Discussion of Traffic Schemes for Stage 3 and Stage 5

Construction of Segment 5 is shown on **Figure 4-119**.

Stage 3A/3B Traffic:
Stage 3A/3B traffic schemes are shown on **Figures 4-120** through **4-129**.

Location of southern crossover: north of Adams Road
- No lane closures on NB I-75 south of Adams Road but HOV lane closed along NB I-75.

Location of northern crossover: south of M-59
- Right lane of SB I-75 closed south of ramp from SB I-75 to WB M-59.

Ramp Closures and Detours:
- **Adams Road to NB I-75**
  Post detour for Adams Road traffic to go north on Adams Road, west on Auburn Road, north on Squirrel Road, take the ramp from Squirrel Road to WB M-59, go west on M-59, and take the ramp from WB M-59 to NB I-75.

- **SB I-75 to Adams Road/Square Lake Road**
  Post detour for SB I-75 traffic to exit at WB I-75 BL (Square Lake Road), go west on I-75 BL, take the ramp from WB I-75 BL to Opdyke Road, go south on Opdyke Road, and east on Square Lake Road to Adams Road.

- **NB I-75 to WB I-75 BL (Square Lake Road)** and **Opdyke Road**
  Post detour for NB I-75 traffic to exit at the ramp from NB I-75 to WB I-696, go west on I-696, north on US-24 and east on I-75 BL.

- **EB I-75 BL (Square Lake Road) to NB I-75**
  Post detour for US-24 traffic to go north on US-24, east on M-59, and take the ramp from EB M-59 to NB I-75. Post another detour for M-1 traffic to go north on M-1, east on M-59, and follow the EB M-59 detour signs to get to NB I-75.

- **EB M-59 to SB I-75** (no access to SB I-75, open to WB I-75 BL only)
  Post detour for EB M-59 traffic to continue east on M-59, south on M-53, take the ramp from SB M-53 to WB I-696, go west on I-696, and take the ramp from WB I-696 to SB I-75.

- **WB M-59 to SB I-75**
  Post detour for WB M-59 traffic go south on M-53, take the ramp from SB M-53 to WB I-696, go west on I-696, and take the ramp from WB I-696 to SB I-75.

- **Square Lake Road/Opdyke Road to NB I-75 via EB I-75 BL**
  Post detour for Square Lake Road / Opdyke Road traffic to go north on Opdyke Road, take the ramp from Opdyke Road to EB M-59, go east on M-59, and take the ramp from EB M-59 to NB I-75

- **Square Lake Road/Opdyke Road to SB I-75 via EB I-75 BL**
  Post detour for Square Lake Road / Opdyke Road traffic to go east on Square Lake Road to the Square Lake Road / Adams Road interchange and take the ramp from Square Lake Road/Adams Road to SB I-75.

Additional Stage 3A/3B Traffic Notes:
- I-75 mainline is constructed part-width between the POB and Ramp ES and between Ramp SW and the POE. This is to maintain Ramp ES (ramp from EB I-75 BL/Square Lake Road to SB I-75) and Ramp SW (ramp from SB I-75 to WB I-75 BL) at all times.
- Ramp closures in Stage 3A and Stage 3B are the same. The only difference between Stage 3A and Stage 3B is the use of temporary ramp connections in Stage 3B to maintain Ramp ES and Ramp SW.
- Maintain only 1 lane on Ramp ES and Ramp SW.
- Detours for the ramps from EB and WB M-59 to SB I-75 were chosen to avoid the Pontiac area. Other detours using MDOT routes are available and can be evaluated in more detail during the design phase.
- It is assumed that the HOV lane constructed in Segments 1 through 4 is in operation prior to construction of Segment 5.

Other Options for Stage 3:
Stage 3A/3B traffic shows maintaining three NB lanes and two SB lanes during construction to minimize impacts to NB I-75 traffic during construction of the SB I-75 roadway. This allows NB I-75 to have a lane closure only when that side of the roadway is under construction.

Once the project is in the design phase, variations to the Stage 3A/3B MOT Concepts for Segment 5 are available:
- Option 1: Maintain five lanes on the NB roadway but maintain two NB lanes and three SB lanes. This would require a left lane closure on NB I-75 along with closure of the HOV lane along NB I-75. This would also require that three lanes of SB I-75 traffic cross over, instead of two as currently shown. However, no lane closures on SB I-75 will be required.
- Option 2: Maintain five lanes on the NB roadway by maintaining three NB lanes and two SB lanes as currently shown. However, close two lanes of SB I-75 traffic, instead of one lane as currently shown. Once SB traffic is crossed over, maintain a temporary ramp crossover for Ramp SW (ramp from SB I-75 to WB I-75 BL) south of South Boulevard. This option will allow full width construction of the SB I-75 roadway between Ramp SW and the POE, instead of part-width as currently shown.
  Full width construction between the POB and Ramp ES (ramp from EB I-75 BL/Square Lake Road to SB I-75) was not evaluated since the large grade differential between the existing and proposed I-75 roadway due to lowering of the proposed roadway does not make it feasible to maintain a temporary ramp crossover for Ramp ES.

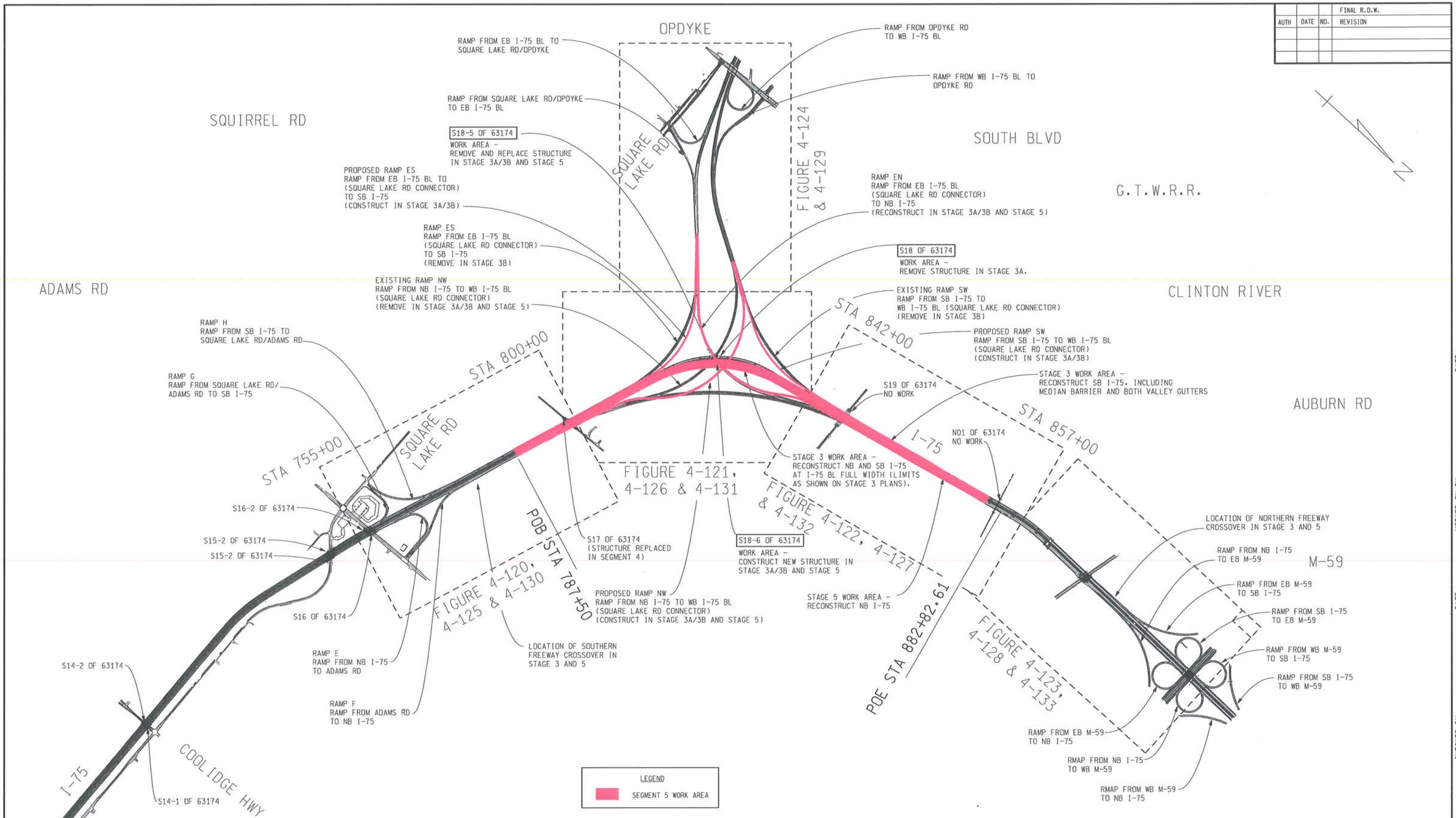

FIGURE 4-119
ALT 3: TWO LANE OPERATION USING CROSSOVERS
SEGMENT 5 COVER SHEET

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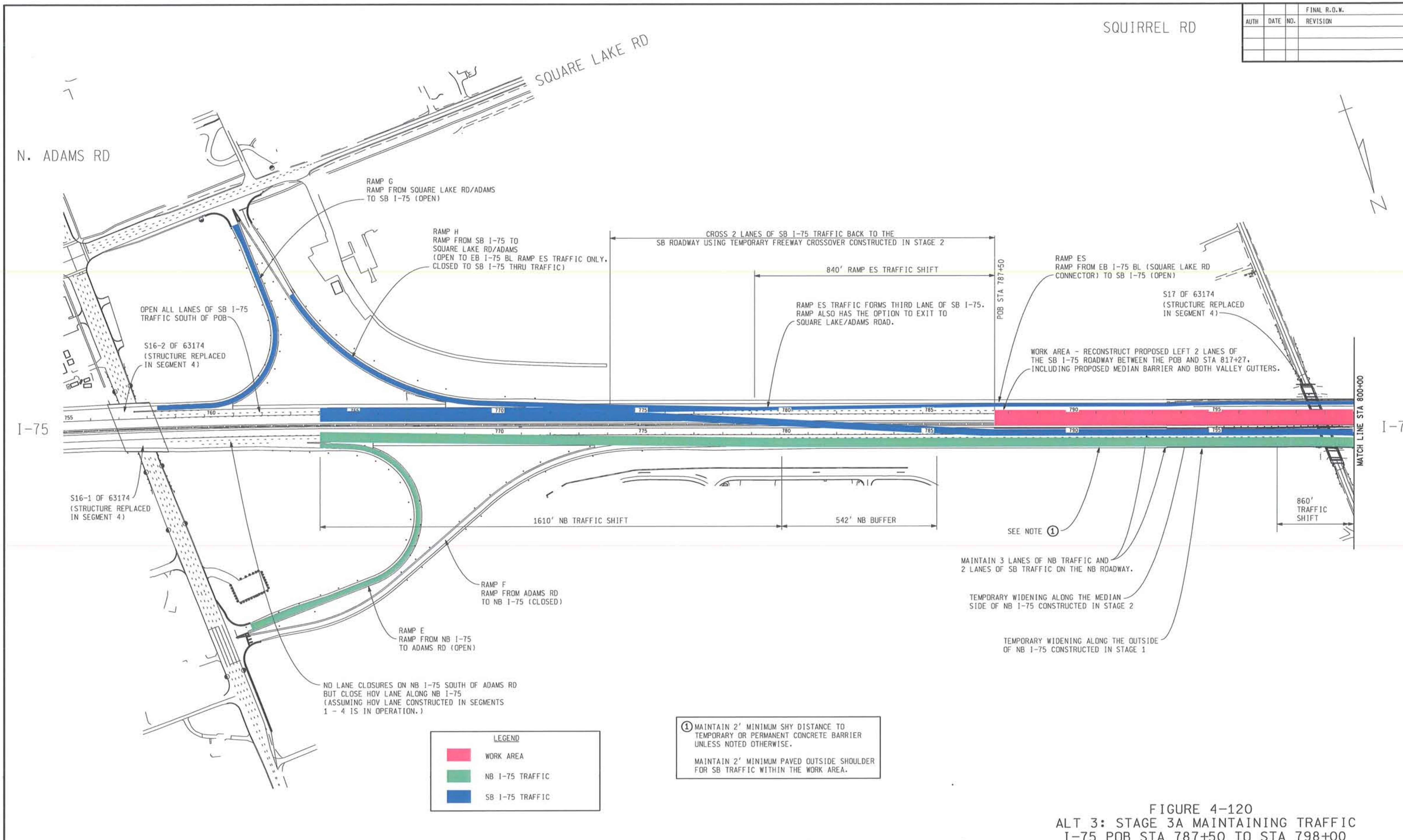

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FIGURE 4-120
ALT 3: STAGE 3A MAINTAINING TRAFFIC
I-75 POB STA 787+50 TO STA 798+00

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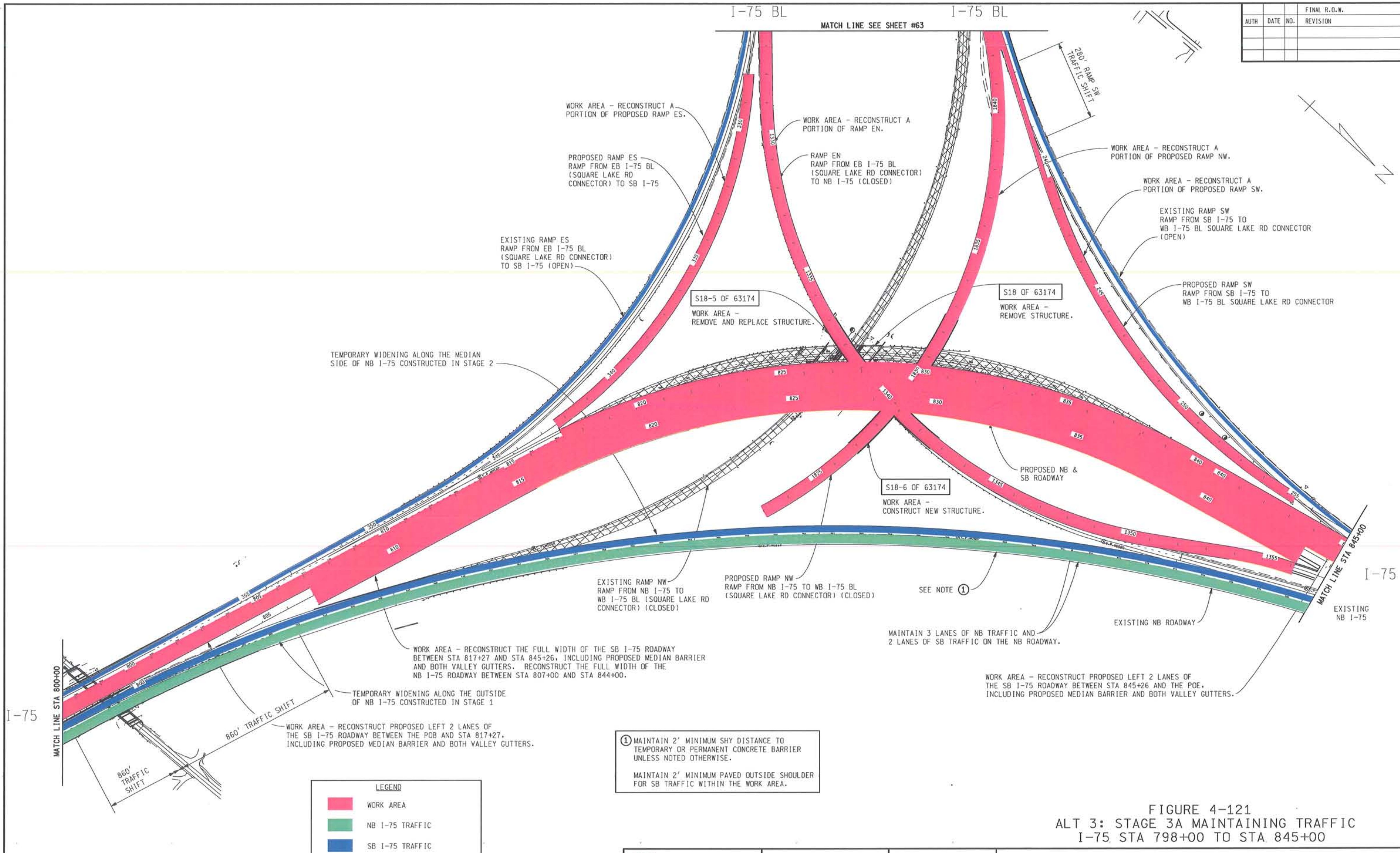

