Oklahoma Department of Transportation

**Office Engineer Division**
200 N.E. 21st Street
Oklahoma City, OK 73105-3204
www.odot.org

**Date:** April 18, 2016

**To:** Contractors

**From:** Office Engineer

**Subject:** ACNHPPI-2350-(004)SS / ACNHPPI-2350-(005)SS, J/P 160189, Oklahoma County, Call Order 195, April 21, 2016 AM Letting.

**THIS OFFICIAL NOTIFICATION CONCERNS THE ABOVE SUBJECT PROJECT:**

Attached are two documents for:

- I-35 Corridor Incident Management Plan
- Traffic Management Plan

pertaining to the subject project.

Please download the complete fax from:
http://www.okladot.state.ok.us/contracts/a2016/docs1604/CO195_160421_JP160189_Fax-01.pdf
This revision will take place at Contract time.
Please bid accordingly.

This and all faxes can be downloaded from ODOT web site.
If you have any questions, need directions or a direct fax please call (405)521-2625.

**ALSO, if you are bidding this project, please indicate receipt of this notification by immediately signing and returning via FAX at (405)522-0972 or email to mpajoh@odot.org.**

Masoud Pajoh, P.E.
Asst. Division Engineer
Office Engineer Division

Printed Name Signature Title

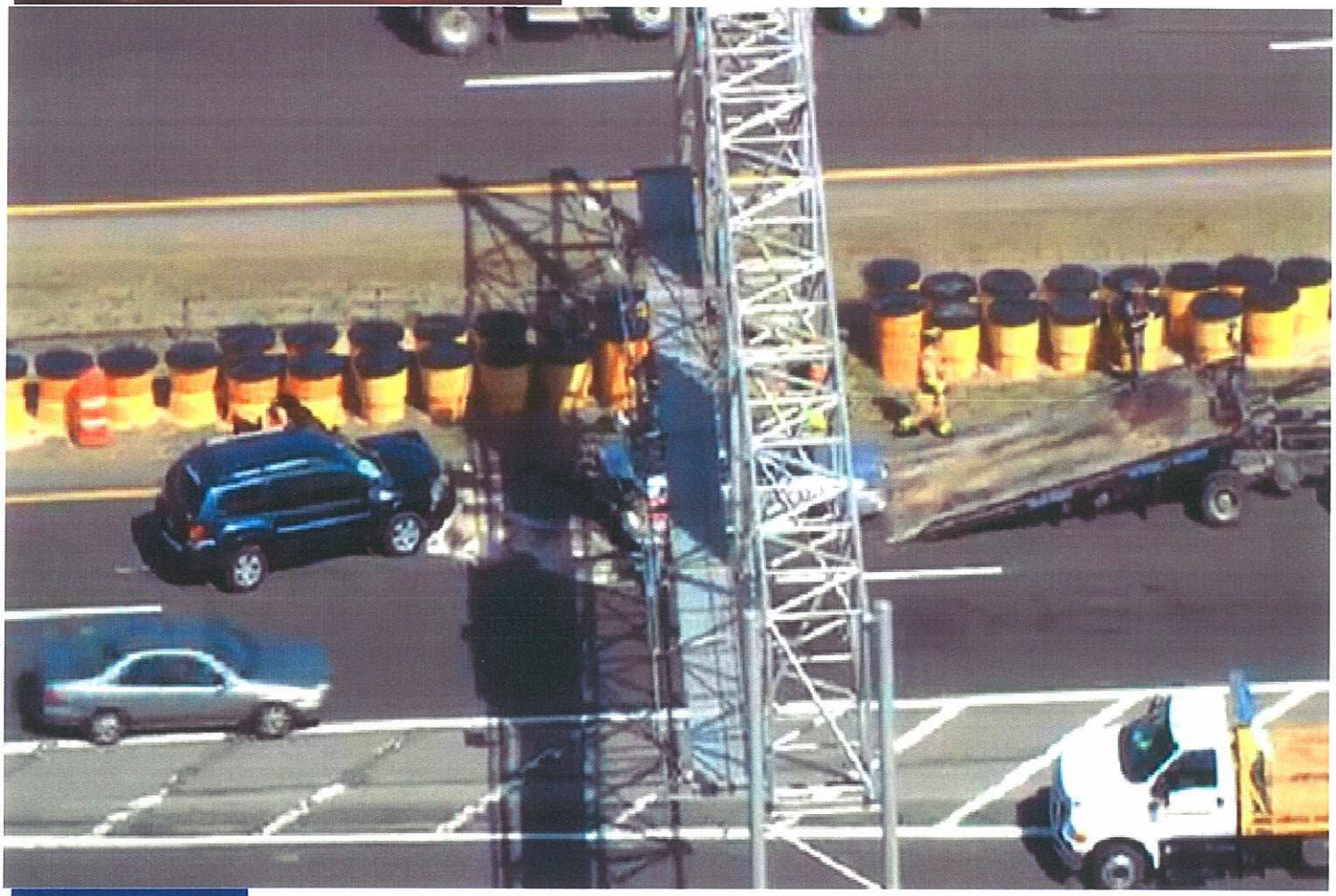
Company Date

cc: Roadway Design Division
OKC Resident Engineer
Field Division IV Engineer
Association of General Contractors

Attachments:

# Interstate 35 Corridor
# Traffic Incident Management Plan
# Norman, Oklahoma

**Prepared by:**
**City of Norman - Public Works Department**
**March 19, 2013**



U.S. Department of Transportation
**Federal Highway Administration**

OKLAHOMA DEPARTMENT OF TRANSPORTATION

INTERSTATE
OKLAHOMA
35

# Index

# Interstate 35 Corridor
# Traffic Incident Management Plan
# Norman, Oklahoma

## 1. INTRODUCTION

In 2010, the Average Daily Traffic (ADT) along I-35 ranged from 69,400 at the McClain – Cleveland County Line to 99,000 vehicles per day north of Exit 109 (Main Street) in Norman. In addition to the high ADT, traffic incidents have occurred regularly on the stretch of I-35 between Lindsey Street and Robinson Street. The incidents vary in severity, from debris on the Interstate to overturned tractor-trailers, which cause motorists to seek detours on local streets, spreading congestion onto the parallel roads.

On January 7, 2013, the Oklahoma Department of Transportation began reconstruction of the Main Street interchange. This project is one of several that will be affecting the corridor during the next decade. During the first 30 days of construction, the Oklahoma Highway Patrol had to close Interstate 35 on five different occasions due to injury or fatal crashes. Each time, the Norman Police Department and the City's Traffic Control Division attempted to guide detoured traffic through the City's Transportation network without the benefit of a comprehensive Traffic Incident Management Plan.

It has become evident that a corridor-wide traffic incident management solution has become increasingly critical to keep people and goods moving. As a result, the City of Norman in cooperation with the Oklahoma Department of Transportation and the Federal Highway Administration (FHWA) met to discuss the scope, roles and responsibilities of future events involving the closure of Interstate 35.

The overall vision of the I-35 Traffic Incident Management Plan (TIMP) is the seamless management of traffic and emergency operations across multiple jurisdictional and agency boundaries for the I-35 Corridor from the McClain – Cleveland County Line to the Norman – Moore City limit. This section of I-35 has seven interchanges and runs through the City of Norman.

In general, the I-35 TIMP promotes cooperation, coordination, information sharing and the application technology-based solutions, such as the use of dynamic message signs (DMS) to disseminate traffic information to motorists, and traffic signal coordination to increase throughput on alternate routes during incidents along the I-35 corridor. By improving the

exchange of information among agencies, the Oklahoma Department of Transportation and its contractors, Oklahoma Highway Patrol, the Norman Police Department and the Norman Public Works Departments can react more effectively to incidents on I-35, and minimize and manage the impact to local streets and services.

Development of this Plan has included an examination of the primary and secondary parallel alternate routes to I-35, identification of cooperative strategies and technologies that would aid in alleviating congestion, and recommendations for operations and maintenance roles and responsibilities.

Existing policies and procedures dealing with incident response need to be enhanced to better coordinate resources and efforts. It is highly recommended that a Traffic Incident Management (TIM) Team be formed to review current practices with the goal of improving response time among the various agencies responsible for the management of incidents while enhancing communications with the traveling public and improving the flow of traffic on agreed upon alternate routes used during the diversion of traffic from I-35.

## 2. ALTERNATE ROUTE GUIDELINES

If an alternate route must be used due to an incident on the Interstate, a set of guidelines and considerations must be followed for:

- Implementation of an alternate route,
- Operation of the traffic on the alternate route, and
- Return to normal conditions

### 2.1 Implementation

After determining that an alternate route should be implemented, the following steps should be taken to establish an alternate route:

**ODOT must be notified of any lane closures or the implementation of an alternate route. The notification should include:**

- Direction of closure (NB or SB)
- Extent and location of closure (# of lanes, closed between which exits)
- Anticipated duration of closure
- Presence of HAZMAT

ODOT Field Division personnel and their contractors will provide resources for the operation of alternate routes. These resources may include arrow boards, portable DMS, traffic cones, and other traffic control devices.

