DEPARTMENT OF TRANSPORTATION

CONNECTICUT DEPARTMENT OF TRANSPORTATION

Statewide Advanced Traffic Management System (ATMS) for Limited Access Highways - Strategic Plan

January 2021

ACRONYMS

ATMS -- Advanced Traffic Management System

BOC -- Bridgeport Operations Center

CCTV -- Closed-Circuit Television

CTDOT -- Connecticut Department of Transportation

FHWA -- Federal Highway Administration

HAR -- Highway Advisory Radio

ITS -- Intelligent Transportation System

MDSS -- Maintenance Decision Support System

MPO -- Metropolitan Planning Organization

NOC -- Newington Operations Center

RWIS -- Road Weather Information Stations

TFM -- Traffic Flow Monitors

TIM -- Traffic Incident Management

VMS -- Variable Message Signs

CRCOG -- Capitol Region Council of Governments

MetroCOG -- Connecticut Metropolitan Council of Governments

NOAA -- National Oceanic and Atmospheric Administration

NVCOG -- Naugatuck Valley Council of Governments

NWS -- National Weather Service

RiverCOG -- Lower Connecticut River Valley Council of Governments

SCRCOG -- South Central Regional Council of Governments

WestCOG -- Western Connecticut Council of Governments

SECCOG -- Southeastern Connecticut Council of Governments

EXECUTIVE SUMMARY

Advanced Traffic Management System (ATMS) devices deployed throughout the State of Connecticut serve an important role in operating and managing the state's limited access freeways. This document describes a strategic plan for the ATMS for the Connecticut Department of Transportation (CTDOT). The plan was developed based on a review of relevant studies and documents, with input from CTDOT personnel at the Bridgeport Operations Center (BOC) and the Newington Operations Center (NOC), and with consideration for the interests of other relevant public- and private-sector Intelligent Transportation System (ITS) stakeholders. This strategic plan represents a snapshot in time and will need to be regularly revisited and re-evaluated based on evolving needs and priorities.

This strategic plan identifies goals and objectives for CTDOT's ATMS as well as performance measures for evaluation. Consistent with CTDOT's existing Mission, Principles, and Values, CTDOT's ATMS deployments are focused on supporting the following goals for Connecticut's transportation system:

- Provide Safe and Secure Travel
- Reduce Congestion and Maximize Throughput
- Preserve and Maintain our Transportation Infrastructure
- Provide Mobility Choice, Connectivity, and Accessibility
- Improve Efficiency and Reliability
- Preserve and Protect the Environment
- Support Economic Growth
- Strive for Organizational Excellence

This strategic plan also identifies ATMS objectives and strategies for implementing ATMS throughout the state in support of these goals. Objectives and strategies are focused on maintaining existing ATMS infrastructure in a state of good repair, expanding ATMS device coverage, and increasing capacity and reliability of fiber-optic and wireless communications to support ATMS deployments.

This strategic plan also identifies tactics for implementing ITS projects to address ATMS needs, including:

- Mainstream ITS and ATMS infrastructure into traditional transportation construction projects along key corridors.
- Initiate ITS projects to expand infrastructure and/or replace aging ITS equipment.

Finally, this strategic plan identifies eleven potential ATMS projects throughout Connecticut based on criteria including traffic volumes, crash volumes, and gaps in coverage. These projects would include one or a combination of the following actions:

- Replace and upgrade existing infrastructure that is approaching the end of its serviceable lifespan;
- Update and expand communications equipment and the fiber-optic network to reduce maintenance costs and communication expenses, as well as offer improvements in communications redundancy and reliability;
- Close system coverage gaps along existing key routes; and
- Provide additional new coverage along heavily traveled routes.

INTRODUCTION

The ATMS plays an important role in enabling CTDOT to meet its mission to provide a safe, efficient, and cost-effective transportation system that meets the mobility needs of its users. ATMS technologies are a type of ITS designed to help monitor roadway conditions, detect and verify incidents, manage roadway infrastructure, and disseminate traffic and road condition information to first responders, the motoring public, and other transportation stakeholders.

CTDOT'S ATMS

ATMS includes field devices such as Closed-Circuit Television (CCTV), Variable Message Signs (VMS), Highway Advisory Radio (HAR), and Road Weather Information Stations (RWIS). In order to achieve maximum benefit of ATMS technologies, a strategic approach to ATMS needs to be regularly re-assessed to ensure that the technologies are being deployed to best meet CTDOT-identified goals, objectives, and priorities.

CTDOT's existing ATMS deployments are discussed on the opposite page.

THIS STRATEGIC PLAN

This document presents a strategic look at Connecticut's current ATMS goals and objectives, and identifies high-level strategies, tactics, key corridors, and potential projects. This ATMS Strategic Plan represents a snapshot in time and will need to be re-evaluated over time to reflect changing objectives and priorities, the status of ongoing ATMS deployments, and ever-evolving technological advances. This information is intended to assist CTDOT and its many project partners (federal agencies, local planning agencies, elected officials, and other stakeholders) in identifying and highlighting opportunities to improve and advance ATMS technology deployments throughout the state.

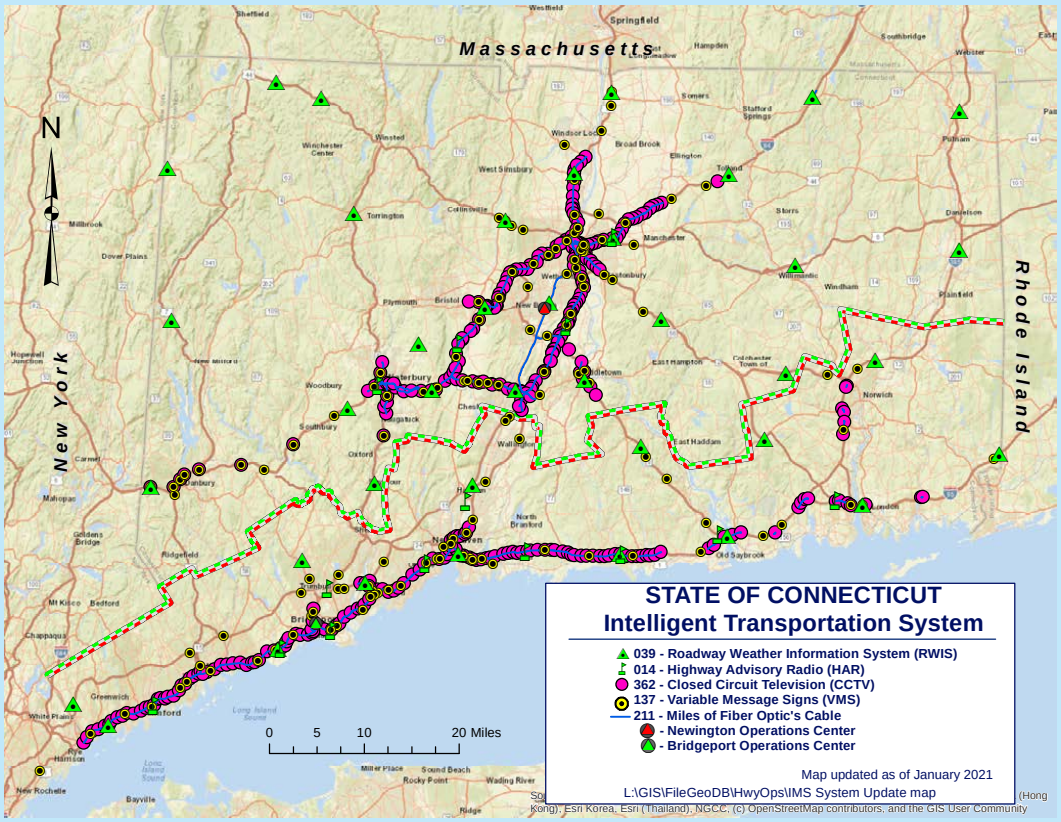
This Statewide ATMS Strategic Plan was developed with input from CTDOT staff, including Highway Operations staff and operators at the BOC and the NOC. The Strategic Plan was also informed by a review of relevant planning documents produced by CTDOT, metropolitan planning organizations (MPOs), and other relevant ITS stakeholders. These documents are referenced in Section 8. The Strategic Plan is intended to reflect not only CTDOT's ATMS goals and objectives, but also reflect the goals and objectives of several other outside agencies that have been communicated to CTDOT, including first responders, Traffic Incident Management (TIM) stakeholders, MPOs, Chambers of Commerce, and other stakeholders.

