FHWA OFFICE OF OPERATIONS PEER EXCHANGE WORKSHOP

INNOVATIVE CONTRACTING AND ACCELERATED CONSTRUCTION TECHNIQUES FOR WORK ZONE SAFETY AND MOBILITY

I-93 Fast 14

Neil E. Boudreau, MassDOT State Traffic Engineer

June 5 & 6, 2012

Denver, CO

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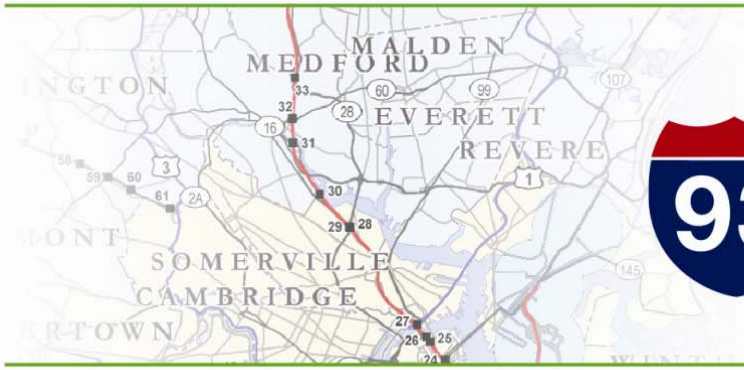

93 FAST 14

I-93 Rapid Bridge Replacement Project

MassDOT's I-93 Fast14

- Project Overview
- Traffic Impacts/Mitigation
- Lessons Learned
- Achievement of Goals

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Project Overview

- I-93 in Medford area constructed in early 60's
- Four travel lanes each direction – minimal shoulder width
- Processes 200,000 VPD
- Weekend hourly volumes still at 5,500 VPH in both directions during peaks

August 2010

- *A scheduled highway resurfacing project, started in 2008, exposed severely deteriorated bridge decks*
- *Old age, chloride intrusion, from snow & ice control, main contributor to degradation*

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Birth of a Project

- *Valley Street failure underscored need for deck replacement project for entire corridor*
- *Traffic volumes preclude long term closures*
- *Concept started a month earlier*
- *Decision made,*

FIX THEM ALL IN SUMMER 2010

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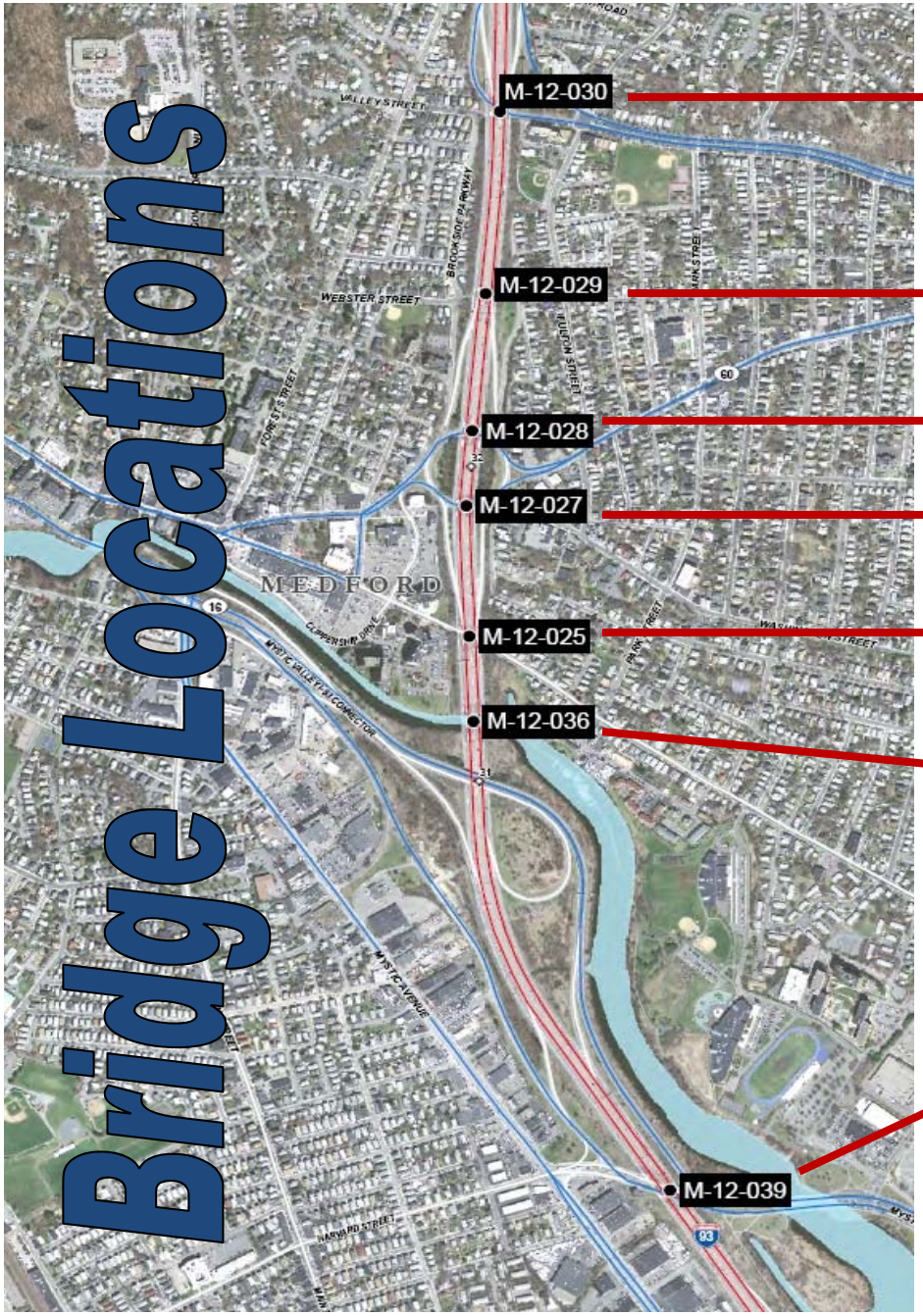
Bridge Locations



Valley Street

Webster Street

Salem Street WB

Salem Street EB

Riverside Avenue

Mystic River

Route 16

7 Bridges are spaced out within a 1.5 mile corridor

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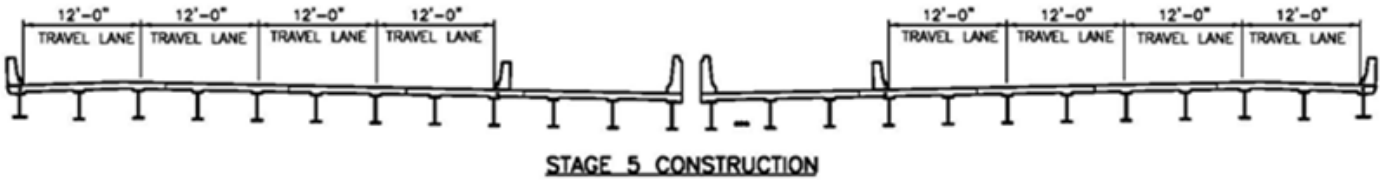
Conventional Construction

- Multi stage – (possibly five)
- Minimum 4 years
- Worker safety issues
- Traffic splits
- Narrow travel lanes
- Loss of accel/decel lanes
- Concern over durability of the existing decks



STAGE 5 CONSTRUCTION

Project Approach

- Replace 14 deteriorated bridge superstructures over 10 weekends in June, July, August
- No Work on July 4th
- 2-weekends of float for weather/construction issues
- Use one side of I-93 to provide 2 lanes NB and SB over weekend

Accelerated Bridge Construction

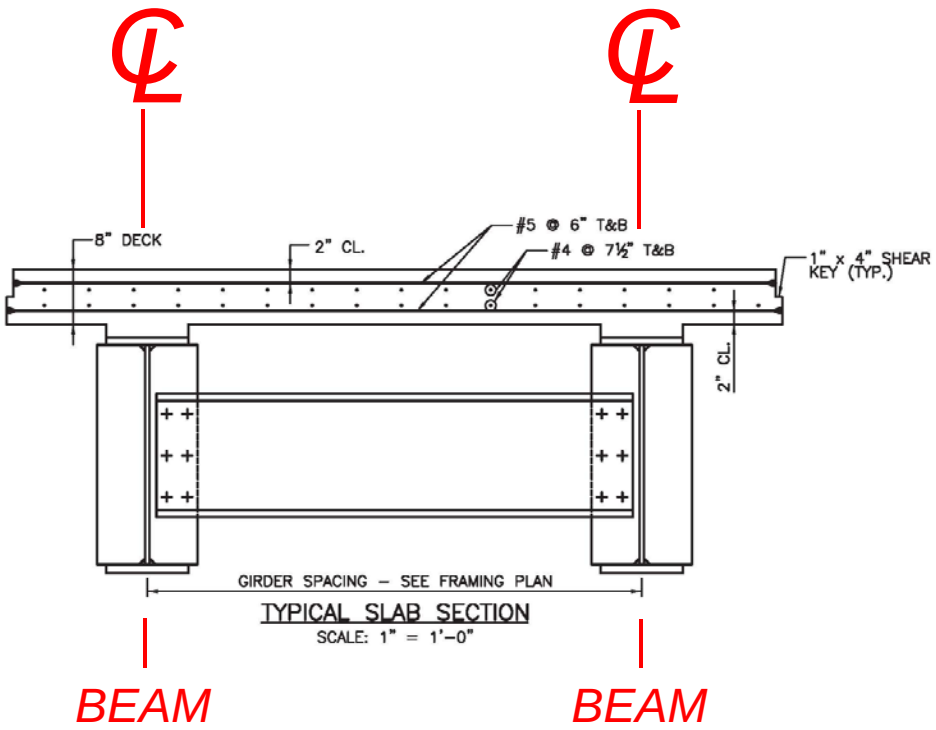
- Benefit of ABC on reducing the duration of construction and impacts on motorists
- Prefabricated steel beam & pre-cast deck panels
- Aggressive traffic management
- Innovative materials and construction methods
- Accelerated construction schedule

Procurement Method - Design Build

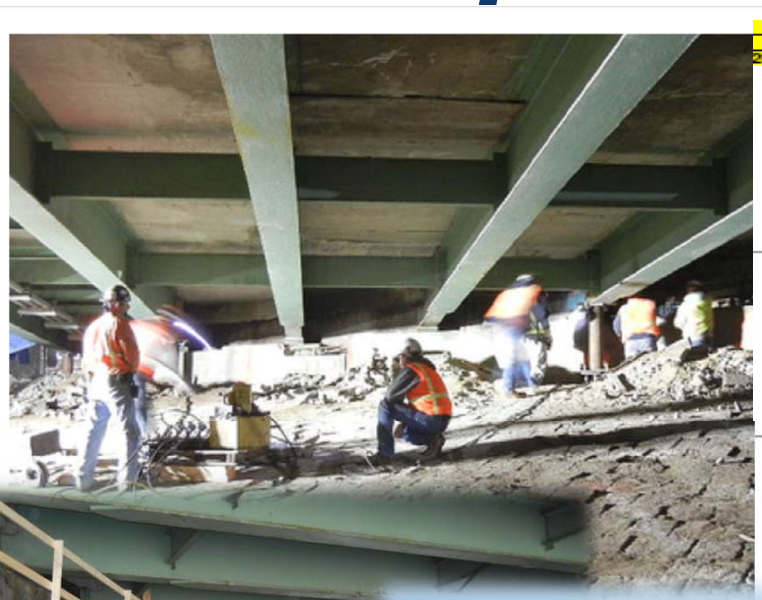
- Method shortens schedule – Construction & Design occurring simultaneously
- Risk of design is distributed to contractor who hires consultant to complete design from 25% level. Contractor owns the design.
- Incentive/Disincentive used to push schedule and reward acceleration and penalize delays.
- Project initiated in August 2010, RFP out in late October and NTP issued on Feb. 7, 2011. All bridge/highway work complete: Nov. 2011