ODOT will be responsible for notifying the City of Norman of any incident on I-35 that requires the use of an alternate route.

## 2.2 Operation of Traffic Along Alternate Routes

Upon notification, the City of Norman should implement "incident signal timings" to accommodate a particular alternate route. The City of Norman Traffic Control Division will develop such signal timings and will implement them upon receiving proper notification of all diversion route implementations. If the City is not able to change the signal system timing remotely, it will dispatch Traffic Signal Technicians to specific intersections for manual programming or assign Norman Police Officers at the critical intersections along the alternate route to manually operate the signals.

ODOT will monitor the operation of the alternate routes and suggest enhancements, as needed, to the Incident Commander and municipal personnel. ODOT will also disseminate traveler information with details regarding the alternate route through DMS, Media and other available means.

In the event of a long-term closure, traffic may need to be detoured on a regional basis beyond the adjacent alternate routes. This type of diversion should be carried out through the dissemination of regional traveler information and in coordination with the media, Cleveland County, McClain County, Oklahoma County, the City of Newcastle, the City of Moore, the City of Norman and the City of Oklahoma City.

## 2.3 Return to Normal Conditions

Once the Interstate is re-opened to traffic and the alternate route is no longer needed, ODOT will coordinate with City of Norman staff to return operations to normal conditions. This would include resetting the traffic signal timings, removing traffic control devices such as arrow boards, traffic cones, and portable DMS. ODOT and its contractors will also remove any traveler information messages regarding the alternate route from DMS devices and also contact the media and other transportation agencies to inform them of the return to normal conditions.

## 2.4 Alternate Route Detour Plans

Two alternate route plans are recommended for I-35 detoured traffic. Option 1 should be used for all incidents occurring north of Lindsey Street where access to the on and off ramps at the Lindsey Street interchange are opened to traffic. Option 2 should be used for incidents occurring between the South Canadian River bridge and Lindsey Street.

Alternate Route Option No. 1

The **preferred** route provided in Option No. 1 uses the less congested parallel arterials in the City of Norman. The route includes Lindsey Street west of I-35, 36th Avenue West, between Lindsey Street and Tecumseh Road, and Tecumseh Road, between 36th Avenue West and I-35.

The route is 5.3 miles long and offers a combination of 4 and 5 lane wide urban arterial roadways constructed to ODOT standards. I-35 traffic would be diverted at the Tecumseh Road interchange on the north (Exit No. 112) and Lindsey Street on the south (Exit No. 108B).

The highest Average Daily Traffic volume on the route is less than 18,000 vehicles per day, with most segments carrying volumes in the 10,000 to 13,000 vehicle per day range.

All major intersections are controlled with traffic signals (a total of fourteen). Only one of the fourteen intersections is not interconnected (36th Avenue NW and Rock Creek Road). Special traffic signal plans can be downloaded from a remote location for the other thirteen locations.

Alternate Route Option No. 2

The route provided in Option No. 2 should only be used when the incident on I-35 restricts the use of the Lindsey Street interchange. It uses a more congested parallel route along the east side of I-35. The route includes State Highway 9, between I-35 and 24th Avenue West, 24th Avenue West, between State Higwhay 9 and Tecumseh Road, and Tecumseh Road, between 24th Avenue West and I-35.

The route is 5.6 miles long and offers a combination of 4 lane wide urban arterial roadways constructed to ODOT standards. The two-mile long segment between Robinson Street and Tecumseh Road offers a divided section with a well-managed access program. I-35 traffic would be diverted at the Tecumseh Road interchange on the north (Exit No. 112) and State Highway 9 East on the south (Exit No. 108A).

The highest Average Daily Traffic volume on the route is slightly over 30,000 vehicles per day (State Highway 9, between I-35 and 24th Avenue East). Traffic volumes are generally higher that in Option No. 1, particularly along 24th Avenue West, between State Highway 9 and Robinson Street, with volumes in the 20,000 vehicle per day range).

All major intersections are controlled with traffic signals (a total of fifteen). All the intersections are interconnected. Special traffic signal plans can be downloaded from a remote location upon notification of an incident involving the diversion of I-35 traffic.

Appendix A includes a map of the I-35 alternate routes and a summary of the steps necessary for efficient traffic diversion, including the specific responsibilities of each of the stakeholders.

## 3. COMMUNICATIONS

One of the key issues on any emergency scene is the ability for responding units to communicate with one another. The protocol for communications involving City of Norman Traffic Control Division will be through the Norman Police Department via 911 dispatch. Traffic Signal Technicians with the City of Norman may also be reached at 405-329-0528 (during regular working hours) or 405-226-0043 (afterhours or on weekends and holidays). Traffic Signal Technicians are on-call 24/7.

## 4. WORK ZONE CONSIDERATIONS

There are two effective strategies for implementing effective traffic incident management in a work zone. First, is to identify Traffic Incident Management as a planning priority. The deployment of an Advance Traffic Management System (ATMS)prior to construction on I-35 will enable ODOT to monitor the impacts of construction on the corridor. The second is to actively incorporate incident management as a key component of the reconstruction project. The inclusion of a comprehensive traffic incident management program in construction projects supports safety goals and provides traffic mitigation during construction.

I-35 has become an active work zone and will remain for several years. ODOT should establish a Traffic Incident Management (TIM) Team empowered to determine how existing strategies can be modified for the Work Zone. The TIM Team should meet with the contractor to determine the additional traffic incident management needs. Additional needs might include:

- Contact lists for contractor and utility personnel.
- Procedures for communicating with the contractor during an incident.
- Procedures for updating the TIM Team on changes to traffic patterns / traffic control.
- Emergency access requirements during construction.
- Coordination of Portable VMS for work zone construction with the I-35 ATMS.
- Revisions or changes to detour / alternate routes.
- Procedures for altering construction activities in response to incidents to facilitate emergency response activities/movement of traffic.
- Implementation of Variable Speed Limits in work zones and in response to incidents.
- Inclusion of break-down areas within the construction zones.
- Motorists Assistance Patrols in the work zone to aid in quick clearance of minor incidents or breakdowns.

The contractor should anticipate meeting with the TIM Team to identify all potential concerns and develop mitigation strategies. Since I-35 will be reconstructed over multiple phases, it will be necessary to develop strategies for each phase of the reconstruction. The contractor should document all Work Zone strategies and distribute the documentation to the TIM Team for their approval. Strategies that require implementation (signing, ITS devices, motorist assistance patrols) should be implemented prior to the start of construction.

The use of the Robinson Street interchange as a detour route must be avoided at all cost. Robinson Street immediately east and west of I-35 is the most congested segment of roadway in the City of Norman. The configuration of the Robinson Street interchange is already inadequate for normal traffic conditions and would result in gridlock if I-35 traffic is diverted through the area.

## 5. AGENCY ROLES AND RESPONSIBILITIES

As indicated previously, one of the key issues that must be addressed with the development of this Plan is the formalization of operational roles and responsibilities for traffic incident management on the corridor. As such, the Project Team has documented the Traffic Incident Management activities within the corridor.

Each agency responding to an incident in the corridor has specific priorities and responsibilities. During complex incidents, some of these roles may overlap. Documenting these roles and responsibilities will minimize the probability of conflicts and confusion during an actual incident.

The scene management responsibilities for the response agencies are listed below. Not all activities are required for every incident

**Oklahoma Highway Patrol (OHP)**

Incident Response Responsibilities:

- Incident Commander for non-injury/fatal crashes
- Traffic Control including highway closure
- Determine type of tow truck required and contact tow trucks provider
- Contact ODOT Resident Engineer, Risk Manager and Division Engineer
- Contact Norman Police Department
- Coordinate with the Norman Fire Department for contacting HAZMAT Team and Medical Examiner
- Act as the primary disseminator of regional roadway traffic information to the broadcast Media

**Fire / Rescue / EMS**

Incident Response Responsibilities:

- Incident Commander for injury/fatal crashes
- Lead medical / life saving efforts
- Support OHP in traffic control
- Coordinate with Fire for contacting HAZMAT Team and Medical Examiner

**ODOT and their Contractors**

Incident Response Responsibilities:

- Provide support and resources to Incident Commander such as sand trucks and traffic control devices
- Contact Norman Traffic Control Division
- Prepare incident report

**City of Norman**

Incident Response Responsibilities:

- Provide assistance based upon available resources for local traffic management as a result of a diversion from the Interstate

**Towing and Recovery**

Incident Response Responsibilities:

- Respond quickly to incident when called
- Coordinate with Incident Commander immediately upon arrival at the scene
- Remove vehicles in a safe manner

**HAZMAT Teams**

Incident Response Responsibilities:

- Respond quickly to incident when called
- Coordinate with Incident Commander immediately upon arrival at the scene

## 6. TRAFFIC SIGNAL OPERATIONS

The traffic signals in the alternate route corridors are owned and operated by the City of Norman. Implementation of advanced traffic signal systems allow for adjustments to the signal timings in "real time" can be an effective strategy for alleviating congestion during an incident.