FIGURE 4-121
ALT 3: STAGE 3A MAINTAINING TRAFFIC
I-75 STA 798+00 TO STA 845+00

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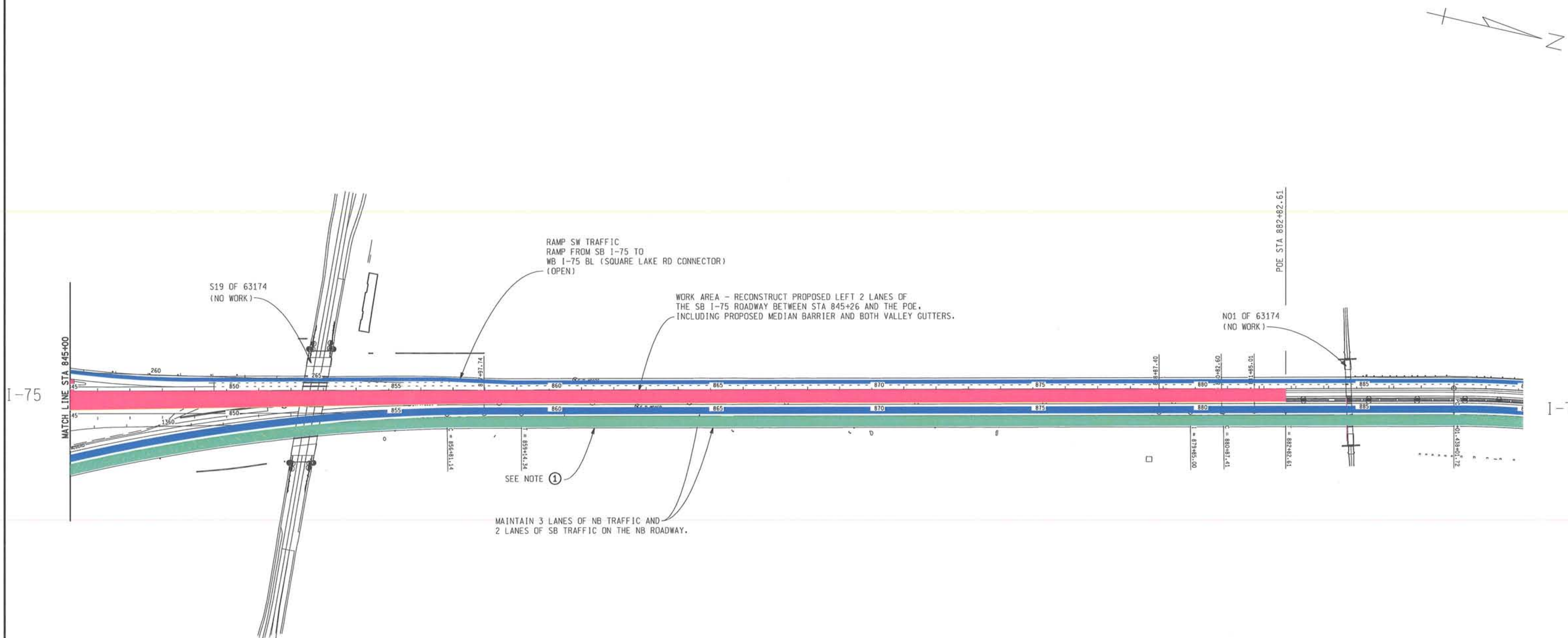
SOUTH BLVD



LEGEND

- WORK AREA
- NB I-75 TRAFFIC
- SB I-75 TRAFFIC

(1) MAINTAIN 2' MINIMUM SHY DISTANCE TO TEMPORARY OR PERMANENT CONCRETE BARRIER UNLESS NOTED OTHERWISE.

MAINTAIN 2' MINIMUM PAVED OUTSIDE SHOULDER FOR SB TRAFFIC WITHIN THE WORK AREA.

FIGURE 4-122
ALT 3: STAGE 3A MAINTAINING TRAFFIC
I-75 STA 845+00 TO STA 890+00

SOUTH BLVD

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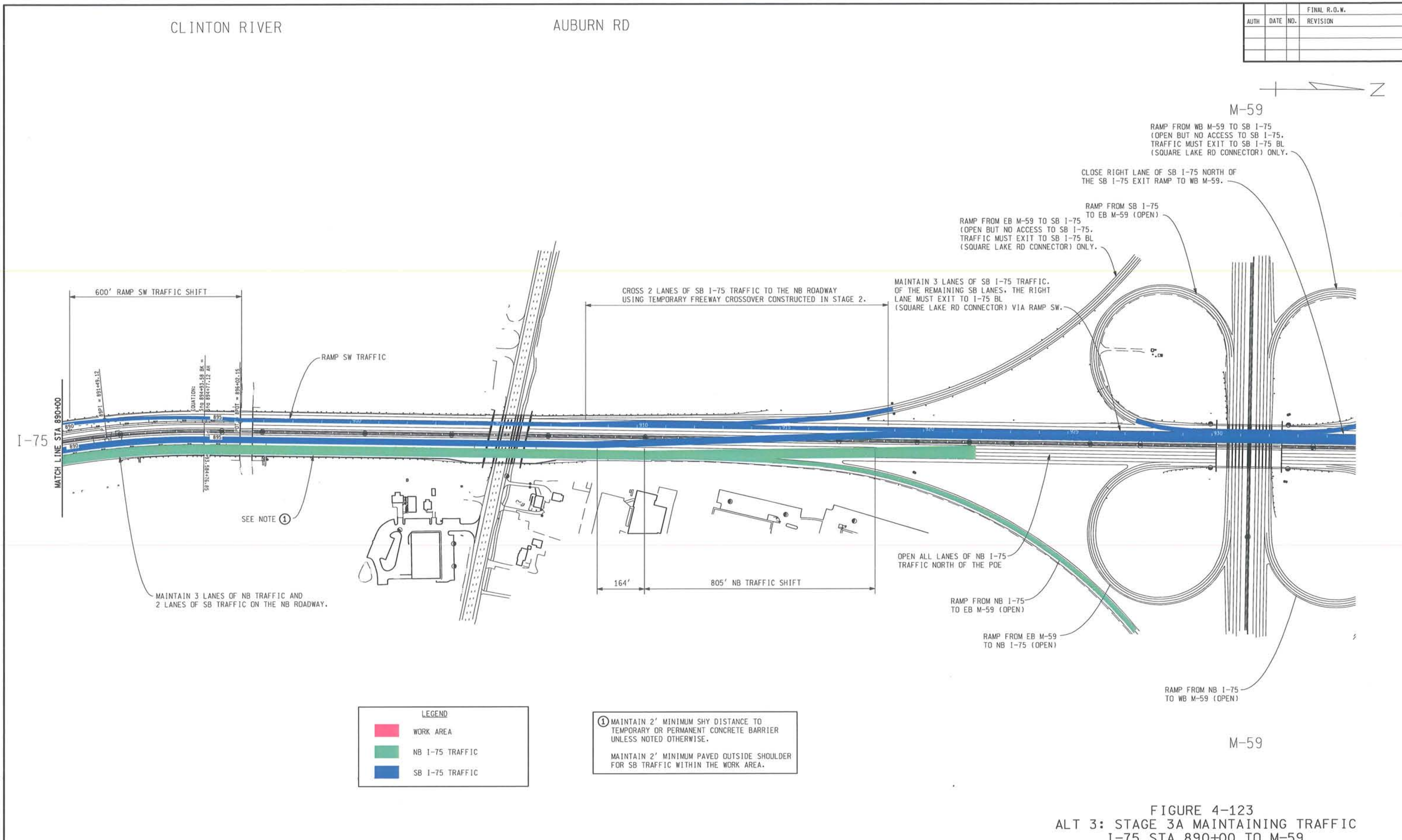

LEGEND

- WORK AREA
- NB I-75 TRAFFIC
- SB I-75 TRAFFIC

(1) MAINTAIN 2' MINIMUM SHY DISTANCE TO TEMPORARY OR PERMANENT CONCRETE BARRIER UNLESS NOTED OTHERWISE.

MAINTAIN 2' MINIMUM PAVED OUTSIDE SHOULDER FOR SB TRAFFIC WITHIN THE WORK AREA.

FIGURE 4-123
ALT 3: STAGE 3A MAINTAINING TRAFFIC
I-75 STA 890+00 TO M-59

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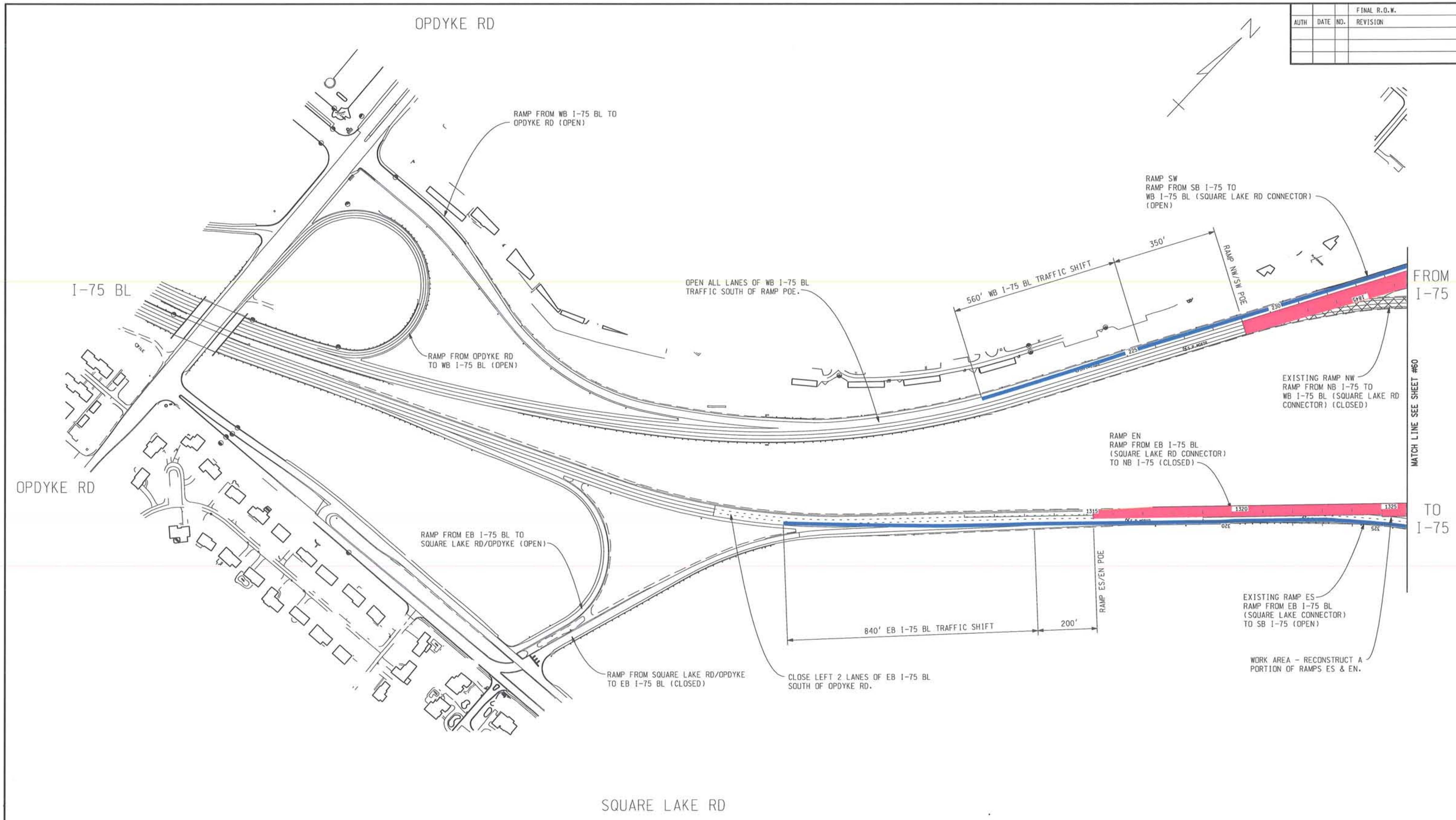

FIGURE 4-124
ALT 3: STAGE 3A MAINTAINING TRAFFIC
I-75 BL (SQUARE LAKE RD CONNECTOR)

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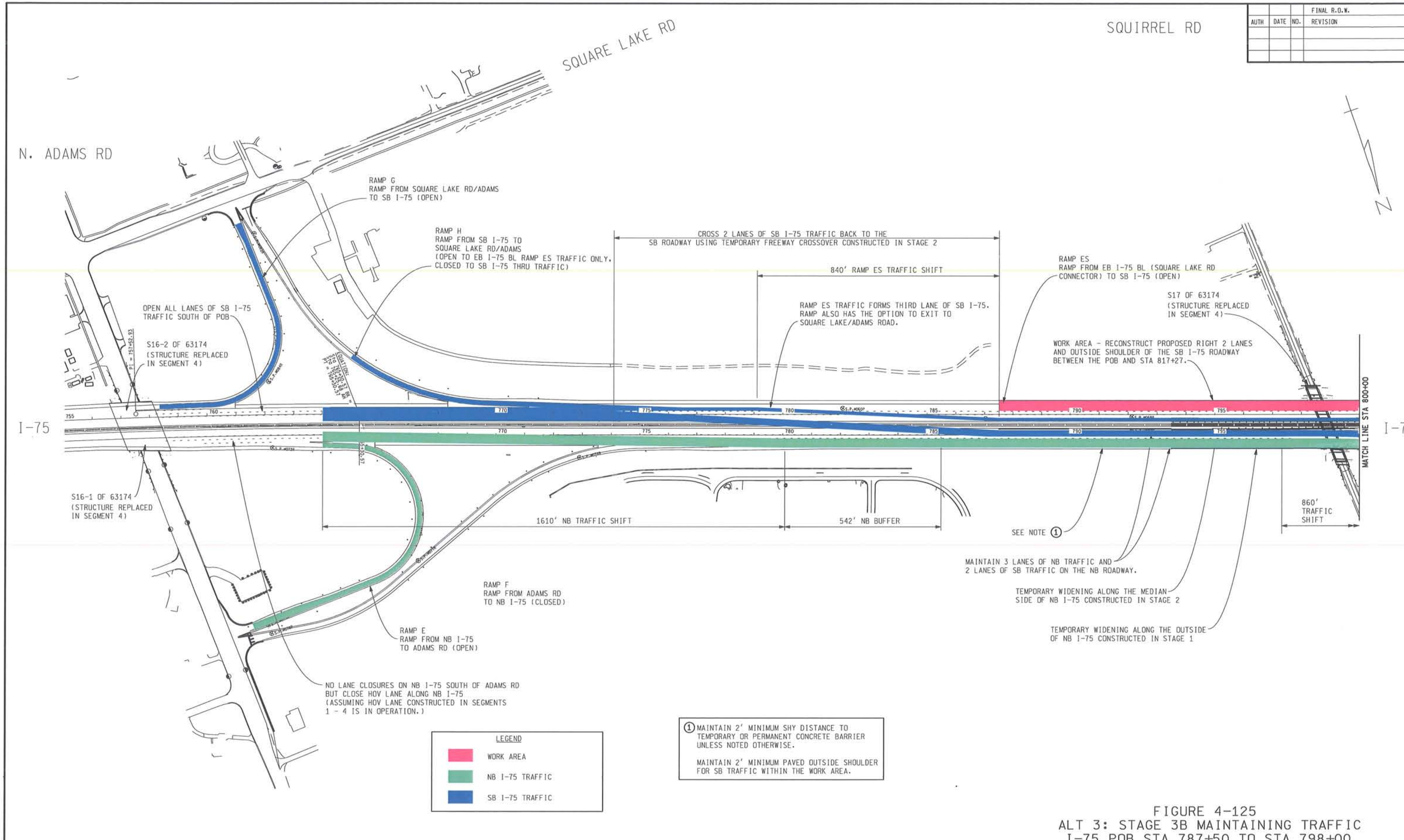

FIGURE 4-125
ALT 3: STAGE 3B MAINTAINING TRAFFIC
I-75 POB STA 787+50 TO STA 798+00

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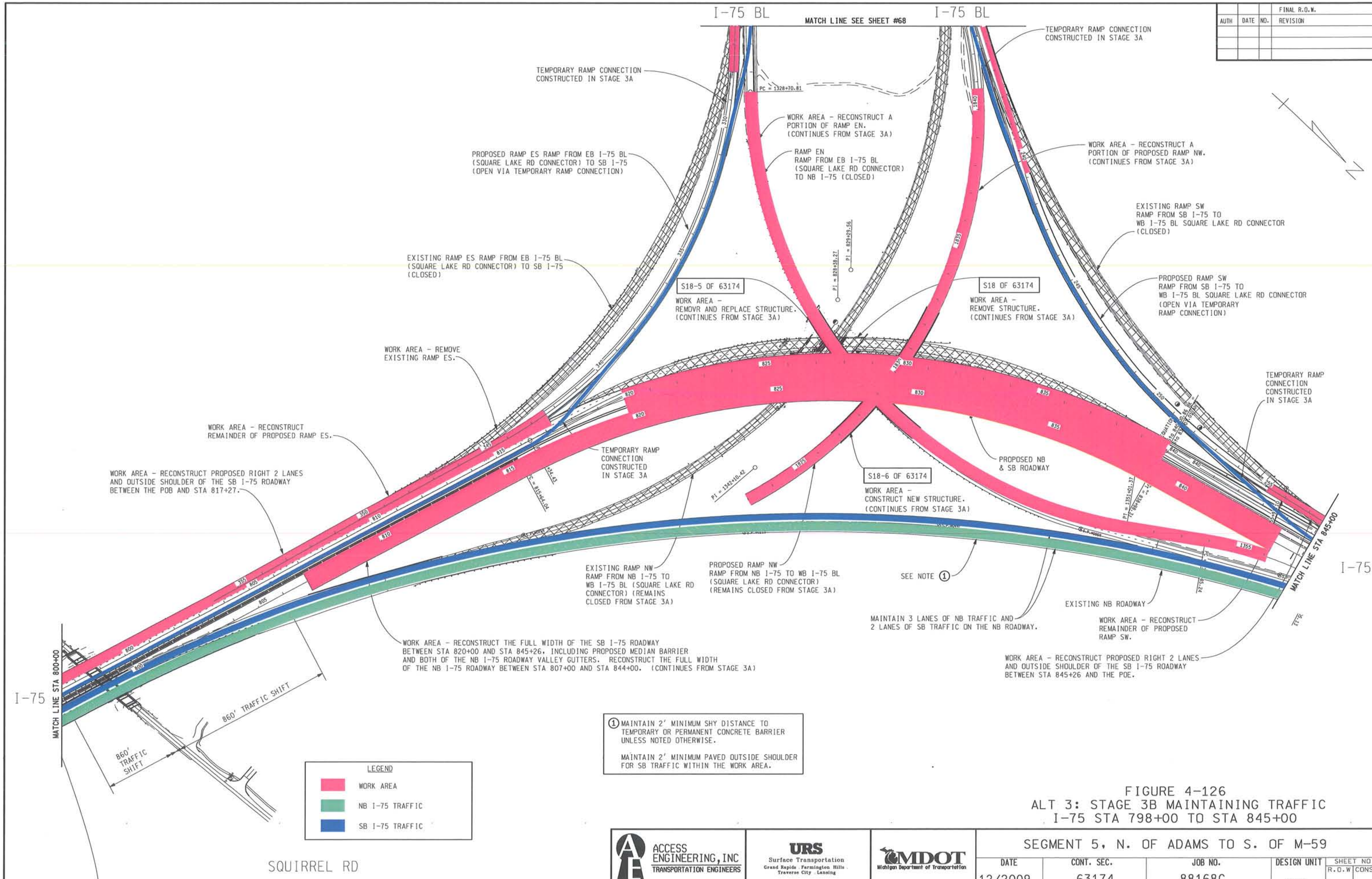

