Acknowledgements

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Oregon Department of Transportation

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TRANSPORTATION SOLUTIONS

Table of Contents

List of Tables

List of Figures

Oregon Department of Transportation

DKS Associates
TRANSPORTATION SOLUTIONS

Project Background

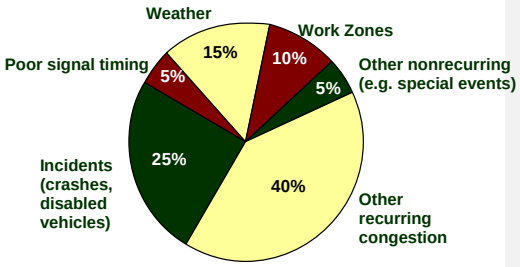
The *Salem-Keizer Intelligent Transportation System (ITS) Plan* was collectively developed by the Oregon Department of Transportation (ODOT), the City of Salem, the City of Keizer, Marion County, Polk County, the Mid Willamette Valley Council of Governments (MWVCOG), the Willamette Valley Communication Center (WVCC) and the Federal Highway Administration (FHWA). The outcome is a 20-year deployment plan of ITS projects, which includes advanced technologies and management techniques, aimed to improve the safety and efficiency of the transportation system and to improve the driving experience for travelers in the Salem-Keizer Metropolitan Area. This effort is consistent with plans put together in other regions statewide to ensure that ITS strategies used are integrated and complementary. This document presents the Executive Summary of the Final Report.

The Problem

Increasing traffic congestion, due to recurring and non-recurring events, affects traveler mobility within the Salem-Keizer region. Congestion results in travel delay, reduced productivity, additional collisions and a frustrated driving public. The City of Salem is the state capital and according to the 2004 census estimates[1], the second largest city in Oregon. Many corridors in the Salem-Keizer Metropolitan Area are currently operating at capacity. As the population continues to increase, the number of vehicles on the road will also increase; ultimately resulting in more congestion. Freight mobility on Interstate 5 and transportation facilities such as the Marion and Center Street bridges that provide limited access to West Salem from downtown contribute to the transportation challenges in the region. Non-recurring congestion caused by incidents, construction and special events along the waterfront and at the Capitol building also have significant effects on traveler delay and contributes to a frustrated motoring public. Incidents reduce the capacity of a roadway, and whether it occurs within the city or on surrounding roadways, can have region-wide impacts on the transportation system and travelers. As the region continues to expand, a coordinated approach will be necessary to manage the transportation system and continue to provide accessible traveler information to motorists. Agencies working together and sharing resources will be the most efficient way to manage the transportation system. There is not one single answer to solving these problems, but ITS offers a cost effective way to obtain a more efficient transportation system without adding more capacity.

Over half (60 percent) of congestion results from temporary disruptions to traffic flow, caused from weather, work zones, special events and incidents, thus demonstrating a significant need for improvements specifically tied to these problem areas. These temporary disruptions reduce the roadway capacity and unanticipated disruptions have negative effects on travel time reliability for travelers and also for freight carriers, thus affecting economics.

Reasons for Congestion



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[1] U.S. Census Bureau Website. Accessed online: www.census.gov June 2005.

Project Background

An integrated ITS system can help to reduce the impacts and return the system to full capacity, whereas simply building new roads and adding capacity cannot solve these unexpected events. A focus on preserving operational capacity by managing operations day to day and creating and implementing a coordinated ITS plan will yield the most appropriate benefits for these scenarios.

The Opportunity

ITS applications offer a significant opportunity to improve the safety and efficiency of the surface transportation system and benefit travelers in the Salem-Keizer region. These applications help improve transportation system operations by performing a function more quickly or by providing a service that was not previously available. ITS helps improve the mobility of people and goods on the existing roadway infrastructure and also offers the potential for substantial savings on future construction. Often the importance of investing in operations is overlooked, but is necessary to ensure that the traveling public makes safe and efficient use of existing roadways.

The Future

Within the timeframe of this plan we will see ITS converge with information as well as wireless and automotive technologies that disseminate this information to spark a new and more efficient way of providing customers with the best transportation services possible. Customer service will be the primary principle to govern the deployment of ITS.

The Oregon traveler of tomorrow is our most important customer. We are not deploying ITS to solely benefit the City, Counties or State Governments. We are deploying ITS to benefit the traveler. The Oregon traveler of tomorrow has a PDA and is served by wireless connectivity. The Oregon traveler of tomorrow will have a smart vehicle with a guidance system. The Oregon traveler of tomorrow will choose to use transit if he/she can be more productive en route. The Oregon traveler of tomorrow will base his mode and trip route decisions on reliability, not congestion. The traveler might select and view video clips of alternate routes and make an informed decision. This will require public agencies to enhance wireless communication of data with on-board vehicle technology being deployed by the automotive industry. Cell phone signal tracking, 511, and the GM On-star product, are good examples of traveler accessible information at all points on his/her route. In the future, destination problems may be communicated to the en route vehicle without requiring the driver to initiate the contact.