The City of Norman uses Econolite ASC-3 Controllers interconnected with fiber optic cables. Interconnect systems exist along most of the alternate route corridors.

The City also uses Econolite's CENTRACS Traffic Management System for remote communications, malfunctioning alarms and general download and upload of traffic signal timing data. Limited video capabilities exist through Econolite's Autoscope video detection system cameras.

A thorough review of Norman's traffic signal system should be conducted by ODOT to determine what upgrades could be made to improve traffic signal operations during an I-35 incident (e.g., Adaptive Traffic Control Systems).

## 7. INSTITUTIONAL STRATEGIES

The following is a list of strategies that can be incorporated into existing ODOT activities. Most of these strategies require additional activities related to incident management rather than the deployment of systems. The Institutional Strategies are easy to implement, require relatively limited funding, and promote coordinated Traffic Incident Management among all agencies.

***Personnel Resource List*** – A prepared list of ODOT personnel resources improves the timely response of appropriate personnel for various incident types. The resource list should include contact information for personnel and department designations (traffic, maintenance, etc.). The resource list must be updated and distributed regularly.

***Equipment / Materials Resource List*** – A prepared list of equipment and materials improves the timely response of appropriate equipment for various incident types. This type of resource may be difficult to maintain due to the relocation of equipment such as arrow boards and portable DMS.

***Pre-planned Alternate Routes*** – Alternate route planning is a key aspect of response, site management, clearance, and motorist information. Pre-established detour routes provide quick removal of traffic from the Interstate, allowing easier access to the site by Emergency Responders, easier and more effective site management, and clear, definitive information for motorists forced off the Interstate.

***Communication Protocols*** – Radio communications between agencies is enhanced with predetermined frequency assignments, lists of channel access for responding agencies, and interagency communication protocols.

***Traffic Signal Control*** – Active traffic signal control is the responsibility of the City of Norman, including during the times of incidents on the Interstate. Special traffic signal timing plans at critical intersections along the alternate route can be implemented with relative ease. Upgrades to the various interconnect systems should be a priority and be included in future projects along I-35.

***Video Sharing*** – ODOT's CCTV along I-35 should be expanded to better cover the construction area and interchanges. There will be an inherent benefit to sharing this video feed with other agencies performing Traffic Incident Management activities.
Agreements between response agencies and ODOT are required for shared video feeds. The CCTV camera control would remain with ODOT.

***Interagency Training Program –*** Training programs can reduce response and clearance time by ensuring that personnel are trained to respond quickly and effectively. They enhance site management by providing a common understanding of the incident command system and program guidelines. Personnel training can improve motorist information by assuring a pre-established information dissemination procedure and designated personnel.

***Equipment Storage Sites –*** Equipment storage sites provide quick access to necessary equipment, improving both incident response and site management.

***Incident Response Manual -*** An Incident Response Manual, available to emergency response personnel, provides clear guidelines and information for responding to an incident, managing an incident, and informing the public. Much of the information necessary for quick response and incident management is predetermined, including guidelines, preplanned alternative routes, and general response information, thereby reducing the time and resources needed to address these issues during an incident.

***Closure and Alternate Route Guidelines*** – In addition to pre-determined routes and traffic control, guidelines should be determined for the implementation of alternate routes to ensure proper and effective use. Closure and Alternate Route Guidelines are included in Section 2.

***Media Interface Guidelines –*** One of the best sources of motorist information is the media. Improved media ties that provide fast, accurate information to the media will improve information dissemination to the traveling public.

***Public Education and Awareness Campaign –*** Public information activities may include websites, press releases, or newsletters informing the public of planned construction and phasing activities. These provide an opportunity to inform the public of procedures related to incidents such as the Quick Clearance Law. The use of public education campaigns, press releases, and signs along the Interstate can greatly enhance compliance with the Quick Clearance Law and accident alerts.

## 8. TECHNOLOGY / ITS DEPLOYMENTS

The use of advanced technologies is a proven strategy to enhance the efforts of traffic incident management. The technology should only be used to enable the responders to coordinate and communicate more effectively, and should not replace the actual direct communication and cooperation among incident management teams. Several technological strategies and programs are:

***I-35 ITS Deployments*** – Currently, ODOT has limited ITS deployments along the I-35 corridor. Upgrades are being planned and implemented in a number of phases that are tied to the individual projects along the corridor. The availability and use of a complete system early on in the reconstruction program will be beneficial.

It is recommended that ODOT share the scope of the ITS deployment plan with other stakeholders and TIM Team members to better understand the type of information that is available and the means of benefiting from direct access to this data. As a minimum, the system should include:

- Weather Stations
- CCTV Systems
- Dynamic Message Signs (DMS)
- Highway Advisory Radio (HAR)
- Vehicle Detection Stations (VDS)

***Traffic Signal Incident Timing Plans –*** Pre-established traffic signal control plans can be used to quickly implement alternative incident timing plans on the alternate routes during a closure of the Interstate. Traffic responsive equipment can ensure the most efficient use of roadways for the new traffic demand.

The TIM Team may evaluate the effectiveness of implementing traffic signal control plans within the framework of evaluating alternate routes. This evaluation could include the determination of road condition and congestion thresholds, which could trigger a traffic signal timing, plan change.

***Smart Work Zone Systems –*** Smart work zone systems, typically comprised of portable ITS equipment distributed on and along the roadway, monitors and controls traffic prior to and within a work zone. These systems may be stand-alone units (DMS, CCTV, Variable Speed Limits, Vehicle Detectors), stand-alone integrated systems (usually comprised of a co-located VMS, camera and Vehicle Detector), and/or systems comprised of multiple stand-alone units that are

integrated to form a traffic management system. The field devices could send traffic data and CCTV images to a remote base station for operator control of the system. These systems are also capable of autonomous control; for example, a programmed VDS may send a signal to a remote DMS to display a caution message when the detected speed decreases below a set threshold. A work zone system was included in the Main Street interchange project and it is anticipated that it will also be included in other future I-35 widening projects. Coordination of multiple system deployments by different contractors must be accounted for during initial design and construction.

If established, the TIM Team may make a number of recommendations to ODOT on Smart work zones, including:

- Number and type of devices, location and configuration of the system.
- Alert notification procedures
- Remote system monitoring