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FIGURE 4-126
ALT 3: STAGE 3B MAINTAINING TRAFFIC
I-75 STA 798+00 TO STA 845+00

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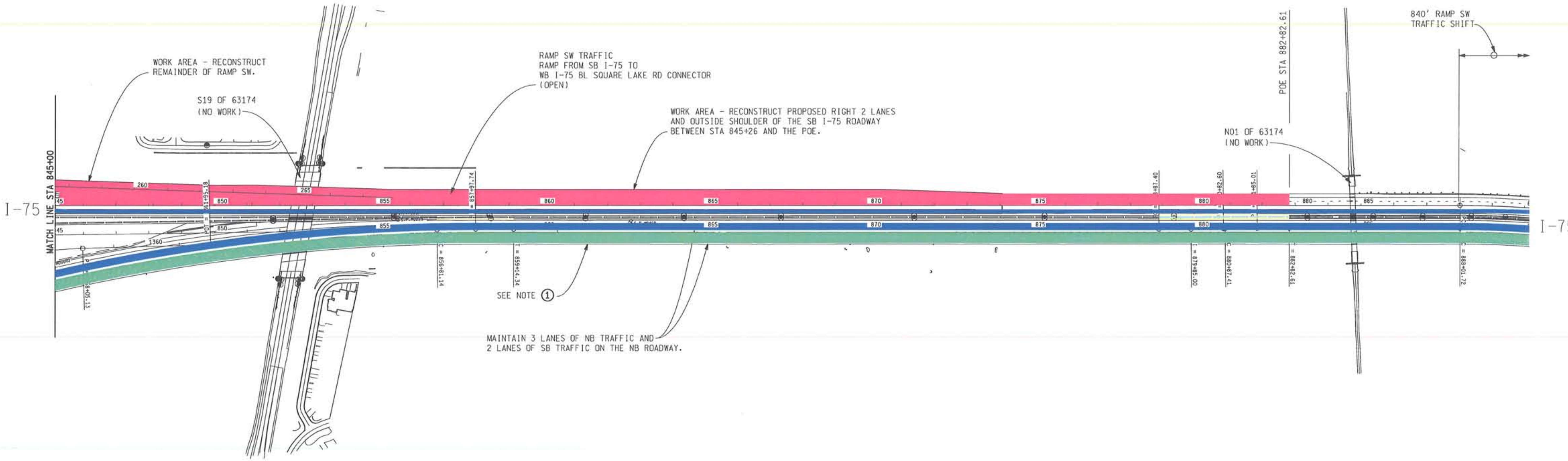
SOUTH BLVD



LEGEND

- WORK AREA
- NB I-75 TRAFFIC
- SB I-75 TRAFFIC

(1) MAINTAIN 2' MINIMUM SHY DISTANCE TO TEMPORARY OR PERMANENT CONCRETE BARRIER UNLESS NOTED OTHERWISE.

MAINTAIN 2' MINIMUM PAVED OUTSIDE SHOULDER FOR SB TRAFFIC WITHIN THE WORK AREA.

FIGURE 4-127
ALT 3: STAGE 3B MAINTAINING TRAFFIC
I-75 STA 845+00 TO STA 890+00

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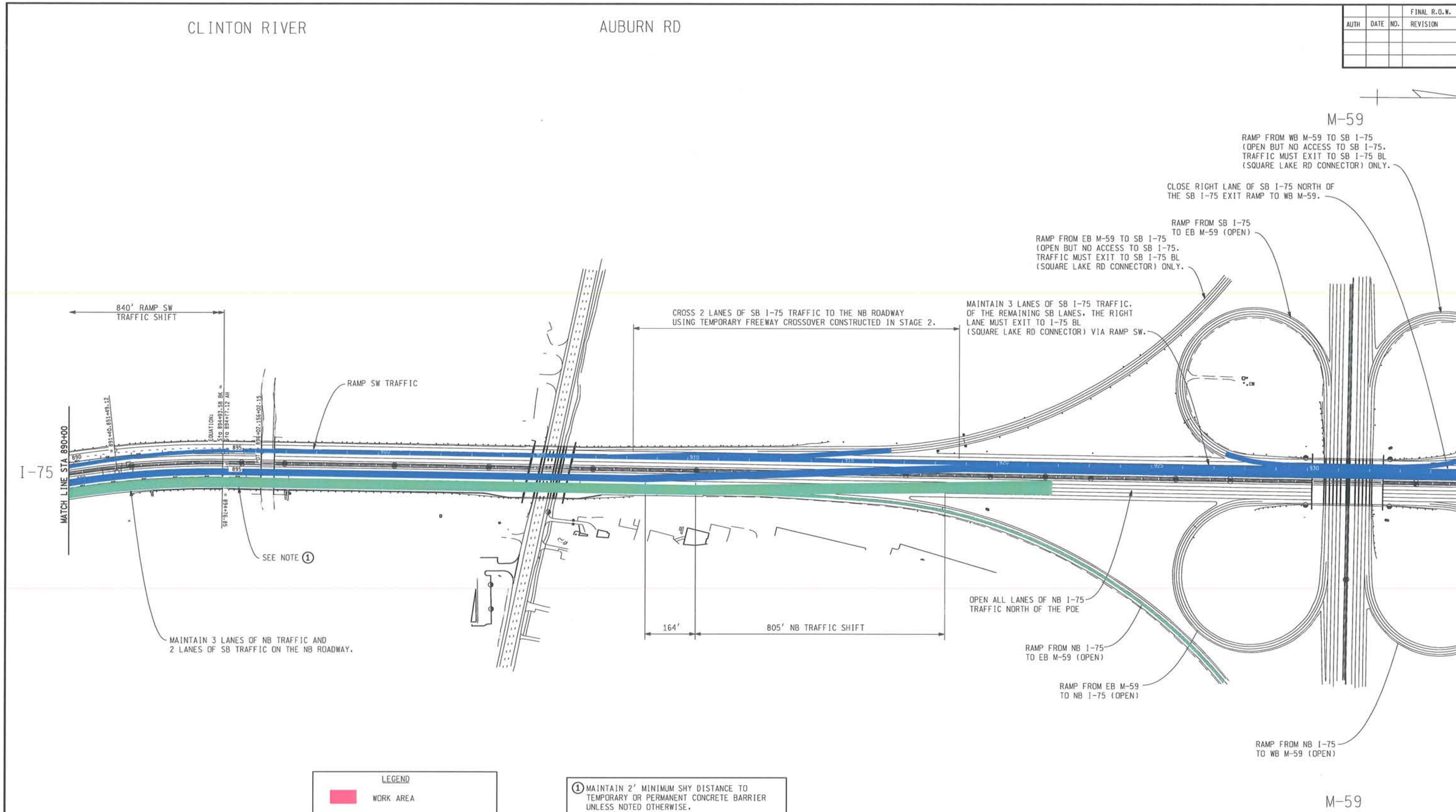

LEGEND

- WORK AREA
- NB I-75 TRAFFIC
- SB I-75 TRAFFIC

① MAINTAIN 2' MINIMUM SHY DISTANCE TO TEMPORARY OR PERMANENT CONCRETE BARRIER UNLESS NOTED OTHERWISE.

MAINTAIN 2' MINIMUM PAVED OUTSIDE SHOULDER FOR SB TRAFFIC WITHIN THE WORK AREA.

FIGURE 4-128
ALT 3: STAGE 3B MAINTAINING TRAFFIC
I-75 STA 890+00 TO M-59

CLINTON RIVER AUBURN RD

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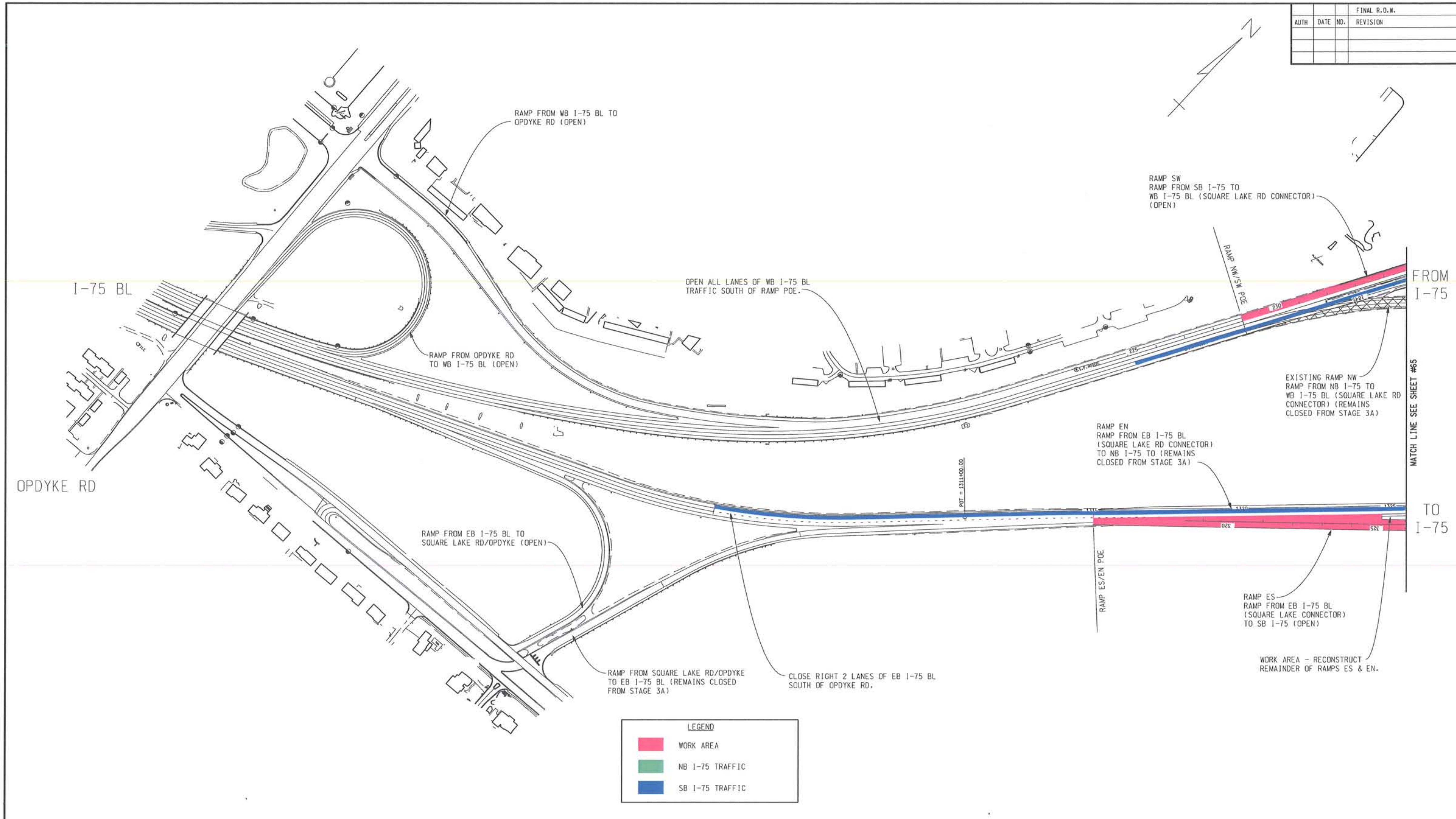

FIGURE 4-129
ALT 3: STAGE 3B MAINTAINING TRAFFIC
I-75 BL (SQUARE LAKE RD CONNECTOR)

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Stage 5 Traffic:
Stage 5 traffic schemes are shown on **Figures 4-130** through **4-133**.

Location of southern crossover: north of Adams Road

- Right lane of NB I-75 and HOV lane along NB I-75 closed south of Adams Road

Location of northern crossover: south of M-59
Left lane of SB I-75 closed south of ramp from SB I-75 to WB M-59

Ramp Closures and Detours:

- **Adams Road to NB I-75**
  Same detour as Stage 3

- **NB I-75 to WB I-75 BL (Square Lake Road) and Opdyke Road**
  Same detour as Stage 3

- **EB I-75 BL (Square Lake Road) to NB I-75**
  Same detour as Stage 3

- **Square Lake Road/Opdyke Road to NB I-75 via EB I-75 BL**
  Same detour as Stage 3

- **Square Lake Road/Opdyke Road to SB I-75 via EB I-75 BL**
  Same detour as Stage 3

Additional Stage 5 Traffic Notes:

- Maintain Ramp ES (ramp from EB I-75 BL/Square Lake Road to SB I-75) and Ramp SW (ramp from SB I-75 to WB I-75 BL) at all times.
- Maintain only one lane on Ramp ES and Ramp SW.
- The ramp from NB I-75 to EB M-59 is maintained by forming a ramp deceleration lane from the temporary freeway crossover at the north end.
- It is assumed that the HOV lane constructed in Segments 1 through 4 is in operation prior to construction of Segment 5.

Once the project is in the design phase, the following details can be further investigated for Alternative 3 for Segment 5:

- Advantage, if any, of the two options for Stage 3 traffic.
- Get approval of detour routes for ramp and roadway closures or investigate better alternatives depending on other construction projects within the area and with input from MDOT and local agencies.
- Need for traffic signal upgrades along local detour routes for ramp traffic.
- Need for utility relocations prior to construction.
- Use of temporary barrier gates for emergency access – cost already included in estimate.
- Locations for emergency shoulders and pull off areas – cost already included in estimate.
- Consider using temporary real-time work zone systems to aid and inform traffic during construction.
- Strategies for incident management and coordination with emergency response agencies.
- Strategies for community involvement and development of public information plan.

Advantages of Alternative 3 (for Segments 1 through 5):

- Better mobility than Alternatives 1 and 2 since freeway traffic is maintained on I-75 – as shown in the traffic simulation for each segment, as detailed in ***APPENDIX F: T-CONCEPTS TRAFFIC MODELING.***
- Lowest impact to other state trunklines and the local roadway system when compared to Alternatives 1 and 2.
- Local traffic can remain on I-75 and access their destinations via open ramps or ramp crossovers, which has the best local access compared to Alternatives 1 and 2.
- Lowest user delay costs since through traffic can remain on I-75.
- Contractor access and lay down areas will have minimal conflict with traffic due to closure of one side of the freeway – same as Alternative 2.
- MOT concept may apply to the southern section of I-75 between I-696 and south of 12 Mile Road.
- Alternative 3 meets the requirements of the Environmental Impact Statement.

Disadvantages of Alternative 3 (for Segments 1 through 5):

- Highest temporary construction cost when compared to Alternatives 1 and 2 due to additional temporary pavement and some bridge widening, temporary and ramp crossover construction, and use of more sheet piling (excluding user delay costs).
- Longest construction duration when compared to Alternatives 1 and 2 due to additional stages required to accommodate temporary freeway and bridge work prior to construction of the first half of I-75.
- Provides less room between traffic and the work area when compared to Alternative 2, causing more impact to Contractor operations .
- More traffic shifts and temporary crossovers than Alternatives 1 and 2.