Understanding the customer, understanding the technology the customer desires (will purchase), and finally helping the customer avoid transportation problems automatically is critical to the successful management of our transportation system of tomorrow. The customer who avoids transportation problems does not contribute to the problem, and thereby helps to solve it! The consolidating common thread in all transportation management tasks will be customer service.

ITS systems of the future will not be deployed as separate traffic, transit and emergency management systems as the ITS Architecture seems to depict. ITS systems of tomorrow will be deployed with a single customer service focus. Consolidating ITS systems into a single customer service focus, will support data sharing between emergency, traffic and transit management resulting in reduced deployment costs and common information.

Project Background

What is ITS?

Intelligent Transportation Systems (ITS) involve the application of advanced technologies and management techniques to relieve congestion, enhance safety, provide services to travelers, and assist transportation system operators in implementing suitable traffic management strategies. ITS focuses on increasing the efficiency of existing transportation infrastructure, which enhances the overall system performance and reduces the need to add capacity (e.g., travel lanes). Efficiency is achieved by providing services and information to travelers so they can make better travel decisions and to transportation system operators so they can better manage the system.

Why Develop an ITS Plan?

An ITS plan provides a framework of policies, procedures, and strategies for integration of a region's existing resources to effectively meet future regional transportation needs and expectations. Within the Salem-Keizer Metropolitan Area, many opportunities exist for incorporating ITS into the region including:

- City of Salem's central signal system and existing and planned communication infrastructure
- ODOT's Incident Response Program
- ODOT's TripCheck and 511 traveler information systems
- Northwest Transportation Operations Center

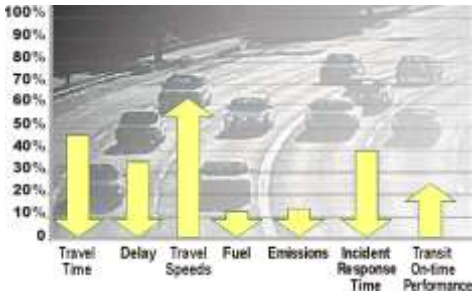
In addition, the following factors outlined below, provide the basis for developing an ITS plan for the Salem-Keizer Metropolitan Area:

- The region endeavors to maximize the efficiencies and improve the safety of the existing infrastructure.
- The public demands better information about traffic congestion and weather-related information.
- The plan fosters multi-agency coordination for system operations.
- The Federal Highway Administration requires that all ITS projects funded through the Highway Trust Fund shall be in conformance with the National ITS Architecture and applicable standards by April 2005 or prior to requesting federal funds for ITS projects any time thereafter.

What are the Expected Benefits?

Intelligent Transportation System projects are aimed at improving the safety and operational efficiency of our existing transportation infrastructure by:

- Reducing vehicle delays related to recurrent and non-recurrent congestion
- Reducing collisions and incident response times
- Providing travelers with real-time information to make informed route and mode choice decisions



Quantifiable benefits resulting from Intelligent Transportation Systems include:

- Reduced vehicle delays
- Reduced number of collisions
- Improved air quality
- Reduced fuel consumption
- Improved travel times

Other accrued benefits, which are more difficult to quantify, include improved travel time reliability, reduced driver frustration, and reduced driver anxiety from having real-time travel information. Additionally, improved efficiency due to coordinated and cooperative agency actions can produce long term savings, particularly in relation to coordinating regional projects and a coordinated regional response to incidents. ITS deployments around the state of Oregon have yielded many of these; some of these are benefits are highlighted below.

Traveler Information

The dissemination of real-time traveler information provides travelers the ability to make informed travel choices, which could include changing a route, or selecting an alternate mode of travel. The resulting benefits include:

- 7- to 12-percent reduction in travel time
- Up to 33-percent reduction in emissions

Incident Management

The Oregon Department of Transportation, in association with the Oregon State Police, currently operates an incident management program in Region 2 to assist disabled vehicles. The incident management program includes incident response vehicles that patrol the Region 2 roadways to assist motorists and reduce the duration of incidents and reduce the resulting traffic congestion. Based on an evaluation of the program, the following benefits have been identified:

- 15-percent reduction in average incident duration
- 35-percent reduction in vehicle-hours of incident delay

Transit Management

ITS benefits also apply to alternate travel modes such as transit. The use of a global positioning system (GPS) on transit vehicles and devices at traffic signals allow transit vehicles to proceed through the signal by providing an early green or green extension. A joint TriMet and City of Portland project has experienced the following initial benefits:

- 8- to 10-percent improvement in service reliability
- Up to 10-percent reduction in travel time