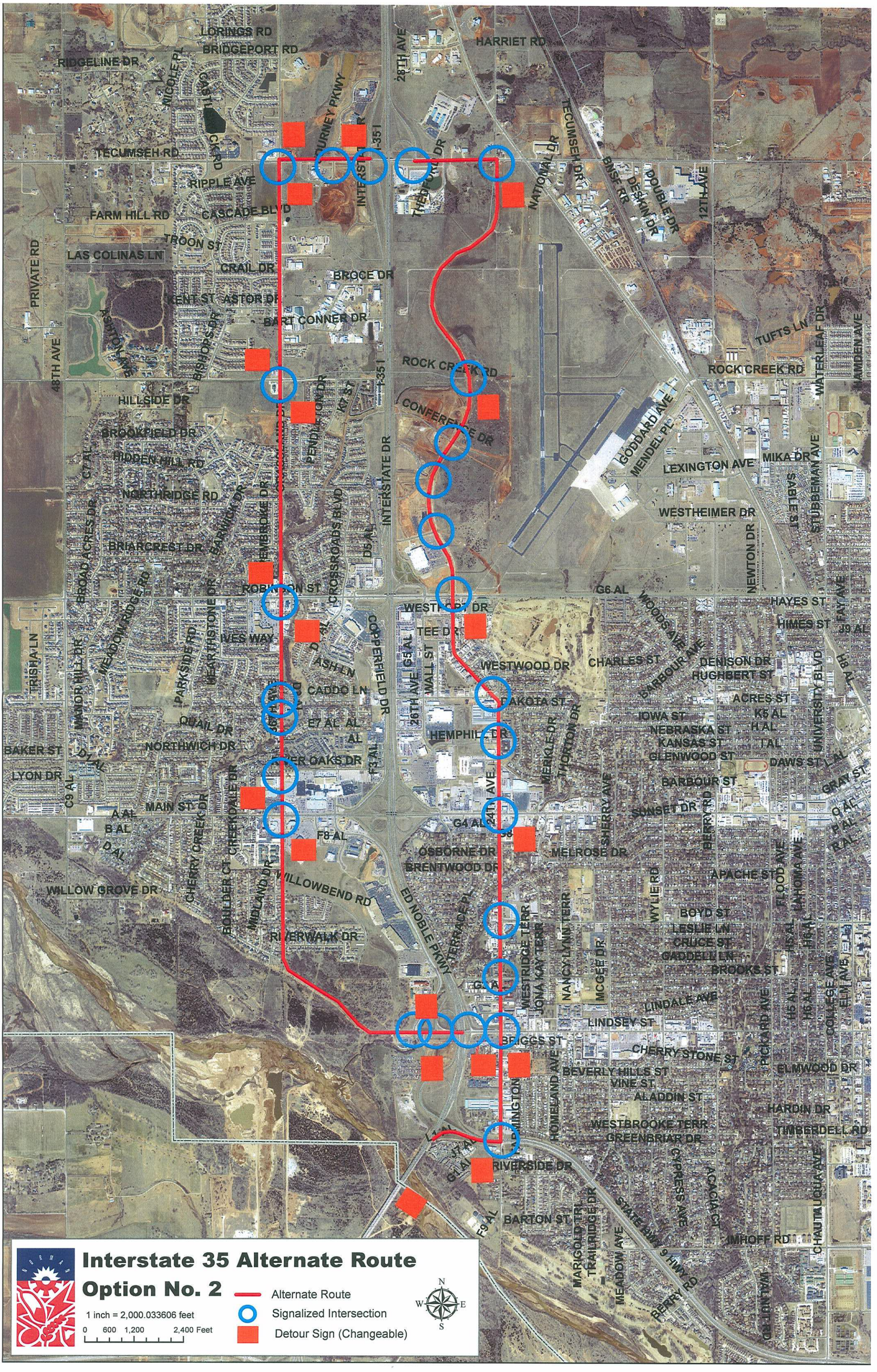
# Appendix A

## Alternate Route Plans
## &
## Responsibilities

# I-35 Diversion Plan

| Step No. | Event / Actions | Responsible Party |
|---|---|---|
| 1 | **Traffic Incident Reported** | 911 / City of Norman Dispatch |
| 2 | **Verification of Incident** | Norman P.D. / O.H.P. |
| 3 | **Decision to close I-35**<br>• O.H.P to contact Norman P.D. and ODOT Risk Manager | O.H.P. |
| 4 | **Notice to proceed with diversion plan and request for assistance with implementation**<br>• Provide location of I-35 closure and suggest Detour Plan Option<br>• Contact Caleb Riemer, ODOT Resident Engineer, @ (405) 388-8189 (Cel) or (405) 527-5569 (Office)<br>• Contact Public Works – Traffic Control Division, @ 405-226-0043 (Cel) or (405) 329-0528 (Office) | Norman P.D. |
| 5 | **Implementation of Diversion Route**<br>• Close I-35 on and off ramps as necessary | ODOT and their Contractors |
| 6 | **Activate Changeable message signs and implement special incident traffic signal timing plans** | City of Norman Traffic Control Division |
| 7 | **Decision to Reopen I-35**<br>• O.H.P. to contact Norman P.D. | O.H.P. |
| 8 | **Reopen I-35**<br>• Norman P.D. to contact ODOT and City of Norman Traffic Control<br>• I-35 ramps re-opened by ODOT and their subcontractors<br>• Traffic signal timing plans returned to normal by Norman Traffic Control | Norman P.D., Norman Traffic Control and ODOT |

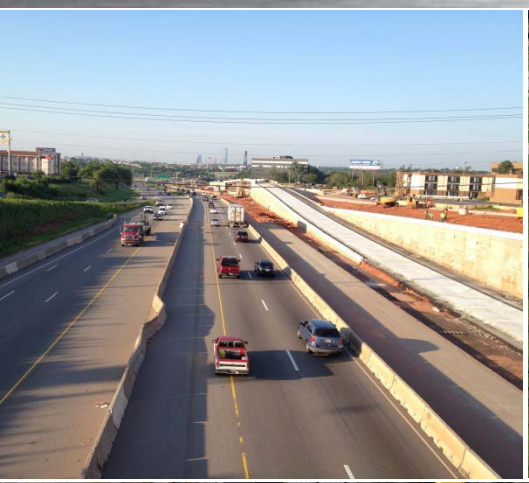

LORINGS RD
BRIDGEPORT RD
RIDGELINE DR
NICOLE PL
CASEY LN
TECUMSEH RD
CR 1
RIPPLE AVE
FARM HILL RD
CASCADE BLVD
TROON ST
LAS COLINAS LN
CRAIL DR
PRIVATE RD
48TH AVE
KENT ST
ASTOR DR
BISHOPS DR
BART CONNER DR
BROCE DR
HILLSIDE DR
BROOKFIELD DR
HIDDEN HILL RD
NORTHRIDGE RD
BRIARCREST DR
BROAD ACRES DR
MEADOWRIDGE RD
TRISHA LN
MAJOR HILL DR
PARKSIDE RD
BEARTHSTONE DR
IVES WAY
ROBINSON ST
QUAIL DR
NORTHWICH DR
LYON DR
BAKER ST
MAIN ST
CREEKDALE DR
CHERRY CREEK DR
WILLOW GROVE DR
FOULDER CT
MIDLAND DR
WILLOWBEND RD
RIVERWALK DR
ED NOBLE PKWY
TERRACE PL
TURNEY PKWY
28TH AVE
INTERSTATE 35
HARRIET RD
TECUMSEH RD
NATIONAL DR
BNSF RR
DEAN DR
DOUBLE DR
12TH AVE
TUFTS LN
WATERLEAF DR
HAMDEN AVE
ROCK CREEK RD
CONFERENCE DR
INTERSTATE DR
PENDLETON DR
KT ST
CROSSROADS BLVD
HEMBRIDGE DR
SARWICK DR
GODDARD AVE
MENDEL PL
LEXINGTON AVE
MIKA DR
WESTHEIMER DR
NEWTON DR
SABLE ST
STUBBEMAN AVE
WESTPORT DR
TEE DR
WESTWOOD DR
CHARLES ST
WOODS AVE
HARBOUR AVE
DENISON DR
HUGHBERT ST
HAYES ST
HIMES ST
FAY AVE
UNIVERSITY BLVD
ACRES ST
IOWA ST
NEBRASKA ST
KANSAS ST
GLENWOOD ST
DAWS ST
BARBOUR ST
SUNSET DR
BERRY RD
GRAY ST
APACHE ST
FLOOD AVE
OKLAHOMA AVE
BOYD ST
LESLIE LN
CRUCE ST
GADDELL LN
BROOKS ST
LINDALE AVE
LINDSEY ST
CHERRY STONE ST
BEVERLY HILLS ST
VINE ST
ALADDIN ST
HARDIN DR
TIMBERDELL RD
ELMWOOD DR
PICKARD AVE
COLLEGE AVE
ELM AVE
WESTBROOKE TERR
GREENBRIAR DR
CYPRESS AVE
ACACIA CT
CHAUTAUQUA AVE
IMHOFF RD
STATE HWY 9
BERRY RD
MEADOW AVE
MARIGOLD TRL
TRAILRIDGE DR
FARMINGTON AVE
HOMELAND AVE
RIVERSIDE DR
BARTON ST
HEMPHILL DR
MERKLE DR
THORTON DR
SHERRY AVE
MELROSE DR
OSBORNE DR
BRENTWOOD DR
WESTRIDGE TERR
JONA KAY TERR
NANCY LYNN TERR
MCGEE DR
WYLIE RD
OAKWOOD DR
CADDO LN
ASH LN
COPPERFIELD DR
WALL ST
26TH AVE
24TH AVE
A AL
B AL
C AL
D AL
E7 AL
F3 AL
F8 AL
G4 AL
G8 AL
G3 AL
G6 AL
G5 AL
D5 AL
K5 AL
H AL
I AL
J AL
H5 AL
H6 AL
J5 AL
J6 AL
L1 AL
G AL
F9 AL
Interstate 35 Alternate Route
Option No. 1
1 inch = 2,000 feet
0 600 1,200 2,400 Feet
Alternate Route
Signalized Intersection
Detour Sign (Changeable)
N
W
E
S