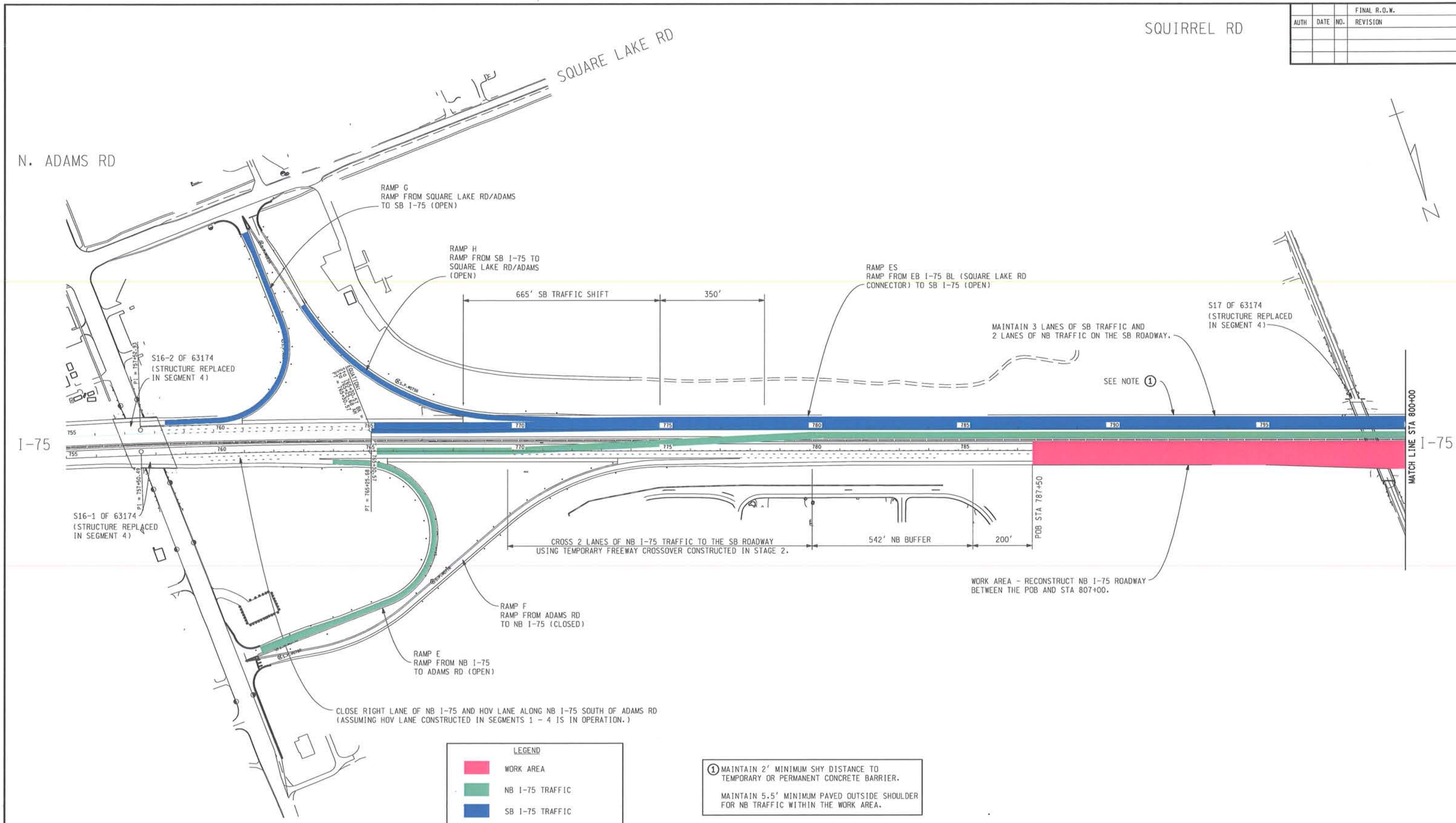

FIGURE 4-130

ALT 3: STAGE 5 MAINTAINING TRAFFIC

I-75 POB STA 787+50 TO STA 798+00

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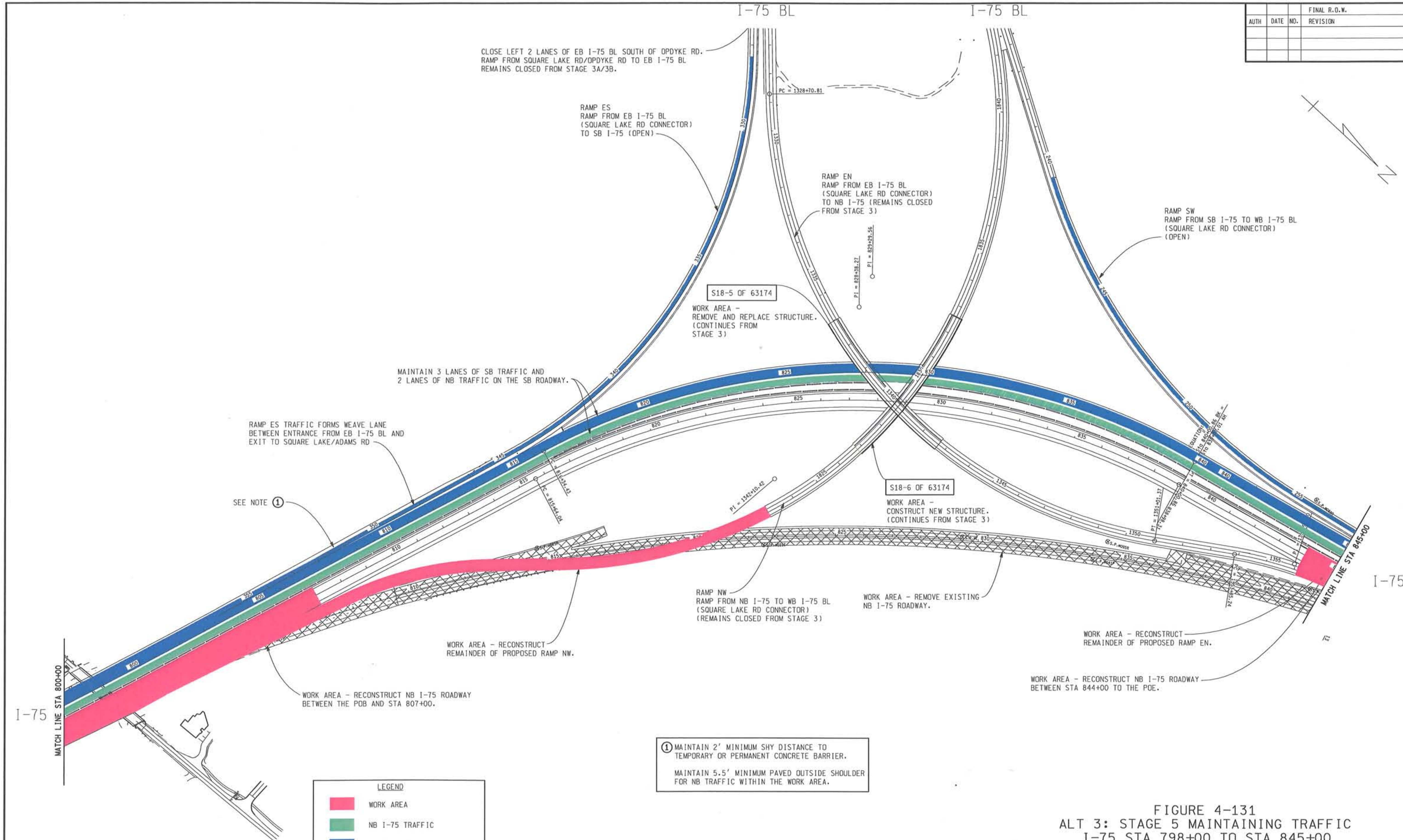

FIGURE 4-131
ALT 3: STAGE 5 MAINTAINING TRAFFIC
I-75 STA 798+00 TO STA 845+00

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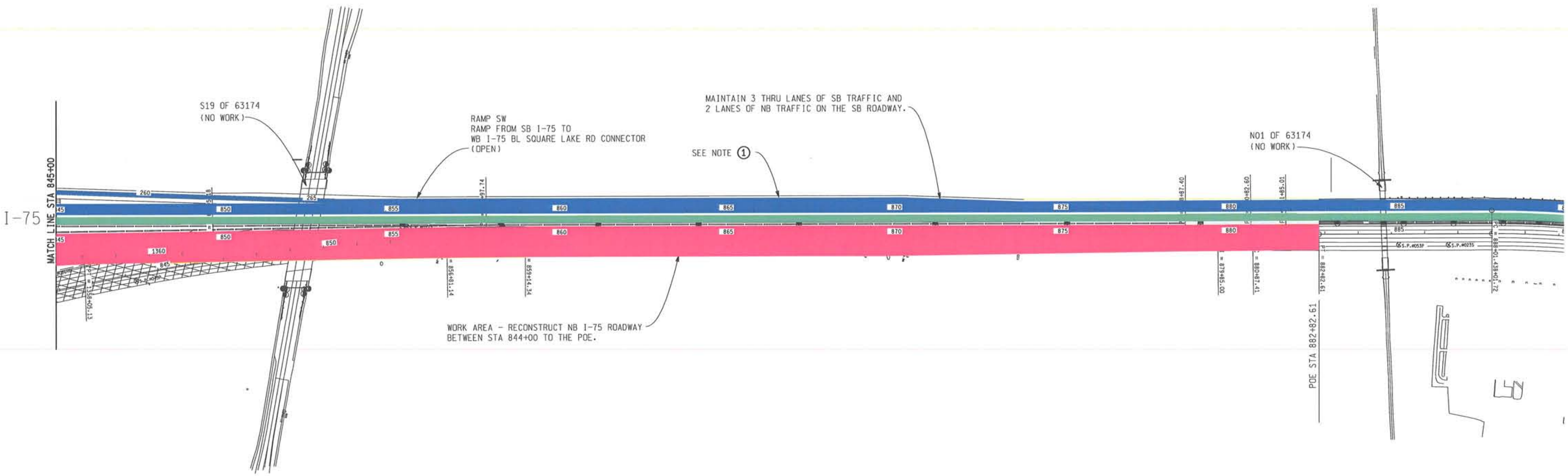

LEGEND

- WORK AREA
- NB I-75 TRAFFIC
- SB I-75 TRAFFIC

(1) MAINTAIN 2' MINIMUM SHY DISTANCE TO TEMPORARY OR PERMANENT CONCRETE BARRIER.

MAINTAIN 5.5' MINIMUM PAVED OUTSIDE SHOULDER FOR NB TRAFFIC WITHIN THE WORK AREA.

FIGURE 4-132
ALT 3: STAGE 5 MAINTAINING TRAFFIC
I-75 STA 845+00 TO STA 890+00

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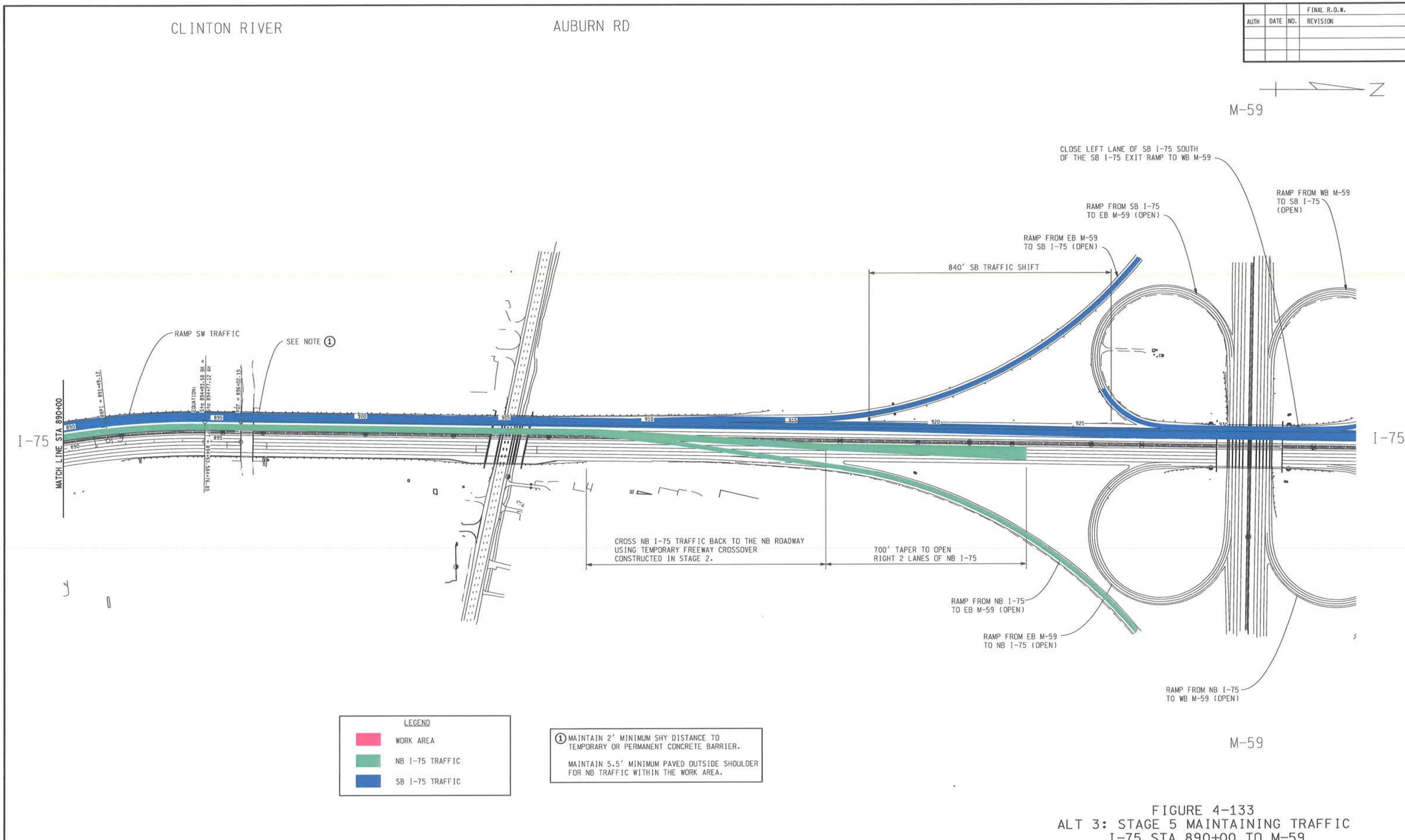

FIGURE 4-133
ALT 3: STAGE 5 MAINTAINING TRAFFIC
I-75 STA 890+00 TO M-59

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4.14.3.4 Alternative 4: Three Lane Operation Minimum in Each Direction of I-75 (Contra-Flow

Alternative 4 involves part-width construction of each direction of I-75 while maintaining a minimum of three NB lanes and three SB lanes.

Staging for Segments 1 through 4 is described below. Stages 3 through 6 are shown on **Figures 4-134** and **4-135.**

Segments 1 through 4 (south of 12 Mile Road to north of Adams Road):

Stage 1 Construction:
- Construct temporary pavement widening on the outside of the SB I-75 roadway within the segment(s).
- Remove all bridges carrying local roadways over I-75 within the segment(s) due to location of existing piers.

Stage 1 Traffic:
- Close right lane of SB I-75.
- Close local roadway traffic over I-75 due to closure of bridges carrying local traffic over I-75.

Stage 2 Construction:
- Construct temporary bridge widening on the NB median side of the bridges within the segment(s). A total of 26 structures for Segments 1 through 4.
- Construct temporary pavement widening on the median of the NB I-75 roadway within the segment(s).
- Construct temporary freeway crossovers within the segment(s).

Stage 2 Traffic:
- Close left lane in each direction of I-75.

Stage 3 Construction:
- Reconstruct the outside half of the NB I-75 roadway within the segment(s).
- Reconstruct all NB I-75 ramps within the segment(s).
- Reconstruct the outside half of all bridges carrying NB I-75 traffic over local roadways/waterways within the segment(s).

Stage 3 Traffic:
- Maintain three SB lanes and one NB lane on the SB roadway using temporary freeway crossovers as shown on Figure 4-134.
- Maintain two NB lanes on the median side of the NB roadway as shown on Figure 4-134.
- Close all NB I-75 ramps within the segment(s) under construction.

Stage 4 Construction:
- Reconstruct the median half of the NB I-75 roadway, including median barrier and valley gutters, within the segment(s).
- Remove temporary bridge widening and reconstruct the median half of all bridges carrying NB I-75 traffic over local roadways/waterways within the segment(s).
- Construct proposed bridges carrying local roadways over I-75.

Stage 4 Traffic:
Same as Stage 3 Traffic with the following changes:
- Maintain two NB lanes on the outside of the NB roadway as shown on Figure 4-134.
- Open all NB I-75 ramps (with exception of some entrance ramps).

Stage 5 Construction:
- Reconstruct the median half of the SB I-75 roadway within the segment(s).
- Reconstruct the median half of all bridges carrying SB I-75 traffic over local roadways/waterways within the segment(s).

Stage 5 Traffic:
- Maintain three NB lanes and two SB lanes on the NB roadway using temporary freeway crossovers as shown on Figure 4-135.
- Maintain one SB lane on the outside of the SB roadway as shown on Figure 4-135.
- Open all local roadway traffic over I-75.

Stage 6 Construction:
- Reconstruct the outside half of the SB I-75 roadway within the segment(s).
- Reconstruct all SB I-75 ramps with the segment(s).
- Reconstruct the outside half of all bridges carrying SB I-75 traffic over local roadways/waterways within the segment(s).

Stage 6 Traffic:
Same as Stage 5 Traffic with the following changes:
- Maintain one SB lanes on the median side of the NB roadway as shown on Figure 4-135.
- Close all SB I-75 ramps within the segment(s).

Stage 7 Construction:
- Remove temporary freeway crossovers.
- Restore existing freeway section outside the limits of the work area to existing configuration prior to construction.

Stage 7 Traffic:
- Maintain three NB lanes and three SB lanes in their respective roadways.
- Open all ramps.