Project Background

Project Approach

Figure 1 illustrates the project approach used to develop this ITS plan for the Salem-Keizer Metropolitan Area. The stakeholder outreach program has been a key component of every aspect of this plan development and ensures a plan that meets regional needs regardless of jurisdiction. A Steering Committee composed of key stakeholders from regional transportation agencies and the regional 911 center guided the project. Additional input came from expanded stakeholders, such as emergency management personnel, maintenance personnel and city officials. Key outreach activities included the following:

- Monthly steering committee meetings
- Interviews with key stakeholders to collect existing conditions and transportation user needs information
- Two expanded stakeholder workshops (User Needs Workshop and Deployment Plan Workshop)

Figure 1. Project Approach

Mission, Goals & Objectives

To guide the development and ultimate deployment of intelligent transportation systems in the Salem-Keizer Metropolitan Area, key project stakeholders developed a mission statement and accompanying goals and objectives.

Salem-Keizer Mission Statement

To enhance economic productivity by improving the safety, efficiency, and reliability of our existing and future transportation system using enhanced operations, advanced technologies, coordinated management techniques and real-time information

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Salem-Keizer Goals and Objectives

Goal #1 Improve the safety, efficiency and reliability of our transportation system.

Objectives

- Reduce frequency, duration, and effects of incidents.
- Reduce emergency response times.
- Reduce recurrent congestion.
- Coordinate incident/emergency response with other local and regional agencies.
- Improve the management and operations during incidents and emergencies.

Goal #2 Enhance management of the transportation system to improve maintenance and operations efficiencies.

Objectives

- Reduce the number of stops.
- Reduce overall vehicle-hours of delay.
- Reduce incident related capacity restrictions.
- Increase average vehicle occupancy.
- Reduce intermodal transfer time.
- Reduce fuel consumption and environmental impacts.
- Provide weather information to coordinate snow and ice removal.
- Enhance management and maintenance of vehicle fleets.
- Provide more efficient response to customer complaints.
- Reduce operating costs by improving maintenance and operations processes.

Goal #3 Improve traveler mobility.

Objectives

- Reduce recurrent and non-recurrent congestion related delay.
- Improve travel time for all transportation system users including transit vehicles, commuters, freight, and tourists.
- Improve travel time reliability.
- Improve transit travel time reliability.

Goal #4 Deploy functional and cost efficient ITS infrastructure.

Objectives

- Provide real-time multi-modal transportation system information to travelers.
- Provide real-time information about construction activities.
- Provide incident information.
- Provide real-time road condition and weather information.
- Provide one location where customers can access all regional and local traveler information.
- Provide accessible traveler information to all users of the transportation system.
- Provide one central location for dissemination of all traveler information.

Goal #5 Integrate regional ITS projects with local and regional partners.

Objectives

- Deploy systems that fit in with future improvements and can be coordinated and integrated with other agencies.
- Deploy systems with a high benefit-to-cost ratio and maximize the use of existing infrastructure.
- Deploy systems with minimal maintenance and operational support requirements.
- Integrate deployments with other local and regional projects.
- Share infrastructure and operations resources between local and regional agencies.
- Build consensus among the Steering Committee members.
- Follow a phased plan and implement projects with high likelihood of success.
- Evaluate ITS projects using before and after surveys to document and promote the benefits and educate the public.
- Use data collection devices to document and track the transportation system performance.
- Educate decision makers, operators, planners and engineers using outreach, project benefit summaries, training and workshops.

Salem-Keizer ITS Architecture

The National ITS Architecture and the Oregon Statewide ITS Architecture provide the basis for the Salem-Keizer Regional ITS Architecture. The Salem-Keizer ITS Architecture is characterized by linking separate systems and stakeholders to provide an overall coordinated approach to ITS deployment as depicted in Figure 2. Although the graphic depicts separate management systems, the region should seek to consolidate systems at the data sharing level to support a coordinated and consistent management approach. Providing compatibility amongst jurisdictions will enable the region to fully maximize the use of ITS technologies and manage the transportation network on a regional scale.