EXISTING ATMS DEPLOYMENTS

CTDOT operates ATMS infrastructure throughout the state, consisting primarily of the following devices and components:

- **Closed-Circuit Television:** CCTV cameras provide live images to operators at the BOC and NOC, allowing CTDOT to monitor road conditions, including traffic and weather, remotely.
- **Variable Message Sign:** VMS sites are installed on state roads to allow CTDOT to display route travel times, traffic crash information, special event information, active road work activity, traffic delays, and road weather condition information
- **Road Weather Information Stations:** RWIS sensors are installed adjacent to State routes to monitor continuously and remotely real time weather conditions, such as road and atmospheric temperature. Connecticut RWIS sensor data is also available for use by other users such as local public works departments, National Weather Service (NWS)/ National Oceanic and Atmospheric Administration (NOAA), and others. Additionally, RWIS data can serve as an input in road weather management system strategies such as the Federal Highway Administration (FHWA) Pathfinder and Maintenance Decision Support System (MDSS) initiatives.
- **Highway Advisory Radio:** HAR provides live traffic information to motorists on certain limited access highways via a dedicated low-power AM radio channel.
- **Traffic Flow Monitors**: TFM units measure highway travel speeds in real-time and alert operations staff of traffic congestion and slow-downs.
- **Fiber-optic and Wireless Communication:** Fiber-optic and wireless communication allows the information from various ITS devices, such as the ones discussed above, to be sent quickly to the operations centers. Wireless communication is provided over cellular signals, and fiber-optic cable is installed underground to connect devices to the wider fiber-optic network.

CTDOT'S CURRENT ITS DEPLOYMENTS ACROSS THE STATE



ATMS GOALS & OBJECTIVES

GOALS

Consistent with CTDOT's existing Mission, Principles, and Values, CTDOT's ATMS deployments are focused on supporting the following goals for Connecticut's transportation system:

- Provide Safe and Secure Travel
- Reduce Congestion and Maximize Throughput
- Preserve and Maintain our Transportation Infrastructure
- Provide Mobility Choice, Connectivity and Accessibility
- Improve Efficiency and Reliability
- Preserve and Protect the Environment
- Support Economic Growth
- Strive for Organizational Excellence

Upgrading and expanding CTDOT's ATMS deployments will help CTDOT meet these goals. The ATMS can reduce the adverse impacts of these events and allows traffic to flow safely and efficiently more often. In addition, ATMS devices aid CTDOT in monitoring conditions and collecting data so that CTDOT can evaluate its progress toward meeting these goals.

OBJECTIVES

CTDOT aims to provide a functional and effective ATMS system, with coverage of all major limited access highways throughout Connecticut, to facilitate Traffic Incident Management (TIM), efficient roadway management, and to provide travelers with useful and timely information on road conditions. In doing so, CTDOT aims to maintain its existing ATMS devices and corridors in a state of good repair, in line with equipment's serviceable life. In addition, CTDOT aims to expand ATMS coverage where heavily traveled routes lack coverage or where gaps in coverage exist along routes that already are a part of the state's ATMS network.

CTDOT aims to achieve the following objectives for the ATMS program:

- Maintain state of good repair for existing ATMS infrastructure. Many ATMS devices are approaching the end of their serviceable lives and require replacements and upgrades. In some cases, this will require installation of new support structures and infrastructure as well.
- Expand ATMS device coverage on all limited access highways. There are some breaks in system coverage that challenge the ability of operators to provide up-to-date information about congestion and crashes along major routes. There is a need for additional ATMS coverage along heavily-traveled routes currently lacking infrastructure.
- Increase capacity and improve reliability of fiber-optic and wireless communications to support the ATMS. Further expansion and interconnection of the fiber network and moving devices off leased telecommunications lines offers improved reliability and reduced ongoing operational costs. Extension of the fiber-optic network to all limited access highways will also provide important system redundancy, which is critical to maintain 24/7/365 system operations.
- Maintain a workforce that is knowledgeable about the ATMS subject matter.
- Minimize life cycle cost.
- Manage queues.

ATMS STRATEGIES & TACTICS

STRATEGIES

Operationally, the CTDOT ATMS network is highly functional and focused on the major travel corridors in the state. The general strategies for CTDOT's ATMS program are as follows:

- Reliable Travel Time
- Deploying the latest equipment technology
- Evaluate maintenance processes for possible improvement
- Review Regional Coordination
- Update Asset Management Plan and record keeping practices
- Improve Risk Management process
- Account and provide storage for spare ATMS parts
- Support professional development
- Improve personnel strategies
- Maintain ATMS projects in capital improvement plan
- Improve inter Department coordination

HIGH-LEVEL TACTICS

Below are the following tactics for implementation of ATMS projects:

- Collaborate with traditional transportation construction projects to mainstream ATMS infrastructure. As CTDOT projects are proposed and designed along key travel corridors, project proponents will identify ATMS infrastructure to be included as part of these projects. This may include the provision of CCTV and VMS along key corridors, or conduit and communications infrastructure to support future provision of ATMS technologies.
- Initiate Highway Operations' projects to expand traditional infrastructure. Highway Operations undertakes these projects to propose and design infrastructure along key travel corridors. This may include the provision of CCTV and VMS along key corridors, or conduit and communications infrastructure to support future provision of ATMS technologies.
- Initiate Highway Operations' projects to replace aging equipment. As Highway Operations undertakes these projects, this will ensure that it also considers the need to replace ATMS equipment when the equipment reaches the end of its useful service life or replacement parts and service no longer become available, and it will ensure ATMS coverage remains consistent.
- Use preventative maintenance to maintain a state of good repair for 50% of the ATMS devices deployed.
- Perform routine checks for all ATMS devices to see if properly working to monitor current system for failures.
- Coordinate events with out-of-state and in-state regions.
- Document 100% of the fiber optic cable utilization within 5 years.
- Ensure compliance with FHWA's Systems Engineering Process.
- Provide on-going ATMS training.
- Allocate minimum of $20 million per year on Highway Operations-initiated ATMS projects to set minimum investment standards for replacement of equipment.

KEY ATMS CORRIDORS & PROJECTS

CRITERIA FOR KEY ATMS CORRIDORS AND PROJECTS

In identifying key ATMS corridors and projects, the following criteria were considered:

Crash Frequency

With ATMS playing a key role in the timely and effective detection, verification, and management of incident response, corridors with high crash volumes should be prioritized for ATMS deployment.

Traffic Volume

Corridors with high traffic volume and recurring levels of congestion should be prioritized for ATMS deployment.

Traffic Delay

Corridors with high traffic delay and slower speeds should be prioritized for ATMS deployment.

Gaps in Coverage

Gaps in coverage exist in project areas where the highway network is mostly covered by ATMS, but there remain sections without ATMS. For example, a project with few gaps in coverage would be covered fully by CCTV monitoring and have frequent, functional VMS. A project with many gaps in coverage would have sections of highway without CCTV monitoring and long distances without the ability to communicate to travelers over VMS.

ATMS Equipment and Technological Obsolescence

Many corridors are covered fully by ATMS; however, much of this equipment and related technologies are becoming obsolete. Corridors with equipment and related technologies that are becoming obsolete should be prioritized for updated ATMS deployment.