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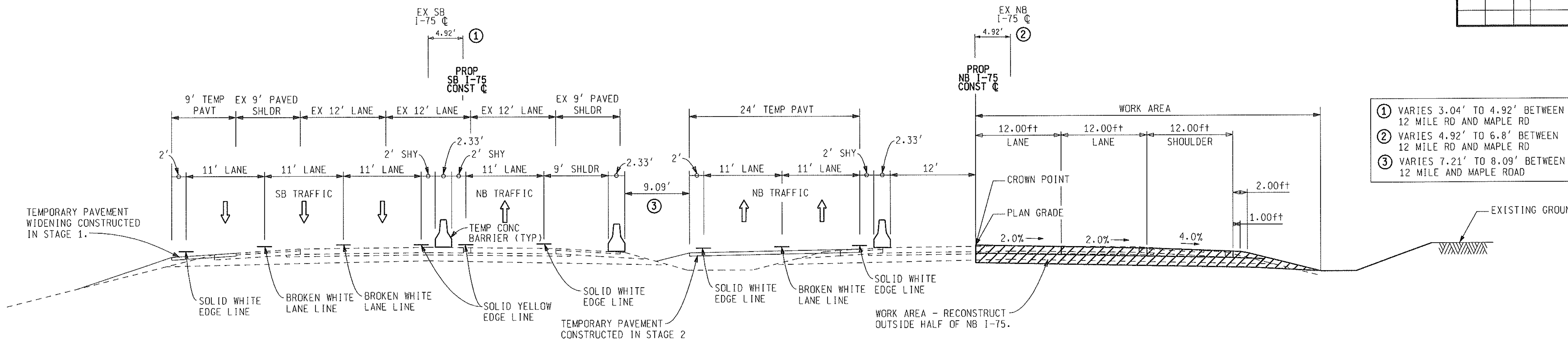
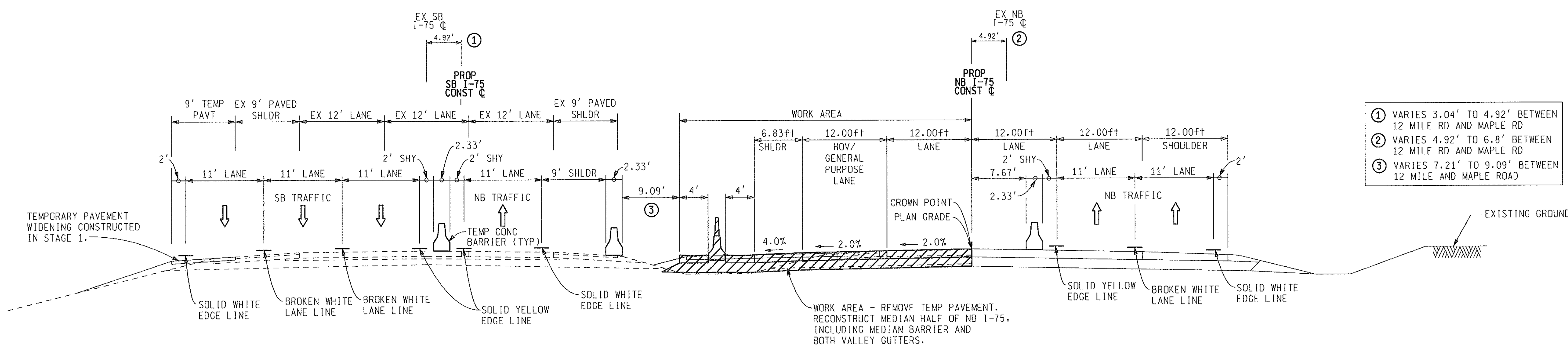


STAGE 3 MAINTAINING TRAFFIC TYPICAL

SEGMENTS 1 THROUGH 4
POB TO POE



STAGE 4 MAINTAINING TRAFFIC TYPICAL

SEGMENTS 1 THROUGH 4
POB TO POE

FIGURE 4-134
ALT 4: THREE LANE OPERATION (CONTRA-FLOW)
STAGE CONSTRUCTION TYPICALS

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SEGMENT 1 - 4, S. OF 12 MILE TO N. OF ADAMS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET NO. R.O.W	CONST.
12/2009	63174	88168C	DATTA		

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FILE NAME: Concept 4 SHT 1.dgn

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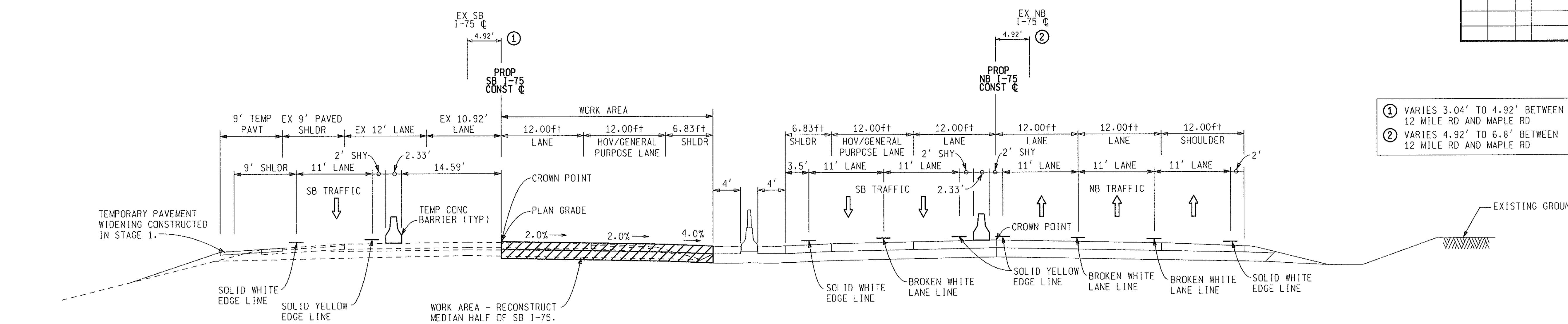
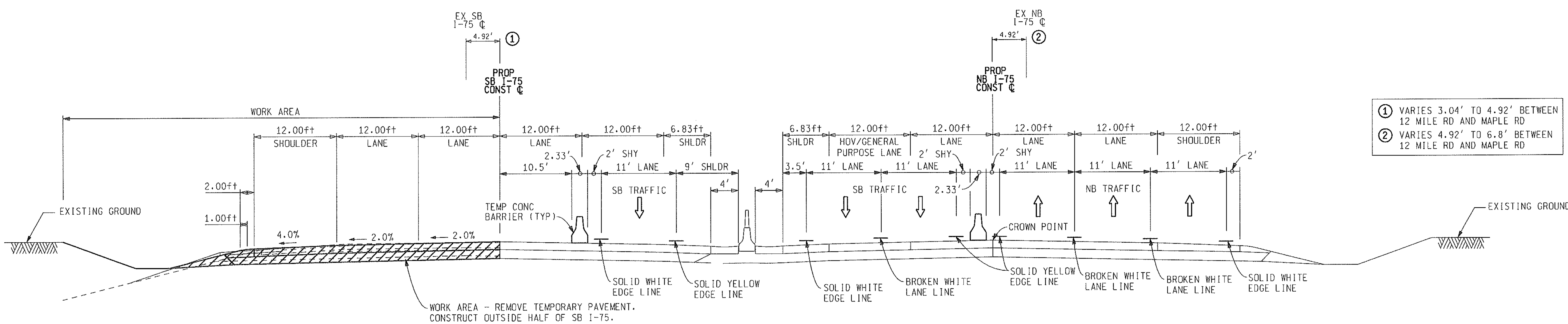


STAGE 5 MAINTAINING TRAFFIC TYPICAL

SEGMENTS 1 THROUGH 4

POB TO POE



STAGE 6 MAINTAINING TRAFFIC TYPICAL

SEGMENTS 1 THROUGH 4

POB TO POE

FIGURE 4-135

ALT 4: THREE LANE OPERATION (CONTRA-FLOW)

STAGE CONSTRUCTION TYPICALS

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SEGMENT 1 - 4, S. OF 12 MILE TO N. OF ADAMS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET NO. R.O.W	SHEET NO. CONST.
12/2009	63174	88168C	DATTA		

DATE: WORKED ON BY: DATE: CHECKED BY:

FILE NAME: Concept 4 SHT 2.dgn

Segment 5 (north of Adams Road to south of M-59):
Segment 5 is the least desirable application for Alternative 4. The proposed geometrics involve upgrading the I-75/Square Lake Road interchange by eliminating the existing left exit and left entrance ramps in favor of right exit and right entrance ramps. The ramp modifications result in realigning NB I-75, lowering SB I-75 and raising Ramp NW (ramp from NB I-75 to WB I-75 BL/Square Lake Road) via proposed structure S18-5. The interchange reconstruction also requires a massive amount of earthwork, removal of the existing S18 structure that carries SB I-75 freeway traffic, and closure of Ramp NW and Ramp EN (ramp from EB I-75 BL/Square Lake Road to NB I-75). Maintaining traffic on the existing SB I-75 roadway at the interchange is not feasible due to the construction of Ramp NW and Ramp EN bridges, which are the critical items in this segment.

Alternative 4 was not investigated further as a viable MOT concept due to the following reasons:

- Longest Duration compared to the other alternatives
  Alternative 4 involves 7 total stages of construction, with 4 main critical stages – compared to a maximum of 2 main stages for Alternatives 1 through 3. Construction time under Alternative 4 will be at least double that of Alternative 3, which already has the longest construction time when compared to Alternatives 1 and 2.

- Part-width Construction of 26 bridges
  The portion of I-75 between 12 Mile Road and M-59 includes 26 bridges which carry I-75 traffic over local roadways. Part-width construction of all 26 bridges will be required under Alternative 4. This is not ideal since bridge construction is usually a critical item that determines the duration of construction.

- Temporary Bridge Widening
  All 26 bridges will need to be temporarily widened, which adds to the duration of the construction.

- Temporary Sheet Piling
  Grade differentials between existing and proposed pavement will require more temporary sheet piling compared to the other alternatives due to maintaining six lanes of traffic.

- Drainage
  Maintaining positive drainage while constructing the proposed drainage will be difficult to do when constructing part-width. Temporary connections will be required to maintain existing drainage and construction of proposed drainage will need to be done in multiple stages.

- Highest Construction Cost
  Temporary construction costs will be the highest compared to the other alternatives due to the following reasons:
    - More temporary pavement widening required to maintain 6 lanes of traffic
    - Temporary bridge widening of all 26 structures required
    - More temporary sheet piling
    - More temporary drainage needs
    - More traffic control items like TCB required

- Difficult Contractor Access
  Part- width construction will require that Contractors work in the middle during Stage 2, 4 and 5, creating issues for Contractor access in the following ways:
    - Cause traffic delays when the Contractor enters and exits the work zone.
    - Limited Contractor lay down areas.
    - Some stages do not provide enough room for a haul road.
    - The use of temporary sheeting will further reduce access points for the Contractor.

- Temporary ramp crossovers will be difficult to maintain.

- Harder to combine segments into fewer contracts because of the duration of the staging for each segment

4.15 Summary of Traffic Modeling Results

Twelve scenarios were modeled including the existing baseline condition (Scenario 0) and three conceptual MOT alternatives using MOTSIM and the larger Regional SEMCOG Model. While the limits of the northern project extended from south of 12 Mile Road to south of M-59, the modeling effort needed to include the limits and work performed in the southern section (8 Mile Road to south of 12 Mile Road) as these future projects will continue to build on the additional geometric improvements (ramps, laneage, etc.) provided with the previous projects. Except for Segment 1, the construction of these two projects (north and south) is not anticipated to be done at the same time. Thus, unless the modeling results of the project to the south have relevance to the subject of this project, no additional detail for the modeling of the southern project limits is included.

The eleven scenarios (Scenarios 1 to 8) were modeled for the partial width alternative (Alternative 3). The additional scenarios modeled for the full and half closure alternatives (Alternatives 1 and 2) demonstrated the impacts the closure of various interchange ramps would have on network-wide traffic operations, using Regional Models. The closure of crossroad bridges over I-75 was not modeled, nor was the full or half (closure of one bound) closure of I-75 modeled with MOTSIM.

The MOT alternatives modeled by construction segment are in **Table 4-7**:

Table 4-7 MOTSIM Alternatives

SCENARIO #	CONSTRUCTION OPTION	CONSTRUCTION SEGMENT	CONSTRUCTION STAGE	ANALYTICAL TOOLS
0	Base Conditions			MOTSIM
1	Partial Closure	Segment 2	Stage 3	MOTSIM
2	Partial Closure	Segment 2	Stage 5	MOTSIM
3	Partial Closure	Segment 3	Stage 3	MOTSIM
4	Partial Closure	Segment 3	Stage 5	MOTSIM
5	Partial Closure	Segment 4	Stage 3	MOTSIM
6	Partial Closure	Segment 4	Stage 5	MOTSIM
7	Partial Closure	Segment 5	Stage 3	MOTSIM
8	Partial Closure	Segment 5	Stage 5	MOTSIM
9	Full Closure	Segment 2	-	TDM
10	Full Closure	Segment 5	-	TDM/HCS
11	Half Closure	Segment 2	-	TDM
12	Half Closure	Segment 5	-	TDM/HCS

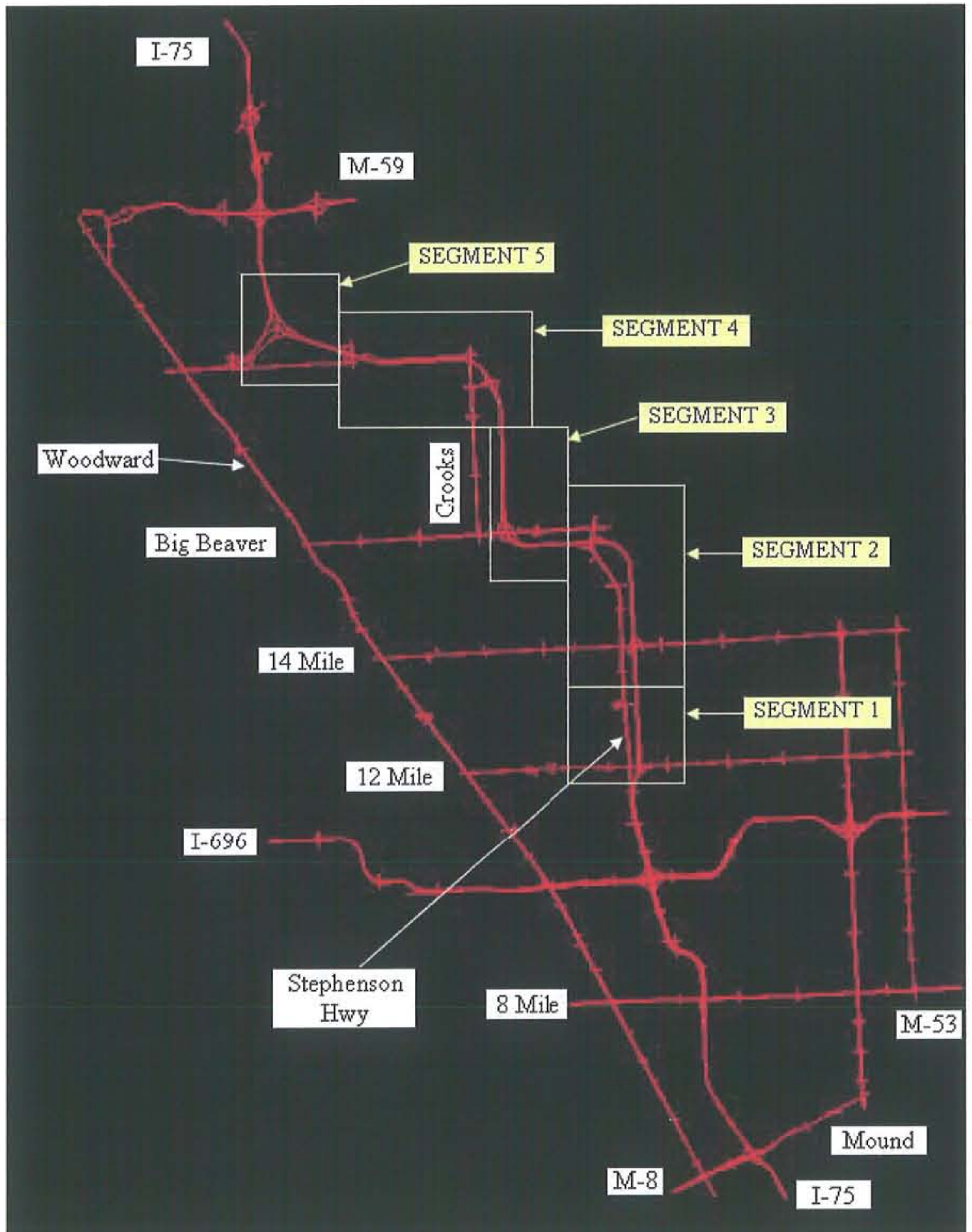

Figure 4-136 I-75 MOTSIM Network and Construction Segments

The baseline conditions model, **Figure 4-136** was used to evaluate and compare the results output from each of the MOT alternative models against existing conditions. This allowed for identification of differences in operation and significant operational deficiencies resulting from implementation of each. A summary table of the MOTSIM modeling assumptions and results obtained for the baseline and MOT alternatives with scenarios may be found in ***APPENDIX F: T-CONCEPTS TRAFFIC MODELING*** of this report. A brief synopsis of the finding for the baseline and MOT alternatives is include here, with user delay costs for the partial closure alternative (Alternative 3).