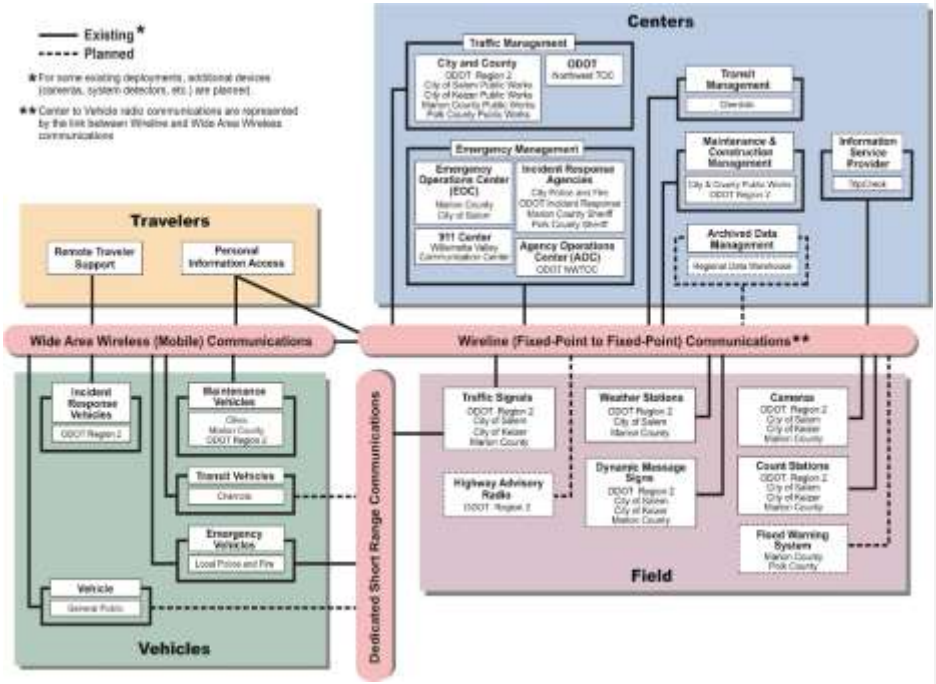


Figure 2. Salem-Keizer Area High-Level Physical Architecture

Operational Concept

The operational concept, which supplements the ITS physical architecture, defines the roles and responsibilities of the participating transportation and emergency management agencies and identifies information flows between the agencies in the Salem-Keizer Metropolitan Area. The operational concept defines the responsibilities of the various agencies providing ITS services in the region for activities such as design, construction, integration, planning, operations and maintenance. In addition, the operational concept defines the level and types of information shared between agencies such as data, video, status, request and control.

Implementation Plan

The Salem-Keizer ITS Implementation Plan can be defined by three time frames: 0-5 years, 6-10 years, and 11-20 years. Based on stakeholder input and key findings from system evaluations, the projects recommended for implementation in the Salem-Keizer Metropolitan Area have been organized and described by the following program areas:

- Traffic Management (TM)
- Traveler Information (TI)
- Communications (CO)
- Public Transportation Services (PT)
- Emergency Management (EM)
- Archived Data Management (AD)
- Maintenance & Construction Management (MC)

The following section discusses each ITS program area, high priority project costs for projects that will be implemented in the 0-5 year timeframe, and some additional descriptions of key high priority projects. Table 6 includes a brief description of each project included in the 20-year plan. The project numbers used in this table are for reference purposes only and although they generally follow the ranking developed by the steering committee, do not solely indicate project priority. Table 7 includes an implementation schedule that was determined based on a scoring exercise to determine project rankings. Criteria included: safety/crash prevention, traffic volumes, key traveler decision location, user needs, statewide consistency, relativity to other planned projects, short term funding availability, input from the Steering Committee, cost, expected benefits, technical and institutional feasibility and equitable distribution of projects. Study area corridors were also ranked according to the number of collisions and traffic volumes to phase the deployment of field devices and communications infrastructure.

Traffic Management

Projects within this program area are focused on improving the safety and efficiency of the existing roadway system by providing tools to better manage the existing infrastructure, to coordinate with regional partners, and to provide traveler information to the public. Table 1 describes the projects included in the 5-year plan. The purpose of most of these projects is to improve travel time, to reduce crashes and the effects of crashes, and support incident management.

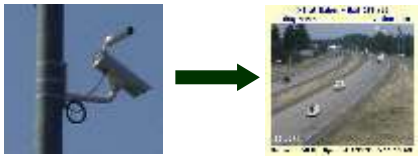
Table 1. Capital Costs for Traffic Management

Traffic Management	Capital Cost
Metropolitan Area Wide Video Deployment	$2,100,000
Incident Management and Operations Plan for West Salem Bridges	$1,100,000
Incident Response Program Enhancements	$500,000
Detour Route Management	$400,000
Total:	**$4,100,000**

Incident Management Plan for West Salem Bridges

This project will provide traffic management and traveler information tools (cameras, advisory radio, moveable barriers) and a specific plan outlining roles and responsibilities for agencies throughout the region and procedures for handling an emergency bridge closure on the Marion and Center Street bridges. This project will also include detour route designations and field devices in the surrounding area to convey real-time traveler information to motorists and send images and roadway information back to transportation and emergency management agencies.

Implementation Plan



Metropolitan Area Wide Video Deployment
This project will post existing City of Salem camera images on ODOT's TripCheck traveler information website. The City of Salem currently has many cameras throughout the study area that are used at the traffic management center to monitor traffic conditions.

Traveler Information

These projects are designed to improve the availability and dissemination of real-time traveler information to assist pre-trip and en-route travel decisions. Enhanced traveler information contributes to benefits related to customer satisfaction and improved safety and reliability of the transportation system.

