency Communications and Notifications

Pre-planning activities:

- MDOT TSC establish local contact/notification list (email and telephone)
MDOT TOC establish contact/notification list for each corresponding Region (email and telephone)
MDOT pre-determine key regional contacts that need to be notified of established reroutes. Key stakeholders for reroute notifications include:
Michigan State Police
County Road Commissions
911 dispatch centers (link to police, fire, emergency services)
Municipal street/traffic public works
Media (radio, TV)
Others who have opted in during planning activities
MDOT issue a notification to stakeholders about the process that will be used and from whom they will receive reroute notifications, updates, and "all-clear"
MDOT establish a process to log and archive reroute notifications

On-Scene Communications and Notifications

The incident commander will involve appropriate agencies in determining the need for an emergency reroute, and will defer routing decisions to MDOT, County Road Commissions, and other local agencies based on the location, duration, and any additional influences (such as weather, route restrictions, or vehicle class restrictions). The TSC will be the primary contact during normal business hours (8a-5p) with STOC or SEMTOC covering overnight (5p-8a).

Checklist for notifications about established reroute:

- Incident commander notifies (or designate an entity) MDOT Regional Maintenance Contact of incident, impacts, and to request support
MDOT maintenance staff notifies local MDOT TSC and corresponding TOC of the impact, MDOT response action, and reroute
MDOT TSC confirms notification of incident and document established route, and expected/estimated duration
TOC confirms incident is in the MDOT MiDrive System and document established route and expected/estimated duration
TOC identifies potential permanent DMS that should be activated to warn travelers of the incident and that a detour is in place (per event response plans)
MDOT TSC (business hours) or TOC (after hours) to issue email alert to distribution list developed during pre-planning activities
MDOT TSC (business hours) or TOC (after hours) to remain in contact with MDOT maintenance on any changes or updates to rerouting strategy

For emergency reroutes lasting longer than 4 hours:

- MDOT TSC and/or TOC to issue an update to the distribution list of status of reroute and anticipated duration. If duration cannot be estimated, MDOT issues a statement in the update that reroute is in effect until further notice
MDOT TOC updates MiDrive with reroute status and information as it becomes available
The MDOT maintenance personnel to keep MDOT TSC and TOC updated of status of reroute



Evaluations

A key step when implementing any process is to evaluate its effectiveness. A good evaluation should provide insight into areas where the process works well and identify areas for process improvement.

Feasibility Evaluation – This evaluation is made to determine if road geometry, freight limitations, congestion levels, or other factors have changed resulting in the pre-determined route no longer being the most feasible detour.

Effectiveness Evaluation – This evaluation should be made after a reroute has been used to determine the effectiveness of the route during the detour, and to identify potential changes that may improve the detour operation.

We have applied the checklist provided within the manual to evaluate this segment, under the assumption that EM1 was selected and applied as the emergency reroute and then evaluated after implementation a past date.

Emergency Rerouting Development Checklist – Evaluation Methods

Road/Closure Name: X1 from Y1 to Oak Road

Date: September 30, 2012

Feasibility Evaluation	
Timeframe: Annually	
Involvement: State and local transportation agencies impacted by the rerouting plans.	
Process: Feasibility of the rerouting plans should be reviewed on an annual basis. The purpose of this review is to determine if changes to the route (such as a change in a bridge weight restriction) or changes to the environment (such as the addition of a new school zone) impact the feasibility of a detour. State and local transportation representatives from jurisdictions impacted by the reroute should be involved in the review.	
Checklist: Evaluate the emergency rerouting plans to determine if any of the following exist on routes included in the plan and the impact of the change to the plan. If necessary, the plans may need to be modified to ensure the routes remain effective and feasible.	
	Selected Alternate Emergency Route
<input checked="" type="checkbox"/> Changes in road geometry	No
<input checked="" type="checkbox"/> Changes in signing	No
<input checked="" type="checkbox"/> Changes in striping	No
<input checked="" type="checkbox"/> Changes in speed limits	No
<input checked="" type="checkbox"/> Changes in weight restriction on bridges	No
<input checked="" type="checkbox"/> Change in height restrictions	No
<input checked="" type="checkbox"/> Changes in at-grade railroad crossings	No
<input checked="" type="checkbox"/> Changes in HAZMAT restrictions	No
<input checked="" type="checkbox"/> Additional traffic signals	No
<input checked="" type="checkbox"/> Addition of school zones	No
<input checked="" type="checkbox"/> Additional business or residential developments	No
<input checked="" type="checkbox"/> Significant change in traffic congestion levels	No
<input checked="" type="checkbox"/> Any planned changes to the routes scheduled for implementation in the next year	No



Permanent Signage Evaluation

An evaluation of the signage along the selected emergency reroutes must be conducted annually in order to ensure that any changes in signing needs are reviewed and updated. This shows an example of how the checklist applies to this segment for an inspection conducted on at a later date after implementation of the Emergency Reroute EM 1.