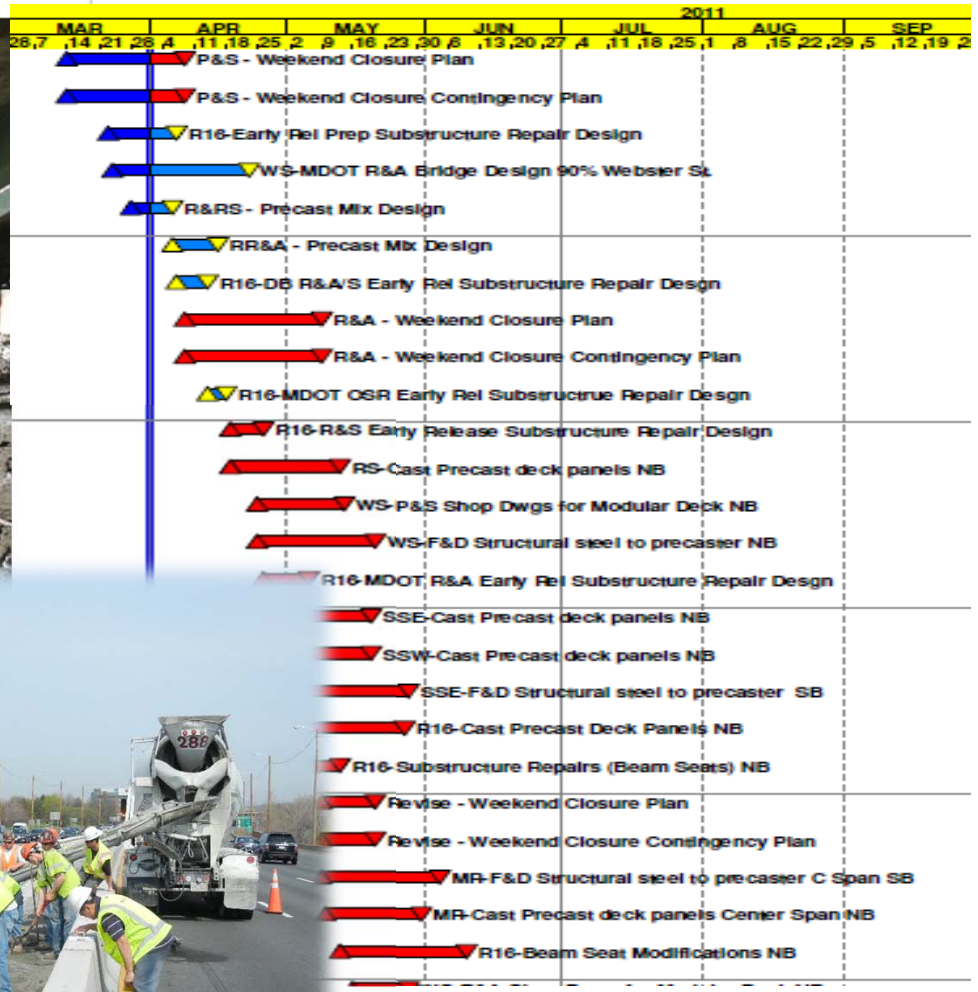
The Construction Plan

- 14 bridge superstructures in ten weekend
- 252 modular units
- 18 for a three span bridge (6 across)
- Rapid strength gain concrete for 32” closure pour between units
- Minimize pick weights – cast parapet walls in-place after deck complete



Preparation Work





Sub-Structure Repair Work

- De-lead, shore, jack and cope 684 beam-ends to provide access for beam seat work

- Prep & pour 1008 beam seats total

Fabrication of Modular Units

- 252 Modular units cast in New Jersey, transported to MA

Precast Lifting Exercise

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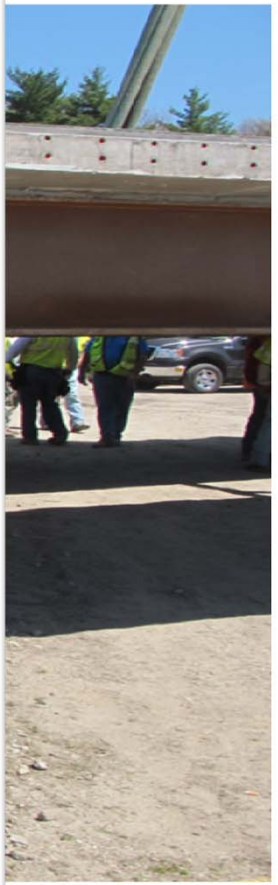
Dry Runs & After Action Reviews



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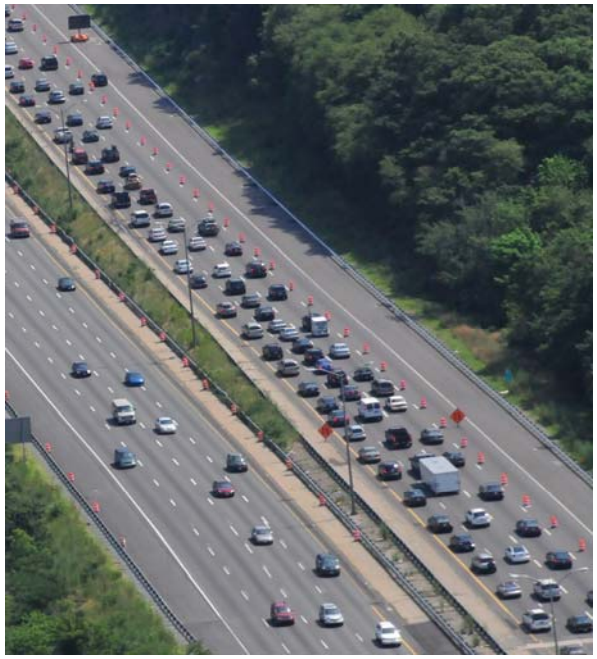
Traffic Outreach Goals

- Manage Interstate Traffic with half the capacity each weekend
- Encourage diversion to alternate routes through providing real-time travel time information
- Monitor alternate routes to ensure that capacity is available
- Communicate work schedule to the public effectively
- Make safety a priority

Existing Traffic Volumes

- Evaluation of historical I-93 summer count data to determine the possible impact for dropping two lanes on a 4-lane interstate highway
- Reducing a four lane section to a two lane section is expected to have a capacity of approximately 2,960 vehicles per hour.
- I-93 weekend traffic volumes for the highest hours of the day are still up in the 5,500 vehicles per hour range in both directions
- Encourage diversion and use other regional roadways, Route 128/95, I-495, I-90 and Route 1
- The primary local detour route, Fellsway/Route 28 carries between 700 to 1,800 vehicles per hour on Saturdays and Sundays
- Impacts expected on other regional facilities, Route 16, Route 38 and Route 60 expected



Goal: Traffic Diversions

NORTHBOUND	DIVERSION RATE (Percentages)	QUEUE LENGTH (miles)	AVERAGE DELAY (minutes)
SATURDAY			
	0%	20	172
Need 15%	10%	11	94
	20%	3	29
	30%	0	0
	40%	0	0
	50%	0	0
SUNDAY			
	0%	18	158
Need 15%	10%	9	80
	20%	2	15
	30%	0	0
	40%	0	0
	50%	0	0

SOUTHBOUND	DIVERSION RATE (Percentages)	QUEUE LENGTH (miles)	AVERAGE DELAY (minutes)
SATURDAY			
	0%	43	460
	10%	31	327
	20%	19	206
Need 35%	30%	9	100
	40%	1	15
	50%	0	0
SUNDAY			
	0%	47	512
	10%	29	313
	20%	19	202
Need 35%	30%	9	94
	40%	1	8
	50%	0	0

*Based on Highest Hour of Traffic Observed

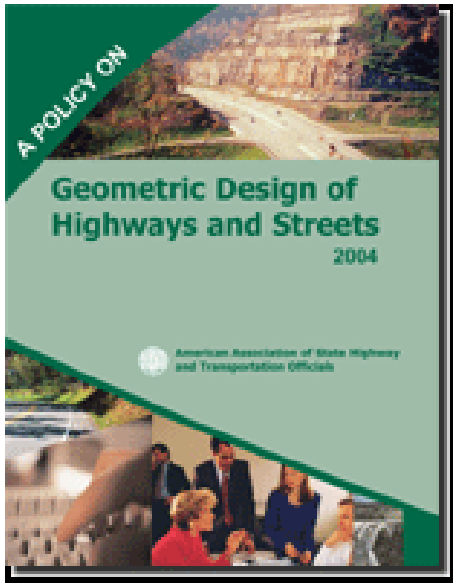
Need Minimum of **15%** traffic diversion Northbound on I-93

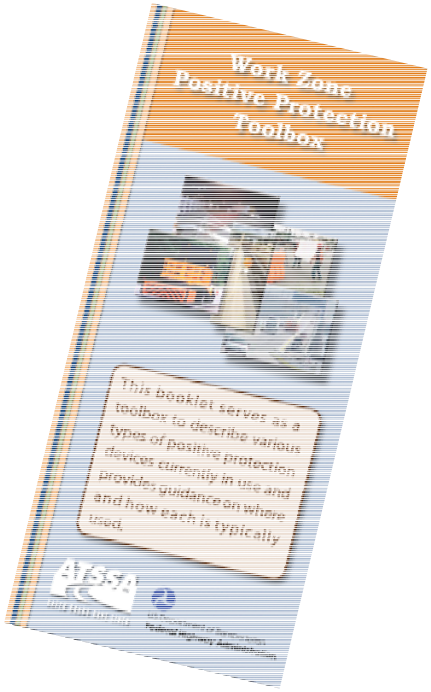
Need Minimum of **35%** traffic diversion Southbound on I-93

So how do we do it?

Traffic Management Approach

- Provide for safe and efficient maintenance of traffic on all roadways in project area.