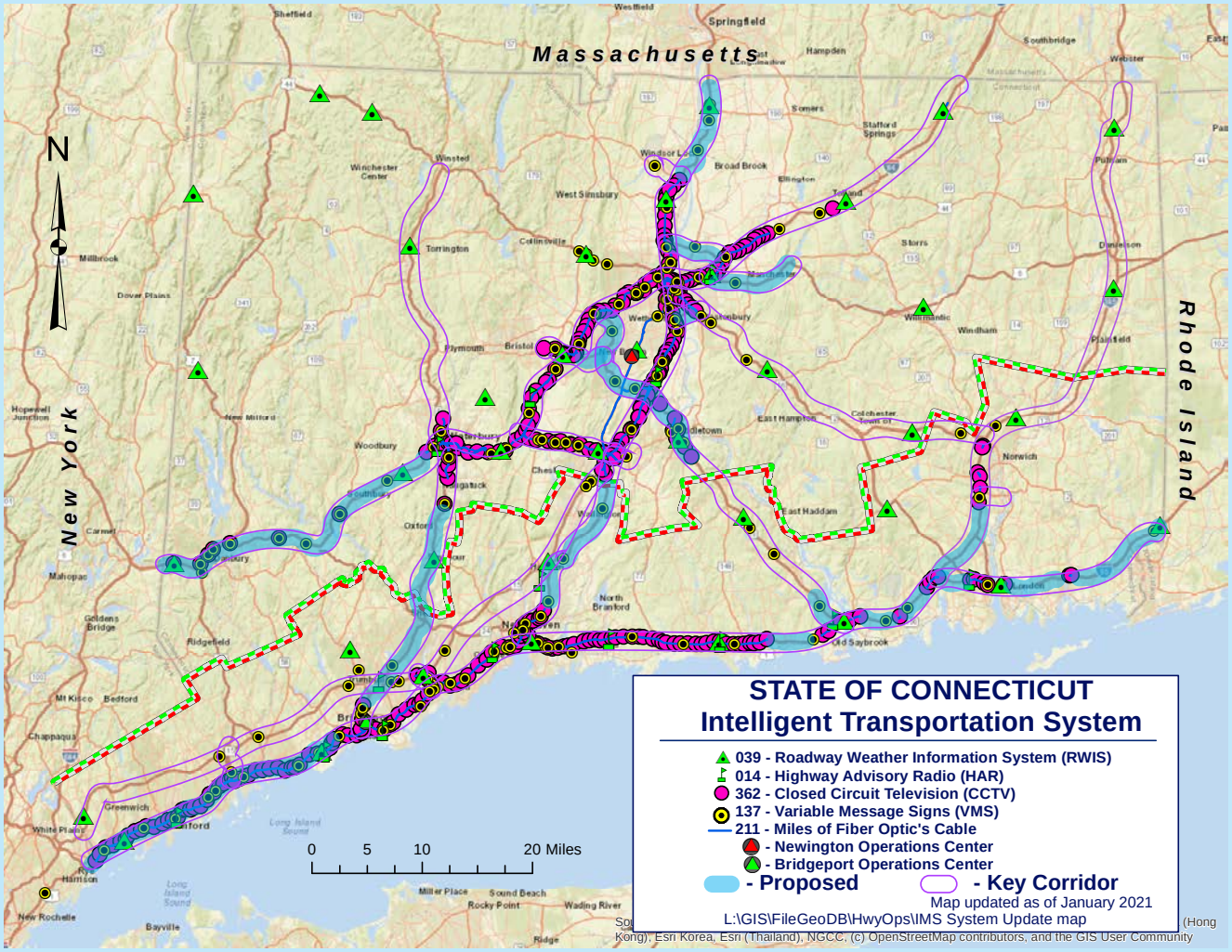
KEY ATMS CORRIDORS

CTDOT aims to install ITS Equipment Infrastructure, including fiber-optic conduit, cable and highway traffic cameras, on the following Key Corridors listed below:

- I-84: All (from New York border to Massachusetts border)
- I-91: All (from Massachusetts border to I-95)
- I-95: All (from New York border to Rhode Island border)
- I-291: All (from I-91 to I-84)
- I-384: All (from I-84 to Route 44)
- I-395: All (from I-95 to Massachusetts border)
- I-691: All (from I-84 to I-91)
- Route 2: All (from East Hartford to Norwich)
- Route 2A: All (from I-395 to Mohegan Sun Blvd)
- Route 3: from I-91 to Route 2
- Route 7: from I-95 to Grist Mill Rd
- Route 8: All (from I-95 to Route 44)
- Route 9: All (from I-84 to I-95)
- Route 15: All, where feasible (from I-91 to New York border)
- Route 20: from I-91 to airport
- Route 66: from I-91 to Route 147
- Route 72: from Route 9 to Exit 1
- SR796: All; from Route 15 to I-95

Proposed key ITS corridors and deployments as well as those under construction and in-use are shown on the opposite page. These key corridors and projects are also discussed in further detail in this report.

KEY ATMS CORRIDORS AND ITS DEPLOYMENTS - EXISTING AND PROPOSED



PROJECT ACTION PLAN

The eleven projects presented on the following pages have been identified as priority ATMS implementations:

1. Route 9 from I-84 to Middletown and Route 72 from Route 9 to I-84 Camera and Fiber Installation
2. I-95 from NY Border to Fairfield Camera Replacement Project
3. I-91 Connection Installation Project
4. Hartford Area Camera Replacement Project
5. Southeast Connection: Westbrook and Old Saybrook and Route 9 Exit 3 to I-95
6. Southeast Connection: Old Lyme, East Lyme, and Waterford
7. I-91 North of Route 20 Camera Installation
8. I-395 from I-95 to Route 2 and Route 2A
9. Southeast Expansion
10. Route 8 I-95 to Shelton
11. Danbury VMS/ Camera Installation

NOTE: Projects will be implemented based on the availability of funding.

PROJECT 1

Route 9 from I-84 To Middletown and Route 72 from Route 9 to I-84 Camera and Fiber Installation Project

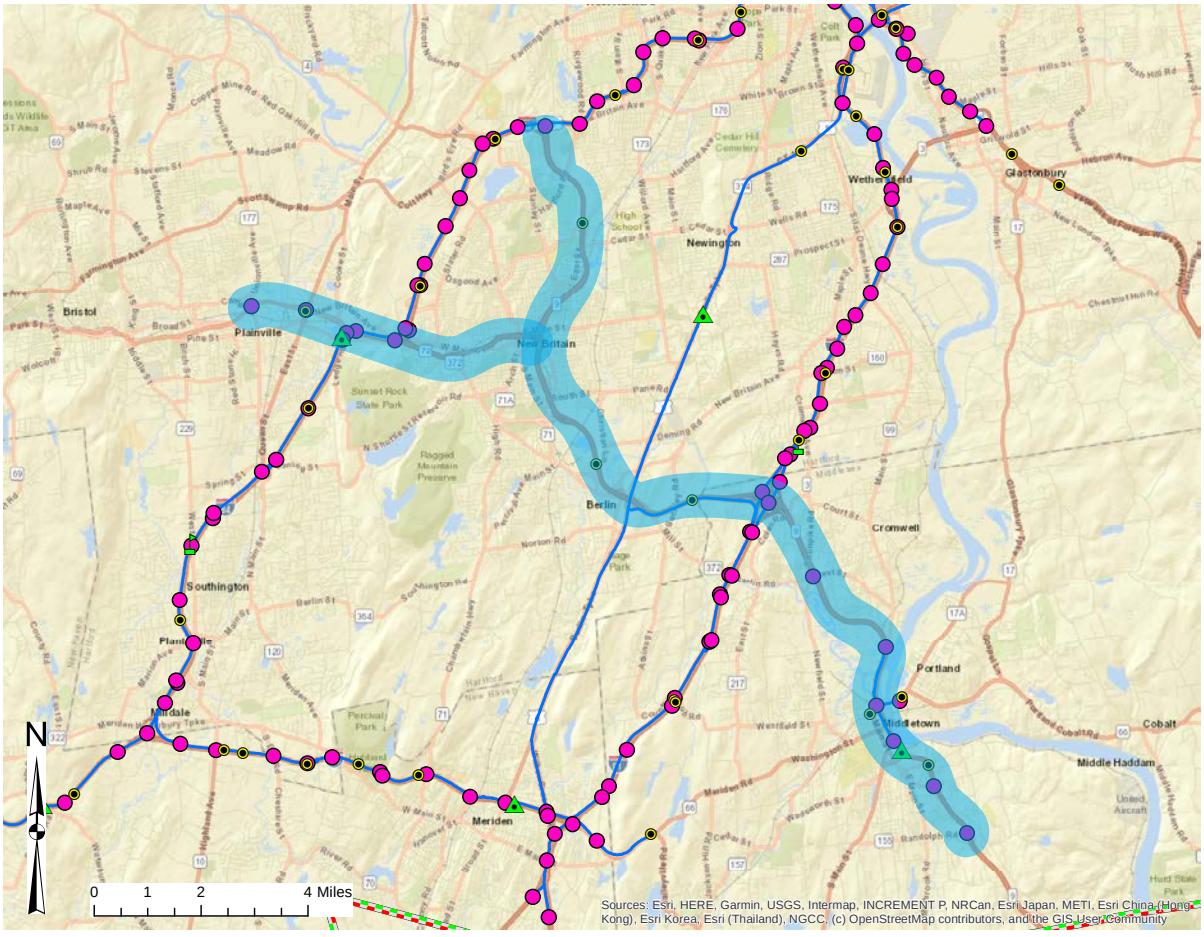
CRCOG and RiverCOG

PROJECT BACKGROUND

CT-9 and CT-72 are secondary freeways in the Hartford region connecting I-91 south of Hartford near Cromwell with I-84 in West Hartford through New Britain. It is a primary corridor for the communities south and west of central Hartford. Together with CT-9, CT-72 provides a primary east-west corridor between I-84 and I-91. CT-72 connects CT-9 in New Britain with the communities of Central Connecticut, including Bristol and Plainville.

