

ITS STRATEGIC DEPLOYMENT PLAN FOR CHITTENDEN COUNTY

Final Report

Revised December 2005



***Chittenden County
Metropolitan Planning
Organization***

*Communities working together
to meet Chittenden County's
transportation needs*



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Metropolitan Planning
Organization***

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**RESOLUTION OF THE
CHITTENDEN COUNTY METROPOLITAN PLANNING ORGANIZATION APPROVING THE
REGIONAL INTELLIGENT TRANSPORTATION SYSTEMS ARCHITECTURE**

WHEREAS, the Chittenden County Metropolitan Planning Organization (CCMPO), which was designated by the Governor of Vermont to meet the requirements of federal transportation laws, is responsible for managing the continuous, cooperative and comprehensive Transportation Planning process in Chittenden County; and

WHEREAS, the CCMPO published the *Chittenden County Intelligent Transportation Systems (ITS) Strategic Deployment Plan* (September 20, 2000), a document prepared to guide the planning and implementation of ITS in Chittenden County; and

WHEREAS, the Federal Highway Administration (FHWA) issued a Final Rule and the Federal Transit Administration (FTA) issued a similar policy on National ITS Architecture on January 8, 2001 to implement §5206(e) of the Transportation Equity Act for the 21st Century, and

WHEREAS, the Rule/Policy requires that any region currently implementing ITS projects shall have a regional ITS architecture in place by April 8, 2005; and

WHEREAS, the *2025 Metropolitan Transportation Plan (MTP)* recommends ITS projects to improve travel efficiency with technology-based tools to manage traffic volumes and flows; and

WHEREAS, an ITS Stakeholders Group was involved in developing and reviewing the architecture with representatives from the following organizations represented: municipal staffs, Chittenden County Regional Planning Commission (CCRPC), Federal Highway Administration (FHWA), Vermont Agency of Transportation (VTrans), Department of Motor Vehicles (DMV), Burlington International Airport (BIA), Chittenden County Transportation Authority (CCTA), University of Vermont (UVM) and private industry; and

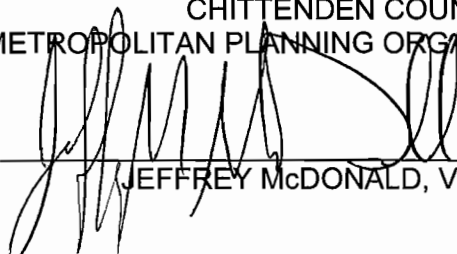
WHEREAS, the Chittenden County Technical Advisory Committee recommended approval of the Regional ITS Regional Architecture Report at their March 2, 2005 meeting;

NOW THEREFORE BE IT RESOLVED THAT:

The Chittenden County Metropolitan Planning Organization hereby approves the report, *Regional ITS Architecture for Chittenden County*, dated February 2005, as the regional vision and policy plan regarding the use of specific ITS applications to address regional transportation problems.

Dated this 16th day of March 2005 in South Burlington, Vermont.

CHITTENDEN COUNTY
METROPOLITAN PLANNING ORGANIZATION



JEFFREY McDONALD, VICE CHAIR

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Acronymns and Abbreviations

Common acronyms and abbreviations featured in this report are listed below:

APTS	Advanced Public Transportation System
ATIS	Advanced Traveler Information System
ATMS	Advanced Traffic Management System
AVL	Automatic Vehicle Location
CARS	Conditions Acquisition and Reporting System
CATMA	Campus Area Transportation Management Association
CCMPO	Chittenden County Metropolitan Planning Organization
CCTA	Chittenden County Transportation Authority
DMS	Dynamic Message Sign
GPS	Global Positioning System
HAR	Highway Advisory Radio
ITS	Intelligent Transportation Systems
TIP	Transportation Improvement Plan
TOC	Chittenden Regional Transportation Operations Center
TRIO	TRaveler Information Online, (VT-NH-ME Traveler Info. System)
VMS	Variable Message Sign
VTrans	Vermont Agency of Transportation

1. INTRODUCTION

This document presents a ten-year Intelligent Transportation Systems (ITS) Strategic Deployment Plan for Chittenden County, Vermont. The ITS Strategic Deployment Plan (“the Strategic Plan”) was prepared on behalf of the Chittenden County Metropolitan Planning Organization (CCMPO), in cooperation with local, regional, and state transportation and emergency management stakeholders as part of the Regional ITS Architecture Development Process.

The Strategic Plan recommends specific, project-based initiatives for implementing the Regional ITS Architecture for Chittenden County, which provides an overall logical framework for ITS implementation in the region. This Plan and the *Regional ITS Architecture for Chittenden County* report, taken together, provide a roadmap for coordinated ITS deployment in the County.

The Strategic Plan was developed in close coordination with the Vermont Statewide ITS Strategic Deployment Plan. This collaboration ensured consistency between the two plans and enables the region to best leverage state and interstate investments in ITS services such as traveler information, traffic management, and roadway weather information systems, among others.

1.1 ITS Planning in Chittenden County

In 2002, CCMPO completed the *ITS Project Development Final Report*, the culmination of a study undertaken to assess ITS initiatives in the region and make recommendations about future courses of action.

Since this document was created, new U.S. Federal requirements, evolving local needs, ITS deployment (regional and statewide), technology advances, and other factors have generated the need for an updated ITS planning initiative in the form of a Regional ITS Architecture and an updated Strategic Deployment Plan.

The Regional ITS Architecture, the companion document to this Strategic Plan, defines an institutional and technological framework to ensure coordinated ITS deployment in response to identified regional transportation and emergency management needs. Coordination maximizes the value of individual investments and ensures that individual initiatives are conceived and implemented mindful of their regional context.

The Architecture was developed in accordance with the framework provided in the National ITS Architecture, Version 5.0 (www.iteris.com/itsarch), as well as the requirements set forth in the 2001 Federal Highway Administration (FHWA) Rule and Federal Transit Administration (FTA) Policy that implement section 5206(e) of the U.S. Department of Transportation (USDOT) Transportation Equity Act for the 21st Century (TEA-21). The Final Rule 23 CFR 940 and FTA Policy require that ITS projects funded through the Highway Trust Fund and the Mass Transit Account must conform to a Regional ITS Architecture that is developed based on the National ITS Architecture standards.

The process undertaken for building the Architecture included four steps:

- **The Needs Analysis** process, in which regional transportation needs and ITS goals were determined by reviewing documents and engaging with stakeholders.
- **The Architecture Development** process, during which the component systems of the ITS Architecture and interfaces between them were developed, based on the results of the Needs Analysis.

- **The Operational Concept**, which was developed to define the institutional roles and responsibilities of the stakeholders in implementing and operating component systems of the architecture.
- **The Strategic Plan**, the final step in the Architecture Development Process, provides a strategy and timeline for achieving the integrated transportation system envisioned by the architecture through a series of identified initiatives.

Each step of the process was founded on the comprehensive input and involvement of local ITS stakeholders, with the goal of creating a final Regional ITS Architecture rooted in local needs. The stakeholders who participated in the Chittenden County architecture development process represented a wide range of local, regional, and statewide entities, multiple modes of transportation, and both public and private interests. A number of stakeholders simultaneously participated in the development of the Vermont Statewide ITS Architecture, and thus helped to promote consistency and exchange of ideas between these two endeavors. The stakeholders participated in workshops and meetings, reviewed project deliverables (draft documents and website), and provided input at each stage of the process, from needs analysis to the strategic plan.

The following stakeholders were invited to participate in the Architecture Development process (including this Plan):

Municipal (Public Works, Police, and Fire Depts.)

All Cities, Towns, and Villages in Chittenden County, including:

- City of Burlington
- City of South Burlington
- City of Winooski
- Town of Colchester
- Town of Essex
- Town of Williston
- Town of Shelburne
- Village of Essex Junction

Regional

- Burlington International Airport
- Campus Area Transportation Management Association (CATMA)
- Chittenden County Metropolitan Planning Organization (CCMPO)
- Chittenden County Regional Planning Commission (CCRPC)
- Chittenden County Transit Authority (CCTA)

State

- Vermont Agency of Transportation (VTrans)

- Vermont Department of Motor Vehicles (DMV)
- Vermont Department of Public Safety - Vermont State Police
- Vermont Fire Chief's Association

Federal

- Federal Highway Administration (FHWA)
- Federal Transit Administration (FTA)

Private and Institutional

- IBM (major private employer)
- Fletcher Allen Health Care (emergency services and major employer)
- The University of Vermont – Burlington (major transportation generator)
- Lake Champlain Regional Chamber of Commerce
- Lake Champlain Transportation Company (passenger ferries)
- Vermont Railway (freight railway)
- Vermont Transit Co., Inc. (motor coach lines)
- Vermont Transit Authority (VTA)

1.2 Strategic Plan Objectives and Approach

The objective of the Strategic Plan is to translate the recommendations of the completed logical Architecture into specific short-, medium- and long-term projects that can be incorporated into the regional Transportation Improvement Program (TIP). The recommended projects must take into consideration the unique attributes of Chittenden County and present an efficient, effective means of deploying ITS to achieve both early success and long-term integration with regional, state, and interstate advanced technology infrastructure.

