City of St. Albert

Intelligent Transportation Systems (ITS) Implementation Strategy

August 2018



Associated Engineering

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1 Introduction and Background

1.1 INTRODUCTION

The Intelligent Transportation Systems (ITS) Strategy aligns to the commitment of the community towards supporting the safest and most efficient transportation network for all forms and levels of mobility. Following the vision of “Building a better community through transportation innovation”, the ITS Strategy documents a plan to enable a wide range of applications that process and share information with road users, assists in easing congestion through improved traffic management, minimizes environmental impacts and increases benefits of transportation services for commercial goods movement and to residents and visitors of the City.

Each ITS strategy and project can be “mapped” to that vision. The ITS Strategic Plan is comprised of 41 distinct projects within 9 specific and 5 general ITS strategies. The plan covers a period of 10 years (2018 to 2028), with projects scheduled in short (0-3 years), medium (3-5 years) and long-term (greater then 5 years) phases.

A key component of the ITS Plan is the short (0 to 3 years) to medium (3 to 5 years) term periods, essentially from 2019 to 2023. These are critical years in which key elements of the ITS and Smart City plans will become reality. However, the ITS Plan is a “high level” blueprint for ITS considerations and integration into the City; greater detail is required for actual project planning, resource allocations and necessary engagement for completion of strategies.

This report expands on the ITS Strategic Plan and Smart City Master Plan, detailing an implementation plan for the next five years by recommending a project schedule and providing detailed project summaries including descriptions, current status, specific tasks, agency roles, expected users and stakeholders, benefits, other projects that are dependencies, prerequisites, or related, relative priorities and resources.

1.2 BACKGROUND

St. Albert has already begun the implementation and testing of ITS technology throughout the City. Figure 1-1 below shows the locations of installed ITS infrastructure in various “pilot tests” in the City. At present, deployed technologies include:

- Fiber Communications
- Road Weather Information Systems (RWIS)
- Pan-Tilt-Zoom (PTZ) CCTV Web Cams
- Permanent Vehicle Counters
- Microwave Sensors
- Intersection Video Sensors
- Bluetooth Travel Time Sensors
- Emergency Vehicle Signal Pre-emption

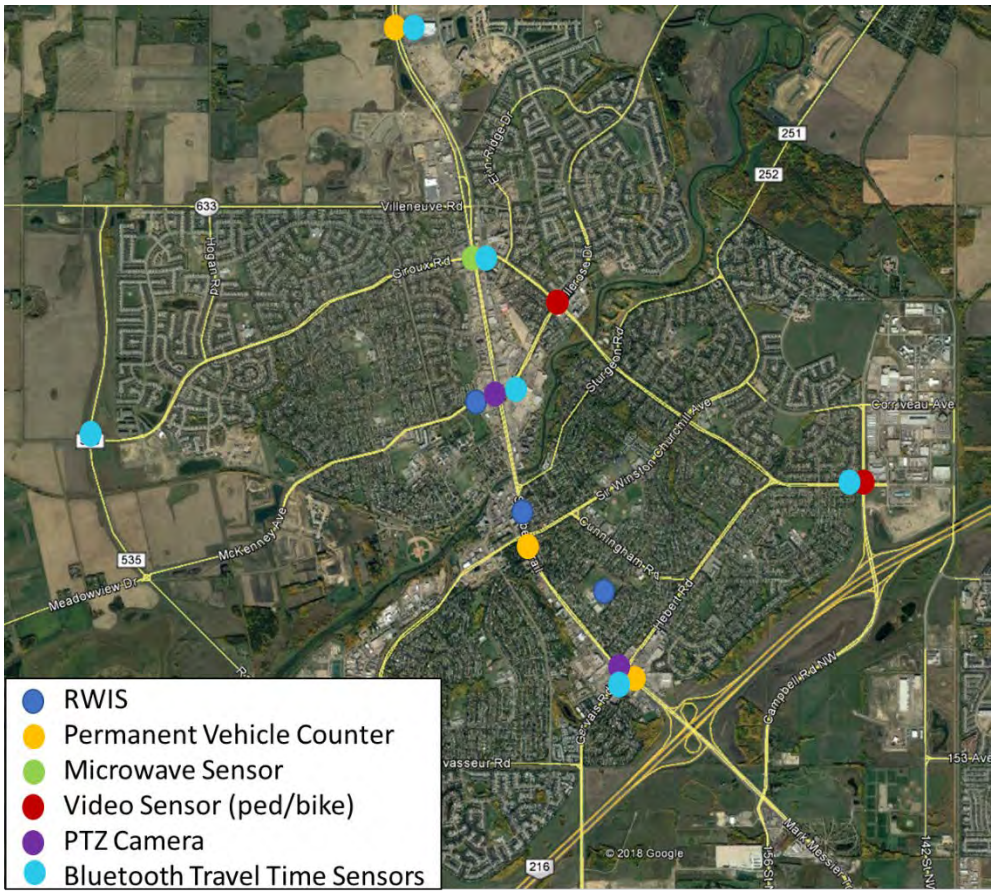


Figure 1-1
Locations of ITS Infrastructure

- The City's fiber communication system is the backbone for ITS integration. It empowers the capability for locations to "communicate" to one another and back to a central system, or to have specific information open to stakeholders or public through shared platforms (PTZ cameras viewed by residents). The use of fiber over other communication systems such as wireless, provides greater speed, data transfer size and reliability with reduced interruptions.
- The Road Weather Information Systems (RWIS) stations monitor the weather and local pavement conditions. The data generated from the RWIS sensors can be used to support decision making including snow and ice removal, provision of road advisory warnings and road closures for public safety.
- The permanent vehicle counters operate 24/7 to count and classify the size of vehicles. This process supports safety and planning decisions and monitoring of ITS strategies due to changes in traffic volumes.

- The microwave radar sensor is used to detect and identify vehicle speed and classification (length/size) of vehicles. The information is used to assist the signalized intersection by recognizing if a vehicle is potentially going to have issue stopping safely (from measurements of speed, size and distance from the intersection) and result in a potential running of the amber or red light. When this scenario is recognized, the signal is held green for an additional short period. Intersection video sensors are also used to count and classify vehicles, pedestrians, and cyclists. The city uses video vehicle detection for all signalized intersections; however, these sensors are slightly different as they can collect information on active modes (cyclists and pedestrians) The data generated by these types of sensors can be used in planning decisions and incident management. Currently, pilot tests are being carried out for video sensors at two intersections; Boudreau Road / Bellerose Drive and Boudreau Road / Campbell Road.
- Pan, Tilt, Zoom (PTZ) cameras provide real-time / live views of the roadways. They can be used by traffic control centre operators for incident management and provide real-time traffic conditions to the public. This information allows the public to make informed decisions regarding travel, routes and modes.
- Bluetooth travel time readers use Bluetooth technology to capture travel time from one point to another within the city. The information is used to measure operations of the network and also to provide information to road users to assist in pre-trip planning.
- St. Albert presently operates 63 signalized intersections, 23 of which have pre-emptive signal control that prioritizes movement for emergency medical services and results in improved response time. Signal pre-emption involves interruption of the signal timing plan to allow emergency vehicles to proceed safely and quickly through the intersections. Figure 1-2 shows the locations of the signals with pre-emptive control. With the system integrated into the field at signalized intersections, there is capability for it to be expanded upon beyond emergency service vehicles, to operate for other service vehicles such as Transit or Public Services.

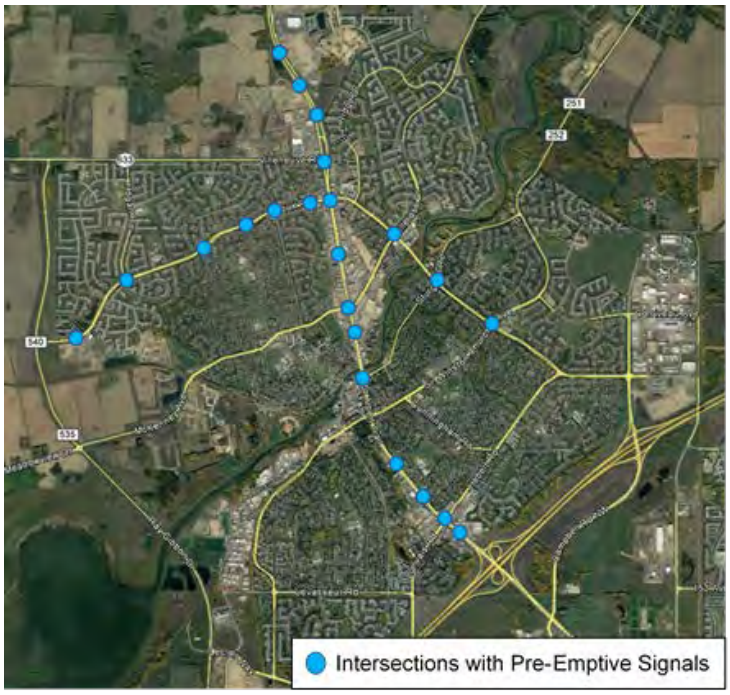


Figure 1-2
Locations of Signals with Pre-Emptive Control

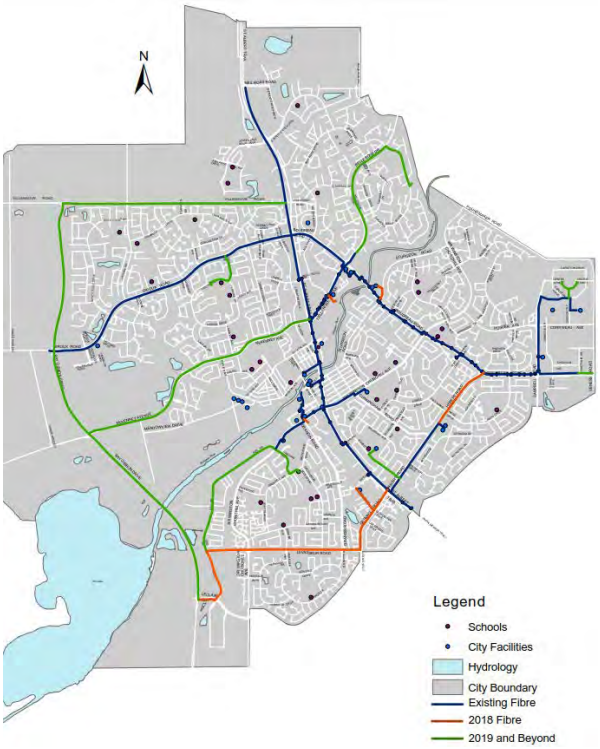


Figure 1-3
2018 Fiber Optic Infrastructure

2 Implementation Schedule

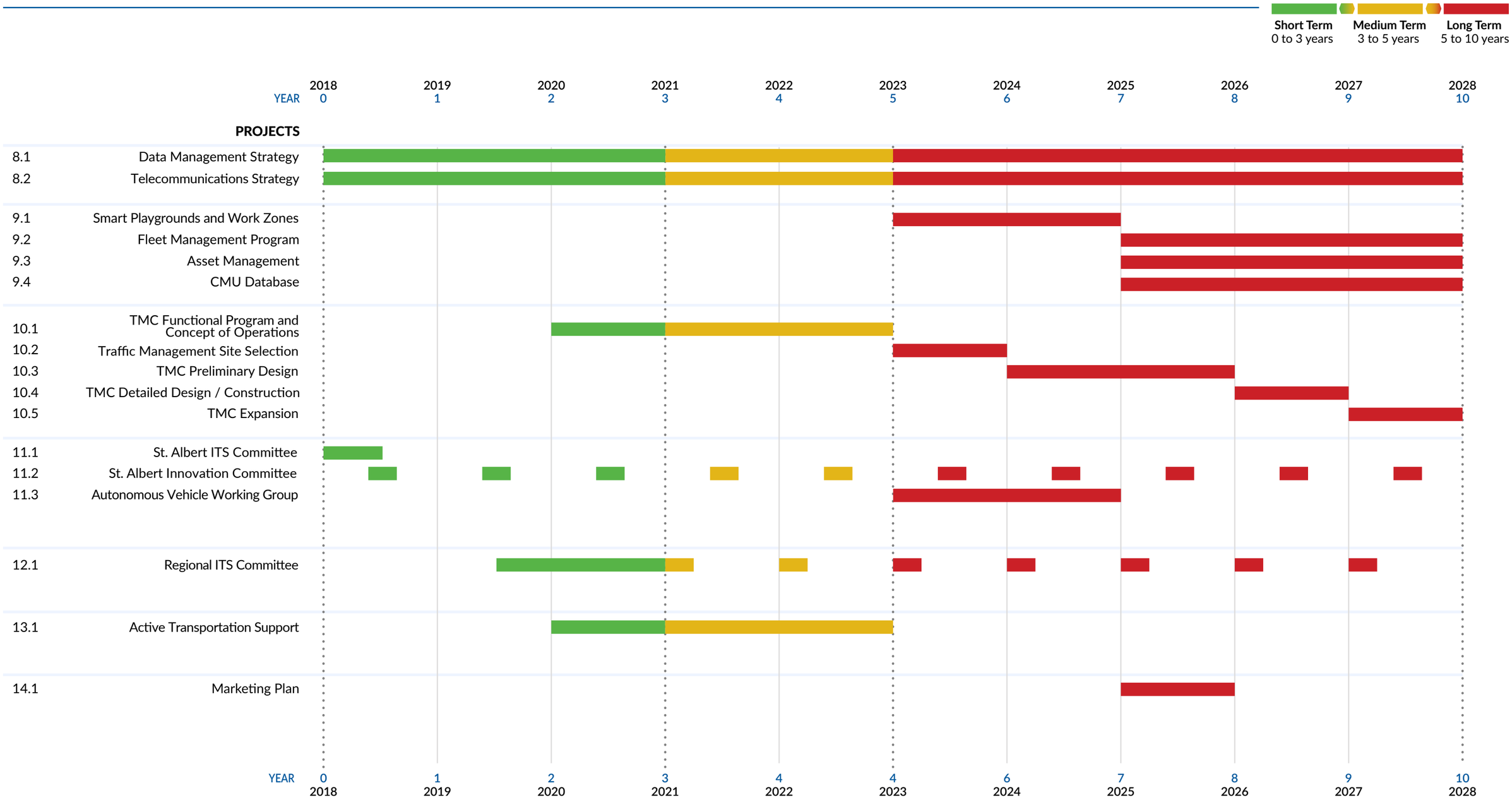
Within an ITS plan, an implementation schedule allows agencies to plan their capital programs and tasks, schedule resources and seek funding. These schedules are illustrated in “Gantt charts” that show each project and their expected duration, phase and priority. The charts also illustrate the relative order and dependencies of various projects.

The two Gantt charts below show:

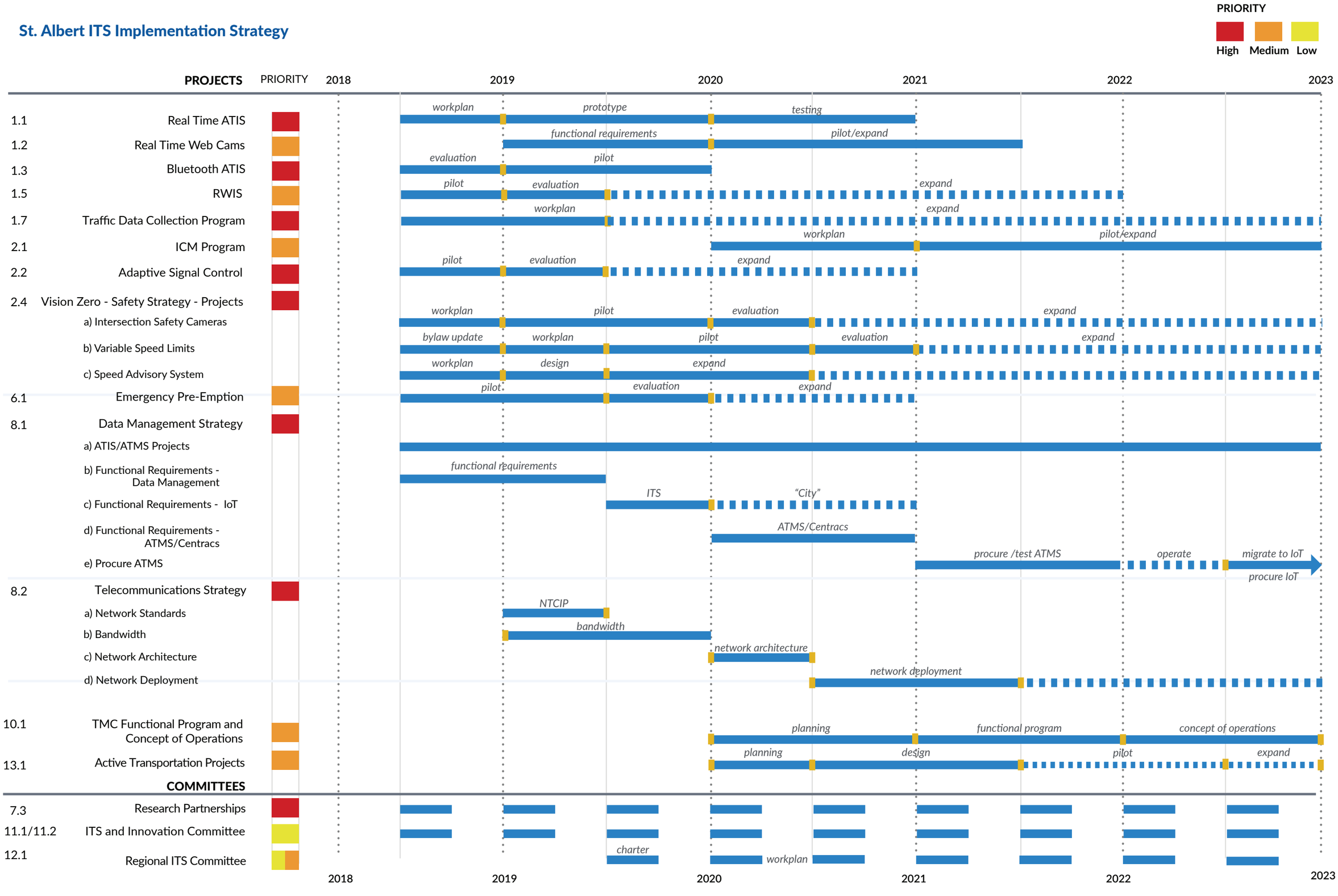
.1 The schedule for the St. Albert ITS Strategic Plan, 2018 to 2028, for short to long-term projects
.2 The detailed implementation plan for short and medium-term projects in the first five years.

It should be noted that both schedules show the same projects, but the implementation plan illustrates the first five years in greater detail. The projects are described in the next Section 3, while Appendix A contains lists of project tasks by year and project.


Short Term
0 to 3 years
Medium Term
3 to 5 years
Long Term
5 to 10 years
YEAR
2018 0
2019 1
2020 2
2021 3
2022 4
2023 5
2024 6
2025 7
2026 8
2027 9
2028 10
PROJECTS
1.1 Real Time ATIS
1.2 Real Time Web Cams (Pilot + Program)
1.3 Bluetooth ATIS
1.4 Trip Planner
1.5 St. Albert RWIS (Pilot + Program)
1.6 Speed Advisory Systems
1.7 Traffic Collection Program
2.1 ICM Program
2.2 Adaptive Signal Program (St. Albert Tr. Pilot)
2.3 Incident Management (Pilot & Program)
2.4 Vision Zero - Safety Strategy - Projects
3.1 On-Demand Transit
3.2 Next Bus Upgrade
3.3 Transit Signal Priority
3.4 Smart Bus Architecture
3.5 Transit Infrastructure
4.1 Electronic Payment
5.1 Regional Truck Survey
5.2 CVE Strategy
5.3 Dangerous Goods Monitoring
6.1 Emergency Pre-Emption
7.1 Connected Vehicles
7.2 Autonomous Vehicles
7.3 Research Partnerships
YEAR
0 2018
1 2019
2 2020
3 2021
4 2022
4 2023
6 2024
7 2025
8 2026
9 2027
10 2028


Short Term
0 to 3 years
Medium Term
3 to 5 years
Long Term
5 to 10 years
YEAR
2018 0
2019 1
2020 2
2021 3
2022 4
2023 5
2024 6
2025 7
2026 8
2027 9
2028 10
PROJECTS
8.1 Data Management Strategy
8.2 Telecommunications Strategy
9.1 Smart Playgrounds and Work Zones
9.2 Fleet Management Program
9.3 Asset Management
9.4 CMU Database
10.1 TMC Functional Program and Concept of Operations
10.2 Traffic Management Site Selection
10.3 TMC Preliminary Design
10.4 TMC Detailed Design / Construction
10.5 TMC Expansion
11.1 St. Albert ITS Committee
11.2 St. Albert Innovation Committee
11.3 Autonomous Vehicle Working Group
12.1 Regional ITS Committee
13.1 Active Transportation Support
14.1 Marketing Plan
YEAR
0 2018
1 2019
2 2020
3 2021
4 2022
4 2023
6 2024
7 2025
8 2026
9 2027
10 2028

St. Albert ITS Implementation Strategy



3 Short and Medium-Term Project Summaries

Project summaries for the short and medium-term projects have been developed. These summaries include:

- Project descriptions – these are general descriptions of each project.
- Project Status – as some projects may be underway in some way, either in planning stages, piloting stages or actual implementation, the current state of the strategy at the City is identified.
- Tasks – these are detailed and specific tasks to develop and implement the project.
- Agency roles – specific roles of St. Albert departments as well as other stakeholder agencies. The LEAD agency or department is also recommended.
- Expected users and stakeholders – these are typically the beneficiaries of the project.
- User benefits – high level benefits to the stakeholders.
- Prerequisites and related projects with dependencies:
  - Prerequisites are those initiatives that must occur before the project can be implemented.
  - Dependencies are those initiatives that depend on the deployment of the project.
  - Related projects are those initiatives with a link to the work.
- Relative priorities – provided via the steering committee and ITS Plan.
- Staff requirements – internally for St. Albert to complete the project and support operations.

These summaries were developed to acknowledge actions and resources in the planning and budgeting of the implementation of the ITS strategic plan. Identification of expected resource requirements and user benefits also assisted in the prioritization of project implementation.

Traffic management and safety projects are the top priority in the short to medium term. The distribution of information to users is the second priority.

This report focuses on two phases of the St. Albert ITS Strategic Plan as follows:

- Short term: 0 to 3 years (2018 to 2020)
- Medium term: 3 to 5 years (2020 to 2023)

The project summaries note the extensive use of pilot projects in St. Albert which serve an important role in the City:

- Pilot projects are used to test new products and devices on site before significant investment decisions are made.
- The work provides proof of concept which may relate to systems or integration.
- The pilot projects typically issue lessons learned, performance results, benefits and conclusions in reports to guide future design and deployment.
- The pilot projects may uncover new and innovative approaches to solutions in transportation.

Typically, if pilot projects are successful, the technology may be incorporated into annual programs for future implementation.

Throughout this section and the rest of the report, the same project numbers are used as in the ITS Strategic Plan to maintain consistency and familiarity.