LORINGS RD
BRIDGEPORT RD
RIDGELINE DR
NICOLE PL
CASTLE RD
TURNEY PKWY
28TH AVE
HARRIET RD
TECUMSEH RD
RIPPLE AVE
FARM HILL RD
CASCADE BLVD
TROON ST
LAS COLINAS LN
CRAIL DR
BROCE DR
KENT ST
ASTOR DR
BART CONNER DR
PRIVATE RD
48TH AVE
BISHOPS DR
HILLSIDE DR
BROOKFIELD DR
HIDDEN HILL RD
NORTHRIDGE RD
BRIARCREST DR
BROAD ACRES DR
MEADOWRIDGE RD
TRISHA LN
MANOR HILL DR
HEARTHSTONE DR
PARKSIDE RD
IVES WAY
ROBINSON ST
HEMBRIDGE DR
CARWICK DR
CROSSROADS BLVD
INTERSTATE DR
ROCK CREEK RD
CONFERENCE DR
PENDLETON DR
KF ST
C7 AL
D5 AL
ASH LN
CADDO LN
QUAIL DR
NORTHWICH DR
BAKER ST
LYON DR
C9 AL
C AL
MAIN ST
A AL
B AL
D AL
CREEKDALE DR
CHERRY CREEK DR
WILLOW GROVE DR
FOULDER CT
MIDLAND DR
WILLOWBEND RD
RIVERWALK DR
COPPERFIELD DR
E7 AL
F3 AL
F8 AL
G3 AL
WALL ST
WESTWOOD DR
TEE DR
HEMPHILL DR
DAKOTA ST
MERKLE DR
THORTON DR
26TH AVE
24TH AVE
G4 AL
OSBORNE DR
BRENTWOOD DR
ED NOBLE PKWY
TERRACE PL
WESTRIDGE TERR
JONA KAY TERR
NANCY LYNN TERR
MCGEE DR
SHERRY AVE
MELROSE DR
SUNSET DR
BERRY RD
WYLIE RD
APACHE ST
BOYD ST
LESLIE LN
CRUCE ST
GADDELL LN
BROOKS ST
LINDALE AVE
LINDSEY ST
BRIGGS ST
CHERRY STONE ST
BEVERLY HILLS ST
VINE ST
ALADDIN ST
WESTBROOKE TERR
GREENBRIAR DR
RIVERSIDE DR
HOMELAND AVE
BARTON ST
MARIGOLD TR
TRAILRIDGE DR
MEADOW AVE
STATE HWY 9
IMHOFF RD
CHAUTAUQUA AVE
CYPRESS AVE
ACACIA CT
ELMWOOD DR
HARDIN DR
TIMBERDELL RD
PICKARD AVE
COLLEGE AVE
ELM AVE
FLOOD AVE
OKLAHOMA AVE
UNIVERSITY BLVD
DENISON DR
HUGHBERT ST
CHARLES ST
HARBOUR AVE
WOODS AVE
HAYES ST
HIMES ST
ACRES ST
IOWA ST
NEBRASKA ST
KANSAS ST
GLENWOOD ST
DAWS ST
GRAY ST
H AL
I AL
J AL
K5 AL
H6 AL
I5 AL
J9 AL
G6 AL
NEWTON DR
STUBBEMAN AVE
SABLE ST
FAY AVE
LEXINGTON AVE
MIKA DR
WESTHEIMER DR
GODDARD AVE
MENDEL PL
TUFTS LN
WATERLEAF DR
HAMDEN AVE
ROCK CREEK RD
DOUBLE D DR
DEERAN DR
12TH AVE
NATIONAL DR
TECUMSEH DR
BNSF RR
I-35
Interstate 35 Alternate Route
Option No. 2
1 inch = 2,000.033606 feet
0 600 1,200 2,400 Feet
Alternate Route
Signalized Intersection
Detour Sign (Changeable)
N
W
E
S

Oklahoma Department of Transportation

# I-235/US-77 & I-44 Interchange
# Phases 4A & 7
# Transportation Management Plan

APRIL 18, 2016



ODOT
Oklahoma Department of Transportation

leidos

leidos.com/engineering

Table of Contents

# 1.0 Project Description

The project comprises of reconstruction of I-235 from N 36th St to north of N 50th St, N 50th St from Hudson Ave to Cooper Ave, and several thousand feet of Burlington Northern-Santa Fe Railroad track. The project consists of two phases of the overall I-235/1-44 Interchange reconstruction project. Phases "4A" and "7" were originally designed to be two separate projects, built at different times, but they will now be built together with one suggested construction sequence and traffic control plan.

Key features of the construction project are summarized below.

- Work zone limits
  - **I-235: N 36th St to N 63rd St**
  - **50th St: Hudson Ave to Cooper Ave**
- Specific traffic restrictions expected on major roadways during the work (e.g., shoulder closures, lane closures, lane shifts). For additional details see construction plans for J/P 09033(16).
  - **Stage 1C – I-235 NB inside shoulder closed**
  - **Stage 1D to Stage 1E – I-235 NB outside shoulder closed**
  - **Stage 2B – I-235 NB/SB short-term one lane closure and crossover for I-235 SB lowering**
  - **Stage 2C to Stage 6E – I-235 all lanes shifts around new railroad pier**
  - **Stage 3A – I-235 short term closure between 36th St and I-44 for 50th St Bridge removal**
  - **Stage 3A to Stage 5B – 50th St Bridge closure (50th St closure due to Bridge Construction)**
  - **Stage 3F – 50th St, from Hudson Ave to Bridge, and Ramp 50A closed**
  - **Stage 4B – 50th St, from the Bridge to just east of Sewell Ave, closed**
  - **Stage 4C to Stage 4D – possible short-term closures or lane reductions due to BNSF railroad bridge construction**
  - **Stage 5B – possible short-term closures or lane reductions due to N 50th St bridge construction**
  - **Stage 5D – I-235 short term closure between 36th St and I-44 for BNSF railroad bridge removal**
  - **Stage 5F – Ramp 44D short term closure then alignment shift**
  - **Stage 6C to Stage 6E – I-235 NB lanes shift inside**
  - **Stage 6C to Stage 6D – Ramp 50B closed**
  - **Stage 7A to Stage 7C – I-235 NB lanes shift outside**
  - **Stage 7B to Stage 8C – I-235 SB lanes shift outside and on I-235 NB Detour**
  - **Stage 8 – I-235 SB lanes shifted inside (into NB lane, SB closed)**
- Specific roadways that will be directly affected by the project work zones.
  - **I-235, 50th St, Sewell Ave**
- Regional projects that may impact each other.
  - **I-40 Crosstown**
- Project schedule.
  - **Bid Letting April 2016**
  - **850 Construction Calendar Days**

## 2.0 TMP Team—Roles and Responsibilities

Defining roles and responsibilities of the various involved agencies from the initial stages of a project helps to coordinate all the activities related to TMP development, implementation, and monitoring. This section includes contact information and roles and responsibilities for major personnel involved in the project.

The following tables list contact information and roles and responsibilities of major personnel involved in this project.

| TMP Development Managers | |
|---|---|
| **Department of Transportation (DOT)** | **Consultant** |
| Name/Title: Tarek Maarouf<br>Unit: Traffic Engineering Division<br>Phone: 405-522-2584<br>Email: tmaarouf@odot.org | Name/Title: Duane Kranz<br>Unit: Leidos Engineering<br>Phone: 405-607-6908<br>Email: duane.j.kranz@leidos.com |
| **Roles and Responsibilities:** Primarily responsible for developing the TMP | |

| TMP Implementation/Monitoring Manager | |
|---|---|
| **Contractor Contact A** | **Contractor Contact B** |
| Name/Title:<br>Unit:<br>Phone:<br>Email: | Name/Title:<br>Unit:<br>Phone:<br>Email: |
| **Roles and Responsibilities:** Primarily responsible for implementing the TMP | |

| ODOT Construction Contacts | |
|---|---|
| **Edmond Construction Residency Engineer** | **Division 4 Construction Engineer** |
| Name/Title: Tom Hubbard<br>Phone: (405) 475-2860<br>Email: thubbard@odot.org | Name/Title: Joe Echelle<br>Phone: (580) 336-7340<br>Email: jechelle@odot.org |
| **Construction Project Manager** | |
| Name/Title:<br>Phone:<br>Email: | |
| **Roles and Responsibilities:** TMP oversight | |

| Public Information | |
|---|---|
| **Public Information Officer** | **ODOT Asst. Div. Engineer for ITS & Ops** |
| Name/Title: Terri Angier<br>Unit: Media & Public Relations<br>Phone: (405) 521-6000<br>(405) 210-4294<br>Email: tangier@odot.org | Name/Title: Alan Stevenson<br>Phone: (405) 521-6460<br>Email: astevenson@odot.org |
| **Roles and Responsibilities:** Provide real-time public awareness of the work zone, including detection, prevention, and response to incidents | |

| Emergency Service Contacts | |
|---|---|
| **Oklahoma Highway Patrol** | **ODOT Risk Manager** |
| Name/Title: Oklahoma City HQ<br>Unit: Troop A<br>Phone: (405) 425-2285 | Name/Title:<br>Unit:<br>Phone:<br>Email: |
| **Fire and Emergency Medical Services (FEMS) & HAZMAT** | **OKC Police Department (PD)** |
| Name/Title: OKC Fire Dept.<br>Unit: Operations<br>Phone: (405) 297-3335 | Unit: Emergency<br>Phone: 911<br>Unit: Non-Emergency<br>Phone: (405) 231-2121 |
| **Roles and Responsibilities:** Need to be kept informed about work zone activities, especially in case of a road closures, and contacted during a work zone incident | |

| City of Oklahoma City Contacts | |
|---|---|
| **Assistant City Engineer** | **City Traffic Engineer** |
| Name/Title: Debbie Miller<br>Unit: Public Works Department<br>Phone: (405) 297-3832<br>Email: debbie.miller@okc.gov | Name/Title: Stuart Chai<br>Unit: Public Works Department<br>Phone: (405) 297-2003<br>Email: stuart.chai@okc.gov |
| **Roles and Responsibilities:** Need to be kept informed about work zone activities affecting their jurisdiction | |

| Burlington Northern Sante Fe Contacts | |
|---|---|
| **Roadmaster** | **Public Projects Manager** |
| Name/Title: James R Henley<br>Unit: BNSF Railway Company<br>Phone: 405-670-7693<br>Email: James.Henley@BNSF.com | Name/Title: Kamalah Young<br>Unit: BNSF Railway Company<br>Phone: 913-551-4484<br>Email: Kamalah.Young@BNSF.com |
| **Roles and Responsibilities:** Need to be kept informed about work zone activities affecting their jurisdiction | |

# 3.0 Preliminary Work Zone Impact Assessment

As challenges vary greatly from one project to another, preliminary assessment of work zone impacts were identified in the early planning stages of the project to help identify issues or uncover problem areas that should be considered during project development. The responses to the following items helped determine the level of assessment required for the subject project work zones.