Baseline – Existing Conditions (Scenario 0)
I-75 travel times in the AM are 30 minutes for SB traffic and 25 minutes for NB traffic. I-75 travel times in the PM are 25 minutes for SB traffic and 30 minutes for NB traffic.

Alternative 1 and 2 – Full and Half Closure (Scenarios 9 to 12)
Scenarios 9 through 12 represent the modeling effort for MOT Alternative 1 - the Full Closure of I-75 during construction and MOT Alternative 2 - the Half Closure of I-75 during construction. Because of the requirement of a larger network size, the SEMCOG Regional Planning Model was used instead. Using construction segments 2 and 5, critical MOT areas were identified based on changes in assigned link volumes. Segment 5 (Square Lake Road (I-75BL) Interchange) was recognized to have a major bottleneck and a detailed Level of Service (LOS) analysis was performed. Delays were qualitatively estimated between very severe and extremely severe.

Therefore, MOT Alternative 1 has failed to provide the necessary work zone mobility especially at the I-75/M-59 interchange area. The LOS analysis shows that one weaving segment is expected to double its density, which already has LOS D and F during the base conditions.

MOT Alternative 2 is also expected to have severe congestion though slightly less severe, but similar in manner to the Full Closure construction alternative.

Alternative 3 – Part Width Closure (Scenarios 1 to 8)
The eight scenarios associated with the Part Width Alternative were subjected to detailed traffic operations analyses using the I-75 MOTSIM model. Many system wide performance measures were developed, including vehicle miles of travel (VMT) and vehicle hours of travel (VHT). Total delays were calculated by subtracting VHT estimates of the base conditions from those of the respective scenarios. Hourly congestion hotspot snapshots and minute-by-minute performance measure plots provide confirming visuals of observations. Uniform Daily AM+PM User Costs for each segment were also developed The user costs per segment are in **Table 4-8.**

Table 4-8 Uniform Daily AM + PM User Costs per Segment

CONSTRUCTION SEGMENT	SCENARIO #	CONSTRUCTION CLOSURE	DURATION OF CONSTRUCTION	DAILY AM+PM USER DELAY COSTS*
Segment 2	1,2	Partial Closure	1 yr	$329,500
Segment 3	3,4	Partial Closure	1 yr	-$1,000
Segment 4	5,6	Partial Closure	1 yr	72,000
Segment 5	7,8	Partial Closure	1 yr	55,000

*Note: Uniform daily AM+PM user delay costs were estimated based on the aforementioned assumptions after normalizing different construction durations. These estimates can be easily revised, if necessary, by changing assumptions in the accompanying spreadsheet.

While the traffic modeling performed during this project represent discreet options scoped to be modeled, various other MOT alternatives using different construction closure options for each segment was proposed and can be further explored during the design phase. In addition, during the final design phase further review each specific design package is recommended, as the project limits are better defined, adjacent roadway enhancement projects are completed, and the MOTSIM network is continually updated.

4.15.1 Preferred MOT Concept

The preferred MOT concept was selected using the decision matrix developed to evaluate the four MOT alternatives, as shown on **Figure 4-137.** The decision matrix looks at five main areas of concern encountered with major construction projects and goals that would ideally be met within those areas of concern. The goals were evaluated for each alternative and rated based on the following three categories:

- Meets Goal
- Partially meets Goal
- Does not meet Goal

The ratings of each alternative are not dependent on the other alternatives, i.e. all alternatives could be given a rating of “Meets Goal” for the same goal. The alternatives were then evaluated based on the goals that are met, partially met, and not met.

The five areas evaluated were:

- Safety
- Mobility
- Local Community
- Drainage
- Cost

Safety
The intent of safety goal evaluations are to rate alternatives for components that ensure the safety of both traffic and workers. The four goals aimed for include maximizing the separation between the traffic and the work zone, minimizing the number of traffic incidents on I-75, minimizing the number of traffic disruptions on a system-wide basis, and minimizing the number of crossovers needed.

Alternative 1 meets three of the safety goals, but does not meet the goal of minimizing system-wide incidents. Alternative 2 and 3 meet or partially meet all of the safety goals. Alternative 4 only meets the minimizing system wide incidents.

Mobility
The intent of mobility goal evaluations are to rate alternatives for components that mitigate impacts to the traffic both locally and system-wide. The seven goals aimed for include minimizing system-wide user delay, minimizing detour travel distance, minimizing congestion on I-75, minimizing system-wide congestion, minimizing construction duration, maximizing accommodation of special events, and maximizing cross street mobility.

Alternative 1 meets only two of the seven mobility goals, minimizing construction duration and maximizing cross street mobility and emergency response times. While Alternative 2, does not meet any of the mobility goals. These alternatives do not meet the mobility goals due to the full and half closure and detour of I-75, impacting the system-wide network. Alternative 3 meets or partially meets all of the seven mobility goals. While Alternative 4 meets over half the mobility goals, minimizing system-wide user delay, minimizing detour travel distance, and minimizing system-wide congestion.

Local Community
The intent of local community goal evaluations are to rate alternatives for components that directly impacts communities along I-75. The three goals aimed for; include maximizing access to businesses and residents, minimizing duration of ramp closures, and minimizing noise and dust.

Alternative 1 meets 1 of the 3 local community goals, which is minimizing the noise and dust. This is due to the full closure and detour of I-75, including access to and from the interchanges. Alternative 2 and 3 partially meet all of the local community goals and maximizing community commitment. Alternative 4 partially meets two of the local community goals because all traffic is maintained on I-75, serving access to the interchanges via open ramps.

Drainage
The intent of drainage goal evaluations are to rate alternatives for components that facilitate maintaining temporary drainage during construction. The two goals aimed for include minimizing the complexity of temporary drainage connections and maximizing the overall ease of maintaining positive drainage during construction.

Alternative 1 meets all drainage goals due to the full closure and detour of I-75, allowing the Contractor full access to the work area. Alternatives 2 and 3 partially meets both drainage goals due to the full closure of one direction of I-75, the side that needs to be built first to easily facilitate temporary drainage during construction. Alternative 4 will require a very complicated temporary drainage plan.

Cost
The intent of cost goal evaluations are to rate alternatives for components that minimize the total maintenance of traffic and construction cost. The nine goals aimed for include minimizing the number of construction stages, maximizing contractor work space for materials and delivery, minimizing off-site construction and signing, maximizing flexibility for contractor construction methods, minimizing public information plan effort, minimizing constructability issues, minimizing user delay costs, minimizing overall temporary construction cost (excluding user delay costs), and minimizing upgrades to detour routes. **Table 4-9** details the construction costs by construction segment and MOT Alternative.

Table 4-9 Maintenance of Traffic Construction Cost per Segment
(in 2009 Dollars)

	MAINT. OF TRAFFIC ALTERNATE 1	MAINT. TRAFFIC ALTERNATE 2	MAINT. OF TRAFFIC ALTERNATE 3	MAINT.OF TRAFFIC ALTERNATE 4
Segment 1	$535,727	$1,636,338 ($2,603,741)	$3,508,663 ($4,395,403)	Not Applicable due to constructability and cost issues.
Segment 2	$728,323	$2,365,634	$3,792,495	
Segment 3	$751,392	$2,320,795	$3,518,147	
Segment 4	$885,312	$2,682,971	$3,993,900	
Segment 5	$815,167	$2,092,683	$3,071,188	

*Note: For Segment 1, Alternate 2 and 3, "Option 1 (Option 2)" costs are shown.

These costs include where necessary; pavement widening and earthwork, MOT devices, temporary signal work, sheet piling, structure widening. They do not include any rehabilitation of local roads for detour routes. Detailed MOT cost derivations are included in ***APPENDIX G: COST ESTIMATES***.

Alternative 1 meets five of the cost goals due to the efficiency of construction resulting from full closure and detour of I-75. Alternatives 2 and 3 partially meet eight of the cost goals due to the efficiency of construction resulting from half closure and detour of one direction of I-75 in one stage and the partial closure of I-75. Alternative 4 meets four of the cost goals, minimizing off site construction and signing, minimizing public information plan effort, minimizing economic impact cost and minimizing local road improvement costs.

I-75 FROM 12 Mile TO SOUTH OF M-59 - MAINTENANCE OF TRAFFIC ALTERNATIVES EVALUATION MATRIX					
Goal: Identify a recommended alternative to optimize mobility, safety, duration and costs during construction					
CATEGORY	CRITERION	Alternative 1 Full Closure	Alternative 2 Half Closure	Alternative 3 2 Lanes Each Direction with Crossovers	Alternative 4 Contra flow 3 Lanes Each Direction
WILL THE ALTERNATIVE RESULT IN ACHIEVING THE GOAL OF:					
SAFETY	Maximizing separation between traffic and work zone	●	◒	◒	○
	Minimizing traffic incidents on I-75	●	◒	◒	◒
	Minimizing system-wide incidents	○	◒	◒	●
	Minimizing use of crossovers and laneshifts	●	◒	◒	○
MOBILITY	Minimizing system-wide user delay	○	◒	◒	●
	Minimizing detour travel distance	○	○	●	●
	Minimizing congesting on I-75	●	◒	◒	●
	Minimizing system-wide congestion	○	◒	◒	●
	Minimizing construction duration	●	◒	◒	○
	Maximizing accommodation of special event traffic	○	◒	◒	◒
	Maximizing cross street mobility / emergency response times	◒	◒	◒	◒
LOCAL COMMUNITY	Maximizing access to businesses and residents	○	◒	◒	◒
	Minimizing duration of ramp closures	○	◒	◒	◒
	Minimizing noise and dust	●	◒	◒	○
DRAINAGE	Minimizing complexity of maintenance of drainage during construction	●	◒	◒	○
COST	Minimizing the number of construction stages	●	◒	◒	○
	Maximizing contractor work space for materials and delivery	●	◒	◒	○
	Minimizing off site construction and signing	○	◒	○	●
	Maximizing flexibility for contractor construction methods	●	◒	◒	○
	Minimizing public information plan effort	○	○	◒	●
	Minimizing constructability issues	●	◒	◒	○
	Minimizing economic impact cost	○	◒	◒	●
	Minimizing overall construction cost	●	◒	◒	○
	Minimizing local road improvement cost	○	◒	◒	●
Meets Goal		12	0	1	9
Partially meets goal		1	22	22	5
Does not meet goal		11	2	1	10

Legend:

Meets Goal	●
Partially meets goal	◒
Does not meet goal	○

Figure 4-137 I-75 MOT Alternatives Evaluation Matrix

Recommended MOT Concept

Alternative 3 has only one "Does not meet Goal" ratings and has the most number of "Meets goal" and "Partially meets Goal" evaluations for the five areas selected. Therefore, based on the decision matrix alone, **Alternative 3 is the recommended MOT concept** for the northern section of the I-75 corridor from south of 12 Mile Road to south of M-59. However, using the results of the Decision Matrix alone, Alternative 2 should also be considered during the design phase.

However, URS, Access Engineering, Inc, and T-Concepts understand that the criteria for the decision matrix are subjective. Once the project is in the design phase and the MOT conceptual alternatives are reviewed, several other factors may result in the selection of a different recommended alternative. Some of these factors include but are not limited to the following:

- Input from MDOT, the local agencies, and the public
- The general MDOT plan for the region during the design phase, which could involve construction projects along other corridors that may depend on the I-75 corridor having an expedited construction schedule.
- Funding resources during the design phase
- Community needs

4.16 Develop ITS Initiatives and Strategies

I-75 runs from the Ohio border through Detroit and continues up the Lower Peninsula of Michigan through the Upper Peninsula to the International Bridge at Sault Ste. Marie. I-75 is a major commercial vehicle route, a major commuter artery, and the largest recreational route in the State. It is a major roadway for those traveling to the North Region on vacation resulting in considerable congestion during weekends and holidays. Regionally, it serves as a major connection of outer suburbs and northern Oakland County to job centers in southern Oakland County and as a connection of Oakland County to job centers in Wayne County. It also serves as a vital goods movement corridor for international, interstate, and intrastate commerce. Two other freeways that affect the I-75 corridor in the study area are M-59 to the north and I-696 to the south.

Previous Efforts

The *I-75 Corridor Study in Oakland County*, completed in November 2000, recommended improvements of several interchanges and arterials near I-75 as well as providing four through lanes on I-75, where needed, throughout Oakland County. The 2006 Final Environmental Impact Study (FEIS) considered MDOT's proposal to reconstruct I-75 by widening it from three lanes to four with a High Occupancy Vehicle (HOV) lane from M-102 (8 Mile Road) to South Boulevard and addressed what became the preferred alternative as well as other alternatives. The FEIS was a committed project within SEMCOG's 2030 Regional Transportation Plan (Long Range Transportation Plan – LRTP), as well as their Transportation Improvement Plan and MDOT's 5-year Transportation Plan.

The Regional Concept for Transportation Operations (RCTO) for Southeast Michigan was a management tool developed in partnership between SEMCOG, MDOT, and MSP. Completed in June 2007, the RCTO for Southeast Michigan includes: the mission, vision, and goals for regional operations; summarizes the key activities that have been conducted for developing an RCTO; identifies the top four RCTO objectives, which are the priority tasks to be fulfilled in the next three to five years to improve regional operations; and summarizes the major accomplishments of RCTO development in Southeast Michigan and presents future measures to be undertaken in this ongoing work.

Other Related Projects

Another related corridor project was the Great Lakes Intelligent Transportation System (GLITS) project that examined the feasibility of moving traffic in a multi-jurisdictional freeway and arterial corridor under certain conditions and scenarios. The GLITS project study area focused on the NB travel of I-75 from Square Lake Road to Lapeer Road and included Opdyke Road, a short portion of Lapeer Road, and the connecting roads that linked back to I-75.

Proposed Intelligent Transportation System

The ITS would be deployed, operating in conjunction with the proposed I-75 High Occupancy Vehicle (HOV) lanes, to help reduce travel delay and travel time uncertainty, to enhance safety, and to reduce the costs associated with travel. An ITS will help MDOT achieve these goals through the rapid detection and response to incidents and dissemination of incident, roadway condition, and travel time information to motorists and other stakeholders including, but not limited to local communities, law enforcement and public safety agencies, commercial fleets, and broadcast media. The following ITS elements are included in this project: Dynamic Message Signs (DMS), Closed Circuit Television (CCTV) cameras, Vehicle Detector Stations (VDS) and a Communications System. The Freeway Service Patrol also operates in this area.

DMS will be used to inform motorists of slow traffic ahead/queues, incidents ahead, road closures, and to inform motorists of travel times to key locations. The CCTV cameras of the Surveillance System will be used to monitor the roadway operations with cameras positioned to provide full coverage of the roadway along the corridor. Vehicle detectors will be placed at regular intervals on the roadway to determine congestion levels and the occurrence of incidents. The communications system will connect all ITS elements within the project area and connect these elements to the Michigan Intelligent Transportation System Center (MITSC) in Detroit. The field devices will be operated and monitored by operators at MITSC.

Purpose

Metro Region Operational Vision

The MDOT Metro Region shares the same mission and vision as all of MDOT with respect to the application and use of Intelligent Transportation Systems (ITS). The MDOT ITS mission statement is as follows:

"Develop and sustain a program at MDOT to improve safety, operational performance and integration of the transportation system utilizing Intelligent Transportation System technologies for economic benefit and improved quality of life."

The MDOT vision is fourfold and is comprised in the following statements:

- MDOT integrates and manages ITS into Michigan's transportation systems in a sustainable way, enabling our customers to experience improved system safety, mobility and reliability.
- MDOT is a leader and an effective partner in ITS research, development, deployment, operation, and maintenance.
- MDOT continues to lead in the research, development and sustained deployment of Vehicle Infrastructure Integration (VII).
- MDOT's ITS program is integrated statewide, and coordinated fully and seamlessly into MDOT's business processes.

Although the other points align with the I-75 engineering report, the first vision statement has the most bearing on this project. As part of the vision, MDOT also has various strategic goals and objectives to achieve its vision and mission. Building new partnerships and strengthening existing partnerships within the ITS community to optimize resources and improve product quality is one of the key strategic goals and objectives.

ITS Components

Existing ITS Field Infrastructure – A portion of the ITS deployment in the study area is currently under construction. The following ITS devices will be operational by the fall of 2009:

- I-75 and I-696: upgraded communications
- I-75 at 13 Mile Road: DMS for southbound traffic
- I-75 at 14 Mile Road: CCTV and MVDS.
- I-75 at Rochester Curve: CCTV
- I-75 at Lowry Tower: upgraded communications
- I-75 at Big Beaver: CCTV and (2) MVDS
- I-75 at Wattles Road: DMS for southbound and northbound traffic
- I-75 at Long Lake: CCTV and MVDS
- I-75 at Crooks Road: CCTV

The existing ITS field devices are supported by wireless communications infrastructure.

Michigan Intelligent Transportation System Center (MITSC)

The existing ITS infrastructure is operated from the MITSC in downtown Detroit, a facility that is shared with the Michigan State Police (MSP) Dispatch Center and several private traffic data firms. The Freeway Courtesy Patrol (FCP) is also managed from the MITSC, providing roadside assistance to motorists. The FCP has recently been expanded and services nearly 300 miles of regional freeway. MITSC is the hub of MDOT ITS technology applications for southeast Michigan. It is a world-class traffic management center where staff oversees a traffic monitoring system composed of 200 freeway miles instrumented with approximately 166 CCTV cameras, 72 DMS, and 2500 traffic detectors.

