OPERATIONS AND MAINTENANCE PLAN

DALLAS INTEGRATED CORRIDOR MANAGEMENT (ICM) DEMONSTRATION PROJECT

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16. Abstract

This Operations and Maintenance (O&M) Plan describes how the Integrated Corridor Management System (ICMS) will be used in daily transportation operations and maintenance activities. The Plan addresses the activities needed to effectively operate the US-75 Corridor in a coordinated, multi-modal basis.

This Operations and Maintenance Plan is separate from operating manuals and maintenance manuals used in daily operations by agencies or provided by system or component developers or suppliers. Those documents describe detailed procedures, whereas this Plan describes resources, organization, responsibilities, policies, and activities.

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1 Introduction

1.1 Purpose of the Document

This Operations and Maintenance (O&M) Plan describes how the Integrated Corridor Management System (ICMS) will be used in daily transportation operations and maintenance activities. The Plan addresses the activities needed to effectively operate the US-75 Corridor in a coordinated, multi-modal basis including:

- System operational vision, goals, objectives and strategies
- Agencies who will be responsible for operations and maintenance
- The capabilities of the operating agencies
- Systems and tools that will be involved in operations and maintenance
- Policies and procedures that are to be used in operations and maintenance
- Daily operational activities and procedures
- Operating and Maintenance Costs and Funding Sources
- How system performance will be measured
- An organizational framework for ongoing management and coordination
- Actions needed to transition to full operations including training needs

This Operations and Maintenance Plan is separate from operating manuals and maintenance manuals used in daily operations by agencies or provided by system or component developers or suppliers. Those documents describe detailed procedures, whereas this Plan describes resources, organization, responsibilities, policies, and activities.

This Plan addresses how the functionality of the system will be used in everyday operations, including the manner in which public agencies will use existing and newly deployed field systems, operational policies and procedures to implement the strategies enabled by the ICMS. The *Concept of Operations* for the project contains extensive conceptual information about the ICM System Operational Concept. This Plan updates and adds detail to critical elements of that Concept based on how the project will actually be deployed.

Operations and maintenance should proceed as described in this Operations and Maintenance Plan. Over time the procedures will need to be refined and updated because the system changes or improved procedures are developed. As a result, the Operations and Maintenance Plan needs to be treated as a “living” document.

Note that a 511 system will also be deployed for the entire Dallas/Fort Worth region during the time frame of the ICMS deployment. This Plan will discuss the 511 system as it applies to and supports the ICMS, but will not address 511 system operations and maintenance in detail.

The ICM project includes deployment of the ICM System. Technical Systems Operations and Maintenance Plans for that System, including the DSS, SmartNET and SmartFusion Subsystems, are being developed separately by the Subsystem developers. These Plans will be stand-alone documents and are directly related to the technical operations and maintenance of the three subsystems. They will address items such as:

- Roles and Responsibilities
- Tools
- System Administration
- Configuration Control
- Preventative, Corrective and On Demand Maintenance
- Database Management
- Enhancements
- Problem Management, Severity Levels, Response Requirements and Procedures
- Reporting
- Release Management
- Network Architecture and Hardware

1.2 Project Overview

The US-75 Corridor is a major north-south radial corridor connecting downtown Dallas with many of the suburbs and cities north of Dallas. It contains a primary freeway, continuous frontage roads, a light-rail line, transit bus service, park-and-ride lots, major regional arterial streets, toll roads, bike trails, and significant intelligent transportation system (ITS) infrastructure. The transportation systems and networks are operated and maintained by a variety of agencies at the state, city, town and county levels. The primary corridor is shown in map view in Figure 1.

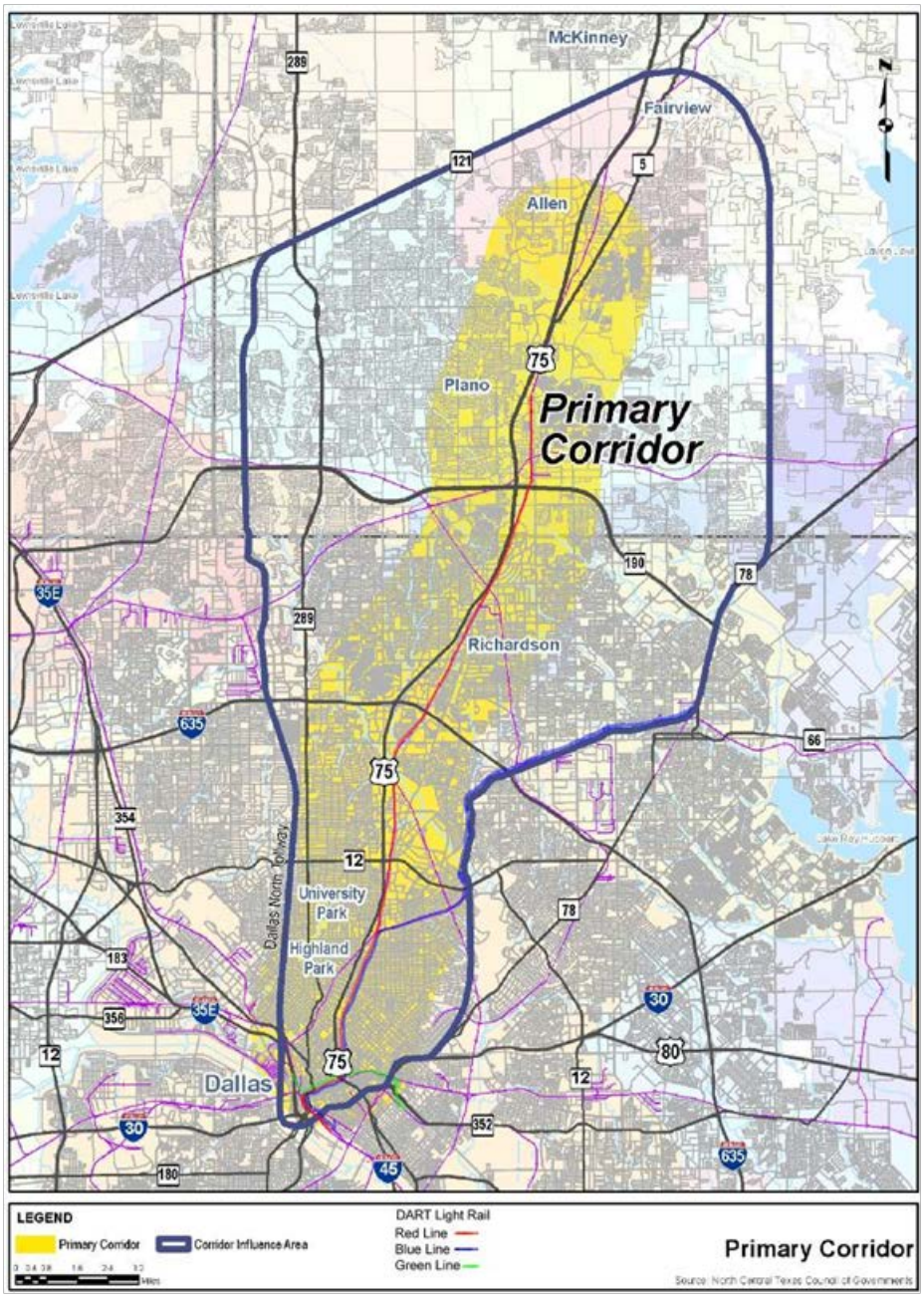

Figure 1: US-75 Integrated Corridor (Source: NCTCOG Map Data, October 16, 2006.)

The Corridor serves commuting trips into downtown Dallas via the freeway, bus routes, light-rail line, and arterial streets. There is also a significant number of reverse commuters traveling to commercial and retail developments in cities and neighborhoods north of Dallas. The Corridor also serves significant regional traffic during off-peak periods.

Freeway Level of Service (LOS) in the corridor is generally D to E in the peak direction with significant recurring congestion. In addition, despite the fact that virtually all traffic signals are interconnected and traffic responsive, most arterial segments are operating at LOS E in the peak direction. The DART bus and light rail systems are generally operating at 50- 75% of capacity.

The purpose of the ICM Project is to implement a system and organizational structure that will provide for the operation of the Corridor in a true multimodal, integrated, efficient, and safe fashion, where the focus is on the transportation customer regardless of facility, jurisdiction or mode of travel. The ICM concept represents a conceptual shift for management and operations within the Corridor – from the current partial coordinated operations between corridor networks and agencies, to a fully integrated and pro-active operational approach that focuses on a corridor perspective rather than a collection of individual networks.

Agencies within the corridor have already taken extensive actions to manage the transportation network and reduce congestion. As a result, they bring considerable resources to the project. The US-75 Integrated Corridor Management Project will build upon these capabilities. Using cross–network operational strategies, the agencies will capitalize on integrated network operations to manage the total capacity and demand of the system in real time in response to changing corridor conditions. With improved traveler information the public will be able to shift trip mode, route and time of day based on current conditions. New transportation operations and management systems will allow agencies to better monitor current conditions and use capacity more efficiently. Strategies to be implemented as a result of the project include:

- Providing improved multi-modal traveler information
- Develop pre-approved response plans among agencies
- Divert traffic to key arterials with responsive traffic signal control
- Shifting travelers to transit during major incidents on the freeway

The ICM project includes the implementation of a number of technology systems and elements that will enable the corridor to implement the new strategies including:

- The ICM System which consists of:
    - A **Decision Support Subsystem** (DSS) that will monitor real-time data to assess current transportation network conditions, recommend pre-approved strategies and response plans when events occur that affect corridor operations, analyze and predict response plan benefits and evaluate response plan results.
    - A **SmartNET Subsystem** which will provide a graphical user interface that supports multi-agency input and information sharing related to the transportation network including incidents, construction, and special events as well as the current status of devices and performance of the roadway and transit networks. It is also the means for communicating and monitoring response plans.
    - **A SmartFusion Subsystem** which will provide data collection, processing, fusion and dissemination functions for the system.

- A number of supporting projects and activities deployed in support of ICM such as a DART parking management system, traffic responsive signal control on key diversion arterials in the Cities of Richardson, Plano and Dallas and a regional 511 traveler information system.

- ICM corridor operations will be de-centralized with the DalTrans Transportation Management Center (TMC) serving as the corridor's central coordination point. Field systems will be operated by the local agency in accordance with ongoing agency operating capabilities, resources and procedures. The ICMS will be located at the DalTrans TMC. In addition, there will be a dedicated ICM Coordinator for the corridor, who will invoke appropriate Response Plans, insure the corridor agencies are responding to requests, and will monitor the overall performance of the corridor.

1.3 Operational Vision, Goals and Objectives

The Project vision for the US-75 corridor is to "Operate the US-75 Corridor in a true multimodal, integrated, efficient, and safe fashion where the focus is on the transportation customer."

Based on this vision, the project Steering Committee developed goals and objectives for the corridor. Subsequently, a set of strategies were identified that would be implemented to meet those goals and objectives. These strategies will drive the ICM operational plan and actions for the corridor. Table 1 identifies the operational Goals and Objectives for the project.

Table 1: Project Goals and Objectives

Goal	Objectives
Increase corridor throughput	• Increase vehicle and person throughput throughout the US-75 corridor • Increase transit ridership, with minimal increase in transit operating costs. • Maximize the efficient use of any spare corridor capacity, such that delays on other saturated networks may be reduced. • Facilitate intermodal transfers and route and mode shifts • Improve pre-planning (e.g., developing response plans) for incidents, events, and emergencies that have corridor and regional implications.
Improve travel time reliability	• Reduce overall trip and person travel time through the corridor. • Improve travel predictability. • Maximize the efficient use of any spare corridor capacity, such that delays on other saturated networks may be reduced. • Improve commercial vehicle operations through and around the corridor

Goal	Objectives
Improved incident management	• Provide/expand means for communicating consistent and accurate information regarding incidents and events between corridor networks and public safety agencies. • Provide an integrated and coordinated response during major incidents and emergencies, including joint-use and sharing of response assets and resources among stakeholders, and development of common policies and processes. • Continue comprehensive and on-going training program – involving all corridor networks and public safety entities – for corridor event and incident management. • Reduce secondary crashes
Enable intermodal travel decisions	• Facilitate intermodal transfers and route and mode shifts • Increase transit ridership • Expand existing ATIS systems to include mode shifts as part of pre-planning • Expand coverage and availability of ATIS devices • Obtain accurate real-time status of the corridor network and cross-network connections

1.4 Systems Overview

The systems involved in ICMS operations fall into two categories:

- **ICMS**: These are the technical systems that make up the ICMS including SmartNET, Smart Fusion and Decision Support System (DSS). This Plan only discusses those systems in the context of their operational functionality and how it will provide for enhanced corridor management. Detailed systems operations and maintenance plans are being developed for the ICMS separate from this Plan.
- **Agency Operations Systems**: These are agency systems, either existing or currently being installed, that provide or support field operations needed to implement ICMS strategies and response plans, collect systems data, etc.

1.4.1 ICMS

Figure 2 is a High Level ICMS Conceptual Diagram that shows the major system components.

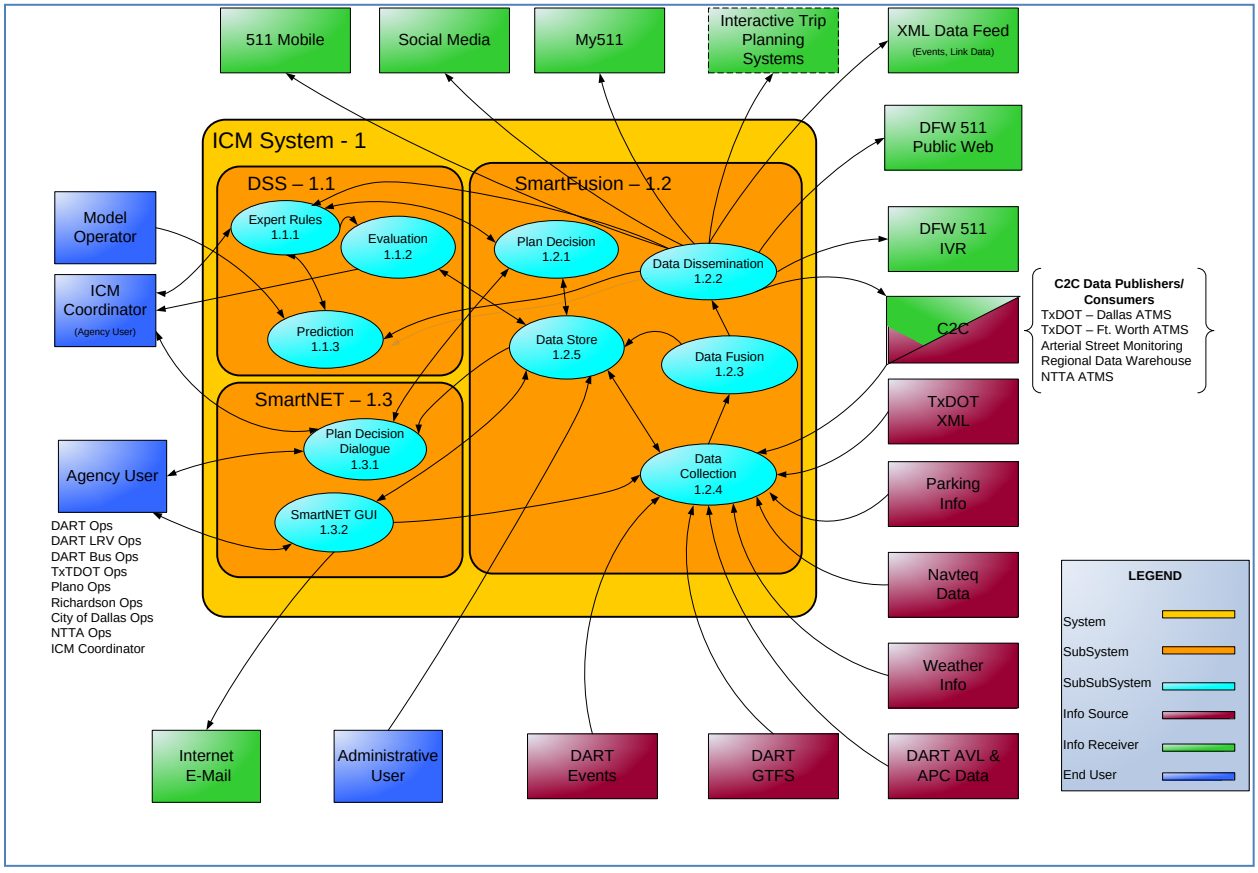

Figure 2: High-Level ICMS Conceptual Diagram (Source: Dallas Area Rapid Transit, March 22, 2013)

Note in particular that the ICMS includes:

- The SmartNET, SmartFusion and Decision Support Subsystems.
- ICMS External Interfaces that provide for new or enhanced operational functions including:
  - data export to the IVR, Public Web, 511 Social Media, mobile web, My 511 Data, Trip Planning, XML Data Feed, Alert System and Center to Center systems;
  - the Internet/E-mail capabilities;
  - data import from a Parking Information, Weather Information, DART Data Portal and Regional Center-to-Center systems; and
  - GUI interfaces to various users including agencies and operators.

1.4.2 Agency Operating Systems and Assets

Agency operating systems and assets provide or support field operations needed to implement ICMS strategies and response plans, collect systems data, etc. Existing systems and assets are summarized at a high level in Table 2.

Table 2: Existing Network Systems and Assets

Transportation Facility (With Corresponding Agency(ies))	Summary Total
Access Controlled Freeways with Frontage Roads (TxDOT)	272 lane-miles
Freeway Management Center (TxDOT)	1 center
High Occupancy Vehicle Facilities (DART/TxDOT)	51 lane-miles
Light Rail Transit System (DART)	3 lines – 24 stations
Bus Transit System (DART)	30 bus routes
City Computer Controlled Traffic Signal Systems	3 systems
Dallas	500 signals
Plano	215 signals
Richardson	125 signals
Arterials Streets (Richardson, Dallas, Plano, University Park, Highland Park)	167 center-line miles
Park and Ride Lots (DART)	9
Tollways (NTTA)	280 lane-miles

Agency operating systems will also include a number of Supporting Projects and Activities deployed in support of the ICM project including:

- responsive traffic signal control on arterial roadways
- parking management systems at key Park and Ride lots
- improved data and video information sharing among agencies
- improved traffic detection on key arterial diversion routes
- improved transit management systems and capabilities including automatic vehicle location, parking management systems in Park and Ride lots and expanded automatic passenger count systems.
- a regional 511 traveler information system

These systems are discussed in more detail later in this document.