Emergency Rerouting Development Checklist – Permanent Signage Evaluation

Road/Corridor Name: X1 from Y1 to Oak Road Date: September 30, 2012

Timeframe: Annually, in order to ensure that any changes in signing needs are reviewed and updated.	
Involvement: State and local transportation agencies impacted by the rerouting plans.	
Process: Signage should be reviewed on an annual basis to make sure that they comply with current standards and are applicable for the rerouting plans. The purpose of this review is to ensure that signage complies with the current edition of the Michigan Manual on Uniform Traffic Control Devices (MMUTCD), including any revisions. This annual review requires a field review of signs that are permanently installed in the field as well as temporary signs that are used by personnel during emergencies.	
Checklist: Evaluate the signs to ensure they are current and meet the needs of the road users.	
<i>Urban Considerations:</i> Duration or estimates duration; specific location; proximity to alternate routes; roadway characteristics; vehicle restrictions; MODT primary for coordination and implementation.	
<i>Rural Considerations:</i> Collaboration for mobilization between MDOT and local agencies; incidents greater than 4 hours recommended to be signed; adequate along lengthy detour.	
	Selected Alternate Emergency Route
<input checked="" type="checkbox"/> Have new signs been installed that conflict with the emergency rerouting signs	no
<input checked="" type="checkbox"/> Have new signs been installed that conflict with the rerouting plan	no
<input checked="" type="checkbox"/> Has the reroute experienced confusion or issues that would warrant permanent signing installations or revisions to existing signage	no
<input checked="" type="checkbox"/> Are the existing signs compliant with the MMUTCD	yes
<input checked="" type="checkbox"/> Are signs still located in the proper location, and are they still in good condition (including meeting retro reflectivity)	yes
<input checked="" type="checkbox"/> Are the signs still in place [after winter]	yes
<input checked="" type="checkbox"/> Are the sign message libraries associated with the portable message signs still accurate	yes
<input checked="" type="checkbox"/> Are the portable message signs in proper working order	yes
<input checked="" type="checkbox"/> Do any changes in land use, roadways, etc. require a change in signing along the emergency routes	no
<input checked="" type="checkbox"/> Do the stakeholders who install temporary signs have appropriate inventory (number and types of signs)	yes



Response Plan

The Response Plan is the final product of the emergency rerouting development. These plans are references by stakeholders responding to an incident and implementing a reroute. They display the final agreed upon alternative route and characteristics that would be relevant in the field in case the alternative route becomes unacceptable. The Plan should include a variety of data to be the “one stop shop” of information. The type of information it should include is:

- Contact information – *anyone who should be contacted during the implementation of an emergency*
- Final alternative map – *this should include any restrictions that were identified during the review of the road network*
 - *Since not all routes may not be signed, temporary signage locations should be identified until more permanent signage has been installed (if there was a decision to deploy)*
- Equipment – *any type of equipment that an agency may use to control traffic along the emergency reroute*
- Directions – *these are explicit directions on how to proceed through the emergency reroute*
- Roadway considerations – *characteristics of the roadway*

Additional information can be added to the plan if necessary to ensure stakeholders are aware of constraints that may affect the reroute.



Route: Interstate X1 Eastbound	Developed: Date: September 30, 2012
MDOT / Lake Region / Green and Spring County	Revised Date:

LEGEND

- Signalized Intersection
- Temporary Incident Management Signs
- Existing DMS
- Bridge
- Tunnel

CONTACT INFORMATION		POINT CONTROL			
Agency	Number	Primary	Cross-Street	Control	
Spring County	(112) 473-6628	1a	X1 off-ramp	Y1 EB	Personnel
Green County	(111) 972-0030	1b	EB Y1 on ramp	X1 EB	Barriers/cones, Personnel
Emergency	911	1c	WB Y1 on ramp	X1 EB	Barrier/cones
Non-Emergency	(112) 532-1078	2	Top of ramp	Y1	Barrier/cones
State Police	(112) 347-0021	3	Y1	M Street	Temp signing; signal timing
State Maintenance	(112) 330-2910	4	Y1	Y3	Temp signing; signal timing
County Maintenance	(112) 473-1117	5	Y1	N Street	Temp signing
		6	Y1	Oak Road	Temp signing; personnel
		7	Oak Road	P Street	Temp signing
		8	Oak Road	On ramp X1	Temp Signing

ROUTE SEGMENTS				
Route	Begin Point	End Point		
Eastbound X1 off-ramp	X1	SR Y1		
SR Y1	X1 Off-ramp	Oak Road		
Oak Road	SR Y1	X1 On-ramp		

ROADWAY CONSIDERATIONS						
	Length	Volume (veh/hr) AM / PM	Capacity (veh/hr)	TOD	Average Queue (miles)	Average Delay (minutes)
Mainline	2.5 miles	2800 / 3250	3200	Peak	1.0	35
Alternate	3 miles	900 / 1050	1600	Off Peak	0.25	8



EMERGENCY REROUTING GUIDANCE AND CHECKLISTS

The manual is a guidance document that integrates findings from across Michigan as well as from several other states' practices. The manual is to be used as a planning tool to assist MDOT in consistently and efficiently developing emergency rerouting plans in response to unplanned incidents. The primary goal of the manual is to establish common procedures for stakeholders to define and document emergency rerouting plans. This approach should build upon lessons learned and foster consistency and effectiveness in the approach in each region.

The manual is the third and final phase of the research project and packages several components stakeholders should consider and provides guidance for the development of emergency rerouting plans. These components are presented in **Figure 14**. **Appendix D** includes standalone checklists to be used when going through the development process.



Figure 14. Step 3 in the Project Process