Table 2. Capital Costs for Traveler Information

Traveler Information	Capital Cost
En-Route Traveler Information System	$980,000
Cable TV Traveler Information	$28,000
Total:	**$1,008,000**

En-Route Traveler Information System
This project will include the deployment of dynamic message signs, arterial message signs, automated detour route signs and Highway Advisory Radio to improve the accessibility of real-time information. Improved incident, construction and weather information for the region and surrounding areas will also be integrated with the existing traveler information systems (i.e. ODOT's TripCheck and 511 system) in the Salem-Keizer region.

Communications

The communication system provides the backbone for deployment of projects in the other six areas by providing a network for exchanging information to and from field devices and stakeholder agencies. The communication network will be deployed on a project by project basis throughout the next 20 years to support the ITS plan as needed. Table 3 illustrates the capital cost of fiber installation on high priority corridors that is not included as part of other deployment projects during the first phase (0-5 years) of implementation.

Table 3. Capital Cost for Communications

Communications	Capital Cost
Fiber Optic Cable Installation	$840,000
Total:	**$840,000**

Archived Data Management

Collecting, archiving, and managing various types of transportation-related data is an integral part of this ITS Plan. Since much of the data collection is closely tied to projects that deploy field devices and systems to collect data, the archived data management project is included in the 11-20 year plan.

Implementation Plan

Public Transportation Services

This program area addresses two major aspects of transit operations: transit agency operations and management and transit traveler information. The projects in this program area are intended to enhance the service of Cherriots fixed route service and other demand-responsive paratransit services that serve the Salem-Keizer area, and to improve the availability of real-time transit traveler information. Table 4 outlines the capital costs for the high priority projects within this program area.

Table 4. Capital Costs for Public Transportation Services

Public Transportation Services	Capital Cost
Automated Vehicle Location (AVL)	$655,000
Real-Time Transit Arrival Information	$150,000
Transit Signal Priority	$130,000
Total:	**$935,000**

Transit Signal Priority

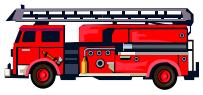
This project will include the installation of transit priority emitters on select coaches and traffic signal controller software upgrades along the selected corridors to support transit signal priority. The first phase will include the High Priority Transportation Corridor (Broadway/North River Road). Future phases of this project will expand transit signal priority capabilities to other corridors in the region.

Real-time Transit Arrival Information

This project will provide real-time transit arrival and departure information to riders via: electronic message signs at selected stops, Cherriots website, integration with ODOT's Regional Trip Planner, mobile phones and PDA's.

Emergency Management

Projects included in this area focus on reducing emergency response times and integrating emergency management with transportation and transit agencies. Emergency response personnel can benefit significantly from improved information about road conditions and incidents. Although there are no projects within this program area in the 0-5 year plan, many projects in other areas will develop the infrastructure needed for the deployment of emergency management projects during the next phases. For example, the deployment of cameras will contribute to improved incident detection and the installation of fiber optic cable will allow future center-to-center connections for information sharing between agencies.



Implementation Plan

Maintenance and Construction Management

These projects are aimed at improving the safety of motorists and workers in construction zones, improving the efficiency of construction management and control, enhancing construction scheduling and tracking weather conditions that affect maintenance. Three key projects are shown in Table 5 and the 5-year deployment schedule.

Table 5. Capital Costs for Maintenance and Construction

Maintenance and Construction Management	Capital Cost
Maintenance and Construction Coordination System	$100,000
Work Zone Management and Safety Monitoring Systems	N/A*
Total:	$100,000

*This project would be funded as part of local construction projects on a project-by-project basis

Maintenance and Construction Coordination System

This project's purpose is to improve traffic mobility through the state of Oregon by providing a central source for all current and planned construction and region-wide/statewide maintenance activities. Deploying an information site that will include details about active and planned construction, weight and width restrictions, and travel times in work zones will ensure that there is always an east-west and north-south route within Oregon for freight movement.

Work Zone Management and Safety Systems

This project will provide portable cameras, variable speed limit signs and speed detection devices to monitor and control traffic conditions in construction work zones that will reduce vehicle conflicts with workers by warning workers of vehicles entering work zones.