1.5 Stakeholders

The following identifies the major public agency operational stakeholders for the project area. Additional detail on these stakeholders is available in the *Concept of Operations for the US-75 Integrated Corridor in Dallas, Texas*:

- **Dallas Area Rapid Transit**: Dallas Area Rapid Transit (DART) provides bus and light rail transit service throughout the Corridor. Currently, DART serves Dallas and 12 surrounding cities with approximately 130 bus routes, 45 miles of light rail transit (DART Rail), 31 freeway miles of high occupancy vehicle (HOV) lanes, and paratransit service for the mobility impaired. DART and the Fort Worth Transportation Authority ("the T") jointly operate 35 miles of commuter rail transit (the Trinity Railway Express or TRE), linking downtown Dallas and Fort Worth with stops in the mid-cities and DFW International Airport.
- **City of Dallas**: Dallas is the largest city in the urban area with a population of 1,210,390. The City operates and maintains 1,300 traffic signals (most of which are in coordinated arterial signal systems) as well as 37 arterial Dynamic Message Signs (DMS), and 3 roadside cameras. A number of the traffic signals are located on the US75 frontage roads. The Dallas Police Department provides incident management on all facilities within the City of Dallas except the HOV lanes and tollways.
- **City of Richardson**: Richardson has a population of 97,800. The Richardson Police Department provides incident management on all facilities within its city limits except the tollways. The city operates a remote-access automated traffic signal system with over 120 intersections under control, and a count station network of 105 locations. A number of the traffic signals are located on the US75 frontage roads.
- **City of Plano**: Plano is the second largest city in the urban area with a population of 249,000. The Plano Police Department provides incident management on all facilities within its city limits except the tollways. The city operates a remote-access automated traffic signal system with 215 intersections under control. A number of the traffic signals are located on the US75 frontage roads.
- **Town of Highland Park**: The Town of Highland Park has a population of 8,800 with 13 isolated traffic signals
- **City of University Park**: The City of University Park has a population of 23,300 with 33 traffic signals under coordination by three field masters. US-75 runs on the east side of University Park with a majority of the city to the west and a few city blocks to the east. The Dallas North Tollway runs along the western edge of the city.
- **North Central Texas Council of Governments**: Regional transportation planning in North Central Texas is conducted by this federally designated Metropolitan Planning Organization (MPO), comprised of the NCTCOG Transportation Department, NCTCOG Executive Board, Regional Transportation Council (RTC), and several technical committees. The MPO works with state and local governments, the private sector, and the region's citizens to plan coordinated transportation systems designed to move goods and people affordably, efficiently, and safely.
- **North Texas Tollway Authority**: North Texas Tollway Authority (NTTA) operates two toll roads within the Corridor: the Dallas North Tollway (running north and south) and the

President George Bush Turnpike (running east and west). Incident management along these tollways is provided by Texas Department of Public Safety Troopers along with a courtesy patrol provided by the Dallas County Sheriff.

- **Texas Department of Transportation – Dallas District**: The Dallas District of the Texas Department of Transportation (TxDOT) is responsible for the Design, Construction, Maintenance, and Operations of the US and State Highway System in seven counties in north Texas. The District has 3,637 centerline miles of highway, including 10,427 lane miles. TxDOT monitors most freeways within the Corridor via CCTV, private ISP providers, field units (enforcement and courtesy patrols), and other available sources along all but 14 highway miles in the Corridor. The remaining 14-mile section (US-75 from I-635 to the northern Corridor limit) will be instrumented within the next two years.

Other significant operational stakeholders include:

- The LBJ Development Infrastructure Group which under a public/private Comprehensive Development Agreement will design, construct, finance, operate and maintain the 13-mile LBJ-635 corridor in Dallas County.
- Emergency responders including police, fire, EMS, Motorist Assist Patrol operators and Towers/recovery.

1.6 References

A number of documents, including the project Concept of Operations, System Requirements and Design Documents provide information related to ICM system operations and maintenance. This document describes in detail how the agencies will carry out real time integrated corridor management from the perspective of their systems, roles and responsibilities.

The following documents were used as references in the development of this plan and, as mentioned in the plan, provide additional detail.

- Concept of Operations for the US-75 Integrated Corridor in Dallas, Texas, June 2010
- Systems Requirements for the US-75 Integrated Corridor in Dallas, Texas, version 7.8, January 2011
- US-75 ICM High Level Design Document, Dallas Integrated Corridor Management Demonstration project, June 20, 2011
- US-75 ICM Detailed Design Document, Dallas Integrated Corridor Management Demonstration project, June 20, 2011
- US-75 System Design Document, Dallas Integrated Corridor Management Demonstration Project, August, 2013
- Integrated Corridor Management Initiative, Demonstration Phase Evaluation, Dallas Corridor Performance Analysis, October 21, 2011
- US-75 ICM Project Proposal, Phase III: Demonstration Project
- Systems Engineering Guidebook for ITS, Version 3.0, *http://www.fhwa.dot.gov/cadiv/segb/index.htm*

2 AGENCY OPERATIONS AND MAINTENANCE

The ICM Project Stakeholder Committee has developed a set of vision, goals and objectives to guide system development and operations. The ICM System is being deployed in a corridor that already has a foundation of strong multi-modal agencies, systems and operations. Agency operational stakeholders have deployed a significant network of transportation management systems in the corridor and have strong real time operational support and experience. In addition, they have well established resources, policies and procedures for the operations and maintenance of their systems.

2.1 Operational Roles, Systems and Resources

This Section documents the strong nature of the operating agency stakeholders existing roles, systems and resources. It should be noted that while the Town of Highland Park and the City of University Park are agency stakeholders in the corridor, their size, operational assets and roles are not nearly as significant as the other agency operating stakeholders. Accordingly their roles, assets, etc. are not detailed in the Tables in this chapter. In addition, while the North Central Texas Council of Governments is not technically a transportation operating agency, their roles and assets are included in the Tables due to their unique involvement and support in the project.

2.1.1 Agency Operational Roles and Resources

The operating agencies in the area have numerous and diverse roles with respect to their transportation operations. This provides a strong foundation for the implementation of the integrated corridor management concept. The agency roles, their normal hours of operation and their staff resources available for traffic systems operation are summarized in Table 3. Key capabilities include:

- Incident response/management
- Freeway monitoring and management
- Transit management
- HOV lane management
- Arterial traffic signal systems
- Traveler information systems such as Dynamic Message Signs (DMS)

In addition to operating during normal work hours, most agencies also operate during extended hours that provide coverage from the beginning of the AM peak to the end of the PM peak while TxDOT and NTTA operate 24/7 year-round.

Approximate staffing numbers are provided for staff directly involved in traffic systems operations which includes but are not limited to TMCs, traffic signal maintenance crews and DART HOV operations.

Table 3: Agency Operational Roles and Resources

Agency	Primary Corridor Operational Role	Normal Hours of Operation	# Operations/ Maintenance Staff for Traffic Systems
Texas Department of Transportation (TxDOT)	Daily Operations Monitoring freeway traffic flow DMS Freeway surveillance Courtesy Patrol Enact response plans Maintenance	24/7 year-round	Approximately 19
City of Dallas	Daily operations Signal systems DMS Arterial surveillance Enact response plans	6:30 AM to 6:30 PM, Monday – Friday (plus special events as needed)	Approximately 25
City of Richardson	Daily operations Signal systems DMS (portable) Arterial surveillance Enact response plans	6:00 AM to 6:00 PM Monday - Friday	Approximately 19
City of Plano	Daily operations Signal systems Arterial surveillance Enact response plans	8:00 AM – 5:00 PM Monday - Friday	Approximately 11

Agency	Primary Corridor Operational Role	Normal Hours of Operation	# Operations/ Maintenance Staff for Traffic Systems
Dallas Area Rapid Transit (DART)	Daily operations including bus, light rail, paratransit and HOV Monitor bus on-time levels Enact response plans Monitoring HOV traffic flow DMS (portable) HOV surveillance Monitor train schedules Monitor parking conditions Transit Police HOV Courtesy Patrol	HOV Operations: 4:00 AM – 12:30 PM and 1:00 PM – 9:30 PM Monday – Friday 7:00 AM – 3:30 PM Sat. Other DART Operations: 4:00 AM – Midnight year-round	HOV Operations: Approximately 50
North Texas Tollway Authority	Daily Operations Monitoring Tollway traffic flow DMS Tollway surveillance Enact response plans Maintenance	24/7 year-round	22
North Central Texas Council of Governments	Data Archiving Coordination	8:00 AM – 5:00 PM Monday - Friday	Approximately 0.5 FTE (in-house IT support staff)

2.1.2 Agency Operational Systems and Facilities

The agency operating stakeholders have already deployed an extensive network of transportation operating and management systems. This provides tremendous capabilities for implementing the Integrated Corridor Management strategy. Table 4 details the existing systems and facilities as well as those that are being added as part of the overall ICM effort, or are being deployed by agencies as part of their individual programs during the ICM project development phase.

The existing assets include:

- Over 100 CCTV
- Over 800 coordinated traffic signals
- 5 TMCs
- Over 24 DMS (permanent and portable)

- Over 50 Dedicated motorist assist patrols
- Over 700 buses with AVL and automated fare collection
- 14 rail stations with message boards
- Traffic speed monitoring detection stations

Table 4: Agency Operational Systems and Facilities

Agency	Operational Systems and Facilities	
	Existing	**Adding for/during ICM Project**
Texas Department of Transportation (TxDOT)	Within the Corridor, DalTrans ITS infrastructure includes: 49 CCTV Cameras (27 more planned within the next two years) 9 Dynamic message signs (5 more planned within the next two years) 25 miles of freeway courtesy patrol coverage (Courtesy patrol operates from 5 a.m. to 9:30 p.m. M-F, and 11:00 a.m. to 8:00 pm on the weekends) 205 miles of freeway with speed detector coverage A TMC is staffed 24/7	Deployment of Additional Devices
City of Dallas	500 coordinated traffic signals Limited number of DMS TMC	Retiming signals in Mockingbird Lane corridor Arterial Street Monitoring System Transit Signal Priority
City of Richardson	125 coordinated traffic signals 36 CCTV 4 Portable Dynamic Message Signs (PDMS) TMC	Complete Upgrade of all Traffic Signal Controllers X Arterial Street Monitoring System Transit Signal Priority
City of Plano	215 coordinated traffic signals 11 Traffic Monitoring cameras TMC	New Coordination Timing of the City's Traffic Signals 3 Bluetooth Arterial Street Monitoring System

Agency	Operational Systems and Facilities	
Dallas Area Rapid Transit (DART)	DART ITS assets within the US-75 ICM Corridor include: HOV management center collocated with TxDOT's DalTrans center 9 Dynamic Message Signs (DMS) for HOV lanes 8 Lane Control Signals (LCS) 16 HOV flashing signs to open and close the HOV Lanes Courtesy patrol for HOV lanes 14 Rail Stations with Public Address/Visual Message Boards 50 Courtesy Patrol operators in two shifts Over 700 Buses equipped with automatic vehicle location (AVL) devices Over 700 Buses equipped with automated fare collection	Bus Service Mobile Data Terminals in Supervisor/ DART Police Vehicles Replacement of Radio System/ AVL Testing of Real-time Passenger Information Systems Rail Service Vehicle Business System Mobile Data Terminal Link to Traffic Monitoring System Rapid Transit DART communication network (intra-agency integration) In-vehicle business system (DART Police) Parking Management for key Park and Ride lots Upgrade radio system network (DART Police) Adding operations console at DalTrans TMC 511 System for Region
North Texas Tollway Authority	6 Dynamic Message Signs Approx. 47 miles of customer service patrol coverage Travel time measurements CCTV	Additional CCTV Cameras Vision-Based Toll Collection
North Central Texas Council of Governments	Data archive	Developing agreement for C2C for signal systems

2.1.3 Agency Maintenance Capabilities

System maintenance is a key part of the success of any transportation operations program. The ICM program will rely on the individual agencies to maintain the field systems and use those systems to support the integrated mission of the program. Each of the agencies has extensive experience in the maintenance of these systems, including specific operating and maintenance procedures. Table 5 summarizes the system maintenance capabilities and approach of the agencies. This can be summarized in general as follows:

- Some key preventative maintenance is performed.
- Most other maintenance is demand maintenance in response to a specific problem.

- Procedures are in place for handling maintenance problems during off hours but in some cases a response will not be dispatched until the next day/work day. This is an issue that the ICM program will need to consider in its operating procedures.
- Most maintenance is done by agency staff. Some agencies have augmented their capabilities through maintenance contractors.

Table 5 Agency Maintenance Capabilities

Agency	Overall Maintenance Approach
Texas Department of Transportation (TxDOT)	Basic maintenance (filter change, DMS bulb change, lubrication, lenses cleaning) is performed on a scheduled basis. Other system maintenance is primarily part or component change out as needed after initial troubleshooting and analysis. More severe problems are handled by on-call contractors.
City of Dallas	Basic preventative maintenance is performed on a scheduled basis. Other system maintenance is primarily response maintenance as needed by City employees with a small amount of support via maintenance contractor.
City of Richardson	Basic preventative maintenance is performed on a scheduled basis. Other system maintenance is primarily response maintenance as needed by City employees. Traffic signal timing is reviewed on a 3-year cycle. Retime traffic signals on an 11- year cycle, fine tune timing as needed.
City of Plano	Basic preventative maintenance is performed on a scheduled basis. Other system maintenance is primarily response maintenance as needed by City employees.
Dallas Area Rapid Transit (DART) – Bus, Rail and HOV	Basic maintenance is performed on a scheduled basis. Other system maintenance is primarily demand maintenance as needed based on problems or failures. Most maintenance is performed by in-house staff with a contractor support available on an on-call basis.
North Texas Tollway Authority	Basic maintenance is performed by either in-house crews or contractors. A night crew is available for off-hours response.
North Central Texas Council of Governments	Dedicated IT staff support the operations and maintenance of the data archive during normal working hours as well as via “on call” during off hours.

2.1.4 Supporting Projects and Activities

During the course of design and implementation of the US-75 ICM Project agencies will be deploying a number of projects and activities within the region that are anticipated to have impact on the US-75 ICM. While the ICM system can be deployed and operate effectively without these improvements, the improvements will provide significant improvement in operational efficiency. They

will also expand the capability to implement improved operation strategies consistent with the program goals and objectives. The Supporting Projects and Activities are summarized below:

Traffic Video Sharing:

- Approximately 35 cameras from TXDOT and the City of Richardson will be available in full motion via the SmartNET system to be shared with other agencies. Snapshots from video cameras will be available to all users via 511/SmartNET.

Transit Data Sharing:

- DART will provide interfaces to share corridor data with the ICMS including parking lot utilization, transit events, transit vehicle location, transit schedule and schedule adherence and HOV lane status.

Automatic Passenger Count System:

- DART will expand its Automatic Passenger Count System to provide additional data on transit vehicle utilization in the corridor.

Parking Management Information System:

- DART will deploy a Parking Management Information System to monitor lot utilization and remaining capacity at five stations (28 lots) in the corridor.

Arterial Street Monitoring System:

- Bluetooth reader traffic detectors will be installed at 36 locations to monitor traffic speeds and travel time on key arterial diversion routes between Plano and Dallas including Greenville, Coit and the frontage road.

Responsive Traffic Signal Control:

- The Targeted Event Accelerated Response System (TEARS) project will develop new signal timing plans that will be implemented at key traffic signals in the Cities of Richardson, Plano and Dallas most frequently and/or significantly impacted by events on US-75. A cluster analysis of historical incident data will identify the events and the Dynamic Intermodal Routing Environment for Control and Telematics (DIRECT) model will identify the impacted signals for which timing plans will be created.

511:

- This project will deploy a Dallas-Fort Worth area 511 system that will utilize data from the ICMS and include a 511 Interactive Voice Response system, a 511 Website and a MY511 personalized traveler information system.

3 NEW ICM OPERATIONAL ENVIRONMENT

As a result of deployment of the Dallas ICM project, as well as the Supporting Projects and Activities being implemented by agencies, there will be an enhanced operational system environment in the corridor that will enable a variety of improved operational strategies, functions and capabilities. This new system environment for coordinated ICM operations is summarized as follows:

3.1 New Operational Systems and Support Tools

3.1.1 The ICM System

- The Decision Support Subsystem (DSS) will monitor real-time data to assess current transportation network conditions, recommend pre-approved strategies and response plans when events occur that affect corridor operations, analyze and predict response plan benefits and evaluate response plan results.
- The SmartNET Subsystem will provide a graphical user interface that supports multi-agency input and information sharing related to the transportation network including incidents, construction, and special events as well as the current status of devices and performance of the roadway and transit networks. It is also the means for communicating and monitoring response plans.
- The SmartFusion Subsystem will provide data collection, processing, fusion and dissemination functions for the System
-

3.1.2 Enhanced Access to Consolidated and Timely Transportation Network Information

- All stakeholders will have access to all information in the ICM System, as well have the ability to enter information, or provide a system interface with the ICM System to provide information available from their native system.
- The system will provide stakeholder agencies the ability to access ICM System information within a web-based GUI, as well as an interface to allow them to integrate ICM System data into their existing systems

- The ICM System will build upon the existing Dallas Regional Center-to-Center System to provide a comprehensive and consolidated database for all incidents/events across all transportation networks within the US-75 Corridor.
- The system will incorporate the TxDOT and NCTCOG GIS mapping data and systems to define incident/event locations. Procedures will be established to provide for periodic updates to this data.
- Monitoring of incidents/events that have adverse effects on travel conditions within Corridor will be more comprehensive, timely and user friendly as a result of the SmartNET implementation and the interface to the existing DalTrans system.

3.1.3 Improved Operational Systems and Capabilities

- Pre-approved response plans will be mutually developed, adopted, and used by operating agency stakeholders within the Corridor. This will allow for faster, more efficient and coordinated response to events.
- The installation of additional detectors on key arterials will provide enhanced insight into current operating conditions and provide information for assessing response effectiveness and overall system performance.
- Signal systems will be remotely monitored and managed by respective jurisdictional software signal control systems and available to support ICM response plans.
- New traffic signal timing plans will be developed that will provide capability to adjust signal timing to support ICM response plans such as those that require revised signal timing in the event of a major incident on the freeway that will divert significant traffic onto local streets. The signal locations affected and the revised timing will have been developed in advance for locations likely to need timing adjustments based on a cluster analysis of incident locations. The appropriate timing plan will be identified in the Response Plan recommendation.
- An interface to a DTN-Meteorlogix weather system will allow the integration of weather real time and forecast weather data and alerts to be associated to specific roadway links, providing agencies enhanced insight into weather conditions on the network and current or potential effects on system status. The weather information will also be available to the public via 511.
- Sharing of traffic video among agencies within the Corridor will be expanded and accessible to all stakeholders, in snapshot or streamed format.
- DART systems enhancements will provide for transit and HOV data and status information sharing with agencies via the ICMS as well as traveler information to the public via 511. DART operations will have park-n-ride lot status within the Corridor
- DART operations will have access to expanded real-time bus and rail passenger load data within the Corridor

3.1.4 Enhanced Traveler Information Systems

A Dallas/Fort Worth regional Advanced Traveler Information System (ATIS) will be deployed. All stakeholder data including travel conditions and incident information for respective networks within the corridor will be fused and integrated into the ATIS via ICM system interfaces. The ATIS will complement the existing DFW travel website to provide a comprehensive and consolidated traveler information source for all transportation networks. The ATIS will include a new 511 traveler information system comprised of a telephone interactive voice response platform as well as a public web site, mobile web, social media and a personalized traveler information system. The ATIS will allow travelers to make best decisions on mode, route and time of day travel based on real time conditions.

4 ICM OPERATIONS

The corridor will be operated in a true multimodal, integrated, efficient, and safe fashion, where the focus is on the transportation customer regardless of facility, jurisdiction or mode of travel. Operation will be based on fully integrated and pro-active strategies that focus on a corridor perspective rather than a collection of individual networks.

4.1 Foundation Strategies, Policies and Systems

4.1.1 Strategies

As an element of the ICM project, the Steering Committee and Stakeholders developed a set of operational strategies that would meet the project goals and objectives through the Integrated Corridor management deployments and initiatives. The strategies are detailed in Table 6. For the purpose of this Plan, the strategies were divided into three groups:

- Direct Operational Strategies: These are strategies that can be directly implemented as part of ICM operations. They are generally the basis for the actions that are identified in the Decision Support System response plans.
- Strategies to Improve Operational Systems: These strategies improve the operational systems that agencies use to enable enhanced real time operations, information and performance measurement.
- Strategies to Improve Operational Organization: These strategies improve the organization that supports effective and efficient operations in the corridor.