Chittenden County's size and diverse project area covering urban, suburban, and rural regions requires a tailored approach to ITS deployment. The general approach to this project was to combine the region's unique attributes and needs with ITS "lessons learned" and demonstrated benefits from other regions. In addition, it is important that the deployment plan is realistic in terms of the scale and phasing of the deployment, ensuring free-standing operability of projects in the short-term.

Other key aspects of the approach include:

- **Consistency with the Regional ITS Architecture:** As previously mentioned, a Regional ITS Architecture was created for Chittenden County concurrent with this Plan. The Architecture was built based on a comprehensive study of local transportation needs, existing ITS systems, and planned ITS initiatives. It was created to assure that all new ITS projects are built to be compatible across time and distance, maximizing value for both the new and existing ITS system.

Therefore all ITS projects suggested in this Strategic Plan are consistent with the recommendations of the Architecture.

- **Responsiveness to Regional Needs:** Large-scale traffic management solutions typical in larger metropolitan areas were not necessarily relevant in an area such as Chittenden County. The scale and cost of the ITS projects proposed, as well as the deployment plan for those projects, must be appropriate to the size of the region and its combination of rural and metropolitan transportation characteristics.
- **Multi-Functional ITS Technologies:** To maximize the value of ITS deployments in Chittenden County, the project concepts have been developed so that ITS equipment can serve more than one purpose whenever possible. This principle can be applied to traffic detectors, surveillance cameras, communications, and a host of other ITS infrastructure elements.
- **Inter-Regional and Interstate Coordination:** While the boundaries of this project were limited to Chittenden County, regional ITS projects will be impacted by statewide and inter-state initiatives. An example is the TRaveler Information Online (TRIO) initiative involving Vermont, New Hampshire, and Maine.
- **Incremental Deployment Based Upon Early Success:** Early success projects, i.e., low-cost deployments which demonstrate real benefits within a short timeframe, build momentum and confidence for the ITS program. These projects address short-term needs while providing a basis for eventual region-wide deployments. For example, a construction traffic management system operating out of a project trailer is a modest project in itself, but it demonstrates the potential of the technology while preparing agencies for the new operational mindset that ITS requires.

1.3 The ITS Project Development Process

Development of the Strategic Plan included the following steps:

- Review of local needs and ITS services (i.e., market packages) identified with project stakeholders during the Regional ITS Architecture development process;
- Prioritization of those ITS services and needs based upon local, regional and statewide factors;
- Identification of discrete ITS projects that provide logical services within well-defined domains (e.g. by corridor, mode, region); then,
- Development of a prioritized list of projects based on early success opportunities, technological maturity, statewide ITS deployment initiatives, and the precedence and interdependence of projects, among other factors.

1.4 Project Descriptions

Each recommended project (Chapter 2) is described in terms of:

- Project number and name
- Project description
- Estimated Cost

- Geographic bounds
- Market packages addressed
- Time frame
- Lead agency
- Other key stakeholders
- Necessary interagency coordination or agreements
- Interstate/international coordination requirements
- Phasing options
- Prerequisite/Co-requisite projects

1.5 Project Cost Estimates

Planning-level cost estimates have been provided for each of the projects identified in this Plan to facilitate decision-making related to project programming, prioritization, and funding.

Cost estimates for Public Transportation (PT) projects reported here have been prepared by CCTA as part of an internal technology assessment. Other project costs have been estimated as part of the Strategic Plan development.

Costing for individual projects is dependent on a wide variety of factors, including: detailed project functional requirements; final quantities and specifications of equipment to be installed; existing field conditions; available communications infrastructure; coordination with other infrastructure construction or rehabilitation projects; and a host of other determinants that shall be investigated in the preliminary engineering phase of each project to produce refined engineering cost estimates.

The planning cost estimates have been prepared based on approximated equipment quantities and installed unit costs for field and headend equipment. Total estimated project costs are reported as part of the Project Descriptions (Section 2.4). Itemized cost estimates for non-CCTA projects are presented in Appendix A.

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2. 2005 COMPREHENSIVE PROJECT DESCRIPTIONS

2.1 Introduction

This chapter presents detailed descriptions for each project included in the Strategic Plan. Through these projects, summarized in Table 1, the functional elements of the Regional ITS Architecture have been translated into project-based deployments that can be prioritized, programmed into the regional TIP, funded, and implemented strategically over time.

Table 1: Regional ITS Projects

Project Title	Estimated Cost ¹	Timeframe	Lead Agency
FM-1: Interchange Safety and Management Systems	\$445,000	Short-Term	VTrans
FM-2: Circumferential Highway Freeway Management System	\$445,000	Sections A,B: Short-Term	VTrans
		Sections C-F: Medium-Term	VTrans
		Sections G-J: Long-Term	VTrans
FM-3: I-89/189 Freeway Management System	\$394,000	Medium-Term	VTrans
AM-1: U.S. Route 7 (Shelburne Rd) Corridor Management System	\$800,500	Short-Term	VTrans
AM-2: U.S. Route 15 Corridor Management System	\$515,000	Medium-Term	VTrans
AM-3: Route 2A Corridor Management System	\$260,500	Medium-Term	VTrans
AM-4: Route 2 Corridor Management System	\$516,000	Medium-Term	VTrans
AM-5: Champlain Parkway Corridor Management System	\$344,000	Long-Term	City of Burlington
AM-6: VT 127 Corridor Management System	\$363,000	Long-Term	VTrans
UTM-1: Burlington Urban Traffic Management System	\$800,000	Medium-Term	City of Burlington
UTM-2: Winooski Urban Traffic Management System	\$323,000	Long-Term	City of Winooski
PT-1: Traveler Info System – Downtown Transit Center	\$492,800	Short-Term	CCTA
PT-2: Traveler Info System – Schedule Info/Trip Planner	\$554,400	Short-Term	CCTA
PT-3: Transit Signal Priority: Initial Design Effort	\$4,405,700	Short-Term	CCTA
PT-4: Transit Signal Priority		Rt 15 Corridor: Short-Term	CCTA
		Secondary Corridors: Medium-Term	CCTA
		Tertiary Corridors: Long-Term	CCTA
PT-5: Fixed Route Operations Management System	\$2,168,600	Medium-Term	CCTA
PT-6: Traveler Info System – Real-time Next Bus Information	\$364,000	Long-Term	CCTA
PT-7: Paratransit Operations Management System	\$1,097,600	Long-Term	CCTA
PT-8: Smart Card Based Fare Payment	\$246,400	Long-Term	CCTA
RMA-1: Chittenden Regional Data Warehouse	\$145,000	Medium-Term	CCMPO
RMA-2: Chittenden Regional Transportation Operations Center (TOC)	\$361,000	Long-Term	CRTA ²

¹ Costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.

²The Chittenden Regional Transportation Authority (CRTA) is a proposed regional entity responsible for regional traffic management coordination.

2.2 Regional ITS Projects by Functional Subsystem

The tables below summarize the ITS projects identified for the region by subsystem, including a description of the deployment timeframe, lead agency, and corresponding National ITS Architecture market packages contained within the Chittenden County Regional ITS Architecture.

Projects are divided into the following classifications:

- Freeway Management (FM)
- Arterial Management (AM)
- Urban Traffic Management (UTM)
- Public Transportation (PT)
- Regional Management and Administration (RMA)

Table 2: Regional ITS Projects – Freeway Management (FM)

Project Title	Timeframe	Lead Agency	Market Packages
FM-1: Interchange Safety and Management Systems	Short-Term	VTrans	ATMS01 EM02 ATMS04 APTS7 ATMS06 ATIS1
FM-2: Circumferential Highway Freeway Management System	Sections A,B: Short-Term	VTrans	ATMS01 EM02 ATMS04 APTS7 ATMS06 ATIS1
	Sections C-F: Medium-Term	VTrans	ATMS01 EM02 ATMS04 APTS7 ATMS06 ATIS1
	Sections G-J: Long-Term	VTrans	ATMS01 EM02 ATMS04 APTS7 ATMS06 ATIS1
FM-3: I-89/189 Freeway Management System	Medium-Term	VTrans	ATMS01 EM02 ATMS04 APTS7 ATMS06 ATIS1

Table 3: Regional ITS Projects – Arterial Management (AM)