Although the original ITS plan is comprised of 41 projects, the detailed implementation plan created additional sub-projects or combined projects for some initiatives.

3.1 PROJECT 1.1 – ADVANCED TRAVELLER INFORMATION SYSTEMS (ATIS)

3.1.1 Description

This project will develop and deploy a “real time” traveller information website linked to or as a part of the existing City website. The traveller information will focus on transportation in a variety of modes and will be the main public hub for ATIS.

The project will review currently available and planned traffic information and data and develop an interactive City advanced traveller information systems (ATIS) website with links to social media. The ATIS site will also be a repository for other traffic information projects in the ITS Plan such as web cameras and RWIS.

3.1.2 Status

No actions completed to date.

3.1.3 Tasks

Specific tasks of the project include:

- Develop functional requirements for a City-wide traveller information website for transportation, considering geographical boundaries and regional partners. Consider other agency’s data to share on the website, including neighbouring municipalities, University of Alberta and Alberta Ministry of Transportation. Information on the website may include:
  - Real time traffic flows including speeds and reliability.
  - Point to point travel times.
  - Real time weather advisories.
  - Congestion information and hot spots.
  - Incident alerts.
  - Construction and maintenance activity.
  - Images or video from CCTV cameras and VMS.
  - Links to other modes and networks.
  - Links to other research and projects.

- Prepare a work plan with ranked projects for design and implementation to feed the website. Projects may include the procurement and installation of technology around the City.
- Develop prototype with wireframes and content management system (CMS) for St. Albert ATIS website with interfaces to devices. Select the CMS for the site for testing and integration.
- Prepare detailed design, specifications and test plans for hardware and software and final design of the website.
- Procure hardware and software including testing.
- Website will be tested and debugged on a test server before transferring to the production server.

3.1.4 Agency Roles

The City of St. Albert IT will be the LEAD department. Other departments and agencies with a role in the project include:

- Smart City – integration of detection equipment into the Smart City Master Plan.
- Public Works – support project management.
- Engineering Services – support the identification and installation of ITS technology and the design of any hardware required, such as poles and field devices to supplement information.
- Communications and Design – support and promote public awareness, marketing and education.
- If the ATIS website contains information from regional partners, integration with their IT departments will be required.

3.1.5 Expected Users and Stakeholders

An ATIS website can have the following users and stakeholders:

- General public – residents, visitors and businesses can use ATIS for real time trip planning, communication regarding incidents, weather and construction.
- Planning and Development – use of historical data to inform planning decisions.
- St. Albert IT department – website maintenance and operation.
- Regional partners – if the website contains information from outside agencies.

3.1.6 User Benefits

A major benefit of a City ATIS website is that it is a reliable source of pre-trip traveller information. Users will be more informed of road and travel conditions which will improve decision making in planning journeys and reduce frustration due to unexpected delays. If this information is also sent via radio, it can be a source of enroute traveller information as well.

The Planning and Development department will access archived and historical data to evaluate network performance and inform planning decisions.

3.1.7 Prerequisites and Related Projects with Dependencies

3.1.7.1 Dependencies

- Project 1.2 – Real Time Web Cameras
- Project 1.3 – Bluetooth ATIS
- Project 1.4 – Trip Planner
- Project 1.5 – St. Albert RWIS
- Project 3.2 – Next Bus Upgrade

3.1.7.2 Prerequisites

- Project 8.1 – Data Management Strategy
- Project 8.2 – Telecommunications Strategy

3.1.7.3 Related Projects

- Project 1.7 – Traffic Data Collection
- Project 2.1 – Integrated Corridor Management
- Project 2.3 – Incident Management
- Project 10.1-10.5 – Traffic Management Centre
- Project 14.1 – Marketing Plan

3.1.8 Relative Priorities

This project is a HIGH priority in the short term as other projects are dependent on it. The following milestones are recommended:

- The ATIS site workplan is expected to start in mid-2018 to 2019
- The prototype development is to be completed in 2020
- Testing of production website will be completed in 2021

3.1.9 Staff Resources

City of St. Albert resources will be required to design, implement and operate the website. If a website is procured through an outside agency, St. Albert will require resources for project and contract management and input into website functional requirements.

3.2 PROJECT 1.2 – REAL TIME WEB CAMERA PROGRAM AND PILOT PROJECT

3.2.1 Description

CCTV cameras today are reliable and sturdy with a host of features including pan-tilt-zoom (PTZ), high definition (HD) lenses, climate control and an excellent optical suite of features such as night vision. CCTV cameras are used for numerous purposes including traveller information systems (ATIS), incident management and security. Developing the functional requirements for a web camera program will influence the type of camera selected, positions of the units and telecommunication needs for St. Albert. For example, if the City requires streaming HD video, the telecommunications requirement is much different than if CCTV screen shots are used for image transmission.

This project involves the development of a City web cam program and a pilot project to demonstrate the benefits of “know B4 you go” so residents can access images prior to their trips. The program will include recommended locations based on the St. Albert ITS Strategy. It should be also noted that research is already underway, testing dome type PTZ CCTV cameras at locations on St. Albert Trail (see Section 1.2). These cameras will form the basis for the pilot project.

The St. Albert web cam pilot project is intended to provide proof of concept for the technology. The project will also feed real time content to the City Traveller Information web site in Project 1.1.

The results will be published and form the basis for additional deployment.

3.2.2 Status

The City has implemented web cameras for internal testing in 2018. Following internal testing, aligning with the work around the ATIS development, the cameras installed in the field may be coordinated for use with the ATIS program.

3.2.3 Tasks

This project will consist of three components or tasks:

CCTV Web Camera Program:

This task is the development of the overall program including specific goals and objectives, technical planning and recommendations.

- Collect baseline data on traffic flows at locations focused on congestion and delay, high collision rates, and intermodal facilities. The data will include the current pilot locations on St. Albert Trail.
- Develop functional requirements for CCTV cameras based on the City ITS Strategy.
- Prepare concept of operations that considers the prerequisite projects such as the traveller information web site and telecommunications.

- Develop evaluation criteria for ranking CCTV camera locations. Include the pilot locations on St. Albert Trail.
- Identify ranked corridors, key and strategic locations for real time City web cameras.
- Prepare conclusions and recommendations.
- This work is expected to be completed in late 2019 as the ATIS program and website must precede it.

CCTV Web Camera Pilot Project and Report:

This task involves the pilot project and report.

- Evaluate the current CCTV pilot project including reliability, performance, costs and responsiveness under different conditions including night vision and poor weather.
- Prepare a “lessons learned” for the project, benefits and best practice recommendations for future City deployments.
- The evaluation of the current pilot project should occur shortly after the web camera program (above) and be complete by mid-2020. It could also be done in parallel with the ATIS project.

CCTV Web Camera Deployment

This task will focus on expansion of the CCTV web camera program:

- Review of current CCTV technologies, integration requirements into the network (ATIS site) and test plans.
- Assess current CCTV standards including compliance with NTCIP 1205.
- Develop network architecture for the system.
- Undertake preliminary and detailed design of all hardware including poles, foundations, clamps, electrical conduit, telecommunications, and software.
- Detail specifications of selected hardware and software.
- Procure CCTV hardware and software.
- Undertake factory and field acceptance testing.
- Document results of benefits to build the business case for future installations.
- CCTV web camera deployment will be done post-pilot project report in 2020 to mid-2021.

3.2.4 Agency Roles

City of St. Albert Engineering Services Department is the LEAD and will ensure that the web cam data is integrated into the ATIS website and TMC operations. Other City departments with roles in the project include:

- Smart City – integration of web cameras into the Smart City program and plan.
- Planning and Development – support web cameras in City planning.
- Public Works – support project management.

- IT – integration of web camera IT requirements into operation and system maintenance.
- Communications and Design – support public awareness, marketing and education.
- St. Albert Transit – integration into transit programs.

3.2.5 Expected Users and Stakeholders

The web camera data and images are intended to be used by the following stakeholders:

- General public for traveller information.
- ITS staff in planning and engineering.
- Traffic Management Centre (TMC) operators in support of incident management.
- Enforcement staff (RCMP and City) to verify traffic incidents.
- Regional ITS Committee for cross-jurisdictional initiatives.

3.2.6 User Benefits

CCTV web cameras are an important tool in supporting the efficiency and safety of the City's transportation network. The web cameras will form one part of the City's traveller information web site.

High level benefits include:

- Improved traffic management and ATIS, particularly in poor weather situations.
- Increased safety for users.
- Better operations for the City and TMC operations.
- Improved response by City staff for incidents and maintenance.
- Access to real time images.

3.2.7 Prerequisites and Related Projects with Dependencies

3.2.7.1 Dependencies

- Project 1.4 – Trip Planner
- Project 2.3 – Incident Management

3.2.7.2 Prerequisites

- Project 8.1 – Data Management Strategy
- Project 8.2 – Telecommunications Strategy

3.2.7.3 Related Projects

- Project 10.1 – Traffic Management Centre Functional Program and Concept of Operations
- Project 2.1 – Integrated Corridor Management
- Project 3.1 – On-Demand Transit
- Project 3.2 – Next Bus Arrival System Update
- Project 1.1 – ATIS program and website

3.2.8 Relative Priorities

Starting in 2019, the St. Albert web camera program and pilot project is a MEDIUM priority in the short term. It is expected that the pilot and expansion will be completed by mid-2021.

The program development is critical to ensure that the technology is deployed at the correct locations and selected to ensure compliance with the ITS standards, while the implementation of the program will assist in network monitoring and provide stronger network information to the public when aligned to the ATIS system.

3.2.9 Staff Resources

City of St. Albert will be required to support post-deployment operation and system maintenance.

3.3 PROJECT 1.3 – BLUETOOTH ADVANCED TRAVELLER INFORMATION SYSTEMS (ATIS)

3.3.1 Description

Bluetooth is a wireless communication standard used to exchange data between devices over short distances. Bluetooth Advanced Traveller Information Systems (ATIS) technology is reliable and mature, and used in many jurisdictions. Devices such as cell phones, computers, headphones, in-vehicle navigation units, and others have Bluetooth units. The units have unique identifiers called “MAC” addresses (media access control) which form part of the network interface and are emitted.

Bluetooth readers are placed at key points in the network to detect the emitted MAC addresses with time stamps from passing vehicles. The readers have a range of 30 to 50 m. When a downstream reader detects the same MAC address, the elapsed time and distance is measured to calculate average speed and travel time. The system then publishes the travel times on a VMS or online map.

If travel time information is desired for routes outside of St. Albert, the Bluetooth system could be expanded to include other regional destinations. This will require cooperation of regional stakeholders. Published travel times could display an array of regional destinations.

Specific travel times can be published on the St. Albert website.

3.3.2 Status

St. Albert has deployed Bluetooth travel time readers with a targeted area of St. Albert Trail in 2018 and a short-term objective of covering key city access / exit points. Currently the City has six Bluetooth sites:

- St. Albert Trail at Neil Ross Road
- St. Albert Trail at Villeneuve Road
- St. Albert Trail at McKenney Avenue
- St. Albert Trail at Hebert Road
- Boudreau Rd at Campbell Rd
- Ray Gibbon Drive at Giroux Rd

3.3.3 Tasks

The St. Albert Bluetooth ATIS program will undertake the following tasks:

- The pilot project will document the current locations and assess performance of the Bluetooth ATIS sites. The report should include proof of concept of the system, lessons learned, suggested best practices, and benefits.
- Develop evaluation criteria for further Bluetooth deployment so that additional appropriate corridors can be selected for the technology. Typically, these corridors may have variations in travel times due to non-recurring congestion or other factors.
- Develop a candidate ranked list of corridors including the end points for the Bluetooth System.
- Select additional locations to expand the pilot project and provide proof of concept and demonstration of benefits for Bluetooth technology. The locations of additional readers and variable message signs (VMS) should provide a complete Bluetooth system for the City.
- Prepare functional requirements, detailed design and specifications for the Bluetooth system.
- Procure the field devices (Readers, VMS, telecommunications) and undertake testing and integration.
- Deploy the pilot and document benefits, using the results to feed a business case for future deployments.
- Prepare a ranked implementation plan for future Bluetooth ATIS deployments.

3.3.4 Agency Roles

City of St. Albert Engineering Services Department is the LEAD. Other City departments with roles in the project include:

- Smart City – integration of Bluetooth readers into the Smart City program and plan.
- Planning and Development – use of travel time data in City planning.
- Public Works – support project management.
- IT – integration of Bluetooth readers into operation and system maintenance.
- Communications and Design – support public awareness, marketing and education.

3.3.5 Expected Users and Stakeholders

Journey time data is intended to be used by the following stakeholders:

- General public for traveller information and route selection.
- ITS staff in planning and engineering.
- Traffic Management Centre (TMC) operators in support of incident management and diversion of traffic around incident locations.

3.3.6 User Benefits

The provision of travel time information decreases anxiety of drivers and allows alternative routes to be selected mid-trip.

High level benefits include:

- Improved traffic management.
- Improved trip planning.
- Increased safety for users.
- Indicates incidents which can improve response by City TMC and operations staff.

3.3.7 Prerequisites and Related Projects with Dependencies

3.3.7.1 Dependencies

- Project 1.4 – Trip Planner

3.3.7.2 Prerequisites

- Project 8.1 – Data Management Strategy
- Project 8.2 – Telecommunications Strategy
- Project 1.1 – ATIS Program and Website

3.3.7.3 Related Projects

- Project 1.7 – Traffic Data Collection
- Project 10.1 – Traffic Management Centre Functional Program and Concept of Operations
- Project 2.1 – Integrated Corridor Management
- Project 2.3 – St. Albert Incident Management Program

3.3.8 Relative Priorities

The Bluetooth ATIS program is a HIGH priority in the short term. It is an important tool for measuring the efficiency of the network and can be used to quantify impacts of implementing ITS strategies. It is also important to drivers in St. Albert to obtain current and accurate travel times in the network. The evaluation of the current pilot will be completed by 2018. Expansion of the pilot will occur in 2019.

3.3.9 Staff Resources

City of St. Albert will be required to support post-deployment operation and system maintenance.

3.4 PROJECT 1.5 – ROAD WEATHER INFORMATION SYSTEMS

3.4.1 Description

Road weather information systems (RWIS) use an array of sensors and devices to collect and monitor weather information in real time as input to activities such as snow clearance, dynamic speed limits, traffic management and traveller information to drivers of road conditions. RWIS stations acquire environmental and local data such as pavement surface and air temperatures, ice and snow measurements and barometric pressure with the objective of assessing and predicting hazardous situations such as black ice and low visibility in snow. CCTV cameras may be deployed near RWIS stations to verify extreme weather. Integration through ATIS to advise motorists and traffic management to close roads may save lives. RWIS stations are often located in areas subject to severe weather changes or critical to traffic flow. This project will develop and oversee the installation of RWIS sensors and the integration of their information into St. Albert systems and processes, primarily via the ATIS website, traffic operations and the TMC.

3.4.2 Status

St. Albert has 3 RWIS sites on or near St. Albert Trail (see Section 1.2), from the same manufacturer, Sites and information shall be evaluated and tasks completed to expand upon the system.

3.4.3 Tasks

Specific tasks of the project include:

- Review the current RWIS sites for performance, results and costs. Assess the standards used in the current sites in terms of NTCIP 1204 compliance.
- Develop functional requirements for RWIS in support of traffic management and traveller information systems. The TMC will be the hub for the integrated RWIS data. These functions will determine the type of sensors used in the RWIS station.
- Assess specific RWIS data needs in the City including air and surface temperature, barometric pressure, pavement conditions (dry, wet, snow, ice), type and intensity of precipitation, humidity, visibility, windspeed and direction. The sites may require simple pavement sensors or a fully

equipped weather station. The software for the RWIS station will be affected by this data requirement.

- Select location(s) for RWIS that will may pose hazardous conditions on the network. Multiple locations may be desired to monitor different microclimates.
- Determine how RWIS data will be used and through which channels the information will be disseminated.
- Develop channels for information dissemination.

3.4.4 Agency Roles

The City of St. Albert IT will be the LEAD department. Other departments and agencies with a role in the project include:

- Smart City – integration of detection equipment into the Smart City Master Plan.
- Public Works – support project management
- Engineering Services – support the installation of technology and the design of any hardware required, such as poles, sensors and devices.
- Communications and Design – support public awareness, marketing and education

If information sharing with regional partners is desired, integration with their IT departments will be required.

3.4.5 Expected Users and Stakeholders

RWIS will have the following users and stakeholders:

- General public – improved information regarding road conditions.
- St. Albert Transit – improved information regarding road conditions, and delays.
- Public Works – improved planning for snow and ice control.
- St. Albert IT department – system maintenance and operation.
- Regional partners – if there is a desire to share information with outside agencies.

3.4.6 User Benefits

Service providers for roadway maintenance will be capable of planning or responding to actual quantified road data and efficiency may be found through remote accessibility of information to mobilize necessary resources to respond to conditions through early monitoring or warning.

Users will be more informed of road and travel conditions, which will improve decision making, reduce frustration due to unexpected delays, and be better able to plan journeys. Safety will be improved as drivers can adjust their behaviour when informed of road conditions.

3.4.7 Prerequisites and Related Projects with Dependencies

3.4.7.1 Dependencies

- Project 1.1 – Advanced Traveller Information Systems

3.4.7.2 Prerequisites

- Project 8.1 – Data Management Strategy
- Project 8.2 – Telecommunications Strategy

3.4.7.3 Related Projects

- Project 1.4 – Trip Planner
- Project 1.6 – Speed Advisory
- Project 2.1 – Integrated Corridor Management
- Project 2.4 – Vision Zero Safety
- Project 10.1-10.5 – Traffic Management Centre
- Project 14.1 – Marketing Plan

3.4.8 Relative Priorities

This RWIS project is considered a MEDIUM priority in the short term, with a duration of:

- Complete current pilot and perform evaluation (mid-2019)
- Expansion of pilot with additional infrastructure (mid-2019 - 2022)

3.4.9 Staff Resources

City of St. Albert resources will be required to select technology and sites for deployment. The information generated will require integration into St. Albert Systems.

3.5 PROJECT 1.7 – TRAFFIC DATA COLLECTION PROGRAM

3.5.1 Description

In ITS and Smart City programs, the primary and necessary component for applications and functions is data. The initial step is to acquire and collect the data. Data will be sent in “real time” to TMC operations for a response and will also be archived to assess performance.

St. Albert requires baseline data to assess the current traffic conditions on City corridors and intersections. Turning movements counts, volumes, speeds and classification data are critically important and will be used as input to business cases for various ITS related initiatives.

Safety related data is also important for the City to support the Traffic Safety Strategy and Vision Zero initiatives.

This project is identified to capture current processes of data collection and the expansion of information being captured with new ITS technology. Efforts performed for the City-wide traffic data collection program will not be on hold as the Data Collection and Management Strategy (Project 8.1) is developed.

3.5.2 Tasks

The project will include the following tasks:

- Develop a work plan to support data collection requirements. The work plan needs to incorporate the results of various pilot and research projects in the City.
- Perform annual traffic volume / speed / classification (through both permanent and temporary applications).
- Perform annual network warrant reviews for traffic and pedestrian controls.
- Collect necessary data to support current capital programs (Safe Journeys to School, Neighbourhood Traffic Calming, Pavement Management, Intersection Improvements).
- Collect collision data from the Provincial system, validate and analyze data.
- Perform necessary annual reporting.

This project is aligned to the City's current annual data collection programs and processes and will be amended as per direction from the proposed Data Collection and Management Strategy (Project 8.1).

3.5.3 Agency Roles

City of St. Albert Engineering Services will be the LEAD department. Other departments and agencies with a role in the project include:

- Smart City – ensure that Smart City data is included in data collection and retrieved when needed.
- Public Works – support project management.
- IT – support any telecommunications and data management needs of traffic data collection.
- Engineering Services – support the traffic data requirements of ITS functions and applications. Support the installation of data collection technology and the design of any hardware required, such as poles, sensors and devices.
- Communications and Design – support public awareness, marketing and education.

3.5.4 Expected Users and Stakeholders

Data will support all users and stakeholders including:

- General public via a better repository of data and users of programs such as Vision Zero.
- Engineering Services with better data on network performance to build business cases.
- TMC operators to manage the network.
- Planning Department with better information.

3.5.5 User Benefits

Generally, establishing a defined, technologically "state of the art" Traffic Data Collection program will support City services as well as the projects in the ITS and Smart City programs. The work is an important and paradigm shift to a proactive, smart environment.

3.5.6 Prerequisites and Related Projects with Dependencies

3.5.6.1 Dependencies

- Project 1.4 Trip Planner
- Project 2.4 Vision Zero – Safety

3.5.6.2 Prerequisites

- Project 8.1 Data Management
- Project 8.2 Telecommunications

3.5.6.3 Related Projects

- Project 1.1 – Advanced Traveller Information Systems
- Project 2.1 – Integrated Corridor Management
- Project 2.3 – Incident Management Program
- Project 9.1 – Smart Work Zones
- Project 10.1 to 10.5 – Traffic Management Centre
- Project 12.1 – Regional Transportation
- Project 13.1 – Active Transportation
- Project 14.1 – Marketing Plan

3.5.6.4 Relative Priorities

The Traffic Data Collection project is a HIGH priority in the short term. It is important that programs and projects be strategically addressing network safety and efficiency and investment be performed with an evidence-based approach that targets highest need areas. Data itself also provides the critical

measurables of network operations and impacts of implementing improvements or changes. The program will continue for the duration of the ITS and Smart City plans as an ongoing measure.

3.5.6.5 Staff Resources

The traffic data collection program is an essential effort that should be supported by staff to develop, implement, operate and maintain the hardware and software. Staff will be required to support data analyses and monitoring activities.

3.6 PROJECT 2.1 – INTEGRATED CORRIDOR MANAGEMENT (ICM) PROGRAM

3.6.1 Description

Integrated Corridor Management (ICM) is based on the concept that a corridor is comprised of "modal assets" that can move people and goods optimally. Some modal capacities may be under-utilized which may help other modes with congested infrastructure by shifting traffic demand. The purpose of ICM is to use ITS technology and applications to move people and goods efficiently and safely, at times, via intermodal connections. ICM provides choices of modes and routes. This concept requires that the City is aware of the "real time" conditions on modes in the corridor.

Corridor operations and related capacity may be "adjusted" based on numerous scenarios which typically include:

- *Normal operations* – the corridor may have predictable and reliable traffic demand during the days and evenings. These recurring operating conditions typically occur reliably on most commuting periods.
- *Event operations* – these events may be one of the following:
  - A special "planned" event may include a city-wide celebration, planned construction or maintenance or perhaps entertainment such as a concert.
  - An "unplanned" event may include an incident that affects traffic flow through major corridors in the City or even in adjacent jurisdictions that result in diverted traffic in and out of St. Albert. Extreme weather events may also affect traffic flows.

In such circumstances, the City must have the infrastructure to monitor the flow conditions on major corridors, modal operations such as transit, and local congestion. At the City level, the following sources of information should be monitored:

- Traffic flows on major arterials. Signal systems and detectors generate reliable data for ICM purposes. Speed, volume, lane occupancy, and headway are parameters that should be monitored at key points.
- Transit operations. This data may include passenger and vehicle information.
- Weather conditions that may be used by City maintenance crews and public.
- Special event details including location, duration, and expected traffic loads.