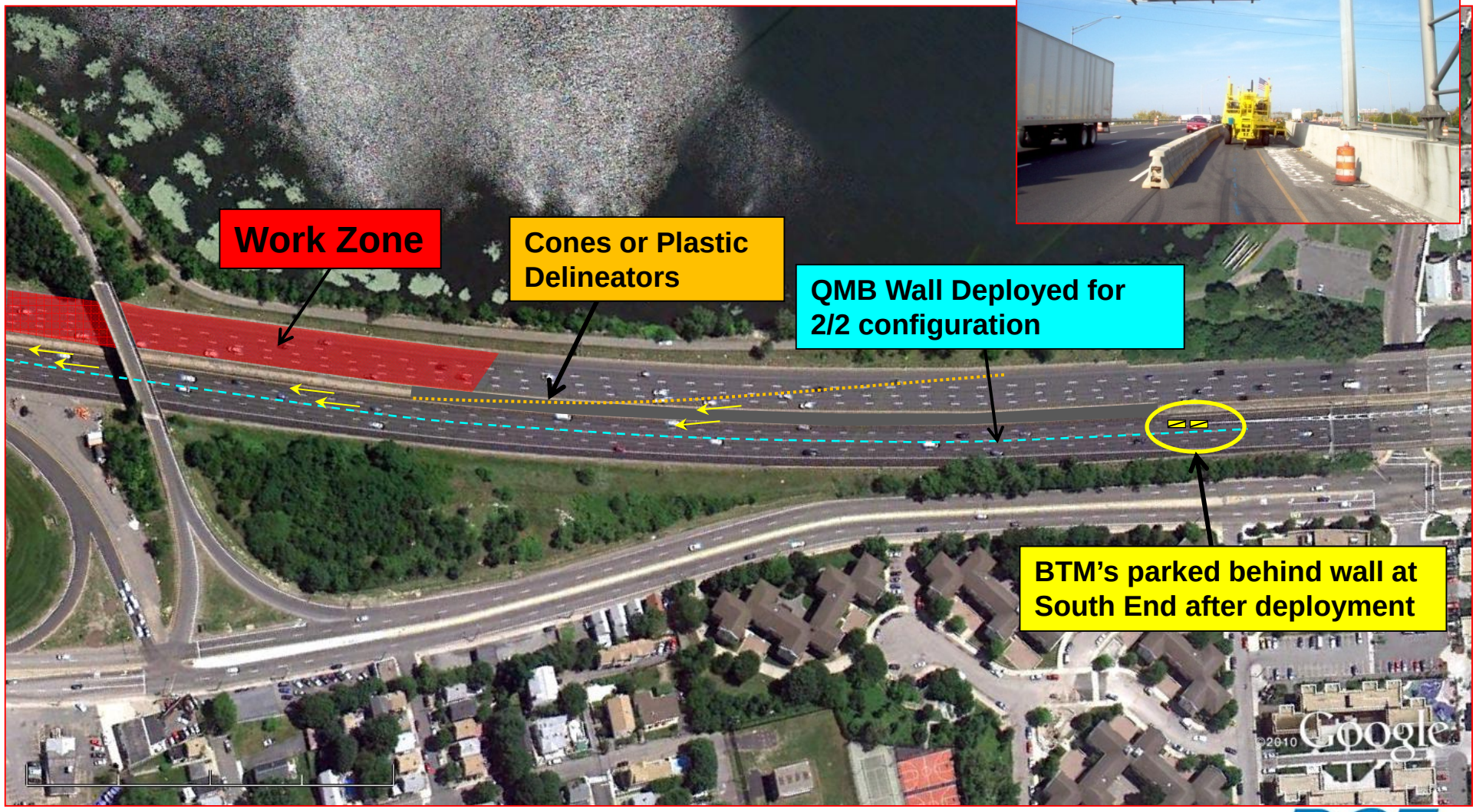
Use of Movable Barrier

The need for positive protection to run counter-flow traffic and still be efficient to deploy, led MassDOT to the “Quick Change” barrier system.

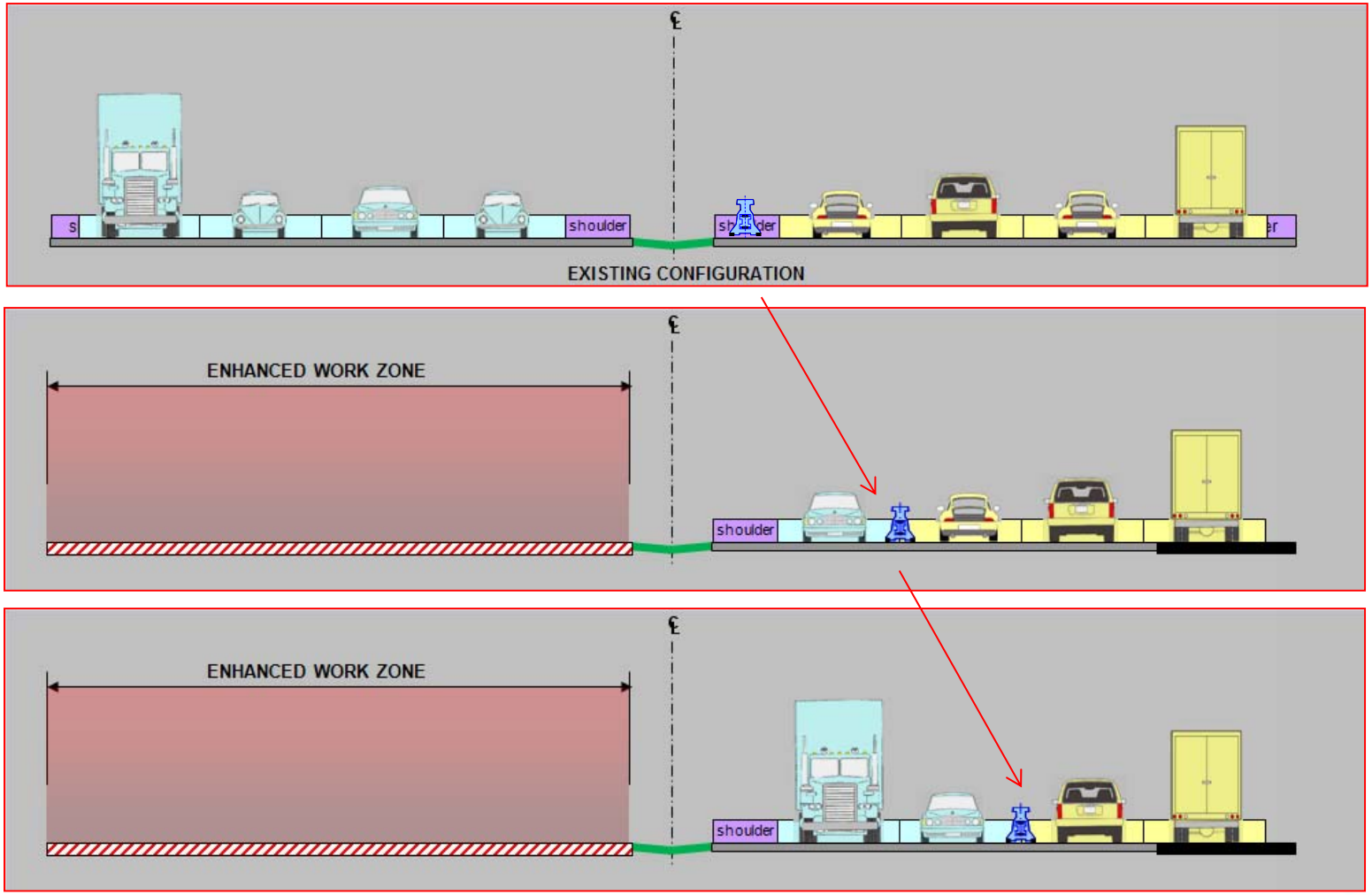
Crossover Design Considerations

- Requirement that crossover be configured for a 65 mph design speed
- Including shifting tapers and curve radii
- Not designed for super-elevation (weekend closures only)
- Minimize conflicts with other roadway elements (i.e., bridge piers, interchanges, sign bridges, etc…)

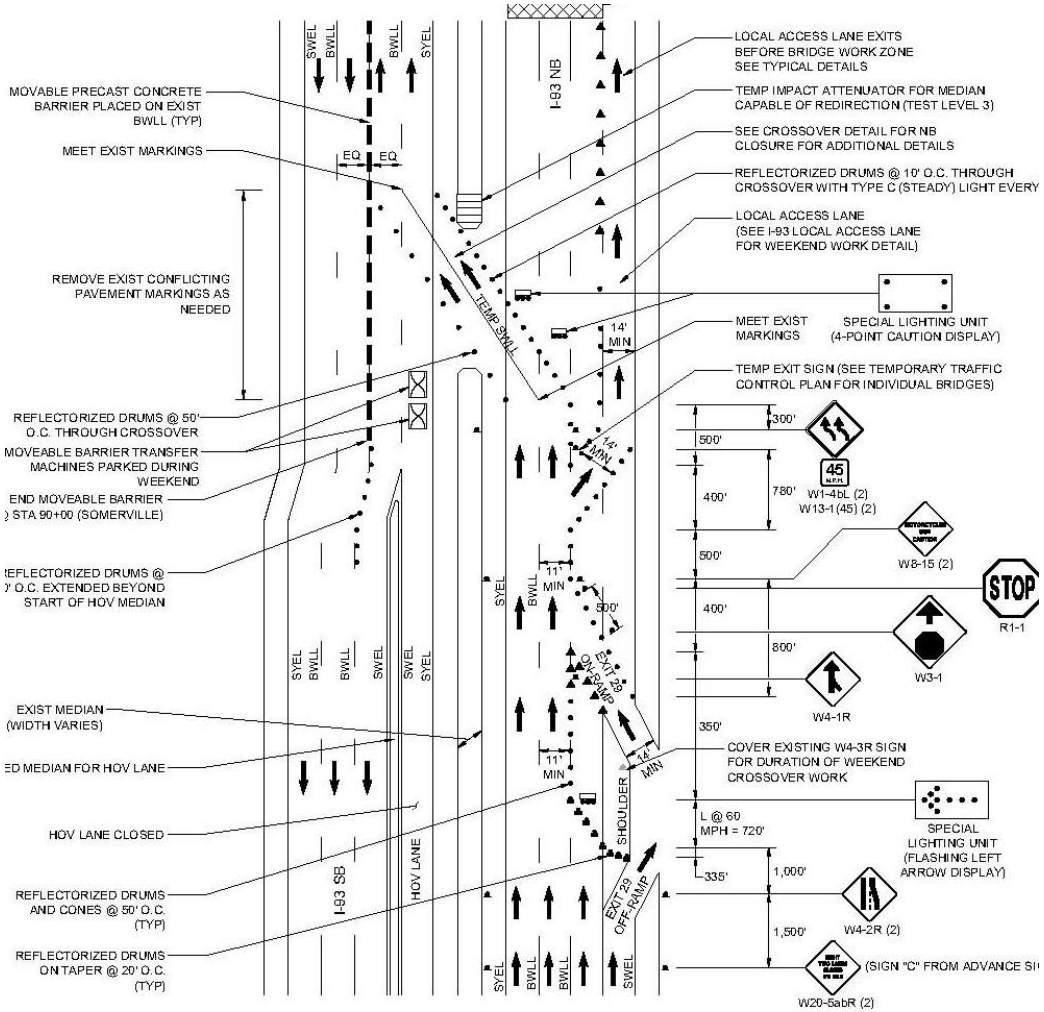
Barrier Configuration



Movable Barrier Deployment



I-93 Crossover TMP



SEE ADVANCE SIGN PLAN IN TEMPORARY TRAFFIC CONTROL PLAN FOR INDIVIDUAL BRIDGES FOR PCMS LOCATIONS AND MESSAGES.