Project Title	Timeframe	Lead Agency	Market Packages	
AM-1: U.S. Route 7 (Shelburne Rd) Corridor Management System	Short-Term	VTrans	ATMS01 ATMS03 ATMS06	EM02 APTS7 APTS8 ATIS1
AM-2: U.S. Route 15 Corridor Management System	Medium-Term	VTrans	ATMS01 ATMS03 ATMS06	EM02 APTS7 APTS8 ATIS1
AM-3: Route 2A Corridor Management System	Medium-Term	VTrans	ATMS01 ATMS03 ATMS06	EM02 APTS7 APTS8 ATIS1
AM-4: Route 2 Corridor Management System	Medium-Term	VTrans	ATMS01 ATMS03 ATMS06	EM02 APTS7 APTS8 ATIS1
AM-5: Champlain Parkway Corridor Management System	Long-Term	City of Burlington	ATMS01 ATMS03 ATMS06	EM02 APTS7 APTS8 ATIS1
AM-6: VT 127 Corridor Management System	Long-Term	VTrans	ATMS01 ATMS03 ATMS06	EM02 APTS7 APTS8 ATIS1

Table 4: Regional ITS Projects – Urban Traffic Management (UTM)

Project Title	Timeframe	Lead Agency	Market Packages	
UTM-1: Burlington Urban Traffic Management System	Medium-Term	City of Burlington	ATMS01 ATMS03 ATMS06	EM02 APTS7 APTS8 ATIS1
UTM-2: Winooski Urban Traffic Management System	Long-Term	City of Winooski	ATMS01 ATMS03 ATMS06	EM02 APTS7 APTS8 ATIS1

Table 5: Regional ITS Projects –Public Transportation (PT)

Project Title	Timeframe	Lead Agency	Market Packages
PT-1: Traveler Info System – Downtown Transit Center	Short-Term	CCTA	APTS8
PT-2: Traveler Info System – Schedule Info/Trip Planner	Short-Term	CCTA	APTS8
PT-3: Transit Signal Priority: Initial Design Effort	Short-Term	CCTA	APTS7
PT-4: Transit Signal Priority	Rt 15 Corridor: Short-Term	CCTA	APTS7
	Secondary Corridors: Medium-Term	CCTA	APTS7
	Tertiary Corridors: Long-Term	CCTA	APTS7
PT-5: Fixed Route Operations Management System	Medium-Term	CCTA	APTS1 APTS5 APTS2 APTS6
PT-6: Traveler Info System – Real-time Next Bus Information	Long-Term	CCTA	APTS8
PT-7: Paratransit Operations Management System	Long-Term	CCTA	APTS1 APTS5 APTS3
PT-8: Smart Card Based Fare Payment	Long-Term	CCTA	APTS4

Note that many Public Transportation ITS projects incorporate vehicle-to-center and center-to-center communications that rely upon enhanced radio communications infrastructure to transport voice, data, and/or video information with sufficient bandwidth and reliability. The Plan recognizes the importance of a radio system evaluation and possible upgrade of the system as a prerequisite to certain ITS deployments; however a communications systems study and/or replacement is not explicitly included as part of this Plan.

Table 6: Regional ITS Projects – Regional Management and Administration (RMA)

Project Title	Timeframe	Lead Agency	Market Packages
RMA-1: Chittenden Regional Data Warehouse	Medium-Term	CCMPO	AD2
RMA-2: Chittenden Regional Transportation Operations Center (TOC)	Long-Term	CRTA ³	ATMS07

³The Chittenden Regional Transportation Authority (CRTA) is a proposed regional entity responsible for regional traffic management coordination.

2.3 Projects by Deployment Timeframe

The Strategic Plan assumes a ten-year project deployment horizon. This period is sufficient in length to describe a vision for layered deployment and integration over time, yet it recognizes the inherent difficulties in long-term (e.g., 15-20 year) planning of rapidly-evolving transportation technologies.

Projects are divided into Short-, Medium-, and Long-Term initiatives based upon the following ranges:

- Short-Term (0-3 years)
- Medium-Term (3-5 years)
- Long-Term (5-10 years)

Table 7: Short-Term Projects (0-3 Years)

Project Title	Lead Agency	Market Packages
FM-1: Interchange Safety and Management Systems	VTrans	ATMS01 EM02 ATMS03 APTS7 ATMS06 ATIS1
FM-2: Circumferential Highway Freeway Management System: Sections A, B	VTrans	ATMS01 EM02 ATMS04 APTS7 ATMS06 ATIS1
AM-1: U.S. Route 7 (Shelburne Rd) Corridor Management System	VTrans	ATMS01 EM02 ATMS03 APTS7 ATMS06 APTS8 ATIS1
PT-1: Traveler Info System – Downtown Transit Center	CCTA	APTS8
PT-2: Traveler Info System – Schedule Info/Trip Planner	CCTA	APTS8
PT-3: Transit Signal Priority: Initial Design Effort	CCTA	APTS7
PT-4: Transit Signal Priority: Route 15 Corridor	CCTA	APTS7

Table 8: Medium-Term Projects (3-5 Years)

Project Title	Lead Agency	Market Packages
FM-2: Circumferential Highway Freeway Management System: Sections C-F	VTrans	ATMS01 EM02 ATMS04 APTS7 ATMS06 ATPS8 ATIS1
FM-3: I-89/189 Freeway Management System	VTrans	ATMS01 EM02 ATMS04 APTS7 ATMS06 ATPS8 ATIS1
AM-2: U.S. Route 15 Corridor Management System	VTrans	ATMS01 EM02 ATMS03 APTS7 ATMS06 ATPS8 ATIS1
AM-3: Route 2A Corridor Management System	VTrans	ATMS01 EM02 ATMS03 APTS7 ATMS06 ATPS8 ATIS1
AM-4: Route 2 Corridor Management System	VTrans	ATMS01 EM02 ATMS03 APTS7 ATMS06 ATPS8 ATIS1
UTM-1: Burlington Urban Traffic Management System	City of Burlington	ATMS01 EM02 ATMS03 APTS7 ATMS06 ATPS8 ATIS1
PT-4: Transit Signal Priority: Secondary Corridors	CCTA	APTS7
PT-5: Fixed Route Operations Management System	CCTA	APTS1 APTS5 APTS2 APTS6
RMA-1: Chittenden Regional Data Warehouse	CCMPO	AD2

Table 9: Long-Term Projects (5-10 Years)

Project Title	Lead Agency	Market Packages
FM-2: Circumferential Highway Freeway Management System: Sections G-J	VTrans	ATMS01 EM02 ATMS04 APTS7 ATMS06 ATIS1
AM-5: Champlain Parkway Corridor Management System	City of Burlington	ATMS01 EM02 ATMS03 APTS7 ATMS06 APTS8 ATIS1
AM-6: VT 127 Corridor Management System	VTrans	ATMS01 EM02 ATMS03 APTS7 ATMS06 APTS8 ATIS1
UTM-2: Winooski Urban Traffic Management System	City of Winooski	ATMS01 EM02 ATMS03 APTS7 ATMS06 APTS8 ATIS1
PT-4: Transit Signal Priority: Tertiary Corridors	CCTA	APTS7
PT-6: Traveler Info System – Real-time Next Bus Information	CCTA	APTS8
PT-7: Paratransit Operations Management System	CCTA	APTS1 APTS5 APTS3
PT-8: Smart Card Based Fare Payment	CCTA	APTS4
RMA-2: Chittenden Regional Transportation Operations Center (TOC)	CRTA ⁴	ATMS07

⁴The Chittenden Regional Transportation Authority (CRTA) is a proposed regional entity responsible for regional traffic management coordination.

2.4 Project Descriptions

Full descriptions of each project are included below. Each description contains the following information:

- **Project Title and Description:** A general overview is given for each project, primarily focusing on the operational capabilities and functional scope of the project.
- **Geographic Bounds:** The approximate geographic extent of the project is described.
- **Market Packages:** The relevant market packages from the Regional ITS architecture are identified. This illustrates the linkages between the project and the Regional ITS Architecture, which is necessary to apply federal funds toward the project.
- **Time Frame (Short, Medium, or Long-Term):** The relative deployment priority for each project was identified as Short-Term (0-3 years), Medium-Term (3-5 years), or Long-Term (5-10 years).
- **Lead Agency:** The public agency or agencies judged to be the most appropriate lead agency for each deployment are identified.
- **Other Key Stakeholders:** Principal stakeholders and agencies whose cooperation and support is critical to the implementation and success of the project are also identified.
- **Necessary Interagency Coordination and/or Agreements:** Coordination activities or agreements between agencies that will be required to deploy and operate the ITS projects are identified.
- **Phasing:** Phased implementation options are described where relevant.
- **Prerequisite/Co-requisite Projects:** Other projects are identified that must be completed before or at the same time, to ensure the proper ordering and prioritization of projects to create a functional ITS system.