Table 6: ICM Strategies

ICM Strategies

Direct Operational Strategies
• Improve multi-modal travel information via convenient and pervasive delivery mechanisms including 511
• Develop and implement pre-approved integrated incident response plans
• Provide comparative travel time to the public and operating agencies for the freeway, HOV lane, frontage roads, arterial streets, and light-rail transit line
• Divert freeway traffic to frontage roads and/or key arterials during major incidents with real time traffic signal timing adjustments implemented via the TEARS system, which is described in more detail in the material following this Table
• Promote mode shift to transit during major highway incidents via traveler information systems such as DMS, 511 and Transit Passenger Information Systems
• Implement traffic signal system improvements to enable enhanced arterial operations including traffic signal priority for transit vehicles
• Coordinate scheduled maintenance and construction to minimize conflicts and overall delays
• Promote transit usage via enhanced ride sharing and market/outreach programs
• Increase capacity during major incidents via actions such as:
  • Add transit capacity by adjusting headways and number of transit vehicles
  • Add capacity at parking lots (temporary lots)

Strategies To Improve Operational Systems • Implement a decision support tool using real time and non-real time network modeling to support improved incident response plan development, implementation and post- event assessment. • Improve real time network status information gathering and sharing, including data and video, via implementation of SmartNET and expanded agency participation. • Provide agencies a common tool for viewing and reporting incidents, construction, special events, etc. The tool will also provide a GIS-based approach to asset management and status as well as alerting functions. • Improve arterial street monitoring capabilities via installation of traffic detectors on key diversion routes. Use the data to provide speed, travel time information and performance information. • Improve transit operations and management via implementation of tools and systems such as mobile data terminals, parking management and automated passenger counting. • Identify, implement and monitor corridor performance measures to maximize operational strategies and effectiveness.

ICM Strategies
Strategies to Improve Operational Organization • Establish an ICM Coordinator function to coordinate agency response and support ICM program management. • Establish an organizational structure to coordinate corridor operations and management. • Periodically conduct de-briefings post major incidents to review lessons learned (what went well, poorly, what can be improved, etc.).

4.1.2 Response Plans

A key to implementing coordinated ICM operations and response is the development of pre-approved Response Plans. A comprehensive effort to develop the response plans has been led by the ICM Operations, Decision Support and Arterial Monitoring Systems Committees. After consideration by the group, it was determined that varying event types and locations would require different response scenarios depending on location and transportation impact. As a result, the following approach was used:

- Frequently occurring event types, recurring areas of congestion and high frequency locations for incidents were considered
- The corridor was divided into multiple sections and directions
- Response strategies were identified
- Event impact indicators (such as queue length and number of lanes affected) were identified

Using this approach, Response Plans were developed for each segment of US-75 northbound and southbound. There are up to four Response Plans for each segment to address the following strategies:

- Minor Incident: Short Diversion to Frontage Road
- Major Incident: Long Diversion to Frontage Road
- Major Incident: Diversion to Frontage Road and Greenville Ave (arterial)
- Major Incident: Diversion to Frontage Road and Greenville Ave (arterial) and Transit

The appropriate strategy to use in the event of an incident is determined based upon the magnitude of the event impact indicators as follows:

- Number of affected lanes on US-75 (including HOV lanes)
- Speed on US-75
- Queue length on US-75
- Speed on Frontage Road diversion route
- Speed on Greenville Ave diversion route
- Current utilization of nearby Park and Ride Lot

- Current utilization of Red and Orange LRT lines

Table 7 is a matrix that shows the relationship between the strategies and the transportation condition parameters.

Table 7: DSS Rules for Response Plan Development

Strategies	No. Affected Lanes General Purpose and HOV	Main Lanes		Speed Frontage Road (on Diversion Route) (mph)	Speed Greenville Ave. (on Diversion Route) (mph)	Prediction Measures of Performance	Park and Ride Utilization	Light Rapid Transit Utilization	Weather
		Speed (mph)	Queue Length Derived from Avg. speed (mi.)						
Minor Incident: Short Diversion to Frontage Road (FR.)	≥ 1	< 30	0.5 < Q <1	> 20	N/A	N/A	N/A	N/A	(2)
Major Incident: Long Diversion to FR.	≥ 1	< 30	Q ≥ 1	> 20	N/A	(1)	N/A	N/A	(2)
Major Incident: Diversion to FR. and Greenville Avenue (GV.)	≥ 2	< 30	Q ≥ 1	< 20	> 20	(1)	N/A	N/A	(2)
Major Incident: Diversion to FR. and GV., Transit	≥ 2	< 30	Q ≥ 4	< 20	< 20	(1)	< 85%	< 85%	(2)
Major Incident: Diversion to FR. and GV., Transit	≥ 2	< 30	Q ≥ 4	< 20	< 20	(1)	> 85%	> 85%	(2)
Return to Normal	< 1	> 30	Q < 0.5	NA	NA	NA	NA	NA	NA

Notes:

1. The Prediction Measures of Performance (MOPs) to be used in Response Plan development are still being assessed as to validity and value. The four measures under assessment are: travel time; number of travelers, travel delay and travel distance.
2. The use of weather conditions as a consideration in Response Plan development is not currently implemented but is a potential enhancement being considered for the future.

When an event occurs, the DSS identifies the location and assesses potential Response Plans as per the condition parameter rules identified in the Table above. Response Plans matching the rules are forwarded to the simulation engine for simulation. Each Response Plan is developed to meet the

strategy dictated by the condition parameters. This is discussed in more detail in Section 4.2.1 Decision Support.

For example, if the conditions are 1) One mainline lane affected 2) Queue on mainline between one-half and one mile (speed on mainline less than 30 mph used to calculate queue length) and 3) Speed on diversion route greater than 20 MPH, then a Response Plan will be selected that is based on the strategy *Minor Incident: Short Diversion to Frontage Road*

Each Response Plan includes:

- A unique Plan identifier (the identifier format is shown and explained in Appendix A)
- Highway Segment/Incident Location
- Location and number of nearby entrance/exit ramps available for diversion
- Location of diversion routes on frontage roads and Greenville Ave as well as significant parallel and cross streets
- Agencies involved
- Response actions for each involved agency, for example: activate DMS signs, adjust traffic signal timing, post conditions to 511, post alternate park and ride lot availability
- Location and agency owner of nearby traffic information and management assets involved in the plan including
    - DMS to be activated and message to display
    - Nearby traffic cameras to monitor
    - Location of traffic signals needing timing adjustment and timing plan to implement
    - Location of nearby Park and Ride lots and Rail Stations that can be utilized for mode shift
    - 511 and or Transit information to be deployed/posted

It should be noted that the due to varying traffic volume conditions during the day on the arterial street network, the traffic signal timing plan to be implemented may differ depending on the time of day. In those cases, different Response Plans have been created for AM, mid-day and PM as necessary, to accommodate the need for implementing different signal timing plans.

Response Plans are documented in both a user-friendly Map/Diagram format as well as a List format. Example Response Plans are provided in Appendix A.

Over 400 Response Plans have been developed and approved to date. Response plans are still being developed and revised as experience is gained. The pre-approved response plans are consolidated and available to agencies via the internet for reference in real time during response plan implementation as well as off line for assessment and refinement. Once the system is operational, agencies will do post-event evaluation and make modifications to the plans as appropriate. In addition, new response plans will be developed as needs arise based on experience and changing conditions.

4.1.3 New/Revised Operational Policies

As an element of the planning and design phase of the ICMS agency operating stakeholders considered the need for any new or revised policies that would be needed to support the effort. The following were identified:

- Revised DMS Message Policy: One of the ICMS strategies is to provide transit-related information on freeways and arterials to promote mode shift during major freeway incidents or to advise motorists of any serious transit incidents or delays that may affect their future travel plans. Conditions requiring this type messaging were identified in the appropriate ICM Response Plans. To ensure consistency in message content, the stakeholders developed an adjustment to the TxDOT statewide DMS message policy that addressed this need. Examples of DMS messages for arterial and transit diversions are contained in Appendix B Example ICM DMS Messages.
- Expanded Video and Data Sharing: In order to provide enhanced video and data sharing among stakeholders a project was initiated to reach sharing agreements with key agencies. A sharing agreement is in place between TxDOT and the City of Dallas and agreements are being pursued with the Cities of Richardson and Plano as well as the NTTA.
- Signal Timing Adjustments on Strategic Arterials: Previously, signal timing on freeway frontage roads were not adjusted to facilitate diverted traffic during major freeway incidents. This was due to an expectation that local traffic on the arterials would be too adversely affected given the existing signal timing and coordination systems. As a result of the ICM project, Responsive Traffic Signal Control will be deployed in the Cities of Richardson, Plano and Dallas via implementation of the Targeted Event Accelerated Response System (TEARS). It should be noted that the revised signal timing will not be implemented automatically in the field nor will it be developed in real time. Rather, the timing and signal locations affected will have been developed in advance for locations likely to need timing adjustments based on a cluster analysis of incident locations, The appropriate timing plan will be identified in the Response Plan and the revised signal timing plan will be implemented by command by operators of the affected agencies once they have been notified a Response Plan has been recommended and approved.

4.2 Foundation Systems

Coordinated operations under the umbrella of the Integrated Corridor Management concept will be supported by the ICM System, including the Decision Support, SmartNET and SmartFusion Subsystems. These Subsystems play a critical role in enabling daily operations. In addition, the Regional 511 system is critical to the provision of traveler information. Accordingly, the following describes their primary functions in more detail as a preface to describing daily ICM operations. The System descriptions that follow are derived from the *US-75 ICMS Detailed Design Document*. More detailed information on those Subsystems is available in that document.

4.2.1 Decision Support

The Decision Support Subsystem is an essential component of the ICMS to assist the corridor operating agencies in selecting and implementing the US-75 ICM strategies. The Decision Support

Subsystem is the collective knowledge resource used to select appropriate response plans and determine potential corridor benefits of proposed response plans. The decision support system is comprised of three main components: 1) an Expert Rules Subsystem, 2) a Prediction Subsystem, and 3) an Evaluation Subsystem.
In daily operations, the Expert Rules Subsystem monitors real time network conditions as provided by the SmartFusion Subsystem, including roadway performance (such as speed) and incident data. When an event is entered into SmartNET that indicates conditions have occurred that may reduce the mobility of the corridor (such as an incident), the Expert Rules Subsystem compares current conditions to a predetermined set of rules related to network performance and will select one or more candidate Response Plans for consideration. To be considered for analysis, network conditions must match all of the applicable rule parameters.

The DSS can then provide the selected response plan to the ICM Coordinator or to the simulation engine (Prediction Subsystem). This gives the flexibility of skipping the Prediction Subsystem if desired. When the Prediction Subsystem mode is on, then the Subsystem provides the selected response plans to the simulation engine. The simulation engine will generate Measures of Performance (MOPs) for the plan(s) and the DSS will then select a recommended plan based on the MOP's. The simulation engine can analyze up to three Plans at once. A simulation of a plan takes approximately 2 minutes. MOPs used by the simulation engine include:

- travel time
- number of travelers
- travel delay and
- travel distance

The MOPs are segregated / totaled by:

- Facility/direction: US-75 mainline, US-75 frontage roads, I-635, George Bush Turnpike and Greenville Ave.
- Mode: car, bus, rail and Park and Ride.

The analysis of response plans will also include a prediction of future network conditions. The Prediction Subsystem will examine three instances of the network: 1. Current Conditions of the network; 2. Future Conditions of the network, 30 minutes into the future, without response plans implemented; 3. Future Conditions of the network, 30 minutes into the future, with response plans implemented.

The Response Plans and rules for selecting such are based upon the pre-approved response plan information provided by the agency operating experts. The recommended plans include ICM strategies to be implemented (i.e., type of route diversion or mode diversion) as well as specific actions to be taken by individual operating agencies. The Expert Rules Subsystem passes the recommended ICM response plan on to the ICM Coordinator via the SmartNET Subsystem.
The Evaluation Subsystem will also provide the ICM coordinator and the operating agencies a critique of how an ICM strategy and associated response plan performed for a given event. The Evaluation Subsystem uses the corridor data from the SmartFusion Subsystem to calculate corridor

performance metrics. These performance measures will allow the operating agencies to refine strategies and response plans off line in attempts to continually improve how the ICMS assists corridor operation. The Subsystem also has the capability to allow users to develop Response Plans and to run simulations off-line.

4.2.2 SmartNET

The purpose of the SmartNET Subsystem is to provide the Graphical User Interfaces (GUIs) need for the web-based information exchange tool for the stakeholder agencies to share information and manage incidents, construction, and special event information. As such, SmartNET provides a wide variety of functionality critical to daily operations.

The main functionality of SmartNET Subsystem is:

- Provide stakeholders with user-friendly capability to input, exchange, view and manage data regarding incidents, construction, and special events in an interactive manner
- Receive the current status of devices and roadway and transit networks within the corridor
- Provide the current status of devices and performance of roadway and transit network within the corridor
- Provide incident response plan information to corridor stakeholders including plan recommendation, and implementation status
- Provides an alerting function that can generate and/or filter alarms based upon pre-defined condition criteria
- Provides an interface to email, cell phone/SMS, pagers, and integrated agency-operated system interface alerts. This allows for automated notification of appropriate agency personnel to predefined conditions/parameters within the ICM System.
- Provides a GIS-based mapping functionality that allows users to input and view condition and device status in a map-based view.

4.2.3 SmartFusion

The purpose of the SmartFusion Subsystem is to provide the data collection, processing, fusion, and dissemination functions for the ICMS. The SmartFusion Subsystem receives data from and provides data to the SmartNET Subsystem information exchange tool. The SmartFusion Subsystem also includes external interfaces for the import/export of data to/from systems critical to agency and ICM operations. While most agency stakeholders will not directly interface with SmartFusion Subsystem, its interface and data storage capabilities support a wide variety of functions critical to daily operations including:

- Receive the current status of devices and roadway network within the corridor
- Provide roadway link information to external systems to include link speeds, volumes, travel times, and weather conditions
- Provide event, construction, and special event information to stakeholder agencies and to external systems

- Store inventory of ITS devices, network data, and device ownership for the corridor network
- Store pre-agreed incident response plans developed and approved by corridor stakeholders
- Store history of implementation of pre-agreed incident response plans
- Provide roadway link information to external systems to include link speeds, volumes, travel times, and weather conditions for the calculation of alternate routes and modes
- Provide transit information to external systems to include routes, schedules, current location of transit vehicles for the calculation of alternate routes and modes

4.2.4 Regional 511 System

The provision of ubiquitous, multi-modal, regional traveler information is critical to the goals and objectives of the project including making transit use more user friendly as well as allowing travelers to make best choices about travel. The data needed for the operation of the 511 system will be automatically extracted from the ICM and agency native systems by electronic interfaces, eliminating any extra burden on the agencies. The 511 system will include a telephone interactive voice response (IVR) platform as well as a public and mobile web sites and a MY511 personalized traveler information system.

The 511 system will fuse and present comprehensive transportation information in user friendly text and map/graphical formats including:

- Traffic camera still video images
- Transit and highway incidents and closures
- Construction and special events
- Weather conditions and forecasts
- Link travel times
- Transit parking lot location and availability
- Links to transit ridesharing and trip planning systems

The 511 system will include a personalized traveler information component wherein users will be able to register their travel profiles in advance, allowing them to quickly access traveler information specific to their needs and receive alerts when events/incidents occur that impact their identified routes of travel.

4.3 Integrated Corridor Management Daily Operations

4.3.1 Concept of Operations

The daily operation of the corridor will build on existing operational systems, arrangements and protocols. The central point for coordination of corridor management will be the existing DalTrans TMC, with TxDOT, DART and Dallas County co-located at the facility. This approach provides a basis for a seamless transition from the current status to integrated corridor management.

Operational strategies and responses will be more fully integrated across modes and agencies. All operations among corridor networks and agencies will be coordinated via the Integrated Corridor Management System with assets strategies and actions attuned to obtain the goals and objectives of ICM.

Member agencies will be connected on a real time basis via a new information exchange network built on center-to-center interfaces. System condition data will be easily shared and available to all agencies via this network and the SmartNET Subsystem, a web-based graphical user interface that supports multi-agency input and information sharing related to the transportation network. SmartNET will provide access to real time and static information about incidents, construction, and special events as well as the current status of devices and performance characteristics of the roadway and transit networks. Transit information such as Automatic Vehicle Location for bus and light rail, transit incidents and transit route and schedule information will be integrated into the system. In addition, weather data will be available in the system to allow agencies to adjust operations based on real time weather conditions.

A Decision Support System will monitor real-time data to assess current transportation network conditions, recommend pre-approved strategies and response plans when events occur that affect corridor operations, analyze and predict response plan benefits and evaluate response plan results. New operational systems and devices such as responsive traffic signal control and parking management systems will allow agencies to better adjust to real time events and balance available capacity.

Traveler information available via IVR, websites, DMS, and through the media and ISPs will be corridor-based, providing information on corridor trip alternatives complete with current and predicted conditions. Travelers will access or be given real-time corridor information so they can plan or alter their trips in response to current or predicted corridor conditions. Each traveler will be able to make route and modal shifts between networks easily due to integrated and real-time corridor information, integrated fare payment system, and coordinated operations between networks. Using one network or another will be dependent on the preferences of the traveler, and not the nuances of each network.
Operational systems will provide wide ranging data on system conditions and performance, providing the means for analysis and provision of comprehensive performance measures that will allow corridor agencies to fine tune plans and response actions.

Inter-agency coordination of operations will be enhanced by the establishment of an ongoing organizational structure that will provide a forum for agencies to address operational issues in the corridor including elements such as policy and real time operations. In addition, an ICM Coordinator will be appointed to coordinate real time operations, in particular the assessment and implementation of Decision Support System response plans, as well as to support ongoing ICM program management issues.

4.3.1.1 Typical Daily ICM Operational Scenario

The following is typical daily ICM operational scenario as described in the ICM Demonstration Project Proposal:

Detectors report information on the current travel conditions on freeways, frontage roads, arterial streets, light-rail transit line (Red and Orange Lines), park-and-ride lots, and HOV lane. Operating agencies share incident, construction, and special event information among each other through a common web interface. When traffic conditions change due to heavy traffic demand, incidents, or inclement weather, transportation agencies change traffic signal timing on arterials and frontage roads as well as direct travelers to faster roadways or transit facilities. The traffic conditions are analyzed at the regional transportation management center. Dedicated staff members monitor the corridor operations and review potential changes. The decision support system allows transportation professionals to evaluate the best operational strategies and determine when to implement them. The decision support system simulates ICM strategies under projected travel demand to determine the benefit from changing the current operations.

When a new strategy is implemented, transportation agencies change messages on dynamic message signs on US-75 and arterial streets. In addition, electronic alerts are sent to travelers with information on the fastest routes to key destinations. For minor incidents, travelers may be encouraged to use frontage roads. For major incidents, travelers may be diverted to parallel arterial streets or to the closest light-rail park-and-ride lot to ride the light-rail. The cities will implement signal timing plans to accommodate higher demand expected from the diversions. Under the most severe incidents, DART may add light-rail vehicles to the Red Line and implement temporary parking at pre-agreed to locations such as shopping centers, with bus bridging to transit parking lots, in order to move more people by transit. When conditions return to normal, the transportation agencies return to normal operating strategies.

