CITY OF NEWTON

IN BOARD OF ALDERMEN

PUBLIC SAFETY & TRANSPORTATION COMMITTEE REPORT

WEDNESDAY, OCTOBER 19, 2011

Present: Ald. Ciccone (Chairman), Harney, Swiston, Shapiro, Yates, Fuller and Freedman
Absent: Ald. Johnson
Also Present: Ald. Hess-Mahan and Sangiolo
City Staff: Clint Schuckel, Director of Transportation; David Turocy, Commissioner Department Public Works and David Koses, Transportation Planner

#288-11 ALD. SWISTON & HESS-MAHAN, requesting the Mayor act on the recommendations made on September 22, 2011 by the Traffic Council relative to item TC5-11 recommending a series of speed humps between Chestnut and Forests Streets to address speeding on Otis Street. [10/07/11 @ 3:28 PM]

ACTION: **RESOLUTION APPROVED 5-0-2 (Freedman and Shapiro abstaining)** to request that the Executive Department fund the speed humps)

NOTE: Mr. Schuckel provided Committee members with a PowerPoint presentation, attached to this report. In February 2011, the Board of Aldermen rescinded Section 19-99(b), speed humps of the Revised Ordinances of the City of Newton. Petitions for traffic calming measures shall meet all of the following standards: Traffic volume on the street is greater than 1,000 vehicles per day; measured 85th percentile speeds are equal to or greater than 9 mph above the speed limit; for vertical deflections, street classification shall be minor collector or local street and for raised crossing(s), the minimum criteria established by the city crosswalk policy shall be met.

On September 22, 201, Traffic Council approved to recommend a series of speed humps on Otis Street between Chestnut and Forest Street but cannot fund these speed humps. Chairman Ciccone said this Committee could approve a resolution to request that the Executive Department allocate these funds. Mr. Schuckel said once Traffic Council favorably votes on a petition, the Mayor has the authority to initiate these funding requests by docketing an item that would be referred to the Public Facilities and Finance Committees, unless an item is budgeted by the Department of Public Works.

Mr. Schuckel provided Committee members with recent photos, traffic counts, street data, street grades and minimum traffic calming thresholds. He stated that Otis Street is 23'-24' wide, there are no parking restrictions with a 25 mph speed limit. Speed humps could be installed as possible traffic calming devices because the required criteria are met. Traffic volume on the street is greater than 1,000 vehicles per day, the measured 85th percentile speeds are equal to or greater than 9 mph above the speed limit and Otis Street is a local street. Chicanes, raised intersections, crosswalks and mini round-abouts should not be considered at this location for various reasons. He then said speed that humps are installed approximately 50' from driveways

perhaps making it difficult to park. Mr. Schuckel provided the following speed hump information and costs:
Speed Hump Information and Costs:
Length of Otis St. (Chestnut to Lowell): 3500'
Maximum speed hump spacing: 500'
Number of speed humps required: 6
Approximate cost per speed hump: $7,500
Cost to install on Otis between Chestnut and Lowell: $45,000

Ald. Hess-Mahan and Swiston said this item was docketed due to ongoing high traffic volumes and high-speed issues. Data provided proves that vehicles are driving excessive. The median speed is 29 mph and the 85th percentile speed is 35 mph on a 25 mph street. They support and request the Mayor to fund the requested speed humps.

Ald. Swiston made the motion to approve this resolution requesting the Executive Department fund the speed humps. Committee members agreed 5-0-2, Ald. Shapiro and Freedman abstaining.

#278-11 ALD. YATES, requesting a report from His Honor the Mayor on the likely impacts on traffic in Newton from the changes to the Route 9/128 intersection as part of the Add-A-Lane Project. [09/26/11 @ 2:37 PM]
ACTION: HELD 6-0, Ald. Shapiro not voting

NOTE: Mr. Schuckel said that this project is in the final phase of MassDOT ongoing work to widen I-95 to four travel lanes from Route 24 to Route 9. It is estimated the design work will be completed in fall 2012, construction to begin in 2013 and completed in 2016. The proposed 127 million dollar project will widen 3.3 miles of I-95 including the three interchanges (Kendrick Street, Highland Street and Route 9).

Mr. Schuckel provided Committee members with a PowerPoint presentation, a letter from the City commenting on the I-95 Project dated June 16, 2011, and a Functional Design Report dated August 2010 provided by McMahon Transportation Engineers & Planners; all are attached to this report. Mr. Schuckel reviewed the project schedule, scope of work including ramp removal, new left-turn and a relocated ramp and traffic impacts.

Mr. Schuckel provided the following crash summary statistics between 2006-2008:
Crash Summary Statistics
I-95 NB ramps at Route 9 totaled 26
I-95 SB ramps at Route 9 totaled 14
I-95 vicinity at Route 9 totaled 33
These crash counts are considered low due to the high volume of vehicles traveling. Crash analysis data is very difficult to make a strong conclusion because of non-specific locations reported by the Police Department.
Mr. Schuckel briefly described future alternatives. **"**In an effort to determine the most appropriate interchange configuration for the Route 9 at I-95/Route 128 interchange, several

alternatives were considered. A full technical analysis was completed as part of an Interchange Modification Report". He reviewed the following alternatives were considered:

Alternatives Considered

- No Build Alternative: Full Cloverleaf
- Build Alternative 1: Full Cloverleaf Interchange with Compliant Geometry
- Build Alternative 2: Diamond Interchange
- Build Alternative 3: Diverging Diamond Interchange
- Build Alternative 4: Single Point Urban Interchange
- Build Alternative 5: Partial Cloverleaf Interchange

Chairman Ciccone opened the discussion for public comment. Maureen Meagher, 342 Quinobequin Road, expressed her concerns. She is hopeful McMahon Transportation Engineers & Planners will attend a future meeting to answer additional questions. She said the neighborhood has dealt with different large projects, which have produced additional traffic, and additional projects such as this will introduce additional traffic. She requests the City advocate for the neighbors by requesting a public hearing with MassDOT and residents who will be impacted on this project. A public hearing would allow residents to communicate, ask questions and the opportunity to request a sound-barrier wall. A Stop Sign on Route 9 would impact the neighborhood and Chestnut Street as people use these as cut-through streets. Ms. Meagher wrote a letter to MassDOT addressing her concerns after the June 1, 2011 public hearing. She asked if the City's letter to MassDOT was amended in the Traffic Study section to include Quinobequin Road and Chestnut Street. Mr. Schuckel said the letter was not amended to reflect this request. It is his understanding the City has not received a written response. He said the letter requested the following. "As the City of Newton is directly downstream along the Charles River, which is immediately adjacent to the Add-a-Lane project and the likely destination of roadway runoff, the City respectfully requests that MassDOT copy the City Engineer, Lou Taverna on all stormwater management plans, analyses, and related documents that are submitted to the Towns of Needham and Wellesley." Mr. Schuckel said MassDOT was not required to notify Newton residents of the public hearing because the project is not physically touching Newton. They are only required to notify residents of Needham and Wellesley.

Ald. Yates suggested inviting MassDOT and McMahon Transportation Engineers & Planners to a future meeting to answer additional questions. Mr. Schuckel said he would invite them. Therefore, Ald. Yates made the motion to hold this item. Committee members agreed 6-0, Ald. Shapiro not voting.

REFERRED TO PUBLIC SAFETY & TRANSPORTATION COMMITTEE on 05/04/09
REFERRED TO PUBLIC FACILITIES & FINANCE COMMITTEES on 02/17/09

#60-09 ALD. SANGIOLO, GENTILE AND HARNEY requesting the installation of traffic islands on CONCORD STREET to be funded with the Cabot, Cabot and Forbes Traffic Mitigation Fund for Lower Falls (Ward 4). [02/03/09 @ 1:01 PM]
FINANCE NO ACTION NECESSARY 7-0 on 03/08/10
HELD 6-0 (Ald. Freedman not voting) on 04/06/11

ACTION: **NO ACTION NECESSARY 6-0, Ald. Shapiro not voting**

NOTE: Mr. Schuckel reviewed with Committee members the funding available on this item. He said that the Riverside Traffic Mitigation Fund was appropriated $150,000 for projects

at three locations. The Auburndale, Lower Falls and the 128 intersection improvements. To date, two projects have been completed spending approximately $115,000. Approximately $35,000 remains in the fund earmarked for Grove Street at Pine Grove. Preliminary design work has been completed for Grove Street at Pine Grove and this area was approved for a raised crosswalk, speed hump or raised intersection. Additional funds would have to be allocated for a raised intersection. Approximately $15,000 remains in the Riverside Traffic Mitigation Fund earmarked for the Lower Falls improvements. The City's Law Department would have to determine if monies could be transferred.

On April 30, 2009, Traffic Council voted no action necessary on either two center islands or alternatively a bike lane along Concord Street. Traffic Council recommended add "share the road" bicycle signage, stripe travel lanes at 10' with striped shoulders and continued Police enforcement of speed limit.

Ald. Sangiolo said Public Facilities Committee was provided with a report from Mr. Taverna, dated July 2, 2009 indicating that the consideration of installing speed tables rather than raised crosswalks could save the City money. Mr. Schuckel provided Committee members with cost estimates. A 12' speed hump is $7,500 (City Engineer memo to Public Facilities Committee in December 2008). The labor cost for a 22' speed hump is very similar; however, increased asphalt is needed for the additional 10 feet of 3" raised surface. Therefore, the DPW estimate for a 22' speed hump is $10,000 each, which is significantly less than a raised crosswalk ($25,000) or raised intersection ($60,000) where sidewalk, curbing, and street drainage improvements are required. The total estimated cost of the five 22' speed humps on Concord Street is $50,000.

Chairman Ciccone opened the discussion for public comment.
Norm Sieman, 100 Clearwater Road, said that based on research conducted by the Lower Falls Traffic Calming Committee, the 22' speed hump is for a higher speed road, such as Concord Street designed to slow traffic to 25mph at the speed hump. The 14' speed hump is for a local street designed to slow traffic to 15 mph at the hump. He recommends the 22' speed humps.

Ald. Harney made the motion for no action necessary, as it is the intention of the Ward 4 Aldermen to docket an item for Traffic Council's consideration of speed tables. Committee members agreed 6-0, Ald. Shapiro not voting.

#235-09 ALD. SANGIOLO, HARNEY & GENTILE on behalf of residents on
TC2(2)-08 Wolcott Street requesting that the traffic control signal located at Wolcott and Lexington Streets be moved to a different location or removed altogether. (Ward 4) [3/28/08 @ 9:59 AM]

ACTION: NO ACTION NECESSARY 6-0, Ald. Shapiro not voting

NOTE: Ald. Sangiolo said that Traffic Council recommended an outside traffic consultant be hired to conduct a traffic study to determine the best location for the traffic signal in the Lexington Street corridor. The traffic signal has become controversial because some residents request the light be relocated, others are opposed. The study has turned out to be quite costly at an estimate of $30,000 to $40,000. Ald. Harney said the area is very dangerous and it is necessary for safety measures come to fruition.

Ald. Sangiolo recommends a motion of no action necessary with the intention a new item will be docketed requesting the traffic study be funded and completed. Therefore, Ald. Harney made the motion for no action necessary. Committee members agreed 6-0, Ald. Shapiro not voting.

REFERRED TO PUBLIC SAFETY/TRANSPORTATION & FINANCE COMMITTEES

#54-11(2) ALD. YATES, CICCONE, HARNEY, FREEDMAN AND SHAPIRO requesting that Chapter 19 MOTOR VEHICLES AND TRAFFIC of the Revised Ordinances be amended by reinstating the Community Parking Program in a manner that charges the participants for the full cost of the program. [05/01/11 @ 10:05AM]
HELD 6-0 (Ald. Freedman not voting) on 05/18/11

ACTION: **NO ACTION NECESSARY 6-0, Ald. Shapiro not voting**

NOTE: A request went out to the Committee to clean up the agenda. In response to this request, Ald. Shapiro suggested this item be voted no action necessary.

Chairman Ciccone said he has not heard from any member of the past Community Parking Program requesting that this program be re-instated. Mr. Schuckel said he receives an occasional call and advises members the program has ended.

Without further discussion, Ald. Swiston made the motion for no action necessary. Committee members agreed 6-0, Ald. Shapiro not voting.

#261-09 ALD. JOHNSON requesting a review of the City of Newton Ordinances Chapter 24, Sections 26–34 Alarm System Regulations to more clearly express the fines and penalties to residential and commercial property owners for false alarms. [08/19/09 @ 9:53 AM]

ACTION: **NO ACTION NECESSARY 6-0, Ald. Shapiro not voting**

NOTE: A request went out to the Committee to clean up the agenda eliminating old or unnecessary items. In response to this request, Ald. Johnson suggested this item be voted no action necessary as it is the intention the Police Department and IT Director, Mr. Smith will docket a much broader item.

Without discussion, Ald. Harney made the motion for no action necessary. Committee members agreed 6-0, Ald. Shapiro not voting.

At approximately 10:05 pm, Ald. Swiston moved to adjourn. Committee members agreed 6-0, Ald. Shapiro not voting.

Respectfully submitted,

Allan Ciccone, Jr. Chairman

TC5-11

Requesting speed calming measures on Otis Street between Chestnut and Forest Streets. (Ward 3)

Study Area

Approach Photos

Near Forest Ave., looking east.

Near Lenox St., looking west.

Traffic and Road Info

- ADT: 1,227 vehicles per day (September, 2010).
  - 2% trucks.
- Speed Limit: 25 mph.
  - Median speed: 29 mph.
  - 85th percentile speed: 35 mph.
- Road width: 23'-24'.
- Hill peaks near Balcarres Rd.
  - Max grade of 6% between Balcarres and Forest.
  - Max grade of 9% between Forest and Lowell.
  - Max grade of 7% west of Balcarres.
  - MassDOT recommended maximum grade: 7%.

Minimum Traffic Calming Thresholds

- Traffic volume on street is greater than 1,000 vehicles per day.
- Measured 85th percentile speeds are equal to or greater than 9 mph above the speed limit.
- For vertical deflections, street classification shall be minor collector or local street.
  - For raised crossings, the minimum criteria established by the city crosswalk policy shall be met.

Possible Traffic Calming Devices: Speed Humps

Not considered: Chicanes

- Otis St. too narrow.

Not considered: Raised Intersections & Crosswalks

- Pedestrian volumes likely aren't high enough.

Not considered: Mini Roundabout

- Grade and right-of-way limitations.

Speed Hump Information

- Length of Otis St. (Chestnut to Lowell): 3500’
- Maximum speed hump spacing: 500’
- Number of speed humps required: 6
- Approximate cost per speed hump: $7,500
- Cost to install on Otis between Chestnut and Lowell: $45,000.