- Parking capacity and availability.
- Incidents in real time.
- Construction and maintenance activities including location, duration and planned outages and lane closures.

This data should be available at the TMC through CCTV cameras, traffic detectors, parking systems, transit tracking and sensors, RWIS and ITS field devices. Mobile City staff should also have access to this data via smart phones or tablets. Thus, much like other ITS applications, data is a key ingredient that feeds the ICM functions.

These attributes demonstrate that ICM requires a significant degree of institutional coordination, particularly between modal departments within the City. The ability to seamlessly move between modes is a key attribute in ICM programs. The specific data may be controlled by different departments and therefore, require coordination and integration to be successful. Further, system interfaces may be required to allow data to flow from one department to another.

ICM requires strategic options in several key areas:

- *Demand* – understanding and recognizing demand patterns is a role for the City. The demand may be recurring and predictable, such as daily commuter traffic.
- *Load* – operating corridors and networks to "balance" loads to match capacity is a role for the City. When loads exceed capacity, the results are immediate and public. Reallocating the load is a primary goal.
- *Response* – the City's response to planned and unplanned events is under its control. Event plans that consider modal capacities are one part of the response. For unplanned events, the TMC would initiate a response, for example, to an accident by deploying the appropriate emergency services.
- *Capital program* – initiating capital and operational projects and changes are long term and require St. Albert's commitment.

ICM allows the jurisdiction to monitor the corridors in the network, supporting diversion to other corridors or modes that have capacity, if there are problems. St. Albert's transportation network is conveniently compact and focused on several east-west and north-south corridors, thus making ICM applications cost-effective. The ICM program should consider the following:

Monitor City Traffic Flows

City arterials can be monitored at key locations including:

- Ray Gibbon Drive at Villeneuve Road
- Ray Gibbon Drive at LeClair Way
- St. Albert Trail at the north
- St. Albert Trail at Anthony Henday
- St. Albert Trail at Hebert / Gervais Road
- St. Albert Trail at Boudreau / Giroux Road

- St. Albert Trail at McKenney Avenue / Bellerose Drive
- Gervais/170th Street at Levasseur Road
- Boudreau Road at Campbell Road
- Boudreau Road at Hebert
- Boudreau Road at Bellerose Drive
- City accesses at Sir Winston Churchill Avenue and Bellerose Drive corridors
- Downtown area

These key locations can be equipped with detection to “seal off” the City and ensure that network traffic flows are monitored in and out of major St. Albert corridors.

Develop Alternative Routes

ICM supports the ability to re-route traffic, if there is a major event or problem, thus maintaining flow during these periods. This function requires that the conditions of alternate routes be known and monitored. There are a series of east-west routes in the City, some that are good options for diversion. Other routes may require more development.

The east-west routes include:

- Villeneuve Road
- Giroux/Boudreau Road
- McKenny Avenue / Bellerose Drive
- Sir Winston Churchill Avenue
- Gervais/Herbert Road
- Anthony Henday Drive

The north-south routes include:

- Ray Gibbon Drive
- St. Albert Trail
- Campbell Road
- Boudreau Road

The ICM program essentially considers the entire network in the City and therefore, will require data.

3.6.2 Tasks

This project will consist of two components:

ICM Work Plan

Integrated Corridor Management is a key component of the City's traffic management program. The first step is to develop a work plan that will:

- Identify the St. Albert corridors for the ICM work plan, especially networks for roads, pedestrians, cycling routes, transit service, and goods movement corridors. The pedestrian and cycling networks should begin with the existing infrastructure documented in the ITS Plan and the TMP.
- Identify alternative routes – often parallel or connecting routes and opportunities for integration
- Identify locations that are key entry and exit points to the City.
- Develop functional requirements for the ICM program, network-wide.
- Based on the functional requirements, collect background data on each corridor including:
  - Traffic volumes, speeds, lane occupancy and headway, where available.
  - Travel time.
  - Accidents and conflicts.
  - Mode split.
  - Pedestrian and cyclist volumes.
  - Telecommunication infrastructure.
- Identify intermodal transfer or coordination points where users can easily move from one mode to another, seamlessly. Capacity of transfer points (for example, park and ride lots) should be considered.
- Develop alternate modal routes for corridors – if one route or segment is blocked, other corridors can relieve the traffic load and balance demand.
- Develop evaluation criteria for an ICM pilot location which can be a corridor, area of development and involve multiple modes. The report should include recommended and ranked pilot locations.
- Prepare a concept of operations and network architecture for the recommended pilot project

This task is a MEDIUM priority in the short term with a duration of 8 months. The work focuses on efficiency which is key priority for the City.

ICM Pilot Project

This pilot project entails the development of design and systems to initiate ICM at the selected location(s). As a demonstration, the pilot project should be simple and select one alternate route and / or mode to show demand balancing and improved efficiency. The work will include preliminary and detailed design tasks as follows:

- Based on the recommended pilot project in the ICM Work Plan, develop a preliminary design including:
  - Civil, system and electrical work to install field devices for ICM.
  - Telecommunications to integrate devices into the TMC
  - Design criteria for the ITS applications.
  - Hardware and software assessments and cost estimates.
- Detailed design including:
  - Specifications and material approvals.
  - Detailed design drawings for civil, systems and electrical.
  - Software design including integration with TMC central software.
  - Prepare tender package and undertake procurement.
  - Factory and field acceptance testing.
- Document results of costs and benefits to build the business case for future work in the network.

The ICM pilot project is a MEDIUM priority in the short term with a duration of 24 months. The work plan is expected to be complete in 2020. The design and implementation of the pilot project is planned for 2024 to 2026.

3.6.3 Agency Roles

City of St. Albert Engineering Services Department is the LEAD. Other City departments with roles in the project include:

- Smart City – integration of intermodal data into the Smart City program and plan.
- Planning and Development – support real time traffic conditions in City planning.
- Public Works – support project management.
- IT – integration of ICM data and related IT requirements into operation and system maintenance.
- Communications and Design – support public awareness, marketing and education.
- St. Albert Transit – integration into transit programs, modal transfer points to active network.

3.6.4 Expected Users and Stakeholders

The ICM program will benefit the residents, businesses and even the “flow through” traffic in St. Albert. The data will help users maximize intermodal capacity, balance traffic demand, and minimize congestion and delay. The expected users and stakeholders are as follows:

- General public for corridor travel alternatives
- Transit service users with simply more options to travel in the region
- ITS staff in planning and engineering
- Traffic Management Centre (TMC) operators in support of incident management and ATIS

3.6.5 User Benefits

The transportation network will be more efficient, thereby accruing travel time savings to the general public and businesses.

High level benefits include:

- Improved traffic management, particularly in poor weather situations and during incidents and special events.
- Increased safety for users due to reduced congestion and delay.
- Better operations for the City with a balanced network.
- Improved response by City staff for incidents and maintenance.

3.6.6 Prerequisites and Related Projects with Dependencies

3.6.6.1 Dependencies

- Project 1.4 Trip Planner
- Project 2.5 Vision Zero – Safety Strategy
- Project 13.1 Active Transportation Support

3.6.6.2 Prerequisites

- Project 8.1 – Data Management Strategy
- Project 8.2 – Telecommunications Strategy

3.6.6.3 Related Projects

- Project 1.5 – RWIS Program
- Project 2.2 – Adaptive Signal Program
- Project 10.1 – Traffic Management Centre Functional Program and Concept of Operations
- St. Albert Incident Management Program
- Next Bus Arrival System Update

3.6.7 Relative Priorities

The St. Albert ICM plan and pilot project are MEDIUM priority in the short-term period. The program development will ensure that the ICM technology is deployed at the correct locations, providing alternate route and mode options for users.

As an ICM corridor, St. Albert Trail is a high priority to improve safety, efficiency and user friendliness of the route.

This project, to be successful, requires public awareness and support but has potentially excellent public and internal benefits.

3.6.8 Staff Resources

City of St. Albert will be required to support ongoing ICM corridor development and post-deployment operation and system maintenance.

3.7 PROJECT 2.2 – ADAPTIVE SIGNAL CONTROL PILOT PROJECT AND PROGRAM EXPANSION

3.7.1 Description

Adaptive Signal Control coordinates the traffic signals in an area or on a corridor to provide improved progression to vehicles through the network using real time information. It allows the signals to respond intelligently, dynamically, and continuously as traffic flow changes and fluctuates throughout the day or even between cycles. Additionally, it removes dependence on fixed “time of day” signal timing plans, which require regular updating. It is based on measuring all traffic flows into and out of a roadway segment while dynamically changing (or “adapting”) the signal timing plans to fit the traffic load. Thus, timing plans are altered in real time to fit demand as it occurs.

Corridors that are strong candidates for adaptive signal timing programs should have certain characteristics:

- Corridors should operate with variation in traffic flows that will benefit from adaptive signals.
- Existing signal controllers should be easily integrated.
- Intersections should be closely spaced so timing plan changes are effective and not lost if vehicular platoons experience dispersion.
- Corridors should have enough intersections to produce a travel time benefit.
- Corridors must have available telecommunications to allow intersections to be integrated.

Generally, the primary objective of many Adaptive Signal Control programs is to produce improved travel time results from the “base case” scenario, typically involving Time Based Coordination (TBC). Corridors with TBC use timing plans based on historical patterns and need to be updated regularly, usually after 5

years or more, depending on the pace of development. TBC plans are unable to respond to any variance from anticipated operations, such as higher than typical volumes or unexpected occurrences; thus, TBC plans can be outdated if development is rapid or trip generation changes. The advantage of Adaptive Signal Control is that signal timings are dynamically and continuously updated, based on current traffic patterns. Agencies should compare “before and after” data for volume, travel time, speeds, delays and “stops” to assess performance of adaptive systems.

3.7.2 Status

A priority for St. Albert surrounds St. Albert Trail and the ITS Strategy identifies a project to focus adaptive signal control operations on the corridor (see Pages 5-8 to 5-9, Project 2.2). The objective of this project is to improve the performance of St. Albert Trail by reducing travel time, delay and congestion, as well as increase throughput. A smoother traffic flow with less “stop and go” conditions may also decrease collisions.

As the priority, this project has begun in 2018, with infrastructure placed and anticipated conversion of signal operations to adaptive style in Q3 of 2018. This project is a pilot for adaptive traffic signal control at sixteen intersections on St. Albert Trail, which includes:

- Both signals at the Anthony Henday Drive interchange (2 signals) – collaboration is required with Alberta Transportation and their contractors
- Commercial access (Real Canadian Superstore access)
- Hebert Road / Gervais Road
- Gate Avenue
- Green Grove Drive / Sterling Street
- St. Anne Street / Sturgeon Road
- St. Vital Avenue / Rivercrest Crescent
- McKenney Avenue / Bellerose Drive
- Inglewood Drive / Lennox Drive
- Boudreau Road / Giroux Road
- Villeneuve Road / Erin Ridge Road
- Coal Mine Road
- Everitt Drive North / Jensen Lakes Boulevard
- Commercial Access
- Neil Ross Road

3.7.3 Tasks

This project will require several tasks:

St. Albert Trail Adaptive Signal Control Pilot Project

Complete the current St. Albert Trail Adaptive Signal Control Pilot Project as follows:

- Communicate and collaborate with stakeholders on project needs, actions and schedule:
  - Alberta Transportation – obtain permissions and develop agreements for infrastructure management for new technology applications to the intersections and integrate the two locations within the City's monitoring system.
  - Econolite Canada – identify corridor needs for infrastructure and provide all background operational information to integrate new systems operations.
- Undertake a "before and after" evaluation of corridor conditions during AM peak, PM peak, and mid-day periods. The evaluation should include:
  - Traffic volumes.
  - Travel time and average speeds.
  - Delays.
  - Cycle lengths.
- Assess benefits due to the pilot project.
- Review integration requirements if the system is expanded beyond St. Albert into the rest of the Region.
- Document and assess telecommunications, standards, signal hardware and adaptive control algorithm on the St. Albert Trail pilot corridor.

The pilot project is a HIGH priority in the short term and should be operational in 2018. It is expected that the above data for the evaluation of the pilot will be collected into mid-2019.

Expansion of Adaptive Signal Control Program

Expansion of the adaptive signal program will require review of the pilot project results and work plan:

- Review evaluation report on Adaptive Signal Control pilot project including lessons learned.
- Assess network segments and develop evaluation criteria for adaptive signal control.
- Prepare a ranked list of corridors for potential adaptive signal control.
- Conduct microsimulation modelling (if required) on the selected corridor(s) to calibrate the algorithms for adaptive signal systems. Populating the model may require collecting traffic volumes and travel speeds.
- Develop a concept of operations describing the quantitative and qualitative characteristics, and requirements of the equipment and software for the adaptive signal control system.
- Prepare a functional assessment of the system required for an adaptive signal control system.
- Review selected corridor infrastructure for adaptive signal control.

- Preliminary design for signal controllers, civil work, electrical and systems on selected corridor.
- Detailed design of selected adaptive signal corridor.
- Procurement and testing.

This work is dependent on the results of the workplan and pilot. It is a HIGH priority in the short term beyond 2020.

3.7.4 Agency Roles

The City of St. Albert Engineering Services will be the LEAD department. Other departments and agencies with a role in the project include:

- Smart City – integration of detection equipment into the Smart City Master Plan.
- Planning and Development – use of collected data for future planning initiatives
- Public Works – support project management,
- IT – integration of the selected technology for IT operation and system maintenance
- Communications and Design – support public awareness, marketing and education

3.7.5 Expected Users and Stakeholders

An adaptive signal control program can have the following users and stakeholders:

- General Public – improved travel times with less delay on corridors with adaptive signal systems.
- St. Albert IT department – integration of any required technology.
- St. Albert Engineering department – increased resources, due to no longer having to update signal timing plans.
- St. Albert Planning and Development department – use of data on planning initiatives.

3.7.6 User Benefits

The expected benefits include:

- Smoother traffic flow and improved corridor travel times, with less “stop and go” conditions.
- Decrease in delay, queues and traffic collisions.
- Reduced demand for St. Albert staff to update signal timing plans; efficiencies in resource allocation.
- Environmental benefits will be realized through the reduction of vehicle emissions.
- Possible benefits if the system expands into other parts of the Region.

3.7.7 Prerequisites and Related Projects with Dependencies

3.7.7.1 Dependencies

- Project 2.1 – Integrated Corridor Management

3.7.7.2 Prerequisites

- Project 8.1 – Data Management Strategy
- Project 8.2 – Telecommunications Strategy

3.7.7.3 Related Projects

- Project 1.7 – Traffic Data Collection
- Project 2.4 – Vision Zero Safety
- Project 14.1 – Marketing Plan
- Project 1.3 – Bluetooth ATIS
- Project 10.1 – Traffic Management Centre Functional Program and Concept of Operations

3.7.8 Relative Priorities

Priorities of the various tasks in the Adaptive Signal Control Program are as follows:

- Adaptive Signal Control Workplan: HIGH priority in the short term.
- St. Albert Trail Adaptive Signal Control Pilot Project and Report: HIGH priority in the short term.
- Adaptive Signal Control Expansion: HIGH priority in medium term (pending results of pilot projects).

3.7.9 Staff Resources

City of St. Albert resources will be required to:

- Prioritize corridors.
- Select intersections for adaptive control.
- Ensure all necessary technology and equipment is in place to support adaptive operations (communications, detection).
- Evaluate hardware and software to select the appropriate technology.
- Procure selected technology.
- Install and test technology.
- Integrate technology into current systems.
- Support capital initiation to expand the system.

3.8 PROJECT 2.4 – VISION ZERO – SAFETY STRATEGY – PROJECTS

3.8.1 Description

This project will build on the work that St. Albert has done supporting Vision Zero – a broad program with the long-term goal of having no serious injuries or fatalities occur due to motor vehicle collisions on St. Albert's roads. In support of this vision, St. Albert has developed the Transportation Safety Plan 2018-2025, which outlines safety related projects. ITS can support the proposed safety projects including:

- Intersection safety cameras.
- Smart school and playground zones.
- Adaptive traffic signal control.
- Speed advisory display devices.
- Variable speed limits.
- Autonomous and Connected Vehicles Strategy.

3.8.2 Status

The City of St. Albert utilizes devices or is in progress of integrating ITS applications in programs. There are currently three sites that operate with Intersection Safety Cameras in the City and there is also an existing mobile photo radar enforcement program. Safety devices such as speed display signs are used in programs such as Safe Journeys to School and Neighbourhood Traffic Calming. A priority in 2018 is the integration of Adaptive Signal Control along the key corridor of St. Albert Trail and upon testing / confirmation of operations, the system may be expanded.

3.8.3 Tasks

This project involves a number of sub-projects, each of which have their own set of tasks. Adaptive signal control (see Project 2.2), speed display devices (see Project 1.6), smart school and playground zones (see Project 9.1), and autonomous and connected vehicle strategy (see Project 11.3) are addressed in other ITS projects. While Speed Advisory Displays is a separate Project 1.6 in the ITS Strategic Plan, it has been aligned with the Safety Program (Project 2.4 Vision Zero) for the Implementation Strategy because it has a defined and strong focus on safety and is already in use in 2 programs – Safe Journeys to School and Neighbourhood Traffic Calming. Intersection safety cameras and variable speed limits also have tasks detailed below.

Intersection Safety Cameras

Video analytics using software can recognize road safety problems and identify solutions. It can accurately assess traffic conditions and driver behaviour at intersections and road segments. The deployment of cameras to measure conflict risk using automated conflict analysis can reduce preventable injuries and collect data on "near misses" to improve robustness of decision making for safety interventions. Some analytics providers can utilize existing CCTV cameras to assess traffic risk. Video analytics can identify vehicle, pedestrian and cyclist safety problems.

Intersections with high volumes of collisions or where the risk of collisions is deemed to be unacceptable require identification and prioritization for technological deployment.

Baseline data will be collected, including traffic volumes, congestion, delay, collision rates and history, and usage of other transportation modes. The following tasks are envisioned:

- Develop functional requirements for cameras based on the St. Albert ITS Strategic Plan.
- Identify ranked, key and strategic locations for video data collection for video analytics.
- Deploy cameras and collect data at selected locations.
- Use data analytics to identify safety issues, conflict points, and problems.
- Prepare conclusions and recommendations based on identified safety issues.
- Expand the program if desired.

Current video analytic software has predictive capabilities. The software can assess current conflicts and identify potential trends which can be used to develop recommendations for safety improvements. The tool can then be used to evaluate projects before and after implementation.

Variable Speed Limit Systems

Variable speed limit systems can be used to improve public safety during times of congestion and poor weather conditions. Typically, variable speed limit systems measure data on traffic flow, speeds, volumes, and weather conditions in real time. The data is processed, often at the Traffic Management Center (TMC), analyzed and updated speed limits are displayed on a Variable Message Sign (VMS). Operationally, information is captured and supported by Road Weather Information Systems (RWIS) stations and / or real time webcams to confirm traffic and weather conditions. These systems adjust speed limits based on traffic incidents or adverse weather and combine the following ITS technologies:

- Radar detectors
- VMS
- RWIS – sensors for pavement and environmental
- CCTV
- Telecom and solar panels

Variable speed limits may require changes to legislation or municipal bylaws to be regulatory and enforceable. If it is desired to use variable speed limits as regulatory, either legislation or municipal bylaws must be in place for enforceability. Amendments to bylaws must be approved by City Council. If variable speed limits are to be advisory, then changes to regulations or bylaws are not required. The following tasks are recommended:

- Identify corridors with high numbers of historical collisions or where the risk is deemed to be unacceptable.
- Develop evaluation criteria to rank these corridors for technological deployment.
- Undertake a best practice review of similar systems in other jurisdictions

- Collect baseline data including traffic volumes, congestion, delay, accident rates, and travel time during peak, off-peak and various seasonal conditions.
- Develop functional requirements for the variable speed limit system.
- Develop concept of operations for the system including development of software to alter speed limit based on road conditions and/or weather conditions.
- Prepare preliminary and detailed design of sites for Variable Speed Limit Systems (VSLS) including poles, signs, foundations, electrical and civil work.
- Prepare specifications for hardware and software including interfaces to central ATMS software in the TMC and a test plan.
- Procure and test technology, plus all civil and electrical work on site.
- Integrate system with the traffic management centre.
- Document benefits to build the case for program expansion to other corridors.

St. Albert Speed Advisory System

Simple and effective, this project measures vehicular speeds of approaching cars and trucks and flashes warnings to speeding vehicles on LED signs ahead. The LED speeds will flash when the measured velocity exceeds the posted limit by a set amount. The LED signs can be posted at locations prone to speeding on roads or at work and school zones. High accident locations are also evidence-based criteria for selecting this system. In many jurisdictions, these systems have been proven to be effective in decreasing speeding and accidents and can be used as an enforcement tool.

In St. Albert, there are commitments to two important initiatives that provide the framework and context in these safety projects:

- Vision Zero is a commitment to reduce fatalities and serious injuries, eventually eliminating them. ITS can be an enabler to this goal.
- Traffic Safety Strategy is coordinated with the Vision Zero initiative and makes safety improvements in transportation toward the goals.

Speed advisory systems combine speed detection with LED advisory signs to encourage drivers to slow down.

The project will undertake the following tasks:

- Review performance results for current locations in Safe Journeys to School and Neighbourhood Traffic Calming programs.
- Collect collision data and history for primary St. Albert corridors.
- Review potential expansion in Safe Journeys to School and Neighbourhood Traffic Calming, particularly for school and playground zones.
- Prepare evaluation criteria for prioritizing system implementation.
- Select locations for additional sites and collect baseline data.
- Prepare detailed design and specifications for additional locations.
- Operate new LED locations for 3 to 4 months, collecting “after” data.

It is expected that, if the projects are successful, there will be a business case prepared for further expansion of the system.

This project supports section 5.3 of the Draft Traffic Safety Strategy and specifically section 5.3.4 that recommends “speed display devices”. This section also supports safer speeds.

3.8.4 Agency Roles

City of St. Albert Engineering Services Department will be the LEAD. Other City departments with roles in the project include:

- Smart City – integration of data and/or variable speed limit technology into the Smart City program and plan.
- Planning and Development – use of analytical safety data in City planning.
- Public Works – support project management.
- IT – integration of IT requirements into operation and system maintenance.
- Communications and Design – support public awareness, marketing and education.
- Legislative Services – amending bylaws or legislature.
- Municipal Enforcement and RCMP – stakeholder input on operational considerations and enforcement of any implemented zones.

3.8.5 Expected Users and Stakeholders

The Vision Zero projects will have the following stakeholders:

- General public for improved traveller safety.
- City construction and maintenance staff.
- School districts in St. Albert.
- ITS staff in planning and engineering.
- Traffic Management Centre (TMC) operators in support of variable speed limits.

3.8.6 User Benefits

The benefits of the Vision Zero programs will be increased safety on St. Albert’s roads. This will benefit all road users, including the residents of St. Albert, pedestrians, cyclists, commercial vehicles, and drivers passing through the City. RCMP and emergency services will also require fewer resources for traffic collisions.