FM-1: Interchange Safety and Management Systems		
Project Description	The Interchange Safety and Management System is intended to provide early deployment of ITS functionality at key Interstate 89 interchanges that suffer from extensive queuing, particularly at locations where queues back up onto the mainline or interfere with the operation of mainline signal operations on the intersection arterial roadways. Key locations for deployment of such systems include Exit 12 in Williston and Exit 14 in South Burlington.	
Estimated Cost	The project will incorporate queue detection/surveillance capabilities; coordination with nearby signals to flush traffic when queues are detected; and coordination with upstream traveler information/warning devices. Integration with upstream Dynamic Message Signs (DMS) and emergency vehicle preemption systems is desirable where possible.	
\$445,000		
		Notes
Geographic Bounds	I-89/189 interchanges and adjacent affected signalized areas	
Market Packages Addressed	ATMS01 - Network Surveillance ATMS03 - Surface Street Control ATMS06 - Traffic Information Dissemination EM02 - Emergency Routing APTS7 – Multi-modal Coordination ATIS1 - Broadcast Traveler Information	
Time Frame	Short-Term	
Lead Agency	VTrans	
Other Key Stakeholders	City of Burlington City of South Burlington City of Winooski Town of Colchester Town of Williston Town of Richmond	
Interagency Coordination	Agreements between VTrans and the municipalities, including Burlington, South Burlington, Winooski, Colchester, Williston, Richmond, and regional emergency response providers to facilitate equipment interoperability.	
Phasing Options	Can be implemented on an intersection-by-intersection basis as systems are largely freestanding	
Prerequisite/Co-requisite projects	None	A regional Emergency Signal Pre-emption/Transit Signal Priority strategy and standard is recommended

FM-2: Circumferential Highway Freeway Management System		
Project Description	The Circumferential (“Circ”) Highway Freeway Management System is intended to provide ATMS functionality and traveler information, to enhance throughput and minimize delays for emergency/transit vehicles. For sections of the roadway already constructed (C-F), the ITS components will be installed on the completed roadway; for sections currently in early or future EIS stage (sections A, B and G -J), ITS deployment should be coordinated with design activity.	
Estimated Cost	The Circ Highway Freeway Management System will deploy a variety of ITS technologies including Head End/Communications (consisting of computer equipment, monitors, and communications equipment housed in a control center), traffic surveillance (e.g. CCTV), traffic detection technology (e.g. inductive loop, microwave, and acoustic sensors), signal priority/preemption equipment, and Dynamic Message Signs (DMS). The system can initially be operated by VTrans and/or municipalities then integrated with other regional ITS infrastructure in the future through the Chittenden Regional TOC.	
\$445,000		
		Notes
Geographic Bounds	Consistent with the completed and planned roadway sections	
Market Packages Addressed	ATMS01 - Network Surveillance ATMS04 – Freeway Control ATMS06 - Traffic Information Dissemination EM02 - Emergency Routing APTS7 - Multimodal Coordination ATIS1 - Broadcast Traveler Information	
Time Frame	Phase I: Short-Term Phase II: Medium-Term Phase III: Long-Term	
Lead Agency	VTrans	
Other Key Stakeholders	City of Burlington Town of Essex Town of Williston Town of Colchester Emergency Management agencies CCTA/Transit providers	
Interagency Coordination	Agreements for VTrans and municipalities to provide road condition information to traveler information providers (municipal websites, media, CARS/511) Regional standards and cooperation regarding transit signal priority and emergency vehicle signal preemption technology	Potential for future linkage with a regional Chittenden County traffic operations center; in the short term the system is likely to be managed from the VTrans statewide facility
Phasing Options	Phase I: Sections C-F Phase II: Sections A, B Phase III: Sections G-J	
Prerequisite/ Co-requisite projects	None	Ideally, ITS components should be included or considered during design of roadway sections

FM-3: I-89/189 Freeway Management System		
Project Description	The I-89/189 Freeway Management System is intended to provide freeway monitoring and control along I-89 between Exits 12 (VT 2A) and 16 (U.S.7) and the I-189 Spur to Shelburne Road. Improved detection systems, coordinated traffic signals, other ATMS functionality, and traveler information will enhance throughput and minimize delays for emergency and transit vehicles. This project is intended to be coordinated with the Route 7 (Shelburne Rd) project.	
Estimated Cost	This project will deploy a variety of ITS technologies including Head End/Communications (consisting of computer equipment, monitors, and communications equipment housed in a control center), traffic surveillance (e.g. CCTV), traffic detection technology (e.g. inductive loop, microwave, and acoustic sensors), signal priority/preemption equipment, and Dynamic Message Signs (DMS). The system can initially be operated by VTrans and/or municipalities, then integrated with other regional ITS infrastructure in the future through the Chittenden Regional TOC.	
\$394,000		
		Notes
Geographic Bounds	Along I-89 between Exits 12 (VT 2A) and 16 (U.S.7) and the I-189 Spur to Shelburne Road	
Market Packages Addressed	ATMS01 - Network Surveillance ATMS04 - Freeway Control ATMS06 - Traffic Information Dissemination EM02 - Emergency Routing APTS7 - Multimodal Coordination ATIS1 - Broadcast Traveler Information	
Time Frame	Medium-Term	
Lead Agency	VTrans	
Other Key Stakeholders	City of Burlington City of South Burlington City of Winooski Town of Colchester Town of Williston Emergency Management agencies CCTA/Transit providers	
Interagency Coordination	Agreements for VTrans and municipalities to provide road condition information to traveler information providers (municipal websites, media, CARS/511) Regional standards and cooperation regarding transit signal priority and emergency vehicle signal preemption technology	
Phasing Options	Integration with the Chittenden Regional TOC is a long-term phasing option.	
Prerequisite/Co-requisite projects	The U.S. Route 7 (Shelburne Rd) Corridor Management System	A regional Emergency Signal Preemption/Transit Signal Priority strategy and standard is recommended

AM-1: U.S. Route 7 (Shelburne Rd.) Corridor Management System		
Project Description	The U.S. Route 7 (Shelburne Rd) Corridor Management System is intended to add ATMS functionality and traveler information to one of the County's most important and congested arterials, Route 7 from the LaPlatte River Bridge, Shelburne, to the congested segment around the I-189 terminus. These systems will enhance throughput and minimize delays for emergency/transit vehicles.	
Estimated Cost	This project will deploy a variety of ITS technologies including Head End/Communications (consisting of computer equipment, monitors, and communications equipment housed in a control center), traffic surveillance (e.g. CCTV), vehicle detection technology (e.g., inductive loop, microwave and acoustic detectors), signal priority/preemption equipment, and Dynamic Message Signs (DMS). The system can initially be operated by VTrans and/or municipalities, then integrated with other regional ITS infrastructure in the future through the Chittenden Regional TOC.	
\$800,500		
		Notes
Geographic Bounds	U.S. Route 7 corridor through the Town of Shelburne, City of South Burlington, and City of Burlington. Inclusion of key traffic signals within the southern portion of the City of Burlington is recommended.	This project was identified as an 'early success' opportunity in the 2002 plan given the pending reconstruction of Shelburne Road.
Market Packages Addressed	ATMS01 - Network Surveillance ATMS03 - Surface Street Control ATMS06 - Traffic Information Dissemination EM02 - Emergency Routing APTS7 - Multimodal Coordination ATPS8 - Transit Traveler Information ATIS1 - Broadcast Traveler Information	
Time Frame	Short-Term	
Lead Agency	VTrans	
Other Key Stakeholders	Town of Shelburne City of South Burlington City of Burlington Emergency Management agencies CCTA/Transit providers	
Interagency Coordination	Agreements for VTrans and municipalities to provide road condition information to traveler information providers (municipal websites, media, CARS/511) Regional standards and cooperation regarding transit signal priority and emergency vehicle signal preemption technology	
Phasing Options	Segmenting of the northern and southern portions may be possible pending further analysis of signal coordination benefits.	
Prerequisite/Co-requisite projects	None	A regional Emergency Signal Preemption/Transit Signal Priority strategy and standard is recommended

AM-2: U.S. Route 15 Corridor Management System		
Project Description	The section of Route 15 between Burlington and Essex Junction is the subject of ongoing study, as it is a major arterial into downtown Burlington but prone to serious peak-hour congestion that impedes emergency and transit vehicle movement. This project will provide signal coordination as well as other ATMS functionality and traveler information to enhance throughput along the congested segments of Route 15.	
Estimated Cost	This project will deploy a variety of ITS technologies including Head End/Communications (consisting of computer equipment, monitors, and communications equipment housed in a control center), traffic surveillance (e.g. CCTV), vehicle detection technology (e.g., inductive loops, microwave and acoustic detectors), signal priority/preemption equipment, and dynamic message signs (DMS). The system can initially be operated by VTrans and/or municipalities, then integrated with other regional ITS infrastructure in the future through the Chittenden Regional TOC.	
\$515,000		
		Notes
Geographic Bounds	U.S. Route 15 between Burlington and Essex Junction	
Market Packages Addressed	ATMS01 - Network Surveillance ATMS03 - Surface Street Control ATMS06 - Traffic Information Dissemination EM02 - Emergency Routing APTS7 - Multimodal Coordination ATPS8 - Transit Traveler Information ATIS1 - Broadcast Traveler Information	
Time Frame	Medium-Term	
Lead Agency	VTrans	
Other Key Stakeholders	City of Burlington Town of Colchester Town of Essex City of Winooski Village of Essex Junction Emergency Management agencies CCTA/Transit providers	
Interagency Coordination	Agreements for VTrans and municipalities to provide road condition information to traveler information providers (municipal websites, media, CARS/511) Regional standards and cooperation regarding transit signal priority and emergency vehicle signal preemption technology	
Phasing Options	Functional separation of ITS equipment and/or physical segmentation of the corridor are potential options for phasing.	
Prerequisite/Co-requisite projects	Interchange Safety and Management System for Exit 15	A regional Emergency Signal Preemption/Transit Signal Priority strategy and standard is recommended