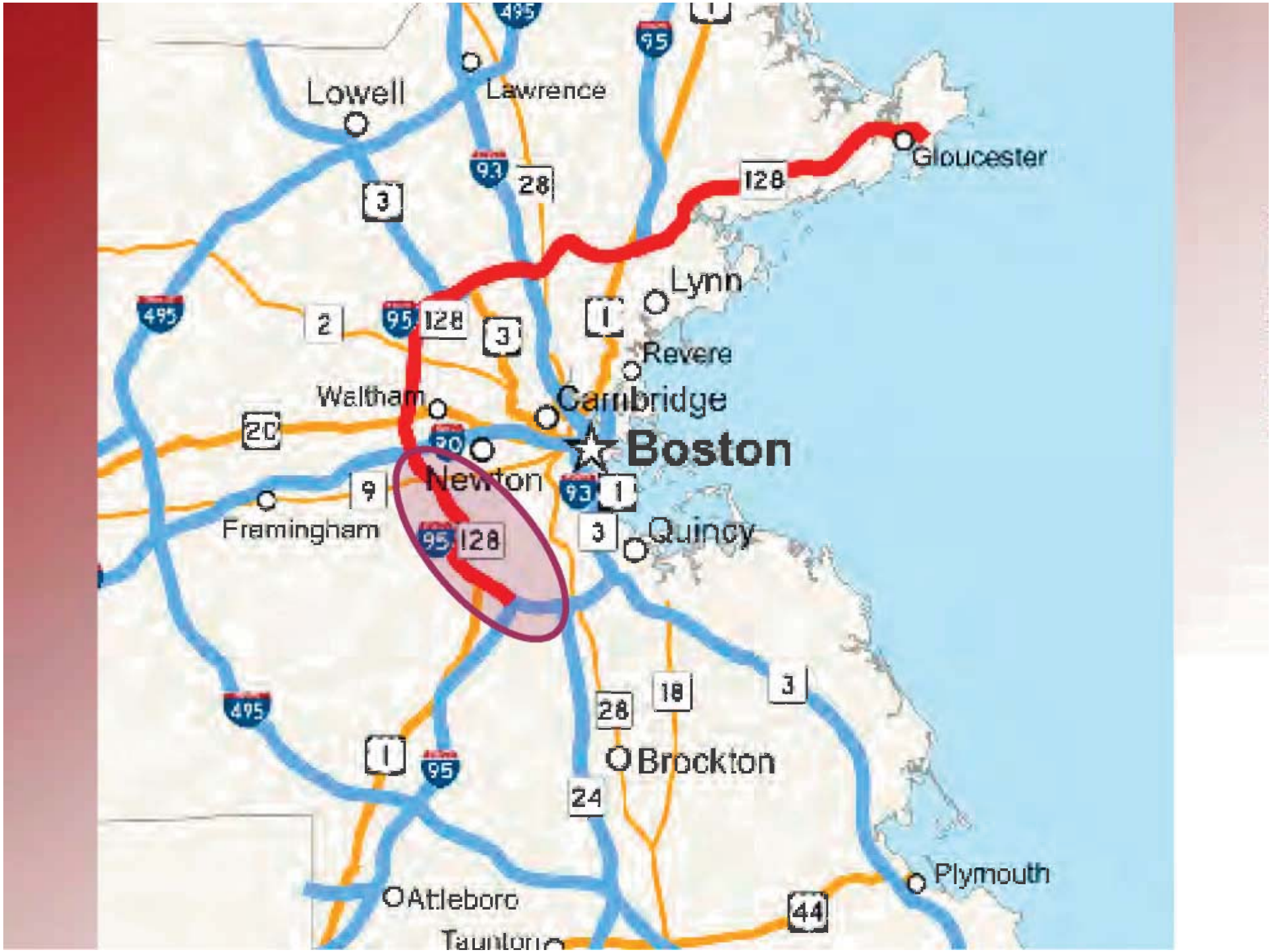
I-95 Add-A-Lane
(Kendrick to Route 9)

Clint Schuckel

Director of Transportation

Newton DPW

October 19, 2011

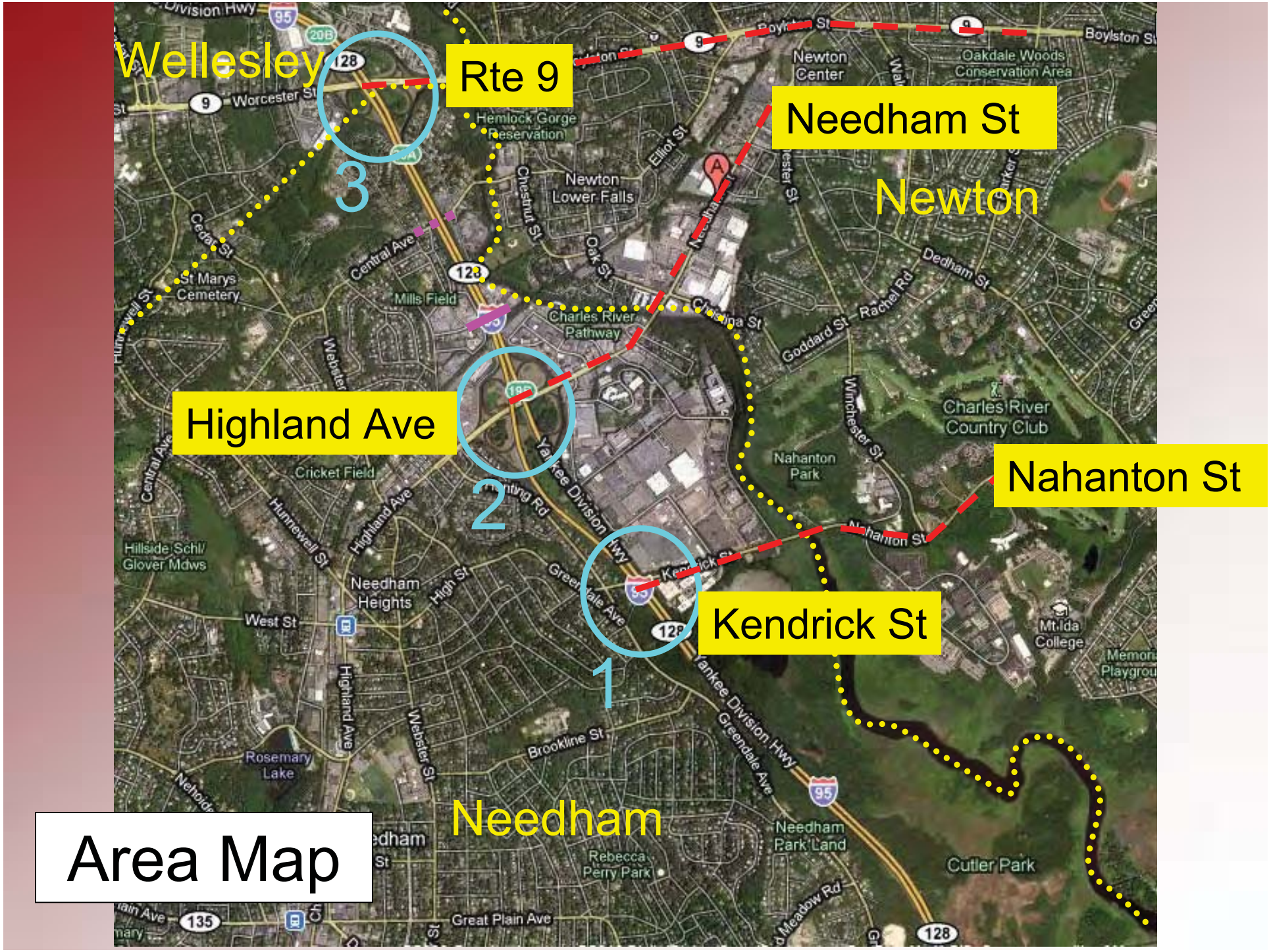

Lowell
Lawrence
Gloucester
Lynn
Revere
Waltham
Cambridge
Boston
Newton
Framingham
Quincy
Brockton
Plymouth
Attleboro
Taunton
495
95
93
128
3
28
2
1
20
9
18
24
44

"Add a Lane" Overview

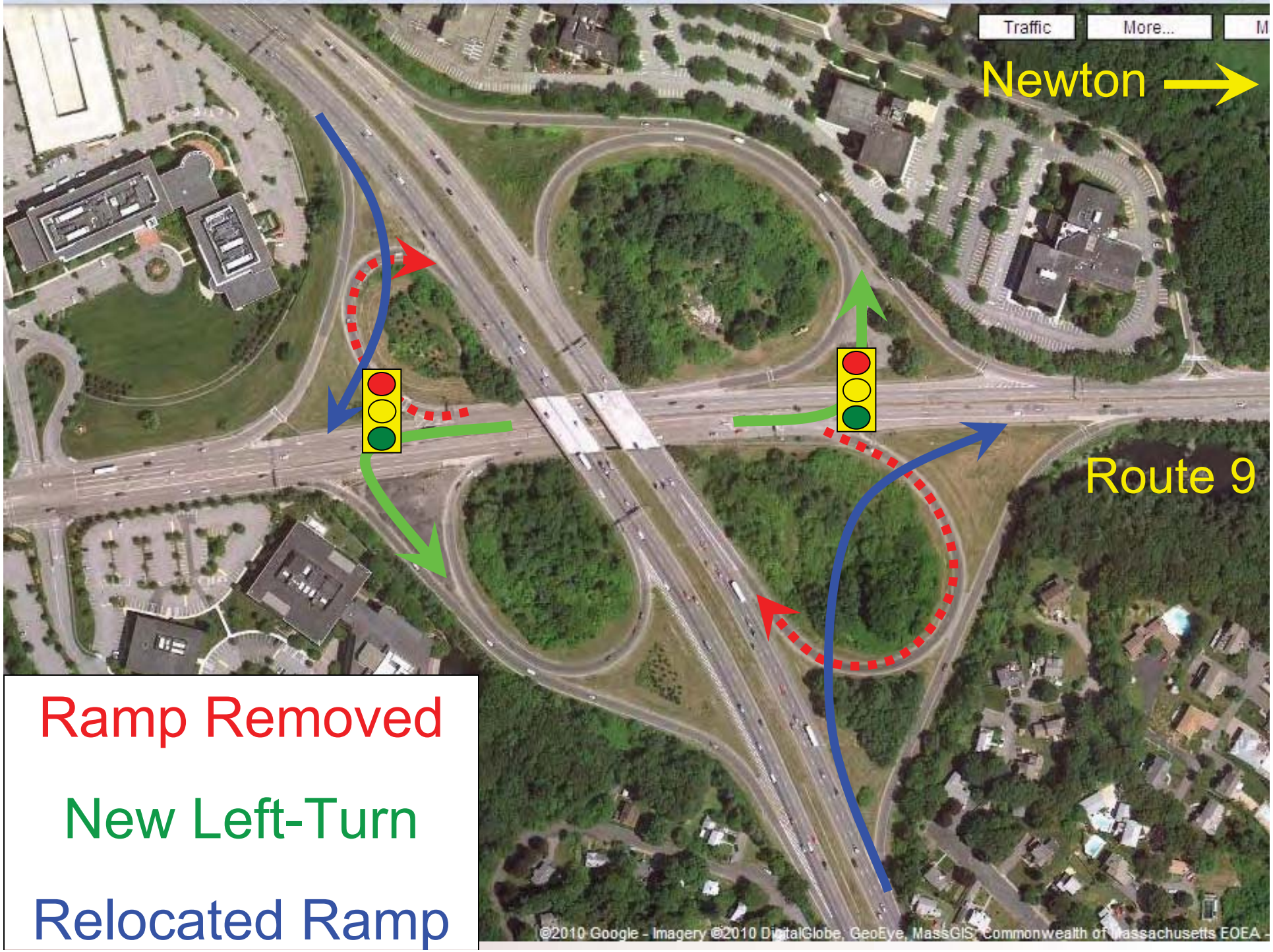
- Reconstruct
  - 14.3 miles of I-95 (widen to 8 full lanes) from Route 24 in Randolph to Route 9 in Wellesley
  - 22 bridges
- Cost= $344 million (Source: BostonGlobe, April 2010)
- Sequence: from south (Rte 24) to north (Rte 9)
- Start: 2003
- Projected completion: 2016

Needham/Wellesley Section Overview
"Bridge V" or "Contract 5"

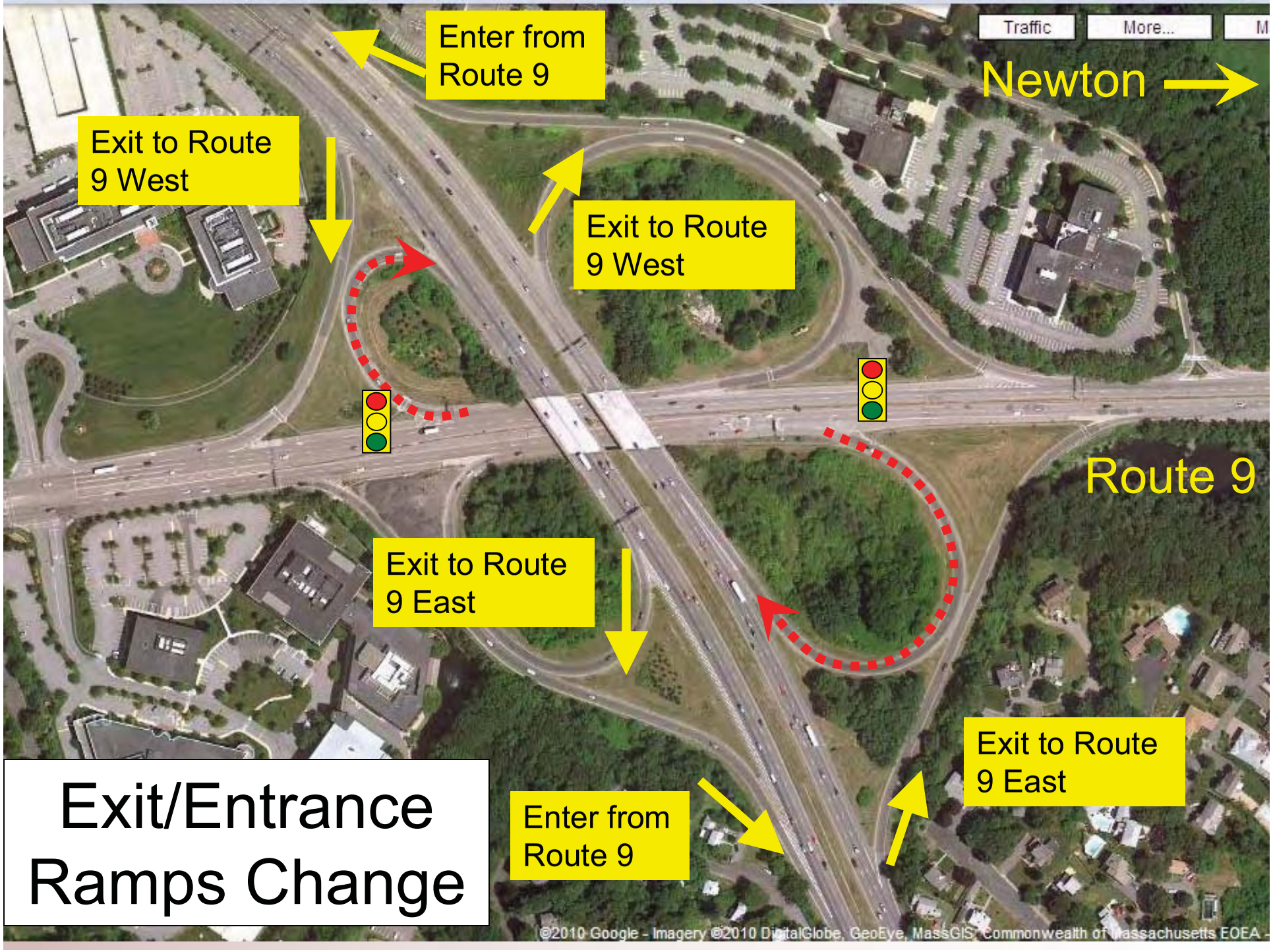
- Reconstruct
  - 3.3 miles of I-95 (widen to 8 full lanes)
  - 3 interchanges (Kendrick, Highland, Route 9)
  - MBTA bridge (center pier only)
  - Central St overpass (becomes Elliot St in Newton)
- Estimated construction cost: $127 million
- Designer: Jacobs/HDR, McMahon (traffic)
- Estimated start date: Fall 2012 or 2013
- Estimated completion: 2016


Wellesley
Rte 9
Needham St
Newton
Highland Ave
Nahanton St
Kendrick St
Needham
3
2
1
Area Map

#278-11


Traffic
More...
Newton
Route 9
Ramp Removed
New Left-Turn
Relocated Ramp
©2010 Google - Imagery ©2010 DigitalGlobe, GeoEye, MassGIS, Commonwealth of Massachusetts EOEA -

#278-11



Exit/Entrance Ramps Change

#278-11

City of Newton

DEPARTMENT OF PUBLIC WORKS

OFFICE OF THE COMMISSIONER

1000 Commonwealth Avenue
Newton Centre, MA 02459-1449

Setti D. Warren
Mayor

Date: June 16, 2011

To: Larry Cash, MassDOT Project Manager

From: David F. Turocy, Commissioner of Public Works

Subject: City of Newton Comments on I-95 Project # 603711, 25% Design Hearing

On behalf of Mayor Setti Warren, I submit the following comments and concerns regarding the Massachusetts Department of Transportation (MassDOT) I-95 "Add-a-Lane" project, located in Wellesley and Needham. The City of Newton supports MassDOT's efforts to improve safety throughout the corridor by eliminating travel in the breakdown lane, creating standard width breakdown lanes on both sides of the highway, and by improving merging areas at the existing Highland Avenue and Route 9 interchanges. However, there are elements of the projects which generate some concerns which the City asks MassDOT to address as the design moves forward. The concerns listed below are representative of the testimony provided by the four City officials who spoke at the MassDOT design public hearing on June 1: Chief Operating Officer Robert Rooney, Alderman Cheryl Lappin, Alderman Deborah Crossley, and Associate City Engineer, Clint Schuckel.

1. The City is concerned that the peak hour traffic projections for the Kendrick Street-Nahanton Street corridor may underestimate the future traffic volumes resulting from the cumulative effect of ten years of annual growth in vehicle traffic, new development in Needham's New England Business Center, and new highway access.

At a minimum, the project's traffic study should be expanded to the following intersections in the City of Newton:

- Nahanton Street at Wells Avenue;
- Nahanton Street at Winchester Street;
- Nahanton Street at Dedham Street; and
- Dedham Street at Brookline Street.