3.8.7 Prerequisites and Related Projects with Dependencies

3.8.7.1 Dependencies

None

3.8.7.2 Prerequisites

- Project 8.1 – Data Management
- Project 8.2 – Telecommunications Strategy
- Project 1.5 – RWIS
- Project 1.2 – Real Time Web Cameras

3.8.7.3 Related Projects

- Project 2.1 – Integrated Corridor Management
- Project 10.1-10.5 – Traffic Management Centre Projects

3.8.8 Relative Priorities

This project will support traffic safety in St. Albert and Vision Zero goals and objectives. This project has a HIGH priority in the short term but also continues throughout the 10-year duration of the ITS Strategic Plan.

3.8.9 Staff Resources

City of St. Albert staff will be required to determine appropriate intersections and / or corridors for technological deployments. The City will have to support post-deployment operations and system maintenance in the case of variable speed limits. For intersection safety cameras and safety analytics, St. Albert Engineering will be required to evaluate and implement recommendations derived from analysis. Variable speed limits will require the support from legislative services to amend bylaws for enforcement.

3.9 PROJECT 6.1 – EMERGENCY PRE-EMPTION

3.9.1 Description

In medical emergencies, it is critical that first responders reach the incident site as quickly as possible. Congested corridors and intersections can delay emergency vehicles and result in safety concerns for EMS staff and public road users while enroute to sites.

To reduce delay through intersections, emergency pre-emption can interrupt traffic signal plans and clear the path for emergency vehicles. Traffic lights must be equipped to receive an activation signal from either a vehicle or a fixed location, such as a fire station. Once traffic lights have been alerted to an approaching emergency vehicle, the signals can enter an “all red” phase to facilitate emergency vehicle movement

through an intersection. The primary requirement is equipment located at individual signal control sites and then a radio frequency ID emitter in each of the emergency vehicles to request pre-emption.

3.9.2 Status

A number of intersections in St. Albert are already equipped with emergency pre-emption technology (please see Figure 1-2, page 1-4). This project will assess the rest of the intersections to determine if pre-emption technology is appropriate and guide expansion of the program.

3.9.3 Tasks

The following tasks will be required for this project:

- Confirm the locations of firehalls, police stations, ambulance stations and hospitals.
- Define primary routes and key intersections for emergency vehicles.
- Review locations of signalized intersections.
- Confirm capability of pre-emption at intersections.
- Confirm inventory of signal controller cards in each cabinet.
- Develop functional requirements for signal pre-emption at selected locations.
- Develop concept of operations for emergency vehicle movements and delay at intersections.
- Investigate RFID emitter requirements.
- Expand technology deployment as per functional requirements and concept of operations.

3.9.4 Agency Roles

City of St. Albert Engineering Services Department will be the LEAD. Other City departments with roles in the project include:

- Public Works – support project management.
- IT – integration of IT requirements into signal cabinets.
- Fire and Rescue Service – provide access to vehicles for RFID installation.

In addition to city departments, the RCMP and Alberta Health Services will be required to provide access to vehicles for RFID installation.

3.9.5 Expected Users and Stakeholders

The emergency pre-emption will have the following stakeholders:

- General public for improved emergency vehicle arrival times.
- Alberta Health Services as ambulance operators and emergency responders.
- St. Albert Fire and Rescue Services as fire truck operators and emergency responders.
- RCMP as emergency responders.

- St. Albert Engineering Services for the maintenance and integration of technology into signal cabinets.

3.9.6 User Benefits

The residents of St. Albert will benefit from reduced emergency services travel time. This may result in a reduction of fatalities, and improved safety for the community. Emergency service providers will encounter less delay at intersections when responding to calls.

3.9.7 Prerequisites and Related Projects with Dependencies

3.9.7.1 Dependencies

None

3.9.7.2 Prerequisites

None

3.9.7.3 Related Projects

- Project 2.2 – Adaptive Signal Program
- Project 2.3 – Incident Management
- Project 2.4 – Vision Zero Safety Strategy

3.9.8 Relative Priorities

This project will support emergency services in St. Albert in their work throughout St. Albert. This project is of MEDIUM priority in the short term.

3.9.9 Staff Resources

City of St. Albert staff will be required to determine appropriate intersections for technological deployments. Consultation with emergency service providers will be required to gain access to vehicles for RFID installation, testing and operation. As well, St. Albert will have to promote and explain the benefits of the program.

3.10 PROJECT 8.1 – DATA MANAGEMENT STRATEGY

3.10.1 Description

Data management is a key and critical component of both the St. Albert ITS Strategic Plan and the Smart City Master Plan. Data management is an ongoing project that continues throughout the duration of the 10 year ITS strategic plan because it directly affects projects that generate or involve data and information. Thus, data management is a component of the "foundational layer" for most ITS projects.

Typically, data management involves several stages including acquisition, transmission, processing, storage and distribution. Once acquired in the field, data is often sent to a hub or traffic management centre for processing. These stages are discussed in the Data Management Discussion Paper and the ITS Strategic Plan. Data itself also transforms from "raw" data to intelligence and then into actionable information. For example, raw data may be traffic counts and delay at key crossings and intersections. When this data is analyzed and converted to level of service (LOS) or other performance-based indicator, it becomes intelligence. Actionable information is produced when the intelligence is distributed to the public and other stakeholders. All these different forms of data and their journey from the field to a TMC is part of the data management process.

Fundamentally, ITS is dependent on data that is generated by or from field devices, vehicles, people and other sources, then transmitted to a central hub, processed and stored before it is distributed. Data is a powerful and necessary part of the ITS and Smart City plans, however, requires careful planning and management.

One challenge of managing data over 10 years (or even shorter durations) is that field and telecommunication technologies are continually changing. As discussed in the ITS strategic plan, the rapid pace of technological development creates new and diverse sources of data, vast amounts and higher speeds of generation, and a need to organize and manage them. Transportation networks have become more complex, multi-modal in nature, and real time. In past systems, detectors were static and passive, counting vehicles as they passed a location. Today, the transportation network and the resultant data requirements have evolved to include continuous tracking and monitoring for improved management and information sharing, thus moving from a static to a mobile data environment. This integrated network of "probes" dynamically illustrates real time performance for the public and TMC operators to monitor.

Finally, the concept of the "Internet of Things" (IoT) envisions an environment where every device is "IP" enabled and connected. Today, many communities, including St. Albert, are aspiring to a "Smart City" state in which there is a connected future. In this future, infrastructure and assets such as field devices, vehicles, mobile units, and even building components will have IP addresses. As St. Albert continues to progress towards the Smart City environment, the City cannot handle the vast amounts and types of data. Thus, the ITS strategic plan developed a Data Management Strategy which supports both the ITS and Smart City goals. The result is a data-rich environment with a need to manage vast amounts of information.

In addition, data management requires that St. Albert, as with other jurisdictions, address the following related issues:

- *Ownership of data and Intellectual Property or "IP"*. The ownership of IP can affect the stakeholders with whom St. Albert can share the data, as well as liability and costs. It is recommended that St. Albert review its contracts for ITS infrastructure and ensure that they address IP ownership, clearly and explicitly, stating that software source code and the generated data is City property, if appropriate.
- *Data Security, or "Cyber Security"*. The security of data is critical to ensure that St. Albert prevents unauthorized intrusion. A cyber security plan and periodic audit should be done to ensure that the systems are not penetrated. Data security in St. Albert should ensure that traffic operations and data networks are not breached.
- *Data Privacy*. Provincial privacy legislation varies throughout Canada. St. Albert should ensure that ITS infrastructure and the data generated by systems conform with Alberta legislation and are not traceable back to an individual.
- *Open Data*. Jurisdictions are moving towards an "open data" environment. Data is shared with other parties who can use it to create new and useful applications. St. Albert should review its open data policies but ensure they are consistent with Provincial legislation.
- *Big Data*. The term "Big Data" refers to data sets that are so large that they are beyond the ability of our software to handle, analyze or even store. Data is created every time we move, drive, use our phones or even turn on our appliances in our homes. Further, data generation is becoming exponential as more sources develop. The results are large data sets that need to be managed. Thus, big data needs to be anticipated and managed by St. Albert.

The IoT Platform

For St. Albert, the "Internet of Things" (IoT) is an important milestone target to which data management network must migrate. The starting point of this transformation is the development of a "central information hub" called the "IoT Platform" which is essentially a software platform that connects field devices to applications. The components of an IoT platform include:

- *Software* that manages field devices and collects, processes and analyses data from them.
- *Hardware* that stores data from the devices. One key component is the "IoT Hub" which receives data from devices and sends it to data management or to a gateway to applications.
- *Connections* to applications for distribution.

In St. Albert, the field devices should be connected via the IoT platform which will support easy integration. As the City is participating in many ITS pilots and research projects, the IoT platform would allow ease of integration. The platform is secure and allows new devices to be easily and efficiently deployed.
The core functionalities of the IoT platform are data collection, device management and distribution. The platform allows administration of the devices to be seamless and simple. Basically, the IoT platform connects the devices to the consumers and end users of the data.

3.10.2 Status

The City of St. Albert gathers multiple types of data through various forms of technology. Within the transportation group, typical operational information gathered is related to vehicle and pedestrian counts, travel times, collision data. In addition, asset data such as condition levels and information on specific infrastructure is collected. This information is typically manually reviewed, verified for quality, compiled, analyzed and then reported. There are currently limited formal processes on how information is collected, compiled and reported.

3.10.3 Tasks

Data Management requires a migration from the current state to the future environment that supports full integration and interoperability. This process of migration includes several stages:

- *Data flows* (current and future) need to be identified and defined to determine what must be supported. The data flows need to include both ITS and Smart City applications.
- *Functional requirements* need to be developed for various applications and the IoT platform. For applications, the focus is traffic management and traveller information systems in St. Albert.
- *Migration to the IOT platform* must start with mapping current processes, devices and users (people) to the needs of the IOT platform. Development of functional requirements for specific ITS devices will support the migration strategy.

The Data Management Project 8.1 is shown as continuous throughout the 10-year horizon of the ITS Strategic Plan because it is comprised of several sub-projects within each phase. The following specific sub-projects are recommended:

Short Term (0 to 3 years)

In the short term, it is recommended that St. Albert focus on deployment of infrastructure instead of integration platforms. The sub-projects should be “low cost” and demonstrate the benefits of each ITS application. The tasks include the following:

- *Projects with benefits to the public*, particularly in traveller information systems (Projects 1.1 to 1.7) and traffic management (Projects 2.1 to 2.4). This sub-task basically involves a significant deployment of short term projects. This approach results in devices on the network that will generate useful data for the public. Web cams, Bluetooth data, and VMS are visible, cost effective, and generate public support for the ITS program. These projects will improve real time monitoring and condition information.
- *Undertake functional requirements for data management* with:
  - Identification and definition of data flows for each ITS device and application in both the ITS and Smart City plans. Identify and define the device types, locations, and data directionality. This task should be done for all new technology deployments, even in pilots.
  - Develop functional requirements for the data in support of applications, focusing on traveller information and traffic management.

- *Develop functional requirements for the IoT platform* – this work will span the short to medium term phases. The work will consider St. Albert's key buildings, services, structures and corridors. The tasks should also define the needs for device management, data collection, processing and storage, application programming interfaces, cyber security and monitoring.

This work should continue for the duration of the short-term phase.

Medium Term (3 to 5 years)

In the medium term, the City will have completed many of its research and pilot projects, with recommended deployments continuing into the medium term. The tasks include:

- *Develop functional requirements for Interim Advanced Traffic Management System (ATMS).* The ATMS software in any jurisdiction's traffic management centre (TMC) will manage data, devices and integration. It is important that the St. Albert ATMS software provide a stable, reliable platform for the TMC, as the needs of the IoT platform are concurrently being developed. Some ATMS software products are available as "commercial off the shelf" or COTS. The City uses the CENTRACS signal control system as the "default" central software. Although some functions are available on CENTRACS, it is proprietary to a signal control vendor and will require more costly software development to implement specific functions. Required application programming interfaces (API), procurement of specific software modules and support for other functions are costly in a proprietary situation. Most ATMS packages will offer specific modules to support applications such as ATIS and Traffic Management. It is recommended that the following tasks are undertaken:
  - Develop best practices and review current technology for ATMS software
  - Prepare functional requirements for ATMS within the TMC environment
  - Identify APIs, applications to be supported and TMC functions
  - Prepare functional requirements report
- *Procure ATMS software for St. Albert:*
  - Prepare detailed design and material approval reports for ATMS
  - Develop specifications for ATMS
  - Prepare a test plan for ATMS software
  - Prepare recommendations for procurement
  - Monitor performance

Long Term (5 to 10 years)

In the long term, it is recommended that the City continue after completion of the functional requirements of the IoT platform. It is recommended that the following tasks are undertaken:

- *Migration Strategy for IoT Platform*. The work will include the following:
  - Examine performance of ATMS software. Document results of benefits to build the business case for the IoT platform development.
  - Develop a phased strategy that maps the current processes, devices and users (people) to the needs of the IOT platform.
  - Update the functional requirements report with a technology review and best practices.
  - Using functional requirements report, prepare detailed design, system architecture and test plan for the IoT platform.
  - Identify and define hardware requirements.
- Procure IoT platform including testing

Note that the long term tasks are not shown on the GANTT chart as this Implementation Strategy is focused on the short to medium term projects.

3.10.4 Agency Roles

In the short-term, City of St. Albert Engineering Services Department is the LEAD for traffic data management including development of short term projects for functional requirements, as well as traveller information projects. Other City departments with roles in the project include:

- Smart City – integration of systems into the Smart City program and plan as well as IoT migration strategy.
- Planning and Development – support data integration into City planning.
- Public Works – support project management.
- IT – integration of data into operation and system maintenance, procurement of software and upgrades for hardware and software. IT has a key role in preparing the City to transition to an IoT data environment in the medium to long term.
- Communications and Design – support public awareness, marketing and education.
- St. Albert Transit – integration of data into transit programs.

For the moderate to long-term transition to IoT, City of St. Albert IT is the LEAD for overarching system investigation, integration and management.

3.10.5 Expected Users and Stakeholders

Data management is a common thread that is linked to most projects in the ITS and Smart City Plans. Since ITS devices generate data that is transformed into useful information through applications, there is a wide array of users and stakeholders including:

- General public and media.
- ITS staff in planning and engineering.
- St. Albert staff in management, operations, maintenance and systems.
- Traffic Management Centre (TMC) operators.
- Enforcement staff (RCMP and City).
- Other regional stakeholders that would share the data including Sturgeon County, City of Edmonton, and Alberta Transportation.

3.10.6 User Benefits

At a high level, implementation of a proactive data management strategy has far-reaching benefits that will improve many areas for the City's staff, Council, residents and businesses.

High level benefits include:

- Higher quality, reliable and accurate data in real time and archival format.
- Improved access to data by City and public.
- Improved City services that rely on data including traffic management and traveller information.
- Increased safety for users due to better data analytics.
- Better planning and operations for the City due to increased historical data.
- Improved responses by City staff for incidents and maintenance.

Each ITS project should be subject to business case assessments and evaluation of effectiveness. Data management will support all these processes.

3.10.7 Prerequisites and Related Projects with Dependencies

3.10.7.1 Dependencies

Generally, most ITS applications require data and are therefore a dependency on the data management and telecommunications programs.

The only projects that are not a dependency on data management are those in ITS Strategy #11 which contain the institutional projects to develop committees (Projects 11.1 to 11.4).

3.10.7.2 Prerequisites

The primary perquisite project is the Telecommunications Network Project 8.2 which needs to be undertaken in parallel with the data management work.

3.10.7.3 Related Projects

Related projects are those with a link to data management on a network architecture diagram. In reality, virtually all ITS and Smart City projects are related because they generate data that must be transmitted to the central hub or Traffic Management Centre.

3.10.8 Relative Priorities

The St. Albert Data Management Strategy, as shown, is comprised of seven projects in the short, medium and long-term phases of the ITS Strategic Plan, spanning the entire 10 year duration of the plan.

In the short term, the implementation strategy recommended that St. Albert focus on the deployment of traffic management and traveller information systems. The feasibility to do so is dependent on several factors including financial and institutional.

The following priorities are recommended in the short term for these projects:

- Traffic management and traveller information projects – each project should be assessed on its merit but generally, these projects are HIGH priority. Please see the project summaries of each.
- Functional requirements for data management – this project is a HIGH priority because deployment cannot proceed without this work.
- Functional requirements for IoT platform – this work spans short and medium-term phases. In the short term, this work is MEDIUM priority.

In the medium term, the following priorities are recommended:

- Develop functional requirements for ATMS software This project is MEDIUM priority.
- Evaluate current traffic monitoring system and impacts of expansion or integration into larger overarching system This project is MEDIUM priority.
- Procure ATMS software for St. Albert – this project is MEDIUM priority.

In the long-term, the following priorities are recommended:

- Migration strategy for IoT platform – this work must precede development and procurement to achieve the future goals for the ITS and Smart City programs. This project is a HIGH priority.
- Procure IoT platform – this project is a HIGH priority.

3.10.9 Staff Resources

City of St. Albert staff will be required to investigate and evaluate current systems, develop the City's needs in support of ITS and Smart City applications and functions, and review planned projects to be implemented. While staff will continue to implement projects and perform evaluations, they will be required to acquire, evaluate and manage "outside specialist" resources to migrate data, develop necessary public information sharing platforms and perform long-term actions to develop and manage IoT.

3.11 PROJECT 8.2 – TELECOMMUNICATIONS STRATEGY

3.11.1 Description

The St. Albert ITS Strategic Plan contains 41 distinct ITS projects, many of which involve deployment of field devices and technologies that communicate with a central hub or the Traffic Management Centre (TMC). The network will support the efficient and secure two-way transmission of data between these field devices and the TMC. The network allows data from field devices to be received and instructions and queries from the TMC to be sent. Generally, the ITS infrastructure will acquire, transmit, process, store and distribute data. Telecommunications is critical to the deployment and operation of ITS infrastructure, functions and applications.

The telecommunications network must also support access to data exchange between internal departments and external regional stakeholders. Much of this data management process requires a path to transmit data. Thus, a telecommunications strategy is a parallel and complementary process with Data Management. At a high level, the primary objective of the telecommunications network is to ensure that the current and future field devices (detectors, sensors, VMS, RWIS and other systems) have a reliable and available network to transmit data for TMC and City functions.

Over time, field device technologies and software applications have evolved and now produce vast amounts of data. These technologies have become more powerful and cheaper, leading to greater functionality and coverage, but also deployment on the transportation network. The result is greater amounts of data, requiring faster speeds and integration, and more demand on the telecommunications network. Today, much of the data is generated by users themselves, as they move through the network, creating exponential growth. The same technologies will continue to evolve, improve and proliferate during the 10-year horizon of the ITS Strategic Plan.

As St. Albert develops the telecommunications network, the following technical concepts must be considered:

1. Bandwidth

From a telecommunications perspective, bandwidth is a measure of a network to transmit data from one point to another within a given amount of time (typically per second). Thus, bandwidth is a measure of "rate", usually in bytes or megabits per second. Devices on the network that require greater bandwidth will affect the medium selected for telecommunications. The telecommunications discussion paper in the ITS

Strategic Plan provided typical bandwidth requirements for each device type. The aggregate total bandwidth demand will depend on the current and planned devices on the telecommunications network.

2. Standards

In many jurisdictions, device standards are focused on ease of integration and interoperability for the ITS infrastructure. The National Transportation Communications for ITS Protocol (NTCIP) is a family of ITS standards that support communications between traffic centres and field devices (so-called “C2F”) and between centre to centre (“C2C”). NTCIP compliant devices and centres as well as their software allow agencies to deploy technologies in a “plug and play” environment because they can seamlessly share data in the same language. Expansion of the system is easily supported, and obsolescence is avoided when the devices and software are NTCIP compliant.

Bandwidth and telecommunication standards must support current and projected system capacity, integration and interoperability.

Fundamentally, fiber telecommunications networks connect the following:

- *Nodes* – these are typically centres or systems that generate data, including City facilities and buildings, field devices and access points to other systems. A primary node on the network would be the Traffic Management Centre.
- *Segments* – these are usually sections of fiber that generate data such as a highway, road or transit corridor, linked to the network.
- *Links* – these connect two or more nodes. One example would be a VPN link between two centres.

While the fiber covers the primary corridors in the City, additional media is required to support operations of intersections and other device locations. In telecommunications, “last mile connectivity” refers to the final leg of service that is delivered to the end user or customer. In St. Albert’s transportation network, last mile connectivity may entail links that connect these locations (for example, a CCTV camera not on the corridor) to the primary fiber backbone via wireless or other media. The following options were discussed in the ITS Strategic Plan:

- *Cellular network* – data can be transmitted in regions with coverage via a cell modem and cell tower to the traffic management centre
- *Wireless radio* – data can be transmitted via wireless mesh networks that connect intersections to the network. The wireless mesh networks can be used in areas with good radio coverage. Connecting radio nodes (for example, signal controllers) can be cost effective and require less cable trenching.
- *Point to point* – a node or centre can be connected to another by a simple wireline connection, for example, between a device and controller
- *WiFi or “wireless fidelity”* is an Institute of Electrical and Electronics Engineers (IEEE) 802.11 standard that supports wireless connections between points, typically via an access point. WiFi access points are relatively inexpensive and supports efficient data transmission. However, the

range is relatively shorter than with other technologies. By connecting nodes, the City can effectively cover corridors and regions.

Any of these options may be used to link various nodes to the fiber backbone.

It is significant that most of St. Albert's fiber network is complete because the main disadvantage of fiber is the large initial capital cost. However, since St. Albert's fiber network is largely built, the technology will now cost effectively support current and future bandwidth requirements for City services including ITS as well as reduce operating costs. As the City's transportation network develops, it is critical that the fiber network be expanded in coordination as the marginal cost of servicing new corridors will be minimal. Ducting for fiber should be installed as new roads and bridges are constructed.

3.11.2 Status

St. Albert has developed a fiber optic network as the backbone for the telecommunications system. Figure 5-3 on page 5-22 of the ITS Strategic Plan is a map of the current and planned fiber network which follows a "star" topology in which links emanate out from a central node. The topology links follow St. Albert Trail (north-south) and Boudreau/Giroux (east-west). The star topology has inherent risk because any outage of the fiber link on either corridor may prevent data transmission to the central node. Figure 5-3 also illustrates that the future fiber network will evolve into a "hybrid" of star and mesh networks, providing an alternate and redundant path for data during an outage.

As a primary asset, the telecommunications system has been designed to account for the following:

- Bandwidth and speeds – this requirement is dependent upon the network devices, but has been developed to support high speeds, high (bandwidth) demand infrastructure such as CCTV cameras.
- Availability – the network will have redundancy and is "self healing" to ensure a data path is available in the event of an outage or interruption.
- Scalability – although the City is largely confined within the municipal boundaries, the network within may expand.
- Manageability – the engineering and IT departments need to use diagnostics and software tools to manage the fiber and telecommunications network. Proper asset management procedures are critical to maximizing the service life of the network.
- Cyber security – the importance of proper cyber security measures cannot be understated. The City should prepare a cyber security audit and an updated plan to ensure that unauthorized intrusions are prevented.
- Asset protection – the fiber network has been identified as a utility to address during construction projects through the "Alberta 1st Call" program.