Table 6. Deployment Project List (Page 1 of 3)

Project Number and Title	Project Description
SK-PM-01 Program Management & System Evaluation	Management and system evaluation of the Salem-Keizer ITS program. This work will be performed by local agency staff and project consultants.
Traffic Management (TM)	
SK-TM-01 Metropolitan Area Wide Video Deployment	This project will deploy video monitoring cameras to monitor traffic conditions and emergency events, optimize signal timings, view high accident locations, monitor flood and slide zones, and provide roadway condition information to travelers. 0-5 years: Highway 22, Lancaster Drive, Commercial St, Kuebler/Cordon Rd, Salem Parkway, Interstate 5 6-10 years: North River Rd, Hawthorne Ave, Center St, Portland Rd 11-20 years: Wallace Rd, Chemewa Rd, Silverton Rd, Market St, Broadway St, 25th St, State St, 12th/13th St SE, Turner Rd, Liberty Road SE
SK-TM-02 Incident Management Plan for West Salem Bridges	This project will provide traffic management and traveler information tools (cameras, advisory radio, moveable barriers) and a specific plan outlining roles, responsibilities and procedures for handling an emergency bridge closure on Marion/Center Street bridges.
SK-TM-03 Incident Response Program Enhancements	This project builds on the current ODOT incident response program to support incident management on state, county and city roadways. This project will equip incident response vehicles with GPS to enhance dispatch. It will also provide additional incident response vehicles and personnel.
SK-TM-04 Detour Route Management	This project supports incident management in Region 2 and expands the existing detour route plans. Improvements will include the mapping of detour route plans in GIS, incident signal timing plans, electronic message signs, and congestion monitoring to support incident responders and management of the roadway network during incidents. Additional improvements on detour routes will include communications to field devices (traffic signals, vehicle detectors, message signs and cameras). High priority corridors have been selected in the event of an I-5 closure and include: *Cordon Road *Salem Parkway/Commercial/Mission
SK-TM-05 Traffic Data Collection System	This project will deploy vehicle detection equipment around the metropolitan area to automate the collection of vehicle count, speed and classification information
SK-TM-06 Arterial Congestion Map	This project will deploy an arterial congestion map based on system detector data and future floating car data from GPS devices to show travel speeds on roadways througout the region. The City of Salem has a current project to install a significant number of system detector locations that could be used for measuring congestion. It is assumed that GPS data from transit vehicles or future vehicle infrastructure integration projects will provide a more accurate measurement in the future.
SK-TM-07 Advanced Rail Warning System	Deploy railroad crossing train detection to determine rail crossing occupation and duration at crossings at: *Commercial St, Liberty St, Broadway St, Silverton Rd *Center St, State St, Madrona Ave Information will be provided to the NWTOC and the 911 center to notify emergency responders of response routes that are blocked or will soon be blocked and to motorists via message signs or in vehicle navigational systems approaching the crossing to enable them to select an alternate route.
SK-TM-08 Coordinated Emergency Management System	This system will be used for major emergencies to coordinate response and management of the event between multiple agencies. This system will provide a common interface for emergency managers to coordinate response to the event across jurisdictions.
SK-TM-09 Center to Center Integration - ODOT, Salem, Keizer, Marion County, Polk County	This project will implement center-to-center communications between the ODOT NWTOC and other traffic management centers at the City of Salem, City of Keizer, Marion County and Polk County. The center-to-center project could use the ODOT Transportation Operations Center Software as the primary interface but will require some integration to provide a system interface between the City of Salem traffic signal system and the operations center software.
SK-TM-10 Salem Traffic Management Center Upgrade	This project will upgrade the existing City of Salem traffic management center to provide a designated space to manage traffic in the Salem-Keizer metropolitan area.
SK-TM-11 Downtown Salem Parking Management	This project will provide real-time parking information in downtown Salem. Dynamic message signs will be installed and highway advisory radio (HAR) messages will be used to direct motorists to facilities with available parking.

Table 6. Deployment Project List (Page 2 of 3)