AM-3: Route 2A Corridor Management System		
Project Description	The Route 2A Corridor Management System is intended to provide coordination of traffic signals, other ATMS functionality, and traveler information to enhance throughput and minimize delays for emergency/transit vehicles through the heavily congested area from Exit 12 to Five Corners, including the Marshall Ave. intersection.	
Estimated Cost	This project will deploy a variety of ITS technologies including Head End/Communications (consisting of computer equipment, monitors, and communications equipment housed in a control center), traffic surveillance (e.g. CCTV), traffic detection technology (e.g. inductive loop, microwave, and acoustic sensors), and Dynamic Message Signs (DMS). The system can initially be operated by VTrans and/or municipalities then integrated with other regional ITS infrastructure in the future through the Chittenden Regional TOC.	
\$260,500		
		Notes
Geographic Bounds	Route 2A from Exit 12 to Five Corners, Essex Junction	
Market Packages Addressed	ATMS01 - Network Surveillance ATMS03 - Surface Street Control ATMS06 - Traffic Information Dissemination EM02 - Emergency Routing APTS7 - Multimodal Coordination ATPS8 - Transit Traveler Information ATIS1 - Broadcast Traveler Information	
Time Frame	Medium-Term	
Lead Agency	VTrans	
Other Key Stakeholders	Town of Williston Village of Essex Junction Emergency Management agencies CCTA/Transit providers	
Interagency Coordination	Agreements for VTrans and municipalities to provide road condition information to traveler information providers (municipal websites, media, CARS/511)	
Phasing Options	Integration with the Chittenden Regional TOC is a long-term phasing option.	
Prerequisite/Co-requisite projects	None	

AM-4: Route 2 Corridor Management System		
Project Description	The Route 2 Corridor Management System is intended to provide coordination of traffic signals, other ATMS functionality, and traveler information to enhance throughput and minimize delays for emergency and transit vehicles through the heavily congested area along Route 2 between Burlington and Williston.	
Estimated Cost	This project will deploy a variety of ITS technologies including Head End/Communications (consisting of computer equipment, monitors, and communications equipment housed in a control center), traffic surveillance (e.g. CCTV), traffic detection technology (e.g. inductive loop, microwave and acoustic sensors), signal priority/preemption equipment, and Dynamic Message Signs (DMS). The system can initially be operated by VTrans and/or municipalities, then integrated with other regional ITS infrastructure in the future through the Chittenden Regional TOC.	
\$516,000		
		Notes
Geographic Bounds	Route 2 between Burlington and Williston	
Market Packages Addressed	ATMS01 - Network Surveillance ATMS03 - Surface Street Control ATMS06 - Traffic Information Dissemination EM02 - Emergency Routing APTS7 - Multimodal Coordination ATPS8 - Transit Traveler Information ATIS1 - Broadcast Traveler Information	
Time Frame	Medium-Term	
Lead Agency	VTrans	
Other Key Stakeholders	City of Burlington City of South Burlington Town of Williston Emergency Management agencies CCTA/Transit providers CATMA	
Interagency Coordination	Agreements for VTrans and municipalities to provide road condition information to traveler information providers (municipal websites, media, CARS/511) Regional standards and cooperation regarding transit signal priority and emergency vehicle signal preemption technology	
Phasing Options	Integration with the Chittenden Regional TOC is a long-term phasing option.	
Prerequisite/Co-requisite projects	None	A regional Emergency Signal Preemption/Transit Signal Priority strategy and standard is recommended

AM-5: Champlain Parkway Corridor Management System		
Project Description	The Champlain Parkway Corridor Management System will provide coordination of traffic signals, other ATMS functionality, and traveler information to enhance throughput and minimize delays for emergency/transit vehicles along the corridor once the road is constructed. Implementation of the system would benefit significantly through coordination with the planned road construction project.	
Estimated Cost	This project will deploy a variety of ITS technologies including Head End/Communications (consisting of computer equipment, monitors, and communications equipment housed in a control center), traffic surveillance (e.g. CCTV), traffic detection technology (e.g. inductive loop, microwave and acoustic sensors), signal priority/preemption equipment, and Dynamic Message Signs (DMS). The system can initially be operated by VTrans and/or municipalities, then integrated with other regional ITS infrastructure in the future through the Chittenden Regional TOC.	
\$344,000		
		Notes
Geographic Bounds	The Champlain Parkway (from I-189 at US 7 to Battery Street)	
Market Packages Addressed	ATMS01 - Network Surveillance ATMS03 - Surface Street Control ATMS06 - Traffic Information Dissemination EM02 - Emergency Routing APTS7 - Multimodal Coordination ATPS8 - Transit Traveler Information ATIS1 - Broadcast Traveler Information	
Time Frame	Long-Term	
Lead Agency	City of Burlington	
Other Key Stakeholders	City of South Burlington VTrans Emergency Management agencies CCTA/Transit providers	
Interagency Coordination	Agreements for VTrans and municipalities to provide road condition information to traveler information providers (municipal websites, media, CARS/511) Regional standards and cooperation regarding transit signal priority and emergency vehicle signal preemption technology	
Phasing Options	Integration with the Chittenden Regional TOC is a long-term phasing option.	
Prerequisite/Co-requisite projects	None	A regional Emergency Signal Preemption/Transit Signal Priority strategy and standard is recommended

AM-6: VT 127 Corridor Management System		
Project Description	The VT 127 Corridor Management System includes deployment of ATMS surveillance, control, and traveler information instrumentation along the length of the VT 127 corridor through Colchester and northern Burlington.	
Estimated Cost	This project will deploy a variety of ITS technologies including Head End/Communications (consisting of computer equipment, monitors, and communications equipment housed in a control center), traffic surveillance (e.g. CCTV), traffic detection technology (e.g. inductive loop, microwave, and acoustic sensors), signal priority/preemption equipment, and Dynamic Message Signs (DMS). The system can initially be operated by VTrans and/or municipalities, then integrated with other regional ITS infrastructure in the future through the Chittenden Regional TOC.	
\$363,000		
		Notes
Geographic Bounds	The VT 127 corridor through Colchester and northern Burlington	
Market Packages Addressed	ATMS01 - Network Surveillance ATMS03 - Surface Street Control ATMS06 - Traffic Information Dissemination EM02 - Emergency Routing APTS7 - Multimodal Coordination APTS8 - Transit Traveler Information ATIS1 - Broadcast Traveler Information	
Time Frame	Long-Term	
Lead Agency	VTrans	
Other Key Stakeholders	City of Burlington Town of Colchester Emergency Management agencies CCTA/Transit providers	
Interagency Coordination	Agreements for VTrans and municipalities to provide road condition information to traveler information providers (municipal websites, media, CARS/511) Regional standards and cooperation regarding transit signal priority and emergency vehicle signal preemption technology	
Phasing Options	Integration with the Chittenden Regional TOC is a long-term phasing option.	
Prerequisite/Co-requisite projects	None	A regional Emergency Signal Preemption/Transit Signal Priority strategy and standard is recommended

UTM-1: Burlington Urban Traffic Management System		
Project Description	The Burlington Urban Traffic Management System initiative is intended to provide coordination of traffic signals with other ATMS functionality and Traveler information to enhance throughput around downtown Burlington.	
Estimated Cost	This project will deploy a variety of ITS technologies including traffic signal coordination, traffic management head-end and communications systems (consisting of computer equipment, monitors, and communications equipment housed in a control center), traffic surveillance (e.g. CCTV), traffic detection technology (e.g. inductive loop, microwave, and acoustic sensors), and signal priority/preemption equipment. The system can initially be operated by the City of Burlington, then be integrated with other regional ITS infrastructure in the future through the Chittenden Regional TOC.	
\$800,000		
		Notes
Geographic Bounds	The boundaries of the City of Burlington with emphasis on signalized and congested corridors	
Market Packages Addressed	ATMS01 - Network Surveillance ATMS03 - Surface Street Control ATMS06 - Traffic Information Dissemination EM02 - Emergency Routing APTS7 - Multimodal Coordination APTS8 - Transit Traveler Information ATIS1 - Broadcast Traveler Information	
Time Frame	Medium-Term	
Lead Agency	City of Burlington	
Other Key Stakeholders	Emergency Management agencies CCTA/Transit providers	
Interagency Coordination	Agreements for VTrans and municipalities to provide road condition information to traveler information providers (municipal websites, media, CARS/511) Regional standards and cooperation regarding transit signal priority and emergency vehicle signal preemption technology	
Phasing Options	Integration with the Chittenden Regional TOC is a long-term phasing option.	
Prerequisite/Co-requisite projects	None	A regional Emergency Signal Preemption/Transit Signal Priority strategy and standard is recommended