MITSC includes an integrated software system includes device control, incident management functions, and Advanced Traveler Information System (ATIS) capabilities. MITSC is connected to a complex hybrid communications system comprising fiber optic ring backbone, five microwave communication hubs/towers, four node towers on the periphery of the system, more than 135 spread spectrum radio links, and coaxial cable. Additionally, MITSC is connected to the Road Commission for Oakland County Traffic Operations Center through a center-to-center link to facilitate area wide management of traffic across jurisdictions.

MDOT is in the process of replacing the central software and hardware with a statewide Advanced Traffic Management Systems.

Design Parameters for ITS Components

High level design parameters for the various ITS elements were developed based on previous ITS design experience with MDOT projects and a review of existing and ongoing ITS projects along the I-75 corridor. These design parameters cover DMS, CCTV, VDS, cabling infrastructure, communications networks, and maintenance considerations. The parameters detail the purpose of the ITS elements, the spacing of these elements, and the need to maintain distances between other ITS elements. In summary, the following high level design parameters were used.

Dynamic Message Signs

Dynamic message signs (DMS) are used to warn drivers of upcoming traffic conditions (traffic queues, lane blocking incidents, etc.) and expected travel times. The DMS for this project will consist of full size signs posted on the right side of I-75.

DMS are typically placed according to the following summarized parameters:

- At decision points in advance of major interchanges where diversion may need to take place
- At intermediate points between major interchanges so that motorists may choose to use alternate routes

The DMS interface shall be compliant with the National Transportation Communications for Intelligent Transportation Systems Protocol (NTCIP), or equivalent.

Surveillance System

Closed Circuit Television (CCTV) cameras are used to confirm detected roadway conditions such as those dealing with congestion and incidents. Operators will also use them to monitor the progress of an incident. For this project, it was determined that full motion video will be provided in accordance with MDOT practice.

CCTV cameras are typically placed according to the following summarized parameters:

- Provide 100% coverage within urban areas
- Mount cameras beyond outside shoulder areas
- Provide full pan/tilt/zoom
- All poles will be at a standard mounting height, which is 85 feet for new CCTV cameras
- All camera locations will be designed to allow maintenance of the camera including parking of maintenance vehicles close to the location without the necessity of closing any highway lanes.
- Camera and cabinet shall be easily accessible for maintenance activities

Vehicle Detector Stations

Vehicle detectors are commonly used to collect speed, volume, and occupancy data. Certain types can also be used to collect vehicle classification data. Detection technology will be as determined by MDOT at the time of installation.

Vehicle detectors are typically placed according to the following summarized parameters:

- Provide detection for each traveled lane
- Space mainline detectors at a maximum of 2 mile spacing, or at key locations for collecting data for traffic monitoring and traveler information

Cabling Infrastructure
Handholes are used to splice cable, provide pull points for cable installation, and to provide slack cable.

Typical design parameters for handholes are summarized below:

- Handholes shall be placed at a maximum spacing of 500 feet
- Handholes shall be placed prior to and after any road crossing
- Handholes shall be placed at any change in direction of conduits
- Handholes are typically to be installed on the outside edges of the roadway, beyond the shoulders. In areas of retaining walls where the shoulder runs up to the retaining wall, consideration may need to be given to locating the cable runs at the top of and behind the retaining wall.
- All handholes and maintenance holes must be easily accessible for maintenance purposes.

Conduit is used to provide a protected path for communications/control cabling and power cabling. Typical design parameters for conduit are summarized as follows:

- All conduit shall be sized to meet the proposed cabling but shall have no more than a 26% fill to allow for future cables and be the minimum size, whichever is larger
- Conduit crossing requirements for mainline roadways shall be a minimum of 2-3 inch conduits
- Conduit which serves backbone communications shall be a minimum of 2-3 inch conduits
- The minimum conduit size is 2 inches for electric service cables
- Conduit for various uses (power, communications/control) are to be placed in common trenches where possible with the cabling (power, communications/control) in separate conduits
- Longitudinal conduit is not required to be on both sides of the roadway
- The number of freeway crossings shall be minimized
- One spare conduit shall be provided on the backbone and one spare conduit for power

Communications
The communications network will be used to link the various ITS elements. Typical design parameters for the communications network are summarized below:

- The communications system will require use of a high bandwidth medium
- Redundant communications are to be provided down to the cabinet level. This redundancy shall be provided through additional fibers and not by additional conduits.
- Drop cables are to be run to each ITS element from the backbone cable
- Communications shall be Ethernet/IP based
- The need for a communications hub shall be determined during the detailed design
- Splices shall be minimized based on a properly calculated splice budget.

Maintenance Considerations
Typical maintenance requirements for the ITS include the following:

- ITS elements are to be installed within the right-of-way, including the portion of the electric service for which MDOT is responsible for maintenance.
- Preferably, ITS elements are to be installed outside the clear zone. Where ITS elements cannot be installed without providing the necessary lateral clearance to meet the clear zone requirements, guard rail is to be used to protect the elements.
- All ITS elements are to be accessible for maintenance without the need to close travel lanes
- Maintenance sites (including gravel, drainage modifications, and/or access roads) will be used only as a last resort to provide maintenance access.

Interface Requirements

To facilitate the interface between the field equipment and MITSC, I-75 ITS devices shall meet the MDOT ITS Special Provisions.

Partner Agencies
MDOT regularly works with the partner agencies in the project area, and reaches out on an annual basis with the Public Incident Responder Safety Workshop through the coordination efforts supported by the Michigan Intelligent Transportation Systems Center (MITSC). The MITSC is co-located with the MSP Second District Regional Dispatch, which has created a close and cooperative relationship with respect to sharing information and incident management.

The Auburn Hills and Troy Police Departments participate in incident management on freeways within their local jurisdictional boundaries. They have implemented quick clearance procedures that allow police officers and first responders to remove disabled vehicles from freeways in an expeditious manner. MDOT has also partnered with Bloomfield Township on many incidents in the I-75 and US-24 Business Route (BR) (Square Lake Road) interchange. MDOT has also dealt with the Madison Heights Police Department and the Oakland County Sheriff's Office. Within the project limits, local police departments, the Oakland County Sheriff's Office, and the MSP patrol the freeway.

There are several users of the I-75 corridor, including commuters, transit operators, and commercial vehicle operators. To capture and address the needs of users, several agencies, facilities, as well as MDOT have been identified as potential stakeholders in the development of the project. The potential stakeholders and their roles are listed below:

- MDOT – Project Lead
- Southeast Michigan Council of Governments (SEMCOG) – Metropolitan Planning Organization (MPO), maintains the Regional ITS architecture and leads the RCTO efforts
- Road Commission for Oakland County (RCOC) – Maintains and operates traffic signals and County-owned Advance Traffic Management System (ATMS) in the county, except for four cities (Royal Oak, Ferndale, Holly, and portions of Pontiac)
- Road Commission of Macomb County (RCMC) – Maintains and operates traffic signals and County-owned ITS devices in the county
- Suburban Mobility Authority for Regional Transportation (SMART) – Operates the transit system
- City of Auburn Hills Police Department – Operates local law enforcement and emergency responders for incident response

- City of Troy – Maintains local transportation system; Operates local law enforcement and emergency responders for incident response
- Michigan State Police (MSP) – Operates law enforcement, security, and crash investigation on the freeway
- Local Agencies – Maintain local transportation system; Operates local law enforcement and emergency responders for incident response. These agencies include: Pontiac, Auburn Hills, Troy, Rochester Hills, Bloomfield Hills, Birmingham, Sterling Heights, Royal Oak, Madison Heights, Oak Park, Hazel Park, Ferndale, Pleasant Ridge, Huntington Woods, Warren, and Clawson
- Traffic Improvement Association (TIA) of Michigan – Assist in addressing, educating, and enforcing safety issues caused by crashes and congestion
- Oakland County Emergency Response & Preparedness, Oakland County – Provides response, and mitigation for emergencies or disasters affecting Oakland County
- The Palace of Auburn Hills – Entertainment facility that implements event management strategies during events

ITS Planning Within the Project Area

A related project was the development of the **I-75 Integrated Corridor Management (ICM) Concept of Operations** by Kimley-Horn & Associates of Michigan. The purpose of this project was to develop a Concept of Operations for an integrated corridor management (ICM) program along the I-75 corridor in Wayne and Oakland Counties, between approximately Michigan Route 102 (8 Mile Road) and the Lapeer Road Connector. ICM is intended to integrate services through collaboration and coordination among State and local agencies. With ICM, the various institutional partner agencies manage the transportation corridor as a system – rather than the more traditional approach of managing individual assets. They manage the corridor as an integrated asset in order to improve travel time reliability and predictability, help manage congestion and empower travelers through better information and more choices. The resulting concept of operations document described the physical, institutional, and operational framework for integrated corridor operations and management to optimize corridor operations under non-incident conditions as well as during incident and weather conditions that cause significant reduction in capacity. It identified goals, objectives, and performance measures for integrated corridor management as well as documents the operational strategies, additional institutional agreements, high-level system requirements for arterial management and ITS infrastructure, and implementation strategies required to achieve them. The project followed recent FHWA guidance for the development of ICM Concepts of Operations and methodologies developed by the MDOT for the I-696 corridor ICM pioneer site application to FHWA (as referenced previously in the Previous Efforts section). Major project activities included:

- The assemblage, review, and synthesis of existing reports and data
- Final definition of a project study area
- Identification of project stakeholders
- Identification of current and forecast corridor capacity and demand
- Inventory and description of current and planned institutional relationships, operational tactics and strategies, and transportation management and ITS infrastructure in the corridor
- Detailing of prevailing legislative conditions and operating agreements in the corridor
- Coordination with current studies and projects including the Southeastern Michigan Council of Government (SEMCOG) regional ITS architecture update; SEMCOG's regional transportation plan (RTP); the Southeastern Michigan Snow and Ice Management (SEMSIM); the I-75 Corridor Study FEIS and ROD; upgrade and expansion activities of the MDOT ITS infrastructure and Michigan ITS Center (MITSC); MDOT's arterial management system upgrade and retiming efforts; deployment, retiming, and system upgrade activities to the City of Detroit and Oakland County Advanced Traffic Management Systems (ATMS); and ongoing Vehicle Infrastructure Integration (VII) development within and adjacent to the corridor
- Stakeholder coordination and engagement including stakeholder workshops
- Development of ICM vision, goals, and objectives
- Development of use case scenarios
- Development of a draft ICM Concept of Operations
- Development of institutional framework and an institutional action plan
- Development of corridor ICM performance measurements
- Development of high-level system requirements, high-level ITS infrastructure needs, and high-level system functional design
- Final ICM Concept of Operations

Other I-75 ITS Deployments

There has historically been a gap in the existing ITS infrastructure along I-75 in the City of Troy, which dates from ITS field device deployment decisions made in the 1990s. This gap has often been referenced as the "Troy Hole." MDOT has recently deployed additional ITS field devices in the project area, including the following:

- In 2006, two cameras were installed in Troy: one on the Lowry Tower (south of Metro Parkway and west of I-75), and another in the I-75 median just south of Metro Parkway on an existing pole.
- Another recent infill project has installed an ITS pole along I-75 at Long Lake Road.
- Additional ITS devices will become operational in the fall of 2009 within the project limits, as noted in an earlier section of this report.
- The June 30, 2009 Road Weather Information Systems Framework Concept of Operations by SRF Consulting Group recommended RWIS be installed along I75. If these elements are approved, they will need to be taken into account during the detailed design of the ITS.

ITS Deployment Concept

As noted previously, various ITS elements will be used to monitor and operate I-75. In addition, HOV lanes will be added in both directions.

The construction of these will require widening the roadway from three to four lanes in each direction and the removal or relocation of most if not all of the existing ITS field equipment in the project area. The construction will allow for deployment of surveillance, detection, and communication equipment in a manner and configuration consistent with the rest of the region's ITS and in line with MDOT's current best practices. The following subsections discuss incident management and the various ITS components of the I-75 ITS Concept.

4.16.1 Incident Management Routes

MDOT's current policy is to detour any I-75 construction or incident diversion traffic to other state roads or trunklines. Based on this policy, the incident management routes for the project limits would utilize US-24 (Telegraph Avenue), M-1 (Woodward Avenue), US-24 BR (Square Lake Road), M-59 (Veterans Memorial Highway), and M-53 (Van Dyke Avenue). The incident management routes that utilize MDOT roadways are the following:

- NB I-75: WB I-696, to NB M-1, to EB US-24 BR, to NB or SB I-75.
- Alternate NB I-75 route: EB I-696, to NB M-53, to WB M-59, to NB or SB I-75.
- SB I-75: WB US-24 BR, to SB M-1, to EB I-696, to SB I-75.
- Alternate SB I-75 route: EB M-59, to SB M-53, to WB I-696, to NB or SB I-75.

In certain circumstances, where roadway capacity and geometrics allow, MDOT has routed I-75 traffic onto local roads. One example of this scenario has been the use of Mound Road between I-696 and M-59, which is under the jurisdiction of the Road Commission of Macomb County. One final pair of routes, therefore, is the following:

- NB I-75: EB I-696 to NB Mound Road, to WB M-59, to NB or SB I-75, and
- SB I-75: EB M-59 to SB Mound Road, to WB I-696, to NB or SB I-75.

In addition, Opdyke Road between Square Lake Road (I-75 BL) and M-59 has previously been used as a diversion route.

As taken from the I-75 Integrated Corridor Management (ICM) Final Concept of Operations report issued in June 2009 prepared by Kimley-Horn and Associates in association with Cambridge Systematics, various arterial routes are planned to be potential alternate routes of I-75:

- M-53 (Van Dyke Road)
- Mound Road
- Dequindre Road
- M-150 (Rochester Road)
- M-1 (Woodward Avenue)
- M-59
- Lapeer Road
- Opdyke Road
- Square Lake Road
- Big Beaver Road (16 Mile)
- Stephenson Highway

The strategies involved in the ICM are at a high-level design phase intending to provide a shared vision of how the system will practically operator and be maintained.

4.16.2 Dynamic Message Signs

The heavy volumes at peak periods mainly comprise commuters from the area northeast of Detroit and of vacation travelers between southeast Michigan and popular destinations to the north. Daily recurring congestion during the morning and afternoon periods is common heading to and from the Detroit metropolitan area. Vacation traffic is particularly acute on Friday and Sunday afternoons. As a result the design will aim to provide travel times via DMS for travelers along the major corridors to motorists, information on traffic conditions in real time and in some cases help them take alternate routes.

Dynamic Message Signs (DMS) - DMS will be used to inform motorists of slow traffic ahead, incidents ahead, and travel times. DMS will be placed on the mainline of I-75 at decision points, in advance of potential backup locations, and at key locations for travel times. All DMS will be mounted on the side of the road. With these points in mind, and consistent with the design parameters previously referenced, it is proposed DMS be placed at the following locations.

- DMS placed at:
  - Northbound I-75 near:
    - 11 Mile Road
    - 13 Mile Road
    - Rochester Road
    - Wattles Road
    - Coolidge Highway
  - Southbound I-75 near:
    - Adams Road
    - Wattles Road
    - Livernois Road
    - 13 Mile Road

4.16.3 Freeway Surveillance

Closed Circuit Television (CCTV) Cameras – CCTV cameras will be used to monitor the roadway operations. Cameras will be positioned to provide full coverage of the roadway. Cameras will provide full pan/tilt/zoom capability, and, as a secondary consideration, will provide viewing of ramps and cross streets. With these points in mind, and consistent with the design parameters previously referenced, it is proposed CCTV cameras be placed at the following locations.

- CCTV cameras placed at:
  - 12 Mile Road
  - 13 Mile Road
  - 14 Mile Road
  - Maple Road
  - Curve between Maple Road and Rochester Road
  - Rochester Road
  - Livernois Road
  - Big Beaver Road
  - Wattles Road
  - Long Lake Road
  - Crooks Road
  - Coolidge Highway
  - Adams Road
  - Square Lake Road

4.16.4 Vehicle Detection Stations

Vehicle Detection Stations (VDS) – Vehicle detectors will be placed at regular intervals spaced approximately every 2 miles and/or at key locations for collecting data for traffic monitoring and traveler information on the roadway. The VDS will provide detection for each traveled lane. The vehicle detectors will be monitored to determine congestion levels and the occurrence of incidents. The vehicle detection system will be capable of providing speed, volume, occupancy, and vehicle length classifications. With these points in mind, and consistent with the design parameters previously referenced, it is proposed vehicle detection stations be placed at the following locations.

- Vehicle detection stations placed at:
  - 12 Mile Road
  - 14 Mile Road
  - Curve between Maple Road and Rochester Road
  - Big Beaver Road
  - Long Lake Road
  - Crooks Road
  - Adams Road
  - Eastbound Square Lake Road to southbound I-75 ramp interchange
  - Northbound I-75 to westbound Square Lake Road ramp interchange
  - Eastbound Square Lake Road to northbound I-75 ramp interchange
  - Southbound I-75 to westbound Square Lake Road ramp interchange

4.16.5 Communication System

Communications will consist of a single mode fiber optic cable system within the project area, since the proposed widening of I-75 will provide MDOT the opportunity to replace the slower and less reliable wireless communication links by adding conduit and fiber-optic communications at a relatively low cost. A communications hub will be connected (by MDOT) to the MITSC via its existing fiber-optic ring. (The necessity for a communications hub will be determined during the detailed design.) Connections to other systems and users are expected to be made from the MITSC. The communications network shall provide sufficient bandwidth to support full motion video at 30 frames per second simultaneously from each camera as well as data from all field devices and provide a two-way path for command and monitoring of all field devices. In addition, the communication system will provide spare bandwidth for additional ITS infrastructure and to support future interconnection with municipal systems.