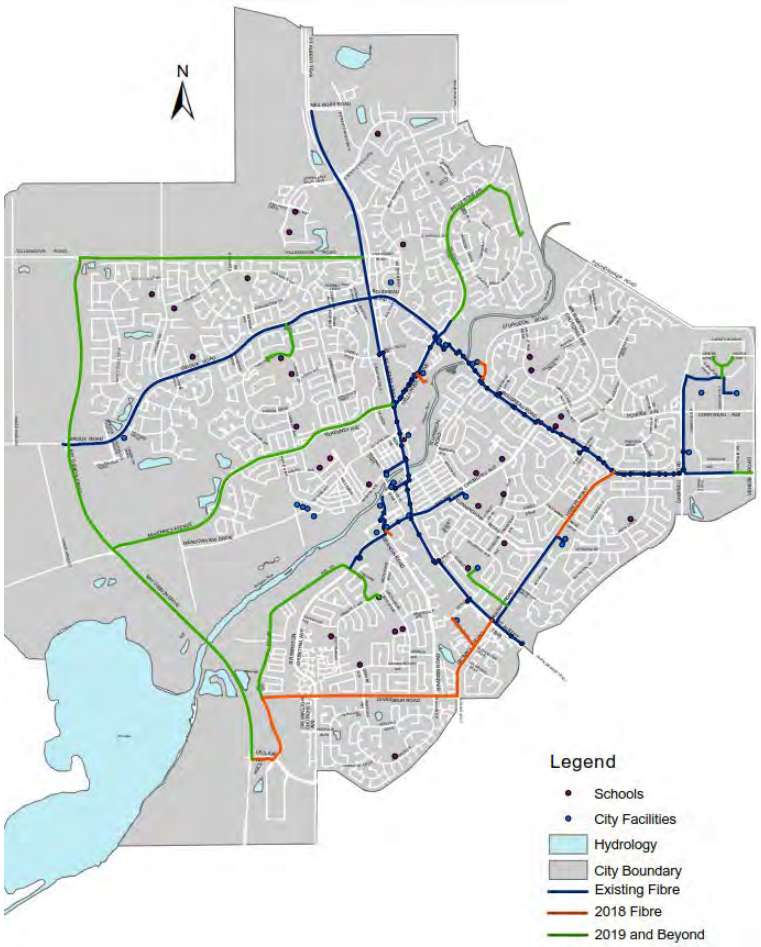


Figure 3-1
St. Albert Fiber Optic network (Existing and Planned)

The current fiber network is 95% complete. It is anticipated that the remaining fiber network will be completed in 2019. The benefits of the network will be through a high bandwidth and reliable connection of the City's buildings, facilities, and field devices.

3.11.3 Tasks

Within Project 8.2 of the St. Albert ITS Plan, the Telecommunications Strategy involves a multi-stage process, primarily in the short to medium-term, that addresses the following issues:

- *Network Standards* (current and future) need to be reviewed and defined to determine what must be supported.
- *Bandwidth* needs to be reviewed for the various ITS projects and applications.
- *Network Architecture* must be completed as a roadmap for supporting functional requirements, security, redundancy, and recovery.

- *Network Deployment* must be developed as a plan to include "last mile connectivity" to support and connect all ITS devices.

Short Term (0 to 3 years)

In the short term, it is recommended that St. Albert focus on following "sub-projects":

- *Network Interconnection Standards.* St. Albert will deploy ITS devices and technologies throughout the road network. It is therefore critical that each device connect to and transfer data seamlessly with the TMC. This interconnection is important, not only for data transfer, but also testing of new technologies. As part of this sub-project, it is recommended that St. Albert undertake the following tasks:
  - Review and identify the current and future ITS devices for compliance to NTCIP standards. Any devices that are not NTCIP compliant will require an interface to the TMC. At a minimum, the relevant NTCIP standards will include:
    - Traffic signals (NTCIP 1202)
    - Variable message signs (NTCIP 1203)
    - Environmental sensor stations (NTCIP 1204)
    - CCTV cameras (NTCIP 1205)
    - Vehicle count stations (NTCIP 1206)
    - Transportation sensor systems (NTCIP 1209)
    - "Centre to Centre" communications (NTCIP C2C)

    Devices reviewed for standards should also include Smart City systems.
  - Review the current central software for NTCIP compliance. If it is not compliant, St. Albert should consider migration to a dedicated ATMS software for the TMC that is NTCIP compliant.
  - Identify devices for which no NTCIP standard exists. The City should prepare alternative plans to deploy those devices including developing software interfaces.
  - Prepare an implementation plan for devices to migrate the City's ITS and Smart City programs to a common standard.

  This sub-project is a HIGH priority in the short term.

- *Bandwidth Analysis.* St. Albert will require assessment of the bandwidth requirements to estimate the network capacity. It is recommended that the following tasks are undertaken:
  - Review all current and future ITS network devices, specifically for bandwidth and speed requirements by phase. It is critical that this task be done in close coordination with the data management work.
  - Prepare a technology assessment of each current and future device type. CCTV assessments should include bandwidth, speeds and frame rate.
  - Prepare a bandwidth forecast for each corridor (with device locations) and the telecommunications network by phase. Data flows and directionality should be part of this task.

- Estimate “gaps” in bandwidth and associated remedies in the network to support the data flows for the ITS and Smart City plans. This task should be done for all new technology deployments.

The bandwidth forecast should be updated as the systems are expanded. This sub-project is a HIGH priority in the short term.

Medium Term (3 to 5 years)

In the medium term, the City will be considering advanced work on the TMC and will have completed many of its research and pilot projects, with recommended deployments continuing into the medium term. In coordination with data management, it is recommended that St. Albert undertake the following “sub-projects” in the medium term for telecommunications:

- *Network Architecture.* St. Albert will require a detailed network architecture design that includes the following tasks:
  - Review and prepare functional requirements for current and future ITS infrastructure. The requirements will include the network standards and bandwidth analysis completed earlier in the short term.
  - Prepare and document requirements for system redundancy, disaster recovery and resiliency of business/City services.
  - Prepare cyber security audit and annual plan. The plan will include recommendations for hardware and software protection, including physical and online access, wireline and wireless networks and current best practices. Mitigation and prevention will be reviewed. The cyber security audit will include all field devices, cabinets, supporting structures, wireless and wireline networks, firmware, software drivers, firewalls and interfaces. The audit should include a “penetration test” to mimic an attack.
  - Prepare an overall detailed network architecture diagram and document for current and future ITS infrastructure. This architecture will act as input to the deployment plan.

  This work is a MEDIUM priority in the short-term, but it is recommended to be started as a HIGH priority (year 3) in the medium-term to coordinate with data management activities.
- *Network Deployment Plan for Telecommunications.* The telecommunications network will require a deployment plan, as a roadmap to support the ITS plan. The following tasks are recommended:
  - Prepare a network deployment plan, based on the Network Architecture (see above) as a starting point. The plan should consider details such as:
    - Fiber optic network
    - “Last mile connectivity” to devices
    - Integration requirements
    - Regional requirements (cross jurisdictional)
    - Budget (capital/operations)
- This work is a HIGH priority (year 4) in the medium term

Long term (5 to 10 years)

In the long term, it is recommended that the City continue to monitor network performance, bandwidth throughput, cyber security, signal strength/loss, and access for maintenance. The City should monitor these aspects, particularly when the ITS network is being expanded.

- *Network Monitoring*. Annual review of telecommunications performance should be done, particularly with respect to speed, network strength, signal loss, security, access for maintenance and interfaces

3.11.4 Agency Roles

City of St. Albert IT Department is the LEAD for telecommunications including the sub-projects. Other City departments with roles in the project include:

- Smart City – integration of telecommunications into the Smart City program and plan.
- Planning and Development – support telecommunications into City planning.
- Public Works – support project management.
- Engineering Services – Device investigation and specification confirmation for integration into the system, and infrastructure and software use and maintenance.
- Communications and Design – support public awareness, marketing and education.

3.11.5 Expected Users and Stakeholders

Telecommunications, much like data management, is a common thread linked to most projects in the ITS and Smart City Plans. Since ITS devices generate data that MUST be transmitted, there is a wide array of users and stakeholders including:

- General public and media.
- City staff in all buildings that are connected.
- ITS staff in planning and engineering.
- St. Albert staff in operations, maintenance and systems.
- Traffic Management Centre (TMC) operators.
- Maintenance and field staff.
- Other regional stakeholders that would share the data through the telecommunications network including Sturgeon County, City of Edmonton, and Alberta Transportation.

3.11.6 User Benefits

At a high level, implementation of a telecommunications strategy and deployment of the network components have significant benefits that will support many ITS and Smart City functions and applications for the City's staff, Council, residents and businesses.

High level benefits include:

- Access to a high bandwidth, reliable and stable telecommunications network to transmit required data in real time and archival format.
- Improved access to services by City and public, supported by fast, reliable data.
- Improved City services that rely on efficient transmission of data between buildings.
- Increased cyber security for users.
- Better planning and operations for the City due to increased historical data.
- Improved responses by City staff for incidents and maintenance.

Each ITS telecommunications project should require business case assessments and evaluation of effectiveness.

3.11.7 Prerequisites and Related Projects with Dependencies

3.11.7.1 Dependencies

Generally, most ITS applications require data transmission and are therefore a dependency on the telecommunications strategy and sub-projects.

The only projects that are not a dependency on telecommunications are those in ITS Strategy 11 which contain the institutional projects to develop committees (Projects 11.1 to 11.4).

3.11.7.2 Prerequisites

The primary prerequisite project is the Data Management Project 8.1 which needs to be undertaken in parallel with the telecommunications work.

3.11.7.3 Related Projects

Related projects are those with a link to telecommunications on the network architecture diagram. In reality, virtually all ITS and Smart City projects are “related” because they generate data that must be transmitted to the central hub or Traffic Management Centre.

3.11.8 Relative Priorities

The St. Albert Data Management Strategy, as shown, is comprised of five (5) projects, concentrated primarily in the short and medium-term phases of the ITS Strategic Plan, spanning the entire 10-year duration of the plan.

In the short-term, the implementation strategy recommended that St. Albert focus on standards and bandwidth assessments.

The following priorities are recommended for these projects:

- Network standards – these projects are HIGH priority in the short tern, basically in the next 2 years because virtually all other projects are dependencies.
- Bandwidth analysis – this project is a HIGH priority in the short term because it is critical to understand network capacity in the early stages.

In the medium-term, the following priorities are recommended:

- Network architecture – this project is a HIGH priority in the medium term. The work was recommended in the medium term to coordinate better with data management.
- Network deployment plan – this project is HIGH priority in the medium term

In the long term, the following priorities are recommended:

- Monitor network performance, bandwidth, cyber security, telecommunications signals, and access. This work is an ongoing activity and is considered as a HIGH priority into the long term.

3.11.9 Staff Resources

City of St. Albert will be required to support telecommunications throughout the duration of the ITS and Smart City programs, as well as post-deployment for operations and system maintenance.

3.12 PROJECT 10.1 – TRAFFIC MANAGEMENT CENTRE FUNCTIONAL PROGRAM AND CONCEPT OF OPERATIONS

3.12.1 Description

A Traffic Management Centre (TMC) is the central hub to which all data from field devices are transmitted and processed. The data management functions are typically performed at the TMC, coordinating with operators who monitor traffic conditions and initiate responses. To the public and media, the TMC is one of the most visible components of a transportation network and related ITS program.

Planning for the Traffic Management Centre begins early in the ITS program. Since vast amounts of data must flow in and out of the TMC, planning of the facility is usually coordinated with data management and telecommunications. TMCs are often located on or near a major telecommunications corridor to facilitate the access to data flow.

Functional programming involves development of specific functions in the TMC, primarily based on the user services in the ITS and Smart City Plans.

- The TMC will be critical with respect to the regional agencies. Data sharing, seamless operations on common corridors and acting as a redundant back up to another TMC in the region.

- The TMC will support St. Albert planning and engineering initiatives through data collection and management.

3.12.2 Status

The City currently utilizes transportation staff offices as a central location for traffic management operations and system monitoring. A central monitoring system software is in place, with a focus of applying network monitoring through system alarms or capability for remote viewing and corridor / intersection assessments. There is no single dedicated resource for consistent system monitoring and this role is performed by a staff member allocated to other program and service delivery functions.

The current system is also in operation solely for the transportation network and is not aligned to additional City service monitoring such as EMS or Transit Operations.

3.12.3 Tasks

This project will include the following tasks:

- Review of the St. Albert ITS Strategic Plan and related projects including the telecommunications network. Each ITS user service and application should be examined by phase to determine their functional requirements and “impact” on the TMC. Traffic Management and traveller information systems are examples of user services in the ITS plan. In this review, the objectives and expected coverage of the systems should also be examined.
- Each user service requires associated field devices to be deployed. For example, incident management technologies require detection (loops, wireless), verification (CCTV cameras), response and removal. Integration with ATIS will require VMS, websites and possibly radio/media. Each system has a physical impact on the TMC operator. As more systems are added, resources (operators) must monitor and coordinate additional functions.
- Assess and summarize, by phase, the TMC operator functions and related physical requirements. The assessment should include peak and off-peak periods. Information for input into this summary includes:
  - Daily incidents and assumed or measured durations.
  - Monitoring and verification functions including review of data and CCTV camera images.
  - Response including phone, radio, and VMS.
  - Coordination requirements with other jurisdictions.
  - Traffic control updates.
  - Weather related reports.
  - Advisories.
  - Data management.
- Convert each TMC operator task into a time allocation over each phase of the ITS plan. This conversion will lead to an estimate of the number of operators required by phase including supervisors.

- Examine other staff requirements in addition to TMC operators. Additional staff may be required in the TMC including those involved in traffic control, IT/data, telecommunications, field technicians, Emergency Services, Transit, Municipal Enforcement, building services, maintenance and managers.
- Develop positions and job descriptions for the TMC staff.
- Review and estimate the number of TMC operator and supervisor work stations to support the staff.
- Estimate the TMC spatial requirements by phase for major areas including:
    - Data/telecommunications hub – this area is typically below or near the operator work stations to minimize cable runs. End termination equipment for the fiber and rack for data servers will be housed in this area.
    - Traffic operations/control room – TMC operator and supervisor work stations will be located here as well as the video wall for collaborative work.
    - Common rooms for staff including washrooms, kitchen, reception/entrance, change room/showers, storage, photocopier and meeting rooms.
    - Offices for key personnel and “break-out” rooms for joint work.
    - Visitor’s viewing area – this area is typically a window from the main boardroom for public and media into the control room.
    - Electrical and mechanical rooms, environmental control room, janitor space for equipment.
    - UPS or standby diesel generators.
    - Security room.
    - Testing area and/or lab for bench tests of equipment.
- Develop a floor plan for various concepts that illustrates locations for operator work stations, offices, major spaces, and video wall. Data rooms and other spaces would also be shown. Human factors guidelines would be used in developing the design including sight lines to the video wall.
- Assess video wall requirements including support and air flow (cooling).
- Governance and operations.
- Review operational policies.
- Prepare a cost estimate for the preliminary design of the TMC including capital, operations and maintenance.

The work is impactful to service delivery and functionality of other ITS projects. This work is a medium priority in the medium-term, starting in 2020 to 2023. Next steps of TMC work (site selection, design, construction) is in the long-term range (beyond 20203) and would be pending results of the needs assessment.

3.12.4 Agency Roles

City of St. Albert Engineering Services will be the LEAD agency and department undertaking and overseeing the functional design and concept of operations. Other City departments include:

- Smart City – integration of the Smart City functions into the TMC. The TMC is a common project with Smart City and ITS.
- Planning and Development – support TMC in City planning.
- Public Works – support project management.
- IT – integration of TMC IT requirements into operation and system maintenance.
- Communications and Design – support public awareness, marketing and education.
- Emergency Services – collaboration on TMC considerations and needs.
- Transit – collaboration on TMC considerations and needs.

Other departments and agencies with a role in the project include:

- Other regional TMC operators – stakeholders in the functional design.
- Regional agencies – participate in data sharing and operations.
- Alberta Ministry of Transportation – stakeholders in the functional design.

3.12.5 Expected Users and Stakeholders

The TMC will be a public facility intended to be used by the following stakeholders:

- Traffic Management Centre (TMC) operators in support of TMC functions and applications.
- Enforcement staff (RCMP and City) to verify traffic incidents.
- Planning staff using archived data.
- ITS staff in planning and engineering.

3.12.6 User Benefits

The TMC functional design will ensure that all user services and applications are properly supported when the TMC becomes operational. The functional design will inform the further design stages, such as the preliminary design, and detailed design.

A TMC supports a number of functions and requires functional design to minimize risk that a user service or an operator task may be missed, leading to re-design, or a TMC that does not meet the requirements of St. Albert.

For St. Albert to budget for TMC operation, the number of required operators and supervisors must be known. To determine the required number of employees, accurate job descriptions, and required tasks must be known. The functional design will provide this information.

3.12.7 Prerequisites and Related Projects with Dependencies

3.12.7.1 Dependencies

- Project 10.2 – TMC Site Selection
- Project 10.3 – TMC Preliminary Design
- Project 10.4 – TMC Detailed Design and Construction
- Project 10.5 – TMC Expansion

3.12.7.2 Prerequisites

- Project 8.1 – Data Management Strategy
- Project 8.2 – Telecommunications Strategy

3.12.7.3 Related Projects

- Project 1.1 – Real Time Traveller Information
- Project 1.2 – Real Time Web Cameras
- Project 1.5 – Road-Weather Information System
- Project 2.1 – Integrated Corridor Management
- Project 2.3 – Incident Management Program
- Project 3.1 – On-Demand Transit
- Project 3.2 – Next Bus Arrival System Update

3.12.8 Relative Priorities

The TMC work is a MEDIUM priority in the medium term phase. As the St. Albert infrastructure becomes developed, this project will become a higher priority as a necessary hub for data and traffic operations.

3.12.9 Staff Resources

- City of St. Albert – if St. Albert undertakes the functional design, a team will be required to detail each ITS user service, hold and facilitate stakeholder workshops, develop operator job descriptions, work stations and floor plans. If St. Albert contracts the functional design to an outside agency, a project manager will be required as well as input to stakeholder workshops.
- St. Albert Transit – input to stakeholder workshops.
- Emergency Services / RCMP / Municipal Enforcement – input to stakeholder workshops.
- Other regional TMC operators – input to stakeholder workshops.

3.13 PROJECT 13.1 – ACTIVE TRANSPORTATION PROJECTS

3.13.1 Description

Active transportation includes any human-powered mode of transportation such as pedestrians, cyclists, skateboarding, in-line skating, and wheel chairs. Development of an active transportation network will support and encourage walking, cycling and healthy forms of travel and provide opportunity to relieve traffic loads on the network.

ITS can support active transportation through safety initiatives, technology and the monitoring of users to support planning and engineering initiatives. Active transportation ITS may include:

- Pedestrian and bicycle counting systems to collect data on usage and encourage more utilization.
- Advanced safety warning systems to reduce conflicts for shared networks where pedestrians and cyclists may impede each other or where trails intersect with streets.

3.13.2 Status

The City of St. Albert is in early stages of developing a formal Active Transportation Plan (ATP). As a component to this work, ITS integration into the network to collect data or improve upon safety or efficiency will be considerations at all stages of the ATP development and implementation.

3.13.3 Tasks

It is important to determine the priorities and objectives of active transportation using ITS. Key objectives to date include improved safety due to decreased conflicts and/or data collection for planning and engineering purposes. When the objectives have been confirmed, the appropriate set of tasks may be undertaken.

Advanced safety warning systems for shared networks will include the following tasks:

- Review St. Albert collision statistics to determine locations of vehicle/pedestrian, vehicle/cyclist and cyclist/pedestrian conflicts. If data needs to be supplemented, conduct surveys at key locations.
- Conduct best practices review of active transportation safety systems in similar jurisdictions.
- Evaluate current detection and warning sign systems for characteristics desirable to St. Albert, such as portability, temperature operability, sensitivity, accuracy, requirements for power supply and telecommunications.
- Prepare preliminary and detailed design of hardware and software for warning systems including civil and electrical work.
- Undertake procurement and acceptance testing of the selected technology. The warning systems may include CCTV and detection systems that will be monitored from the TMC. Therefore, compliance with NTCIP standards and other City codes are required.
- Undertake civil work to install infrastructure, electrical conduits, telecommunications interface and deploy technology.

Pedestrian and cyclist volume data collection systems will include the following tasks:

- Review St. Albert Active Transportation Plan to identify current paths, trails or sidewalks for which pedestrian and cyclist volume data would be desired.
- Consult stakeholder and advocacy groups that represent pedestrian, cycling and transit users.
- Determine if counters should be permanent or temporary for an annual counting program.
- Conduct best practices and evaluate pedestrian and/or cyclist detection and counting technology based on characteristics desirable to St. Albert, such as portability, temperature operability, sensitivity, accuracy, requirements for power supply and telecommunications or discreetness/visibility to passersby.
- Prepare preliminary and detailed design of hardware and software for data collection systems including civil and electrical work.
- Undertake procurement and acceptance testing of the selected technology. The data collection systems may be monitored by and stored at the TMC. Compliance with NTCIP standards and other City codes may be required.
- Undertake civil work to install infrastructure, electrical conduits, telecommunications interface and deploy technology.

3.13.4 Agency Roles

The City of St. Albert Engineering Services will be the LEAD department. Other departments and agencies with a role in the project include:

- Smart City – integration of detection equipment into the Smart City Master Plan.
- Planning and Development – use of collected pedestrian and cyclist data, input into desired locations and reporting on progress for active transportation.
- Public Works – support project management and future operation and maintenance.
- IT – integration of any IT requirements of the selected technology.
- Communications and Design – support public awareness, marketing and education.

3.13.5 Expected Users and Stakeholders

Any active transportation ITS technology can have the following users and stakeholders:

- General public – increased safety, and/or informed planning decisions/communication. This group includes the cycling and pedestrian communities.
- Planning and Development – use of collected data.
- RCMP/Ambulance – reduction of collisions will lead to a reduction in required services.
- Schools – Safe Journeys to School program.
- Public Works – Maintenance.

3.13.6 User Benefits

Pedestrians and cyclists can expect an increase in safety due to advanced warning systems, and decreased collisions. Additionally, data collected and analyzed may support resource allocation towards network maintenance activities that could provide improved service levels.

If pedestrian and cyclist data is collected, the City of St. Albert will benefit from more informed planning decisions, including potential justification of network expansion.

3.13.7 Prerequisites and Related Projects with Dependencies

3.13.7.1 Dependencies

None

3.13.7.2 Prerequisites

- Project 8.1 – Data Management Strategy
- Project 8.2 – Telecommunications Strategy

3.13.7.3 Related Projects

- Project 1.4 – Trip Planner
- Project 1.7 – Traffic Data Collection
- Project 2.1 – Integrated Corridor Management
- Project 2.4 – Vision Zero Safety
- Project 14.1 – Marketing Plan

3.13.8 Relative Priorities

The project is a MEDIUM priority in the medium-term.