PROJECT DESCRIPTION

This project, approved by CTDOT and the MPOs, proposes new camera coverage and a new fiber optic network be placed along CT-9 between the I-84 interchange (exit 39) and the I-91 interchange (exit 22). Additionally, it is proposed that new camera coverage and new fiber optic cabling be placed in the CT-72 corridor between the CT-9 interchange (exit 28) and CT-177. Camera coverage currently exists along CT-9 east of the I-91 interchange, but it is not connected by fiber optic cable. This project also proposes to extend the fiber optic network to CT-155 in the vicinity of Middletown.



PROJECT 2

I-95 from NY Border to Fairfield Camera Replacement Project

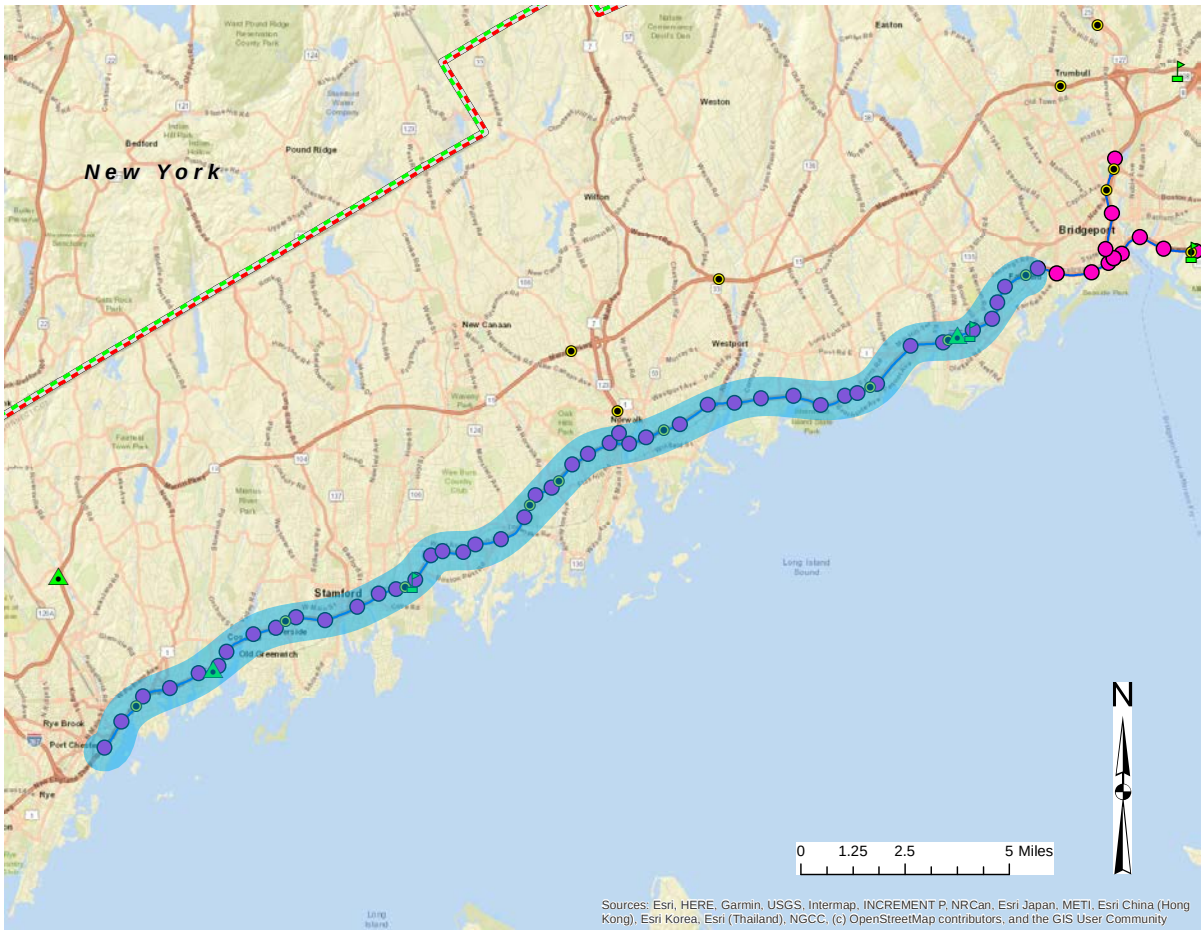
WestCOG and MetroCOG

PROJECT BACKGROUND

I-95 is a primary thoroughfare in coastal Connecticut, connecting the New Haven area and other southwest Connecticut communities with the New York metropolitan area, and Providence, RI. It is one of the most heavily traveled interstate freeways in the country and is a top priority for ATMS implementation in the state.

PROJECT DESCRIPTION

This project, approved by CTDOT and awaiting MPO approval, proposes to replace existing cameras and upgrade communications cabinets along a segment of I-95 between New York State Line and Fairfield.



PROJECT 3

I-91 Connection Project

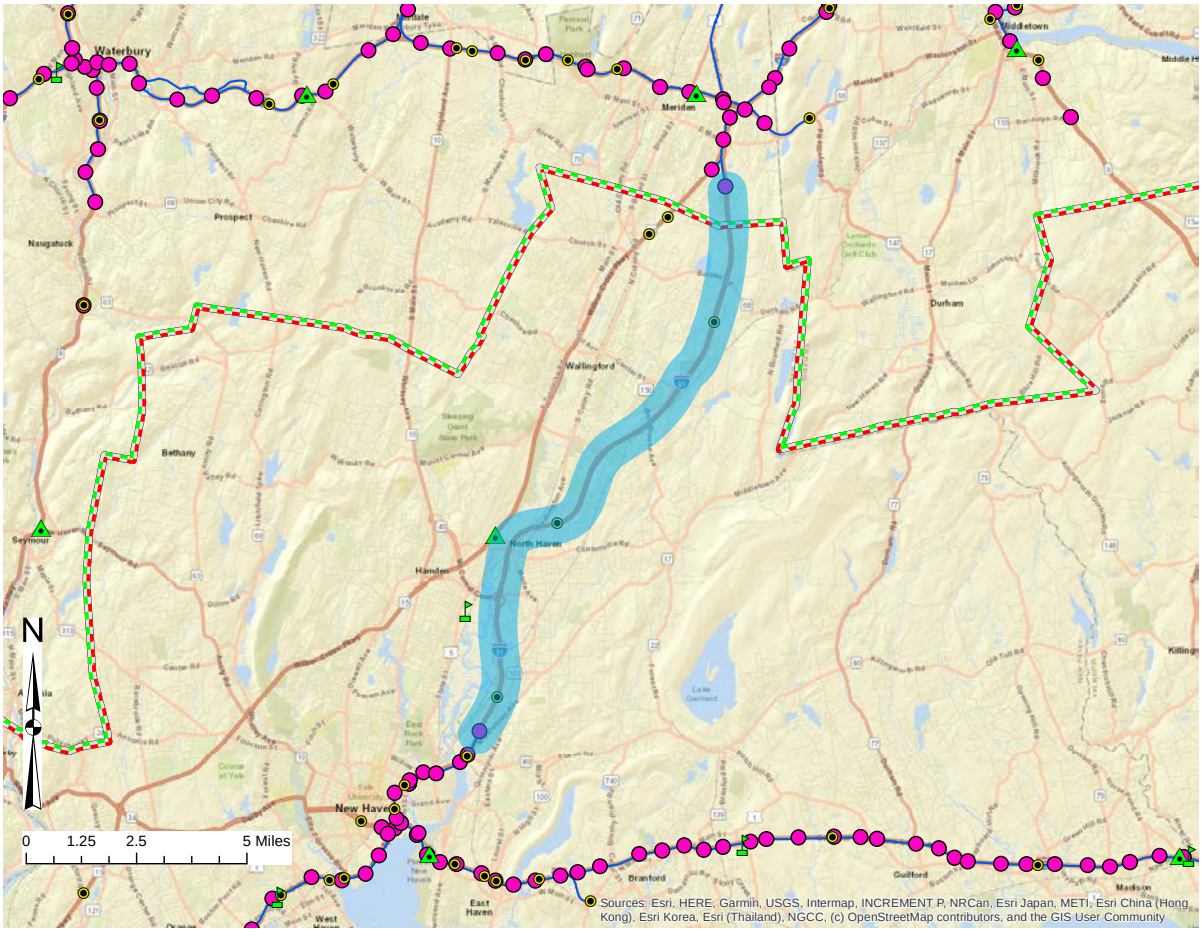
SCRCOG

PROJECT BACKGROUND

I-91 is a primary corridor in the state of Connecticut. There is no current ATMS coverage on I-91 between New Haven and Meriden. Coverage terminates in New Haven near Exit 9. This project will A) provide ATMS coverage on a heavily traveled corridor and B) provide video and data transport redundancy between the NOC and the BOC.