I-93 NB BRIDGE CLOSURE
SOUTH OF SOUTHERN CROSSOVER

Work Zone Speed Limit

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Work Area Protection

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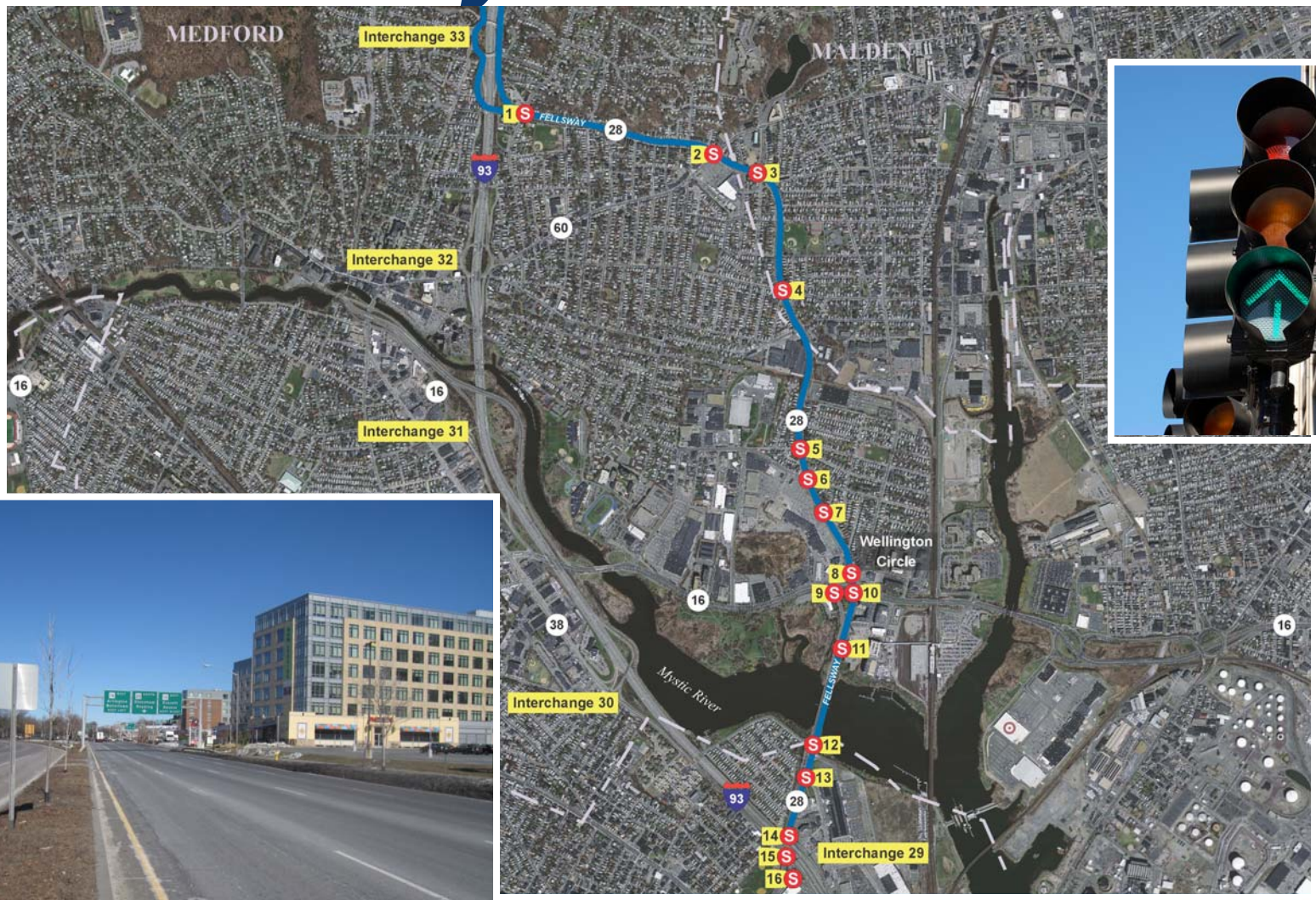
Emergency Access Points

Fellsway Traffic Plan



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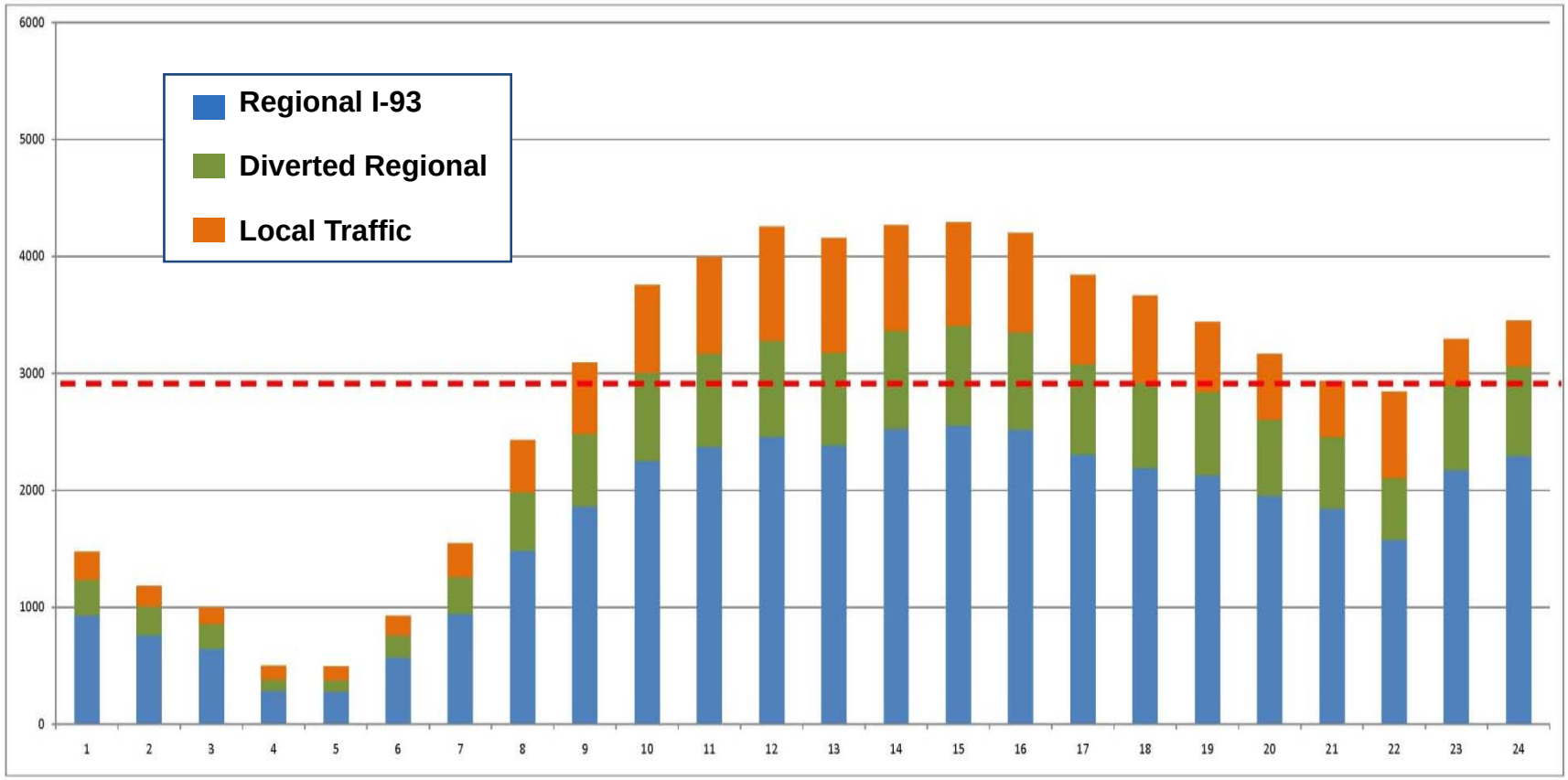
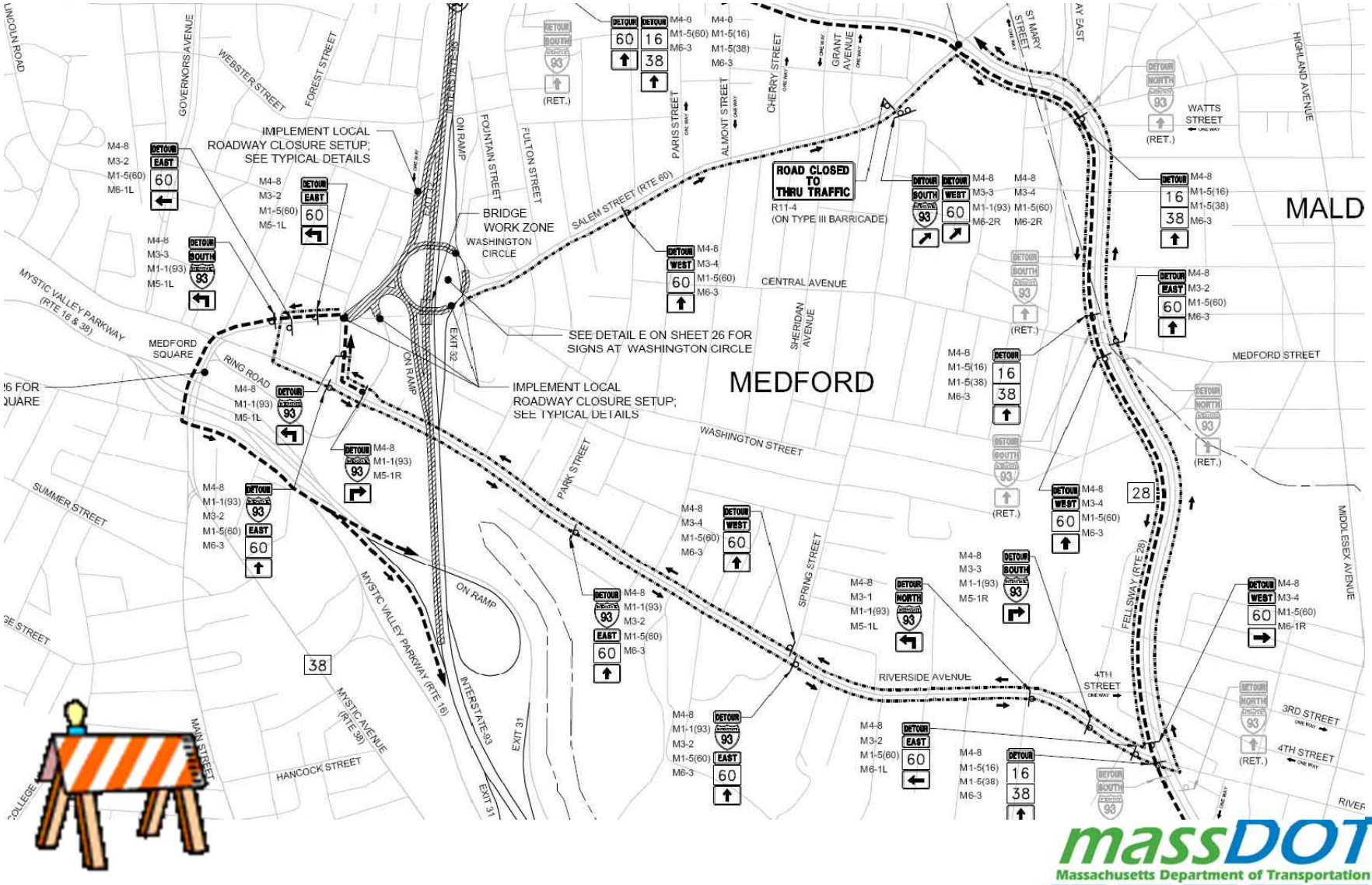
Fellsway Operations Plan: I-93 Traffic Composition