3.13.9 Staff Resources

City of St. Albert resources will be required to:

- Determine priorities
- Select locations
- Evaluate technology
- Procure technology
- Install and maintain technology

4 Committee Charters

The St. Albert ITS Strategic Plan contains a number of committees that will support regional integration of ITS initiatives and technology, research partnerships and innovation. These committees involve ITS stakeholders both inside and outside St. Albert. Committee charters provide outlines for their operation and governance.

Generally, these charters include the following sections:

- The committee's mandate or mission statement which defines the committee's purpose, primary goals, and objectives.
- Authority and responsibilities of the committee. This section clarifies how members will work together to fulfill the goals and objectives of the committee as a whole.
- Board composition, including guidelines for appointing committee members, the committee chair, and officers. This section addresses any professional staff relationships.
- When and how committee meetings will be held, how the meeting agendas will be handled, and how meeting minutes will be drafted, reviewed, and approved. This section includes a quorum requirement for meetings.

4.1 PROJECT 7.3 – ST. ALBERT ITS RESEARCH PARTNERSHIPS

4.1.1 Description

Research into new ITS technologies, as in many industries, creates new opportunities, improves functionality, increases coverage, and reduces costs. It is through collaboration and sharing of information and research that progress is made, allowing agencies to use "lessons learned" and to not "reinvent the wheel", but rather, to improve it. This approach is particularly true for ITS technologies that have parlayed improvements and coverage in systems such as GPS and cell phones to add more offerings for its users and agencies.

In this project, there will be a pursuit of partnerships with the academic and industrial communities to facilitate the research work, jointly sharing in the effort and benefits. It may also involve expansion of existing partnerships within the research and vendor communities.

The result may include seeking federal and provincial funding for these innovative initiatives.

4.1.2 Status

Currently, St. Albert has an extensive number of ongoing pilot projects to provide "proof of concept" and test various technologies. The Smart City Master Plan envisioned that the City would be a "living lab" to promote the use of the network to test these new technologies. The City can be a national leader in implementing many ITS services, including adaptive signal, connected / autonomous and digital technologies.

4.1.3 Tasks

This project will involve the following tasks:

1. Review status and details of all current and planned research projects including duration, vendor, standards, hardware and software, if available
2. Review and define goals, objectives, performance indicators, and evaluation criteria of research projects
3. Summarize results of research projects, including a recommended migration to integrate any new and successful technologies into the ITS programs and projects
4. Develop possible research partnerships with agencies with an interest in similar functions. Potential partnership areas may include:
    - Traffic management including RWIS, traffic detection, and CCTV cameras.
    - Traveller information systems.
    - Data collection.
    - Testing of new technologies.

The primary task of this work is to identify potential partnerships that will facilitate:

- Areas of mutual interest.
- Sharing of research and results.
- Possible joint partnerships for future work.
- Possible funding from federal, provincial, academia, and private sources.

4.1.4 Agency Roles

City of St. Albert Smart City Department is the LEAD. Other City departments with roles in the project include:

- Engineering Services – integration of research results into ITS plan and projects.
- Planning and Development – support research results in City planning.
- Public Works – support capital cost sharing in project management.
- IT – integration of research work into IT operation and system maintenance.
- Communications and Design – support public awareness and marketing of research.

The University of Alberta and Alberta Transportation are already involved in research partnerships.

4.1.5 Expected Users and Stakeholders

The research work is typically used by agencies and academic communities to develop potential systems that may evolve into production. The stakeholders may include:

- Academic community including students, professors at the U of A or other institutions.
- Smart City program staff.
- ITS staff in planning and engineering.
- Traffic Management Centre (TMC) operators in support of integration of the technologies.

4.1.6 User Benefits

Research projects produce many benefits that are direct (student experience, funding) and in the future (development of new applications, functions, production systems). Collaboration and sharing through research partnerships, if the project is successful, can create new systems and provide the City with useful and cost-effective technology.

4.1.7 Prerequisites and Related Projects with Dependencies

4.1.7.1 Dependencies

None

4.1.7.2 Prerequisites

- Project 8.1 – Data Management Strategy
- Project 8.2 – Telecommunications Strategy

4.1.7.3 Related Projects

- Project 10.1 – Traffic Management Centre Functional Program and Concept of Operations
- Project 1.7 – Traffic Data Collection
- Project 1.1 – Real Time ATIS
- Project 2.1 – Integrated Corridor Management
- Project 2.3 – Incident Management Program

4.1.8 Relative Priorities

This St. Albert project to seek research partnerships starts in the short term and continues throughout the duration of the ITS Plan. The program development is dependent on the results of research pilots and tests, and if successful, may lead to production systems.

The priority of this project is HIGH with excellent potential for academic and internal benefits.

4.1.9 Staff Resources

City of St. Albert will be required to support research tests and publish results. The City will be required to prepare a Charter for the project that includes goals, mandate, membership (partners), roles/responsibilities, and principles.

4.2 PROJECTS 11.1 AND 11.2 – ST. ALBERT ITS AND INNOVATION COMMITTEE

4.2.1 Description

St. Albert has all the processes in place to develop a world class online community that aspires to the goals and targets as set in the City TMP, ITS Strategic Plan and Smart City Master Plan. Each project in the ITS plan requires careful planning and development within its capital and operational processes.

Two separate projects 11.1 and 11.2 in the ITS Strategic Plan have been combined in the ITS Implementation Strategy to support ITS and Innovation. The “ITS and Innovation Committee” will oversee the development of the St. Albert ITS program as well as blend new innovation initiatives into the work plan, to beneficially align with corporate objectives. The committee will also keep key stakeholders aware of programs, as well as aligning information for reporting back to the public and outside stakeholders.

While this project creation is lower priority and has a short duration, the ongoing role is important to ensure that continued progress of the ITS program and indeed the related initiatives such as “Smart City” which should be monitored and audited. The results should be reported annually to the City Council and Executive.

4.2.2 Tasks

This project will involve the following tasks:

1. Develop a City ITS and Innovation Committee Charter which includes the following sections:
    - Purpose of committee.
    - Mandate including ownership of the ITS plan and execution of projects.
    - Innovation initiatives in the City.
    - Development of capital projects, related standards and IT support.
    - Accountability to various City departments.
    - Guiding Principles as set in the TMP, ITS Plan and Smart City Master Plan.
    - Roles and Responsibilities of each member. In terms of “Innovation”, the role includes staying on top of current research and pilot projects in the Smart City and ITS space. Testing of new technologies is another role.
    - Membership including Chair.
    - Administrative Details such as meeting frequency and location.
2. Secure review and approval of ITS and Innovation Committee Charter with senior leadership.

3. Secure Council approval and support for ITS and Innovation Committee and reporting requirements.
4. Administer ongoing ITS and Innovation Committee meetings – possibly bi-annually.
5. Responsible for updates to ITS Plan.
6. Responsible to investigate potential innovation initiatives including:
    - ITS and Smart City policies for developing additional functionality.
    - IoT platform improvements.
    - Market and user testing of various ITS and Smart City proposals.
    - Revenue opportunities with respect to data.
    - ITS outreach for residents to participate in forming the next generation services.
    - Autonomous and connected vehicles.
    - Use of the University of Alberta test bed for new ITS technologies.
7. Responsible for representation of St. Albert in any regional ITS/Smart City initiatives.
8. Responsible as “owner” of the ITS plan to lead the other committees and working groups including Regional ITS Committees and Autonomous Vehicle Working Group.

4.2.3 Agency Roles

City of St. Albert Smart City is the LEAD and suggested inaugural Chair. Other City departments with membership and roles in the ITS Committee include:

- Engineering Services
- Planning and Development
- Public Works
- Transit
- Emergency Services
- IT
- Communications and Design

4.2.4 Expected Users and Stakeholders

The work of the ITS and Innovation Committee will reach out to City staff through seamless and efficient project development and progress in the ITS and Smart City plans.

4.2.5 User Benefits

The primary benefit is the smooth operation of the City departments on ITS projects and documented progress in the ITS program.

4.2.6 Prerequisites and Related Projects with Dependencies

4.2.6.1 Dependencies

None

4.2.6.2 Prerequisites

None

4.2.6.3 Related Projects

- Project 8.1 – Data Management Strategy
- Project 8.2 – Telecommunications Strategy
- Project 7.2 – Autonomous Vehicle Working Group
- Project 14.1 – Marketing Plan

4.2.7 Relative Priorities

This project will develop a City ITS and Innovations Committee as a short term, LOW priority initiative which will first establish ownership of the ITS plan and continuing roles and responsibilities as the ITS infrastructure expands.

4.2.8 Staff Resources

City of St. Albert will develop and secure all required reviews and approvals of senior leadership and City Council. The ongoing responsibility of the LEAD department (Smart City) is to administer the operation of the ITS and Innovation Committee including meetings, agenda, venues, presentations and reports.

4.3 PROJECT 12.1 – REGIONAL ITS COMMITTEE

4.3.1 Description

The Regional ITS Committee's role is to develop projects or initiatives that span different jurisdictions or that may have an impact on regional transportation. It is the goal of the Regional ITS Committee to work with stakeholders to verify the roster of critical projects in the region.

This Committee will consider projects such as:

- The TMC which will act as the starting point or "hub" for regional coordination projects but they can clearly be operated in other jurisdictions.
- Projects that affect traffic flows between jurisdictions such as signal progressions that span two boundaries.
- Data sharing between multiple agencies. Sharing access to CCTV images is one example.

- Cross-jurisdictional transit services.
- Commercial vehicle enforcement that is a Provincial responsibility.
- Regional ATIS services.

Members of the Regional Committee would report back to their respective agencies. The St. Albert representative would report directly to the St. Albert ITS and Innovation Committee. Each member is expected to maintain strong liaison with their agencies.

4.3.2 Tasks

This project will involve the following tasks:

1. Develop a Charter for the Regional ITS Committee which includes the following sections:

    - Purpose of Committee.
    - Mandate is to develop new Regional initiatives in ITS and Smart City programs.
    - Development of joint capital projects related to regional systems and technology.
    - Accountability and reporting is to the St. Albert ITS Committee and stakeholder agencies.
    - Guiding Principles will be developed jointly by member agencies.
    - Roles and Responsibilities include liaising with stakeholder agencies on progress.
    - Membership will be Regional agencies including:
        - City of St. Albert
        - City of Edmonton
        - Alberta Transportation
        - Sturgeon County
        - St. Albert Transit
        - Edmonton Transit Service

      It is possible that a member may have more than one representative on the Committee.
    - Administrative details such as meeting frequency and location. The Regional Committee is expected to meet bi-annually.

    This work should be done in coordination with the development of the St. Albert ITS and Innovation Committee (Project 11.1). The work is LOW priority in the short term.

2. *Secure review and approval of Regional Committee Charter* with the St. Albert ITS Committee and stakeholder agencies. This work should be done in the short term as a LOW priority, following through on the Charter.

3. *Develop a regional work plan for joint projects* that may examine the following:

- Traffic flows on corridors that span different regional agencies. Typical deployments include regional signal progressions.
- Centre to centre TMC coordination between jurisdictions.
- Disaster coordination
- TMC data sharing between agencies including access to files and CCTV images.
- Cross-jurisdictional or multi-jurisdictional transit services.
- Regional traveller information systems.
- TMC back up services.
- Coordination of user services such as commercial vehicle enforcement
- Joint marketing and public awareness
- Integration of “Smart City” systems
- Interoperability
- Development of ITS policies and standards to support operation

The Regional Committee would develop each project, initiate design, testing and deployment.

Development of the work plan and initial project development are expected to be a MEDIUM priority in the medium-term, years three to five years.

4.3.3 Agency Roles

Each stakeholder agency will nominate their members. The St. Albert ITS Committee will nominate the City’s representative.

The Chair will be elected at the inaugural meeting

4.3.4 Expected Users and Stakeholders

The stakeholder agencies are represented by the members. Each individual agency will become a user of the Regional Committee initiatives which will affect cross-jurisdictional transportation.

4.3.5 User Benefits

The primary benefit is that regional projects approved for deployment will support seamless transportation across jurisdictions.

4.3.6 Prerequisites and Related Projects with Dependencies

4.3.6.1 Dependencies

- Project 2.3 Incident Management – if expanded beyond St. Albert
- Project 3.2 Next Bus Upgrade – to include Edmonton Transit
- Project 5.1 Regional Truck Survey
- Project 5.2 CVE Strategy
- Project 5.3 Dangerous Goods Monitoring

4.3.6.2 Prerequisites

- Data Management
- Telecommunications
- St. Albert ITS and Innovation Committee

4.3.6.3 Related Projects

- Autonomous Vehicle Working Group
- TMC functional requirements, concept of operations, design

4.3.7 Relative priorities

This project will develop a Regional ITS Committee followed by a work plan for projects to support the ITS and Smart City initiatives. Tasks #1 and #2 to create the Committee Charter and obtain approval are LOW priority in the short term. Task #3 to develop the Regional ITS work plan for joint projects and execute the work is a MEDIUM priority that extends from the medium to long term to support progress in the ITS and Smart City plans.

4.3.8 Staff Resources

City of St. Albert will develop and secure all required reviews and approvals of senior leadership and City Council. The ongoing responsibility of the Regional Committee members will be to develop cross-jurisdictional projects. The Chair of the Committee and their agency will be responsible for organizing meetings, agenda, venues, presentations and reports.

5 Long Term Project Summaries

Descriptions for longer term projects are provided that are anticipated to be developed in the long-term phase in six or more years in the future. These projects have been described in less detail as technology and best practices are likely to evolve within this time frame.

5.1 PROJECT 1.4 – ST. ALBERT TRIP PLANNER

Trip planning has migrated into a mobile, dynamic environment that now involves multiple modes. Users are interested in monitoring real time location and direction, as well as profiles (elevation) for active transportation options.

This project will develop a "city-based" trip planning tool that provides options for various modes and journeys. The trip planner will be a customized version of Google maps to show travel times / directions between an origin and destination. Part of the customization may be to use the profile data to calculate the cardio or health benefits of active trips.

The trip planning tool is envisioned to provide the following:

- A mobile app that allows direct access to various modal options in St. Albert between an origin and destination. The app should update the road network continuously.
- Information on transit, auto, pedestrian, and cycling routes plus intermodal transfer points between modes.
- GPS based tracking of progress for users.
- Security feature to protect users that prompts pedestrians if the location doesn't change for extended periods for personal security.
- A voice activated option. This app should be available for download via the City's web site.

The trip planner, as in many other jurisdictions, may be developed by third parties if given access to City data and networks. The City should ensure that privacy and security details are reviewed and secured prior to releasing access to data.

5.2 PROJECT 2.3 – ST. ALBERT INCIDENT MANAGEMENT PROGRAM

In many cities and communities, daily incidents occur that cause congestion and safety problems. The overall goal of incident management is to minimize the duration of collisions, thereby reducing the probability of secondary incidents and improving overall safety. Typically, incident management involves several phases:

- ***Detection of incidents***: This phase uses various technologies from loops to cameras to wireless radar detectors. The detectors are scanning for "unusual" traffic patterns that algorithms deem are a high likelihood of an incident – high density but zero speed on a road or highway is one scenario.

- ***Verification of incidents***: Once detected, the system will alert an operator at the traffic management centre and display CCTV cameras to verify details. The operator will confirm the number of vehicles involved, lanes affected, possible injuries, fuel spills, and other details.
- ***Response***: The operator will coordinate the response to the incident which may involve multiple emergency agencies arriving at the scene. The operator will also update the ATIS VMS to alert oncoming traffic. The operator may also alert City staff as appropriate.
- ***Removal/Restoration***: The operator will coordinate removal of the vehicles at the incident site and ensure that the incident is recorded. The operator will ensure the corridor is restored to normal operation.

The Needs Assessment report in the ITS Strategic Plan showed that St. Albert Trail contains the seven worst intersections in terms of collision frequency. The incident management program will prioritize on improving safety on St. Albert Trail and may expand to additional corridors.

The following tasks will be completed for this project:

- Identify primary corridors in St. Albert for incident management including Provincial and adjacent stakeholder jurisdictions.
- Investigate ITS infrastructure on each corridor and at intersections including:
  - Traffic detection
  - CCTV cameras
  - Variable message signs
  - Telecommunications network
- Develop functional requirements for incident management program by corridor to a traffic management centre.
- Undertake preliminary design of integrated and centralized incident management for the network including hardware and software.
- Develop detailed design and specifications for field devices, telecommunications and software.

It is envisioned that the incident management system will be scalable and integrate with other regional agencies including Alberta Transportation.

5.3 PROJECT 3.1 – ON-DEMAND TRANSIT

This project involves the development of a “point to point” transit service which is effectively customized transit. The new service will improve upon the systems in the existing program. In addition to supporting the general public, the project will support the sector of public transport users called “paratransit users” that cannot access conveniently the transit services that are available due to physical mobility or mental disabilities.

Serving a community of over 65,000 + will require a system and network approach. The system will require real time location of each service vehicle, accessing the electronic manifest, directionality and speed. The project will involve implementing a central system for users (web based or telephone) for ride requests. The

system monitors vehicle locations, assigns rides and checks status. The project will involve the following tasks:

- Develop functional requirements for the on-demand transit system.
- Prepare a concept of operations and system network design.
- Review on-board technologies including GPS antennae, vehicle logic unit (computer), real time mobile display terminal (MDT) monitor, and integration.
- Develop detailed software design of central system.
- Procurement and implementation.
- Driver training
- Testing.

Network testing will be done on a small number of vehicles before full scale deployment.

5.4 PROJECT 3.2 – NEXT BUS ARRIVAL SYSTEM UPGRADE

St. Albert already utilizes a “Next Bus” system with GPS and a central system that allows users to monitor buses as they progress along a route. For example, Route #203 is the primary route between the University of Alberta and St. Albert, tracked by Next Bus. This ITS project will enhance the current system which operates and displays the information on a computer or smart phone.

This project is an opportunity to improve services to the customer through an upgrade to reliability and information. St. Albert buses are equipped with automatic vehicle location (AVL) devices such as GPS. The following tasks are recommended:

- Develop test plan for on-board GPS, computer and antennae for signal strength, accuracy, directionality, and speed.
- Current buses will be tested for predictions against “ground truth” data including arrival time.
- Current technology specifications and network architecture will be reviewed.
- Next bus service will consider the following:
  - LED signs at key stations showing predicted arrival times
  - On-board LED signs and voice annunciators for passengers
- Specifications and design will be updated and revised to reflect a state of the art system.
- Real time mobile app for next bus arrival information will be improved for the latest version of android or iPhone unit.
- Next Bus will integrate real time location via traveller information system in Project 1.1.

5.5 PROJECT 3.3 – TRANSIT SIGNAL PRIORITY (TSP)

Transit Signal Priority (TSP) involves granting priority at signalized intersections for transit vehicles, usually by extending green or truncating opposing red phases. The TSP system operates on the same system utilized currently by the City for emergency medical service pre-emption and uses real time location, directionality and speed of the buses as well as their schedules to estimate schedule adherence.

Consideration may be given for unconditional priority to buses at TSP-equipped intersections when they are behind schedule, regardless of passenger load. Schedule adherence is often set to a threshold, such as 2 minutes, to trigger the TSP sequence.

The system detects the approaching bus, reviews schedule adherence, and determines if TSP should be granted. If so, the network will direct the extension of the green phase to allow the bus to proceed through the intersection. If the approach is red, TSP will direct truncation of the phase. At strategic congested locations, the bus can maintain schedule adherence or catch up, if behind.

The following tasks will be involved:

- Review bus routes and schedules on the signalized network.
- Assess traffic conditions and queues on network locations including congested locations.
- Develop evaluation criteria for TSP requirements at intersections to rank TSP needs.
- Prepare functional requirements and concept of operations including data management and telecommunications.
- Identify corridors and locations where TSP will be deployed.
- Develop a TSP workplan for network deployment.
- Conduct baseline data collection.
- Develop a TSP pilot project with baseline and “after” data collection.
- Detailed design of TSP at intersections including telecommunications and software interface to controllers.
- Procure TSP on-board and field equipment.
- Deploy and test TSP.

5.6 PROJECT 3.4 – SMART BUS ON-BOARD ARCHITECTURE

Transit technology on board buses are becoming more complex and powerful, yet less costly and widely available to cities and agencies. Buses today have a wide array of on-board systems such as:

- Vehicle logic unit (VLU) which acts as a central computer.
- Mobile Display Terminal (MDT) which shows the driver required information.
- Automated Passenger Counting (APC) units which use infrared beams to count passengers as they board and alight.
- Automated fare boxes.
- Electronic fare payment systems.
- CCTV cameras on-board and outside the bus for security and liability assurance.
- Blind spot detection and sensors.
- On-board LED and voice annunciators as well as “panic” buttons for passengers.
- WiFi access.
- Automated Vehicle Location devices such as GPS.

Most, if not all, of these units have “IP” addresses and are online. Additionally, the buses require specialized cabling and installation.

As buses become filled with complex technology and the data generated becomes critical, it is necessary to develop an on-board road map or “architecture” for buses that manage technology and connect passengers with the Smart City data platform.

It is important in a Smart City environment that transit technology is integrated and managed in terms of data.

The following tasks will be involved:

- Review existing bus infrastructure and “planned” infrastructure.
- Develop an inventory of on-board and roadside technologies for current and future transit infrastructure.
- Undertake a best practice review of transit applications and technologies.
- Develop functional requirements and concept of operations for transit in the City.
- Develop on-board and roadside ITS related network architecture for technology and data management.
- Develop specifications for bus procurement
- Evaluate equipment for NTCIP compatibility.

The objective of this project is to ensure there is a consistent on-board and roadside architecture for all City staff to follow for transit systems. The architecture should be incorporated into procurement documents for future purchases.

5.7 PROJECT 3.5 – TRANSIT ROADWAY INFRASTRUCTURE

Transit services are a combination of vehicles, on-board ITS and field technologies, information networks, software and infrastructure. As the City grows, transit vehicles will require infrastructure (as well as technology) to provide mobility. Infrastructure may include:

- Bus only lanes and access.
- Bus only queue jumpers at strategic locations.
- “Transit only” signals to allow buses to proceed through an intersection before general purpose vehicles.
- Bus bays at transit stops.
- Transit exchanges with passenger information.

This project will review the current transit network performance and determine each application and respective locations. The infrastructure may be strengthened by hardware or software (for example, transit only signals) to improve operations and performance. Transit roadway infrastructure will be integrated with on-board, telecommunications, data and TMC systems.

Specific considerations for applying this project align to St. Albert Trail and may be triggered with planning work associated with a north end transit station. In operational alignment with the south end, Campbell Park and Ride, the implementation of bus only lanes or Bus Rapid Transit (BRT) will maximize efficiency and service level for transit users.

No specific tasks are recommended for this project beyond early identification of opportunity or need to expand on physical infrastructure or roadway design during transit routing or system changes.

