2.9 I-87/US ROUTE 9 CLOSED LOOP TRAFFIC CONTROL SYSTEM

2.9.1 INTRODUCTION

The concept discussed in this section – an I-87/US Route 9 Closed Loop Traffic Control System – is part of the Smart Highways goal, addressing the safety and convenience of drivers traveling along this section of the Northway and adjacent and connecting highways and arterials. In the process, it would help the Capital District find the most cost-effective way to meet its Commuter market demand, in line with the I-87 Corridor Study's underlying goal of supporting the long-term economic development goals of communities along the corridor.

2.9.2 PROJECT DESCRIPTION

As traffic volumes on I-87 (Northway) within the Capital District approach capacity, even minor incidents along this route can cause severe delays and heavy congestion. Data received from the Capital District Transportation Management Center (TMC) show that over the last few years there have been an average of over 1,100 incidents per year between Exit 5 and Exit 10 of the Northway, which is heavily used by both commuter and recreational traffic. (The term “incidents” in this section covers any action that contributes to vehicle stoppage along the roadway – i.e., accidents, disabled vehicles, debris in the roadway, and NYSDOT maintenance operations and road construction.) Of this annual total, over 80% (920) have been of durations greater than an hour, while over 60% (670) lasted more than two hours. In cases where incidents have caused delays of this significance, there traditionally has been little remediation possible. The adjacent arterial system does not have sufficient capacity and is not equipped with control systems that would help it absorb substantial diverted traffic. There are no systems to adequately inform the public of incidents, alternate route choices and expected delay times, and the agencies managing these highways lack sufficient access to real-time traffic conditions on the overall network to make fully informed decisions on the best way to respond to these incidents. With limited ability to expand the number of lanes on I-87 or parallel routes, Intelligent Transportation System (ITS) solutions must be identified to facilitate better driver information and the ability to reroute travelers during times of peak delay. As noted below, NYSDOT and other agencies are already working to improve these conditions. The proposed project focuses on further improvements to these traffic management systems, specifically along the I-87 and Route 9 corridors between Exit 10 in Saratoga County to Exit 5 in Albany County, as shown in Figure 2.9-1.

2.9.2.1 Existing Conditions and Deficiencies

I-87 (Northway), in and around the Capital District, is the primary north-south corridor that links Albany to points north. It is the primary route of nearly 7,000 commuters during a typical weekday peak hour and serves as a gateway to the Adirondack Park and its vast array of hiking, camping and skiing opportunities, amusement parks and resorts. Due to restrictions posed by both geography and terrain, north-south routes in this area are extremely limited, and the region has become heavily dependent on I-87 as a local arterial as well as the area's major interstate highway. Recognizing this, NYSDOT, in partnership with the NY State Police, created the Capital District TMC to monitor traffic operations, detect and react to roadway incidents,
FIGURE 2.9-1

Legend
- Permanent Overhead VMS
- Portable VMS
- CCTV Camera
- Highway Advisory Radio (HAR)

Existing ITS Components

Parsons-Clough Harbour
and to keep motorists informed of potential delays. To date, the Capital District TMC utilizes the following systems to carry out these tasks:

- more than 20 movable (i.e., “pan-tilt-zoom”) CCTV cameras,
- three large-scale overhead Variable Message Signs (VMS),
- more than 50 smaller, permanent placed yet portable VMS,
- two Highway Advisory Radio (HAR) transmitters, and
- three “HELP” trucks that provide roadside assistance to distressed motorists.

The Capital District TMC also informs the media of traffic delays and is the wireless 911 answering point for the area. Figure 2.9-1 provides an overview of the existing ITS field components within the Capital District, including those areas on which the proposed project would focus. Though the TMC does have extensive resources in place, the lack of alternate routing capabilities along I-87 going to and from the north has significantly affected its ability to reduce delays during long-term incidents. By the same token, there is no mechanism to compare travel times along I-87 to those along Route 9. Such information would be very useful to agencies making diversion decisions and appreciated by drivers trying to make informed route choices when faced with incident-related delays as well as regular daily congestion.