The study should examine at least three traffic scenarios: 1) existing, 2) the project's current traffic projections, and 3) a "worst case" scenario in which future traffic increases to a level where mitigation measures (e.g., signalization, geometric improvements, etc.) are required to maintain an acceptable level of service at each of the four intersections above. The City would collaborate with the State's traffic consultant, McMahon Associates, on the methodology and the peak period traffic volumes requiring improvements.

Telephone: (617) 796-1008 • Fax: (617) 796-1050 • dturocy@newtonma.gov

#278-11

For each of the three conditions, the proposed traffic study would identify the most cost-effective intersection improvements and estimated costs. Based on the study findings, the City requests that MassDOT create a reserve fund within the project budget that is dedicated for future traffic monitoring and mitigation at the above four locations should the peak period volumes reach the thresholds established for Condition 3. This fund would be available for up to two years following project completion, during which time the monitoring program would determine if the traffic thresholds have been met to require the study's recommended mitigation.

2. Please explain how the sequencing of this project will intersect with other projects in the area, including but not limited to, the Route 9 improvements associated with the Chestnut Hill Square project and the Needham Street/Highland Avenue reconstruction project.

3. For the Kendrick Street and Highland Avenue interchanges, it appears that while additional vehicle travel lanes are provided to accommodate increased traffic, accommodations for bicycles are limited to striped four foot shoulders. Vehicles utilizing the bridges are both maneuvering to access/egress the interstate and traveling at speeds often exceeding 40 miles per hour. This condition necessitates greater design considerations to provide safe bicycle accommodations such as raising the elevation of the bicycle lane to that of the sidewalk throughout the project limits. Utilizing curbing will provide added protection from errant vehicles and will help to keep roadway detritus off the bicycle lane, another key factor in bicycle crashes.

4. The location of pedestrian crosswalks at the Highland Ave on-ramps to I-95 (northbound and southbound) are currently located too far down the ramp. The result is that a pedestrian attempting to cross has limited sight distance to on-coming traffic due to the ramp curvature and adjacent property obstructions such as shrubs, guardrail, and signage. Given the speeds vehicles travel approaching these on-ramps combined with the limited sight distance, the distance a pedestrian can achieve crossing the ramp is estimated to be the mid-point of the roadway before a vehicle reaches the crosswalk; a potentially very dangerous situation. Therefore, greater sight distance of approaching ramp traffic needs to be provided at the curb line of the crosswalk.

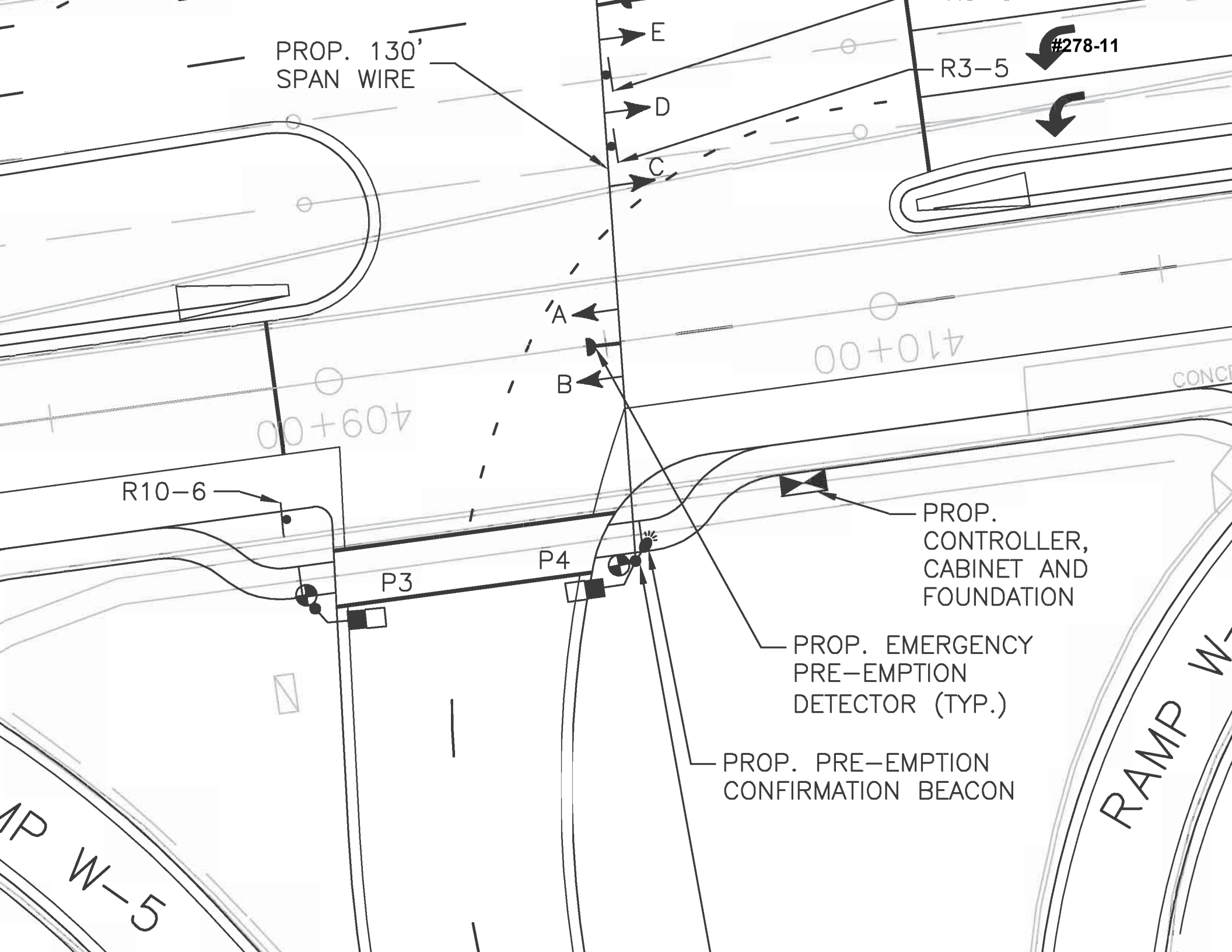
5. As the City of Newton is directly downstream along the Charles River, which is immediately adjacent to the Add-a-Lane project and the likely destination of roadway runoff, the City respectfully requests that MassDOT copy the City Engineer, Lou Taverna (ltaverna@newtonma.gov), on all stormwater management plans, analyses, and related documents that are submitted to the Towns of Needham and Wellesley.

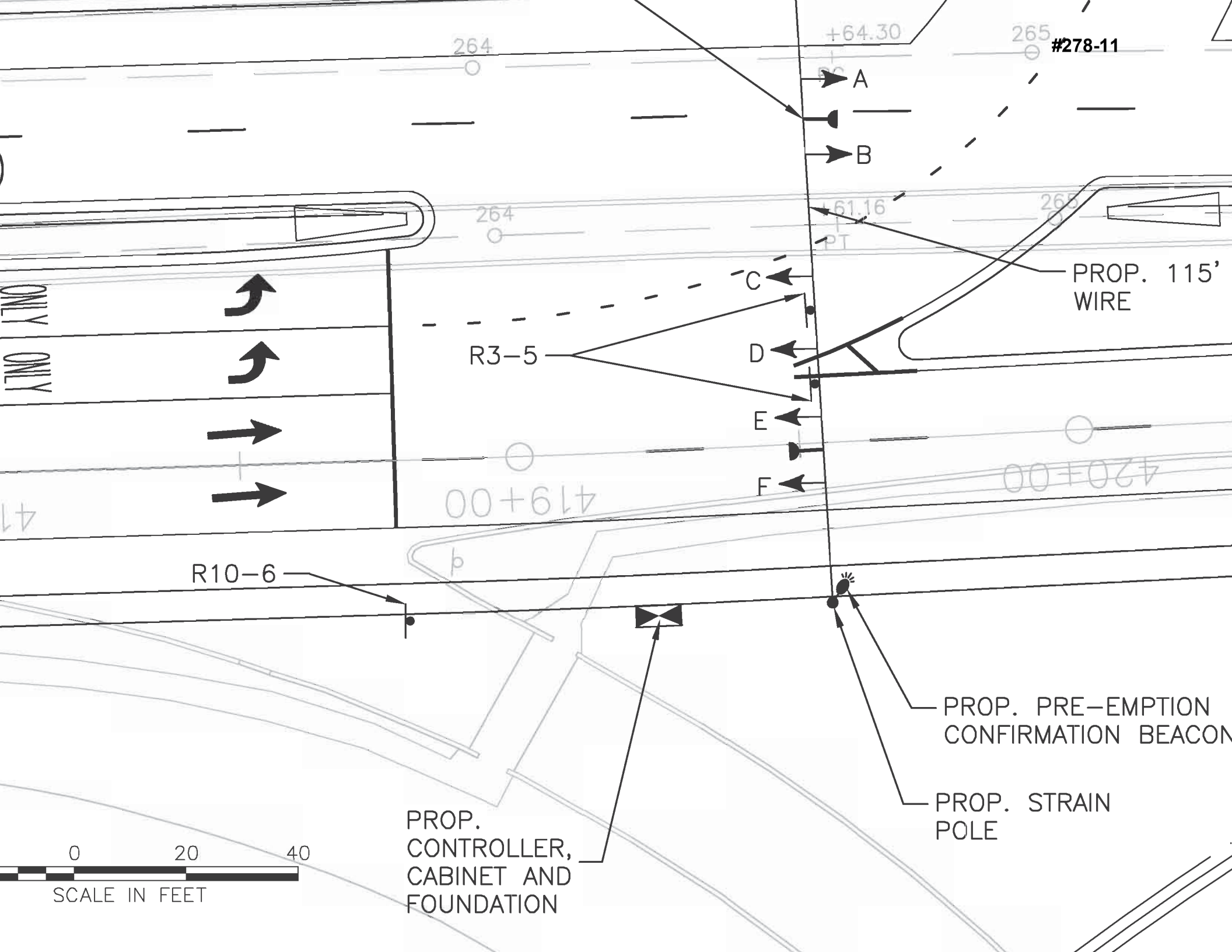
Thank you for your consideration of these comments. I look forward to working with MassDOT on these issues, and to the successful completion of the Add-a-Lane project.

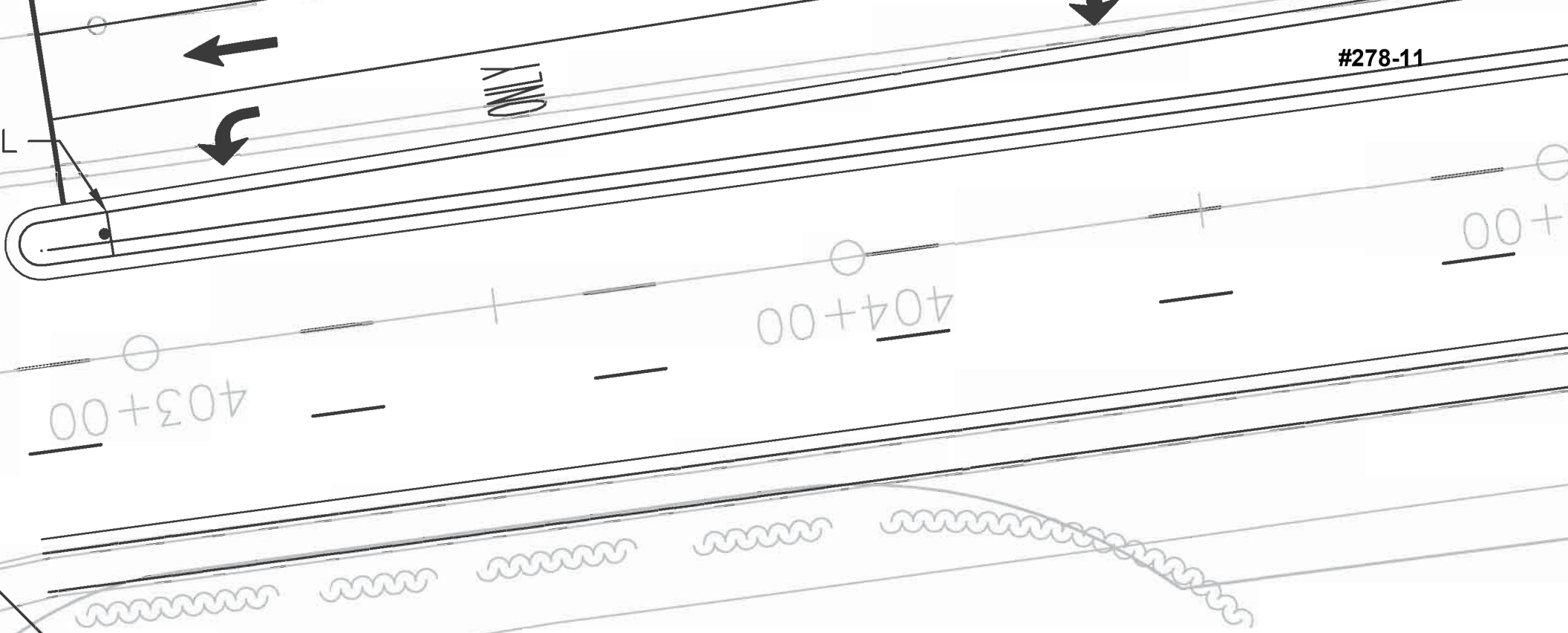
Cc: Robert Rooney, Chief Operating Officer
Alderman Cheryl Lappin
Alderman Deborah Crossley
Lou Taverna, City Engineer
Clint Schuckel, Associate City Engineer

Telephone: (617) 796-1008 • Fax: (617) 796-1050 • dturocy@newtonma.gov


#278-14
RAMP W-6
RAMP W-5
RELOCATED
RAMP W-3
725
720
715
1


PROP. 130' SPAN WIRE
E
D
C
A
B
#278-11
R3-5
R10-6
P3
P4
PROP. CONTROLLER, CABINET AND FOUNDATION
PROP. EMERGENCY PRE-EMPTION DETECTOR (TYP.)
PROP. PRE-EMPTION CONFIRMATION BEACON
RAMP W-5
410+00
409+00


#278-11
264
+64.30
265
A
B
+61.16
PT
PROP. 115' WIRE
C
R3-5
D
E
F
ONLY
ONLY
419+00
420+00
R10-6
PROP. PRE-EMPTION CONFIRMATION BEACON
PROP. STRAIN POLE
PROP. CONTROLLER, CABINET AND FOUNDATION
0
20
40
SCALE IN FEET



EXISTING SIGNAL EQUIPMENT TO BE RETAINED. (TYP.)

20 0 20 40

SCALE IN FEET

LIST OF MAJOR ITEMS REQUIRED

#278-11

FUNCTIONAL DESIGN REPORT

FOR THE

I-95/I-93 TRANSPORTATION IMPROVEMENT PROJECT (BRIDGE V)

ROUTE 9/HIGHLAND AVENUE/KENDRICK ST. SECTION
NEEDHAM AND WELLESLEY, MASSACHUSETTS

AUGUST 2010

PREPARED FOR:

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION

PREPARED BY:

McMAHON
TRANSPORTATION ENGINEERS & PLANNERS

#278-11

Table of Contents

#278-11

List of Tables

List of Figures

List of Appendices

Route 9 Interchange

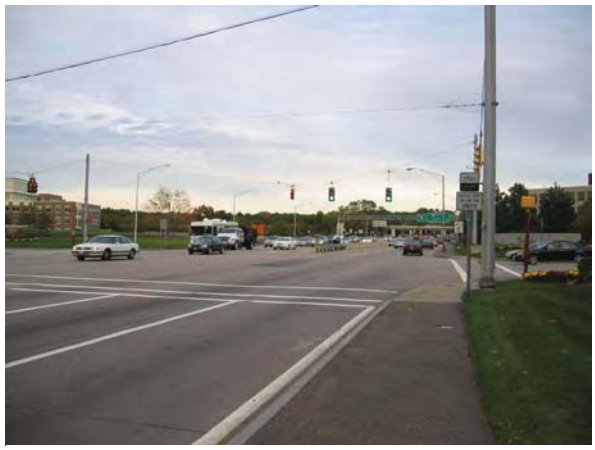
Existing Conditions

Route 9 Interchange

The second of the two existing interchanges in the study area is located at Route 9. This interchange has a cloverleaf ramp configuration. The ramp configurations create a weave section within the interchange in each direction of travel. The weave sections were analyzed and are described as follows:

- I-95/Route 128 northbound between the on-ramp from Route 9 eastbound and the off-ramp to Route 9 westbound
- I-95/Route 128 southbound between the on-ramp from Route 9 westbound and the off-ramp to Route 9 eastbound

<u>Interchange Conditions</u>



Route 9 at Sun Life and Harvard Pilgrim Drives

Interstate 95/Route 128 is designated as a north-south highway and travels in a northwest-southeast direction at the study interchange with a speed limit of 55 miles per hour (mph). South of the Route 9 Interchange, I-95/Route 128 currently provides three travel lanes in each direction. From 6:00 AM until 10:00 AM and again between 3:00 PM and 7:00 PM, travel is allowed in the breakdown lanes in both directions. With travel permitted in the breakdown lanes, I-95/Route 128 operates with four through travel lanes and no right-hand shoulder in each direction during the morning and evening peak hours. To assure that motorists have locations to pull over out of the active traffic stream, there are "pullouts" spaced at approximately ½ mile intervals in both the northbound and southbound directions.