More detailed Operational Scenarios are contained in the Project Concept of Operations. The scenarios are based on a time line of an event and discuss for each affected agency what their specific response actions would be, including the additional actions/strategies supporting the new ICM operations approach. All scenarios include a component of traveler information. Incident scenarios were created for the following situations:

- Major Traffic Incident – Arterials
- Minor Traffic Incident – Freeway
- Major Transit Incident
- Weather Event

4.3.2 Routine Operations and Response

ICM operations will build on existing operational systems, arrangements and protocols. Routine daily operation of the corridor will continue as per current agency procedures, capabilities and

coordination processes. Conditions and events will occur that have only local impact and will not trigger an ICM-level response plan. In those cases, local agencies will continue their usual roles and operational actions as described in Table 3 of this Plan. That is, agencies will monitor their systems, and react and respond to local events using local systems, devices and response mechanisms. Inter-agency coordination related to the local event, if needed, will occur per current procedures, as dictated by the nature and extent of the situation.

However, as indicated previously, the ICM project will have resulted in implementation of a new system operations environment. In the new environment, monitoring and response to even routine daily events will be enhanced by the following:

- Enhanced network condition information and exchange: The SmartNET system will provide a common tool for reporting, viewing and sharing network condition information including video and data. Agencies will be in a better position to monitor real time status of their facilities as well as those of their neighboring agencies. Operations status can be made available throughout the agency, and alerts to management and responders can be automated, making response quicker and more efficient.
- New operations/management systems: New operations systems such as parking management, automated passenger count, arterial monitoring and responsive traffic signal control provide information and management tools that will allow agencies to improve and fine tune operations under all operating conditions.
- Better traveler information: The 511 system will give travelers pervasive, user-friendly access to real time information allowing travelers to plan and adjust travel at all times and under any circumstances.

4.3.3 ICM Coordinated Operations and Response

The ICM System will enable a wide variety of enhanced operational capabilities. However, realizing the full benefits of the new systems and environment will require a new level of interagency operational monitoring and coordination. This enhanced approach will be focused around the establishment of a new ICM Coordinator function. The function of the coordinator is broad and extends across operations as well as program management and support activities.

The following describes daily real time ICM operations at a high level:

- With regard to daily operations, the ICM Coordinator will have the primary responsibility to monitor network conditions, receive/approve ICM response plans from the Decision Support Subsystem and coordinate/monitor agency response. The ICM Coordinator will have access to a variety of information to support his decision-making as described in further detail below.
- During normal daily conditions (i.e. no ICM level event) agencies proceed with normal operating procedures including:
    - Monitor network conditions with various tools such as SmartNET or local ATMS

    - Enter local events into SmartNET or local ATMS including incidents and updates to planned construction and lane closures
    - Respond to local events as per local procedures
    - Operate and maintain transportation management systems and devices
- At the same time, the ICM Coordinator is also monitoring real time conditions on the transportation network using various tools such as SmartNET and the DalTrans ATMS in order to have an up-to-date view of system conditions in the event of an ICM level incident.
- In parallel, the DSS is monitoring conditions on the network based on data received from the SmartFusion Subsystem. As events are entered into SmartNET, the DSS will compare existing conditions to pre-established metrics for determining conditions warranting an ICM level response.
- Upon the occurrence of a qualifying ICM level event, the DSS will recommend an appropriate Response Plan and alert the ICM Coordinator by issuing an alarm via the SmartNET subsystem as well as text and email. The alarm will be sent to the person or persons currently logged into the SmartNET system as the "ICM Coordinator". Multiple persons will be allowed to be logged in as the "ICM Coordinator" to provide for redundancy in response.
- The alarm will identify the Response Plan number and SmartNET event associated with the incident, as well as provide a URL link that will allow the Coordinator to quickly access the Response Plan including agencies involved and recommended actions.
- After receiving the Response Plan alarm, the ICM Coordinator will review the recommended plan at a high level for effectiveness and practicality given current conditions. This review may include high level check of appropriateness of Plan selected, consideration of current real time network conditions, existence of any exceptional conflicts or considerations such as lane closures, construction, special events, incidents, weather, etc.

  If the review indicates the Plan is acceptable, the ICM Coordinator will approve the Plan. Once approved, all agencies with actions involved in the response will be automatically alerted and requested to reply as to their readiness to implement the Plan. Agencies involved in the Plan response actions will receive the ICM alarm via SmartNET, text and email. The alert will be sent to all involved agency operators currently logged into SmartNET and will identify the Response Plan number and SmartNET event associated with the incident, as well as provide a URL link that will allow the operator to quickly access the Response Plan including agencies involved and recommended actions.

  If the ICM Coordinator determines that the plan is not acceptable and should not be implemented, the ICM Coordinator will reject the plan and the DSS will reevaluate conditions and recommend an alternative plan if there is one that meets the criteria.
- Agency operators will assess their ability to perform their response actions and reply with either accept or reject. If the agency operator accepts the Plan he or she will have an opportunity to identify if there are any issues or limitations with fully implementing the

response. For example, it is possible that one of several DMS involved in the response are not available. If the reply is “reject” or “snooze” the operator must provide explanatory information in the reply.

- The ICM Coordinator receives the plan readiness information from the agencies and:
  - If all agencies confirm readiness sends a plan decision message to the agencies confirming the decision to implement the plan
  - If an agency or agencies do not reply in a timely manner the ICM Coordinator contacts those agencies directly via telephone or other approved procedure
  - If an agency indicates they cannot participate in the response, the coordinator assesses whether their participation is not-critical and the response can be implemented anyway.
  - If a plan cannot be implemented due to agencies’ inability to implement it the ICM Coordinator will reject the plan and the DSS will reevaluate conditions and recommend an alternative plan if there is one that meets the criteria.
- Once a response plan is directed to be implemented, agencies will implement it per their pre-approved actions and confirm their implementation actions and status via SmartNET.
- During plan implementation, and upon significant changes in conditions, the DSS Subsystem may propose an updated response plan (e.g. escalating or de-escalating the plan). The ICM Coordinator will continue to monitor SmartNET for the possibility that the DSS will recommend an updated response plan recommendation based on new information/other criteria. For example, if an incident was occurring during the peak hours, and extended beyond, one potential response during the peak could be to increase the number of Light Rail Vehicles (LRV) in operation.
- Once a plan has been implemented the ICM Coordinator will monitor real time conditions resulting from plan and coordinate with agencies on ongoing response, effects and adjustments for most effective management of the corridor as a whole. Monitoring and coordination will include:
  - Monitor delivery of real time information to the public and media for accuracy and timeliness
  - Make notifications to agency operators, managers, public affairs, media, etc. as per policies and systems using email tool, etc.
  - Coordinate with and advise agencies on end of incident and recommended response
  - Monitor predicted conditions vs. actual, provide feedback to system for refinement
  - Maintain logs of actions, replies, response, etc. as per policy and tools
- The Response Plan action will be terminated when the event that caused the activation is closed in SmartNET. All events entered into SmartNET have an agency owner. The agency owner is responsible for closing the event. At that time SmartNET will issue a message advising the ICM coordinator and all participating agencies that the response is closed.
- During the entire period, including both non-ICM event conditions and ICM event conditions, real time and status data on the transportation network status and options

are available to the public via a variety of traveler information delivery mechanisms including 511 as well as agency devices such as DMS. The information is delivered to the 511 system automatically via interfaces. Information routinely delivered will include travel times, incidents, construction, transit status, etc. and where appropriate offer comparisons between network options such as travel time on one facility vs. another or on HOV lanes vs. general purpose lanes. During an ICM event, information will focus even more on cross network or cross mode status such as:

- notification on travelers on freeway DMS of issues with transit operations or parking availability
- notification of travelers in transit stations of major freeway incidents

The ICM Coordinator will also have program management and support activities related to the ICM program. These include:

- Monitor ICMS for operational health; report issues and push resolution as appropriate; advise agencies of any advance planned outages as well as when unplanned outages occur
- Monitor and review DSS Evaluation Subsystem output on effectiveness of ICMS strategies and response plans. Compare to established goals, requirements and performance measures (operational and maintenance). Effectiveness will be judged based on both quantitative and qualitative measures including:
  - MOP's: Standard reports are being developed that will allow queries of the system for pertinent data including MOPs for the network 1) at the time the response was recommended 2) as a result of Plan implementation and 3) predicted MOPs for conditions if the plan were not implemented.
  - Operational post-event assessment by agencies: Response Plan activation and resulting operational actions and results including perceived success, operational issues, etc. will be accessed via regular post-event reviews at Operations Committee meetings.
  - User feedback: Consideration will be given to any feedback from the public/agencies/political persons, etc. that may be provided via 511, telephone calls, email, news, etc.
- Produce (monthly) reports on ICMS usage and effectiveness and distribute to agencies, management, etc.; report to also include up time and other system health parameters
- Meet with agencies (managers, operators, etc.) to review ICMS effectiveness; use data to refine strategies and response plans to improve corridor operations.
- Meet with agencies for post-incident evaluations of major incidents
- Meet with agencies to develop response plans for special events, major construction, etc.
- Meet with agencies (managers, operators, etc.) for ICMS training and outreach as needed
- Develop new response plans, modify plans as needed to increase effectiveness

- Meet with system developers, operators and maintainers to review consistency with requirements, and identify needs
- Support the ICM Program Director in the ongoing management and operation of the program as discussed in more detail in Section 6.0 Structure for Ongoing Coordination later in this Plan.

As can be seen, the ICM coordinator will have extensive 24/7 real time operations responsibilities as well as significant non-real time responsibilities. The ICM Coordinator is, in effect, a program not a single position. Accordingly, although a single person should be designated to be the point person for the function, accomplishing the full breadth of the program will require support from a number of other agency personnel. As a program, the function will require both real time activities in support of everyday operations, as well as non-real time activities in support of development and sustaining the program, as well as continuous improvement.

The ICM Coordinator will be an employee of one of the involved agencies but act in the interest of corridor-wide operations. The following is suggested as one method to address the numerous and diverse responsibilities of the ICM Coordinator:

- Appoint a person to be the lead for the function. The person should have significant operations experience, demonstrate leadership capabilities and be proficient in working in a team format. Additional persons should be identified and trained to act as ICM Coordinator in the place of the lead person. This will allow coverage during vacations, illness and other off times.
- As indicated previously, the SmartNET subsystem will allow multiple persons to be logged in as the "ICM coordinator". This provides effective means for the passing of the responsibility when needed, as well as redundancy in the event that the ICM coordinator is unexpectedly unavailable when a Plan alert is issued. Operational policy should be developed by the agencies to address the specifics of how this capability will be used.

ICM System Hours of Agency Operational Response

Agency Response:
As indicated previously, the participating public agencies have different hours in which they staff a capability to perform an operational response in the event that the DSS recommends a Response Plan. In addition, DART has limitations on their capabilities to staff a person to perform the ICM Coordinator function. After extensive discussion and consideration by the ICM Operations/DSS Committee the agencies have determined the hours of operation to be as shown in Table 8. The primary considerations in establishing these hours of operation were:

- Agency staffing capabilities
- Recognition that DSS response would not be critical during night and some weekend hours due to reduced hours of congestion during those periods.
- A desire to perform operational response when a number of significant agencies had response capabilities, even if all agencies were not capable at that time.

ICM Coordinator Coverage:
Current plans call for ICM Coordinator Coverage via the following:

- A DART employee with significant operational experience will be assigned to be the "lead" ICM Coordinator
- DART HOV operators that work at the DalTrans TMC will also be trained to perform the ICM coordinator function.

The hours during which there will be staff performing the ICM coordinator function are shown in Table 9.

Table 8: Hours of Operation

Hours of ICM Agency Operational Response				
	Activities	**Hours**	**Agencies/Actions**	**Comments/Issues**
1	ICM/DSS Response by all key operational agencies	6 AM – 6 PM M-F ("core hours")	DalTrans, DART, Richardson, Dallas, Plano, NTTA,	All key operational agencies operate during these hours. Agencies will complete response actions for incidents starting during but extending beyond the core hours. (Note: Plano currently operates 8 AM – 4 PM M-F but is evaluating means to expand operations to meet the core hours)
2	ICM/DSS Response by a partial set of operational agencies	Mon. - Fri. 4 AM to 9:30 PM	DalTrans, DART and NTTA	These agencies operate beyond the core hours and may respond to a DSS event during these hours, depending upon the event and action needed. (Note: these are the hours of coverage for the ICM Coordinator as more fully explained in Table B)

Notes: The Cities of Highland Park and University Park have limited operational resources. They will be engaged in ICM response when appropriate to the extent involved and available.

Table 9: ICM Coordinator Hours

Hours of ICM Coordinator Coverage	
Coverage Hours	**Coverage Approach**
Mon. - Fri. 4 AM to 9:30 PM	These are the hours during which DART staffs HOV Operators and/or the ICM Coordinator has normal working hours. During these hours the DART HOV Operator or the ICM Coordinator will be acting as the ICM Coordinator. DART will establish procedures that define the procedures for this. The procedures will address issues such as overlap, vacations and sick leave, absences for meetings, transfer of responsibilities, etc.

4.3.4 ICM Operations and Maintenance Contact Information

The ICM program will require a 24/7 operational approach. As a result, there will be a need for operational coordination during normal as well as off hours, especially on the part of the ICM

coordinator. Table 10 contains the various agencies' operational contact phone numbers by time of day. Note that several agencies will operate during off hours/weekends due to special events, etc. A procedure needs to be established such that agencies alert the ICM Coordinator in these cases.

Table 10: Agency Operations Contacts by Time of Day

Agency	Contact Hours/Telephone Numbers		
	Monday - Friday		Saturday – Sunday
Texas Department of Transportation (TxDOT)	24/7		
	(214) 319-3601		
City of Dallas	6:30 AM – 6:30 PM	12:01 AM – 6:30 AM and 6:30 PM – Midnight	12:01 AM – Midnight
	(214) 670-5276		
City of Richardson	6:00 AM – 6:00 PM	12:01 AM – 6:00 AM and 6:00 PM – Midnight	12:01 AM – 8:00 AM and 5:00 PM – Midnight
	(972) 744-4330	(972) 744-4111	
City of Plano	8:00 AM – 5:00 PM	12:01 AM – 8:00 AM and 5:00 PM – Midnight	12:01 AM – Midnight
	(972) 941-7152	(972) 727-1623	
Dallas Area Rapid Transit (DART) - Bus Service	24/7		
	(214) 928-6200		
Dallas Area Rapid Transit (DART) - Rail Service	24/7		
	(214) 928-6048		
Dallas Area Rapid Transit (DART) - HOV	4:00 AM – 9:30 PM	12:01 AM – 4:00 AM and 9:30 PM - Midnight	12:01 AM - Midnight
	(972) 716-4168	(214) 934-3136	(214) 934-3136
North Central Texas Council of Governments	8:00 AM – 5:00 PM	NA (*)	NA (*)
	(817) 608-2336 or (817) 695-9280		
North Texas Tollway Authority	24/7		
	(214) 224-2203		
City of Highland Park	8:00 AM – 5:00 PM	12:01 AM – 8:00 AM and 5:00 PM – Midnight	12:01 AM – 8:00 AM and 5:00 PM – Midnight
	(214)-521-4161		
City of University Park	8:00 AM – 5:00 PM	12:01 AM – 8:00 AM and 5:00 PM – Midnight	12:01 AM – 8:00 AM and 5:00 PM – Midnight
	(214)-987-5400		

* Because NCTCOG is not an operating agency, it is assumed there will not be a need to contact a NCTCOG ICM point person during off hours.

It is envisioned that ICM, at least in its formative implementation, will require off hours coordination among staff that is more intimately familiar with the program, and is at a high enough level in the organization to decide on response issues. Accordingly, each agency needs to designate a person in their agency to be the point of contact for the program. Table 11 combines the agencies' contact information with their work hours as a means to assist the ICM Coordinator in quickly determining the contact information. Note that Table 11 does not contain the names of the contact individual or individual due to privacy concerns. Another version of the Table that contains names will be created for confidential use by the ICM Coordinator and the operating agencies.

Table 11: Agency ICM Program Point of Contact by Time of Day

Agency	Function	Contact Location	Contact Info (Operations/Maintenance)	
			Normal Hours	Off Hours
Texas Department of Transportation (TxDOT)	Traffic Operations	TMC	(214) 320-4438	(214) 319-3601
City of Dallas	Traffic Engineering	City Traffic	(214) 670-5276	(214) 670-5276
City of Richardson	Traffic Operations Manager	TMC	(972) 744-4324	(972) 744-4324
City of Plano	Transportation Engineering Manager	TMC	(972) 941-7152	(972) 727-1623
Dallas Area Rapid Transit (DART) - Bus Service	DART Bus Operations	DART Bus Operations Control Center	(214) 928-6200	(214) 928-6200
Dallas Area Rapid Transit (DART) - Rail Service	DART Rail Operations	DART Rail Operations Control Center	(214) 928-6048	(214) 928-6048
Dallas Area Rapid Transit (DART) – HOV	DART HOV Operations	TMC	(972) 716-4168	(214) 934-3136
North Central Texas Council of Governments	NCTCOG	HQ	(817) 608-2336 (817) 695-9280	NA (*)
North Texas Tollway Authority	Operations	NTTA Command Center	(214) 224-2203	(214) 224-2203
Town of Highland Park	Traffic Engineering	City Traffic	(214)-521-4161	(214)-521-4161
City of University Park	Traffic Engineering	City Traffic	(214)-987-5400	(214)-987-5400

* Because NCTCOG is not an operating agency, it is assumed there will not be a need to contact an ICM point person during off hours.

4.4 ICM System Maintenance

4.4.1 Local systems

Local systems will continue to be operated by the local agencies in accordance with current agency operations and maintenance resources and procedures. The systems installed as part of the Supporting Projects and Activities will generally be incorporated into the various agency operations

and maintenance responsibilities, as appropriate to the project owner/deployment location. This generally includes all related operations and maintenance costs.

4.4.2 ICM System

The ICM system will be located at the DalTrans TMC. Operations and maintenance of the system will be overseen by DART. Due to the multi-agency aspects of the system, funding for the ongoing operations and maintenance of the system should be addressed in a "regional" context. Funding may be provided via a mix of strategies that could include:

- Federal funds programmed by the MPO (NCTCOG)
- Agency funds
- Agency in-kind contributions

Technical system operations and maintenance will be supported by contracts with the developers for a period of at least 18 months. Detailed System Operations and Maintenance Plans for the DSS and the SmartNET/SmartFusion Subsystems are being developed by DART's project contractors.

4.4.3 System Operations and Maintenance

The ICMS project includes deployment of the SmartNET, SmartFusion and DSS subsystems. Section 2.1.4 also identified additional Supporting Projects and Activities that are being deployed to support the ICMS project. In many cases, agencies implementing the Supporting Projects and Activities will be absorbing the staff effort and cost into their ongoing operations tasks and funding.

However, for some projects this is not the case and there will need to be ongoing efforts to ensure that funding and/or contractor support is in place to support these projects. Table 12 identifies those projects and discusses at a high level the funding and operations and maintenance approach that is in place and/or will need to be addressed in the future to ensure proper operations of the systems.