2.9.2.2. Existing Actions and Programs

The Capital District TMC is continually increasing their capabilities along the Interstate system. The staff currently have plans to add CCTV cameras at interchanges up to Saratoga (Exit 15) and will soon be implementing the TRANSMIT system along all Capital District Interstate Roadways (I-87, I-90, I-787, Alternate Route 7, and the NYS Thruway). The TRANSMIT system anonymously reads E-ZPass transponders on vehicles traveling along a highway, using the time it takes identified vehicles to travel between various points to help agencies detect incidents (e.g., an accident), estimate travel times along those routes and the likely duration of delays. This information will be used by the TMC to make quicker and more accurate responses to incidents, and to provide travelers with better information about how to deal with or avoid them.

2.9.3. PROPOSED SOLUTION

2.9.3.1. System Overview

The proposed solution will establish a viable alternate route to I-87 along Route 9 between Exit 5 and Exit 10 of the Northway to reduce delay times and divert traffic away from long-term incidents that occur on that segment of the Interstate (see Figure 2.9-2). This I-87 segment is considered ideal for this project because of the significant number of incidents along this segment, the heavy congestion that occurs daily (e.g., southbound at Exit 8 and Exit 8A above the “Twin Bridges” during the AM Peak, northbound at Exit 7 (Alternate Route 7) in the PM Peak) and the fact that alternate routes are not clearly defined and not easily recognized by the average user.
However, since Route 9 isn’t perfectly parallel to I-87 and does include numerous traffic signals that can add delay to trips, several components must be in place to make Route 9 a viable alternative route. These components include the following:

- Methods of providing traveler with information along I-87 (e.g., VMS, HAR).
- Similar routing and traveler information systems along Route 9 (VMS, HAR).
- Traffic-responsive traffic signals with established alternative timing plans, to respond to conditions when drivers are diverted onto Route 9.
- TRANSMIT systems along I-87 and Route 9 to monitor travel conditions and travel times.

These improvements are conceptually shown in Figure 2.9-3 and are described in more detail below.

2.9.3.2. System Components

- **Traveler Information Along I-87:** The key to any viable alternate route is driver information. Travelers need to be clearly informed of where to go, the amount of delay to expect, reasons for the delay and expected conditions on the alternate route. For this project, two key technologies are to be enhanced to accomplish this task—VMS and HAR.

Through field observation, it has been determined that the I-87 HAR (frequency 540 AM), centered near Exit 9, has a range that extends down to approximately Exit 7. It is recommended that an additional HAR transmitter broadcasting the same information on the same frequency be established near Exit 2. This HAR will inform northbound travelers entering I-87 from I-90, the Thruway and at the Albany International Airport area of any current incidents and the potential need for alternate routing. Along with this HAR, additional HAR advisory signs informing motorists of message broadcasts should be installed at key entry points to the Northway, with a message stating “Tune to 540 AM When Flashing.”

It is projected that the new HAR would use the same frequency as the upper part of the Northway. The two transmitters are closely spaced and should work together to inform drivers of problems within the alternate route zone. Adding a third frequency would be confusing to drivers, who might have difficulty knowing where to tune their radios. The 540 frequency HAR will not interfere with the 830 HAR, as the frequencies are sufficiently separated to preclude that problem.

The second method of providing travelers with information would be VMS. Currently, the Capital District TMC controls several portable VMS within the project area. Under the proposed project, two larger permanent overhead VMS would be located on either end of this segment of I-87:

- between Exit 2 and Exit 4, and
- just north of Exit 10.

Providing signs in one direction at each location (i.e., southbound at Exit 10, northbound between Exits 2 and 4) would be sufficient to inform motorists of the proposed Route 9 alternate routing. However, it is recommended that VMS facing the opposite direction at both locations also be provided. A southbound sign in the Exit 2-4 area would disseminate information about conditions along I-90 and Thruway Interchange 24, while a northbound sign near Exit 10 would provide gateway information leading into Saratoga and the
FIGURE 2.9-3

Legend
- TRANSMIT Tag Reader
- Alternate Route Signing
- Traffic Signal Closed Loop System
- Permanent Overhead VMS
- Highway Advisory Radio (HAR)

Proposed ITS Improvements
Adirondacks, such as mainline queuing at Exit 20. In addition, the existing VMS on Alternate Route 7, east of Route 9, would be incorporated into the system, informing travelers westbound on Alternate Route 7 whether Route 9 or I-87 is the better route.

The larger permanent signs will provide a better visual impact for motorists than the portable signs currently in use. Preliminary recommendations call for a full matrix display of: 3 lines of 16-18 characters with 18” character height, 1 or 2 lines with fewer but larger characters, or special display of arrows or images. This is roughly double what the portable signs can display, and places the information in a location much easier to read by travelers in all traffic lanes. The signs would conform to all applicable standards (i.e., NTCIP standards for DMS object definition). Information about the type of signs and equipment involved is provided in Appendix A. The exact form, size and type of VMS would be further determined during final design.