Note: assumes a regional diversion of 25%

Example: Riverside Ave NB

Local Detour Routes



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Local Detour Routes

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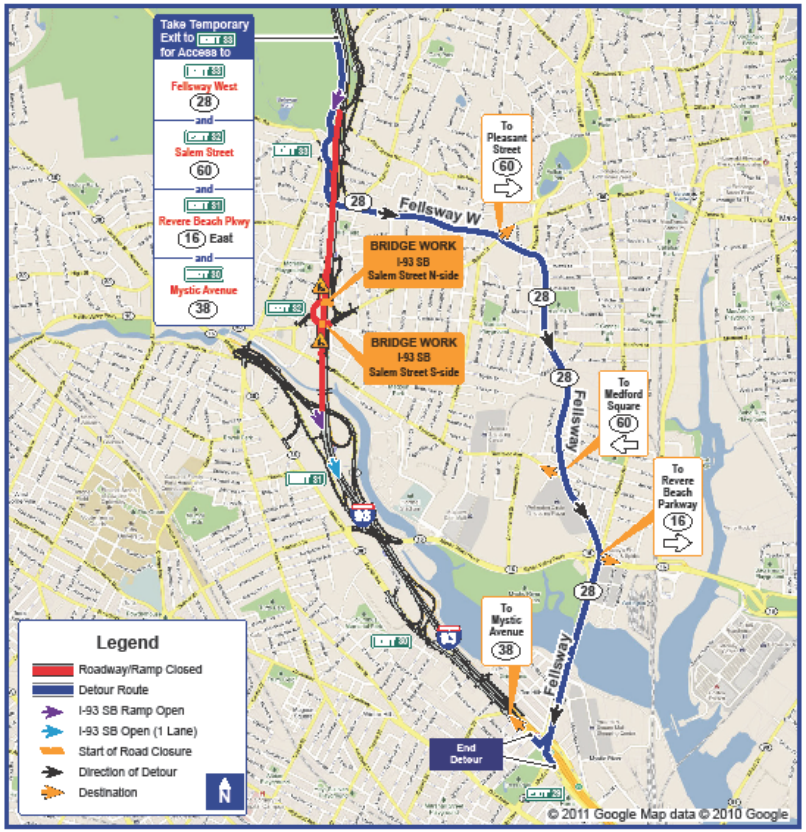
I-93 Rapid Bridge Replacement Project
www.mass.gov/massdot/93fast14

I-93 SB Bridges over Salem Street / Route 60
Detours for Exit Closures



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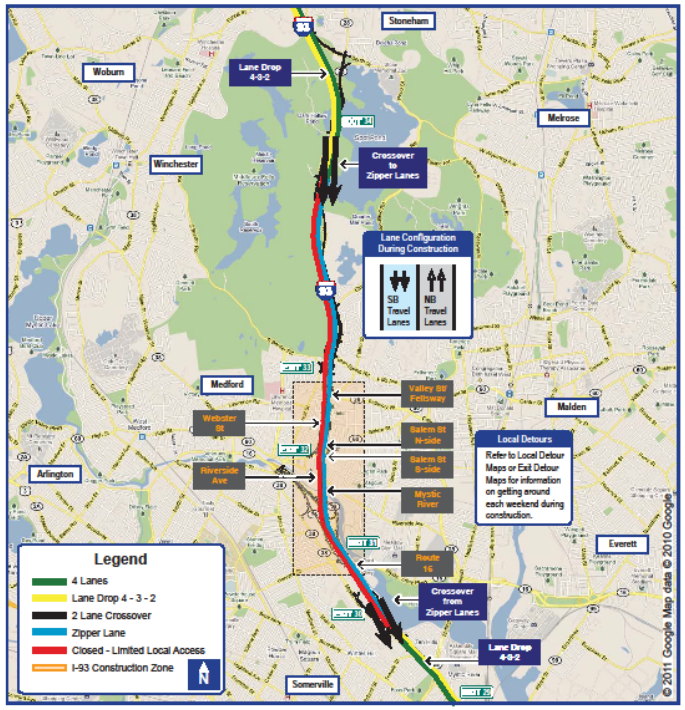
93 FAST 14
I-93 Rapid Bridge Replacement Project
www.mass.gov/massdot/93fast14

DRAFT
5-13-2011
v. 1

Weekend Lane Configuration
During Construction of the I-93 SB Bridges



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Incident Command Structure

- From early on in the process the decision was made to plan the Fast 14 traffic management operations as if the weekend schedule is an “incident” and utilize the Incident Command Structure according to the National Incident Management System (NIMS)
- NIMS provides a systematic, proactive approach to guide departments and agencies at all levels of government, in the management of incidents

Mobile Command Center

The Massachusetts State Police have a mobile "command center" that will serve as the focal point of communications between work zone traffic details, intersection control, construction operations, local police/fire and regional EMS

Active Command Post

Real-Time Traffic Management

- 35 Portable Changeable Message Signs (PCMS)

- 4 Portable Camera Trailers
- 67 Traffic Sensor Trailers
- 3 Blue Tooth Sensors
- ASTI's "CHIPS" Program (Operating System)

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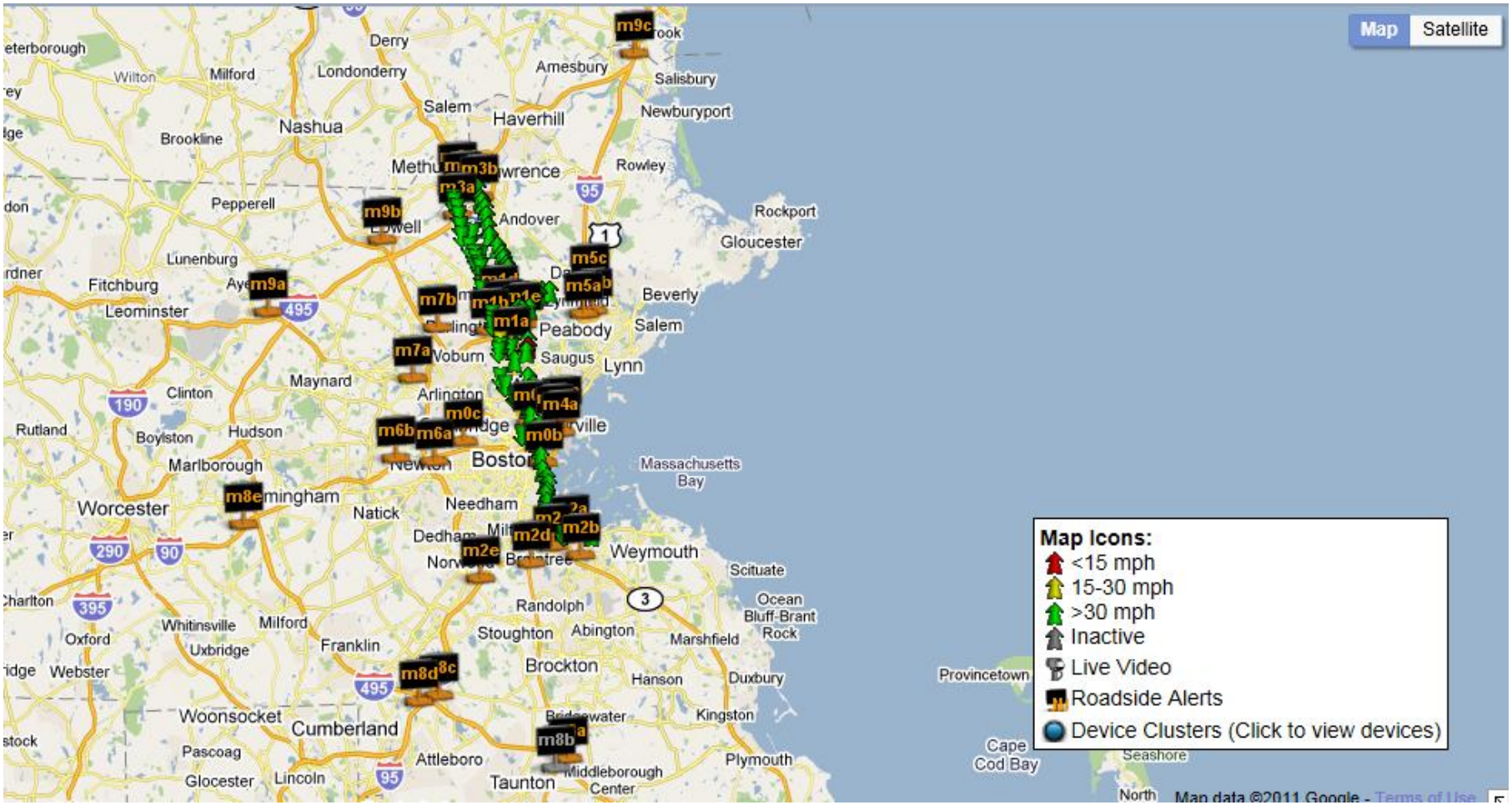
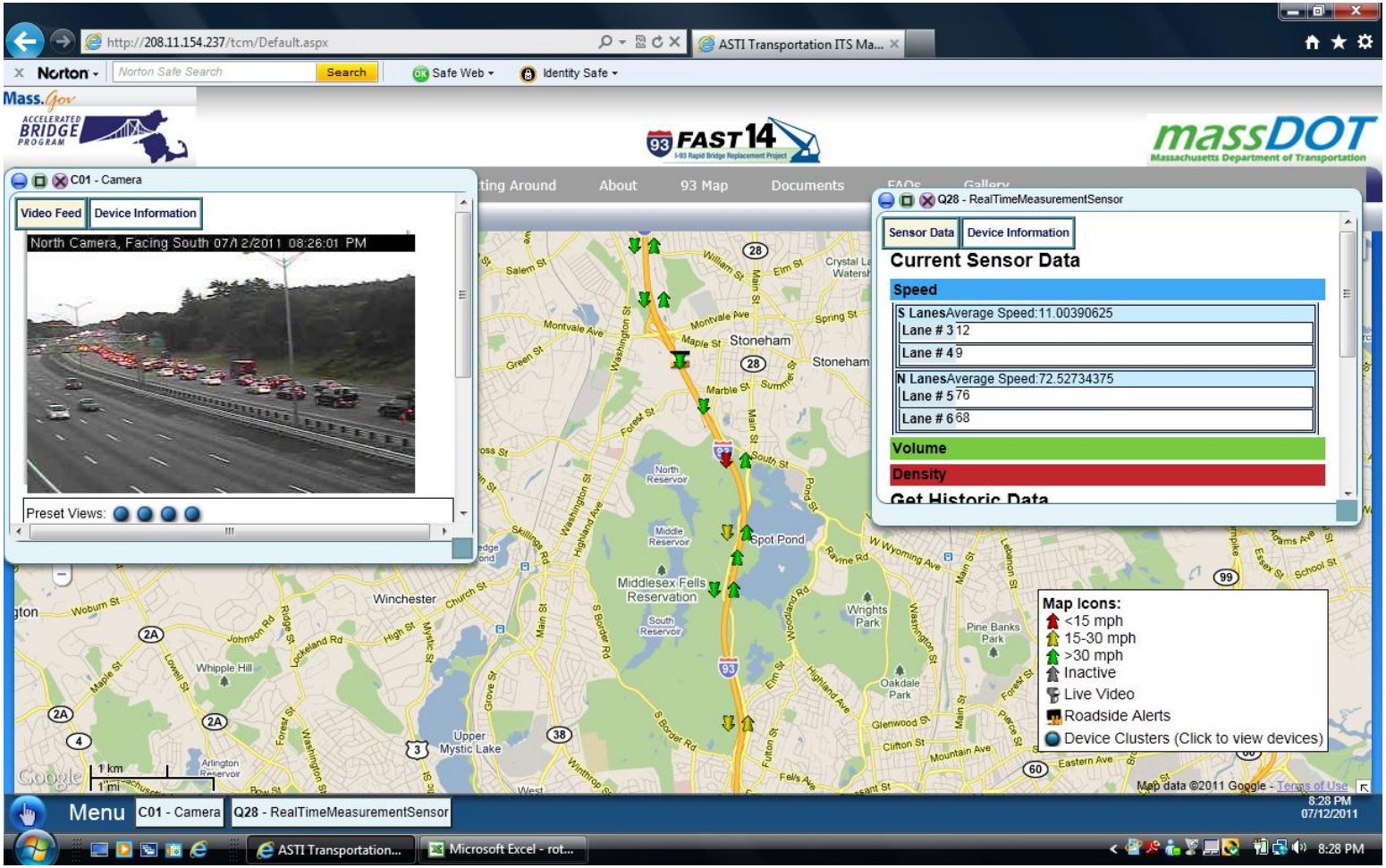
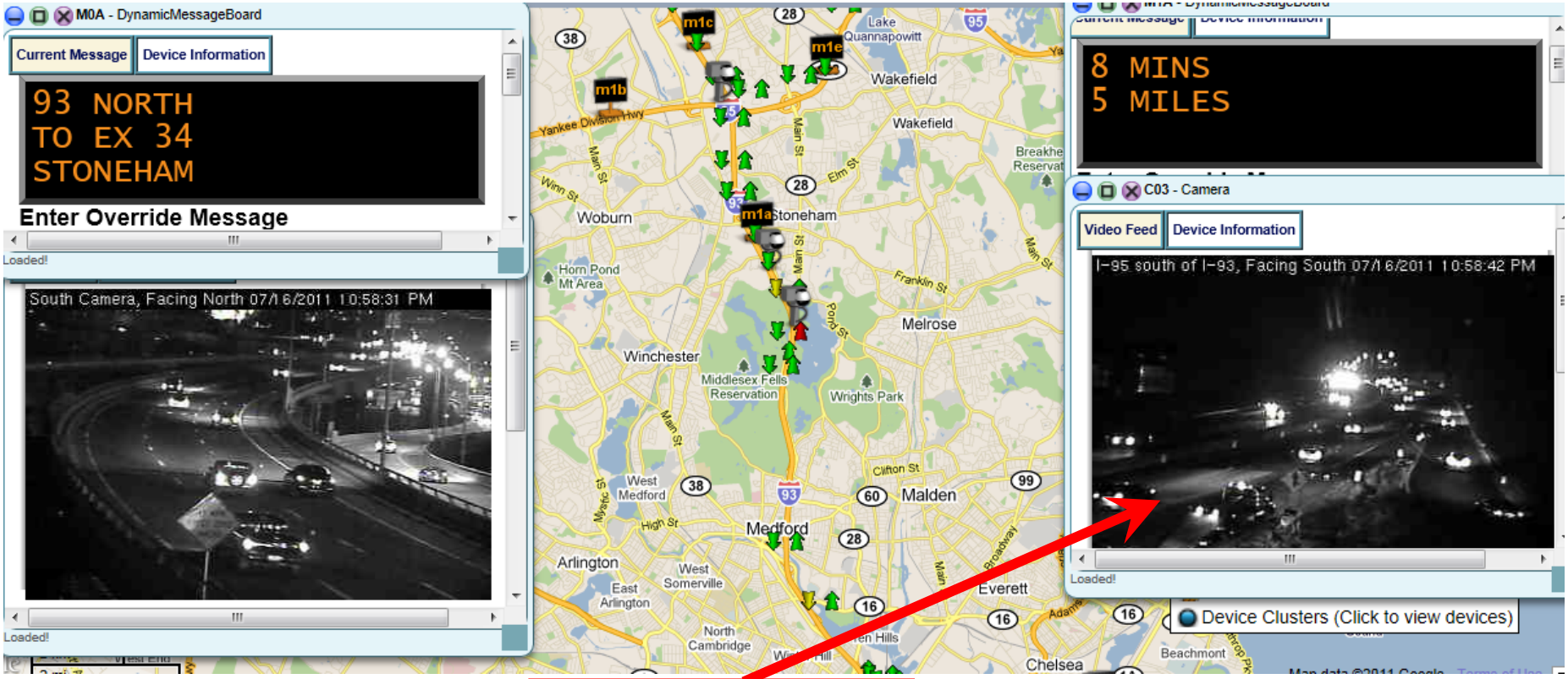
RTTM System Main Screen