The existing interchange provides full access between I-95/Route 128 and Route 9 through a full cloverleaf configuration. The existing ramp configurations create a weave section within the interchange in each direction of travel on both roadways.

Route 9 (Worcester Street) travels east-west and is a median divided four lane roadway. The I-95/Route 128 interchange at Route 9 is a cloverleaf interchange providing right-hand ramps along Route 9. Aside from the I-95/Route 128 ramp intersections, the study area on Route 9 includes one intersection: Route 9 at the Sun Life Driveway. The intersection of Route 9 at the Sun Life Driveway is a four-leg signalized intersection. The eastbound approach has a left turn lane, two through lanes, and a shared through and right turn lane. The right-most eastbound through lane becomes an exit only lane to I-95/Route 128 southbound just east of the intersection. The westbound approach has a left turn lane, three through lanes, and a right turn lane. The three westbound through lanes reduce to two through lanes approximately 0.1 miles west of the intersection. The northbound approach has a shared left turn and through lane and a right turn lane. The southbound approach has a left turn lane, a shared left turn and through lane, and a right turn lane.

Highway Structures

The existing bridges carrying I-95/Route 128 over Route 9 are two span steel stringer structures which were constructed in 1962. Both of the bridges were rehabilitated in 1995. The bridges each carry four lanes of I-95/Route 128 traffic and an additional on off ramp weave lane. Both of these I-95/Route 128 barrels are supported on concrete decks which are 64 feet curb to curb and are separated by a 40 foot open median. These structures span over Route 9, which has a 108-foot wide cross section including a center median of varying width. The median contains a center pier and there is a 6 foot sidewalk adjacent to each abutment. Increase of the vertical clearance over Route 9 is required based on the existing clearance, which is approximately 14 feet.

Traffic Volumes

As mentioned previously, the current conditions of this area were studied in great detail by CTPS. As such, this report has used the traffic counts collected by CTPS and factored them to reflect conditions in 2007. Automatic Traffic Recorders (ATRs) were deployed by MassDOT at key locations in order to accomplish this task. Also, the CTPS study did not include the interchange of I-95/Route 128 at Route 9. New counts were conducted by MassDOT at this location in July 2007. Existing traffic volumes are graphically depicted in Figure 2.

Traffic Safety

Crash data for Route 9 (also called Worcester Street in Wellesley) was summarized by location between its intersection with Maple Street and its intersection with Quinobequin Road, as shown in Table 19. For the years 2006 through 2008, 108 crashes occurred on this segment of Route 9. Of the 108 crashes summarized in Table 19, the

two most common crash types were rear-end (62 percent) and single vehicle crashes (23 percent).

Thirteen crashes occurred on Route 9 at its intersection with Dearborn Street and Sun Life Park, including anything within 200 feet to the east of the intersection. This section of roadway is adjacent to the I-95/Route 128 ramps. Six (46 percent) of the crashes were rear-ends. Rear-end crashes at this location are most likely the result of congestion from merging, diverging, and weaving traffic. Rear-end crashes are not generally severe crashes resulting often in property damage only. The other crashes were sideswipe, same direction, and angle.

There were 14 crashes at the intersection of the I-95/Route 128 southbound ramps with Route 9 from 2006 through 2008. Forty-three percent (6 of them) were rear-end collisions, and seven of the crashes (50 percent) were single vehicle crashes. Six of all crashes at this location were property damage only, and another six resulted in a non-fatal injury and the severity of two crashes is unknown.

Meanwhile, there were 26 crashes that occurred at the intersection of Route 9 with the I-95/Route 128 northbound ramps, the majority of them being rear-end collisions and single vehicle crashes. Thirty-three crashes were known to have occurred in the vicinity of I-95/Route 128, but not enough information existed to know exactly where they occurred. They may have been near the I-95/Route 128 northbound or the I-95/Route 128 southbound ramps or simply near the overpass. Of these collisions, 23 (70 percent) were rear-end collisions and 25 (76 percent) resulted in property damage only. Four crashes resulted in non-fatal injury.

At the intersection of Route 9 and Williams Street there were 20 crashes recorded from 2006 through 2008. Of these, ten (50 percent) were rear-end collisions. The remaining were of the following types: single-vehicle, sideswipe (same direction), and angle. One was unknown. In terms of severity, seventeen (85 percent) were property damage only, and two (10 percent) resulted in non-fatal injury.

Table 19. Route 9 Crash Summary

	Maple / Street	Dearborn Street/ Sun Life Park	I-95 SB Ramps	I-95 Vicinity	I-95 NB Ramps	William Street	Quinobequin Road
2006	1	3	5	14	5	10	0
2007	0	6	2	13	9	5	0
2008	1	4	7	6	12	5	0
Total	**2**	**13**	**14**	**33**	**26**	**20**	**0**
Type							
Rear-end	0	6	6	23	9	10	0
Sideswipe, same direction	1	5	0	5	4	2	0
Angle	1	2	0	2	1	4	0
Single vehicle crash	0	0	7	1	9	3	0
Head-on	0	0	0	0	0	0	0
Rear-to-rear	0	0	0	0	0	0	0
Sideswipe	0	0	0	1	0	0	0
Not reported	0	0	1	1	3	1	0
Unknown	0	0	0	0	0	0	0
Total	**2**	**13**	**14**	**33**	**26**	**20**	**0**
Severity							
Fatal	0	0	0	0	0	0	0
Injury	0	2	6	4	6	2	0
PDO	1	11	6	25	18	17	0
Not Reported	1	0	2	3	2	1	0
Unknown	0	0	0	1	0	0	0
Total	**2**	**13**	**14**	**33**	**26**	**20**	**0**
Weather							
Clear	1	4	7	23	18	8	0
Cloudy	0	5	4	5	2	9	0
Rain	1	3	3	5	4	3	0
Snow	0	0	0	0	2	0	0
Fog	0	0	0	0	0	0	0
Sleet, hail	0	0	0	0	0	0	0
Not reported	0	1	0	0	0	0	0
Total	**2**	**13**	**14**	**33**	**26**	**20**	**0**
Time							
7:00 AM to 9:00 AM	0	1	1	6	3	2	0
9:00 AM to 4:00 PM	0	7	6	16	14	6	0
4:00 PM to 6:00 PM	0	4	2	4	2	9	0
6:00 PM to 7:00 AM	2	1	5	7	7	3	0
Total	**2**	**13**	**14**	**33**	**26**	**20**	**0**

Crash Rate	0.25
District 4 Average Crash Rate	**0.88**

Source: MassDOT

Traffic Operations

Merge/Diverge

Analyses were performed for each merge and diverge point for the ramps at the interchange of I-95/Route 128 and Route 9 based on methodologies contained in the HCM. As described previously, the level of service for merge and diverge areas is based on density for cases of stable operation. Stable operation represents levels of service A through E. Level of service F exists for a merge area when the total flow departing from the merge area exceeds the capacity on the downstream freeway. Likewise, level of service F exists for diverge areas when the volume entering the diverge area exceeds the capacity on the upstream freeway. Level of service criteria for merge and diverge areas was presented in Table 8.

Ramp capacity analyses were performed for existing and projected conditions using the latest version of the Highway Capacity Software, HCS+. The existing conditions ramp capacity analyses worksheets are included in Appendix F.

Results of the existing conditions ramp capacity analyses, summarized in Table 20, indicated that most ramps currently operate at an unacceptable level of service during either the AM and/or PM peak hour, with the exception of the I-95 southbound to Route 9 westbound ramp, and the Route 9 westbound to I-95 southbound ramp.

The following ramps fall within exist weave sections on Route 128 and Route 9:

- Route 9 eastbound to I-95 northbound
- I-95 northbound to Route 9 westbound
- I-95 southbound to Route 9 eastbound
- Route 9 westbound to I-95 southbound

Ramp capacity analyses have not been conducted at these locations. Instead traffic operations at these ramps are analyzed in the weave analysis, which can be found in the following section of this report.

Table 20. 2007 Existing Route 9 Ramp Levels of Service

	Morning Peak Hour		Evening Peak Hour	
	LOS[1]	Density[2]	LOS	Density
I-95/Route 128 at Route 9				
I-95/Route 128 NB to Route 9 EB	F	39.0	D	34.1
Route 9 WB to I-95/Route 128 NB	F	37.6	F	33.2
Route 9 EB to I-95/Route 128 SB	D	29.8	F	30.8
I-95/Route 128 SB to Route 9 WB	D	33.7	D	33.0

[1] Level-of-Service

[2] Density in passenger cars per mile per lane (pc/mi/ln)

#278-11

Weave

Capacity/level-of-service analyses were performed for the weave sections on I-95/Route 128 at the Route 9 interchange. The analyses performed are based on *HCM* methodologies. Level-of-service for weave sections is determined by the density of traffic in the weave section, as summarized in Table 21. Parameters that affect density include: weave segment length, number of lanes, type of weaving configuration, and the type of terrain in the weave segment.

A summary of the results is presented in Table 22. As shown in Table 22, the northbound weave section in the I-95/Route 128 and Route 9 interchange operates at LOS F during both the morning and evening peak hours. The southbound weave section in the I-95/Route 128 and Route 9 interchange operates at LOS E in the morning peak hour and at LOS F in the evening peak hour. The capacity analysis worksheets for the existing conditions weave analysis may be found in Appendix P.

Table 21. Freeway Weaving Segment Level of Service Criteria

Level of Service	Density (pc/mi/ln)
A	≤ 10
B	> 10 – 20
C	> 20 – 28
D	> 28 – 35
E	> 35 – 43
F	> 43

Table 22. 2007 Existing Weave Segment Levels of Service

	Morning Peak Hour		Evening Peak Hour	
	LOS[1]	Density[2]	LOS	Density
I-95/Route 128 at Route 9				
Northbound	F	77.1	F	69.7
Southbound	E	41.5	F	47.6

Corridor Intersections

Based on standard methodologies contained in the *Highway Capacity Manual* (HCM), a detailed capacity/level-of-service analysis was performed for the existing morning and evening peak hour traffic volumes for the one local road intersection in the vicinity of the Route 9 Interchange.

The signalized intersection capacity analysis methodology was described previously under the Highland Avenue/Kendrick Street Interchange. The level of service criteria for signalized intersections was presented in Table 11.

Weekday Morning Peak Hour

The capacity/level-of-service analysis results for the existing weekday morning peak hour are presented in Table 23. As shown in Table 23, the signalized intersection of Route 9 at the Sun Life and Harvard Pilgrim driveways operated at an overall LOS of C. One movement operates at LOS F: the southbound through movement. The remaining movements operate at LOS D or better.

Table 23. 2007 Existing Route 9 Intersection Levels of Service

			Morning Peak Hour			Evening Peak Hour		
Intersection	**Movement**		**LOS[1]**	**Delay[2]**	**V/C[3]**	**LOS**	**Delay**	**V/C**
Route 9 at Sun Life/Harvard Pilgrim	EB	L	C	21.3	0.53	A	9.9	0.20
	EB	TR	C	23.1	0.89	C	20.4	0.71
	WB	L	D	35.8	0.64	A	9.0	0.11
	WB	T	B	13.6	0.55	C	21.3	0.75
	WB	R	A	3.9	0.49	A	6.7	0.07
	NB	LT	D	53.0	0.04	F	263.7	1.44
	NB	R	A	9.8	0.06	A	5.7	0.44
	SB	L	D	53.5	0.17	F	271.5	1.44
	SB	T	F	92.5	0.88	F	290.0	1.49
	SB	R	B	10.2	0.06	A	5.0	0.24
	Overall		*C*	*20.4*		*D*	*47.1*	

[1] Level-of-Service

[2] Average vehicle delay in seconds

[3] Volume to capacity ratio

Weekday Evening Peak Hour

The capacity/level-of-service analysis results for the existing weekday evening peak hour are also presented in Table 23. As shown in Table 23, the intersection of Route 9 at the Sun Life and Harvard Pilgrim driveways operates at LOS D. Failing movements include: northbound shared left and through, southbound left, and southbound through. The remaining movements operate at LOS C or better.

Detailed capacity analysis worksheets for the existing conditions intersection analysis may be found in Appendix G.

#278-11

Roadway Design

Local Roadways

In order to achieve acceptable traffic operations for the entire project area, it is necessary to insure that the local roadways are capable of accepting traffic flows from the improved freeway and ramp systems. In that regard, this section examines the following roadway facilities located at Route 9 (Worcester Street).

The major intersections along these roadways in the immediate site environs were examined. Upstream and downstream traffic signals were evaluated as necessary. Originally, the alterations to the Route 9 at I-95/Route 128 interchange were proposed to be temporary and were primarily related to the traffic management and construction staging elements of this project. However, MassDOT has expressed interest in permanently implementing the temporary improvements at the Route 9 Interchange. Due to the application of the construction staging set up as a permanent interchange configuration, further analysis was conducted and is described in later sections of this report.

Future Alternatives

In an effort to determine the most appropriate interchange configuration for the Route 9 at I-95/Route 128 interchange, several alternatives were considered. A full technical analysis was completed as part of an Interchange Modification Report and can be found in Appendix Q. The following alternatives were considered:

- No Build Alternative: Full Cloverleaf
- Build Alternative 1: Full Cloverleaf Interchange with Compliant Geometry
- Build Alternative 2: Diamond Interchange
- Build Alternative 3: Diverging Diamond Interchange
- Build Alternative 4: Single Point Urban Interchange
- Build Alternative 5: Partial Cloverleaf Interchange

No Build Alternative - Full Cloverleaf

The future No Build roadway network includes an additional travel lane in each direction on I-95/Route 128 (as a result of the I-95/93 (Route 128) Transportation Improvement Plan Project) and the existing full cloverleaf geometry with right-hand maneuvers to and from Route 9 at all I-95/Route 128 ramps. The weave conditions along I-95/Route 128 and along Route 9 will continue to occur for the future No Build condition.

Build Alternative 1 – Full Cloverleaf Interchange with Compliant Geometry

Build Alternative 1 was considered to determine the feasibility of maintaining the existing Full Cloverleaf operations for the study interchange. The configuration, and its expected impacts to the surrounding developments, was reviewed to determine its feasibility. A review of the proposed interchange configuration reveals that, with the redesign of all on and off-ramps to meet AASHTO standards, this configuration would be expected to significantly impact the existing development on all four quadrants of the proposed interchange. The proposed ramp modifications would be anticipated to significantly impact office developments located on the northeast and northwest quadrant of the interchange. On the south side of Route 9, the proposed ramp modifications would be expected to significantly impact Sun Life Financial and residential developments. Given the significant impacts expected as a result of the reconfiguration of the existing ramps to meet AASHTO standards while maintaining a Full Cloverleaf operation, Build Alternative 1 is not a practical solution.

Build Alternative 2 – Diamond Interchange

Build Alternative 2 would be a complete reconstruction of the interchange as a Diamond interchange. All ramps would meet current AASHTO standards. With this geometry, traffic along Route 9 would be controlled by two signals; one at the I-95/Route 128 northbound ramps and one at the I-95/Route 128 southbound ramps. Right turn movements exiting the I-95/Route 128 ramps would operate under yield control. Right turn movements from Route 9 onto I-95/Route 128 would operate as free-flow. Dual left turn lanes would be provided on Route 9 at the signalized intersections. The proposed traffic signals would operate in a coordinated signal system with the existing traffic signal at Route 9/Sun Life/Harvard Pilgrim. Figure 18 shows the proposed interchange design concept for this alternative.

With the removal of the loop ramps connecting Route 9 to I-95/Route 128, the existing weave conditions along mainline I-95/Route 128 would be eliminated in both the northbound and southbound directions of travel. Further, the weave conditions along Route 9 in both the eastbound and westbound directions of travel would also be eliminated with the proposed interchange configuration. This would eliminate any accidents expected to occur as a result of the weave conditions, which could include, among others, rear-end and side-swipe accidents. In addition, the existing safety concern resulting from the weaving maneuver performed from the southbound off-ramp to Route 9 -westbound to the left-turn lane into Sun Life/Harvard Pilgrim, across the Route 9 westbound traffic would be eliminated with the signalization of the southbound off-ramp traffic. Finally, ample queue storage would be provided for the westbound-to-southbound and the eastbound-to-northbound left-turn traffic to assure

#278-11

that the queues from these movements do not spill back into the through traffic stream. This improvement may also reduce the rear-end accidents currently observed along the corridor. Therefore, safety conditions for this Build alternative are expected to improve in comparison to the No Build conditions.