Project Number and Title	Project Description
SK-TM-12 Central Signal System Upgrade	The City of Salem's central computer for traffic signal control will be due for replacement within the timeframe of this plan. This project will define and procure a new central signal system to provide additional functionality including advanced signal control, support for camera control, automated incident response signal timing plans and arterial congestion mapping.
SK-TM-13 Adaptive Signal Timing Project	Deploy adaptive signal timing on select signalized corridors in the region with the highest levels of congestion and the most fluctuation in volumes.
SK-TM-14 Flood Warning System	This project will deploy a system to monitor rising water on the roadway and alert transportation managers of high water. This project will include cameras to monitor the common flood areas and dynamic message signs to provide advanced notification to motorists.
SK-TM-15 Slide Monitoring System	This project will deploy a system to monitor frequent slide zones to identify landslides onto the roadway. The project will include cameras to monitor common slide areas and could include dynamic message signs and road closure systems to manage traffic.
SK-TM-16 Advanced Vehicle System - Mayday to TOCS	Provide for information flow (e.g. notification of airbag deployment) from vehicle Mayday systems to the TOC
SK-TM-17 Advanced Vehicle System - Vehicle Navigation System	This project will use a network of short range communications from the roadside to vehicles to transmit regional traveler information to in-vehicle navigation systems.
SK-TM-18 Isolated Intersection Safety Warning System	This project will deploy devices at high crash locations to warn drivers of changing conditions such as "tee" intersections or sharp horizontal curves.
SK-TM-19 Wheatland and Buena Vista Ferry Traveler Information System	This project will provide the operational status of the ferries via arterial message signs that are located at key traveler decision points and highway advisory radio (HAR) messages.
SK-TM-20 Weigh-in-Motion	This project will deploy weigh stations in Marion County.
Traveler Information (TI)	
SK-TI-01 En-Route Traveler Information	Dynamic message signs, city and county websites and highway advisory radio (HAR) will be deployed in the Salem-Keizer metropolitan area to notify motorists of incidents, detour routes, construction and other traveler information.
	Deploy dynamic message signs on the following corridors: 0-5 years: Highway 22, Lancaster Drive, Commercial St, Kuebler/Cordon Rd, Salem Parkway, Interstate 5, 6-10 years: North River Rd, Hawthorne Ave, Center St, Portland Rd 11-20 years: Wallace Rd, Chemewa Rd, Silverton Rd, Market St, Broadway St, 25th St, State St, 12th/13th SE, Turner Rd, Liberty Road SE
	Deploy Highway Advisory Radio
SK-TI-02 Cable TV Traveler Information Channel	This project will provide camera images and other traveler information to cable TV companies to display on a channel in the Salem-Keizer metropolitan area.
SK-TI-03 Broadcast Traveler Information	A dedicated traffic condition radio channel will be provided in the Salem-Keizer metropolitan area to provide traffic condition information.
SK-TI-04 Interactive Traveler Information	This project will allow the motorist to request specific traveler information, utilize dynamic ridesharing, and provide yellow page and reservation services prior to a trip or en-route using wide area wireless connections.
Communications (CO)	
SK-CO-01 Metropolitan Area Communications	This project will phase in new fiber optic communications cable throughout the metropolitan area to provide high speed communications between management centers and between centers and field devices such as cameras.
SK-CO-02 Communications to Isolated Signalized Intersections	This project will provide communications to all signalized intersections in the metropolitan area that are currently isolated from the central signal system computer.
Public Transportation Services (PT)	
SK-PT-01 Paratransit Mobile Data Devices	This project will deploy mobile data devices that will provide the capability to monitor fuel usage, mileage, passengers, and trips. This project will also include automated vehicle location on paratransit vehicles for enhanced dispatch.
SK-PT-02 Maintenance Management System	This system will support electronic tracking of equipment inventory and automatic scheduling of transit maintenance.
SK-PT-03 Transit Signal Priority	The project will include installing transit priority emitters on select coaches and upgrading traffic signal controllers along the selected corridors. The first phase will include the High Priority Transportation Corridor (Broadway/River Road) Future phases of this project will expand transit signal priority capabilities to other corridors in the region.

Table 6. Deployment Project List (Page 3 of 3)