RTTM System


http://208.11.154.237/tcm/Default.aspx
ASTI Transportation ITS Ma...
Norton
Norton Safe Search
Search
Safe Web
Identity Safe
Mass.gov
ACCELERATED BRIDGE PROGRAM
93 FAST 14
I-93 Rapid Bridge Replacement Project
massDOT
Massachusetts Department of Transportation
About
93 Map
Documents
C01 - Camera
Video Feed
Device Information
North Camera, Facing South 07/12/2011 08:26:01 PM
Preset Views:
Q28 - RealTimeMeasurementSensor
Sensor Data
Device Information
Current Sensor Data
Speed
S Lanes Average Speed:11.00390625
Lane # 3 12
Lane # 4 9
N Lanes Average Speed:72.52734375
Lane # 5 76
Lane # 6 68
Volume
Density
Get Historic Data
Map Icons:
<15 mph
15-30 mph
>30 mph
Inactive
Live Video
Roadside Alerts
Device Clusters (Click to view devices)
Map data ©2011 Google - Terms of Use
Menu
C01 - Camera
Q28 - RealTimeMeasurementSensor
8:28 PM
07/12/2011
ASTI Transportation...
Microsoft Excel - rot...
8:28 PM

Night Time Coverage

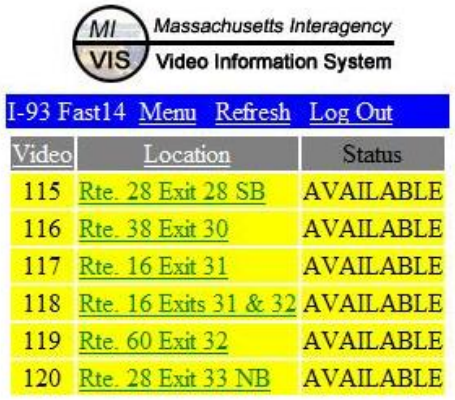


DMV being cleared off shoulder area

Video Wall at Command Post

Field Office Operations Center

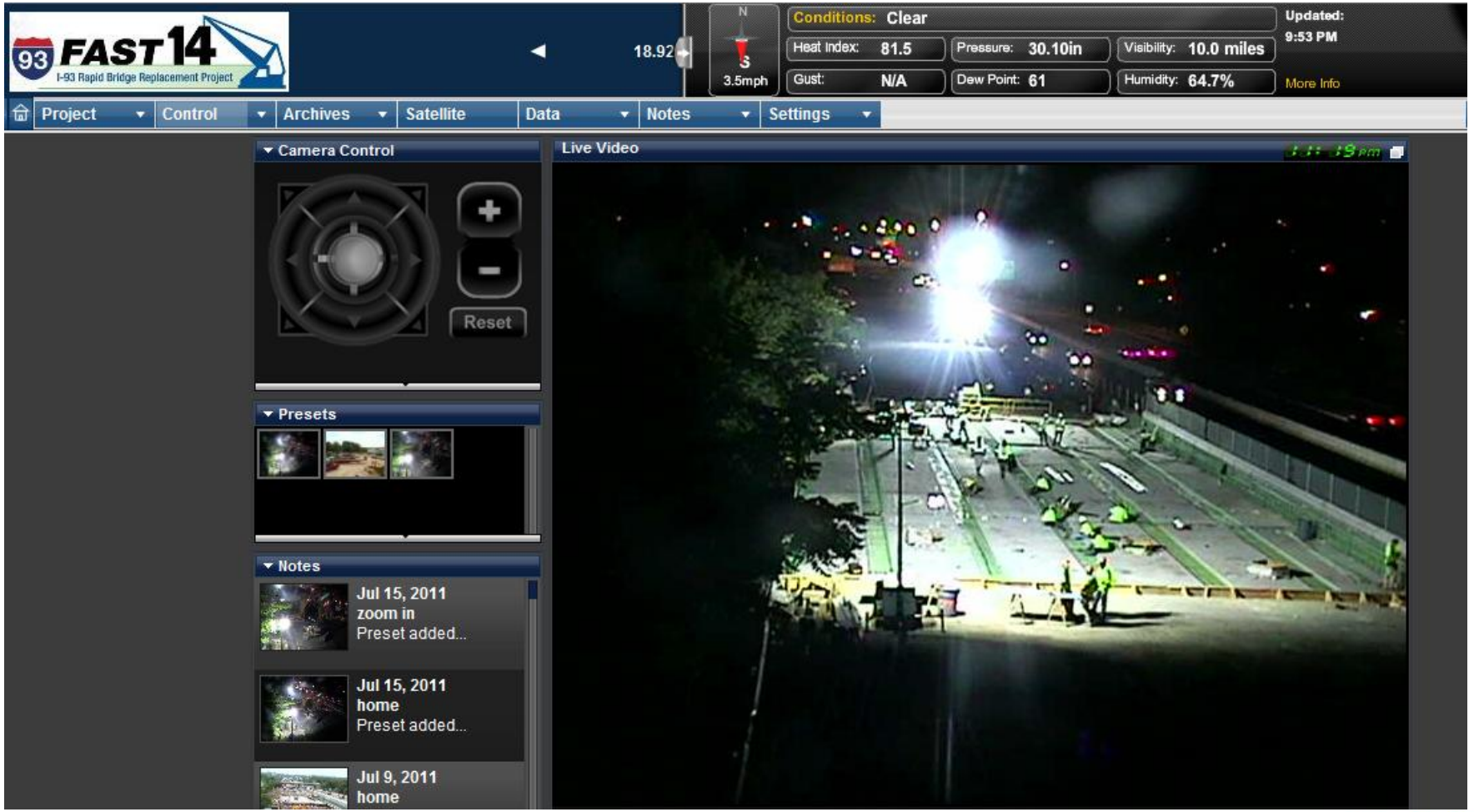
Massachusetts Interagency Video Information System