- **Routing information along Route 9.** There are several connection points between I-87 and Route 9 within the proposed alternate route network. It is important for travelers to know exactly where to go on Route 9 and how and when to get back to the Interstate. Most incidents would not require vehicles to divert for the entire length of the proposed alternate route. Small arterial VMSs mounted at key intersections would be used to inform drivers when they have passed the incident and which access to the Northway should be taken to provide the least delay. Preliminary concepts call for these VMS boards to provide a full matrix display capable of displaying 2-lines of 16 characters with 9” character height and specialty characters such as turn arrows. These signs, projected to be approximately 3’ by 10’ in size, would be NTCIP compliant and mounted on roadside posts or heavy duty traffic signal poles at all approaches to the Route 9 intersections leading to Exits 5, 6, 7, 8A, 9 and 10. Exit 8 was omitted as a detour route between Route 9 and I-87, as that segment is longer than other choices; e.g., Exit 8A. Due to this, traffic diverted because of an incident would use the connecting route to Exit 8A to re-enter I-87.

The typical incident message will inform motorists when they have passed an incident location and can return to I-87, while at other times travel time data from the proposed TRANSMIT system could be displayed on Route 9 and I-87 to assist motorists in making travel route decisions.

- **Remote communications to traffic signals with established alternative timing plans.** Route 9 includes a significant number of traffic signals within the proposed alternate route area. The signals between the Mohawk River (adjacent to Exit 8) and Old Route 146 (adjacent to Exit 9) are coordinated and are controlled at NYSDOT Region 1 through a closed-loop system. Under this project, it is proposed that the remaining signals between the Mohawk River and Watervliet Shaker Road (at Exit 5) and the Exit 5 ramp signals (13 additional signals) be coordinated in a second closed loop system. Each of the systems should have incident management timing plans developed for each signal. Timing plan selection should be automatic based on traffic demand on system detectors, but both the Region 1 NYSDOT office and the Capital District TMC should have the ability to override and select other plans as deemed necessary. This will require an appropriate level of center-to-center communications to be developed and implemented. It is possible that Region 1 could consolidate all “office” responsibility for traffic signals at the TMC, eliminating the need for constant coordination between the TMC and Region 1. Further, any authorized person could remotely change the timing plans for a closed loop system, using a user ID and Internet connection via the Citrix NFuse Metaframe Applications software.
• **Testing 2070 Signal Hardware.** NYSDOT is moving toward a changeover to a more sophisticated 2070 signal controller hardware and software. It is possible that the proposed project could provide an opportunity to test the implementation and effectiveness of these new systems. The potential for this to occur as part of this project would be determined during final design.

• **TRANSMIT system implemented along Route 9.** As discussed previously, the TRANSMIT System can track vehicle movements anonymously by receiving E-ZPass transponder signals. It uses these data to create a historical database of travel times and to predict current travel times based on real time information and a comparison to that database. Because travel time along Route 9 is typically significantly longer than along I-87, accurate travel time information along Route 9 is a critical component for alternate route selection. Under this project, it is proposed to install TRANSMIT readers at various points between Exit 10 and Exit 5.

### 2.9.4. PROJECT IMPLEMENTATION

The first component of this project is the closed loop signal system along Route 9 between Exit 5 and the Mohawk River. A closed loop signal system should improve traffic flows along that route regardless of the alternate route status. The additional HAR and VMS sites along I-87 and the alternate route VMS along Route 9 will route motorists around extreme long-term incidents, such as a multi-car accidents with injuries or HAZMAT spills, and provide travel time information. The final component is the TRANSMIT readers along Route 9. In conjunction with the current Capital District TMC plan to install TRANSMIT on I-87, TRANSMIT readers on Route 9 will provide comparative travel times so that alternate route selection can be made by individual drivers for any incidents. In addition, comparative travel times during daily recurrent congestion will normally be displayed on both I-87 and Route 9 VMSs. This detailed driver information along with the closed loop system ability to adjust timing plans will maximize efficiency for both I-87 and Route 9.