Table 12: System Operations and Maintenance – Key Projects

Project	Operating Agency	O&M Mechanism	O&M Cost	O&M Fund Source
Arterial Street Monitoring System	TTI with field support from the Cities of Richardson, Plano and Dallas/DART	The system will be maintained by contract with the developer, TTI, for at least the initial 18 months of the project. The three City agencies will provide staff field support at no cost to the project.	Approx. $70K for 18 mos. (including $40/month for communications costs.) (See note 1)	This is largely federally funded with DART match. O and M funds have already been assigned through the ICMS project. The city agencies will absorb the field support within their budgets to the extent it remains within the currently expected modest amount.
Responsive Traffic Signal Control	Cities of Richardson, Plano and Dallas	Initial cluster analyses and development of up to 60 timing plans is being done under contract to TTI and Kimley-Horn with support by the City agency staff, The Cities will absorb costs of implementing and operating the timing plans.	$50K for TTI to perform the initial cluster analyses and $200K for Kimley-Horn to develop the related signal timing. The work is anticipated to involve the analyses of about 60 clusters with an equal number of timing plans.	The cost of initial cluster analysis and timing plan development is being done through a mix of federal with local match (Richardson and Plano). If additional analyses and timing plan development is needed there will be a need to identify funds with the MPO/federal funds as the most likely source.

Project	Operating Agency	O&M Mechanism	O&M Cost	O&M Fund Source
511 (DART)	DART (See Note 2)	The system will be maintained by contract with the developer, Telvent, for at least the initial 18 months of the project. Funds have already been assigned through the ICMS project; DART will be the lead agency for managing the O&M during this time.	Costs Still Being Developed	This is largely federally funded with DART match. Initial O and M funds for Telvent have already been assigned through the ICMS project. The exact level of required of both DART and Telvent is still being considered and may impact the need for additional funding.
ICMS / SmartFusion	DART (See Note 2)	The system will be maintained by contract with the developer, Telvent, for at least the initial 18 months of the project. Funds have already been assigned through the ICMS project; DART will be the lead agency for managing the O&M during this time.	Costs Still Being Developed	This is largely federally funded with DART match. Initial O and M funds for Telvent have already been assigned through the ICMS project. The exact level of required of both DART and Telvent is still being considered and may impact the need for additional funding.

Project	Operating Agency	O&M Mechanism	O&M Cost	O&M Fund Source
ICMS DSS	DART (See Note 2)	The system will be maintained by contract with the developer, TTI, for at least the initial 18 months of the project. Funds have already been assigned through the ICMS project; DART will be the lead agency for managing the O&M during this time.	Costs Still Being Developed	This is largely federally funded with DART match. O and M funds have already been assigned to TTI through the ICMS project.

Note 1: Monthly communications costs for Arterial Street Monitoring System could be lower. For example, City of Richardson is moving to a WiMax system that could replace the existing wireless.

Note 2: DART will be the operating agency lead on behalf of all agencies participating in the project.

4.5 Coordination with Stakeholders

4.5.1 ICM Corridor Stakeholders

Due to its multi-agency nature, the ICM project has involved considerable coordination with all corridor operating agencies and other key stakeholders, primarily through the project Stakeholder Committee structure. Participants in this effort were identified earlier in this report in Section 1.5 Stakeholders.

These stakeholders have developed a close relationship over several years during the development of the project Proposal, Concept of Operations and Design Documents. It is expected that this close coordination will continue as the project proceeds into operations through a similar mechanism. Section 6.0 of this report, Structure for Ongoing Coordination, contains more details about the extensive coordination effort that has occurred to date, as well as a proposal for a modified structure that can continue this close coordination as the effort advances from a design/project based phase to an operations/program based phase.

An important additional stakeholder is the LBJ Freeway developer. TxDOT has entered into a comprehensive development agreement with the LBJ Infrastructure Group to reconstruct 13 miles of the LBJ Freeway and I-35 E to add HOV lanes and connectors and make operational improvements. The HOV lanes will be managed lanes allowing non-HOV traffic to use the lanes for a congestion-based toll. The project is under construction and expected to be completed by 2016. The LBJ Infrastructure Group will operate the 13 mile section of the freeway for 52 years. As the project progresses TxDOT and the developers will coordinate closely on design and operational requirements. This will provide the mechanism to ensure that the project, when completed, can be integrated seamlessly into the ICM including video and data sharing via the Information Exchange Network and inclusion in the development and implementation of ICM response plans.

4.5.2 Emergency Response Community

Agency members of the Operations Committee identified another set of key stakeholders that needed to be brought to the table prior to project implementation. That set of stakeholders is the Emergency Response community including but not limited to police, fire, emergency medical services and towing and recovery. While emergency response activities are expected to continue to be performed largely the same after ICMS implementation, it is important that the response community be aware of the ICM and its possible effect on them.

The Committee identified that an ICM information forum for the emergency response community as a possible solution to this need. The forum would include presentation and discussion such as:

- Briefing on the ICM goals, objectives and strategies
- Presentations on and demonstrations of new system and information sharing capabilities

- Explore interest on the part of the responders to have access to SmartNET as an operations information tool
- Feedback on emergency response input and concerns
- Outreach to identify champions from the community who could assist in further program involvement (such as a possible representative on the Operations Committee)
- Any need for follow up

Since there are a large number of jurisdictions involved in the project, the list of emergency response entities invited to the forum would need to be carefully considered to avoid too large of an audience. The Committee agreed that while the forum is needed, the project needs to advance to a mature state before it is scheduled.

4.5.3 Other Agencies, the Public, and Business Enterprises

Additional ICM-related outreach to other agencies, the public and local business entities is expected to take place via an extensive 511 system branding and outreach program that will advise these entities of the 511 system capabilities and promote its use. This is important to fully achieving the ICM goals as widespread use of the 511 system will promote objectives such as mode shift and improved travel reliability.

4.6 Training

Operations and maintenance training will be critical to a smooth transition as well as ongoing operations under ICM.

4.6.1 ICM Systems Operations and Maintenance

As indicated previously, System Operations and Maintenance Plans for the DSS and SmartNET/SmartFusion Subsystems are being developed by DART's project contractors. These Plans will describe in detail the actions needed to operate and maintain these systems including elements such as preventative and response maintenance, software maintenance, roles and responsibilities, system health monitoring, etc. While it is expected that the system developers will provide the operations and maintenance services for at least the first 18 months of operation, it will be important that the developers train appropriate staff from at least DART on key aspects of the system O&M. This is due to the fact that DART will be responsible for managing the ongoing system O&M contracts and activities. The provision of detailed documentation on the various Subsystems will be critical for agency staff to be able to take over operations and maintenance from the contractors.

With multiple agencies using the system, there is the potential that any agency may observe what it believes to be a system problem or failure. When this occurs there will typically be a need for some initial assessment on the part of the agencies before alerting the contractors. This assessment is

most efficient if done through a clearinghouse type process by a knowledgeable entity. It is recommended that one agency be identified to serve in this role as the host facility for the system as well as due to their 24/7 operations. A procedure will need to be developed wherein agencies noting a suspected problem can alert this agency who will perform initial troubleshooting before bringing in contractor support.

4.6.2 Agency Operations and Maintenance

Stakeholder agencies will be using the various ICM systems as a critical part of daily operations. It is important that operational training be provided to ensure that all understand the system functions and capabilities as well as expectations related to agency use of the systems. The following describes at a high level the key systems and related training that is required:

- **SmartNET:** SmartNET will be the primary GUI for agencies to enter and view events and real time network status as well as receive alerts including ICM response plan requests and status. Training needs to address both daily operator needs as well as system manager/administrator needs. The system manager/administrator manages elements such as password control, agency profile and user privileges. Agency profile controls items such as what facilities an agency can enter events on, what event data is seen by the agency and what conditions are that generate agency alerts. Daily operator training needs to address items such as how to view, enter, modify, filter and close events, how to generate and react to alarms, how to send events/alarms via fax, pager or email and how to generate reports.
- **DSS:** The DSS will be the primary mechanism for identifying conditions triggering an ICM response, recommending the appropriate response plans, initiating response plan alerts (to be delivered by SmartNET) and monitoring response plan effectiveness. One or more managers/experienced operations personnel from each agency should have high level training to understand these functions and how the DSS performs them. Daily operators need to be trained to understand what response plans are, how and when response plan alerts are generated, what agency responsibilities are for acknowledging response plans alerts, implementing plan actions and/or advising the agency cannot participate in the plan response.
- **511:** The 511 system will be critical to interfacing with the public to enable smarter travel and promote mode shift. It is extremely important that the system be as up-to-date and accurate as possible in order to maintain the public confidence. This will require agency members to have a strong understanding of how the system works. In particular, agencies will need to establish:
    - quality assurance/quality control procedures in their agency to check system operations and veracity, especially in the early stages of the system implementation
    - data monitoring and update procedures to ensure data such as roadway network information, location of traffic cameras and points of interest are accurate and up-to-date
- **ICM Operations:** ICM operations involve the integrated daily operations under the ICM umbrella. Agencies need training not only on the individual system/Subsystems discussed above, but should also plan and implement operational training related to this integrated operation. This training would largely be focused on drills vs. classroom training and could be based on a phased level on complexity such as:

- Initial drills would be scheduled with agency knowledge of time and scope and largely confirm that systems perform their intended functions when prompted to do so.
- A second level of drills could be scheduled with agency knowledge of time and scope and set up to test/demonstrate that systems perform their intended functions and agencies understand how to use the systems and respond appropriately.
- A third level of drills could be scheduled with agency knowledge of rough time (e.g. day but not hour) and rough scope. The drill would require agencies to react in a timely and proper manner without having advance knowledge of all drill parameters. As an added test, the drill could include a significant change in conditions during the course of the event, requiring agencies to adapt to the new conditions.

- **Agency Internal Training:** Agencies will also have a need to conduct their own internal training on elements that affect them in an agency-specific way. Two significant examples are:
  - When ICM operations affect the core operating procedures of an agency such as the chain of command for off hours notifications or the internal agency procedures for determining actions to an ICM response plan request and subsequent operations.
  - When the agency is implementing one of the Supporting Projects and Activities such as the Targeted Event Accelerated Response System (TEARS) or the DART Parking Management System. These systems change/enhance daily operations of the agency and will require that the agency develop and implement agency specific training on the system operational procedures.

- **ICM System Training Support:** Training is an activity needing ongoing capability to ensure that new personnel can be trained and existing personnel have refresher training to keep skill levels high. Some agencies, especially smaller agencies, will have difficulty accomplishing this. As a result, it is recommended that:
  - Training includes an element of train-the-trainer wherein an agency point person or persons can be trained in sufficient depth to allow them to conduct basic level training on the systems.
  - In larger agencies such as DART and TxDOT, a point person or persons be identified and developed such that they can support their agency as well as smaller agencies with basic system training as well as be a point for technical questions and system capabilities.
  - Funding for ongoing system operations include monies for ongoing training and support by the consultant developers of the systems.

5 Data, Evaluation and Performance Measures

5.1 Data

Stakeholder agencies already collect extensive transportation data within the corridor and deployment of system expansions and the Supporting Projects and Activities will provide even more data.

The ICM System, in particular the SmartFusion Subsystem automatically extracts and shares data via external and internal interfaces and serves as the central data store for the system.

The following is a summary of the data collected:

Real Time and Static Network Status data elements including:

- Incident Events – Both Traffic and Transit events will be provided
- Construction or Planned Events – Future events including schedules
- Link Dynamic Data – Speed, Volume, and Travel Time data as available
- Traffic Signal Status Data – Operational status of the traffic signal as updated in SmartNET
- VMS Status Data – Operational Status of a sign and text representation as available
- HOV Status Data – Operational Status of HOV as available

Response Plan Selection data including:

- The Incident Response Plan Data – Response Plan Identifier and Plan Description
- The Incident Response Plan Dialog Data – Response Plan Request Identifier, Agency Identifier, Decision
- The Plan Decision Results Data – Response Plan Identifier, Decision

Parking Management System data including:

- Transit park-and-ride lot utilization and parking space availability

Transit data including:

- Transit route, schedule adherence information, current location of DART buses and light rail vehicles, and transit incidents, passenger load of the Red and Orange Light Rail lines, construction and special event information

Weather data

- Weather Alerts – National Weather Service alert types including affected counties

This data provides a robust basis for a network based, multi-modal evaluation of the project as well as the establishment and monitoring of corridor operational performance measures that will be used to evaluate ICM system and network effectiveness.

5.2 Evaluation

This US-75 ICMS Project is a part of USDOT's national Integrated Corridor Management Program. It is one of two projects selected nationally for implementation and demonstration (along with a project in San Diego). As such, USDOT has arranged for the project to be evaluated by an independent entity, Battelle.

Under the evaluation Battelle will receive the corridor data described above and use it to evaluate the project according to eight evaluation "analyses" as summarized in Table 13 which was derived from the Battelle Evaluation Test Plans:

Table 13: Relationship between USDOT Hypotheses and Evaluation Analyses

USDOT Hypotheses	Evaluation Analysis Area
• Improve Situational Awareness • Enhance Response and Control	Technical Assessment of the Capability to Monitor, Control, and Report on the Status of the Corridor
• Better Inform Travelers	Traveler Response (also relates to Enhance Response and Control)
• Improve Corridor Performance	Quantitative Analysis of the Corridor Performance - Mobility
• Positive or No Impact on Safety	Quantitative Analysis of the Corridor Performance - Safety
• Positive or No Impact on Air Quality	Air Quality Analysis
• Have Benefits Greater than Costs	Benefit-Cost Analysis
• Provide a Useful and Effective Tool for ICM Project Managers	Evaluation of Decision Support Systems
Cross Cutting Analysis	
Institutional and Organizational Issues: Investigates institutional and organizational issues and relates to all of the hypotheses since the ability to achieve any intended ICM benefits depends upon successful institutional coordination and cooperation.	

The evaluation will collect 12 months of baseline (pre-ICM deployment) data and, following a 6-month shakedown period, 12 months of post-deployment data. Based on current deployment schedule, the anticipated schedule for major evaluation activities is as follows:

- Finalize test plans – Spring 2012
- Collect baseline (pre-ICM deployment) data – Fall 2011 through Fall 2012
- Complete Interim Technical Memorandum on baseline data – Spring 2013
- Collect post-deployment data – Winter 2012 – Summer 2014
- Complete Interim Technical Memorandum on evaluation results – Fall 2014
- Complete Final Report – Spring 2015

5.3 Performance Measures

As indicated previously, the robust data that will be available through the ICM Project will enable the development of a series of corridor performance measures that will allow agencies to assess the performance of the corridor under ICM operations including the effectiveness of ICM response plans. During the project development stage, the US-75 Steering Committee assessed the corridor goals and objectives and identified some potential performance measures as shown in Table 14 below:

Table 14: Corridor Performance Measures

Goal	Potential Performance Measure
Increase corridor throughput	• Vehicle/Person Throughput (Freeway/Arterial) • Person miles traveled/ vehicle miles of travel(Freeway/Arterial) • Volume/Capacity Ratio • Average Travel Time/ Average Speed (Travel Time Index) • Ridership (Transit)
Improve travel time reliability	• Variance to Baseline Expectations (% Change) for time of day and for optimal conditions • Planning Index – 95% percentile travel time • Buffer Index – change between Mean and 95% • Transit Arrival Time (vs. schedule)
Improved incident management	• Clearance time for an Incident (based on Jurisdiction and Corridor) • Response time • Delay to the user • Impact to Capacity to Incident

Goal	Potential Performance Measure
Enable intermodal travel decisions	• Mode Shift – both Short-Term and Long-Term (especially Short-Term) • Park and Ride Trips • Park and Ride lot volumes • Revenue / Ticket sales for Transit

These performance measures will be refined and finalized as the project approaches implementation. Data analysis and production of the performance measures results is expected to be accomplished in several ways including:

- Southern Methodist University's (SMU's) mesoscopic DIRECT model
- The DSS Evaluation Subsystem which provides the ICM coordinator and the operating agencies a critique of how an ICM strategy and associated response plan performed for a given event. The Evaluation Subsystem uses the corridor data from the SmartFusion Subsystem to calculate corridor performance metrics.

As indicated previously, MOPs used by the simulation engine will include:

- travel time
- number of travelers
- travel delay and
- travel distance.

The MOPs are segregated / totaled by:

- Facility/direction: US75 mainline, US75 frontage roads, I-635, George Bush Turnpike and Greenville Ave.
- Mode: car, bus, rail and Park and Ride. The analysis of response plans will also include a prediction of future network conditions. The Prediction Subsystem will examine three instances of the network: 1. Current Conditions of the network; 2. Future Conditions of the network, 30 minutes into the future, without response plans enabled; 3. Future Conditions of the network, 30 minutes into the future, with response plans enabled.

The DSS subsystem will provide for the routine collection and reporting of MOPs to enable:

- Operating agencies to refine strategies and response plans to continually improve how the ICMS improves corridor operation
- Managers to assess the effect of the ICM on system performance and adjust plans, programs, funding, priorities

6 Structure for Ongoing Coordination

6.1 Existing Project Management Structure

In the current phase of the project, the Assistant Vice President of DART's Mobility Programs acts as the Project Director, providing public agency leadership and overall project management. The Project Director has the support of a number of functional and technical committees as well as technical support from the project consultant team. A Stakeholder Committee consisting of members from all key stakeholders provides support and direction to the project including actions such as identification of requirements, review of project designs, inter-agency coordination, etc. In some cases, agencies have the lead for progressing other system deployments that support ICM, such as the responsive traffic signal control system. Telvent, the prime contractor for the project and Texas Transportation Institute, Southern Methodist University and University of Texas at Arlington assist in the ongoing management of the committee and provide technical support. The Stakeholder Committee currently meets monthly.

A number of other sub-committees have been established to provide support and direction related to key aspects of the project. These Committees act similar to sub-committees and were formed to address the following specific functional needs:

- Outreach and Marketing
- Technology
- Policy and Programming
- Arterial Monitoring Systems
- Operations
- Evaluation

In addition, working groups have been formed to address key Subsystems of the project. The Subsystem Committees are:

- SmartNET
- Arterial street monitoring
- 511 Systems
- Transit Applications
- Decision Support
- Parking management
- DART Data Portal
- Adaptive Signals
- Video Sharing
- C2C

The working groups are involved in detailed activities directly related to their particular Subsystem. These committees and working groups meet in accordance with the overall need and magnitude of their responsibilities and report out monthly on status at the Stakeholder Committee meeting. There is considerable overlap among the participants and the purpose of these various additional Committees. To address this, the Operations and Decision Support committees have joined into one.

This approach has worked well for the current phase of the project. It has been successful in keeping agencies informed and active and reduced risks associated with project deployment.

6.2 Proposed Structure for Ongoing Corridor Operations Coordination

Once the project has been deployed and begins the ongoing operation phase there will be different needs with respect to management and coordination. Key emphasis will shift from activities such as requirements development, system design and testing to activities such as operations, performance measurement and evaluation. In effect, the transition is from a largely project based environment to an operations and program management environment. This will require a somewhat different organization structure, but one that can build upon rather than completely replace the existing structure. In addition, the new structure must be simpler. The current situation with multiple committees and a high degree of participant overlap will not be efficient or sustainable in the new operations environment.

The new management structure will need to address three major functions:

- ICM Program leadership
- ICM Corridor Management including interagency coordination
- Daily operations including the functions of the ICM Corridor Manager

The following presents a proposed approach that may address these needs.

6.2.1 ICM Program Leadership

The Assistant Vice President of DART's Mobility Programs currently acts as the ICM Program Director and provides overall ICM program leadership. This should continue as the project moves into the operational phase to provide continuity during this important step. However, this person will need significant staff support to accomplish the role. This support could be provided by the ICM Coordinator.