UTM-2: Winooski Urban Traffic Management System		
Project Description	The Winooski Urban Traffic Management System initiative is intended to provide coordination of traffic signals with other ATMS functionality and Traveler information to enhance throughput around downtown Winooski.	
Estimated Cost	This project will deploy a variety of ITS technologies including traffic signal coordination, traffic management head-end and communications systems (consisting of computer equipment, monitors, and communications equipment housed in a control center), traffic surveillance (e.g. CCTV), traffic detection technology (e.g. inductive loop, microwave, and acoustic sensors), and signal priority/preemption equipment. The system can initially be operated by the City of Winooski, then be integrated with other regional ITS infrastructure in the future through the Chittenden Regional TOC.	
\$323,000		
		Notes
Geographic Bounds	Consistent with the boundaries of the City of Winooski	
Market Packages Addressed	ATMS01 - Network Surveillance ATMS03 - Surface Street Control ATMS06 - Traffic Information Dissemination EM02 - Emergency Routing APTS7 - Multimodal Coordination APTS8 - Transit Traveler Information ATIS1 - Broadcast Traveler Information	
Time Frame	Medium-Term	
Lead Agency	City of Winooski	
Other Key Stakeholders	Emergency Management agencies CCTA/Transit providers	
Interagency Coordination	Agreements for VTrans and municipalities to provide road condition information to traveler information providers (municipal websites, media, CARS/511) Regional standards and cooperation regarding transit signal priority and emergency vehicle signal preemption technology	
Phasing Options	Integration with the Chittenden Regional TOC is a long-term phasing option.	
Prerequisite/Co-requisite projects	None	A regional Emergency Signal Preemption/Transit Signal Priority strategy and standard is recommended

PT-1: CCTA Traveler Information System – Downtown Transit Center		
Project Description	The existing transit center on Cherry Street and the new downtown transit center that is under development may be equipped with a system of Dynamic Message Signs (DMS) for real-time en-route traveler information. Large DMS may be located inside the new transit center that passengers can use to find out which bay is assigned to each incoming CCTA route. These interior displays may also indicate the next bus time for each bay. In addition to this CCTA information, the interior displays may provide multimodal information about the upcoming ferry (Lake Champlain Transportation Company) and rail (Vermont Railway and Amtrak) departures, as well as CCTA and public service messages.	
Estimated Cost	The area of the interior signs display that is reserved for CCTA and public service messages may also be used to assist in the Vermont America’s Missing Broadcast Emergency Response (AMBER) alert program, which was initiated by the Vermont Department of Public Safety in May 2003. Complementary smaller Dynamic Message Signs (DMS) at each bay may also indicate the route and next bus time. The monitoring and control software for this transit center DMS system may be integrated with the fixed route software as discussed above to ensure that the DMS displays are always based on up-to-date schedule information. This software would also be integrated with any future scheduling systems for the ferry and rail services.	
\$492,800		
		Notes
Geographic Bounds	Existing and proposed transit centers in Burlington	
Market Packages Addressed	APTS8 – Transit Traveler Information	
Time Frame	Short-Term	
Lead Agency	CCTA	
Other Key Stakeholders	City of Burlington Lake Champlain Transportation Company Vermont Railway Amtrak	
Interagency Coordination	Schedule Information Sharing	
Phasing Options	Integration with AMBER Alert could be deployed as a future project phase	
Prerequisite/Co-requisite projects	None	

PT-2: Traveler Information System – Schedule Information and Trip Planner		
Project Description	The initial multimodal passenger information project at the transit center may be designed for subsequent enhancement with additional transit passenger information capabilities. These additional capabilities may include providing a telephone Interactive Voice Response (IVR) passenger information system and an Internet passenger information system through the CCTA, ferry and rail websites, including schedule information and a trip itinerary planner. These telephone and website passenger information systems may also be linked to the telephone and website passenger information systems of Vermont 511 operated by VTrans.	
Estimated Cost		
\$554,400		
		Notes
Geographic Bounds	CCTA service area	
Market Packages Addressed	APTS8 – Transit Traveler Information	
Time Frame	Short-Term	
Lead Agency	CCTA	
Other Key Stakeholders	None	
Interagency Coordination	VTrans (511) Lake Champlain Transportation Company Vermont Railway Amtrak	
Phasing Options	None	
Prerequisite/ Co-requisite projects	None	

PT-3 and PT-4: Transit Signal Priority (TSP)		
Project Description	<p>Transit signal priority to enhance operations along key corridors, in collaboration with municipal and Vermont Agency of Transportation (VTrans) traffic signal operations management. Each bus may be equipped with an emitter that can request the activation of transit signal priority phasing at equipped traffic signals. The software for these signal controllers may be upgraded to allow the controllers to extend the duration of the green signal for an approaching bus. If the signal is not green when a bus is approaching, the controller would truncate the red signal as quickly as possible by initiating the pedestrian clearance interval on the opposing approach.</p> <p>Transit signal priority shall be compatible equipment can be used for traffic signal pre-emption by these emergency vehicle fleets. Additional measures will be incorporated to improve ease of use for pedestrian crossings at selected traffic signals in each corridor, as well as to implement corridor traffic signal interconnects and signal timing optimization.</p>	
Estimated Cost		
\$4,405,700	<p>Transit Signal Priority is initially being pursued for the Route 15 corridor, in conjunction with initial overall design efforts with corridor transit signal priority. CCTA plans to subsequently pursue similar efforts for other key corridors such as Pearl Street/Colchester Avenue, Riverside Drive, North Street (Burlington), Main Street, Shelburne Road, Williston Road, Route 2A, and College Street (a total of 140 signalized intersections was assumed for corridors that will be equipped).</p>	
		Notes
Geographic Bounds	CCTA service area	
Market Packages Addressed	APTS7 – Multi-modal Coordination	
Time Frame	Phase I: Short-Term Phase II: Short-Term Phase III: Medium-Term Phase IV: Long-Term	
Lead Agency	CCTA	
Other Key Stakeholders	VTrans Municipalities along transit corridors CCMPO (regional standard development)	
Interagency Coordination	TSP Request Criteria TSP Provision Criteria TSP Implementation Details	
Phasing Options	Phase I: Initial Design Effort for Transit Signal Priority Phase II: Transit Signal Priority – Primary Route 15 Corridor Phase III: Transit Signal Priority – Secondary Corridors Phase IV: Transit Signal Priority – Full Build-Out	
Prerequisite/Co-requisite projects	None	A regional Emergency Signal Pre-emption/Transit Signal Priority strategy and standard is recommended

PT-5: Fixed Route Operations Management System		
Project Description	This project envisions an Automatic Vehicle Location/Computer Aided Dispatching (AVL/CAD) system to monitor fleet locations and schedule adherence in real-time. This may include equipping fixed route vehicles with Mobile Data Computers (MDCs). As part of installing the AVL/CAD system, CCTA will investigate the need for a new radio communications infrastructure to support voice and mobile data communications between the transit management center and vehicles.	
Estimated Cost	Several other "smart bus" technologies will also be implemented for fixed route vehicles in conjunction with the AVL/CAD system at CCTA, including on-board next stop announcements, Automatic Passenger Counting (APC) on selected buses, real-time monitoring of the engine and other critical components, accident reconstruction data systems, digital video recording, covert alarm switch/microphone monitoring for security, and an ignition drive train lock system.	
\$2,168,600		
		Notes
Geographic Bounds	CCTA service area	
Market Packages Addressed	APTS1 – Transit Vehicle Tracking APTS2 – Transit Fixed Route Operations APTS5 – Transit Security APTS6 – Transit Maintenance	
Time Frame	Medium-Term	
Lead Agency	CCTA	
Other Key Stakeholders	None	
Interagency Coordination	None	
Phasing Options	None	
Prerequisite/Co-requisite projects	None	