Build Alternative 3 – Diverging Diamond Interchange

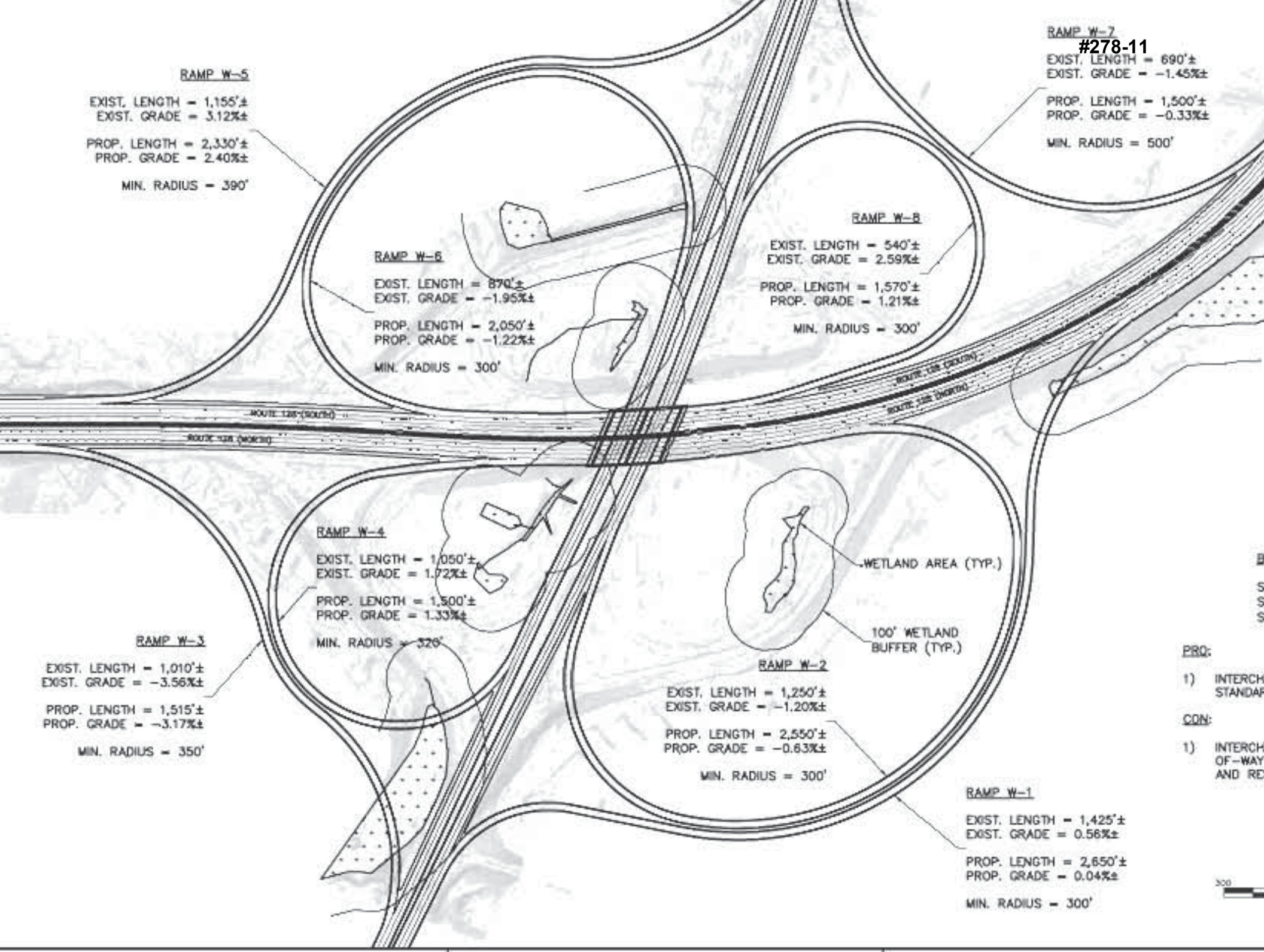
Build Alternative 3 was developed as a Diverging Diamond interchange. All ramps would be reconfigured to meet current AASHTO standards. With this geometry, the eastbound and westbound travel movements along Route 9 would cross at a signalized intersection west of I-95/Route 128 and again at a signalized intersection east of I-95/Route 128.

Under this scenario, the left turn movements of a conventional diamond interchange are converted to free flowing or merge movements by crossing the two directions of travel along Route 9. Right turn movements entering ramps are free-flow and right turn movements exiting ramps are under yield condition. The Route 9 traffic reverses direction at two signalized intersections; one to the east of Route 128 and one to the west of Route 128. The signalized intersections do not have left turn movements, allowing the signals to operate in two phases; one phase for eastbound traffic and one phase for westbound traffic.

Figure 19 shows the proposed interchange design concept for this alternative.

With the removal of the loop ramps connecting Route 9 to I-95/Route 128, the existing weave conditions along mainline I-95/Route 128 would be eliminated in both the northbound and southbound directions of travel. This would eliminate any accidents expected to occur as a result of the weave conditions, which could include, among others, rear-end and side-swipe accidents. In addition, the existing safety condition occurring as a result of the weaving maneuver performed by the southbound-to-westbound traffic and the westbound traffic along Route 9 would be eliminated with the signalization of the southbound off-ramp traffic. However, a new weave condition would be introduced between the northbound-to-westbound traffic and the westbound-to-southbound traffic on Route 9 westbound. On Route 9 eastbound, a new weave condition would be introduced between the southbound-to-eastbound traffic and the eastbound-to-northbound traffic. Therefore, while this alternative eliminates the weave sections on Route 128 which may be contributing to the high occurrence of accidents, it creates weave sections along Route 9 that effectively retain the existing weave areas. The diverging diamond is also a newer type of interchange configuration that has not been used in this region. It is expected that significant driver education efforts would be needed for drivers to understand the new roadway configuration.

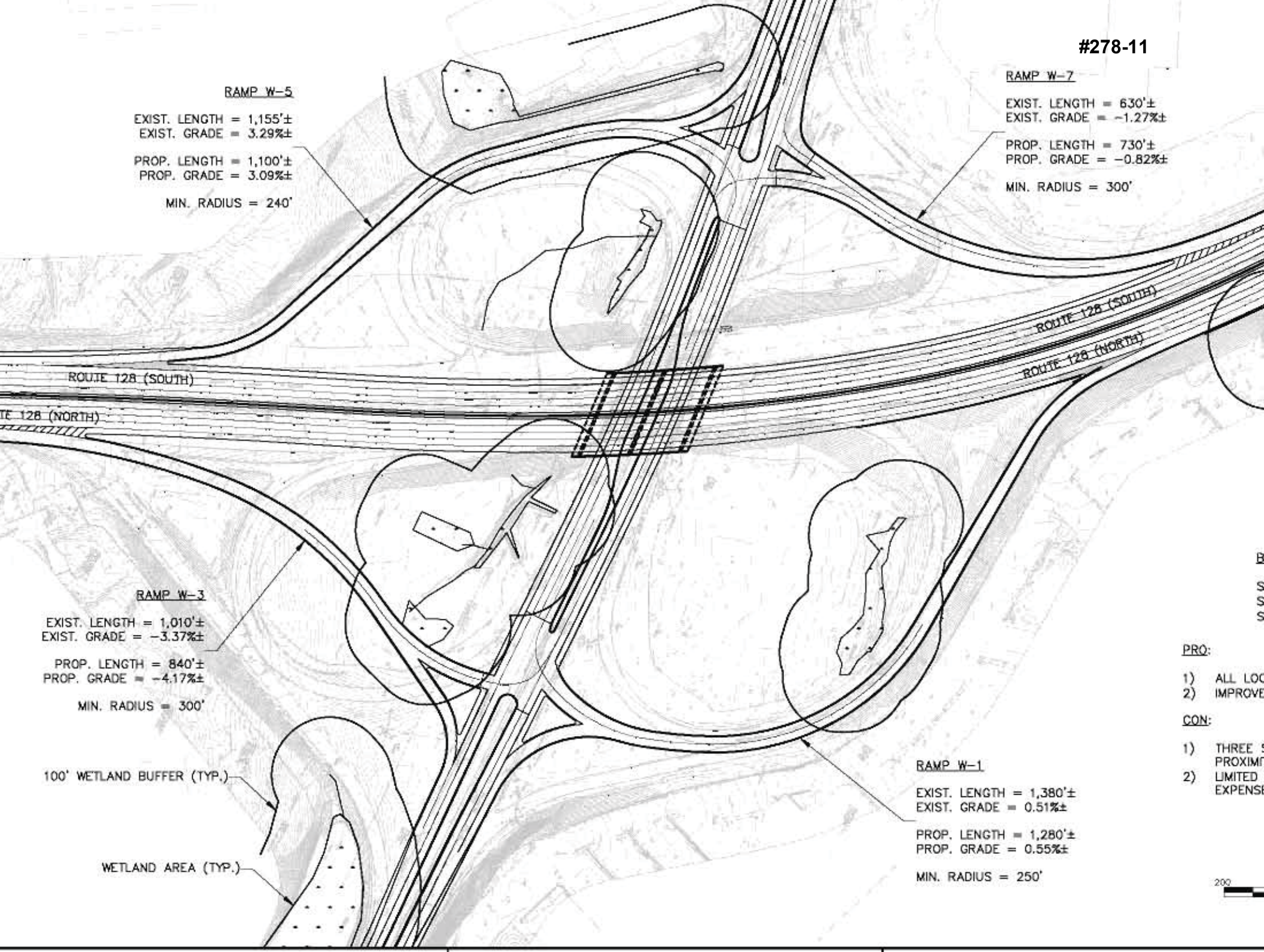
#278-11



Full Standards for Current AASHTO Standards

I-95/I-93 (Route 128) Tran

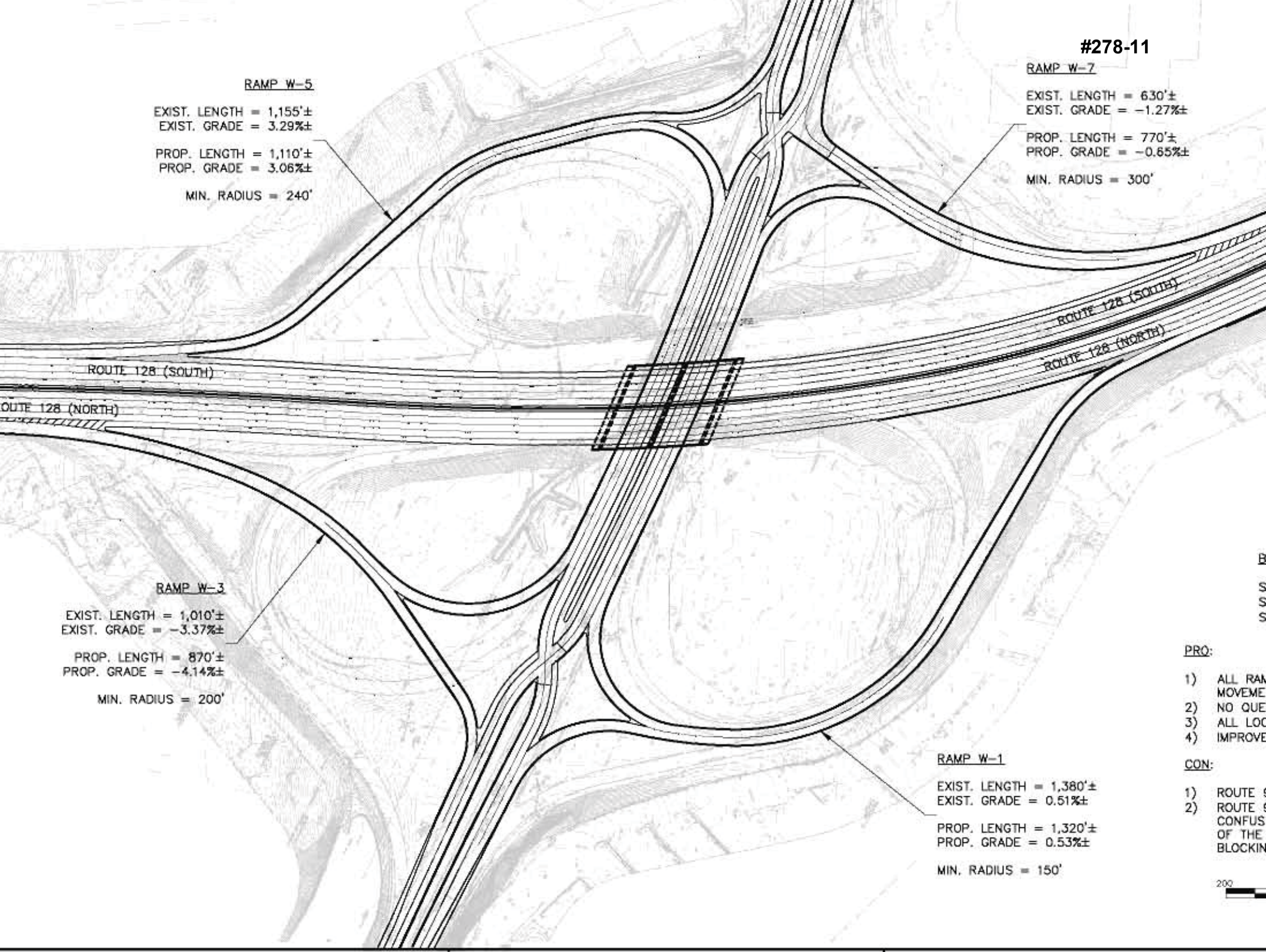
#278-11



Proposed Full Diamond Options

I-95/I-93 (Route 128) Trans

#278-11


RAMP W-5
EXIST. LENGTH = 1,155'±
EXIST. GRADE = 3.29%±
PROP. LENGTH = 1,110'±
PROP. GRADE = 3.06%±
MIN. RADIUS = 240'
RAMP W-7
EXIST. LENGTH = 630'±
EXIST. GRADE = −1.27%±
PROP. LENGTH = 770'±
PROP. GRADE = −0.65%±
MIN. RADIUS = 300'
ROUTE 128 (SOUTH)
ROUTE 128 (NORTH)
ROUTE 128 (SOUTH)
OUTE 128 (NORTH)
RAMP W-3
EXIST. LENGTH = 1,010'±
EXIST. GRADE = −3.37%±
PROP. LENGTH = 870'±
PROP. GRADE = −4.14%±
MIN. RADIUS = 200'
RAMP W-1
EXIST. LENGTH = 1,380'±
EXIST. GRADE = 0.51%±
PROP. LENGTH = 1,320'±
PROP. GRADE = 0.53%±
MIN. RADIUS = 150'
PRO:
1) ALL RAM
MOVEME
2) NO QUE
3) ALL LOC
4) IMPROVE
CON:
1) ROUTE 9
2) ROUTE 9
CONFUS
OF THE
BLOCKIN
200

#278-11

Build Alternative 4 – Single Point Urban Interchange

Build Alternative 4 was developed as a Single Point Urban interchange. All ramps would be reconfigured to meet current AASHTO standards. With this geometry, all left turns and the Route 9 through movements would converge at a single signalized intersection on Route 9. Dual left turn lanes are provided on Route 9 and on the exiting ramps. The signal operates in three phases. Route 9 traffic turning right onto a ramp runs as free-flow and the ramp traffic turning right onto Route 9 runs under yield conditions. Figure 20 shows the proposed interchange design concept for this alternative.

With the removal of the loop ramps connecting Route 9 to I-95/Route 128, the existing weave conditions along mainline I-95/Route 128 would be eliminated in both the northbound and southbound directions of travel. Further, the weave conditions along Route 9 in both the eastbound and westbound directions of travel would also be eliminated with the proposed interchange configuration. This would eliminate any accidents expected to occur as a result of the weave conditions, which could include, among others, rear-end and side-swipe accidents. In addition, although the southbound-to-westbound right-turn movement would continue to be performed under free-flow control, the existing safety condition occurring as a result of the weaving maneuver performed by the southbound-to-westbound traffic and the westbound traffic along Route 9 would be eliminated given the relocation of the ramp. The southbound-to-westbound right-turn lane would transition into a westbound through travel lane along Route 9 with the proposed interchange configuration. Safety conditions for this Build alternative would be expected to be improved when compared to No Build conditions.