5.8 PROJECT 4.1 – ST. ALBERT ELECTRONIC PAYMENT SYSTEM (EPS)

Electronic Payment Services (EPS) supports a broad array of City and Regional services. These systems support easy and convenient payment for services such as:

- Parking on both on-street and off-street facilities.
- Transit systems.
- Tolls.
- General City services such as community centres, libraries, clinics, and special events that may require a “smart card” type system.
- Commercial goods movement systems such as “Weigh in Motion” or WIM.

The following tasks are recommended in this project:

- Review current transportation and City services.
- Review goods movement functional requirements.
- Develop a concept of operations for a City-wide smart card program for parking, buses and facilities.
- Prepare network architecture and diagram for communication network in support of EPS, integrated into the traffic management centre.
- Develop best practice review for municipal EPS including state of the art technologies.
- Develop specifications for readers, ID devices (cards, GPS, transponders) and network infrastructure.
- Develop framework for software and operating system including “back office”
- Preliminary design of hardware and software
- Prepare technology assessment reports.
- Detailed design of hardware and software development including material reports.
- Procurement and acceptance testing of readers and transponders (factory and field).
- Deployment of systems with a period for user testing
- Initiation of back office systems with user testing
- Marketing of systems to the public

5.9 PROJECT 5.1 – REGIONAL TRUCK SURVEY AND WORKSHOP

This initiative will involve three phases:

1. Commercial and Large Load Data Collection and Network Review
    - 1.1 Record field commercial and large load travel information such as volume, speed, classification and frequency of truck traffic on major goods movement corridors by time of day and cargo type.
        - 1.1.1 In addition, collection of data on non-approved truck routes will be used to identify non-compliance to City Bylaws and may be used for network evaluation and communication to industry representatives.
        - 1.1.2 If possible, the collection of this truck data will also include origin and destination.
        - 1.1.3 This task will require development of a truck survey plan to collect data.
    - 1.2 Update the current City traffic model by integrating the data and information collected.
    - 1.3 Analyze information for appropriate use of the network by large load carriers and identify gaps of potential connectivity or effective movement through the city.
    - 1.4 Document opportunities of amendments to large load routes through the city

2. Develop Workshop for the large load and commercial carrier community:

    - Prepare an online questionnaire with a “Primer” that will summarize the issues to the trucking community and an invitation to attend a workshop.
    - Present results of the data collection in the field.
    - Display opportunities of amendments to large load routes through the city.
    - Discuss other issues such as dangerous goods movement through the urban area.
    - Working with the trucking association and province, develop a workshop to inform the trucking community of the future network, obtain feedback and input for improvements.

The regional truck workshop serves as the stakeholder input and needs assessment of the goods movement community.

3. Update the City’s Traffic Bylaw and make field level changes for signage and operational considerations of large load routes through the city. This result is the objective of this project to produce an enforceable bylaw, developed through consultation with the user community.

5.10 PROJECT 5.2 – COMMERCIAL VEHICLE ENFORCEMENT STRATEGY

Development of a regional commercial vehicle enforcement (CVE) strategy will require coordination with the province and regional agencies. It is important that the CVE strategy capture and respect the needs of the province and national trade corridors as well as the requirements of the local community.

The CVE Strategy will examine the following to support the goods movement objectives of the region:

- Infrastructure – fixed weigh scales
- Resources – enforcement staff and mobile units
- Technology – ITS with WIM and CCTV

In the City, monitoring corridors such as St. Albert Trail to discourage heavy trucks from using it requires ITS technology. There are numerous options as follows:

- Radar sensing data collection which includes installation of the sensor on a pole with a cell modem to transmit the data to the traffic centre.
- Radar sensing data collection (same as above) with built-in alarms to alert authorities in real time of a violator.
- Virtual weigh scale system using bending plate WIM scales, loops, CCTV, plate readers and cell modems.

These systems can be strategically located throughout the City to detect violators and issue notices. This project will consider the feedback from the Goods Movement stakeholder workshop (Project 5.1) and the survey responses. Together, the agencies including St. Albert, will develop operational policies and rules to enforce on key urban corridors using ITS technology.

5.11 PROJECT 5.3 – DANGEROUS GOODS (DG) MONITORING PROGRAM

Dangerous goods movement includes explosive and hazardous materials. The issuance of permits allows carriers to move these dangerous goods on certain corridors, typically in designated time periods.

St. Albert Trail is currently a designated 24-hour dangerous goods movement corridor. However, future development of St. Albert Trail as a multi-modal active transportation corridor will require re-evaluation for dangerous goods transport. Development and completion of 127th Street and Ray Gibbon Drive expansion will also support moving dangerous goods away from St. Albert Trail.

Future proactive monitoring to protect the residents and businesses of St. Albert will require the following:

- Review legislation in Alberta governing dangerous goods movement.
- Review input from trucking community in stakeholder workshop in project 5.1.
- Assess dangerous goods types that require transport in and around St. Albert.
- Develop list of designated carriers and fleets for transportation of DG.
- Prepare best practices of DG monitoring programs in similar municipal and regional environments.
- Review technologies and systems for monitoring DG.
- Prepare functional requirements and concept of operations for DG monitoring.
- Prepare preliminary design of DG monitoring system.
- Develop specifications of systems (hardware and software) and detailed design.
- Procurement and testing.

5.12 PROJECT 7.1 – CONNECTED VEHICLE IMPACTS

Connected Vehicles (CV) use on-board technologies to communicate between them and infrastructure. CV technologies are now common and found in many vehicles, even in older models. Examples of CV technologies include backup CCTV cameras, collision avoidance sensors, warning systems for vehicle components, and transponders in support of tolling and access. Many newer vehicles today come with lane keeping, braking and other safety related CV features.

This project will undertake the following tasks:

- City staff involvement with connected vehicle working groups or ITS related committees.
- Review current and future CV technologies.
- Investigate how CV systems can benefit the City services.
- Develop innovative methods of integrating the CV technologies into the City's Smart City systems and IoT platform.
- Leverage the CV technologies to improve safety and efficiency in the transportation network.
- Develop data flows to support CV functions.

5.13 PROJECT 7.2 – AUTONOMOUS VEHICLE IMPACTS

This project involves research into autonomous (driverless) vehicle impacts on the City services and staff functions. As driverless vehicles penetrate the market, the impact on the City will increase. The specific City staff functions are described in Project 11.3 (Autonomous Vehicle Working Group).

This project will use the Discussion Paper and input from the Working Group to develop a report, based on results and experiences in other jurisdictions. The report will allow the City to prepare for the eventual deployment of autonomous vehicles over time.

5.14 PROJECT 9.1 – SMART WORK AND PLAYGROUND ZONES

Section 5.2 of the St. Albert Transportation Safety Strategy addresses the need to protect "vulnerable road users" such as pedestrians, cyclists, motorcyclists, and the disabled or impaired with mobility aids. These users are not protected and are particularly vulnerable in a collision with vehicles. Part of the effort to increase public safety is with the deployment of LED speed signs in Project 1.6 to reduce speeds of vehicles. This project aligns to current programs in St. Albert, such as Safe Journeys to School and Neighbourhood Traffic Calming; however, is identified for both expansion of current practice to target work zones and acknowledgment for continual investigation into new or improved safety measures that result in improved messaging or efficiencies for services.

Data from this project can be shared with the City and enforcement staff to target locations where speeding is common.

This project involves the following tasks:

- Review best practices and current technologies used to monitor vehicular speeds through crowded areas such as work and school zones, and playgrounds.
- Prepare evaluation criteria to select pilot project location for the system.
- Develop functional requirements and concept of operations for the smart. work/school/playground zone system. The system will compare actual with posted speeds, develop a speed profile by time of day and identify the locations of most frequent violations for enforcement in real time.
- Technology components may include speed detectors (radar unit) to measure speeds, CCTV cameras to identify frequent violators, and LED signs to advise motorists to reduce speeds.
- Prepare preliminary and detailed design and software integration for the pilot location into the traffic management centre.
- Baseline data collection should include local speeds, volumes, collisions, and vehicle types.
- Procure and deploy pilot project.

5.15 PROJECT 9.2 – FLEET MANAGEMENT PROGRAM

St. Albert owns and operates a fleet of City vehicles including buses, snow plows, salt trucks, maintenance vehicles, construction vehicles, ambulances, fire trucks, and garbage trucks. As the City grows, it will be critical for the safe and efficient operation to track fleet vehicles in real time. The data can be analyzed to assess the effectiveness of services, in real time. For example, knowing the corridors that have been serviced by snow plows can assist in planning the next location.

This project involves the development of a GPS based tracking system for the City's mobile assets, primarily vehicles, for their real time locations, direction and condition. This work supports Project F.1.3 in the Smart City Master Plan.

These vehicles will communicate their locations continually with the City's network, allowing the tracking of services as part of the Smart City environment.

As a starting point, the following tasks are recommended:

- Prepare a functional requirements study for the fleet management program to identify needs. The work will include preparing a business case for the next phase.
- Develop concept of operations and system design for the on-board technologies, communication network as well as the operating software.
- On-board hardware will include GPS antennae, cameras (front and rear), hands-free communications, remote diagnostics, and interfaces to each specific truck (for example, monitoring of sand, chemicals, etc.).
- Snow plows may include a signal pre-emption unit to the traffic controller that will allow the formation of plows (or individual plows) to proceed through intersections without stopping.

- Monitoring of vehicles will be supported at the Traffic Management Centre. Data will be archived for future analysis.
- Detailed design, procurement and testing will be part of this project.

The project will produce a “lessons learned” report for the City.

5.16 PROJECT 9.3 – ASSET MANAGEMENT

As part of the Smart City future, it is expected that all municipal buildings and assets will be connected via high speed broadband telecommunications. In a connected world with the IoT platform, it is expected that most, if not all, infrastructure will have an “IP” address and be online. The list of infrastructure and assets is virtually endless and includes such items as:

- All mobile vehicles such as trucks and buses.
- All equipment on the vehicles such as fareboxes on transit buses.
- Field devices such as CCTV cameras, variable message signs and others.
- Road infrastructure such as parking meters.
- Buildings and the networks in them.

This project develops an asset management system to monitor and assess the condition, and in some cases, the locations, of assets for St. Albert. The project would be coordinated closely with the data management and telecommunications work.

The tasks would include:

- Developing an inventory of all City assets, mobile and stationary.
- Preparing functional requirements and concept of operations for the asset management system.
- Data management system and interfaces will be reviewed.
- Detailed design of software and related modules.
- Procurement and testing.

The asset management system will help to operate and maintain assets, monitor performance and optimize life cycle. The system will also make the services of the City more accessible as per Project IM.3 and IM.4.

5.17 PROJECT 9.4 – ST. ALBERT DATABASE FOR CONSTRUCTION, MAINTENANCE AND UTILITY CREWS

The purpose of the database is to provide real time information of the City crews’ construction and maintenance activities. The database would act as a source of input to the City Traveller Information web site in Project 1.1 and this information would allow the general public to make trip decisions in terms of route choice, time, and mode. The database would also act as a record of work for construction, maintenance and utility crews. City planners could use the database as a tool for the capital program.

The tasks include the following:

- Develop a summary of various City crews that work on roads and systems that may require closures.
- Prepare a functional requirement and concept of operations document that summarizes the system. The work would include developing the central software on the network with an interface to the ATIS web site.
- Mobile tablets on the crews' trucks could utilize an interface to input details of the work (duration, number of lanes closed, etc.) and the GPS coordinates can update the location in real time on the City map.
- Prepare best practices and technology assessment of hardware and software.
- Prepare preliminary and detailed design of all hardware and software.
- Prepare specifications and test plans.
- Procurement and testing of systems.

5.18 PROJECT 10.2 – TRAFFIC MANAGEMENT CENTRE SITE SELECTION

When the TMC Functional Program and Concept of Operations (Project 10.1) is completed, the next step is to select a site. This project will review various factors in confirming the optimal site for the TMC and evaluate them including:

- Availability of a high-speed telecommunications backbone.
- Cost and availability of property.
- Protection from flooding, earthquakes, wind, and catastrophic explosions.
- Good access to modes by the public including transit, roads and highways, pedestrians, and cyclists.
- Accessibility for staff and public including guidelines for handicapped (wheelchair) access.
- Parking.
- Scalability for future expansion.
- Systems support.
- Potential for procurement options such as through a "P3" model or some innovative leasing.

The information will be used to prepare a business case for the development and location of the TMC.

5.19 PROJECT 10.3 – TMC PRELIMINARY DESIGN

The preliminary design of the TMC will focus on the selected site (Project 10.2) which may be a standalone (new) or retrofitted location. The work will require a preliminary design of the site services including structural, utilities, HVAC, mechanical, transportation, electrical, telecommunications, water/sewer, emergency services and UPS, and the physical spaces.

The work will include a cost estimate and drawings for site preparation, servicing, and construction. Hardware and central operating software design and engineering is included.

5.20 PROJECT 10.4 – TMC DETAILED DESIGN AND CONSTRUCTION

The detailed design will include full tender-ready drawings and specifications for the TMC including all hardware and software. The software includes both customized central operating software and commercial off the shelf software. The work will include material approvals for all hardware and software components as well as factory and field acceptance test plans.

The project includes construction of all hardware and software in the TMC.

5.21 PROJECT 10.5 – TMC EXPANSION

The design and implementation of the TMC will be done in accordance with the ITS plan which covers 10 years. This project covers future expansion beyond the ITS plan's horizon which may require additional space or conversion of systems.

5.22 PROJECT 11.3 – AUTONOMOUS VEHICLE WORKING GROUP

This working group would assess the specific impacts of autonomous vehicles on the City of St. Albert, with the goal of preparing the City for their introduction.

The Autonomous Vehicle Working Group would essentially execute the recommendations of the Discussion Paper and will consider the following impacts:

- Land use planning
- On-site and off-site parking
- Traffic demand
- Engineering and standards
- Traffic forecasting and modelling
- Enforcement
- Liability (City)
- Transit vehicles
- Goods movement
- Medical services
- Legal services

The Autonomous Vehicle Working Group will report to the ITS Committee and work on the specific initiatives for driverless vehicles.

5.23 PROJECT 14.1 – MARKETING PLAN

The project includes development of the following:

- ITS information brochures on user services, benefits and specific examples in the City.
- Online versions of the brochures.
- Development of “media ready” packages for the public including a short video of the ITS improvements.
- TMC tours for public and media.
- Open houses for ITS.
- Development of power point presentations to be used as materials for introduction in schools.
- Open data for ITS.

6 Conclusions and Recommendations

The St. Albert ITS Strategic Plan is a key cornerstone document that enables the City to reach the goals and objectives set in the Transportation Master Plan (TMP) and Smart City Master Plan. The ITS Plan recommends a total of 41 projects as part of 9 specific and 5 general ITS strategies, with a “high level” schedule and descriptions of projects.

The first five years of the ITS plan are critical to establish processes to execute key short to medium term projects. The implementation periods provide lead and supporting ITS personnel time to develop the work, build the core ITS infrastructure, demonstrate benefits and pursue long-term projects. This period will define the foundation of the ITS program, moving forward.

Building on the St. Albert ITS Strategic Plan, this *Implementation Strategy* now develops the critical first 5 years of projects (short to medium phases) by expanding the project summaries from the ITS Strategic Plan. A total of 16 projects are identified in detail, spanning the first 5 years of the ITS Strategic Plan. The Implementation Strategy also accounts for other projects that are dependencies, prerequisites or related work.

High priority tasks and projects in the first 5 years are focused in traffic management, safety and traveller information systems. These projects are deemed to be important to all stakeholders and will address key transportation problems and generate efficiencies for City resources to monitor, maintain and respond to network needs.

It is important to note that all short and medium-term projects are essentially dependent on data management and telecommunications work (Projects 8.1 and 8.2) in the ITS Strategic Plan. These two initiatives are high priorities and require support. They should be done in parallel and with close coordination. Many tasks in data management and telecommunications are common to both the ITS and Smart City Plans, and ultimately support the City moving forward with an evidenced based capital budget for investment and service provision.

The Implementation Strategy provides a check on ITS projects from different perspectives:

- *Strategic Priority* – scope of projects aligns to Council and Corporate priorities.
- *Logical* – scope, phasing, and action plan are proposed based upon project dependencies and prerequisites.
- *Technical* – technology proposed for use in projects currently exist and resources can support it.
- *Financial* – the proposed projects may be scaled for integration, targeting key areas to result in best improvements to the network for the best value.
- *Collaborative* – As ITS impacts multiple departments and services, lead roles and actions are collaborated upon and shared through the organization to effectively complete projects.

- *Institutional* – Aspects of the ITS Strategic Plan may not be fully led by St. Albert and will require regional support. Such projects are identified and the ITS Implementation Strategy may be a starting point for discussion or direction.
- *Public* – Project delivery targets priorities of improved service delivery or network experiences, safety and efficiency.

It is recommended that St. Albert stay current with new innovative ITS technologies that have been developed. Technologies change continuously as products and systems become more powerful, affordable, and interoperable. Maintaining an open system to testing technology prior to large scale investment, with targeted network applications for effective evaluation and highest opportunity for improvement, will be important; however, the City shall first ensure that the current systems are performing properly and efficiently prior to any expansion.

As the City progresses through the ITS projects, it is recommended that a review is completed and an update be performed to both the ITS Strategic Plan and Implementation Strategy at about the half way point of the work (2023). This will allow for identification and updates related to technology, priorities, resource allocation and transparent communication of anticipated implementation to be incorporated. Through the duration of the work, updates on performance measures of the network and results of the ITS investment in the community should be provided to senior management, City Council and residents. Key performance indicators to measure success are provided for each project in the ITS Strategic Plan. Monitoring of the network and system operations shall be ongoing; however, annual updates and reports will assist in clear communication of the transportation network demands, system operations, impacts of investment and should provide support and rationale for "next steps" of ITS implementation.

The ITS Implementation Strategy is the bridge between the higher level ITS Strategic Plan and deployment of projects. It follows the principles and objectives of the ITS Strategic Plan and shall act as a reference for program details and background for capital funding requests. In moving the Implementation Strategy forward and enacting proposed projects, the City of St. Albert will be meeting the ITS Vision and be *"Building a better community through transportation innovation."*

It is recommended that St. Albert use the Implementation Strategy as a guide to initiate and develop new projects in the short to medium phases.

Closure

This report was prepared for the City of St. Albert as an Implementation Strategy that provides details and recommendations for the short and medium-term projects in the St. Albert ITS Strategic Plan.

The services provided by Associated Engineering Alberta Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,
Associated Engineering Alberta Ltd.



Keenan Kitasaka, P.Eng.
ITS Specialist and Technical Lead

ASSOCIATED ENGINEERING
QUALITY MANAGEMENT SIGN-OFF
Signature:
Date: 2018-08-20
APEGA Permit to Practice P 3979

Appendix A – Project Task Lists by Year and by Project

ANNUAL PROJECT LAYOUT

2018 IMPLEMENTATION PLAN / ACTION ITEMS

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
1.2	Real Time Web Camera Program	ENG	2019	Medium	Develop functional requirements for CCTV cameras based on the City ITS Strategy.
1.3	Bluetooth Travel Information	ENG	2018 2019	High High	Develop evaluation criteria for further Bluetooth deployment. Develop a candidate ranked list of corridors, including the end points for the Bluetooth System. Pilot project of Bluetooth technology. Prepare functional requirements, detailed design and specifications for the Bluetooth system. Deploy the pilot and document benefits.
1.6	Speed Advisory System	ENG ENG	Ongoing Ongoing	High High	Collect collision data and history for primary St. Albert corridors. Collect network speed data Review locations and data for school and playground zones.
1.7	Traffic Data Collection and Management	ENG	Ongoing – anticipated process changes with development of Strategy (Project 8.1)	High	Following existing processes and plans: · Workplan to support data collection · Annual traffic counting (permanent and temporary applications) · Annual warrant reviews (proactive and community response related) · Network data collection for support of programs (Safe Journeys to School, Neighbourhood Traffic Calming, Pavement Management) · Integration of short-term ITS technologies to collect new information · Collision data collection / validation / reporting of Provincial “E Collision” data
2.2	Adaptive Signal Control	ENG ENG	2019 2019	High High	St. Albert Trail Adaptive Signal Pilot Assess network segments and develop evaluation criteria for adaptive signal control.

ANNUAL PROJECT LAYOUT

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
6.1	Emergency Pre-Emption	EMS	2019	Medium	Define primary routes and key intersections for emergency vehicles.
		ENG	2018	Medium	Confirm capability of pre-emption at intersections. Confirm inventory of signal controller cards in each cabinet.
		EMS / ENG	2018	Medium	Develop functional requirements for signal pre-emption at selected locations.
8.2	Telecommunications Strategy	IT	2018	High	Review and establish ITS devices compliance to NTCIP standards (identify anything non-compliant and seek process or tasks needed to integrate into the larger system. Bandwidth analysis.

ANNUAL PROJECT LAYOUT

2019 IMPLEMENTATION PLAN / ACTION ITEMS

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
1.1	Advanced Traveller Information Systems (ATIS)	IT	2019	High	Develop functional requirements for city wide traveller information website.
		ENG	2019	High	Prepare a work plan with ranked projects for design and implementation to feed the website. Projects may include the procurement and installation of technology around the City.
1.2	Real Time Web Camera Program	ENG	2018	Medium	Prepare concept of operations that considers the prerequisite projects such as the traveller information web site and telecommunications. Develop evaluation criteria for ranking CCTV camera locations. Include the pilot locations on St. Albert Trail. Identify ranked corridors, key and strategic locations for real time City web cameras. Evaluate the current CCTV pilot project including reliability, performance, costs and responsiveness under different conditions including night vision and poor weather. Prepare a “lessons learned” for the project, benefits and best practice recommendations for future City deployments. Review of current CCTV technologies, integration requirements into the network (ATIS site) and test plans. Assess CCTV standards including compliance with NTCIP 1205.
1.3	Bluetooth Travel Information	ENG	2018	High	Prepare a ranked implementation plan for future Bluetooth ATIS deployments.
			2019	High	Expansion of the Bluetooth Travel program.

ANNUAL PROJECT LAYOUT

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
1.5	Road Weather Information Systems (RWIS)	ENG	2019	Medium	Review the current RWIS sites for performance, results and costs. Assess the standards used in the current sites in terms of NTCIP compliance.
1.6	Speed Advisory System (note aligns to programs such as Safe Journeys to School and Neighbourhood Traffic Calming)	ENG	2018	High	Prepare evaluation criteria for prioritizing system implementation.
1.7	Traffic Data Collection and Management	ENG	Ongoing	High	Following existing processes and plans: - Annual traffic counting (permanent and temporary applications) - Annual warrant reviews (proactive and community response related) - Network data collection for support of programs (Safe Journeys to School, Neighbourhood Traffic Calming, Pavement Management) - Integration of short-term ITS technologies to collect new information - Collision data collection / validation / reporting of Provincial “E Collision” data Note – The Data Collection and Management Strategy Development (Project 8.1) is critical to the program and following completion may impact processes / delivery.
2.2	Adaptive Signal Control	ENG	2021	High	Prepare a ranked list of corridors for potential adaptive signal control. Conduct microsimulation modelling (if required) on the selected corridor(s) to calibrate the algorithms for adaptive signal systems. Develop a concept of operations describing the quantitative and qualitative characteristics, and requirements of the equipment and software for the adaptive signal control system. Prepare a functional assessment of the system required for an adaptive signal control system. Review selected corridor infrastructure for adaptive signal control.