- Does the project includes a long-term closure and/or extended weekend closure? **Yes**
- If yes, what is/are the applicable type of facilities?
  - Freeway
    - **I-235: max. 6 weekend closures**
  - Minor Arterial
    - **50th St: long-term closure (350 days)**
- Can traffic be detoured? **Yes.**
- Is the local alternate detour route in good condition? **Yes.**
- Will the detour route have a detrimental impact on emergency vehicles, school buses, or other sensitive traffic? **No.**
- Are there load limit restrictions on the detour? **No.**
- Are there bridge/culvert height or width restrictions on the detour? **No.**
  Is the existing shoulder sufficient to support traffic during construction? **No, the existing shoulder along I-235 will be rebuilt where necessary.**
- Is additional width required on culverts or bridges to maintain traffic? **No.**
- Is there a pedestrian/bicycle facility that must be maintained? **No.**
- Would a temporary structure(s) be required? **No.**
- Would a median crossover be needed? **Yes.**
- Would it be necessary to maintain railroad traffic? **Yes.**
- Could maintenance of traffic have an impact on existing or proposed utilities? **Yes, maintenance of traffic will have an impact on existing utilities, so the existing utilities will be relocated.**
- Does it appear that maintenance of traffic will require additional right-of-way? **No.**
- Can the contractor restrict the roadway during the time periods listed?
  - a.m. & p.m. peak hours both directions – **A maximum of one lane per direction may be closed by the contractor with a lane rental fee of $10,000/hour/lane between 6:01A.M. – 7:59 P.M.**
- Overnight– **Yes, one lane per direction may be closed by the contractor between 8:00P.M. – 6:00 A.M. weekdays at no fee.**
- Weekends – **Yes, one lane per direction may be closed by the contractor at no fee.**
- Will project timing (for example, start or end date) be affected by special events:
  - School closings or openings? **No.**
  - Holidays? **No.**
  - Sporting events? **No.**

- Are there any projects to be considered along the corridor or in the region? **No.**
  - Roadwork in the immediate area that may affect traffic or the contractor's operations? **No**.
  - Roadwork on other roads that may affect the use of alternate routes? **No.**
- Are there other maintenance of traffic issues? If so, specify. **See Section 5.2 for details on the quantitative traffic analysis, expected impacts, and potential strategies to manage the impacts.**

## 4.0 Existing Conditions

This section provides an overview of the existing conditions within the study area.

- Roadway characteristics (history, roadway classification, number of lanes, geometrics, urban/suburban/rural).
  - **I-235**
    - **4-lane Freeway**
    - **BNSF Railroad bridge over I-235**
    - **Urban**
  - **50th St**
    - **4-lane Minor Arterial**
    - **Existing Bridge over I-235 and BNSF Railroad bridge**
    - **Urban**
- Historical traffic data (volumes, speed, capacity, volume/capacity, percent trucks).
  - **I-235 / US-77**
    - **Volume: 80,400 (2002 AJR)**
    - **Speed Limit: 60 mph**
    - **Capacity: 4700/hr**
    - **Volume/Capacity: 0.99**
    - **Percent Trucks (DHV): 2.0%**
    - **Percent Trucks (AADT): 2.5%**
  - **50th St**
    - **Volume: 10,835 (1997)**
    - **Speed Limit: 40 mph**
    - **Capacity: 3800/hr**
    - **Volume/Capacity: 0.17**
    - **Percent Trucks (DHV): 2.0%**
    - **Percent Trucks (AADT): 2.5%**
- Traffic operations (signal timing, traffic controls). **There are no existing traffic signals located in the project area.**
- Crash data
  - **The crash data provided by ODOT includes all crashes on I-235/US-77 from N 23rd St to Wilshire Blvd**

- **Corridor had a total of 1067 accidents in 2011-2013. Including partial data from 2014 there was a total of 1228 accidents from the data set.**
- **Most accidents seem to be caused by regular commuting congestion.**
  - **18.7% of accidents occurred from 7 A.M. - 9 A.M.**
  - **32.0% of accidents occurred from 4 P.M. - 6 P.M.**
  - **Nearly half of those accidents were vehicles following too closely**
  - **61.2% of the total accidents were rear-end collisions**
- **Weather did not seem to play a large role in accidents**
  - **85.7% of accidents occurred in dry roadway conditions and nearly 80% of those occurred during daylight**
  - **59.8% of the total accidents occurred during clear weather conditions**
- **92.2% of all crashes were multi-vehicle accidents**
- **Fridays had the highest percentage of accidents at 20.9% while the least accidents occurred on weekends. Less than 15% of the accidents occurred on Saturday and Sunday combined.**

- Pedestrian/bicycle facilities: **None.**
- Transit facilities: **None.**
- Truck routes: **No designated truck routes.**
- Local community and business concerns/issues.

  **Comments were received during the public meeting process. Concerns included:**
  - **Access to N 50th St from I-235**
  - **Access to I-235 from N 50th St**
  - **Increased truck traffic on alternate routes**

The table below summarizes pertinent project information including volumes, capacity and level of service.

**Roadways Affected By MOT Plans—Summary**

| Roadway/Street Name | Classification | ADT | Capacity (One-way) | Peak Hour Volume (One-way) | Existing LOS | Proposed LOS |
|---|---|---|---|---|---|---|
| I-235 / US-77 | Freeway | 80,400 | 4700/hr | 4280 | E | C |
| N 50th Street | Minor Arterial | 10,835 | 3800/hr | 650 | A | B |
| | | | | | | |

# 5.0 Operational Analysis

This section provides information on the safety and mobility aspects within the project influence area, including traffic safety, traffic analysis, and other issues and concerns. The intent of this operational analysis is to identify potential work zone impacts, and guide selection of TMP strategies.

## 5.1. Safety Analysis

A safety analysis helps identify the potential locations for monitoring and/or other strategy deployments during construction to help manage work zone safety. Ongoing monitoring of the

potential locations for any increase in crashes is important while the TTC, TOP, and PI&O are implemented.

**The table below summarizes the crash data provided by ODOT from I-235/US-77 from N 23rd St to Wilshire Blvd during the years of 2011-2014.**

| Summary of Crashes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Intersection Name/ Control Section** | **Injuries** | **Fatalities** | **Work Zone** | **Type of Crashes** | | | | | | | | |
| | | | | **Pedestrian** | **Angle-Turning** | **Sideswipe** | **Rear-End** | **Rollover** | **Head-on** | **Single-Vehicle** | **Other** | **Total** |
| **I-44 EB Exit to Broadway Ext.** | 1 | 0 | 3 | 0 | 0 | 0 | 3 | 1 | 0 | 1 | 0 | 5 |
| **I-44 WB Entrance from Broadway Ext.** | 15 | 0 | 24 | 0 | 0 | 2 | 23 | 0 | 0 | 0 | 3 | 28 |
| **I-44 EB Collector Distributor Road** | 0 | 0 | 0 | 0 | 0 | 2 | 7 | 0 | 0 | 0 | 0 | 9 |
| **I-44 & I-235/US-77 Underpass** | 34 | 0 | 1 | 0 | 3 | 1 | 55 | 0 | 3 | 0 | 4 | 65 |
| **I-44 WB Collector Distributor Road** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| **I-44 WB Exit to Broadway Ext.** | 4 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 2 |
| **I-44 EB Entrance from Broadway Ext.** | 2 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 3 |
| **Broadway Ext. & I-44 Overpass** | 9 | 0 | 0 | 0 | 0 | 1 | 8 | 0 | 0 | 0 | 0 | 9 |
| **I-235 & N. 23rd St. Overpass** | 61 | 0 | 0 | 1 | 44 | 1 | 61 | 0 | 1 | 0 | 4 | 112 |
| **I-235 SB Exit to N. 23rd St.** | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 3 |
| **I-235 NB Entrance from N. 23rd St.** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| **Mile Marker 3** | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |

| Summary of Crashes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection Name/ Control Section | Injuries | Fatalities | Work Zone | Type of Crashes | | | | | | | | |
| | | | | Pedestrian | Angle-Turning | Sideswipe | Rear-End | Rollover | Head-on | Single-Vehicle | Other | Total |
| **I-235 NB Exit to N. 36th St.** | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 |
| **I-235 & N. 36th St. Overpass** | 16 | 0 | 0 | 0 | 15 | 0 | 15 | 0 | 0 | 1 | 2 | 33 |
| **Mile Marker 4** | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 3 |
| **BNSF RR Underpass** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| **I-235 SB Entrance from N. 50th St.** | 2 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 0 | 0 | 0 | 5 |
| **I-235 & N. 50th St. Underpass** | 1 | 0 | 0 | 0 | 2 | 0 | 6 | 1 | 0 | 1 | 0 | 10 |
| **I-235 NB Exit to 50th/Santa Fe** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| **I-235 SB Exit to 50th/Santa Fe (removed in new design)** | 5 | 0 | 2 | 0 | 3 | 0 | 2 | 1 | 0 | 0 | 1 | 7 |
| **I-235 NB Entrance from N. 50th St.** | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 1 | 4 |
| **Mile Marker 5** | 1 | 0 | 0 | 0 | 1 | 0 | 5 | 0 | 1 | 0 | 0 | 7 |
| **I-235 NB Exit to N. 63rd St.** | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 4 | 0 | 7 |
| **I-235 SB Entrance from N. 63rd St.** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| **I-235 & N. 63rd St. Underpass** | 19 | 0 | 0 | 0 | 22 | 0 | 12 | 0 | 1 | 1 | 1 | 37 |
| **I-235 NB Entrance from N. 63rd St.** | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| **I-235 SB Entrance from Wilshire** | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| **I-235 & Wilshire Overpass** | 7 | 0 | 0 | 0 | 11 | 1 | 4 | 0 | 0 | 4 | 0 | 20 |