Build Alternative 5 – Partial Cloverleaf Interchange

Build Alternative 5 was developed as a Partial Cloverleaf interchange. With this geometry, the ramps in the northeast and southwest quadrants will remain. In the northwest quadrant, the loop ramps carrying traffic from Route 9 westbound to I-95 southbound will be removed and this movement will be served via Ramp W-6 on the opposite side of Route 9. Similarly, the loop ramp in the southeast quadrant will be removed and the movement from Route 9 eastbound to I-95 northbound will be served via Ramp W-1 on the opposite side of Route 9.

The eastbound to northbound movement that was made via Ramp W-4 under existing conditions will now be served via a left turn from Route 9 eastbound onto Ramp W-1. The westbound to southbound movement that was made via Ramp W-8 under existing conditions will now be made via a left turn from Route 9 onto Ramp W-5.

#278-11

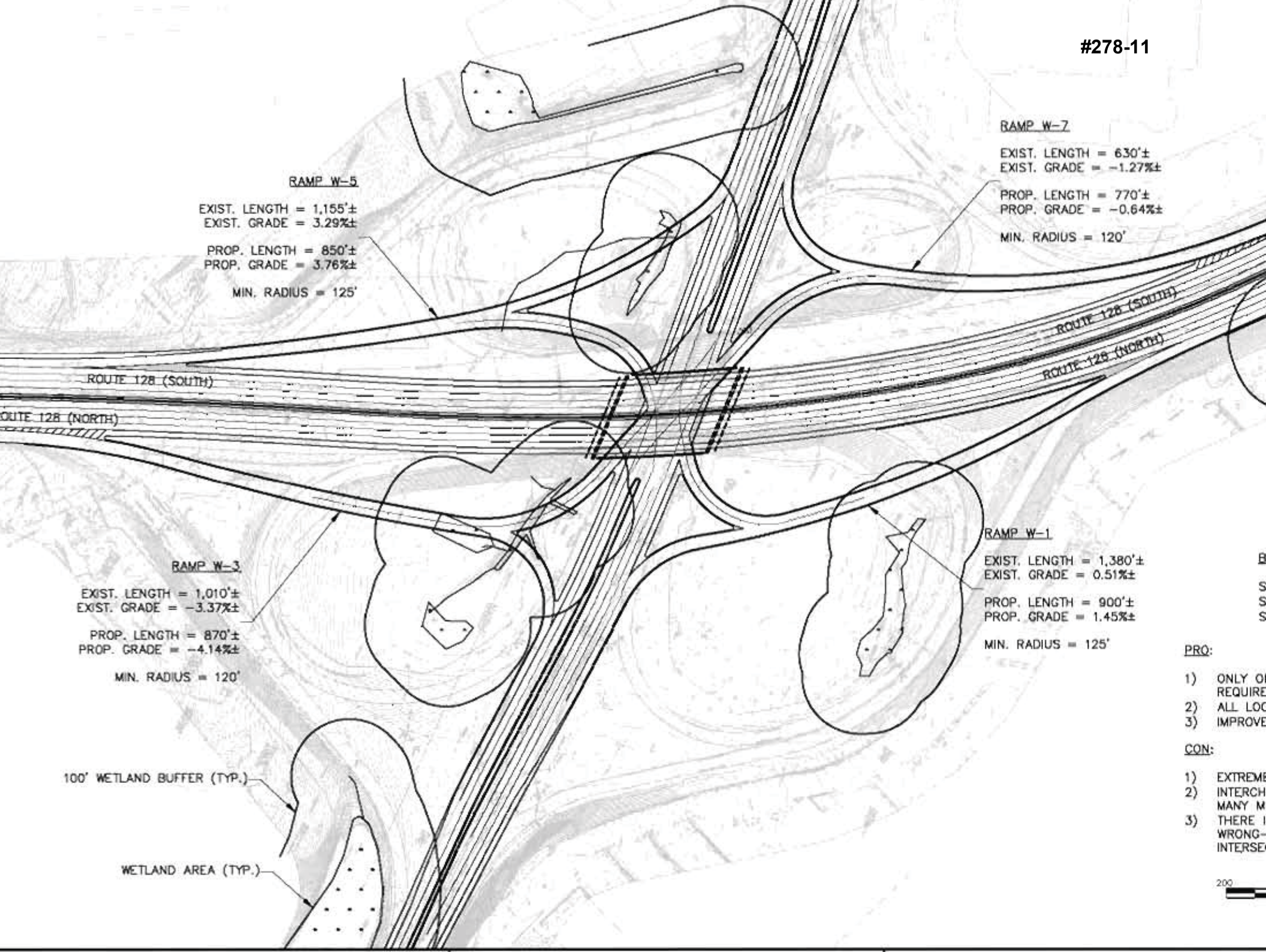
The new ramp in the northeast quadrant will intersect Route 9 opposite of Ramp W-5. The four-legged intersection will be signal controlled with dual left turn lanes on Route 9. To the east of I-95/Route 128, the intersection of Route 9 and Ramp W-1 will also be signalized with dual left turn lanes on Route 9. These signals will operate in coordination with the Route 9/Sun Life/Harvard Pilgrim intersection.

Traffic entering Ramps W-1 and W-5 via right turns will continue to operate as free flow. Traffic exiting Ramp W-3 via a right turn will operate under yield conditions. Traffic exits Ramp W-7 via two right turn lanes. There is not adequate length along Route 9 prior to the adjacent signalized intersection to allow the dual right-turn lanes to merge onto Route 9. Therefore, the right turn lanes will be signal controlled.

Figure 21 shows the proposed interchange design concept for this alternative.

With the removal of the eastbound-to-northbound and the westbound-to-southbound loop ramps connecting Route 9 to I-95/Route 128, the existing weave conditions along mainline I-95/Route 128 would be removed in both the northbound and southbound directions of travel. Further, the weave conditions along Route 9 in both the eastbound and westbound directions of travel would also be removed with the proposed interchange configuration. This would eliminate any accidents expected to occur as a result of the weave conditions, which could include, among others, rear-end and side-swipe accidents. In addition, the existing safety concerns occurring as a result of the weaving maneuver performed by the southbound-to-westbound traffic and the westbound traffic along Route 9 would be eliminated with the signalization of the southbound off-ramp traffic. Therefore, safety conditions for this Build alternative would be expected to be improved when compared to No Build conditions.

#278-11



PRO:

1) ONLY O
REQUIRE
2) ALL LOC
3) IMPROVE

CON:

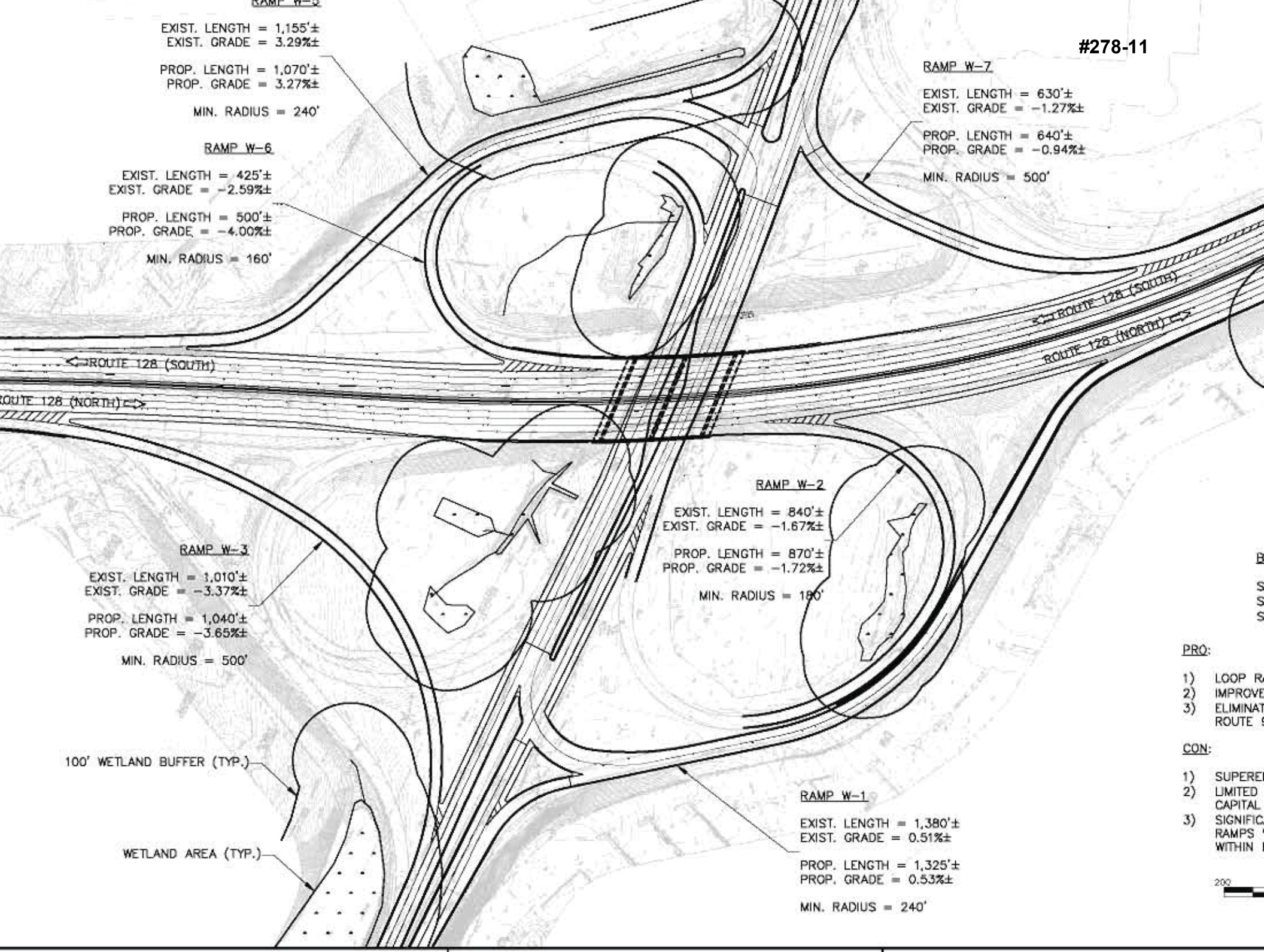
1) EXTREME
2) INTERCH
MANY M
3) THERE I
WRONG-
INTERSE

200

Proposed Single Point Urban Interchange Option

I-95/I-93 (Route 128) Trans

#278-11



PRO:

1) LOOP R
2) IMPROVE
3) ELIMINAT ROUTE

CON:

1) SUPEREL
2) LIMITED CAPITAL
3) SIGNIFIC RAMPS WITHIN

200

#278-11

Preferred Alternative – Partial Cloverleaf Interchange

The results of the intersection and ramp capacity analyses for the proposed alternatives and the No Build Alternative were compared and evaluated.

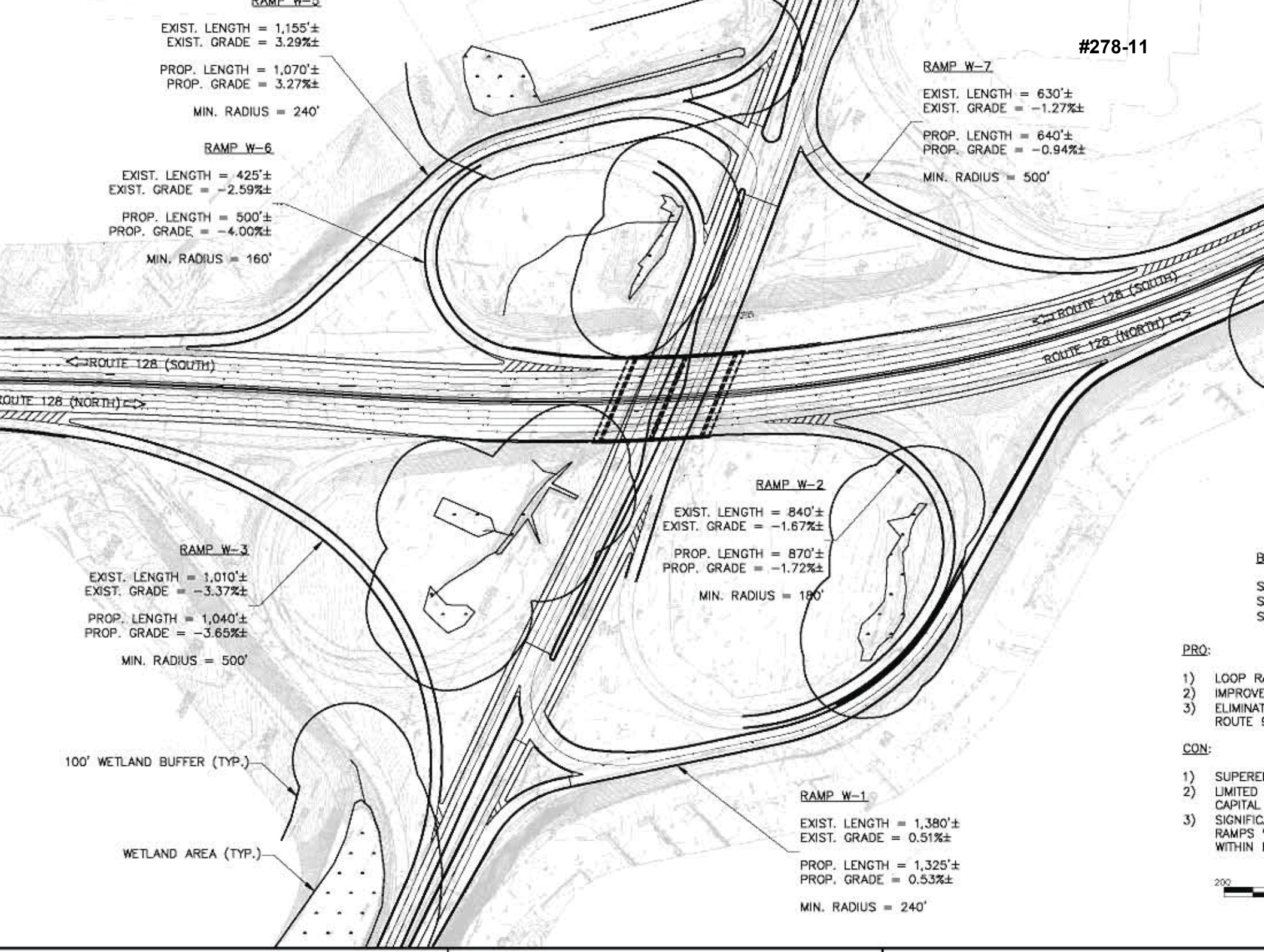
The Build alternatives offer safety improvements as they eliminate the inadequate weaves on Route 128 and eliminate some of the weave maneuvers on Route 9. Under the Build alternatives, the ramps are projected to operate at poor levels of service due to the over-capacity peak hour conditions of I-95/Route 128. Build Alternative 1 would likely provide the best traffic operations relative to capacity given that all the ramps operate under free-flow condition. However, the construction of the ramps to AASHTO standards renders the project infeasible given its impacts to the abutting properties. A comparison of the analyses for the practical alternatives revealed that the Partial Cloverleaf Alternative would provide significant improvement in vehicle delays and, therefore, in levels of service, when compared to the other Build alternatives and when compared to the No Build Alternative.

Given the results of the analyses, the preferred interchange configuration for the proposed reconstruction of the interchange of Route 9 and I-95/Route 128 is Build Alternative 5 – Partial Cloverleaf. The preferred Alternative is graphically depicted in Figure 22.

Design Exceptions

With the selected alternative for the Route 9 interchange configuration, there are a series of exceptions to design standards and requirements from AASHTO and MassDOT. These design exceptions are required in order to implement the proposed design alternative. The design exceptions are listed and described in a memo from HDR Engineering and can be found in Appendix R. Such exceptions include vertical clearances, distance between successive ramps, and ramp curve radii and lengths.

#278-11



PRO:

1) LOOP R
2) IMPROVE
3) ELIMINAT ROUTE

CON:

1) SUPEREL
2) LIMITED CAPITAL
3) SIGNIFIC RAMPS WITHIN

200

#278-11

Future Traffic Volumes

No-Build

Figure 11 presents the morning and evening peak hour traffic flows for the No-Build condition for the year 2025 and Figure 14 depicts the morning and evening peak hour traffic volumes for the 2017 No-Build condition. These scenarios represent full growth in the study area without the improvements to I-95/Route 128 resulting from this project.

Build

Future traffic volumes along Route 9 and at the I-95/Route 128 interchange for this alternative were estimated based upon a reassignment of the future Full Cloverleaf volumes. The resulting 2017 Partial Cloverleaf Interchange traffic volumes along Route 9 and the I-95/Route 128 ramps are graphically depicted in Figure 15 for the morning and evening peak hours. The 2025 morning and evening peak hour traffic flows for the Build Condition are shown in Figure 12.