ANNUAL PROJECT LAYOUT

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
					Preliminary design for signal controllers, civil work, electrical and systems on selected corridor. Detailed design of selected adaptive signal corridor. Procurement and testing of new technology. Expansion of the adaptive signal operations.
7.3	St. Albert Research Partnerships	Smart City	2019	Medium	Review status and details of all current and planned research projects including duration, vendor, standards, hardware and software. Review and define goals, objectives, performance indicators, and evaluation criteria of research projects. Summarize results of research projects, including a recommended migration to integrate any new and successful technologies into the ITS programs and projects.
8.1	Data Management Strategy	ENG	2019	High	Develop a Data Collection and Management Strategy. Target areas of types of data collected, infrastructure and technology used, how information is stored and shared and “data flow”. Develop functional requirements for Interim Advanced Traffic Management System (ATMS). See Project 1.1 for ATMS details / considerations.
8.2	Telecommunications Strategy	IT	2018	High	Develop Network Architecture Design.
10.1	Traffic Management Centre Functional Program & Concept	ENG	2019	Medium	Review of the St. Albert ITS Strategic Plan and related projects including the telecommunications network. Each ITS user service and application should be examined by phase to determine their functional requirements and “impact” on the TMC. Traffic Management and traveller information systems are examples of user services in the ITS plan. In this review, the objectives and expected coverage of the systems should also be examined.

ANNUAL PROJECT LAYOUT

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
					Each user service requires associated field devices to be deployed. For example, incident management technologies require detection (loops, wireless), verification (CCTV cameras), response and removal. Integration with ATIS will require VMS, websites and possibly radio/media. Each system has a physical impact on the TMC operator. As more systems are added, resources (operators) must monitor and coordinate additional functions.
11.1	ITS and Innovation Committee	Smart City	2019	Medium	Develop a City ITS Committee Charter; SLT approval of Charter and Committee.
13.1	Active Transportation Projects	ENG	2019	Medium	Integration of ITS into the active transportation network shall be identified and aligned to the Active Transportation Plan. Key projects are related to: - Advanced safety warning systems for shared networks - Pedestrian and cyclist data collection (note – this also aligns to the Data Collection and Management Strategy)

ANNUAL PROJECT LAYOUT

2020 IMPLEMENTATION PLAN / ACTION ITEMS

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
1.1	Advanced Traveller Information Systems (ATIS)	IT	2019	High	Develop prototype with wireframes and content management system (CMS) for St Albert ATIS website with interfaces to devices. Select the CMS for the site for testing and integration. Prepare detailed design, specifications and test plans for hardware and software and final design of the website.
1.2	Real Time Web Camera Program	ENG	2018	Medium	Develop network architecture for the system. Undertake preliminary and detailed design of all hardware including poles, foundations, clamps, electrical conduit, telecommunications, and software. Detail specifications of selected hardware and software. Procure CCTV hardware and software. Undertake factory and field acceptance testing.
1.3	Bluetooth Travel Information	ENG	2018	High	Expansion of the Bluetooth Travel program.
1.5	Road Weather Information Systems (RWIS)	ENG	2018	Medium	Develop functional requirements for RWIS in support of traffic management and traveller information systems. Assess specific RWIS data needs in the City including air and surface temperature, barometric pressure, pavement conditions (dry, wet, snow, ice), type and intensity of precipitation, humidity, visibility, windspeed and direction Select location(s) for RWIS that may pose hazardous conditions on the network.

ANNUAL PROJECT LAYOUT

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
1.6	Speed Advisory System (note aligns to programs such as Safe Journeys to School and Neighbourhood Traffic Calming)	ENG	2018	High	Expansion of the Speed Advisory System.
1.7	Traffic Data Collection and Management	ENG	2018	High	Pending completion of the Data Collection and Management Strategy (Project 8.1), follow process / plans for network data collection.
2.1	Integrated Corridor Management (ICM) Program	ENG	2020	Medium	Identify the St. Albert corridors for the ICM work plan, especially networks for roads, pedestrians, cycling routes, transit service, and goods movement corridors. Identify alternative routes – often parallel or connecting routes and opportunities for integration. Identify locations that are key entry and exit points to the City. Develop functional requirements for the ICM program, network-wide. Based on the functional requirements, collect background data on each corridor. Identify intermodal transfer or coordination points where users can easily move from one mode to another, seamlessly. Develop alternate modal routes for corridors – if one route or segment is blocked, other corridors can relieve the traffic load and balance demand.
			2023	Medium	ICM Pilot Project.
2.2	Adaptive Signal Control	ENG	2021	High	Expansion of the adaptive signal operations.

ANNUAL PROJECT LAYOUT

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
7.3	St. Albert Research Partnerships	Smart City	2019	Medium	Develop possible research partnerships with agencies with an interest in similar functions.
8.1	Data Management Strategy	ENG	2019	High	Develop functional requirements of the IoT platform.
10.1	Traffic Management Centre Functional Program & Concept	ENG	2019	Medium	Review of the St. Albert ITS Strategic Plan and related projects including the telecommunications network. Each ITS user service and application should be examined by phase to determine their functional requirements and "impact" on the TMC. Traffic Management and traveller information systems are examples of user services in the ITS plan. In this review, the objectives and expected coverage of the systems should also be examined. Each user service requires associated field devices to be deployed. For example, incident management technologies require detection (loops, wireless), verification (CCTV cameras), response and removal. Integration with ATIS will require VMS, websites and possibly radio/media. Each system has a physical impact on the TMC operator. As more systems are added, resources (operators) must monitor and coordinate additional functions.
11.1	ITS and Innovation Committee	Smart City	2019	Medium	Administer ongoing ITS and Innovation Committee meetings and reports.

ANNUAL PROJECT LAYOUT

2021 IMPLEMENTATION PLAN / ACTION ITEMS

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
1.1	Advanced Traveller Information Systems (ATIS)	IT	2019	High	Procure hardware and software including testing. Website will be tested and debugged on a test server before transferring to the production server.
1.2	Real Time Web Camera Program	ENG	2018	Medium	Expansion of the real time camera program.
1.3	Bluetooth Travel Information	ENG	2018	High	Expansion of the Bluetooth Travel program.
1.5	Road Weather Information Systems (RWIS)	ENG	2018	Medium	Determine how RWIS data will be used and through which channels the information will be disseminated. Develop channels for information dissemination.
1.6	Speed Advisory System (note aligns to programs such as Safe Journeys to School and Neighbourhood Traffic Calming)	ENG	2018	High	Expansion of the Speed Advisory System
1.7	Traffic Data Collection and Management	ENG	2018	High	Pending completion of the Data Collection and Management Strategy (Project 8.1), follow process / plans for network data collection.
2.1		ENG	2020	Medium	Develop evaluation criteria for an ICM pilot location which can be a corridor, area of development and involve multiple modes.

ANNUAL PROJECT LAYOUT

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
	Integrated Corridor Management (ICM) Program				Prepare a concept of operations and network architecture for the recommended pilot project.
2.2	Adaptive Signal Control	ENG	2018	High	Expansion of the adaptive signal operations.
7.3	St. Albert Research Partnerships	Smart City	2019	Medium	Develop possible research partnerships with agencies with an interest in similar functions.
10.1	Traffic Management Centre Functional Program & Concept	ENG	2019	Medium	Review of the St. Albert ITS Strategic Plan and related projects including the telecommunications network. Each ITS user service and application should be examined by phase to determine their functional requirements and "impact" on the TMC. Traffic Management and traveller information systems are examples of user services in the ITS plan. In this review, the objectives and expected coverage of the systems should also be examined. Each user service requires associated field devices to be deployed. For example, incident management technologies require detection (loops, wireless), verification (CCTV cameras), response and removal. Integration with ATIS will require VMS, websites and possibly radio/media. Each system has a physical impact on the TMC operator. As more systems are added, resources (operators) must monitor and coordinate additional functions.
11.1	ITS and Innovation Committee	Smart City	2019	Medium	Administer ongoing ITS and Innovation Committee meetings and reports.

ANNUAL PROJECT LAYOUT

2022 IMPLEMENTATION PLAN / ACTION ITEMS

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
1.1	Advanced Traveller Information Systems (ATIS)	IT	2019	High	Manage and Maintain the ATIS.
1.2	Real Time Web Camera Program	ENG	2018	Medium	Expansion of the real time camera program.
1.3	Bluetooth Travel Information	ENG	2018	High	Expansion of the Bluetooth Travel program.
1.5	Road Weather Information Systems (RWIS)	ENG	2018	Medium	Expansion of RWIS program at prioritized locations.
1.6	Speed Advisory System (note aligns to programs such as Safe Journeys to School and Neighbourhood Traffic Calming)	ENG	2018	High	Expansion of the Speed Advisory System.
2.1	Integrated Corridor Management (ICM) Program	ENG	2020	Medium	ICM Pilot Project.
2.2	Adaptive Signal Control	ENG	2018	High	Expansion of the adaptive signal operations.
7.3	St. Albert Research Partnerships	Smart City	2019	Medium	Develop possible research partnerships with agencies with an interest in similar functions.

ANNUAL PROJECT LAYOUT

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
8.1	Data Management Strategy	ENG	2019	High	Develop migration strategy or actions for shift to IoT platform.
10.1	Traffic Management Centre Functional Program & Concept	ENG	2019	Medium	Assess and summarize, by phase, the TMC operator functions and related physical requirements. The assessment should include peak and off-peak periods. Convert each TMC operator task into a time allocation over each phase of the ITS plan. This conversion will lead to an estimate of the number of operators required by phase including supervisors. Examine other staff requirements in addition to TMC operators. Additional staff may be required in the TMC including those involved in traffic control, IT/data, telecommunications, field technicians, Emergency Services, Transit, Municipal Enforcement, building services, maintenance and managers. Review and estimate the number of TMC operator and supervisor work stations to support the staff.
11.1	ITS and Innovation Committee	Smart City	2019	Medium	Administer ongoing ITS and Innovation Committee meetings and reports.

ANNUAL PROJECT LAYOUT

2023 IMPLEMENTATION PLAN / ACTION ITEMS

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
1.1	Advanced Traveller Information Systems (ATIS)	IT	2019	High	Manage and Maintain the ATIS.
1.2	Real Time Web Camera Program	ENG	2018	Medium	Expansion of the real time camera program.
1.3	Bluetooth Travel Information	ENG	2018	High	Expansion of the Bluetooth Travel program.
1.5	Road Weather Information Systems (RWIS)	ENG	2018	Medium	Expansion of RWIS program at prioritized locations.
1.6	Speed Advisory System (note aligns to programs such as Safe Journeys to School and Neighbourhood Traffic Calming)	ENG	2018	High	Expansion of the Speed Advisory System.
2.1	Integrated Corridor Management (ICM) Program	ENG	2020	Medium	ICM Pilot Project Continued (implementation and evaluation).
2.2	Adaptive Signal Control	ENG	2018	High	Expansion of the adaptive signal operations.
7.3	St. Albert Research Partnerships	Smart City	2019	Medium	Develop possible research partnerships with agencies with an interest in similar functions.

ANNUAL PROJECT LAYOUT

Project Number	Project Name	Lead	Anticipated Completion	Priority in Short Term	Task
10.1	Traffic Management Centre Functional Program & Concept	ENG	2019	Medium	Estimate the TMC spatial requirements by phase. Develop a floor plan for various concepts that illustrates locations for operator work stations, offices, major spaces, and video wall. Data rooms and other spaces would also be shown. Human factors guidelines would be used in developing the design. Assess video wall requirements including support and air flow (cooling). Governance and operations. Review operational policies. Prepare a cost estimate for the preliminary design of the TMC including capital, operations and maintenance.
11.1	ITS and Innovation Committee	Smart City	2019	Medium	Administer ongoing ITS and Innovation Committee meetings and reports.

PROJECT LAYOUT

Project Number	Project Name	Lead	Prerequisites	Priority in Short Term	Task Start Year	Task Completion Year	Task
1.1	Advanced Traveller Information Systems (ATIS)	IT	- Data Management Strategy - Telecommunications Strategy	High	2019	2019	Develop functional requirements for city wide traveller information website.
						2019	Prepare a work plan with ranked projects for design and implementation to feed the website. Projects may include the procurement and installation of technology around the City.
					2020	2020	Develop prototype with wireframes and content management system (CMS) for St. Albert ATIS website with interfaces to devices. Select the CMS for the site for testing and integration.
						2021	Prepare detailed design, specifications and test plans for hardware and software and final design of the website.
					2021	2022	Procure hardware and software including testing.
						2022	Website will be tested and debugged on a test server before transferring to the production server.
1.2	Real Time Web Camera Program	ENG	- Data Management Strategy - Telecommunications Strategy	Medium	2018	2018	Develop functional requirements for CCTV cameras based on the City ITS Strategy.
							Review of current CCTV technologies, integration requirements into the network (ATIS site) and test plans.
							Assess CCTV standards including compliance with NTCIP 1205.
					2019	2019	Prepare concept of operations that considers the prerequisite projects such as the traveller information web site and telecommunications.
							Develop evaluation criteria for ranking CCTV camera locations.
							Identify ranked corridors, key and strategic locations for real time City web cameras.
						2021	Evaluate the St Albert Tr. CCTV pilot project including reliability, performance, costs and responsiveness under different conditions including night vision and poor weather.

PROJECT LAYOUT

Project Number	Project Name	Lead	Prerequisites	Priority in Short Term	Task Start Year	Task Completion Year	Task
					2019	2021	Prepare a "lessons learned" for the project, benefits and best practice recommendations for future City deployments.
					2020	2020	Develop network architecture for the system.
						2021	Undertake preliminary and detailed design of all hardware including poles, foundations, clamps, electrical conduit, telecommunications, and software.
					2021	2021	Detail specifications of selected hardware and software.
					2022	2022	Procure CCTV hardware and software.
						2024	Expansion of the real time camera program.
1.3	Bluetooth Travel Information	ENG	- Data Management Strategy - Telecommunications Strategy - ATIS Program & Website	High	2018	2019	Develop evaluation criteria for Bluetooth deployment, so that additional appropriate corridors can be selected for the technology. Typically, these corridors may have variations in travel times due to non-recurring congestion or other factors.
							Develop a candidate ranked list of corridors, including the end points for the Bluetooth System.
							St Albert Trail Pilot Project for Bluetooth technology
							Prepare functional requirements, detailed design and specifications for the Bluetooth system.
					2019	2019	Develop a prioritized implementation plan for future Bluetooth ATIS deployments.
						2022	Expansion of the Bluetooth Travel program.
1.5	Road Weather Information Systems (RWIS)	ENG	- Data Management Strategy - Telecommunications Strategy	Medium	2019	2020	Review the current RWIS sites for performance, results and costs. Assess the standards used in the current sites in terms of NTCIP compliance.
					2020	2020	Develop functional requirements for RWIS in support of traffic management and traveller information systems.

PROJECT LAYOUT

Project Number	Project Name	Lead	Prerequisites	Priority in Short Term	Task Start Year	Task Completion Year	Task
					2020	2020	Assess specific RWIS data needs in the City including air and surface temperature, barometric pressure, pavement conditions (dry, wet, snow, ice), type and intensity of precipitation, humidity, visibility, windspeed and direction.
							Develop a candidate ranked list of corridors and locations, for RWIS technology
					2021	2021	Determine how RWIS data will be used and through which channels the information will be disseminated.
							Develop channels for information dissemination.
						2024	Expansion of RWIS program at prioritized locations.
1.6	Speed Advisory System	ENG	- Data Management Strategy - Collision / Traffic Data reporting	High	2018	Ongoing	Collect collision data and history for primary St. Albert corridors and neighbourhood roads.
						Ongoing	Review locations and data for school and playground zones.
					2019	Ongoing	Prepare evaluation criteria for prioritizing system implementation.
					2020	Ongoing	Expansion of the Speed Advisory System
1.7	Traffic Data Collection and Management	ENG	- Data Management Strategy - Collision / Traffic data reporting - Telecommunications Strategy	High	2018	Ongoing	· Annual traffic counting · Annual traffic control & pedestrian warrant reviews · Network data collection for support of programs (Safe Journeys to School, Neighbourhood Traffic Calming, Pavement Management) · Integration of short-term ITS technologies to collect new information · Collision data collection / validation / reporting Note – The Data Collection and Management Strategy Development (Project 8.1) is critical to the program and following completion may impact processes / delivery.

PROJECT LAYOUT

Project Number	Project Name	Lead	Prerequisites	Priority in Short Term	Task Start Year	Task Completion Year	Task
2.1	Integrated Corridor Management (ICM) Program	ENG	- Data Management Strategy - Telecommunications Strategy	Medium	2021	2022	Identify the St. Albert corridors for the ICM work plan, targeting networks for roads, pedestrians, cycling routes, transit service, and goods movement corridors.
							Identify alternative routes – often parallel or connecting routes and opportunities for integration.
							Identify locations that are key entry and exit points to the City.
							Develop functional requirements for the ICM program, network-wide.
					2022	2022	Based on the functional requirements, collect / review background data on each corridor.
							Identify intermodal transfer or coordination points where users can easily move from one mode to another, seamlessly.
							Develop alternate modal routes for corridors – if one route or segment is blocked, other corridors can relieve the traffic load and balance demand.
					2023	2023	Develop evaluation criteria for an ICM pilot location which can be a corridor, area of development and involve multiple modes.
							Prepare a concept of operations and network architecture for the recommended pilot project.
					2024	2026	ICM Pilot Project.
2.2	Adaptive Signal Control	ENG	- Data Management Strategy - Telecommunications Strategy	High	2018	2020	Procurement and testing of adaptive signal technology. 2018 = St. Albert Trail Adaptive Signal Pilot.
						2019	Assess network segments and develop evaluation criteria for adaptive signal control.
					Pending site selection	Pending site selection	Conduct microsimulation modelling (if required) on the selected corridor(s) to calibrate the algorithms for adaptive signal systems. Note – 2018 / 2019 St Albert Trail work.

PROJECT LAYOUT

Project Number	Project Name	Lead	Prerequisites	Priority in Short Term	Task Start Year	Task Completion Year	Task
					Pending site selection	Pending site selection	Prepare a functional assessment of the system required for an adaptive signal control system.
					2019	2019	Prepare a ranked list of corridors for potential adaptive signal control.
							Review selected corridor infrastructure for adaptive signal control.
						2021	Detailed design of selected adaptive signal corridor.
					2020	2024	Expansion of the adaptive signal operations.
6.1	Emergency Pre-Emption	EMS	None	Medium	2018	2019	Continue to evaluate primary routes and key intersections for emergency vehicles.
							Confirm capability of supporting pre-emption at intersections.
						Ongoing	Expand technology deployment as per functional requirements and concept of operations.
7.3	St. Albert Research Partnerships	Smart City	- Data Management Strategy	Medium	2019	2019	Review status and details of all current and planned research projects including duration, vendor, standards, hardware and software.
						Ongoing	Review and define goals, objectives, performance indicators, and evaluation criteria of research projects.
							Summarize results of research projects, including a recommended migration to integrate any new and successful technologies into the ITS programs and projects.
							Develop possible research partnerships with agencies with an interest in similar functions.

PROJECT LAYOUT

Project Number	Project Name	Lead	Prerequisites	Priority in Short Term	Task Start Year	Task Completion Year	Task
8.1	Data Management Strategy	ENG / IT	- Telecommunications Strategy	High	2019	2020	Develop a Data Collection and Management Strategy. Target areas of types of data collected, infrastructure and technology used, how information is stored and shared and "data flow".
							Develop functional requirements for Interim Advanced Traffic Management System (ATMS). See Project 1.1 for ATMS details / considerations.
					2020	2022	Develop functional requirements of the IoT platform.
					2025	2026	Migration strategy or actions for shift to IoT platform.
8.2	Telecommunications Strategy	IT	- Data Management Strategy	High	2018	Ongoing – pending technology	Review and establish ITS devices compliance to NTCIP standards (identify anything non-compliant and seek process or tasks needed to integrate into the larger system.
					N/A	Monitoring ongoing	Bandwidth analysis. Preliminary completed – continued evaluation of needs.
							Develop Network Architecture Design. Preliminary completed – continued evaluation of expansion.
10.1	Traffic Management Centre Functional Program & Concept	ENG	- Data Management Strategy - Telecommunications Strategy	Medium	2019	2021	Review of the St. Albert ITS Strategic Plan and related projects including the telecommunications network. Each ITS user service and application should be examined by phase to determine their functional requirements and "impact" on the TMC. Traffic Management and traveller information systems are examples of user services in the ITS plan. In this review, the objectives and expected coverage of the systems should also be examined.

PROJECT LAYOUT

Project Number	Project Name	Lead	Prerequisites	Priority in Short Term	Task Start Year	Task Completion Year	Task
					2019	2021	Each user service requires associated field devices to be deployed. For example, incident management technologies require detection (loops, wireless), verification (CCTV cameras), response and removal. Integration with ATIS will require VMS, websites and possibly radio/media. Each system has a physical impact on the TMC operator. As more systems are added, resources (operators) must monitor and coordinate additional functions.
					2022	2023	Assess and summarize, by phase, the TMC operator functions and related physical requirements. The assessment should include peak and off-peak periods.
							Convert each TMC operator task into a time allocation over each phase of the ITS plan. This conversion will lead to an estimate of the number of operators required by phase including supervisors.
							Examine other staff requirements in addition to TMC operators. Additional staff may be required in the TMC including those involved in traffic control, IT/data, telecommunications, field technicians, Emergency Services, Transit, Municipal Enforcement, building services, maintenance and managers.
							Review and estimate the number of TMC operator and supervisor work stations to support the staff.
					2023	2023	Estimate the TMC spatial requirements by phase.
							Develop a floor plan for various concepts that illustrates locations for operator work stations, offices, major spaces, and video wall. Data rooms and other spaces would also be shown. Human factors guidelines would be used in developing the design.

PROJECT LAYOUT

Project Number	Project Name	Lead	Prerequisites	Priority in Short Term	Task Start Year	Task Completion Year	Task
							Assess video wall requirements including support and air flow (cooling).
					2024	2025	Governance and operations.
							Review operational policies.
							Prepare a cost estimate for the preliminary design of the TMC including capital, operations and maintenance.
11.1	ITS and Innovation Committee	Smart City	None	Medium	2019	2019	Develop a City ITS Committee Charter; SLT approval of Charter and Committee
					2020	Ongoing	Administer ongoing ITS and Innovation Committee meetings and reports
13.1	Active Transportation Projects	ENG	- Data Management Strategy - Telecommunications Strategy - Active Transportation Plan	Medium	2019	2021	Integration of ITS into the active transportation network shall be identified and aligned to the Active Transportation Plan. Key projects are related to: - Advanced safety warning systems for shared networks - Pedestrian and cyclist data collection (note – this also aligns to the Data Collection and Management Strategy)