6.2.2 ICM Corridor Management

The ICM corridor management structure needs to address a means to coordinate at a high level among the key agency stakeholders as well as handle the specific operations and technical needs of the program. The needs are discussed in further detail below:

6.2.2.1 Stakeholders

The existing Stakeholder Committee should remain in place and continue its current role. It may be appropriate to examine the number of participants as well as their role and position in their agency to ensure the proper person represents the agency in the new operational environment. Key responsibilities of the Stakeholder Committee will be to provide for overall program direction, inter-agency coordination, agency awareness and support for the program at the management level and agency identification and delivery of operational and technical commitments to the program. While

the Stakeholder Committee may need to continue to meet monthly while the system matures, it may eventually be able to meet less often, such as quarterly. It will be possible to phase out many of the existing sub-committees and working groups as their current role in the design phase is addressed and operations are stabilized. If there is a need for continued effort in a sub-committee's area of responsibility, or new issues arise needing group attention, working groups should be formed under the umbrella of either the Stakeholder or ICM Operations and Technology Committees, depending on the focus of the effort (policy/management vs. operations/technical).

6.2.2.2 ICM Operations and Technology

As the ICM System transitions into operations a single committee should be established to oversee operational and technical issues. The existing Operations Committee should be the core for this, while adding key members from other committees such as Decision Support and Policy and Programming. This committee will be responsible for activities such as inter-agency operations coordination, establishing or revising operational policies and agreements, monitoring system effectiveness, performing post-incident reviews and updating ICM response plans. The Operations and Technology Committee will need to meet monthly for the foreseeable future. If there is a need for new or continued detailed effort of an operations or technical nature, working groups should be formed under the umbrella of the Operations and Technology Committee.

6.2.3 ICM Daily Operations

Daily operations and maintenance of local systems are managed and performed by the local agencies, as described elsewhere in this Plan. Operations and maintenance of the core ICM System (SmartNET, SmartFusion and Decision Support Subsystems) is performed as per the individual operations and maintenance plans which are separate documents. The ICM Coordinator coordinates operational response to ICM-level events.

6.2.4 ICM Coordinator

A key element of daily operations is the ICM coordinator. The ICM Coordinator will have both program and real time responsibilities. At the program level the ICM coordinator will support the Project Director and, in turn, interface with the Stakeholder and Operations and Technology Committees on program-level issues such as management briefings, system performance, schedule, budget operational policies, outreach, etc. With respect to real time operations, the ICM Coordinator will be involved in daily operations as a key link in receiving and approving ICM response plans from the Decision Support Subsystem as well as monitoring response and system performance. The role of the ICM Coordinator is further described in Section 4.3.3 of this Plan.

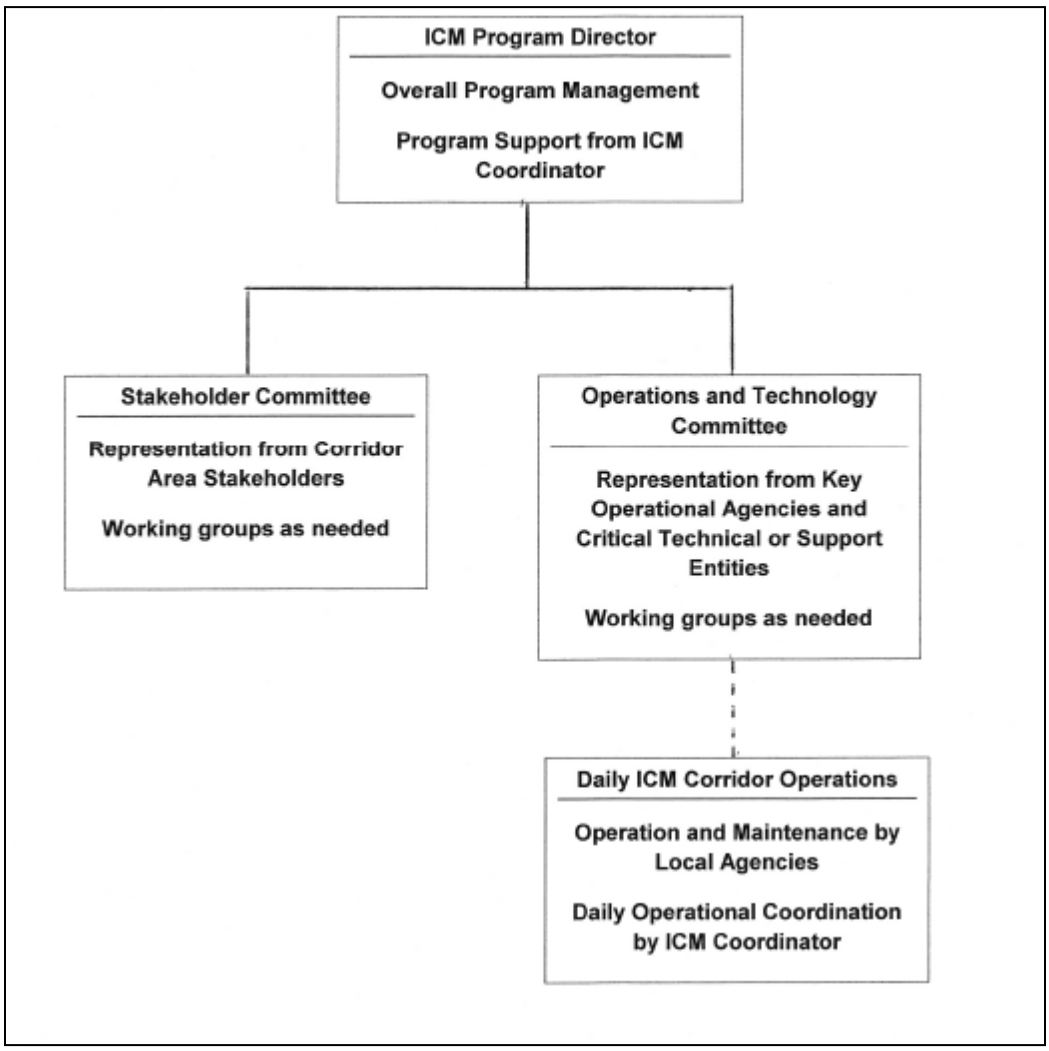

Figure 3: Proposed ICM Management and Coordination Structure (Source: Dallas Area Rapid Transit , October 21, 2012)

6.2.5 Future Management Structure for Regional Operational Coordination

The management structure described above is focused on operations in the US-75 Corridor. The approach is similar to organizational structures established for the Transportation Operations Coordinating Committee (TRANSCOM) and Niagara International Transportation Technology Coalition (NITTEC) operations coordinating coalitions in NYS. There is ongoing discussion in the area, particularly at NCTCOG, on mechanisms to establish a structure that would have a broader role in inter-agency regional operational coordination that extends beyond the corridor and is useful for the entire MPO area. However, at present, there are no specific actions being taken or timetable to establish this structure.

There are a number of issues associated with the establishment of this type organizational structure. Implementing the revised structure described above has several advantages:

- It establishes the mechanism to effectively shepherd the ICM Corridor System into operations.
- It builds upon the existing organizational structure to avoid duplication and take advantage of continuity.
- It establishes an organizational approach that can be used as a straw man to test and develop operational coordination in a way that could be transitioned into a broader regional coordination entity as that concept is established.

7 Transition Actions

This section contains actions needed to ensure a smooth transition from current operations to ICM operations. In some cases the actions may have already been accomplished or are in the process of being accomplished. Some actions cannot be taken until the system design and implementation has reached a stage beyond where it is today. The actions are listed below but are not in priority order:

General Actions

1. Appoint the ICM Coordinator as soon as possible to allow the person time to learn the project, participate in training and interface with the stakeholders. Once on board the ICM Coordinator can develop detailed operating procedures for the position. Backups for the coordinator, as discussed earlier in the report can be identified later but should also be brought on board as soon as possible.
2. Plan for and implement the transition from the existing design/project-based organizational structure to an operations/program structure. The existing structure may remain relevant beyond the point where the ICM system becomes operational but is not conducive as the long term structure. In particular, the Operations Committee needs to be prepared for new duties such as ongoing assessment and refinement of response plans, necessary revisions to operating procedures, etc.
3. Complete the development of ICM Response Plans. Monitor the network operations and revise plans or develop new plans as needed based on performance.
4. Continue the provision of operational training on the DSS, SmartNET and 511 until all start up needs are met. Agencies should identify a point person for coordinating their needs. If possible, agencies should identify a person who can be trained under a train-the-trainer format such that larger or ongoing training needs can be met.
5. Ensure that ongoing training is included in the scope and funding for consultant operational support contracts for the ICM Subsystems.
6. Develop and implement operational training and drills using the ICM to allow agencies to run through practice scenarios using the ICM systems.
7. Complete development and implementation of key operational policies.
8. Continue close project management and monitoring of the ancillary systems agencies are deploying in support of ICM, such as transit parking lot status, responsive signal control, etc. to maximize on-time system implementation and integration. Implementing agencies need to revise, develop and/or integrate operations and maintenance policies for these systems.
9. Complete the modeling and analysis (via DIRECT and SYNCHRO) needed to identify events, locations, clusters and signal timing changes needed to be implemented for the responsive traffic signal system implementation. Incorporate the results into the

DSS/Response Plans and implement the revised timing plans. Continue to monitor the network operations and revise events/locations/timing plans as needed based on performance.

10. Complete agreements and actions related to increased video and data sharing among agencies.
11. Use ICMS as an opportunity to engage the emergency response community. An ICM informational workshop for this community is discussed earlier in the Plan.
12. Examine the need for project briefings/outreach to agencies and the public and develop a schedule to ensure any outreach required before ICM implementation dovetails with the system implementation date.

Specific Actions Related to Needs for Policy/Procedure Development

1. Agencies should identify and update any internal policies and operational procedures that will be affected by ICM implementation including revising contact lists to reflect ICM needs. Three areas needing action are also detailed in **Section 4.1.3 *New/Revised Operational Policies***. Action status on these is as follows:
    a. Revised DMS policy – policy completed
    b. Expanded data and video sharing agreements – still being progressed
    c. Signal Timing Adjustments on Strategic Arterials – policy agreed to
    d. This Plan includes several Tables that include updated contact information
2. Agencies should establish responsible parties and develop procedures to accomplish the following tasks that need to be performed on behalf of a regional responsibility:
    a. HELP-desk support and reporting and initial troubleshooting of problems
    b. monitoring the systems for quality and timeliness of data
    c. coordinating data updates
    d. training
    e. system administration such as passwords
3. Policies and procedures related to the functions and responsibilities of the ICM Coordinator should be developed to address critical items such as:
    a. Daily operations
    b. Clear assignment of responsible person including vacation, absences, non-work hours, etc.
    c. Program management
    d. Record keeping and reporting

8 System Startup

Schedule and Actions for ICM System Operational Start Up

The ICM System will be deployed beginning in April, 2013. An implementation approach has been developed that will provide for a final pre-operations shake-down, followed by initial operations and then a period of expanded system operations and functionality. This should result in a well-honed system from both a technical and operational perspective by the time that USDOT begins its formal system evaluation in October, 2013.

Table 15: ICM Deployment Approach

ICM DEPLOYMENT APPROACH	
Date/Phase	**Status**
April 15, 2013 **Soft Roll Out**	**Operations:** On this date the ICM Systems will be rolled out and available to agencies for a final pre-operations shakedown.
April 26 to June 25, 2013 **Soft Launch Phase 1**	**Soft Launch Overview:** On April 26, 2013 the ICM system will begin its formal soft launch. The Soft Launch period is divided into three Phases that allow agencies to refine and expand operations based on real time experience as well as the incorporation of additional functionality into the system. Each Phase will last about 2 months. **Phase 1 Functionality:** The following summarizes the functionality expected to be ready at the beginning of this phase: **Available At Soft Launch Start-up April 26, 2013** • DSS will be operational (see Section 4.2.1 for a detailed description of functionalities)

ICM DEPLOYMENT APPROACH	
Date/Phase	**Status**
April 26 to June 25, 2013 **Soft Launch Phase 1 continued**	• SmartNET/SmartFusion will be operational (see Section 4.2.2 and 4.2.3 for a detailed description of functionalities). • 511will be operational under a soft launch phase (see Section 4.2.4 for a detailed description of functionalities) • Data Interfaces: The Center to center Interface will be complete allowing data to transportation event information to flow from the TxDOT ATMS to SmartNET and SmartFusion. • Arterial Traffic Signal Timing Plans: Timing plans for the two highest priority clusters will be available. • Arterial Street Monitoring System (ASMS)/Speed Data: The ASMS is installed and operational. Speed data from NAVTEQ will also be available for the corridor, The NAVTEQ data will be used in place of NTTA data until a data interface is completed. • DSS Response Plans: Over 100 Response Plans will have been approved. • Video Sharing: Snapshots from video cameras will be available to all users via 511/SmartNET. • Weather real time data, forecasted and alerts will be available. Additional functions will be added during the course of Phase1. **Phase 1 Operations:** During Phase 1 the agencies will gain experience with using the systems including: • enter incidents and construction information into SmartNET • monitor SmartNET and 511 for operational awareness and use these systems to coordinate operations • shake out any missing or incorrect data in the systems • monitor the DSS and verify its proper operation • practice the process involved in ICM Response Plan alerts and review selected Plans for correctness

ICM DEPLOYMENT APPROACH	
Date/Phase	**Status**
	At the start of this Phase there will be some system functions not implemented including Parking Management as well as most traffic signal diversion timing plans. As a result, there will only be a minimal number of Response Plans that could be implemented at initial startup. Accordingly, during this Phase the agencies could choose to respond to any Recommended Plans on their own.
June 26 to August 25, 2013 **Soft Launch Phase 2**	**Phase 2 Functionality:** During Phase 2 additional functions will be implemented and added to the system. The schedule for their implementation and testing is fluid, with intent to implement as quickly as possible. At the present time, it is hoped that many of the major functions can be added by the end of the Soft Launch Phase 2. This includes: • Expanded Video Sharing • Most or all of the initial DSS Response Plans • Data from the AVL and Automatic Passenger Count Systems for an expanded number of the fleet. • Data from the Parking Management system for at least one lot • Data Sharing: NTTA traffic condition data will be interfaced to the system. • Arterial Traffic Signal Diversion Timing Plans will have been completed for most of the critical cluster locations **Phase 2 Operations:** During Phase 2 agencies will begin using the system for real time operations and response within the available set of capabilities. Additional functionalities will be added and incorporated into operations as the Soft Launch period progresses. The ICM coordinator function will be fully staffed and operational under DART. Agencies will continue to use SmartNET and 511 to enter transportation network status information, monitor the network for operational status and coordinate operations. The DSS will be monitoring system conditions and

ICM DEPLOYMENT APPROACH	
Date/Phase	**Status**
	recommending Response Plans as appropriate. Agencies will respond to Response Plan recommendations within the context of the available functions and implementable Response Plans.
August 26 to October 26, 2013 **Soft Launch Phase 3**	**Phase 3 Functionality:** Missing functions will continue to be installed during Phase 3. It is expected that all functions will be implemented by the end of this Phase including: • Expanded Video Sharing: 35 cameras from TXDOT and the City of Richardson will be available in shared with the agencies in full motion via SmartNET. • A complete set of initial DSS Response Plans: 121 approved DSS Response Plans will be completed. More may be developed depending on the operational experience during the phase. • Data from the AVL and Automatic Passenger Count Systems for an expanded number of the fleet. • Data from the Parking Management system for all sites. • Data Sharing: NTTA traffic condition data will be interfaced to the system. • Arterial Traffic Signal Diversion Timing Plans; Plans will have been completed and installed in the field to

ICM DEPLOYMENT APPROACH	
Date/Phase	**Status**
	address the needs of most of the top 60 locations identified by the cluster analysis. **Phase 3 Operations:** Phase 3 will provide for a day period of full operation of the system, including full functionality (to the extent implemented for or during the period) as well as full coordinated operations including DSS response. This will enable the agencies to fully break in the systems and operations prior to the beginning of USDOT's formal evaluation.
October 26, 2013 **Full Operations - Formal Evaluation Begins**	**Operations/Functionality:** It is expected that all functionality described above will be fully implemented. Full operations of the ICM will have been implemented. The agencies will have refined their operations based on experience during the Soft Launch Phase. The ICM System will grow and evolve as per this experience and the identification of further needs. During this Phase USDOT will conduct the formal evaluation of the System.

9 DEFINITIONS, ACRONYMS AND ABBREVIATIONS

- ATIS – Advanced Traveler Information System
- ATMS – Advanced Transportation Management System
- ARDT – Arterial Detection Subsystem
- AVL – Automatic Vehicle Location
- C2C – Center to Center
- CAD – Computer Aided Dispatch
- CCTV – Closed Circuit Television
- Con Ops – Concept of Operations
- DalTrans – Dallas Transportation Management Center
- DART – Dallas Area Rapid Transit
- DIRECT - Dynamic Intermodal Routing Environment for Control and Telematics
- DMS – Dynamic Message Sign
- DNT – Dallas North Tollway
- DSS – Decision Support Subsystem
- ERD – Entity Relationship Diagram
- ETC – Electronic Toll Collection
- FHWA – Federal Highway Administration
- FTA – Federal Transit Administration
- GIS – Geographic Information System
- HOV – High Occupancy Vehicle
- HTTP – Hypertext Transfer Protocol
- ICD – Interface Control Document
- ICM – Integrated Corridor Management
- ICMS – Integrated Corridor Management System
- IEEE – Institute of Electrical and Electronics Engineers
- INCOSE – INternational Council On System Engineering
- INFR – Infrastructure
- ISP – Information Service Provider
- ITS – Intelligent Transportation System
- IVR – Interactive Voice Response
- JMS – Java Messaging System
- LBJ – Lyndon Bayne Johnson
- LRT – Light Rail Transit

- LRV – Light Rail Vehicle
- MOP – Measures of Performance
- MS/ETMC – Message Set for External TMC to TMC Communication
- MOD – ICM Model Subsystem
- NCTCOG – North Central Texas Council of Government
- NITTEC – Niagara International Transportation Technology Coalition
- NTTA – North Texas Tollway Authority
- P and R – Park and Ride
- PARK – Parking Management
- PDA – Personal Data Assistant
- PGBT – President George Bush Turnpike
- RITA – Research and Innovative Technology Administration
- RTC – Regional Transportation Council
- SOAP – Simple Object Access Protocol
- SNMP – Simple Network Management Protocol
- SMTP – Simple Messaging Transport Protocol
- SRS – System Requirement Specification
- TRANSCOM – Transportation Operations Coordinating Committee
- TEARS – Targeted Event Accelerated Response System
- TMDD – Traffic Management Data Dictionary
- TRE – Trinity Railway Express
- TxDOT – Texas Department of Transportation
- USDOT – United States Department of Transportation
- VXML – Voice eXtensible Mark-up Language
- W3C – World Wide Web Consortium
- WDMS – Web-based Database Management System
- WSDL - Web Services Description Language
- XML – eXtensible Mark-up Language

10 APPENDIX A – EXAMPLE ICM RESPONSE PLANS

As indicated in Section 4.1.2 Response Plans, it is expected that approximately 130 Response Plans will be developed initially, with all applying to incidents that occur on US-75. This Appendix includes examples of four Response Plans developed for a section of US-75 southbound between the Beltline Exit and the Collins exit:

- Plan N75S202AM: Minor Incident between Collins and Beltline – Short Diversion to Frontage Road
- Plan J75S254AM: Major Incident between Collins and Beltline – Short Diversion to Frontage Road
- Plan J75S255AM: Major Incident between Collins and Beltline t – Long Diversion to Frontage Road and Greenville Ave (arterial)
- Plan J75S268AM: Major Incident between Collins and Beltline – Diversion to Frontage Road and Greenville Ave (arterial) with Transit Mode Diversion Actions

Each Response Plan includes the Map/Diagram format as well as the List format. The following explains the naming convention for Response Plans:

- N or J: for Minor or Major Incident
- 75: for Route US-75
- S or N: for Southbound or Northbound direction
- XXX : a three digit number based on the type and location of the incident as follows:
    - For incidents north of PGBT:
        - Minor 300 – 349
        - Major 350 - 399
    - For incidents between PGBT and LBJ:
        - Minor 200 – 249
        - Major 250 – 299
    - For incidents south of LBJ
        - Minor 100 – 149
        - Major 150 – 199
- AM (morning), MD (Mid-Day) or PM (afternoon) represent the time of day

Response Plan: N75S202 AM

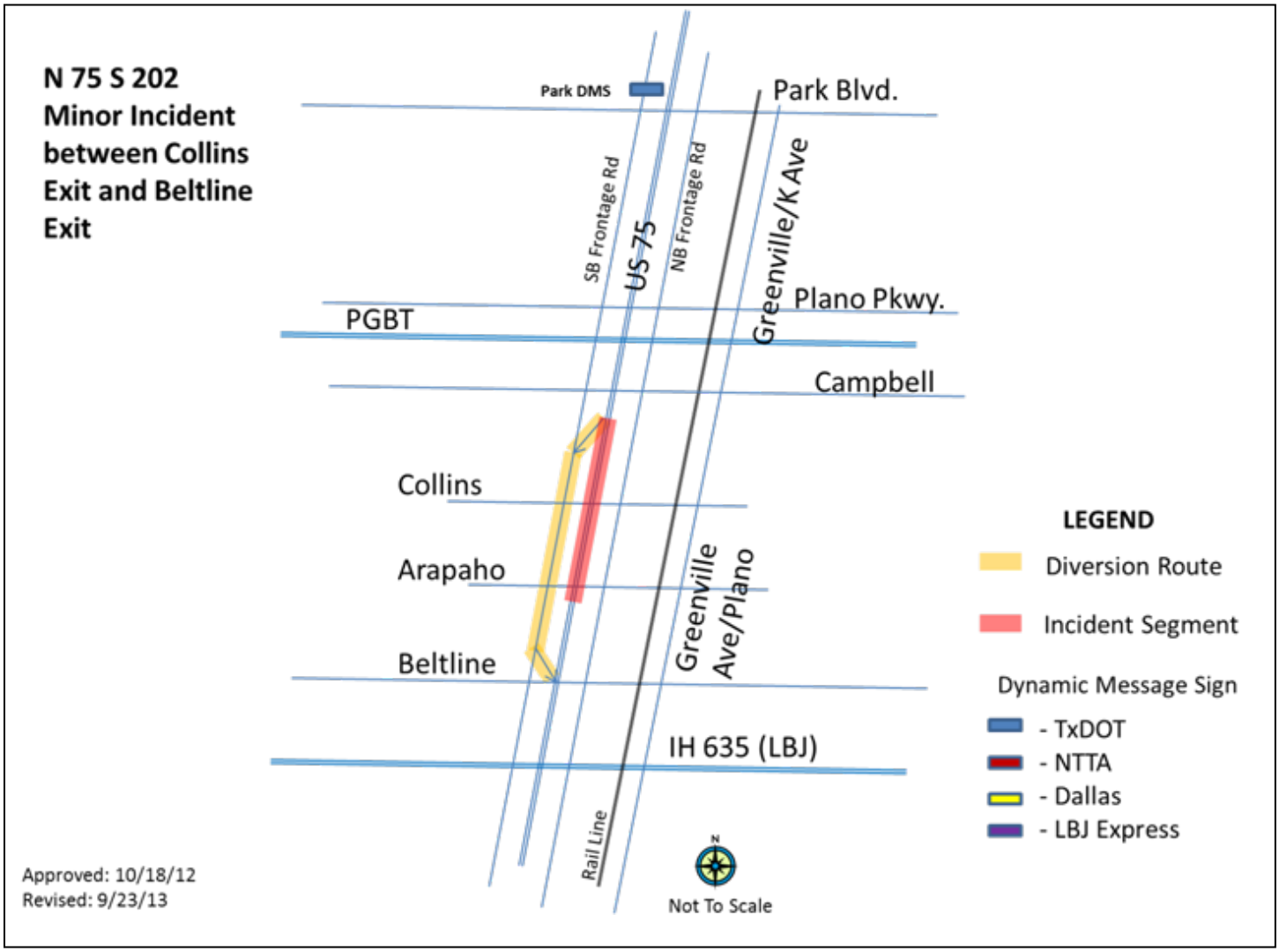

Figure 4: Response Plan N75S202 AM (Source: Dallas Area Rapid Transit , April 26, 2013)

Involved Agencies/Required Actions

- ## Richardson

  - Activate Flex Group 20 and monitor every 15 min. Applicable only during AM Peak Period (6-9am).

- ## Plano

  - Activate Flex Group 20 and monitor every 15 min. Applicable only during AM Peak Period (6-9am).

No.	Signal	TEARS/DIRECT ID	CITY	Flex Group	SmartNet ID
1	Alma @ Renner	4317	RIC	20	1010154880
2	Arapaho @ Custer	3331	RIC	20	1010154510
3	Arapaho @ US75 NBFR	4227	RIC	20	1010154650
4	Arapaho @ US75 SBFR	182	RIC	20	1010154640
5	Belt Line @ US75 NBFR	3340	RIC	20	1010154500
6	Belt Line @ US75 SBFR	3337	RIC	20	1010154490
7	Campbell @ Canyon Creek	175	RIC	20	1010154770
8	Campbell @ Collins	4370	RIC	20	1010154780
9	Campbell @ Custer	174	RIC	20	1010154570
10	Campbell @ US75 NBFR	4355	RIC	20	1010154800
11	Campbell @ US75 SBFR	4352	RIC	20	1010154800
12	Campbell @ Waterview	3387	RIC	20	1010154550
13	Collins @ Municipal	4373	RIC		1010154770
14	Custer @ Renner	167	RIC	20	1010154880
15	Frankford @ Waterview	3370	RIC	20	
16	Plano @ Renner	4300	RIC	20	1010154870
17	Plano @ SH190 EBFR	4296	RIC	20	
18	Plano @ SH190 WBFR	4286	RIC	20	1010147220
19	Renner @ Renner Pkwy	431711	RIC	20	1010154890
20	Renner @ Routh Creek	N/A	RIC	20	1010154990
21	Renner @ US75 NBFR	4303	RIC	20	1010154860

No.	Signal	TEARS/DIRECT ID	CITY	Flex Group	SmartNet ID
22	Renner @ US75 SBFR	4306	RIC	20	1010154850
23	Spring Valley @ Weatherred	3314	RIC	20	1010154400
24	14th @ K Avenue	4280	PLA	20	1010147300
25	14th @ L Avenue (Municipal)	428011	PLA	20	1010147390
26	15th @ Alma	4407	PLA	20	1010147160
27	15th @ Avenue L (Municipal)	428013	PLA	20	1010147400
28	15th @ Center	N/A	PLA	20	1010147240
29	15th @ Custer	145	PLA	20	1010143320
30	15th @ K Avenue	428012	PLA	20	1010147310
31	15th @ US 75 NBFR	4476	PLA	20	1010147260
32	15th @ US 75 SBFR	4408	PLA	20	1010147250
33	18th @ K Avenue	78	PLA	20	1010147330
34	Accent @ Plano	N/A	PLA	20	1010147180
35	Alma @ Park Blvd	41	PLA	20	1010147170
36	Alma @ Parker	5722	PLA	20	1010151660
37	Custer @ Plano Pkwy	151	PLA	20	1010143290
38	Custer @ SH 190 EBFR	165	PLA	20	1010154590
39	Custer @ SH 190 WBFR	158	PLA	20	1010143280
40	F Avenue @ Plano Pkwy	4428	PLA	20	
41	Independence @ SH 190 EBFR	3368	PLA	20	1010154580
42	Independence @ SH 190 WBFR	3470	PLA	20	1010143210
43	Jupiter @ Parker	5755	PLA	20	1010151870
44	K Avenue @ Park Blvd	18	PLA	20	1010151700
45	K Avenue @ Plano Pkwy	4282	PLA	20	1010147230
46	Park Blvd @ Republic	17	PLA	20	1010147320
47	Plano Pkwy @ US 75 NBFR	4415	PLA	20	1010147200
48	Plano Pkwy @ US 75 SBFR	4418	PLA	20	1010147190

- ## TxDOT

  - DMS:

Message ID	Name	SmartNet ID
1	US 75_SB Park	5074700

Response Plan: J75S254 AM

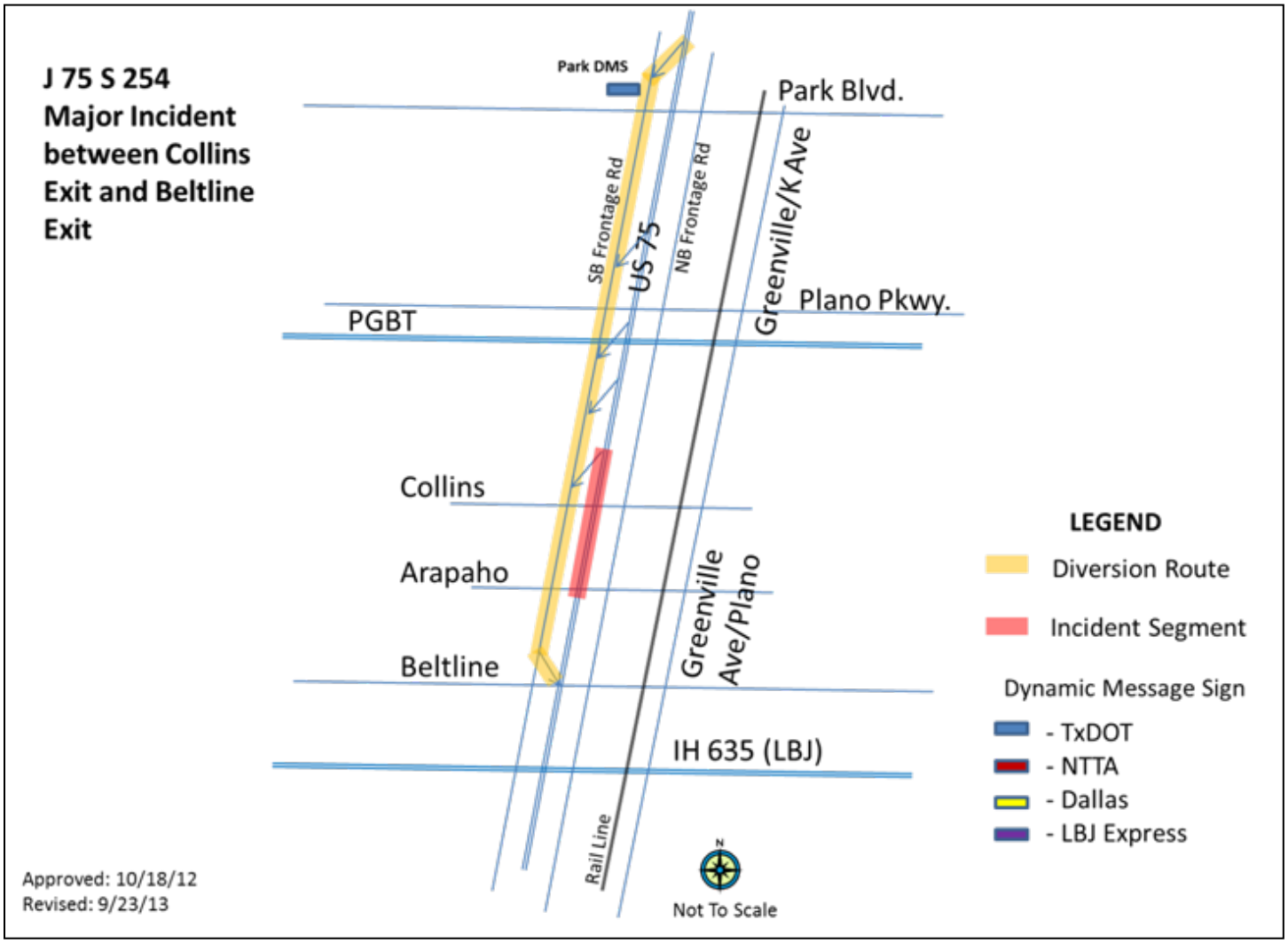

Figure 5: Response Plan J75S254 AM (Source: Dallas Area Rapid Transit, April 26, 2013)

Involved Agencies/Required Actions

- **Richardson**
  - Activate Flex Group 20 and monitor every 15 min. Applicable only during AM Peak Period (6-9am).

- ## Plano

  - Activate Flex Group 20 and monitor every 15 min. Applicable only during AM Peak Period (6-9am).

No.	Signal	TEARS/DIRECT ID	CITY	Flex Group	SmartNet ID
1	Alma @ Renner	4317	RIC	20	1010154880
2	Arapaho @ Custer	3331	RIC	20	1010154510
3	Arapaho @ US75 NBFR	4227	RIC	20	1010154650
4	Arapaho @ US75 SBFR	182	RIC	20	1010154640
5	Belt Line @ US75 NBFR	3340	RIC	20	1010154500
6	Belt Line @ US75 SBFR	3337	RIC	20	1010154490
7	Campbell @ Canyon Creek	175	RIC	20	1010154770
8	Campbell @ Collins	4370	RIC	20	1010154780
9	Campbell @ Custer	174	RIC	20	1010154570
10	Campbell @ US75 NBFR	4355	RIC	20	1010154800
11	Campbell @ US75 SBFR	4352	RIC	20	1010154800
12	Campbell @ Waterview	3387	RIC	20	1010154550
13	Collins @ Municipal	4373	RIC	20	1010154770
14	Custer @ Renner	167	RIC	20	1010154880
15	Frankford @ Waterview	3370	RIC	20	
16	Plano Rd @ Renner	4300	RIC	20	1010154870
17	Plano Rd @ SH190 EBFR	4292	RIC	20	
18	Plano Rd @ SH190 WBFR	4286	RIC	20	1010147220
19	Renner @ Renner Pkwy	431711	RIC	20	1010154890
20	Renner @ Routh Creek	N/A	RIC	20	1010154990
21	Renner @ US75 NBFR	4303	RIC	20	1010154860
22	Renner @ US75 SBFR	4306	RIC	20	1010154850
23	Spring Valley @ Weatherred	3314	RIC	20	1010154400
24	14th @ K Avenue	4280	PLA	20	1010147300
25	14th @ L Avenue (Municipal)	428011	PLA	20	1010147390
26	15th @ Alma	4407	PLA	20	1010147160
27	15th @ Avenue L (Municipal)	428013	PLA	20	1010147400
28	15th @ Center	N/A	PLA	20	1010147240

No.	Signal	TEARS/DIRECT	CITY	Flex	SmartNet ID
29	15th @ Custer	145	PLA	20	1010143320
30	15th @ K Avenue	428012	PLA	20	1010147310
31	15th @ US 75 NBFR	4476	PLA	20	1010147260
32	15th @ US 75 SBFR	4408	PLA	20	1010147250
33	18th @ K Avenue	78	PLA	20	1010147330
34	Accent @ Plano Pkwy	N/A	PLA	20	1010147180
35	Alma @ Park Blvd	41	PLA	20	1010147170
36	Alma @ Parker	5722	PLA	20	1010151660
37	Custer @ Plano Pkwy	151	PLA	20	1010143290
38	Custer @ SH 190 EBFR	165	PLA	20	1010154590
39	Custer @ SH 190 WBFR	158	PLA	20	1010143280
40	F Avenue @ Plano Pkwy	4428	PLA	20	
41	Independence @ SH 190 EBFR	3368	PLA	20	1010154580
42	Independence @ SH 190 WBFR	3470	PLA	20	1010143210
43	Jupiter @ Parker	5755	PLA	20	1010151870
44	K Avenue @ Park Blvd	18	PLA	20	1010151710
45	K Avenue @ Plano Rd	4282	PLA	20	1010147230
46	Park Blvd @ Republic	17	PLA	20	1010147320
47	Plano Pkwy @ US 75 NBFR	4415	PLA	20	1010147200
48	Plano Pkwy @ US 75 SBFR	4418	PLA	20	1010147190

- ## TxDOT

  - DMS:

Message ID	Name	SmartNet ID
1	US 75_SB Park	5074700

Response Plan: J75S255 AM

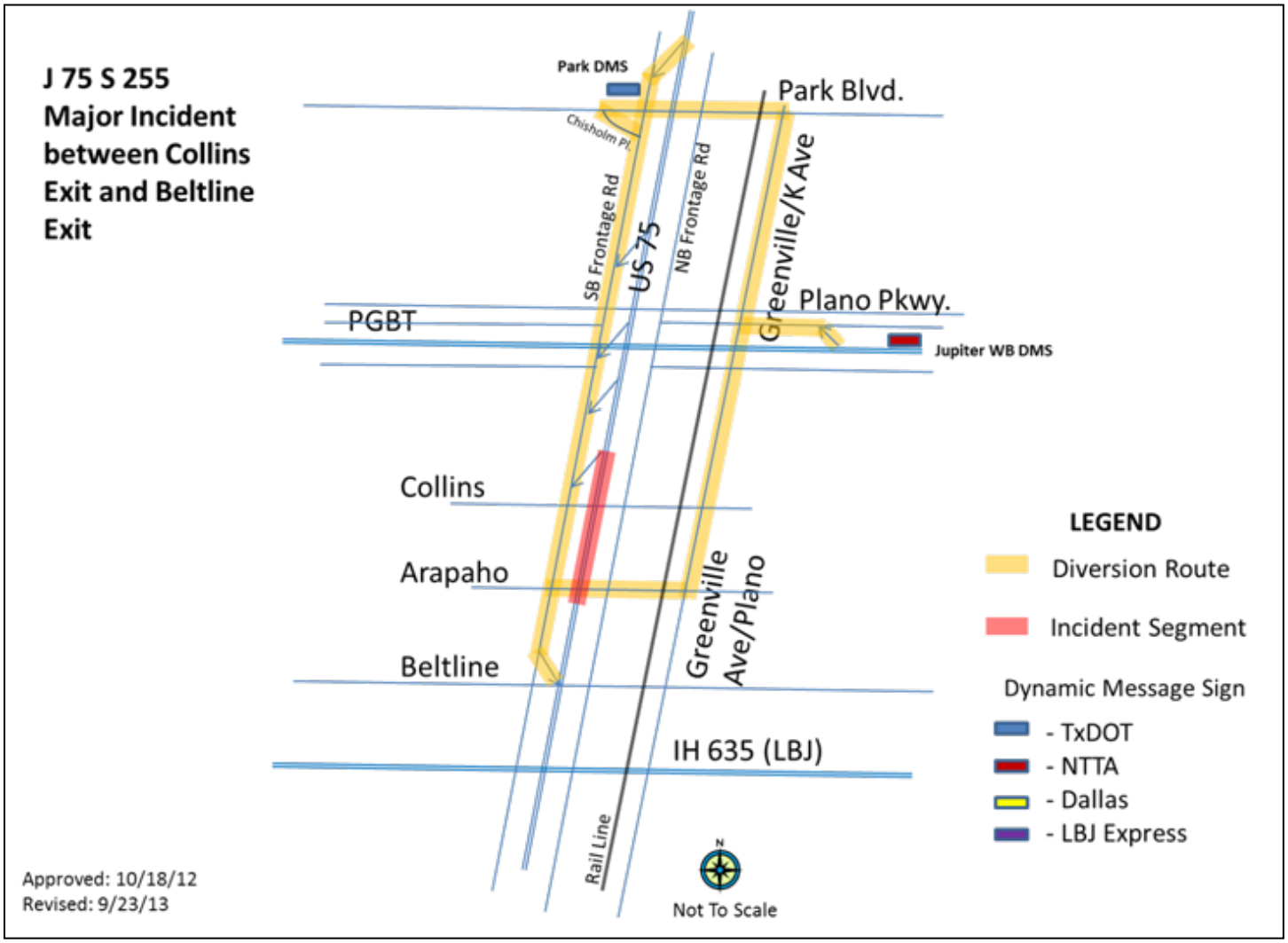

Figure 6: Response Plan J75S255 AM (Source: Dallas Area Rapid Transit, April 26, 2013)

Involved Agencies/Required Actions

- **Richardson**
  - Activate Flex Group 20 and monitor every 15 min. Applicable only during AM Peak Period (6-9am).