Future Analysis

Ramps

Table 24 displays the levels of service for the ramp merge and diverge movements during the morning peak hour for the 2025 no build and 2025 build scenarios. Table 25 presents the analysis results for the ramps for the evening peak hour for both the 2025 no build and build conditions. As shown in Table 24 and Table 25, for the 2025 no build condition all of the ramps in the Route 9 Interchange are expected to operate at LOS F during both the weekday morning and evening peak hours. With the partial cloverleaf alternative the two new ramps will operate at LOS E during the morning peak hours and LOS F during the afternoon peak hours. During the 2025 build scenario all maintained ramps will continue to operate at LOS F during both the weekday morning and evening peak hours, with two exceptions.

Two of the ramps were not analyzed utilizing HCS, since they are classified as lane additions/drops instead of merges and diverges. These ramps are located at the southern most part of the Route 9 Interchange, identified as Ramp W-5 and W-3. Traffic travels on Ramp W-5 from Route 9 eastbound to I-95/Route 128 southbound and results in an added lane in the southbound direction on I-95/Route 128. Ramp W-3 travels from I-95/Route 128 northbound to Route 9 eastbound and results in a dropped lane on I-95/Route 128 in the northbound direction. The HCS procedure does not adjust for mainline lane additions or lane drops at a ramp junction. Therefore, different analyses were completed to account for the mainline lane addition and drop.

#278-11

When dealing with ramps that either add a lane or drop a lane from the mainline, a ramp merge analysis does not provide the complete analysis. Instead these types of merges are considered lane additions. As indicated on page 25-9 of the HCM, it should be analyzed by comparing the capacities of each entering ramp lane and the departing freeway (Exhibit 25-7) to the peak demand flow. The downstream segment should simply be looked at as a basic freeway segment with an added lane or subtracted lane. In the case of the partial cloverleaf interchange alternative, the freeway segment will be analyzed as a weave segment, due to the proximity of the Highland Avenue interchange.

Ramp W-5 in the southbound direction results in an added lane to the mainline, resulting in a five lane cross-section downstream of the ramp. Using the data from Exhibit 25-7, the downstream capacity is approximately 2,400 passenger cars per hour (pc/h) per lane or 12,000 pc/h for the roadway. Demand during the morning peak hour is approximately 9,046 pc/h and the demand during the evening peak hour is approximately 10,040 pc/h. Using this methodology, sufficient capacity has been calculated downstream of the W-5 ramp for the demand during both the morning and evening peak hours. In addition to these calculations, the ramp was analyzed with HCS utilizing a 5 lane cross-section. Although this is not accurate depiction of how the ramp is configured, it does generate an approximate LOS for the ramp. Using this analysis, the ramp would operate at a LOS D for the morning peak period and at LOS C during the evening peak period.

This same logic can be applied to ramp W-3 in the northbound direction. This ramp is a dropped lane which results in a four lane cross-section north of the ramp. Using the data from Exhibit 25-7, the capacity upstream and downstream of the ramp is approximately 2400 pc/h per lane or 9,600 pc/h. Demand during the morning peak hour is approximately 8,918 pc/h and the demand during the evening peak hour is approximately 9,646 pc/h. Therefore, sufficient capacity has been calculated downstream of the W-3 ramp for the demand during the morning peak hour. During the afternoon peak hour, the downstream segment is just slightly over capacity as the demand flow is less than one percent higher than the capacity. Again, using HCS to approximate a LOS, the ramp would operate at a LOS E for both the morning and evening peak period

The 2025 Build Alternative 5 conditions ramp capacity analyses worksheets and calculations are included in Appendix K.

Table 24. Route 9 Ramp Levels of Service for 2025 Morning Peak Hour

	No Build		Build	
	LOS[1]	Density[2]	LOS	Density
I-95/Route 128 at Route 9				
I-95/Route 128 NB to Route 9 EB	F	*	**	**
I-95/Route 128 NB to Route 9 WB	n/a	n/a	E	37.7
Route 9 WB to I-95/Route 128 NB	F	*	F	*
I-95/Route 128 SB to Route 9 WB	F	*	F	*
I-95/Route 128 SB to Route 9 EB	n/a	n/a	E	38.5
Route 9 EB to I-95/Route 128 SB	F	*	**	**

[1] Level-of-Service

[2] Density in passenger cars per mile per lane (pc/mi/ln)

[*] Volume exceeds capacity. Density is not calculated.

[**] Ramp analysis not completed using HCS

Table 25. Route 9 Ramp Levels of Service for 2025 Evening Peak Hour

	No Build		Build	
	LOS[1]	Density[2]	LOS	Density
I-95/Route 128 at Route 9				
I-95/Route 128 NB to Route 9 EB	F	*	**	**
I-95/Route 128 NB to Route 9 WB	n/a	n/a	F	*
Route 9 WB to I-95/Route 128 NB	F	*	F	*
I-95/Route 128 SB to Route 9 WB	F	*	F	*
I-95/Route 128 SB to Route 9 EB	n/a	n/a	F	*
Route 9 EB to I-95/Route 128 SB	F	*	**	**

[1] Level-of-Service

[2] Density in passenger cars per mile per lane (pc/mi/ln)

[*] Volume exceeds capacity. Density is not calculated.

[**] Ramp analysis not completed using HCS

Weave Sections

Table 26 shows the summary of results from the capacity analysis of the weave sections in the study area for the morning and evening peak hours, respectively. For the 2025 no build conditions, the northbound weave section on I-95/Route 128 at the Route 9 interchange is expected to operate at LOS F during both the weekday morning and evening peak hours. For the 2025 no build scenarios, the I-95/Route 128 southbound weave section at the Route 9 interchange is expected to operate at LOS F during the morning and evening peak hour. The worksheets for the No Build capacity analysis for

#278-11

the weave sections may be found in Appendix S. Note that the weave sections are eliminated under the build condition.

Table 26. 2025 No Build Weave Segment Levels of Service

	AM Peak Hour		PM Peak Hour	
	LOS[1]	Density[2]	LOS	Density
I-95/Route 128 at Route 9				
Northbound	F	74.6	F	84.6
Southbound	F	50.5	F	54.5

[1] Level-of-Service

[2] Density in passenger cars per mile per lane (pc/mi/ln)

Local Street Corridor Intersections

Previously, no permanent changes were proposed as part of this project for the Route 9 corridor as no change in traffic patterns or volumes would result from the Add-a-Lane project. The Route 9 corridor is included in this analysis as it will experience changes from the proposed construction staging for the I-95/Route 128 overpass. In order to reconstruct these bridges, it is proposed to remove the loop ramps entering onto I-95/Route 128, thereby eliminating the need for an acceleration lane on the bridge. The ramp modification would occur for both northbound and southbound entering traffic. To effect the elimination of the loop ramps entering onto I-95/Route 128, two new traffic signals would be required near the existing ramp termini on Route 9 to allow entering ramp traffic to turn left from Route 9 onto the ramps. Although this plan was originally meant to be temporary, as part of the construction, MassDOT expressed interest in maintaining the configuration permanently. As a result, further analysis and evaluation were conducted to evaluate the traffic operations of the corridor intersections of this alternative and is described below.

Table 27 is a summary of the expected traffic operations for the Route 9 ramp modifications for the existing morning and evening peak hours. As illustrated on this table, the traffic operates at LOS C for the Route 9 at Harvard Pilgrim/Sun Life driveway. The new signal at the southbound ramps to I-95/Route 128 would operate at LOS B during the morning peak hour and at LOS A during the evening peak hour. The new signal at the northbound ramps to I-95/Route 128 would operate at LOS A during the morning peak hour and at LOS C during the evening peak hour. Further, the traffic operates at an acceptable LOS for the Route 9 mainline traffic, thus minimizing traffic queues in the area. As the signals are constructed, fine tuning of the signal timings based on field conditions is recommended. The capacity analysis worksheets for the Route 9 ramp modifications intersection analysis for the existing morning and evening peak can be found in Appendix T.

Table 27. 2007 Existing Route 9 Ramp Modification Levels of Service

Intersection	Movement		Morning Peak Hour LOS[1]	Morning Peak Hour Delay[2]	Morning Peak Hour V/C[3]	Evening Peak Hour LOS	Evening Peak Hour Delay	Evening Peak Hour V/C
Route 9 at Sun Life/Harvard Pilgrim	EB	L	E	60.3	0.63	D	47.9	0.26
	EB	TR	D	35.4	0.97	C	22.1	0.68
	WB	L	E	56.2	0.57	D	52.9	0.13
	WB	T	B	17.2	0.50	C	24.1	0.94
	WB	R	A	4.3	0.43	A	3.5	0.09
	NB	LT	E	55.3	0.03	F	175.2	1.21
	NB	R	B	10.2	0.10	A	6.3	0.48
	SB	L	E	57.9	0.21	F	103.3	0.95
	SB	T	F	229.3	1.31	F	100.4	0.94
	SB	R	A	8.2	0.07	A	5.8	0.34
	Overall		*C*	*34.1*		*C*	*33.0*	
Route 9 at I-95/Route 128 SB Ramps	EB	T	C	23.3	0.83	A	6.0	0.55
	WB	L	C	28.6	0.76	D	36.2	0.78
	WB	T	A	0.3	0.40	A	0.6	0.62
	Overall		*B*	*15.7*		*A*	*7.7*	
Route 9 at I-95/Route 128 NB Ramps	EB	L	B	16.8	0.56	D	52.9	0.86
	EB	T	A	1.5	0.67	A	0.3	0.40
	WB	T	A	7.2	0.42	C	20.4	0.89
	Overall		*A*	*4.9*		*B*	*19.6*	

[1] Level-of-Service

[2] Average vehicle delay in seconds

[3] Volume to capacity ratio

No Build

Intersection capacity analyses were performed for the intersection of Route 9 at Sun Life/Harvard Pilgrim. The 2017 No Build conditions intersection capacity analyses worksheets are included in Appendix U.

Build

Intersection capacity analyses were performed for 2017 Build Alternative 5 conditions at the intersection of Route 9 at Sun Life/Harvard Pilgrim and Route 9 at the proposed I-95/Route 128 ramps. The signals along Route 9 were coordinated to a 100-second cycle length for analyses purposes. The 2017 build conditions intersection capacity analyses worksheets are included in Appendix V. Results of the analyses are summarized in Table 28 and Table 29.

Table 28. Route 9 Levels of Service for 2017 Morning Peak Hour

Intersection	Movement		2017 No Build LOS[1]	2017 No Build Delay[2]	2017 No Build V/C[3]	2017 Build LOS	2017 Build Delay	2017 Build V/C
Route 9 at Sun Life/Harvard Pilgrim	EB	L	D	49.0	0.58	D	49.0	0.58
	EB	TR	C	25.5	0.92	C	25.5	0.92
	WB	L	F	145.8	1.09	F	126.5	1.09
	WB	T	C	22.3	0.72	B	15.8	0.72
	WB	R	A	5.3	0.47	A	2.2	0.47
	NB	LT	D	45.0	0.03	D	45.0	0.03
	NB	R	B	10.8	0.13	B	10.8	0.13
	SB	L	D	48.3	0.21	D	48.3	0.21
	SB	T	F	251.3	1.38	F	251.3	1.38
	SB	R	A	7.2	0.06	A	7.2	0.06
	Overall		*C*	33.1		C	30.2	
Route 9 at I-95 Southbound Ramps	EB	T	n/a	n/a	n/a	A	7.7	0.77
	EB	R	n/a	n/a	n/a	A	3.1	0.46
	WB	L	n/a	n/a	n/a	D	46.5	0.84
	WB	T	n/a	n/a	n/a	A	8.1	0.62
	SB	R	n/a	n/a	n/a	D	49.2	0.91
	Overall		***n/a***	n/a	n/a	B	16.4	
Route 9 at I-95 Northbound Ramps	EB	L	n/a	n/a	n/a	D	41.0	0.57
	EB	T	n/a	n/a	n/a	A	1.1	0.66
	WB	T	n/a	n/a	n/a	B	13.5	0.60
	Overall		***n/a***	n/a	n/a	B	10.0	

[1] Level-of-Service

[2] Average vehicle delay in seconds

[3] Volume to capacity ratio

As seen in Table 28 and Table 29 the intersection of Route 9 at Sun Life/Harvard Pilgrim would be expected to continue to operate at an overall acceptable level of service during AM and PM peak hour conditions. However, delays would continue to be observed along the minor streets of the intersection. The intersection of Route 9 and I-95/Route 128 Northbound Ramps and the intersection of Route 9 and I-95/Route 128 Southbound Ramps would be expected to operate at an overall acceptable level of service B during both peak periods. Further, all movements would be expected to operate at an acceptable level of service during both peak periods. It is also worth noting that the future queues for the eastbound-to-northbound and the westbound-to-southbound left-turn movements would not be anticipated to exceed the available storage expected to be provided on Route 9.

Table 29. Route 9 Levels of Service for 2017 Afternoon Peak Hour

Intersection	Movement		2017 No Build LOS[1]	2017 No Build Delay[2]	2017 No Build V/C[3]	2017 Build LOS	2017 Build Delay	2017 Build V/C
Route 9 at Sun Life/Harvard Pilgrim	EB	L	D	45.7	0.26	D	45.7	0.26
	EB	TR	C	23.6	0.82	C	23.6	0.82
	WB	L	D	45.1	0.13	C	26.4	0.13
	WB	T	C	25.6	0.84	B	18.3	0.84
	WB	R	A	7.8	0.09	A	6.1	0.09
	NB	LT	F	288.9	1.50	F	288.9	1.50
	NB	R	A	7.8	0.54	A	7.8	0.54
	SB	L	F	244.4	1.36	F	244.4	1.36
	SB	T	F	246.1	1.36	F	246.1	1.36
	SB	R	A	7.8	0.34	A	7.8	0.34
	Overall		*D*	47.1		*D*	*44.1*	
Route 9 at I-95 Southbound Ramps	EB	T	n/a	n/a	n/a	B	12.9	0.82
	EB	R	n/a	n/a	n/a	A	6.5	0.63
	WB	L	n/a	n/a	n/a	D	51.7	0.75
	WB	T	n/a	n/a	n/a	B	13.0	0.56
	SB	R	n/a	n/a	n/a	D	41.6	0.67
	Overall		*n/a*	*n/a*	*n/a*	*B*	*17.7*	
Route 9 at I-95 Northbound Ramps	EB	L	n/a	n/a	n/a	C	27.1	0.79
	EB	T	n/a	n/a	n/a	A	0.5	0.53
	WB	T	n/a	n/a	n/a	C	30.4	0.93
	Overall		*n/a*	*n/a*	*n/a*	*B*	*17.7*	

[1] Level-of-Service

[2] Average vehicle delay in seconds

[3] Volume to capacity ratio

The improved operations associated with this alternative are due to the fact that only one direction of Route 9 traffic and the left –turn onto the ramp are under signal control at each intersection. These signals are able to operate with an efficient two-phase configuration.

Conclusions

Overview of Preferred Plan

As documented in this report, the improvements from this project will provide an overall benefit for this sector of the I-95/Route 128 corridor. This project will result in four travel lanes and a full shoulder in each direction along I-95/Route 128. This cross section will provide an increase in the capacity of the mainline, primarily through improved merge and diverge operations. The elimination of travel on the shoulder will provide for a smoother traffic flow and safer environment by returning the shoulder/breakdown lane to its intended purpose during the eight hours it is currently used as a travel lane and by providing adequate merge and diverge areas. In addition, this project will result in a new interchange at Kendrick Street. The new interchange will provide more direct access to office and industrial parks to the east of I-95/Route 128 and will divert trips from the Highland Avenue interchange and the Great Plain Avenue interchange to the south. The interchange at Route 9 will also be reconfigured to eliminate the weave sections which currently exist due to the substandard existing cloverleaf interchange. After a thorough analysis of the available interchange alternatives, the redesigned interchange will be built as a partial cloverleaf interchange.

Operational Analyses and Findings

For this project, analyses were conducted for the freeways, ramps and local street systems. The freeways and ramps were analyzed using the CTPS 2025 travel forecasts and the local street network used a 2017 planning horizon. Both are consistent with MassDOT design guidelines.

The opening of a new interchange on Kendrick Street is the most dramatic improvement to the study area and in particular to the economic opportunities to the neighboring communities. This interchange will provide relief to the Highland Avenue corridor and Greendale Avenue and allow better access into the office/industrial area to the east. By allowing only turns to the east for exiting traffic at this interchange, with the exception of right turning vehicles off of the southbound off ramp, there is protection offered to residential uses to the west of the proposed interchange.