PROJECT DESCRIPTION

This project proposes to add fiber optic cable, cameras, and VMSs along the I-91 corridor from Exit 8 to Exit 16.



PROJECT 4

Hartford Area Camera Replacement Project

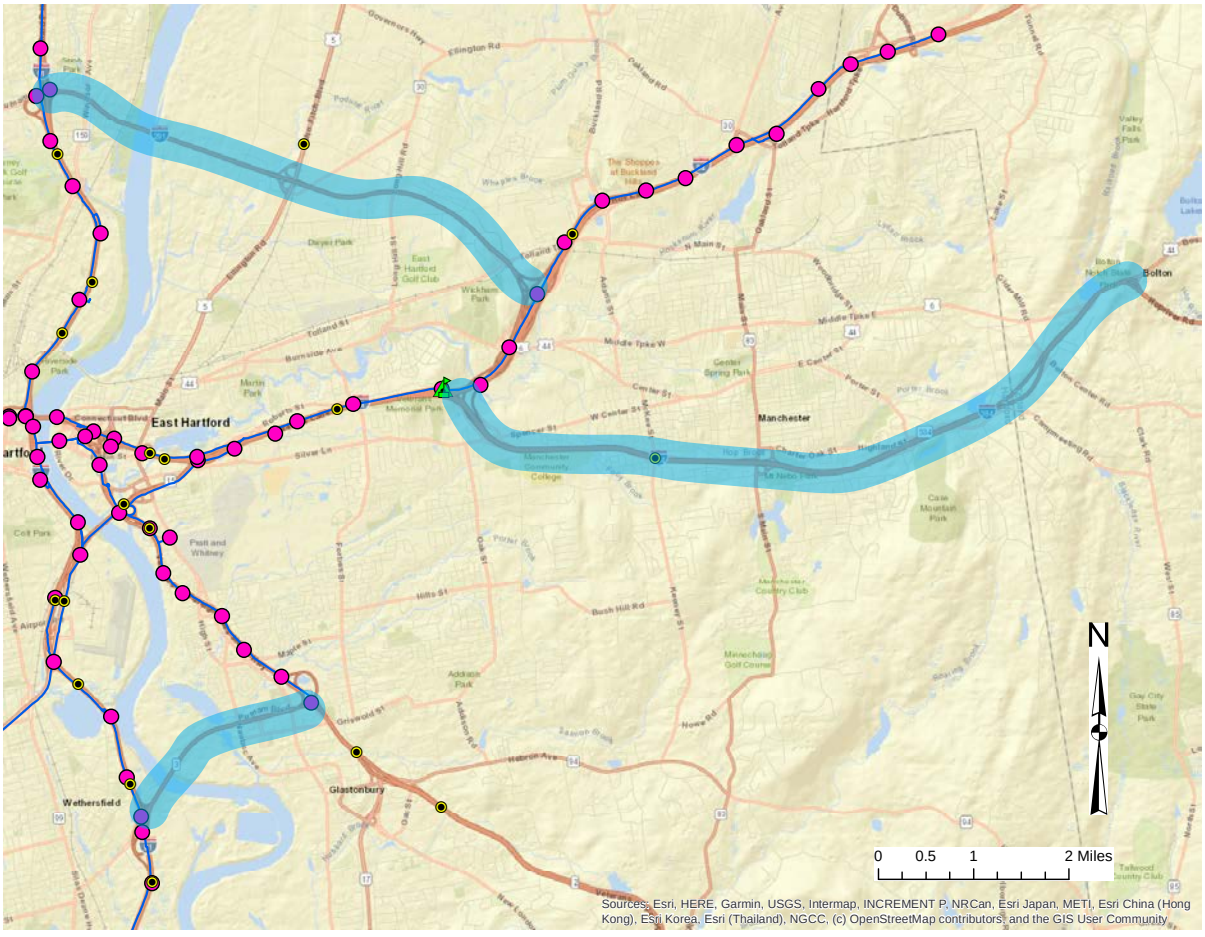
CRCOG

PROJECT BACKGROUND

CCTVs in the Hartford area were installed in the early-2000s. The ATMS equipment is nearing the end of its useful life and some components are no longer manufactured or available.

PROJECT DESCRIPTION

This project is proposed to replace CCTVs and communications equipment in the Hartford area with modern equipment on larger camera poles with camera lowering devices and expand coverage on Route 3, I-291, and I-384. This project can be split up into multiple sub projects due to the amount of CCTVs and fiber optic trunkline miles.



PROJECT 5

Southeast Connection: Westbrook and Old Saybrook and Route 9 Exit 3 to I-95 Project

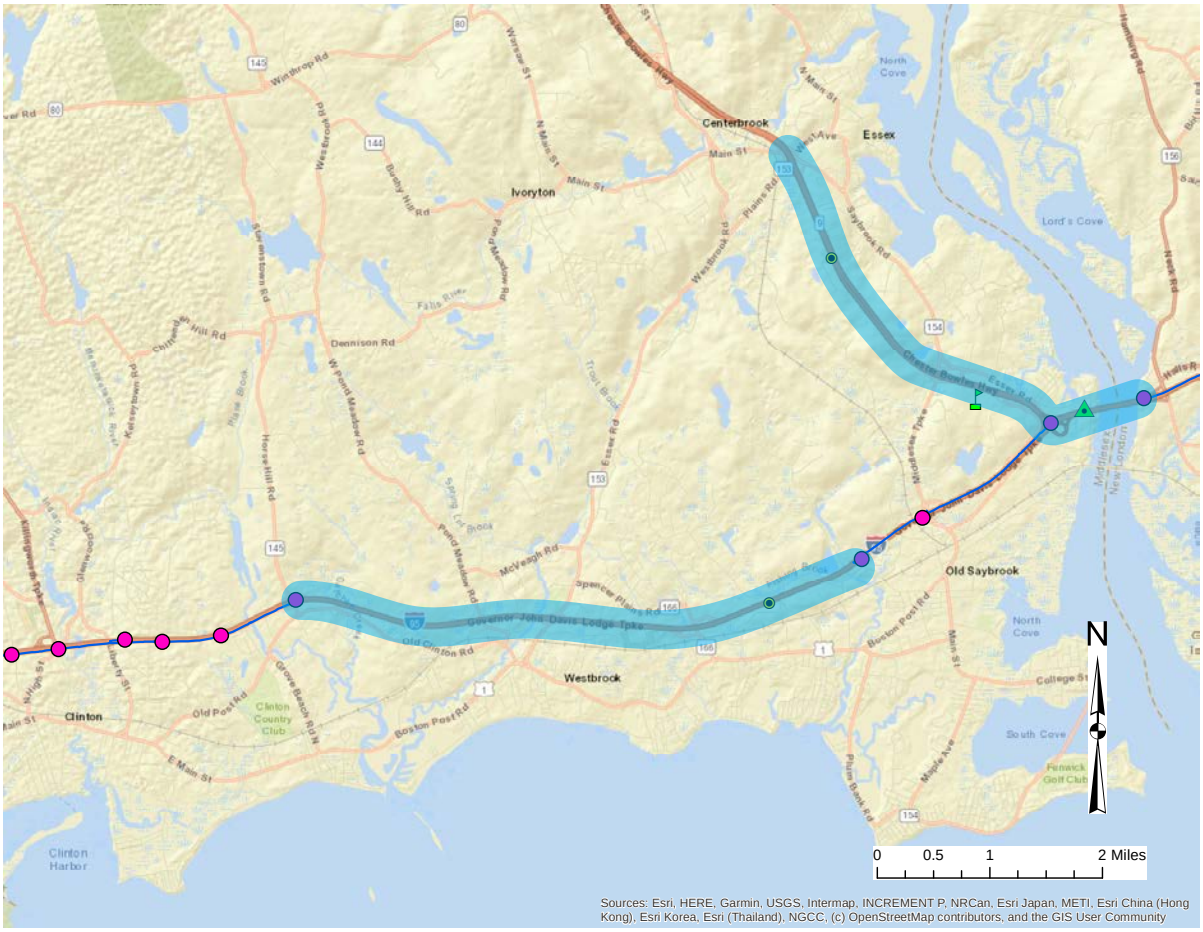
RiverCOG

PROJECT BACKGROUND

I-95 is the primary coastal thoroughfare in Connecticut, connecting major cities in the southwest section of the state with the New York metropolitan area, central Connecticut via I-91, and major New England cities, such as Providence, RI, and Boston, MA.