## 5.2. Traffic Analysis

Traffic operational analysis was conducted for the project area freeway mainline, ramp merge, ramp diverge, and weave sections, and intersections using Synchro and HCS, both based on the methodologies and guidelines of the Highway Capacity Manual (HCM).

**Analysis was completed for the following roadways:**

- **Existing I-235**
- **Existing 50th St**
- **I-235 short-term crossover**

**Analysis was completed for the following ramps:**

- **Ramp 44D**
- **Ramp 50A**
- **Ramp 50C**

| Roadways Affected By MOT Plans—Summary | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ramp | Freeway Peak Hour Volume (One-way) | Ramp Peak Hour Volume (One-way) | Capacity (One-way) | Merge Length (ft) | Density (pc/mi/ln) | Existing LOS | Construction LOS |
| I-235 / US-77 | 4280 | - | 4500/hr | - | 45.0 | E | F |
| N 50th Street | 650 | - | 3800/hr | - | 49.4 | A | (Closed) |
| 44D - Existing | 3330 | 950 | 4700 | 750 | 36.9 | E | - |
| 44D – Stage 5 & 6 | 3330 | 950 | 4700 | 200 | 40.4 | E | F |
| 44D – Stage 7 | 3330 | 950 | 4700 | 400 | 39.1 | E | F |
| 44D – Stage 8 | 3330 | 950 | 4700 | 100 | 41.0 | E | F |
| 50A – Existing | 4280 | 190 | 4700 | 1000 | 38.2 | F | - |
| 50C&44B – Weave Existing | 3770 | 400 | 4069 | 400 | - | F | - |
| 50C – Stage 8 | 3770 | 400 | 4700 | 100 | 49.1 | F | F |

**Through the analysis it was observed that the I-235 mainline is operating just under capacity during normal conditions. The reduction in speed alone for the work zone will lower the capacity enough to be oversaturated, LOS F. Therefore, any ramp analysis is inconsequential because if the freeway is over-capacity then any ramp junction will also be over-capacity regardless of ramp volume or merge length. There will be major delays during the I-235 short-term crossover if the construction occurs during a typical workday with typical commuting peak hour volumes. Based on the anticipated vehicular delays, it is recommended that this work be accelerated and completed either during a regular weekend, an extended holiday weekend, or traffic be detoured to an alternate route.**

### 5.2.1. Alternatives/Impact Assessment

A work zone impact assessment is the process of understanding the safety and mobility impacts of a road construction, rehabilitation, or maintenance projects. The analysis compares and documents various work zone options and associated maintenance of traffic constraints, including staging/phasing options as well as temporary traffic control options, for each project and work zone design alternative. Performing an alternatives analysis during the preliminary stages of the project helps in selecting the best option going forward.

An alternative assessment may involve a high-level qualitative analysis or a detailed quantitative analysis using various models. It involves a comparison between existing and future traffic operations for different alternatives.

To assess the impacts, traffic analysis is usually conducted for existing conditions and proposed work zone alternatives, and the results compared. Traffic analysis helps to:

- Provide a baseline to compare with future work zone alternatives.
- Identify the extent of possible traffic backups, which can then be used to determine potential detour routes or where traffic may naturally reroute itself, or locations that may need additional monitoring.
    - **Preconstruction queues of 2 miles southbound AM Peak and northbound PM Peak but may increase during construction**

- **Traffic may reroute to OK-74/I-44, I-35 or parallel arterials**

The table below provides an easy comparison of MOEs for different alternatives. Agencies can modify the table to meet their needs.

| Summary Of MOEs For Alternatives – Existing with Construction Conditions | | | |
|---|---|---|---|
| **MOEs** | **Existing** | **4-lane Work Zone** | **2-lane Work Zone** |
| **LOS** | **E** | **F** | **F** |
| **V/C** | **0.99** | **1.05** | **2.48** |
| | | | |

This section also includes a brief review of the impact assessment of the selected construction alternative in different areas such as:

- Community Accessibility—**Commercial businesses and residential areas near N 50th St may be affected by the various closures of I-235 exit and entrance ramps to and from N 50th St.**
- Pedestrians and Bicyclists—**No existing pedestrian or bicycle facilities will be impacted.**
- Public Transportation—**No existing bus routes will be impacted.**
- Commercial Vehicles—**Will use normal routes or detour routes**.
- Utilities—**Have already been considered during the temporary traffic control design process.**

## 6.0 Work Zone Impact Management Strategies

This section provides an overview of various strategies deployed to improve the safety and mobility of work zones and reduce the work zone impacts on the road users, community, and businesses.

The strategies are grouped according to the following three categories.

1. Temporary Traffic Control (TTC)
    a. **Designs have been completed for the contractor's use. See Construction Plan, State Job No. 09033(16), Sheets Nos. 100 to 157.**
2. Transportation Operations (TO)
    a. **Smart Work Zone:**
    A Smart Work Zone system will be implemented with the temporary traffic control measures. The system includes speed sensors and wirelessly-connected changeable message signs to convey speed and travel time through the work zone. Portable message signs will also be deployed along nearby cross streets to improve driver awareness.
    b. **ODOT ITS Coordination:**
    Contractor and Resident Engineer shall coordinate occur with ODOT ITS, as necessary, in order to capitalize on the existing ITS infrastructure for information

gathering and message dissemination. ODOT's permanent dynamic message signs located on the surrounding freeway system could be used to display such things as travel time, incident information, alternate/detour routes. Work zone traffic operations could also be monitored by the existing ITS tower located at the I-235/I-44 interchange.

**c. Regional Signage:**

Special construction signs will be placed on existing overhead sign structures and at I-235/US-77 cross streets to inform drivers of the construction area and to consider alternate travel routes. Portable Changeable Message Signs will be used on regional freeways that interchange with I-235/US-77 in order to inform drivers of the construction area/work before using I-235/US-77. Construction signs will be placed prohibiting cell phone use throughout the construction zone to improve driver awareness and safety.

**d. Alternate & Detour Routes:**

Throughout the construction process traffic will need to be detoured for planned I-235 full closures and likely for unplanned incidents. ODOT's recommended detour is I-44 and I-35. It will be the responsibility of the contractor set up signage and/or message boards to adequately detour traffic. It will also be the contractor's responsibility to inform the ODOT Construction Residency a minimum of 6 weeks before any planned closure and immediately upon an incident within the work zone.

**e. Incident Management Plan:**

During unplanned incidents within the work zone it is important to coordinate all responsible parties immediately in order to provide safety as well expedite normal traffic operations. Each agency will have their specific roles depending on the type of incident. Roles will be assigned as follows:

***Oklahoma Highway Patrol (OHP)-***

- Acting Incident Commander for non-injury/fatal crashes
- Traffic Control including highway closure
- Determine type of tow truck required and contact tow trucks provider
- Contact ODOT Resident Engineer, Risk Manager and Division Engineer
- Contact Oklahoma City Police Department
- Coordinate with the Oklahoma City Fire Department for contacting HAZMAT Team and Medical Examiner
- Act as the primary disseminator of regional roadway traffic information to the broadcast Media

***Fire and Emergency Medical Services (FEMS)-***

- Acting Incident Commander for injury/fatal crashes
- Lead medical/lifesaving efforts
- Support OHP in traffic control

- Coordinate with Fire for contacting HAZMAT Team and Medical Examiner

***ODOT & Contractor-***

- Provide support and resources to Incident Commander such as sand trucks and traffic control devices
- Coordinate possible detour route
- Prepare incident report

***Tow Services-***

- Coordinate with Incident Commander immediately upon arrival at the scene
- Remove vehicles in a safe manner