The project design phase could be initiated immediately, and implementation could occur as soon as a project funding source is identified. The technologies used are proven and reliable, though some adjustments of travel time algorithms can be expected. The process would require detailed design for each of the ITS sites and traffic signals plans for each signal to be modified. Timing plans for anticipated alternate route traffic conditions will be developed and inputted in controllers by NYSDOT personnel, then fine tuned including development of plan selection parameters. Power to each site would be routed from the nearest Niagara Mohawk power source and communication would be achieved through standard hardwire 56 kbps modems or dedicated phone lines where readily available. In areas where landline connections are not cost effective, wireless communications should be considered.

The project concept presented here includes a fair amount of detail about, for example, the projected size of VMS, the required number of VMS, signal controllers and other hardware, and similar system detail. However, these are only preliminary assessments of likely system needs, the details of which cannot be fully determined until final system design.

### 2.9.4.1. Regulatory, Environmental, and Agency Coordination Issues

A big hurdle for this type of project is typically inter-agency coordination. However, given the considerable amount of traffic control coordination and cooperation that already exists among the area's transportation and public safety agencies, this program could move forward by simply building on those relationships. It is likely that the Capital District TMC would take over
day-to-day control of signal systems historically controlled by the NYSDOT Regional Office, and the TRANSMIT system could be designed so that data gathered by the proposed closed-loop system would be processed and managed by a local server and disseminated to the TMC.

HAR and VMS information on systems controlled by the Thruway Authority would need to be kept up-to-date on I-87 incident and alternate route conditions so that travelers will have adequate advance knowledge of problems, and local law enforcement authorities need to keep the TMC informed of incidents in which they are involved. Appropriate intergovernmental agreements or working protocols covering maintenance and operations procedures and responsibilities would be needed. Minimal environmental issues would be raised by the implementation of this system, which would generally be invisible to the public, except for VMS equipment and signs relating to HAR messages.

2.9.4.2. Project Costs

The following are the projected costs for the proposed project:

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<tr>
<th>ESTIMATED CAPITAL COSTS</th>
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<tr>
<td><strong>Capital Costs</strong></td>
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<tr>
<td><strong>Quantity</strong></td>
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<tr>
<td>Equipment &amp; Construction**</td>
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<tr>
<td>Freeway VMS w/ Structure</td>
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<td>Arterial VMS, F&amp;I w/ Structure</td>
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<tr>
<td>TRANSMIT Receiver [1]</td>
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<td>Closed Loop Signal System</td>
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<td>New Controllers &amp; Cabinets [2]</td>
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<tr>
<td>Master &amp; Modems for 12 Controllers, Sys Detectors</td>
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<td>Fiber Interconnect, 4 Mi. [3]</td>
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<tr>
<td>Center-to-Center Communications Hardware &amp; Software</td>
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<tr>
<td>HAR</td>
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<tr>
<td>Transmitter [4]</td>
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<tr>
<td>Advisory Signs w/ Wireless Activation</td>
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<tr>
<td>Central Software [5]</td>
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<tr>
<td><strong>Sub-Total</strong></td>
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<tr>
<td><strong>Design &amp; Misc. (Incl. Contingency)</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
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Approximately $5.8 Million

[1] Adds to Fig 9-3: readers Rte 9 south end, north end & at US 9 shield south of Mohawk River
Unit cost: $105k for h/w plus 1 year of O&M, $25k for supplier installation support.
[2] Assumes replacement of 1/2 of controllers & cabinets
[3] Assumes 75% of 5.3 mile run requires new conduit, 25% does not. Fiber in existing conduit covered by unit price.
[4] Approximately $20,000 - $25,000 for purchase/installation of transmitter + power, conduits/pull boxes, restoration
As shown, the design and construction of each of the components of this project would cost approximately $5.8 million. Temporary increases in volumes along feeder routes when traffic is diverted would be mitigated through signal timing adjustments; no geometric changes to increase ramp and feeder road capacity would be required, and no cost is associated with these adjustments.

The proposed system would involve installation of additional hardware and software in the field and within the Capital District TMC and other offices. The likely range of annual operation of the system is difficult to estimate. Much of the systems operation and even maintenance could be handled by the same systems and staff already in place at the TMC and related local and State agency operations covering everything from TRANSMIT readers to VMS. Given that, the incremental annual operating costs for the system would likely be in the $100,000 to $150,000 range. It is also recommended that after approximately one year of operation, the effectiveness of the system should be reviewed, along with the merits of its expanded application to other components of the regional highway system.