Video	Location	Status
115	Rte. 28 Exit 28 SB	AVAILABLE
116	Rte. 38 Exit 30	AVAILABLE
117	Rte. 16 Exit 31	AVAILABLE
118	Rte. 16 Exits 31 & 32	AVAILABLE
119	Rte. 60 Exit 32	AVAILABLE
120	Rte. 28 Exit 33 NB	AVAILABLE

- MIVIS – Provides Remote Camera Access
- Screen Shot from 1 of 6 new cameras in corridor
- All password protected

EarthCam – Contingency Assist



511 Construction Updates

- Partnering with our 511 provider Sendza we had over **1,100 users** of the dedicated I-93 Fast 14 Construction Alerts
- Saturday, July 30th – General Message

  "MassDOT- Medford I93 reduced to 2 lanes each dir – NB Ramps open, SB to Ex 33 only. Local access via Rt 28. Expect traffic delays/plan extra time/use alt rtes"
- Voice over – In addition to the traditional text messages that we send Sendza, we also prepare and send a local roadway detour plan

Highway Advisory Radio

- MassDOT deployed six HAR units approaching key alternate routes
- Message sets were drafted for eight different traffic scenarios based on varying delay thresholds

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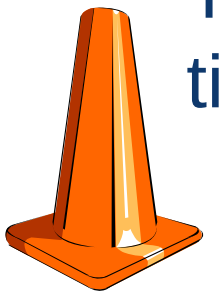
MassDOT Maintenance Support

- District 4 Maintenance has provided the Fast 14 project with on-call traffic operations needs, general highway maintenance and work zone traffic control

- Weekly deployment PCMS boards to support the local detour routes
- Without the support of the Highway Maintenance Team, MassDOT would have had a very difficult time managing the weekend schedule



Highway Operations Center Support

- Each week the HOC supports the Fast 14 project with schedule/traffic advisories for the next weekend's bridge (Mon-Fri)
- During the weekend, the HOC provides 7-10 site specific messages
- Two-way communications Using 800 MHz radios

Emergency Response

- Project team held 4 meetings with 16 local Police Departments as a part of the process in developing the Contingency Plan and Incident Action Plan.
- Team also conducted one big regional meeting with Armstrong Ambulance that included several other regional companies. In addition, there were coordination meetings with representatives from both Boston EMS and Massachusetts General Hospital (MGH).
- The MSP Truck Team Commander held several discussions with the MSP Truck Team, Coady's and DEP to ensure that an agreement on an expedited version of the HazMat cleanup protocol was reached.
- MSP Troop A worked with the Accident Recon Team (CARS) to develop an expedited accident reconstruction protocol to ensure a very quick cleanup and clearance for any accident involving a serious injury or fatality occurring within the Fast 14 Project boundary.

State Police Emergency Response Teams

CVES

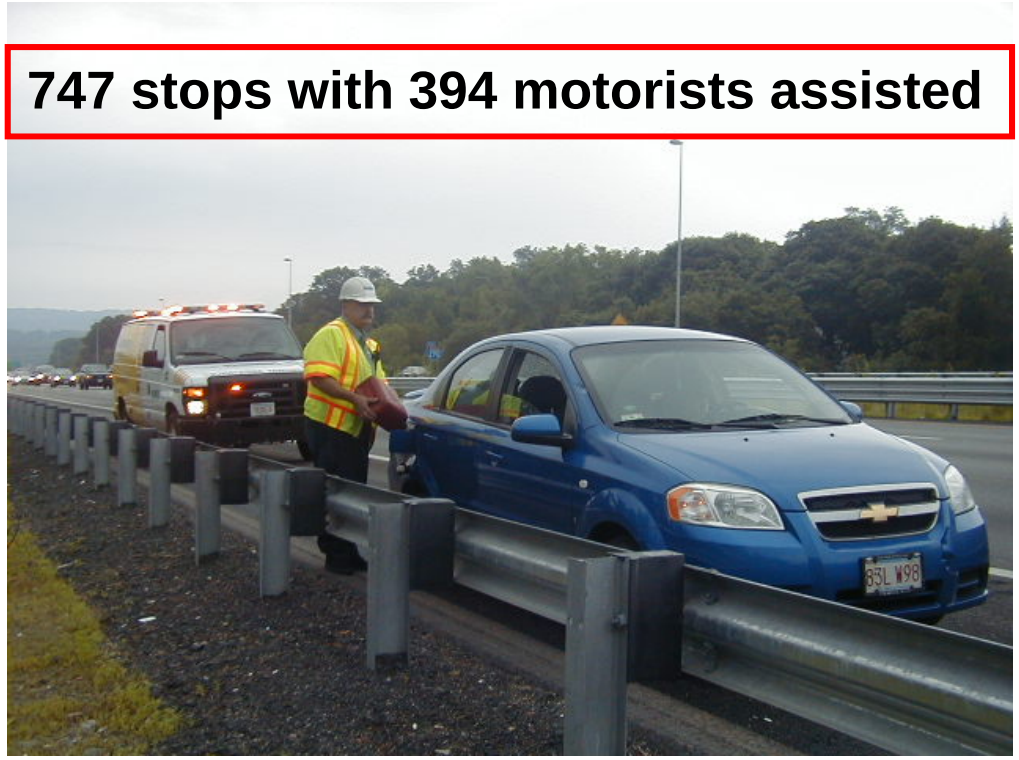
CARS

On-Site Tow Services

Motorist Assistance Vans

In order to keep the “alternate routes” a viable option for motorists to consider diverting to, MassDOT has schedule the traditional weekday rush hour Motorist Assistance Vans to keep the road free from breakdowns and incidents

747 stops with 394 motorists assisted



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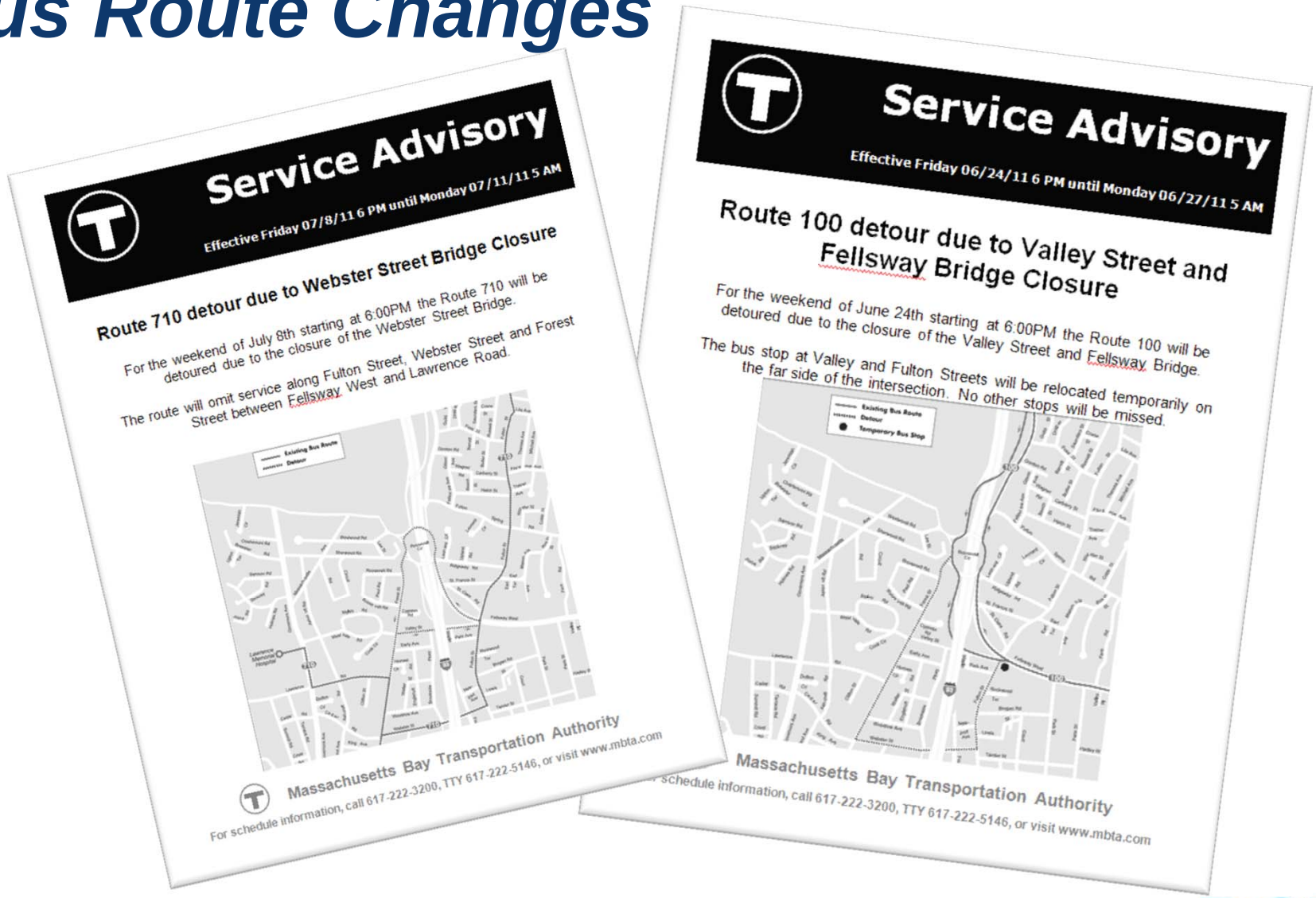
Public Transportation

Anderson RTC -

People were encouraged to take advantage of the free parking

Bus Route Changes



Lessons Learned

- Involve key decision makers from the start
- Aggressive schedule requires organization
- Co-locate with Design-Build contractor
- Form discipline-based working groups
- Work with locals regarding impacts / expectations
- Engage law enforcement early
- Develop/exercise contingency plans
- Use any and all communication methods
- Practice key work activities
- Two-way radio communication
- Adjust methods to improve efficiency

Achievement of Project Goals

- Managed interstate traffic without long queues/excessive delays
- Kept local detour routes moving with acceptable levels of delay
- Protected workers from hazards of the work zone zone/highway
- Avoided serious crashes in TMP

Fast 14 Traffic Observations

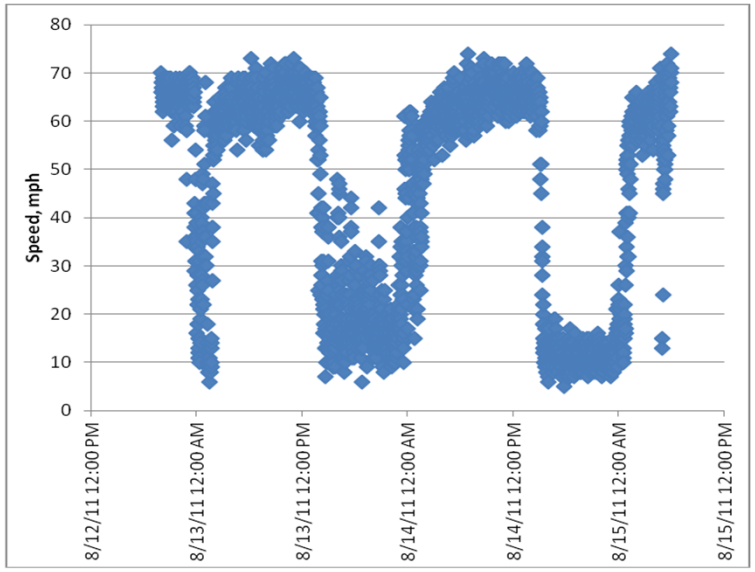
- Traffic on I-93 averaged speeds of 35 mph through the work zone, with lower speeds entering the lane drop areas (15-20 mph) and higher speeds inside the movable barrier lanes (40- 45-mph).
- Local detour routes maintained an average speed of 25-mph and delays were kept to and average of 2-3 cycles at key intersections.