The communications system will provide redundancy to the field cabinet level. Redundant fibers and equipment are required but redundant fibers can be in the same conduit (i.e. geographic redundancy is not required).

4.16.6 Operational Requirements

Partner Agency Roles

Similar to current practice, MDOT's partner agencies will support freeway operations activities based on the RCTO framework. Further deployment of the I-75 ICM concept may influence the roles and responsibilities of the partner agencies, and it may be possible that additional agencies are involved to support additional incident management routes.

Incident Management

Similar to current practice, emergency responders, local police, county sheriff, state police, and the freeway courtesy patrol will provide incident management support. Further deployment of the I-75 ICM concept may influence the responsibilities of the partner agencies.

Operations Staffing

Similar to current practice, the MITSC control room staff will operate the ITS field devices and support coordination within MDOT, MSP, and MDOT's partner agencies. No additional staff will be necessary. The MITSC control room staff is funded by MDOT. The ITS management software that MDOT is currently deploying statewide is intended to be flexible and scalable, so that there should not be a significant cost related to adding additional ITS field devices to the MITS.

Maintenance

Similar to current practice, MDOT will contract with a prequalified third-party electrical contractor to maintain the I-75 ITS using its existing contract mechanisms. There will be a cost associated with maintaining the additional ITS devices beyond those devices already deployed. The Michigan Department of Information Technology (MDIT) will be involved with the continuing development and maintenance of the communications infrastructure associated with ITS.

4.17 Environmental Impacts

The reconstruction of I-75 with an HOV lane on land taken from the median would have minimal environmental impacts. Between 12 Mile Road and M-59 there would be: no business or residential relocations; disruption to community cohesion or impacts to minority or low-income persons; effects on land use or any protected resources such as parks, historic sites, or farmlands; effects on threatened or endangered species; or, substantial changes to the two crossings of River Rouge and ten county drains. Storm water quantity will increase, but flow rate will not, through use of detention areas. There would be: loss of grassy median green space and, more particularly, loss of 1.13 acres of palustrine emergent (PEM)/palustrine shrub-scrub (PSS) wetlands, requiring compensatory wetland replacement of 1.70 acres at a mitigation site identified in the project EIS. This is an increase from the 0.41 acre impact and 0.61 acre compensation identified in the FEIS. The change results from proposed design modification at Square Lake Road. The earlier design resulted in an approval by the Michigan Department of Environmental Quality of a preliminary Wetland Mitigation Plan.

Environmental benefits include: improved safety and traffic flow; and, reduced air pollution and energy use with the reduced congestion. The project is included on air quality conforming *2030 Regional Transportation Plan.*

Between 12 Mile Road and M-59, 2.9 miles of reasonable and feasible noise walls were identified in the FEIS analysis. These consist of Walls 8 through 16 and 18 as identified in Table 5-1 in the *Noise Study Report* (The Corradino Group, revised, January 2005). No additional analysis of noise walls was conducted with this study as there were no changes to the adjacent land-use density.

4.18 Cost Estimates

The cost estimate for this project was detailed by construction project segment and completed using standard MDOT estimating procedures.

Unit Cost Development
The unit cost items are a compilation of various MDOT pay item average unit prices. For the freeway, ramp and local road work the MDOT "Weighted Average Item Price Cost Report" for 2009 was utilized. While the bridge estimating was performed utilizing the procedures outlined in the MDOT Bridge Repair Cost Estimating. In addition bid prices from recent construction projects were consulted and used to adjust some of the higher unit price items.

Quantity Calculations
The individual quantity values were calculated based on the current design level of detail. These values were then applied to the unit cost values to develop grand total project cost estimates in 2009 construction year dollars for all five construction segments.
Cost Items

Table 4-10 summarizes the probable opinions of cost for each segment (2009 dollars). The Segment 1 dollars will need to be combined with the southern project, as it is recommended that this project be built in coordination with the northern project segment. Detailed cost estimate spreadsheets are included in ***APPENDIX G: COST ESTIMATES***.

Table 4-10 Total Construction Estimates by Segment

CONSTRUCTION SEGMENT	2009 CONSTRUCTION COST	PE	CE	ROW	TOTAL
Construction Segment 1	$76,140,297	$4,568,418	$7,614,030	$500,000	$88,822,745
Construction Segment 2	$71,043,964	$4,262,638	$7,104,396	--	$82,410,998
Construction Segment 3	$68,893,683	$4,133,621	$6,889,368	--	$79,916,672
Construction Segment 4	$72,107,052	$4,326,423	$7,210,705	--	$83,644,180
Construction Segment 5	$50,017,021	$3,001,021	$5,001,702	--	$58,019,744
				Total	**$392,814,340**

The following subsections provide background for the corresponding sections of the cost opinion summary sheets. Refer to the probable cost summary sheets contained in ***APPENDIX G: COST ESTIMATES*** for detailed breakdowns of item costs.

Construction Cost
All roadway elements are estimated using MDOT unit costs and estimated quantities.

i. Maintenance of Traffic
- Overall maintenance of traffic schemes of Alternative 3 (partial closure) were developed for each segment. As a result cost estimates for each segment were developed. A design contingency of 15% was added to all maintenance of traffic estimates based on the current design level of detail.

- The mobilization and staking percentages were applied to the total construction costs.

ii. ITS
- An estimate for each segment was developed assuming that all devices within that segment will be in need of replacement at the time of construction.

iii. Freeway Lighting / Interchange Lighting
- Lump sum estimates for freeway lighting and interchange lighting were added to the construction costs based on the level of detail of the design.

iv. Permanent Signing and Pavement Marking
- The permanent signing estimate for each segment was based on 2007 MDOT JN 80569A, which had final plans submitted by URS in May of 2008. This information was adjusted based on variations in scope to meet the requirements of the current project.

- Pavement marking summaries were developed for each segment based on the current level of detail of the design.

- Each estimate for both permanent signing and pavement marking were adjusted with a design contingency of 15% based on the current design level of detail.

v. Alignments
- Individual estimates were created for each NB and SB I-75, each ramp, and local road.

- All major drainage crossings in each segment were estimated as part of the ***VOLUME 5: DRAINAGE STUDY***, and included as part of the NB I-75 estimate.

- A design contingency of 20% was added to all roadway cost estimates based on the current design level of detail.

vi. Noise Walls
- The noise walls identified as part of the EIS and in Table 5-1 in the *Noise Study Report* (The Corradino Group, revised, January 2005) were broken down to fit the limits of the various construction segments. Estimates were then developed based on the current level of design detail.

vii. Structures
- Structure studies were performed for each of the structures within the corridor. The associated cost estimates were included as part of the constructions costs for each segment.

viii. Miscellaneous Items
- 1% of the total construction cost was added to account for Aesthetic Improvements for each segment.

- 0.5% of the total construction cost was added to account for Unsuitable Soils in each segment.

Other Cost Items (Not included in estimate)
The relocation of private utilities is cost that is currently not included in the Construction Segment estimates. This item would include costs associated with the relocation of any private utility (electric, gas, telephone and cable television) that are located in their own easement within MDOT right-of-way. These costs would most likely be associated with work on the local roads as part of the various interchange reconfigurations. Private utility companies are be generally responsible for relocating utilities located in public rights-of-way although this will be negotiated between MDOT and each utility company.

Construction Year Costs
Federal guidelines require construction estimates to be shown for the year of incurrence. This was achieved by using an inflation factor. A 4% inflation growth factor per year was assumed to determine the cost escalation for each segment estimate.

Table 4-11 shows the total construction segment cost and anticipated construction start date for each segment within the project limits.

Table 4-11 Construction Year Estimates by Segment

CONSTRUCTION SEGMENT AND ANTICIPATED CONSTRUCTION START DATE	CONSTRUCTION COST	PE	CE	ROW	TOTAL
Construction Segment 1 – 2026	$148,313,722	$8,898,823	$14,831,372	$500,000	$172,543,918
Construction Segment 2 – 2028	$149,678,917	$8,980,735	$14,967,892	--	$173,627,544
Construction Segment 3 – 2029	$150,954,543	$9,057,273	$15,095,454	--	$175,107,270
Construction Segment 4 – 2030	$164,315,248	$9,858,915	$16,431,525	--	$190,605,687
Construction Segment 5 – 2031	$118,536,278	$7,112,177	$11,853,628	--	$137,502,082

Section 5. Public Involvement Plan

Public involvement, Context Sensitive Solution (CSS) development and stakeholder involvement for this phase of the project was suspended. In coordination with the southern section of the I-75 project, a project status was forwarded to all of the project stakeholders, the project website was maintained on MDOT's homepage and the project hotline was continued. For the duration of the project there were no calls recorded on the hotline.

Additional CSS efforts can be undertaken during the individual design phases of the project. These efforts may include landscaping outside the clearzones and within the individual interchange areas. Fence lines customarily gain established vegetation over time and make the freeway a better neighbor. As vegetation matures it acts as a buffer to adjacent land uses. Each individual project segment design will need to be sensitive to maintaining existing mature trees, where possible. Drainage, however, is an issue in the at-grade/elevated section of the corridor and much of the noise wall construction will be at fence lines. Therefore, there will be areas where much of the existing vegetation will need to be removed. The future CSS process can offer a perspective of what vegetation can replace the removed vegetation. There may also be areas where wetlands can be created to support the storm water drainage goals.

The primary opportunity for CSS treatments within each project segment is the retaining walls, railings and exposed concrete along the bridge sides and abutments.

During the design phase both the freeway and local roadway lighting can be developed in collaboration with the MDOT and local agency guidelines at the time. For example, high mast lighting may be acceptable and desirable in some locations, but less desirable in neighborhoods that do not desire night glare. Decorative lighting may be used in coordination with the landscaping and within community context as plans are developed.

Section 6. Project Implementation

6.1 Funding Alternatives

SEMCOG's recently adopted 2035 Regional Transportation Plan, Direction 2035, includes funding for improvements on I-75 from Eight Mile Road to M-59 that amounts to $1.2 Billion for widening I-75 to four lanes in each direction and reconstruction of the interchanges. According to the plan, construction of the southern section (north of 8 Mile Road to south of 12 Mile Road) is expected to begin in 2021 with $220,751,000 in federal funds and $55,188,000 in state funds. While this section is expected to commence in 2026 and includes $745,687,000 in federal funds and $185,653,000 in state funds. If additional federal or state funds become available or smaller independent projects can proceed with funding, portions of the project may proceed.

The challenge of maintaining a safe and efficient transportation system that enhances economic development and local quality of life is no small challenge.

6.2 Construction Contracting

There are various methods of construction currently used in Michigan for the delivery of projects. The traditional method for MDOT includes:

Design - Bid - Build
1. The design is performed by prior to the start of construction.
2. MDOT would generally low-bid the project
3. A contractor would build the project for MDOT
4. MDOT would provide construction oversight

Advantages
1. Familiar delivery method
2. Simple process to manage
3. Low and ideally "best" price for construction
4. Much of price risk shifted to Contractor
5. Design plans need to be comprehensive at the outset with fully defined scope of work

Disadvantages
1. MDOT takes on construction quality risk (because of low bid), but mitigates with fully defined scope and specifications in design plans and strict construction oversight
2. Longer duration to get to finished product from design inception
3. Price unknown until low bids received (although estimate should be close later in design stage using consistent unit prices within the Region)
5. No design phase input from Contractor
6. Change orders and claims may increase the "best" price
7. Consolidates responsibility for the construction of the project into one entity

A more recently practice of design and constructing is the use of MDOT Design Build (DB) process.

Design - Build procurement

Various DB procurement methods are
1. Low bid with no short-listing (one-step)
2. Low bid with short-listing (two-step)
3. Best value (two-step)

The criteria for the latter two, regards the short-listing process, is variable and can be established to match selection process to project. MDOT CSRT reviews the scoring criteria for approval and has certain requirements that must be met.

The criteria for the latter selection after short-listing is also variable and can be established to match selection process to project. This mostly revolves around the weighting of technical proposal/qualifications score and price and what impact each will have on the selection.

Advantages
1. Familiar delivery method (MDOT has used since 2008)
2. Project can be advertised quickly
3. If simple project - low price for design and construction can be pursued
4. If complex project - most qualified designer and constructor can be pursued
5. Much of price risk shifted to design-builder
6. Mechanisms are established to control price risk where appropriate (to mitigate having excessive risk priced into project)
7. Design-build team knows and coordinates design with construction
8. Utility coordination is consolidated into single entity (design-builder) and is ongoing through both design and construction of project

Disadvantages
1. Possibility that excessive risk priced into project thereby raising costs
2. May increase number of firms involved in a project (MDOT, FHWA, Procurement and DADC consultant, CE consultant, design-builder consultant) involved in project
3. Engineering costs may increase due to increase in number of firms involved

Methods of design and construction will be developed during the programming phase of each construction segment.

6.3 FEIS Commitments

The FEIS obligated the resolution of the following project impacts through the development of the Engineering Report and continuation to final design. Following is **Table 4-12** which contains the status of the items mitigated with this report:

Table 4-12 FEIS Green Sheet: Project Mitigation Status

IMPACT CATEGORY	MITIGATION MEASURES - FEIS	STATUS
I. Social and Economic Environment		
a. Noise	Analysis finds 18 individual reasonable and feasible noise walls, plus replacement noise walls in Madison Heights would total 4.9 miles in length.	Further analysis will need to be completed during final design.
b. Fire Hydrant Access	MDOT will consult with local fire departments during the design phase to ensure adequate placement of and access to fire hydrants in locations where noise walls are to be constructed.	Further design details will be developed during final design.
c. Visual Effects	Noise wall construction and construction materials will be discussed with the affected public in the vicinity of potential construction.	Additional public involvement and context sensitive solutions will be developed during final design.
II. Natural Environment		
a. Wetlands	0.4 acres of impacted wetlands in the Square Lake Road Interchange will be replaced by 0.6 acres of wetlands in Armada Township in Macomb County. A permit will be obtained form the MDEQ for this compensatory wetland mitigation. A preliminary Wetland Mitigation Plan has been approved by the MDEQ.	The wetland impacts will increase from 0.4 acres of impacted wetlands to 1.13 acres of palustrine emergent (PEM)/palustrine shrub-scrub (PSS) wetlands at the Square Lake Road interchange.
b. Tree Removal/Clearing/Landscaping	Mature trees will be preserved within MDOT right of way (principally at fence lines), where safety requirements are met. Property owners will be notified before any trees in front of their residences are removed and will be offered replacement trees. Native vegetation will be considered in plantings.	During final design tree impacts will need to be categorized and tree replacements budgeted. Primary impacts are in the vicinity of interchange upgrades. Impacts to residential properties are not anticipated within the northern project limits.
c. Water Quality	For highway runoff, storm water management facilities will include detention basins and grassed channels or swales to reduce the concentration of road contaminates reaching receiving bodies of water. Ditch check dams will be installed to control runoff velocities. Storm water management will be incorporated into final roadway design. The project will include separation of MDOT storm water south of 12 Mile Road from the combined sewer system that now carries this storm water. Detention will be included in pump station and possibly within the 12 Mile Road interchange allowing settling of debris and sediment. Oil/water separators will be included in the system.	Preliminary drainage design was conducted during the development of the Engineering Report and hydraulic analysis completed for proposed detention basins, ditching and storm sewer. Pump stations are not required for the northern project limits.
III. Hazardous / Contaminated Materials		
a. Contaminated Sites	A *Project Area Contamination Survey* has been completed. One site has been identified for a Preliminary Site Investigation, prior to right of way acquisition. Any areas of contamination found by that PSI will be marked on design plans.	During final design areas of contamination will need to be designated on the plan sheets and quantities estimated.
IV. Construction		
a. Maintenance of Traffic	Two lanes of traffic will be maintained in both directions at all times on I-75	The recommended maintenance of traffic concept, includes two lanes in both directions along I-75.
b. Vibration	Basement surveys will be offered in areas where vibration effects could occur. These areas will be identified during the design phase, where pavement and bridge removal will occur, or where piling and/or steel sheeting is planned. Impacts are not anticipated at this time.	It is not anticipated that this is an impact for the northern project limits.
c. Wetlands	Delineated wetlands are to be included on construction plans sheets, so they can be flagged for avoidance during construction.	This will be addressed during the development of the final plans and construction.
d. Parks	Reconstruction of the service drive adjacent to Maddock Park may be necessary. No grading permit will be obtained for the park.	This is not an impact for the northern project.

6.4 Utility Coordination

Numerous utilities will be impacted as a result of the construction activities throughout the project limits. Coordination with the utility companies prior to the design phase of each segment should be implemented to ensure that relocations or other arrangements can be made in advance and unnecessary delays or outages will not be encountered. See section 4.9 and ***APPENDIX A: UTILITY MATRIX CONFLICT*** for a summary of the anticipated utility conflicts within the project limits.