- ## Plano

  - Activate Flex Group 20 and monitor every 15 min. Applicable only during AM Peak Period (6-9am).

No.	Signal	TEARS/DIRECT ID	CITY	Flex Group	SmartNet ID
1	Alma @ Renner	4317	RIC	20	1010154880
2	Arapaho @ Custer	3331	RIC	20	1010154510
3	Arapaho @ US75 NBFR	4227	RIC	20	1010154650
4	Arapaho @ US75 SBFR	182	RIC	20	1010154640
5	Belt Line @ US75 NBFR	3340	RIC	20	1010154500
6	Belt Line @ US75 SBFR	3337	RIC	20	1010154490
7	Campbell @ Canyon Creek	175	RIC	20	1010154770
8	Campbell @ Collins	4370	RIC	20	1010154780
9	Campbell @ Custer	174	RIC	20	1010154570
10	Campbell @ US75 NBFR	4355	RIC	20	1010154800
11	Campbell @ US75 SBFR	4352	RIC	20	1010154800
12	Campbell @ Waterview	3387	RIC	20	1010154550
13	Collins @ Municipal	4373	RIC	20	1010154770
14	Custer @ Renner	167	RIC	20	1010154880
15	Frankford @ Waterview	3370	RIC	20	
16	Plano Rd @ Renner	4300	RIC	20	1010154870
17	Plano Rd @ SH190 EBFR	4292	RIC	20	
18	Plano Rd @ SH190 WBFR	4286	RIC	20	1010147220
19	Renner @ Renner Pkwy	431711	RIC	20	1010154890
20	Renner @ Routh Creek	N/A	RIC	20	1010154990
21	Renner @ US75 NBFR	4303	RIC	20	1010154860
22	Renner @ US75 SBFR	4306	RIC	20	1010154850
23	Spring Valley @ Weatherred	3314	RIC	20	1010154400
24	14th @ K Avenue	4280	PLA	20	1010147300
25	14th @ L Avenue (Municipal)	428011	PLA	20	1010147390
26	15th @ Alma	4407	PLA	20	1010147160
27	15th @ Avenue L (Municipal)	428013	PLA	20	1010147400

No.	Signal	TEARS/DIRECT	CITY	Flex	SmartNet ID
28	15th @ Center	N/A	PLA	20	1010147240
29	15th @ Custer	145	PLA	20	1010143320
30	15th @ K Avenue	428012	PLA	20	1010147310
31	15th @ US 75 NBFR	4476	PLA	20	1010147260
32	15th @ US 75 SBFR	4408	PLA	20	1010147250
33	18th @ K Avenue	78	PLA	20	1010147330
34	Accent @ Plano Pkwy	N/A	PLA	20	1010147180
35	Alma @ Park Blvd	41	PLA	20	1010147170
36	Alma @ Parker	5722	PLA	20	1010151660
37	Custer @ Plano Pkwy	151	PLA	20	1010143290
38	Custer @ SH 190 EBFR	165	PLA	20	1010154590
39	Custer @ SH 190 WBFR	158	PLA	20	1010143280
40	F Avenue @ Plano Pkwy	4428	PLA	20	
41	Independence @ SH 190 EBFR	3368	PLA	20	1010154580
42	Independence @ SH 190 WBFR	3470	PLA	20	1010143210
43	Jupiter @ Parker	5755	PLA	20	1010151870
44	K Avenue @ Park Blvd	18	PLA	20	1010151710
45	K Avenue @ Plano Rd	4282	PLA	20	1010147230
46	Park Blvd @ Republic	17	PLA	20	1010147320
47	Plano Pkwy @ US 75 NBFR	4415	PLA	20	1010147200
48	Plano Pkwy @ US 75 SBFR	4418	PLA	20	1010147190

- ## TxDOT

  - DMS:

Message ID	Name	SmartNet ID
2a	US 75_SB Park	5074700

- ## NTTA

  - DMS:

Message ID	Name	SmartNet ID
2	Jupiter WB PGBT	5072200

Response Plan: J75S268 AM

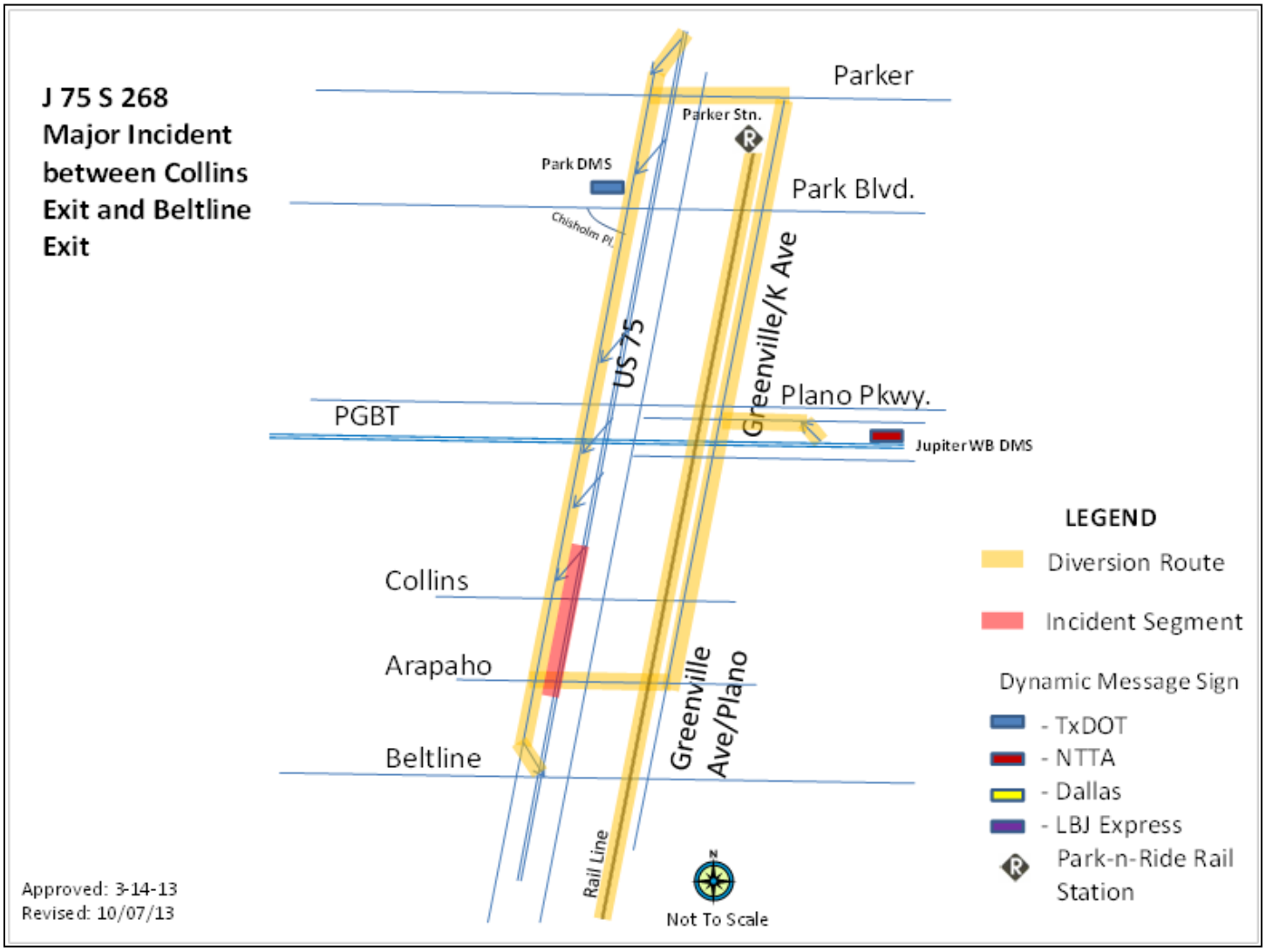

Figure 7: Response Plan J75S268 AM (Source: Dallas Area Rapid Transit, April 26, 2013)

Involved Agencies/Required Actions

- **Richardson**
  - Activate Flex Group 20 and monitor every 15 min. Applicable only during AM Peak Period (6-9am).

- ## Plano

  - Activate Flex Group 20 and monitor every 15 min. Applicable only during AM Peak Period (6-9am).

No.	Signal	TEARS/DIRECT ID	CITY	Flex Group	SmartNet ID
1	Alma @ Renner	4317	RIC	20	1010154880
2	Arapaho @ Custer	3331	RIC	20	1010154510
3	Arapaho @ US75 NBFR	4227	RIC	20	1010154650
4	Arapaho @ US75 SBFR	182	RIC	20	1010154640
5	Belt Line @ US75 NBFR	3340	RIC	20	1010154500
6	Belt Line @ US75 SBFR	3337	RIC	20	1010154490
7	Campbell @ Canyon Creek	175	RIC	20	1010154770
8	Campbell @ Collins	4370	RIC	20	1010154780
9	Campbell @ Custer	174	RIC	20	1010154570
10	Campbell @ US75 NBFR	4355	RIC	20	1010154800
11	Campbell @ US75 SBFR	4352	RIC	20	1010154800
12	Campbell @ Waterview	3387	RIC	20	1010154550
13	Collins @ Municipal	4373	RIC	20	1010154770
14	Custer @ Renner	167	RIC	20	1010154880
15	Frankford @ Waterview	3370	RIC	20	
16	Plano Rd @ Renner	4300	RIC	20	1010154870
17	Plano Rd @ SH190 EBFR	4292	RIC	20	
18	Plano Rd @ SH190 WBFR	4286	RIC	20	1010147220
19	Renner @ Renner Pkwy	431711	RIC	20	1010154890
20	Renner @ Routh Creek	N/A	RIC	20	1010154990
21	Renner @ US75 NBFR	4303	RIC	20	1010154860
22	Renner @ US75 SBFR	4306	RIC	20	1010154850
23	Spring Valley @ Weatherred	3314	RIC	20	1010154400
24	14th @ K Avenue	4280	PLA	20	1010147300
25	14th @ L Avenue (Municipal)	428011	PLA	20	1010147390
26	15th @ Alma	4407	PLA	20	1010147160
27	15th @ Avenue L (Municipal)	428013	PLA	20	1010147400
28	15th @ Center	N/A	PLA	20	1010147240
29	15th @ Custer	145	PLA	20	1010143320

No.	Signal	TEARS/DIRECT	CITY	Flex	SmartNet ID
30	15th @ K Avenue	428012	PLA	20	1010147310
31	15th @ US 75 NBFR	4476	PLA	20	1010147260
32	15th @ US 75 SBFR	4408	PLA	20	1010147250
33	18th @ K Avenue	78	PLA	20	1010147330
34	Accent @ Plano Pkwy	N/A	PLA	20	1010147180
35	Alma @ Park Blvd	41	PLA	20	1010147170
36	Alma @ Parker	5722	PLA	20	1010151660
37	Custer @ Plano Pkwy	151	PLA	20	1010143290
38	Custer @ SH 190 EBFR	165	PLA	20	1010154590
39	Custer @ SH 190 WBFR	158	PLA	20	1010143280
40	F Avenue @ Plano Pkwy	4428	PLA	20	
41	Independence @ SH 190 EBFR	3368	PLA	20	1010154580
42	Independence @ SH 190 WBFR	3470	PLA	20	1010143210
43	Jupiter @ Parker	5755	PLA	20	1010151870
44	K Avenue @ Park Blvd	18	PLA	20	1010151710
45	K Avenue @ Plano Rd	4282	PLA	20	1010147230
46	Park Blvd @ Republic	17	PLA	20	1010147320
47	Plano Pkwy @ US 75 NBFR	4415	PLA	20	1010147200
48	Plano Pkwy @ US 75 SBFR	4418	PLA	20	1010147190

- ## TxDOT

  - DMS:

Message ID	Name	SmartNet ID
3	US 75_SB Park	5074700

- ## NTTA

  - DMS:

Message ID	Name	SmartNet ID
3	Jupiter WB PGBT	5072200

- ## DART

  - Monitor Parker Station park-n-ride utilization and capacity of Red and Orange Light Rail Line every 15 min.

11 APPENDIX B – EXAMPLE ICM DMS MESSAGES

As indicated in this Plan, one of the ICMS strategies is to divert traffic to arterials and/or transit during certain types of incidents. Conditions requiring this type messaging were identified in the appropriate ICM Response Plans. To ensure consistency in message content, the stakeholders developed an adjustment to the TxDOT statewide DMS message policy that addressed this need. The following are example DMS messages for the following situations:

- Minor Incident – Short Diversion to Frontage Road – Message ID #1
- Major Incident – Long Diversion to Frontage Roads and Greenville – Message ID #2
- Major Incident – Long Diversion to Frontage Road and Greenville – For use only on DMS located at SB US 75 and Park Blvd. - Message ID #2a
- Major Incident – Long Diversion to Frontage Road and Greenville – For use only on DMS located at NB US 75 at Galatyn – Message ID #2b
- Major Incident – Long Diversion to Frontage Road, Greenville and Transit – Message ID #3

11.1 Minor Incident

This diagram shows the message for Minor Incident – Short Diversion to Frontage Road – Message ID #1

Minor Incident (Short Diversion to Frontage Rd.) Message ID "1". Note: current TxDOT message.

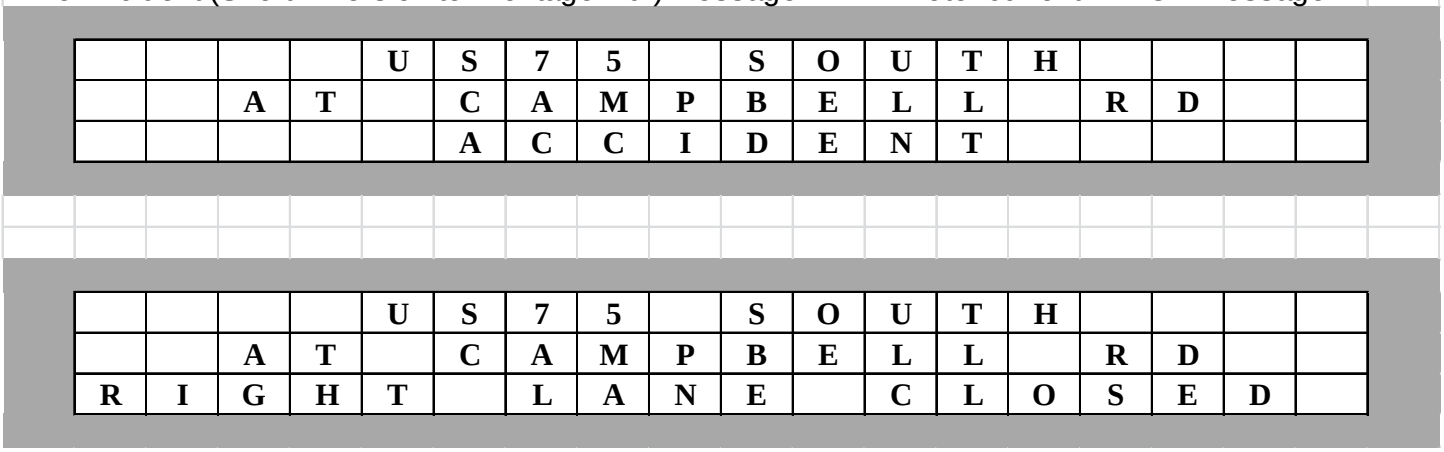

Figure 8: DMS Message ID "1" (Source: Texas Department of Transportation, April 26, 2013)

11.2 Major Incident

These diagrams shows the messages for Major Incident – Long Diversion to Frontage Road

Major Incident (Long Diversion to Frontage Rd. and Greenville) Message ID "2"

				U	S	7	5		S	O	U	T	H				
		A	T		C	A	M	P	B	E	L	L		R	D		
T	R	Y		G	R	E	E	N	V	I	L	L	E		A	V	E

				U	S	7	5		S	O	U	T	H				
		A	T		C	A	M	P	B	E	L	L		R	D		
R	I	G	H	T		L	A	N	E		C	L	O	S	E	D	

Major Incident (Long Diversion to Frontage Rd. and Greenville). SB US 75 @ Park Blvd. DMS Only Message ID "2a"

				U	S	7	5		S	O	U	T	H				
			A	T		P	A	R	K		B	L	V	D			
					T	R	Y		K		A	V	E				

				U	S	7	5		S	O	U	T	H				
			A	T		P	A	R	K		B	L	V	D			
R	I	G	H	T		L	A	N	E		C	L	O	S	E	D	

Major Incident (Long Diversion to Frontage Rd. and Greenville). NB US 75 @ Galatyn DMS Only Message ID "2b"

				U	S	7	5		N	O	R	T	H				
		A	T			R	E	N	N	E	R			R	D		
	T	R	Y		P	L	A	N	O		R	D		A	V	E	

				U	S	7	5		N	O	R	T	H				
		A	T			R	E	N	N	E	R			R	D		
R	I	G	H	T		L	A	N	E		C	L	O	S	E	D	

Figure 9: DMS Messages ID "2, 2a and 2b" (Source: Texas Department of Transportation, April 26, 2013)

11.2.1 Major Incident

This diagram shows the message for Major Incident – Long Diversion to Frontage Road, Greenville and Transit

Major Incident (Long Diversion to Frontage Rd., Greenville, and Transit) Message ID "3"

				U	S	7	5		S	O	U	T	H				
		A	T		C	A	M	P	B	E	L	L		R	D		
		T	R	Y		L	I	G	H	T		R	A	I	L		

				U	S	7	5		S	O	U	T	H				
		A	T		C	A	M	P	B	E	L	L		R	D		
R	I	G	H	T		L	A	N	E		C	L	O	S	E	D	

Figure 10: DMS Message ID "3" (Source: Texas Department of Transportation, April 26, 2013)

U.S. Department of Transportation
ITS Joint Program Office-HOIT
1200 New Jersey Avenue, SE
Washington, DC 20590

Toll-Free “Help Line” 866-367-7487
www.its.dot.gov

FHWA-JPO-13-120

U.S. Department of Transportation