In order to open a new interchange at Kendrick Street and to reduce conflicts on the mainline, a C-D roadway was required to distribute traffic between Highland Avenue and Kendrick Street in an efficient and safe manner. This C-D Road is an integral component of the improvement scheme. A refinement to the C-D roadway was presented by the project team to separate the northbound I-95/Route 128 traffic exiting to Kendrick Street from the traffic exiting to the northbound C-D roadway by

constructing separate ramps. Construction of separate ramps for the Kendrick Street interchange and the C-D Road will provide acceptable operations on both ramps.

This FDR also analyzed the Highland Avenue and Kendrick Street corridors. In particular, the Kendrick Street corridor is essential to understand the traffic implications of the proposed interchange at Kendrick Street. The Highland Avenue corridor is also an important roadway that serves the industrial developments to the east of I-95/Route 128.

As shown in this document, the impacts to Kendrick Street can be accommodated with modest improvements to existing intersections including an additional lane in the eastbound direction between the proposed interchange and Third Avenue.

The Highland Avenue corridor will be somewhat improved under this project due to changed traffic patterns and additional improvements to this corridor that are currently being designed by the Town of Needham. The overall improvement scheme for the I-95/I-93 Transportation Improvement Project (Bridge V) will not be detrimental to Highland Avenue as traffic is afforded a more direct connection to many of the local traffic generators via the proposed Kendrick Street ramps. However, traffic operations along Highland Avenue will continue to be strained given plans to expand the New England Business Center and other growth potential in the immediate environs. The operations of Highland Avenue should be further assessed during the permitting for future development projects.

Another component of the project is for the temporary construction staging alterations to the Route 9 interchange to become part of the improvement scheme. The traffic operation with two signals on Route 9 eliminates a substandard weave length on the mainline of the freeway and eliminates the weaving sections on Route 9. This component of the project was not included as part of the original project, but has now been included due to the reconsidered scope and design.

Based on the findings in this FDR, it is concluded that this project will be beneficial to traffic operations and safety on I-95/Route 128, and in the neighboring communities.

City of Newton

DEPARTMENT OF PUBLIC WORKS

OFFICE OF THE COMMISSIONER

1000 Commonwealth Avenue

Newton Centre, MA 02459-1449

Setti D. Warren

Mayor

Date: June 16, 2011

To: Larry Cash, MassDOT Project Manager

From: David F. Turocy, Commissioner of Public Works

Subject: City of Newton Comments on I-95 Project # 603711, 25% Design Hearing

On behalf of Mayor Setti Warren, I submit the following comments and concerns regarding the Massachusetts Department of Transportation (MassDOT) I-95 "Add-a-Lane" project, located in Wellesley and Needham. The City of Newton supports MassDOT's efforts to improve safety throughout the corridor by eliminating travel in the breakdown lane, creating standard width breakdown lanes on both sides of the highway, and by improving merging areas at the existing Highland Avenue and Route 9 interchanges. However, there are elements of the projects which generate some concerns which the City asks MassDOT to address as the design moves forward. The concerns listed below are representative of the testimony provided by the four City officials who spoke at the MassDOT design public hearing on June 1: Chief Operating Officer Robert Rooney, Alderman Cheryl Lappin, Alderman Deborah Crossley, and Associate City Engineer, Clint Schuckel.

1. The City is concerned that the peak hour traffic projections for the Kendrick Street-Nahanton Street corridor may underestimate the future traffic volumes resulting from the cumulative effect of ten years of annual growth in vehicle traffic, new development in Needham's New England Business Center, and new highway access.

At a minimum, the project's traffic study should be expanded to the following intersections in the City of Newton:

- Nahanton Street at Wells Avenue;
- Nahanton Street at Winchester Street;
- Nahanton Street at Dedham Street; and
- Dedham Street at Brookline Street.

The study should examine at least three traffic scenarios: 1) existing, 2) the project's current traffic projections, and 3) a "worst case" scenario in which future traffic increases to a level where mitigation measures (e.g., signalization, geometric improvements, etc.) are required to maintain an acceptable level of service at each of the four intersections above. The City would collaborate with the State's traffic consultant, McMahon Associates, on the methodology and the peak period traffic volumes requiring improvements.

For each of the three conditions, the proposed traffic study would identify the most cost-effective intersection improvements and estimated costs. Based on the study findings, the City requests that MassDOT create a reserve fund within the project budget that is dedicated for future traffic monitoring and mitigation at the above four locations should the peak period volumes reach the thresholds established for Condition 3. This fund would be available for up to two years following project completion, during which time the monitoring program would determine if the traffic thresholds have been met to require the study's recommended mitigation.

2. Please explain how the sequencing of this project will intersect with other projects in the area, including but not limited to, the Route 9 improvements associated with the Chestnut Hill Square project and the Needham Street/Highland Avenue reconstruction project.

3. For the Kendrick Street and Highland Avenue interchanges, it appears that while additional vehicle travel lanes are provided to accommodate increased traffic, accommodations for bicycles are limited to striped four foot shoulders. Vehicles utilizing the bridges are both maneuvering to access/egress the interstate and traveling at speeds often exceeding 40 miles per hour. This condition necessitates greater design considerations to provide safe bicycle accommodations such as raising the elevation of the bicycle lane to that of the sidewalk throughout the project limits. Utilizing curbing will provide added protection from errant vehicles and will help to keep roadway detritus off the bicycle lane, another key factor in bicycle crashes.

4. The location of pedestrian crosswalks at the Highland Ave on-ramps to I-95 (northbound and southbound) are currently located too far down the ramp. The result is that a pedestrian attempting to cross has limited sight distance to on-coming traffic due to the ramp curvature and adjacent property obstructions such as shrubs, guardrail, and signage. Given the speeds vehicles travel approaching these on-ramps combined with the limited sight distance, the distance a pedestrian can achieve crossing the ramp is estimated to be the mid-point of the roadway before a vehicle reaches the crosswalk; a potentially very dangerous situation. Therefore, greater sight distance of approaching ramp traffic needs to be provided at the curb line of the crosswalk.

5. As the City of Newton is directly downstream along the Charles River, which is immediately adjacent to the Add-a-Lane project and the likely destination of roadway runoff, the City respectfully requests that MassDOT copy the City Engineer, Lou Taverna (ltaverna@newtonma.gov), on all stormwater management plans, analyses, and related documents that are submitted to the Towns of Needham and Wellesley.

Thank you for your consideration of these comments. I look forward to working with MassDOT on these issues, and to the successful completion of the Add-a-Lane project.

Cc: Robert Rooney, Chief Operating Officer
Alderman Cheryl Lappin
Alderman Deborah Crossley
Lou Taverna, City Engineer
Clint Schuckel, Associate City Engineer

City of Newton

DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION - TRANSPORTATION
1000 Commonwealth Avenue
Newton Centre, MA 02459-1449

David B. Cohen
Mayor

#60-09

DATE: July 2, 2009

TO: Public Facilities Committee

THRU: Lou Taverna, City Engineer

FROM: Clint Schuckel, City Traffic Engineer

RE: **Docket Item # 60-09, Concord Street**

CC: Tom Daley – DPW Commissioner
Assistant Chief Bruce Proia – Fire Department
Captain Howard Mintz – Police Department
File

At its June 17, 2009 meeting, the Public Facilities Committee requested a concept level design and cost estimate for the installation of speed humps on Concord Street. In response, I have prepared this memo and the two attached figures. **Figure 1** shows approximate locations of five speed humps with a spacing of 650 to 700 feet, which is at the maximum recommended spacing to encourage vehicle speeds at or near 30 mph. The options for speed hump locations are very limited on Concord Street given the street alignment with vertical and horizontal curves as well as the numerous locations of intersections and driveways on either side of the roadway. I attempted to locate speed humps at least 50 feet from a driveway or intersection, which means only sections of the street with no driveways or intersections for 122 feet can be considered. Per the request of the Committee, I have also attached a standard detail for 22' speed humps copied from the City of Portland, Oregon Traffic Manual as **Figure 2**.

DPW's cost estimate for a 12' speed hump is $ 7,500 (City Engineer memo to PF Committee December 2008). The labor cost for a 22' speed hump is very similar, however, increased asphalt is needed for the additional 10 feet of 3" raised surface. Therefore, the DPW estimate for 22' speed hump is $10,000 each, which is significantly less than a raised crosswalk ($25,000) or raised intersection ($60,000) where sidewalk, curbing, and street drainage improvements are required. The total estimated cost of the five 22' speed humps on Concord Street is $50,000.

Telephone: (617) 796-1024 • Fax: (617) 796-1051 • cschuckel@newtonma.gov

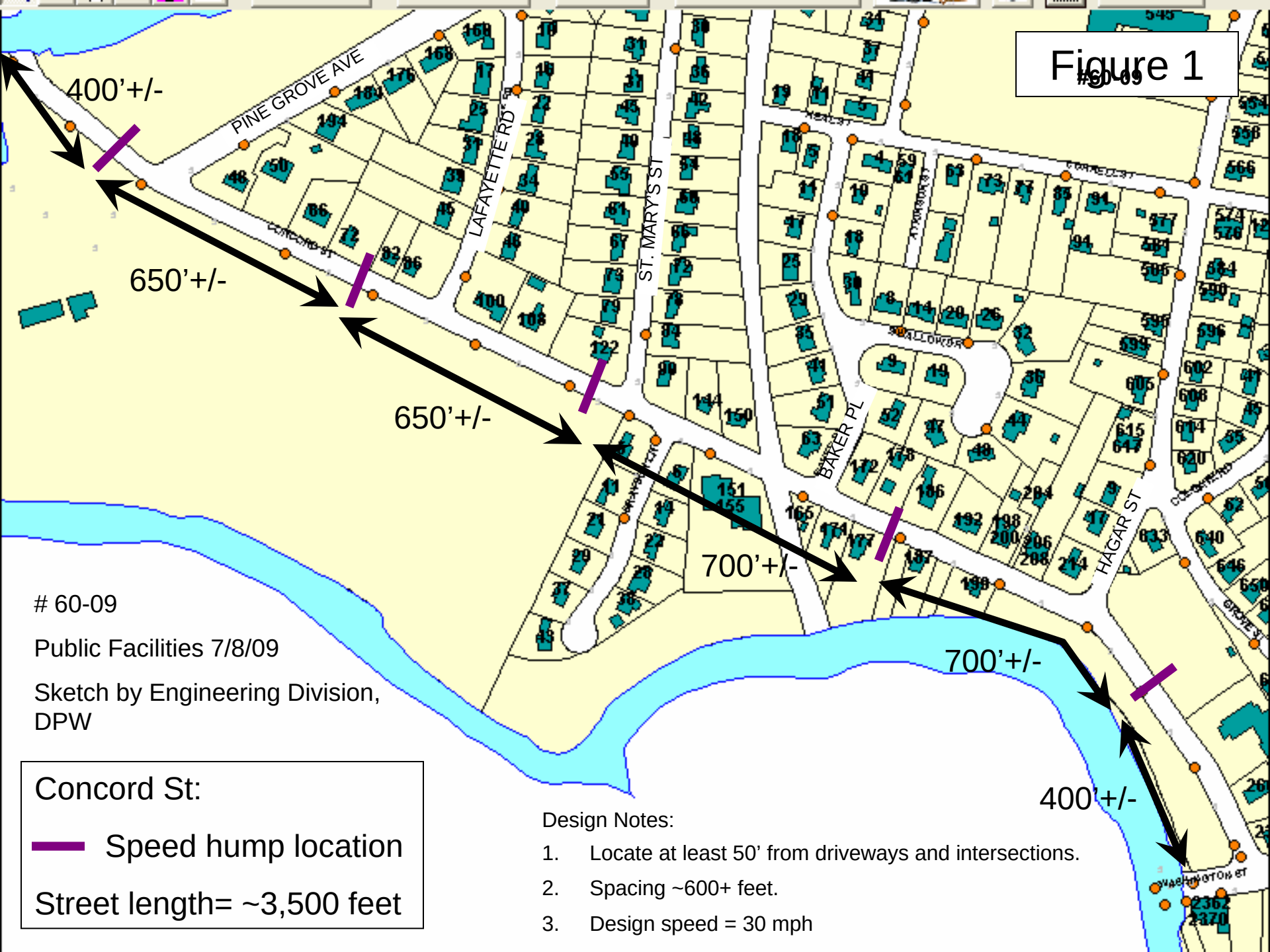
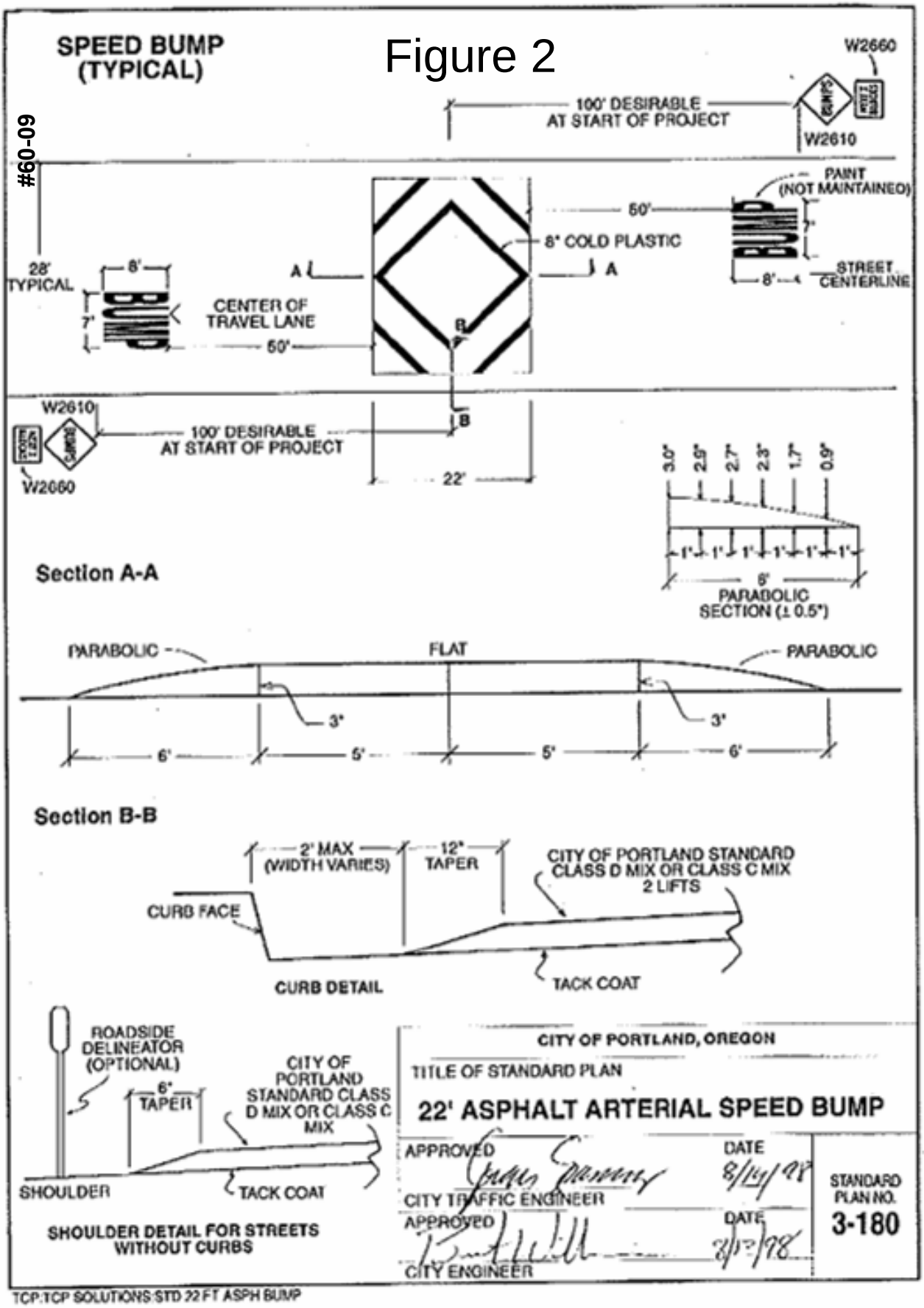


Figure 1
400'+/-
650'+/-
650'+/-
700'+/-
700'+/-
400'+/-
PINE GROVE AVE
LAFAYETTE RD
ST. MARY'S ST
BAKER PL
HAGAR ST
CONCORD ST
60-09
Public Facilities 7/8/09
Sketch by Engineering Division, DPW
Concord St:
Speed hump location
Street length= ~3,500 feet
Design Notes:
1. Locate at least 50' from driveways and intersections.
2. Spacing ~600+ feet.
3. Design speed = 30 mph



City of Portland, OR Traffic Manual, Chapter 11- Speed Bumps