PT-6: Traveler Information System – Real-time Next Bus Information		
Project Description	Following installment of the Fixed Route Operations Management System, software enhancements may be developed to predict next bus times for stops throughout the system based on real-time schedule adherence data. This project also envisions onboard bus stop announcements (verbal and visual) based upon GPS vehicle position tracking.	
Estimated Cost		
\$364,000	Passengers may be able to access next bus predictions through DMS at the transit center, the telephone and website traveler information systems, and additional DMS installed at major bus stops.	
		Notes
Geographic Bounds	CCTA service area	
Market Packages Addressed	APTS8 – Transit Traveler Information	
Time Frame	Long-Term	
Lead Agency	CCTA	
Other Key Stakeholders	VTrans (511)	
Interagency Coordination	None	
Phasing Options	Integration with 511 systems is a separable phasing option	
Prerequisite/Co-requisite projects	Fixed Route Operations Management System	

PT-7: Paratransit Operations Management System		
Project Description	This project envisions demand response scheduling and dispatch management software for paratransit contractors, including equipping demand response vehicles with Mobile Data Computers (MDCs), covert alarm switch/microphone monitoring for security, and integrated Automatic Vehicle Location/Computer Aided Dispatching (AVL/CAD) capabilities for the demand response software.	
Estimated Cost		
\$1,097,600		
		Notes
Geographic Bounds	CCTA service area	
Market Packages Addressed	APTS1 – Transit Vehicle Tracking APTS3 – Demand Response Operations APTS5 – Transit Security	
Time Frame	Long-Term	
Lead Agency	CCTA	
Other Key Stakeholders	Paratransit operations contractors	
Necessary interagency coordination or agreements	None	
Phasing Options	None	
Prerequisite/Co-requisite projects	Fixed Route Operations Management System	

PT-8: Smart Card Based Fare Payment		
Project Description	Fareboxes may be upgraded to accept a stored value smart card issued by CCTA, as well as potentially other stored value smart cards that might be in active use which CCTA is willing and able to integrate. In addition, several locations may be established where smart cards can be issued and/or revalued. Development of a region-wide transit smartcard is viewed as a long-term initiative and is thus a lower priority than other transit ITS projects identified in this Plan.	
Estimated Cost		
\$246,400		
		Notes
Geographic Bounds	CCTA service area	
Market Packages Addressed	APTS4 – Transit Passenger and Fare Payment	
Time Frame	Long-Term	
Lead Agency	CCTA	
Other Key Stakeholders	Other stored value smart card issuers Other stored value smart card acceptors (e.g., colleges/universities, employers, parking authorities)	
Interagency Coordination	Standards and financial agreements to support interoperability between multiple smart card issuers and acceptors	
Phasing Options	Initial Phase – Transit only smart card Subsequent Phase – Integration with third-party partners	
Prerequisite/Co-requisite projects	None	

RMA-1: Chittenden Regional Data Warehouse		
Project Description	The Chittenden Regional Data Warehouse is intended to expand CCMPO's existing data storage capabilities to collect transportation data from municipalities and agencies throughout the region and make it available on their website.	
Estimated Cost		
\$145,000		
		Notes
Geographic Bounds	Region-wide	
Market Packages Addressed	AD2 – ITS Data Warehouse	
Time Frame	Medium-Term	
Lead Agency	CCMPO	
Other Key Stakeholders	Municipalities CCTA/Transit Agencies VTrans Other data generating and/or utilizing organizations	
Interagency Coordination	ITS Information Sharing	
Phasing Options	Gradual expansion of systems on an entity-by-entity basis as source data becomes available.	
Prerequisite/Co-requisite projects	None	

RMA-2: Chittenden Regional Transportation Operations Center (TOC)		
Project Description	The Chittenden Regional Transportation Operations Center (TOC) is intended to combine all regional signal control systems into a single regional traffic management system that would coordinate transportation activities in the region. This project will consolidate and upgrade the central control software and hardware systems of any advanced traffic management system previously deployed at the municipal level. This project is proposed in the event that the extent of regional ITS deployment and traffic operations needs requires a local control center in addition to, or in lieu of, the VTrans statewide traffic and emergency operations center.	
Estimated Cost	The TOC project will also provide linkages to transit dispatch centers, emergency responders, and statewide traffic management entities. Development of this project must be coordinated with these agencies.	
\$361,000	This project will deploy a variety of ITS technologies including Head End/Communications (consisting of PC computer equipment, monitors, and communications equipment housed in a control center).	
		Notes
Geographic Bounds	Region-wide	
Market Packages Addressed	ATMS07 – Regional Traffic Control	
Time Frame	Long-term	
Lead Agency	Chittenden Regional Transportation Authority*	
Other Key Stakeholders	Municipalities VTrans Emergency management agencies CCTA/Transit agencies	Opportunity for shared control of ITS systems with VTrans statewide operations center.
Interagency Coordination	Information sharing Equipment control sharing	
Phasing Options	Phased integration of field equipment and sub-systems	
Prerequisite/Co-requisite projects	None	

* The Chittenden Regional Transportation Authority (a proposed future entity created for purposes of regional traffic management).

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3. PROJECT DEPLOYMENT PLAN MAINTENANCE

Like the Chittenden County Regional ITS Architecture itself, this Strategic Plan is a 'living document' intended to evolve with changing needs and ITS deployment progress in the region and at the statewide level.

The Strategic Plan and Regional ITS Architecture provide a road map that can be used to guide the deployment of future ITS components in a manner that is complementary to existing and planned infrastructure and operational investments. The Plan ensures that the ITS deployments are responsive to real transportation needs, functional requirements, and technological advances. The projects developed in this study are a snapshot of ITS opportunities based on current conditions in the region.

The Strategic Plan and the project list are evolving documents that present an outlook and strategy for ITS deployment in Chittenden County. As such, they need to be updated as Chittenden County's transportation needs change and as technology changes. It is recommended that the Strategic Plan and the project list be reassessed at regular and frequent intervals.

In updating the project list, the following factors should be taken into consideration:

- Reassessment of the needs, existing ITS elements and institutional structure;
- Reevaluation of the needed actions and associated functional requirements;
- Reevaluation of the proposed system architecture strategies;
- Reevaluation of the specific list of proposed projects and identification of specific pending funding sources; and
- The emergence of new technologies or ITS initiatives that are advantageous in meeting the needs of the County.

The Standing Regional ITS Coordination Committee ("Standing Committee"), recommended as a maintenance and advisory group for the Regional ITS Architecture, is well suited to address updates to the Strategic Plan as well. Because the members of the Standing Committee make up the core interest group for the region, their continued involvement in the ITS planning and deployment process will expedite ITS development in the region and promote inter-agency dialogue and coordination on ITS issues.

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APPENDIX A

ITEMIZED PROJECT COST ESTIMATES

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FM-1: Interchange Safety and Management Systems

	Unit Cost	Qty.	Total Cost
<i>Equipment (Installed)</i>			
CCTV Cameras	\$15,000	4	\$60,000
Wireless Communications (per Camera)	\$5,000	4	\$20,000
Signal Preemption/Coordination Upgrades	\$25,000	6	\$150,000
Queue Detectors	\$5,000	4	\$20,000
Leased Line Communications (per Signal/Detector)	\$500	10	\$5,000
Portable DMS	\$25,000	4	\$100,000
<i>Headend Equipment (Installed)</i>			
Central Computer/Server	\$10,000	1	\$10,000
Networking Equipment	\$5,000	1	\$5,000
Central Software	\$75,000	1	\$75,000
Video Monitors	\$1,000	0	\$0
Furniture	\$2,000	0	\$0
TOTAL CAPITAL COSTS			\$445,000

Note: Quantities and unit costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.

FM-2: Circumferential Highway Freeway Management System

	Unit Cost	Qty.	Total Cost
<i>Equipment (Installed)</i>			
CCTV Cameras	\$15,000	10	\$150,000
Wireless Communications (per Camera)	\$5,000	10	\$50,000
Signal Preemption/Coordination Upgrades	\$25,000	0	\$0
Queue Detectors	\$5,000	10	\$50,000
Leased Line Communications (per Signal/Detector)	\$500	10	\$5,000
Portable DMS	\$25,000	4	\$100,000
<i>Headend Equipment (Installed)</i>			
Central Computer/Server	\$10,000	1	\$10,000
Networking Equipment	\$5,000	1	\$5,000
Central Software	\$75,000	1	\$75,000
Video Monitors	\$1,000	0	\$0
Furniture	\$2,000	0	\$0
TOTAL CAPITAL COSTS			\$445,000

Note: Quantities and unit costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.

FM-3: I-89/189 Freeway Management System

	Unit Cost	Qty.	Total Cost
<i>Equipment (Installed)</i>			
CCTV Cameras	\$15,000	8	\$120,000
Wireless Communications (per Camera)	\$5,000	8	\$40,000
Signal Preemption/Coordination Upgrades	\$25,000	0	\$0
Queue Detectors	\$5,000	8	\$40,000
Leased Line Communications (per Signal/Detector)	\$500	8	\$4,000
Portable DMS	\$25,000	4	\$100,000
<i>Headend Equipment (Installed)</i>			
Central Computer/Server	\$10,000	1	\$10,000
Networking Equipment	\$5,000	1	\$5,000
Central Software	\$75,000	1	\$75,000
Video Monitors	\$1,000	0	\$0
Furniture	\$2,000	0	\$0
TOTAL CAPITAL COSTS			\$394,000

Note: Quantities and unit costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.