RTTM Weekend Data

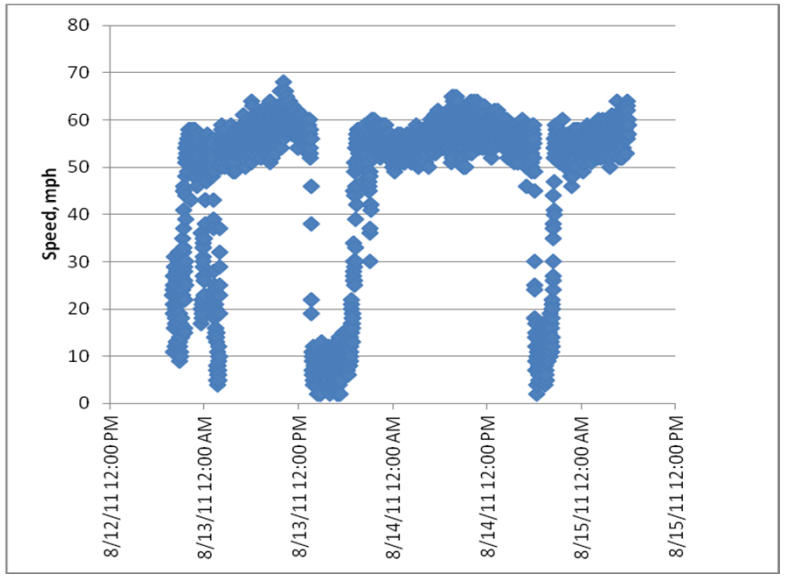
Weekend 10 Speed Plot Data:

I-93 Southbound over Route 16 (Mystic Valley Parkway)

August 12-14



Q29: Southbound



Q19: Northbound

Traffic volumes exceed capacity of the lane and speed drop to a crawl for periods of the day.

Project Crash History

- Between June 3rd and August 15th, there has been a total of 348 Motor Vehicle Accidents (MVAs) on I-93 within the TMP limits
- 144 of those MVAs actually occurred during the 55-hour construction window over the ten weekends of work I-93(*No work on 4th of July Weekend)*
- 55 of 144 were Paper Exchanges = not reportable
- A total of 35 Disabled Motor Vehicles have been cleared during the 55-hr schedule

I-93 Fast 14

Project In Action

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Moving the Barrier

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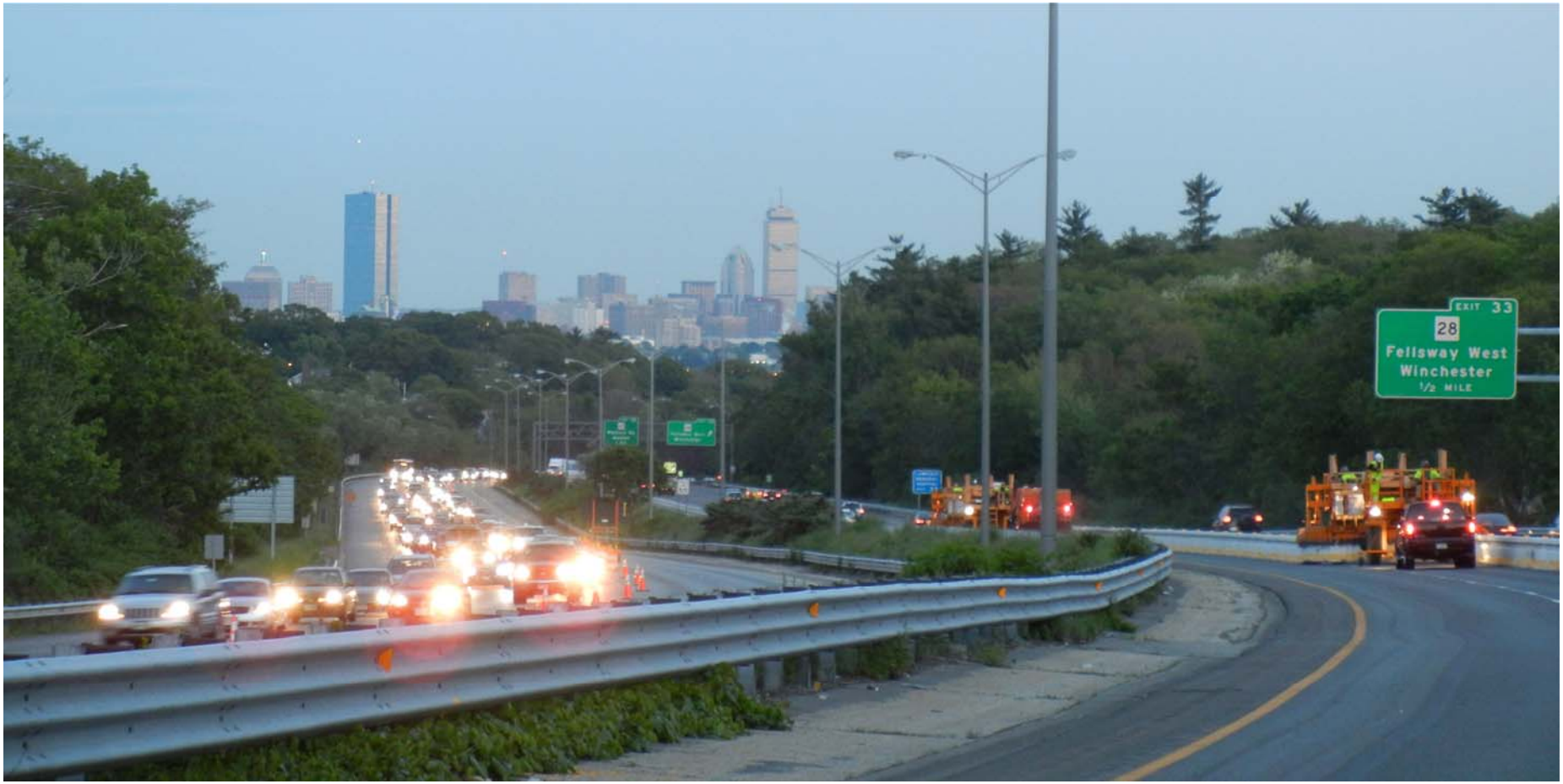
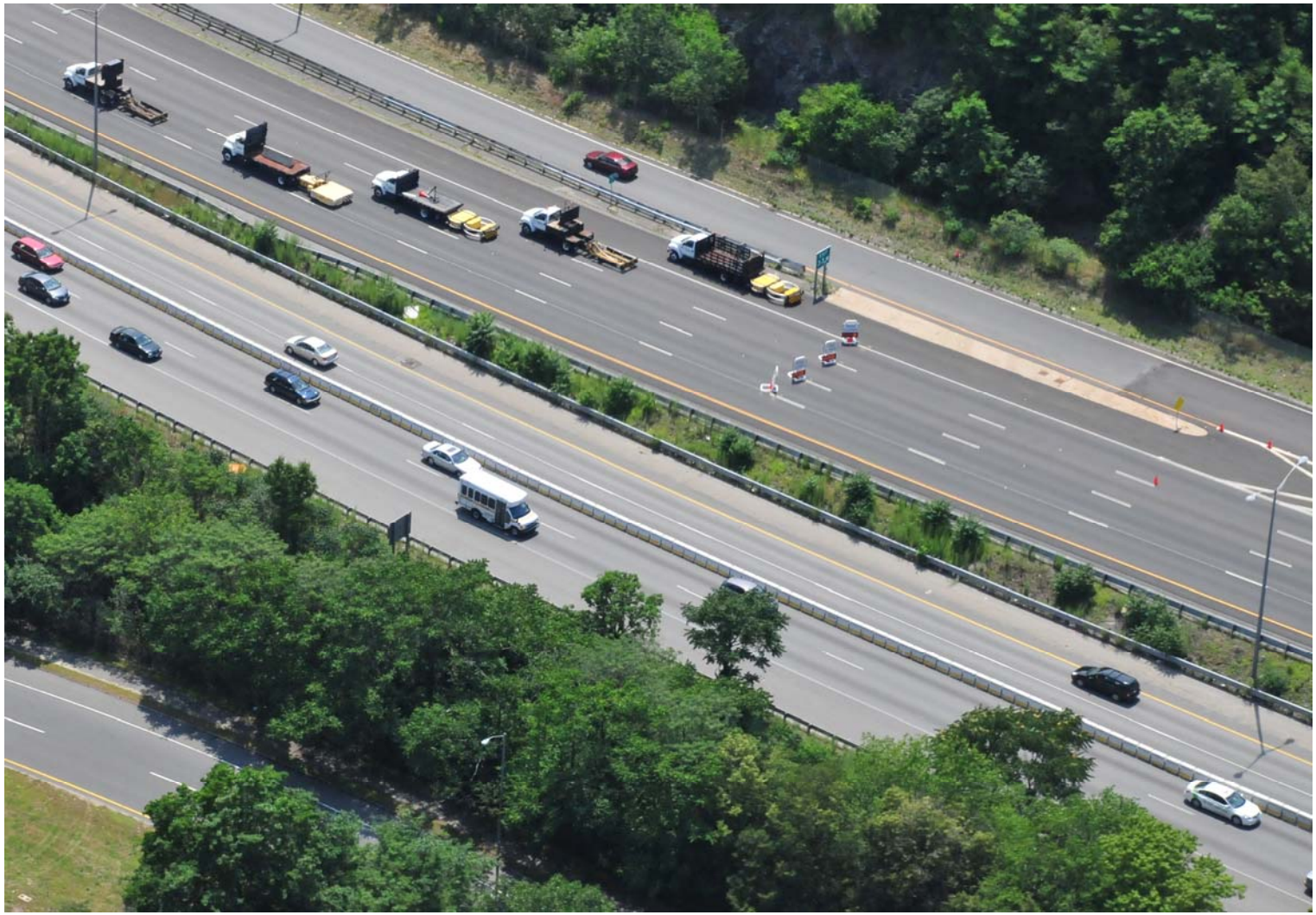
Sky Eye View of Barrier

Northbound Exodus



Dedicated Work Area Protection



Early Start on Demo

View of Early-Start Demolition

Truck Convoy Mobilization

Deck Panels on the Move

Parade of Sail

Release the Hounds

The morning after

Counter-Flow Operation


Way to go!
mymassagent.com

Modular Unit Erection

Modular Unit Erection Cont.

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Forming, Reinforcement Installation

Forming, Dowel Bar Splicers

Approach Work/Cleanup

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