PROJECT DESCRIPTION

This project will install cameras and a fiber optic network in current gaps along I-95, most notably between Exits 64 and 68. The plan will also install cameras along Route 9 from I-95 to Exit 3, eliminating the need for leased telephone lines along I-95.



PROJECT 6

Southeast Connection: Old Lyme, East Lyme, and Waterford Project

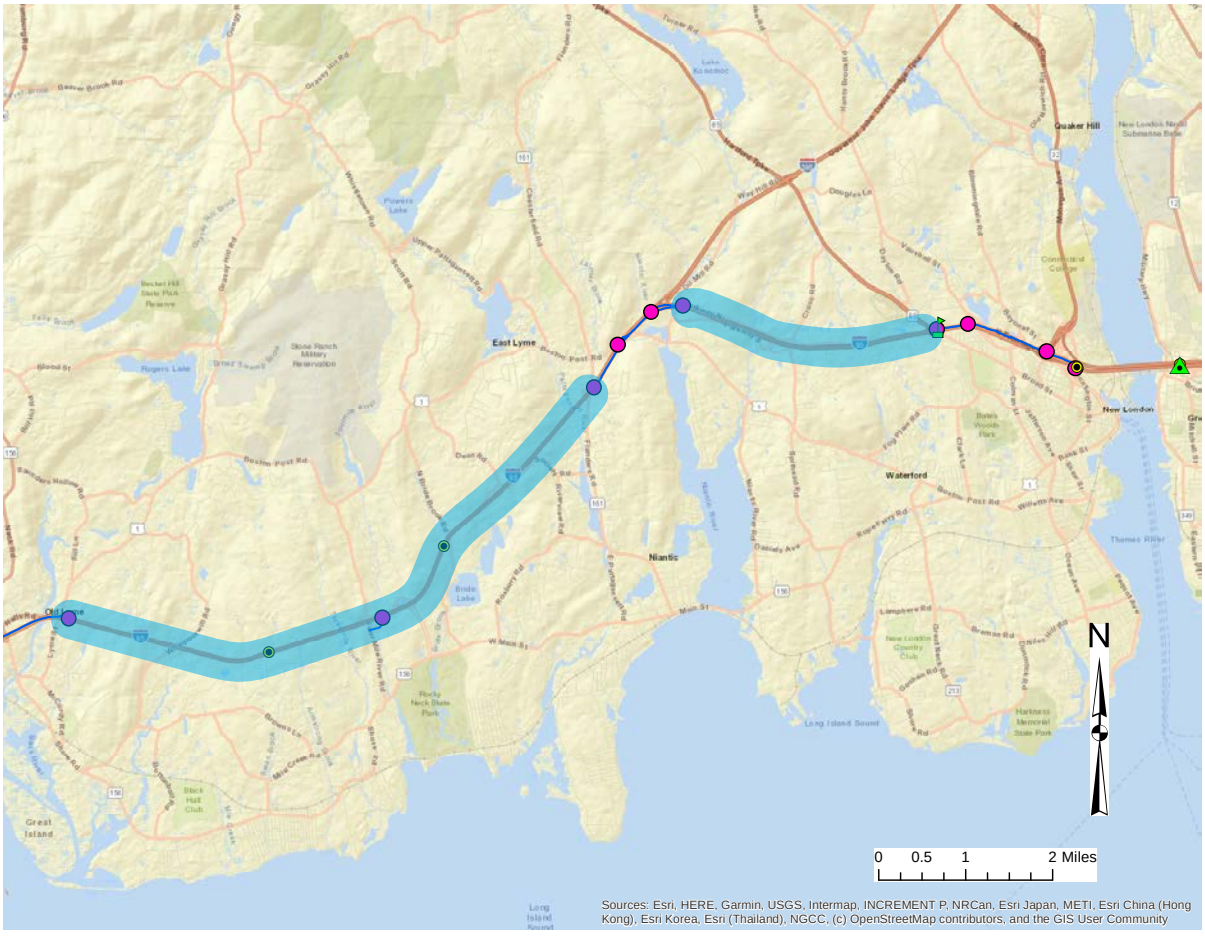
RiverCOG and SECCOG

PROJECT BACKGROUND

I-95 is the primary coastal thoroughfare in Connecticut, connecting major cities in the southwest section of the state with the New York metropolitan area, central Connecticut via I-91, and major New England cities, such as Providence, RI, and Boston, MA.

PROJECT DESCRIPTION

This project will install cameras and a fiber optic network in current gaps along I-95, most notably between Exits 70 and 74 and between Exits 76 and 82, eliminating the need for leased telephone lines along I-95.



PROJECT 7

I-91 North of Route 20 Camera Installation Project

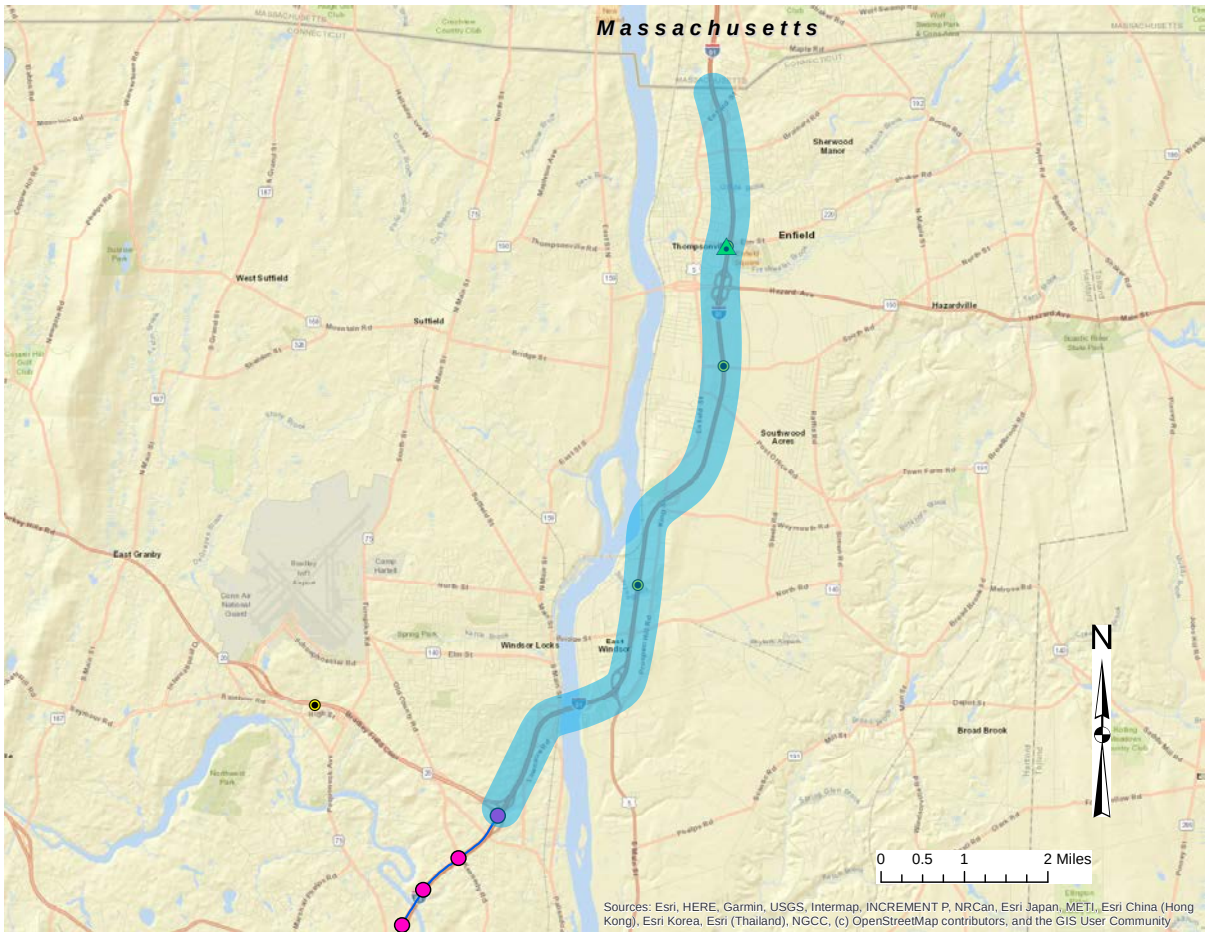
CRCOG

PROJECT BACKGROUND

I-91 is a primary North-South thoroughfare through the state of Connecticut, with this section connecting the Hartford area to the North, including Bradley International Airport and Springfield, MA. The Dexter Coffin Bridge along I-91 provides a major crossing of the Connecticut River in Northern Connecticut.