AM-1: U.S. Route 7 (Shelburne Rd.) Corridor Management System

	Unit Cost	Qty.	Total Cost
<i>Equipment (Installed)</i>			
CCTV Cameras	\$15,000	11	\$165,000
Wireless Communications (per Camera)	\$5,000	11	\$55,000
Signal Preemption/Coordination Upgrades	\$25,000	15	\$375,000
Queue Detectors	\$5,000	6	\$30,000
Leased Line Communications (per Signal/Detector)	\$500	21	\$10,500
Portable DMS	\$25,000	3	\$75,000
<i>Headend Equipment (Installed)</i>			
Central Computer/Server	\$10,000	1	\$10,000
Networking Equipment	\$5,000	1	\$5,000
Central Software	\$75,000	1	\$75,000
Video Monitors	\$1,000	0	\$0
Furniture	\$2,000	0	\$0
TOTAL CAPITAL COSTS			\$800,500

Note: Quantities and unit costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.

AM-2: U.S. Route 15 Corridor Management System

	Unit Cost	Qty.	Total Cost
<i>Equipment (Installed)</i>			
CCTV Cameras	\$15,000	6	\$90,000
Wireless Communications (per Camera)	\$5,000	6	\$30,000
Signal Preemption/Coordination Upgrades	\$25,000	10	\$250,000
Queue Detectors	\$5,000	0	\$0
Leased Line Communications (per Signal/Detector)	\$500	10	\$5,000
Portable DMS	\$25,000	2	\$50,000
<i>Headend Equipment (Installed)</i>			
Central Computer/Server	\$10,000	1	\$10,000
Networking Equipment	\$5,000	1	\$5,000
Central Software	\$75,000	1	\$75,000
Video Monitors	\$1,000	0	\$0
Furniture	\$2,000	0	\$0
TOTAL CAPITAL COSTS			\$515,000

Note: Quantities and unit costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.

AM-3: Route 2A Corridor Management System

	Unit Cost	Qty.	Total Cost
<i>Equipment (Installed)</i>			
CCTV Cameras	\$15,000	6	\$90,000
Wireless Communications (per Camera)	\$5,000	6	\$30,000
Signal Upgrades	\$50,000	1	\$50,000
Queue Detectors	\$5,000	0	\$0
Leased Line Communications (per Signal/Detector)	\$500	1	\$500
Portable DMS	\$25,000	0	\$0
<i>Headend Equipment (Installed)</i>			
Central Computer/Server	\$10,000	1	\$10,000
Networking Equipment	\$5,000	1	\$5,000
Central Software	\$75,000	1	\$75,000
Video Monitors	\$1,000	0	\$0
Furniture	\$2,000	0	\$0
TOTAL CAPITAL COSTS			\$260,500

Note: Quantities and unit costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.

AM-4: Route 2 Corridor Management System

	Unit Cost	Qty.	Total Cost
<i>Equipment (Installed)</i>			
CCTV Cameras	\$15,000	6	\$90,000
Wireless Communications (per Camera)	\$5,000	6	\$30,000
Signal Preemption/Coordination Upgrades	\$25,000	12	\$300,000
Queue Detectors	\$5,000	0	\$0
Leased Line Communications (per Signal/Detector)	\$500	12	\$6,000
Portable DMS	\$25,000	0	\$0
<i>Headend Equipment (Installed)</i>			
Central Computer/Server	\$10,000	1	\$10,000
Networking Equipment	\$5,000	1	\$5,000
Central Software	\$75,000	1	\$75,000
Video Monitors	\$1,000	0	\$0
Furniture	\$2,000	0	\$0
TOTAL CAPITAL COSTS			\$516,000

Note: Quantities and unit costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.

AM-5: Champlain Parkway Corridor Management System

	Unit Cost	Qty.	Total Cost
<i>Equipment (Installed)</i>			
CCTV Cameras	\$15,000	4	\$60,000
Wireless Communications (per Camera)	\$5,000	4	\$20,000
Signal Preemption/Coordination Upgrades	\$25,000	4	\$100,000
Queue Detectors	\$5,000	4	\$20,000
Leased Line Communications (per Signal/Detector)	\$500	8	\$4,000
Portable DMS	\$25,000	2	\$50,000
<i>Headend Equipment (Installed)</i>			
Central Computer/Server	\$10,000	1	\$10,000
Networking Equipment	\$5,000	1	\$5,000
Central Software	\$75,000	1	\$75,000
Video Monitors	\$1,000	0	\$0
Furniture	\$2,000	0	\$0
TOTAL CAPITAL COSTS			\$344,000

Note: Quantities and unit costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.

AM-6: VT 127 Corridor Management System

	Unit Cost	Qty.	Total Cost
<i>Equipment (Installed)</i>			
CCTV Cameras	\$15,000	6	\$90,000
Wireless Communications (per Camera)	\$5,000	6	\$30,000
Signal Preemption/Coordination Upgrades	\$25,000	6	\$150,000
Queue Detectors	\$5,000	0	\$0
Leased Line Communications (per Signal/Detector)	\$500	6	\$3,000
Portable DMS	\$25,000	0	\$0
<i>Headend Equipment (Installed)</i>			
Central Computer/Server	\$10,000	1	\$10,000
Networking Equipment	\$5,000	1	\$5,000
Central Software	\$75,000	1	\$75,000
Video Monitors	\$1,000	0	\$0
Furniture	\$2,000	0	\$0
TOTAL CAPITAL COSTS			\$363,000

Note: Quantities and unit costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.

UTM-1: Burlington Urban Traffic Management System

	Unit Cost	Qty.	Total Cost
<i>Equipment (Installed)</i>			
CCTV Cameras	\$15,000	10	\$150,000
Wireless Communications (per Camera)	\$5,000	10	\$50,000
Signal Preemption/Coordination Upgrades	\$25,000	20	\$500,000
Queue Detectors	\$5,000	0	\$0
Leased Line Communications (per Signal/Detector)	\$500	20	\$10,000
Portable DMS	\$25,000	0	\$0
<i>Headend Equipment (Installed)</i>			
Central Computer/Server	\$10,000	1	\$10,000
Networking Equipment	\$5,000	1	\$5,000
Central Software	\$75,000	1	\$75,000
Video Monitors	\$1,000	0	\$0
Furniture	\$2,000	0	\$0
TOTAL CAPITAL COSTS			\$800,000

Note: Quantities and unit costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.

UTM-2: Winooski Urban Traffic Management System

	Unit Cost	Qty.	Total Cost
<i>Equipment (Installed)</i>			
CCTV Cameras	\$15,000	4	\$60,000
Wireless Communications (per Camera)	\$5,000	4	\$20,000
Signal Preemption/Coordination Upgrades	\$25,000	6	\$150,000
Queue Detectors	\$5,000	0	\$0
Leased Line Communications (per Signal/Detector)	\$500	6	\$3,000
Portable DMS	\$25,000	0	\$0
<i>Headend Equipment (Installed)</i>			
Central Computer/Server	\$10,000	1	\$10,000
Networking Equipment	\$5,000	1	\$5,000
Central Software	\$75,000	1	\$75,000
Video Monitors	\$1,000	0	\$0
Furniture	\$2,000	0	\$0
TOTAL CAPITAL COSTS			\$323,000

Note: Quantities and unit costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.

RMA-1: Chittenden Regional Data Warehouse
(not including facilities)

	Unit Cost	Qty.	Total Cost
<i>System Design and Equipment (Installed)</i>			
Website Interface	\$30,000	1	\$30,000
Central Hardware	\$25,000	1	\$25,000
Database Development	\$50,000	1	\$50,000
Software/Licensing	\$20,000	1	\$20,000
Agency Interconnects	\$20,000	1	\$20,000
TOTAL CAPITAL COSTS			\$145,000

Note: Quantities and unit costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.

RMA-2: Chittenden Regional Transportation Operations Center (TOC)
(not including facilities)

	Unit Cost	Qty.	Total Cost
<i>Control Center Equipment (Installed)</i>			
Central Computer/Server	\$50,000	1	\$50,000
Networking Equipment	\$20,000	1	\$20,000
Central Software	\$200,000	1	\$200,000
Video Monitors	\$25,000	1	\$25,000
Furniture	\$10,000	1	\$10,000
Workstations	\$3,000	2	\$6,000
Central Communications Equipment	\$50,000	1	\$50,000
TOTAL CAPITAL COSTS			\$361,000

Note: Quantities and unit costs are approximate pending definition of detailed functional requirements and engineering design. Intended for planning purposes only.