***HAZMAT-***

- Coordinate with Incident Commander immediately upon arrival at the scene

3. Public Information and Outreach (PI&O)
   a. **PI&O to inform the traveling public about ramp closures and especially the mainline I-235 closures. The Public information outreach will encompass key stakeholders including City of Oklahoma City and Oklahoma County, media and the public.**
   b. **It is the responsibility of the ODOT Construction Residency or the designated consultant in charge of Construction Residency duties (with prior approval from ODOT Division Construction Manager) for this project to notify ODOT's Media & Public Relations office at least six weeks in advance of the start of construction. All additional notifications to Media & Public Relations office are required no less than 48 hours in advance of any lane and ramp closures and other details affecting the public throughout this project for media outreach purposes. Emergency lane and ramp closures must also be given to the Media & Public Relations office for purposes of traffic advisories with media outreach.**

The table below provides a summary of the project specific work zone management strategies along with cost information for significant items.

| Temporary Traffic Control | √ | Cost |
|---|---|---|
| **Control Strategies** | √ | |
| 1. Construction phasing/staging | √ | |
| 2. Full roadway closures | √ | |
| 3. Lane shifts or closures | √ | |
| 4. One-lane, two-way controlled operation | N/A | |
| 5. Two-way, one-lane traffic/reversible lanes | N/A | |
| 6. Ramp closures/relocation | √ | |

| | | |
|---|---|---|
| 7. Freeway-to-freeway interchange closures | √ | |
| 8. Night work | √ | |
| 9. Weekend work | √ | |
| 10. Work hour restrictions for peak travel | √ | |
| 11. Pedestrian/bicycle access improvements | N/A | |
| 12. Business access improvements | N/A | |
| 13. Off-site detours/use of alternate routes | √ | |
| **Traffic Control Devices** | √ | $2.05M |
| 14. Temporary signs | √ | |
| 15. Arrow boards | √ | |
| 16. Channelizing devices | √ | |
| 17. Temporary pavement markings | √ | |
| 18. Flaggers and uniformed traffic control officers | N/A | |
| 19. Temporary traffic signals | N/A | |
| 20. Lighting devices | N/A | |
| **Project Coordination Strategies** | √ | |
| 21. Other area projects | N/A | |
| 22. Utilities | √ | |
| 23. Right-of-Way | √ | |
| 24. Other transportation infrastructure | N/A | |
| **Innovative Contracting Strategies** | √ | |
| 25. Design-Build | N/A | |
| 26. A+B Bidding | √ | |
| 27. Incentive/Disincentive clauses | √ | $2,515,000 |
| 28. Lane rental | √ | $10,000/ln/hr |
| 29. Performance specifications | N/A | |
| **Innovative or Accelerated Construction Techniques** | N/A | |
| 30. Prefabricated/precast elements | N/A | |
| 31. Rapid cure materials | N/A | |

| Transportation Operations | √ | Cost |
|---|---|---|
| **Demand Management Strategies** | N/A | |
| 1. Transit service improvements | N/A | |
| 2. Transit incentives | N/A | |
| 3. Shuttle services | N/A | |
| 4. Parking supply management | N/A | |
| 5. Variable work hours | N/A | |
| 6. Telecommuting | N/A | |
| 7. Ridesharing/carpooling incentives | N/A | |
| 8. Park-and-Ride promotion | N/A | |

| | | |
|---|---|---|
| **Corridor/Network Management Strategies** | √ | |
| 9. Signal timing/coordination improvements | N/A | |
| 10. Temporary traffic signals | N/A | |
| 11. Street/intersection improvements | N/A | |
| 12. Bus turnouts | N/A | |
| 13. Turn restrictions | N/A | |
| 14. Parking restrictions | N/A | |
| 15. Truck/heavy vehicle restrictions | N/A | |
| 16. Reversible lanes | N/A | |
| 17. Dynamic lane closure system | N/A | |
| 18. Ramp closures | √ | |
| 19. Railroad crossing controls | N/A | |
| 20. Coordination with adjacent construction site(s) | N/A | |
| **Work Zone ITS Strategies** | √ | $397,600 |
| 21. Late lane merge | N/A | |
| 22. PCMS with speed display | √ | |
| 23. Travel time estimation system | √ | |
| 24. Advanced speed information system | √ | |
| 25. Advanced congestion warning system | √ | |
| 26. Conflict warning system (e.g., construction vehicles entering roadway) | N/A | |
| 27. Travel time monitor system | √ | |
| 28. Freeway queue monitor system | √ | |
| 29. CCTV monitoring | √ | |
| 30. Real-time detour | N/A | |
| **Work Zone Safety Management Strategies** | √ | |
| 31. Speed limit reduction/variable speed limits | √ | |
| 32. Temporary traffic signals | N/A | |
| 33. Temporary traffic barrier | √ | |
| 34. Movable traffic barrier systems | N/A | |

| Transportation Operations | √ | Cost |
|---|---|---|
| 35. Crash cushions | √ | |
| 36. Temporary rumble strips | N/A | |
| 37. Intrusion alarms | N/A | |
| 38. Warning lights | √ | |
| 39. Automated flagger assistance devices (AFADs) | N/A | |
| 40. Project task force/committee | N/A | |
| 41. Construction safety supervisors/inspectors | √ | |
| 42. Road safety audits | N/A | |
| 43. TMP monitor/inspection team | √ | |

| Incident Management and Enforcement Strategies | √ | |
|---|---|---|
| 44. ITS for traffic monitoring/management | √ | |
| 45. TMC | N/A | |
| 46. Surveillance (e.g., CCTV) | √ | |
| 47. Helicopter for aerial surveillance | N/A | |
| 48. Traffic Screens | N/A | |
| 49. Call boxes | N/A | |
| 50. Mile-post markers | N/A | |
| 51. Tow/freeway service patrol | N/A | |
| 52. Total station units | N/A | |
| 53. Photogrammetry | N/A | |
| 54. Media coordination | N/A | |
| 55. Local detour routes | √ | |
| 56. Contract support for incident management | N/A | |
| 57. Incident/Emergency management coordination | N/A | |
| 58. Incident/Emergency response plan | N/A | |
| 59. Dedicated (paid) police enforcement | √ | $21,000 |
| 60. Cooperative police enforcement | N/A | |
| 61. Automated enforcement | N/A | |
| 62. Increased penalties for work zone violations | √ | |
| 63. Emergency pull-offs | N/A | |

| Public Information and Outreach | √ | Cost |
|---|---|---|
| **Public Awareness Strategies** | | |
| 1. Branding | | |
| 2. Press kits | | |
| 3. Brochures and mailers | | |
| 4. Press releases/media alerts | | |
| 5. Mass media (earned and/or paid) | | |
| 6. Paid advertisements | | |
| 7. Project Information Center | | |
| 8. Telephone hotline | | |
| 9. Planned lane closure website | | |
| 10. Project website | | |
| 11. Public meetings/hearings, workshops | | |
| 12. Community task forces | | |
| 13. Coordination with media/schools/business/emergency services | | |
| 14. Work zone education and safety campaigns | | |
| 15. Work zone safety highway signs | | |
| 16. Rideshare promotions | | |
| 17. Visual information | | |

| Public Information and Outreach | √ | Cost |
|---|---|---|
| **Motorist Information Strategies** | | |
| 18. Radio traffic news | | |
| 19. Changeable message signs | | |
| 20. Temporary motorist information signs | | |
| 21. Dynamic speed message sign | | |
| 22. Highway Advisory Radio (HAR) | | |
| 23. Extinguishable Signs | | |
| 24. Highway information network (web-based) | | |
| 25. Traveler information systems(wireless, handheld) | | |
| 26. Transportation Management Center (TMC) | | |
| 27. Live traffic camera(s) on a website | | |
| 28. Project information hotline | | |
| 29. Email alerts | | |

# 7.0 TMP Implementation/Monitoring

The TMP needs to be implemented in the field, as specified, unless any changes have been approved by the agency. To help ensure appropriate implementation, 23 CFR 630 Subpart J §630.1012(e) requires that the State/Agency and the contractor each designate a trained person at the project level who has the primary responsibility and sufficient authority for implementing the TMP and other safety and mobility aspects of the project.

Monitoring the performance of the TMP during the construction phase is important to establish whether the predicted impacts closely resemble the actual conditions in the field, and whether the TMP strategies are effective in managing the impacts. TMP monitoring by the Contractor and ODOT's Resident Engineer is needed for both oversight and evaluation purposes, such as:

- Monitoring and documenting TMP changes during construction.
- Preparing an evaluation of the TMP, including lessons learned.
- Refining work zone impact analysis processes and models based on outcomes.

TMP monitoring includes details of any specific observational, logging, and/or recording activities conducted during the project for work zone performance measurement purposes. Examples of possible performance measures for TMP monitoring include:

- Volume
- LOS
- Queue length
- Delay
- Travel time
- Number of crashes/incidents
- Incident response and clearance times
- Type and frequency of legitimate complaints received.

It is helpful for the TMP Implementation/Monitoring Managers to meet with the Project Manager on a regular basis to discuss and assess the safety and mobility impacts of the project

work zone to date. This helps to assess how well the TMP is managing the project impacts, and can help identify and address issues before they become problems. It also provides the opportunity to verify that all key stakeholders and project officials have been receiving timely notifications where required.