PROJECT DESCRIPTION

This project is proposed to extend camera coverage and fiber optic cable from the existing terminus near the I-91/CT-20 interchange (Exit 40) over the Dexter Coffin Bridge continuing to the Massachusetts state line.



PROJECT 8

I-395 From I-95 to Route 2 and Route 2A Project

SECCOG

PROJECT BACKGROUND

It is proposed that the fiber optic network be extended from I-95 to Route 2 and along Route 2A to provide a continuous link in the I-395 corridor.

PROJECT DESCRIPTION

This proposed project will install cameras and a fiber optic network in current gaps along I-395, eliminating the need for leased telephone lines along I-95.

PROJECT 9

Southeast Expansion Project

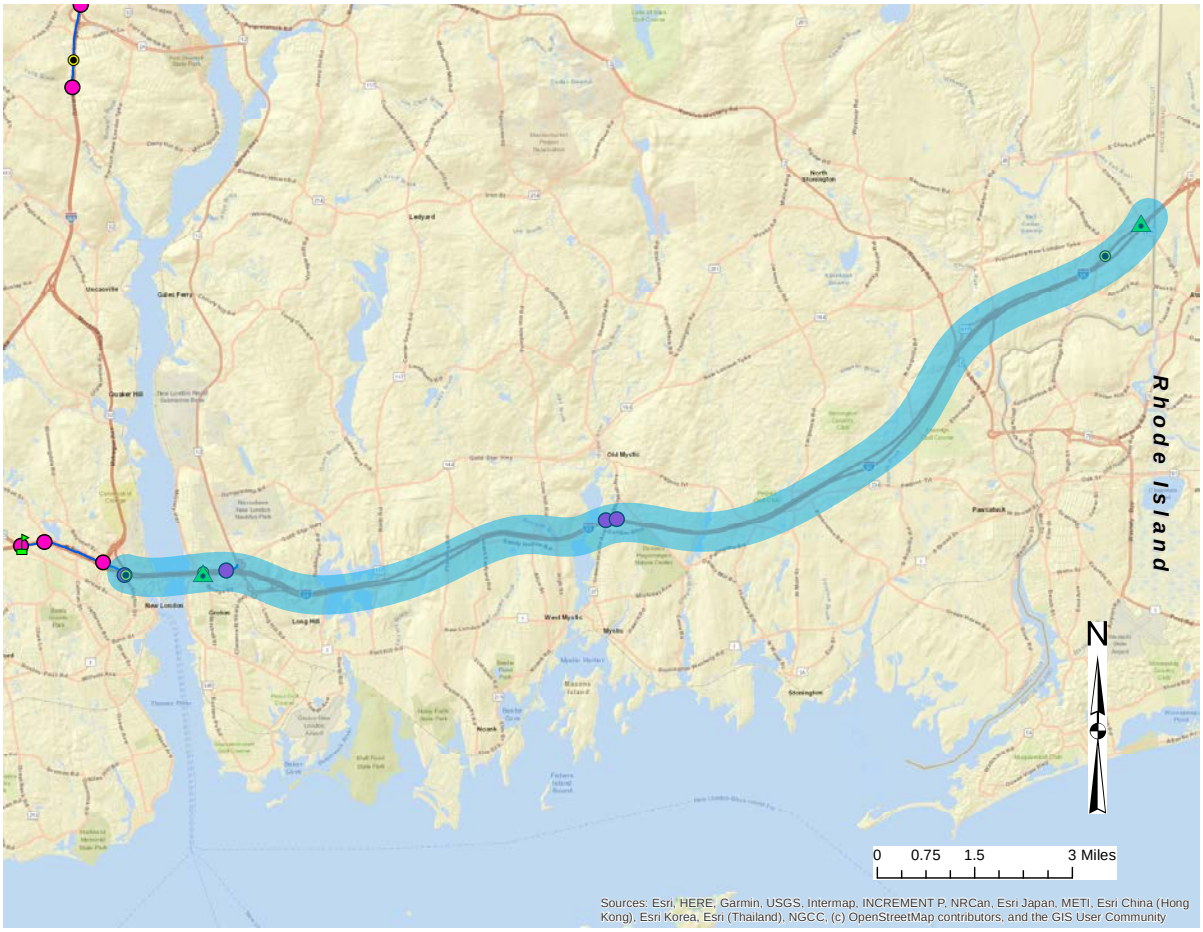
SECCOG

PROJECT BACKGROUND

I-95 is the primary coastal thoroughfare in Connecticut, connecting major cities in the southwest section of the state with the New York metropolitan area, central Connecticut via I-91, and major New England cities, such as Providence, RI, and Boston, MA.

PROJECT DESCRIPTION

This proposed project would extend the CTDOT fiber optic network and CCTV coverage from the easternmost terminus along I-95 to provide a continuous link in the corridor to the vicinity of Exit 93.



PROJECT 10

Route 8 Exit 5 to Exit 25 Project

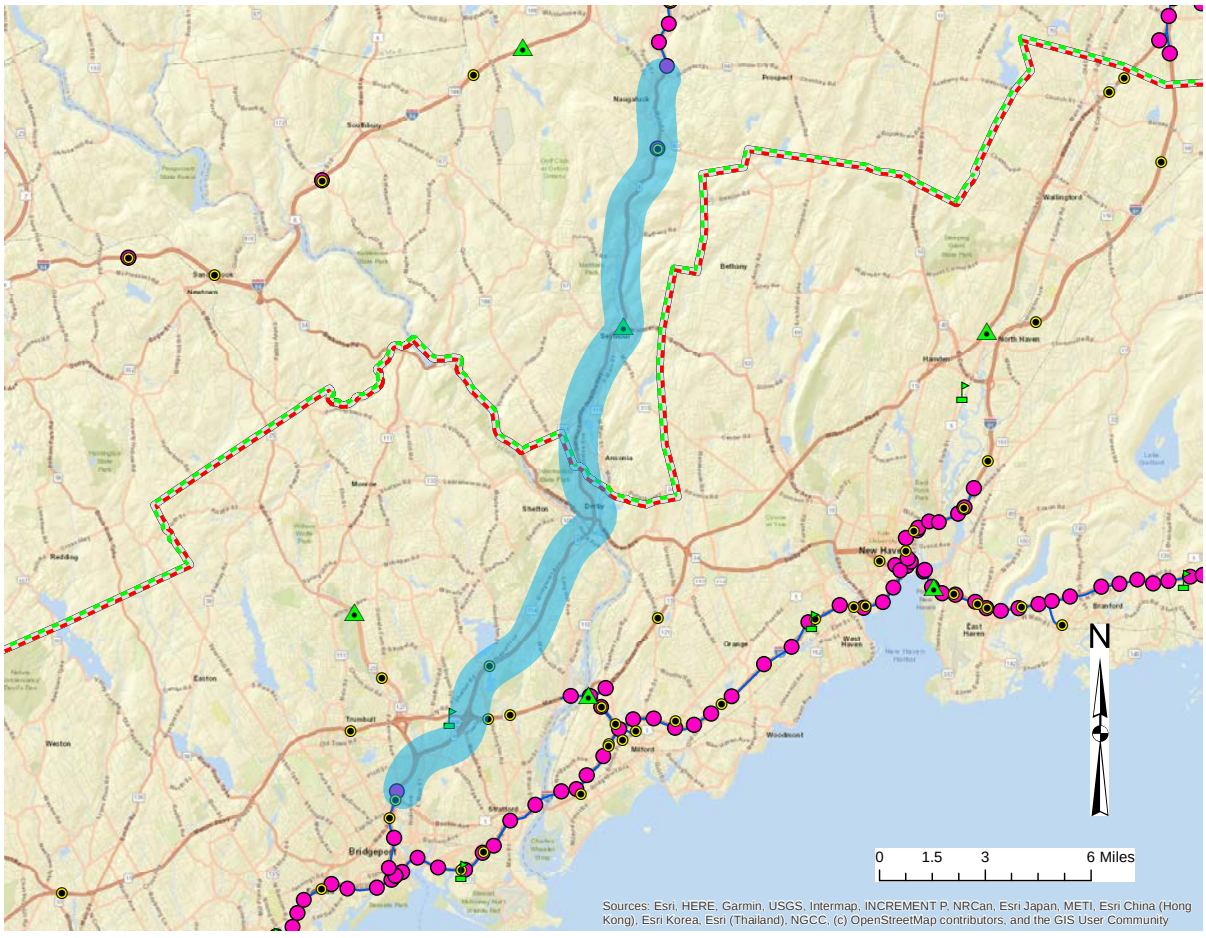
MetroCOG and NVCOG

PROJECT BACKGROUND

CT-8 is a limited access highway that links Bridgeport with Waterbury. Currently, ATMS devices extend from I-95 to Exit 5.

PROJECT DESCRIPTION

This proposed project will install a fiber optic network and CCTVs from Exit 5 in Bridgeport to Exit 25 in Naugatuck.



PROJECT 11

Danbury Area VMS/Camera Installation Project

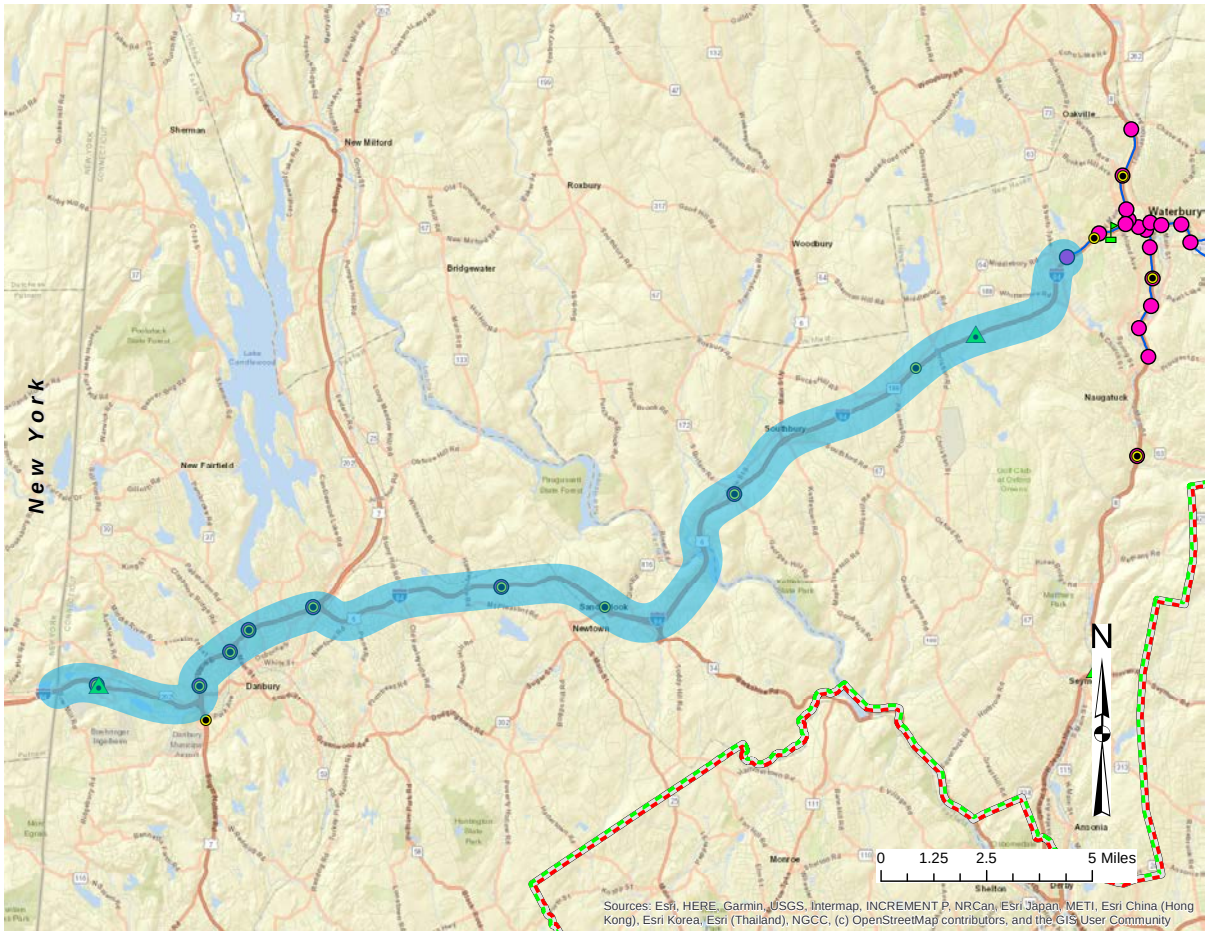
WestCOG and NVCOG

PROJECT BACKGROUND

I-84 is a limited access highway in the state of Connecticut. As a temporary remedy, CTDOT placed portable VMSs with low height cameras in strategic locations between Danbury and Waterbury along I-84. Currently, the fiber optic network terminates at Exit 17.

PROJECT DESCRIPTION

This proposed project will replace the existing portable VMS with camera equipment along I-84 with a permanent solution. This proposed project will also install the fiber optic network and CCTV in coverage gaps from Exit 17 to the New York State line.



CONCLUSION

ATMS devices throughout the State of Connecticut serve an important role in operating and managing the state's limited access freeways. In order to keep the system operating efficiently, it is important to periodically conduct a strategic review of CTDOT's ATMS system.

In addition to describing CTDOT's goals and ATMS objectives, this Statewide ATMS Strategic Plan has also identified high-level strategies, tactics, key ATMS corridors, and proposed project actions to further develop and achieve these goals and objectives. This Strategic Plan represents a snapshot in time and will need to be periodically reviewed and updated to remain relevant to changing transportation needs, goals, and priorities. Updates to this Strategic Plan should be closely coordinated with CTDOT Highway Operations staff and the Asset Management Group.

This Strategic Plan includes a list of key ATMS corridors and potential future ATMS implementations throughout the state. These potential future ATMS implementations are intended to: replace and upgrade existing infrastructure that is approaching the end of its serviceable lifespan; update communications equipment and the fiber-optic network to reduce maintenance costs and communication expenses as well as offer improvements in communications redundancy and reliability; close system coverage gaps along existing key routes; and provide additional new coverage along heavily-traveled routes. By addressing these current system challenges, CTDOT will be well-prepared to continue to provide ATMS services to support the state's transportation network and the traveling public.

REFERENCED DOCUMENTS

This document references and was informed by other transportation planning documents applicable throughout Connecticut. These documents include:

- South Central Regional Long Range Transportation Plan for 2015-2040, (April 2015)
- Lower Connecticut River Valley Long Range Regional Transportation Plan for 2015-2040, (April 2015)
- Southeastern Connecticut Long-Range Regional Transportation Plan for 2015-2040, (April 2015)
- Connecticut Statewide Transportation Improvement Program, (2018)
- Connecticut Strategic Long-Range Transportation Plan for 2009-2035, (June 2009)
- Hartford Region Regional ITS Architecture Update, (2015)
- Western COG Regional Transportation Plan for The Housatonic Valley Region, (2015)
- South Western Region Long Range Transportation Plan for 2015-2040, (2015)
- Central Naugatuck Valley Long-Range Regional Transportation Plan for 2015-2040, (2015)
- Regional Transportation Plan for the Valley Planning Region for 2015 – 2040, (2015)
- Regional Transportation Plan for the Greater Bridgeport Planning Region for 2015-2040, (2015)
- South Western Region Intelligent Transportation Systems Strategic Plan, (2008)
- Intelligent Transportation System Strategic Plan 2015-2019, USDOT
- Regional Transportation Plan for the Housatonic Valley Region, for 2015-2040, (2015)
- Capitol Region ITS Strategic Plan, (2015)
- State of Connecticut 2011 & 2012 Work Zone Safety Reviews
- A Primer on the Connected Vehicle Environment, by the National ITS Architecture Team, (2015)
- National ITS architecture (ARC-IT), version 8.1, USDOT, (February 2018)
- Hartford Area Regional ITS Architecture Update, (2015)
- Transportation in Connecticut: The Existing System

Prepared by IBI Group