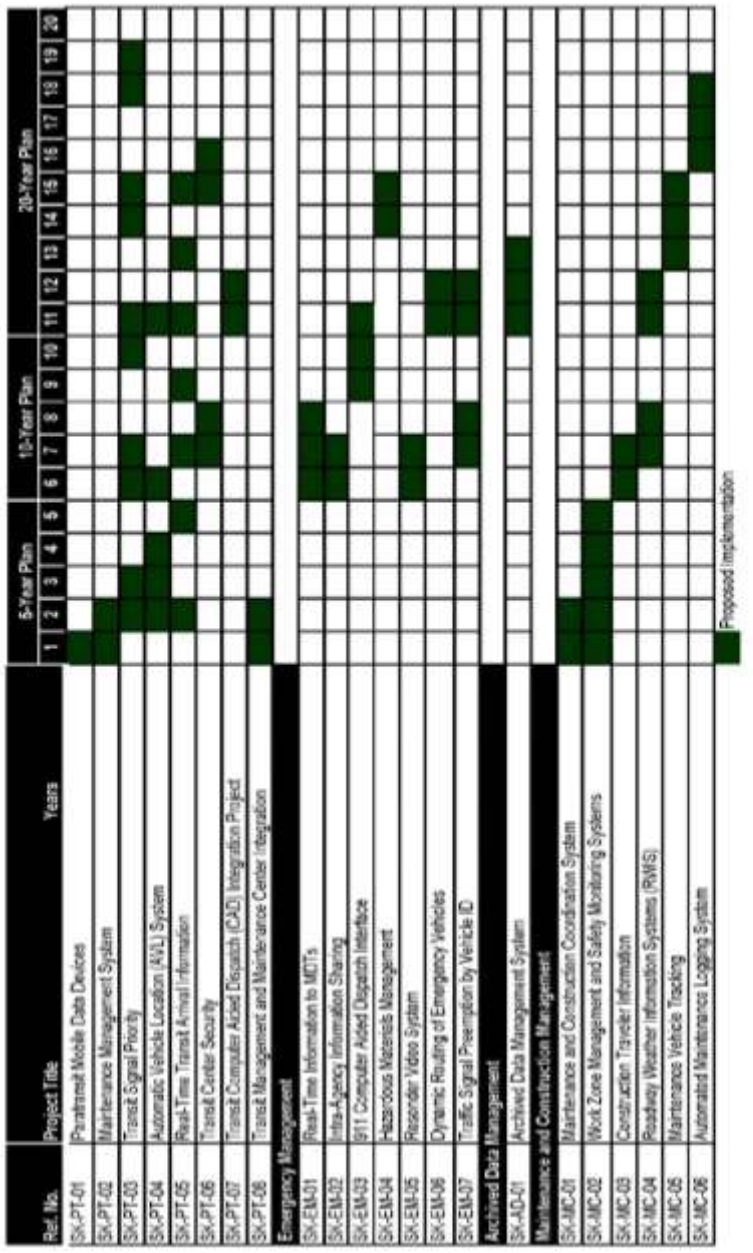
Project Number and Title	Project Description
SK-PT-04 Automated Vehicle Location (AVL) System	Install automated vehicle location (AVL) devices on the Cherriots Transit fleet and integrate transit vehicle locations with the existing computer aided dispatch (CAD) system. This project will support future deployments for transit arrival information, enhanced transit signal priority capabilities, automated passenger counting systems, and using transit vehicles to estimate roadway congestion.
SK-PT-05 Real-Time Transit Arrival Information	This project will provide real-time transit arrival and departure information to riders. The project will provide traveler information via an updated Cherriots website, integration with the Regional Trip Planner, electronic message signs at selected stops, mobile phones and PDA's.
SK-PT-06 Transit Center Security	Cherriots has two new transit centers planned for the future; one in Keizer and one in South Salem. This project will provide security camera images at both sites and communications infrastructure for remote monitoring of the images.
SK-PT-07 Transit Computer Aided Dispatch (CAD) Integration Project	This project will integrate the various CAD systems used today by transit providers in the Salem-Keizer metropolitan area.
SK-PT-08 Transit Management & Maintenance Center Integration	Project would provide communications between the transit management center in downtown Salem and the maintenance management center at DellWeb.
Emergency Management (EM)	
SK-EM-01 Real-Time Information to Mobile Data Devices	Provide real-time traffic information to emergency responder's mobile data devices.
SK-EM-02 Intra-Agency Information (Data/Video) Sharing	This project will provide a two-way information flow (video images from the roadway cameras, related weather and construction information) between traffic management centers, the 911 center, police, fire and Emergency Operations Centers.
SK-TM-03 911 Computer Aided Dispatch Interface	This project will provide a direct interface with the 911 Computer Aided Dispatch system to automatically post traffic-related incidents and provide traffic congestion and video information.
SK-EM-04 Hazardous Materials Management	This project will detect and classify security sensitive hazardous material information in trains and commercial vehicles to coordinate emergency response availability.
SK-EM-05 Responder Video System	Provide emergency/incident responders with video mobile phones and develop a link to the TOC to link video to other agencies.
SK-EM-06 Dynamic Routing of Emergency Vehicles	This project will automatically calculate the ideal route between two points based on real-time roadway congestion, construction, and incident information.
SK-EM-07 Traffic Signal Preemption by Vehicle ID	Implement preemption equipment to provide traffic signal preemption by specific vehicle ID.
Archived Data Management (AD)	
SK-AD-01 Archived Data Management System	This project will enhance the traffic data collection system and provide a central storage facility to archive data. The central data storage facility will collect transportation related data from multiple agencies and provide the data in formats that can be used to manage and study existing transportation systems or to plan new ones.
Maintenance and Construction Management (MC)	
SK-MC-01 Work Zone Safety Systems and Monitoring	This project will provide portable cameras, variable speed limit signs and speed detection devices to monitor and control traffic conditions in construction work zones. It will also deploy technology within work zones that will reduce motor vehicle conflicts with workers by warning workers of vehicles entering work zones.
SK-MC-02 Maintenance and Construction Coordination System	Deploy a construction activity information site that contains details about region wide/statewide maintenance and construction activities by public agencies, and utility companies. The system will include active construction, planned construction, weight and width restrictions, and travel times through work zones.
SK-MC-03 Work Zone Traveler Information Systems	This project will provide travel time information through work zones using electronic message signs, the Internet, and highway advisory radio (HAR).
SK-MC-04 Roadway Weather Information System	Weather stations with roadway temperature, wind speed, humidity, and precipitation sensors will be installed at the following locations: West Salem Hill, East of Cordon Road on Highway 22, Grand Ronde, and Falls City.
SK-MC-05 Maintenance Vehicle Tracking	This project will track maintenance vehicles to enhance dispatch of personnel and equipment to daily events and for management of the transportation network during storms
SK-MC-06 Maintenance Event Logging System	Log maintenance requirements through an automated system to record items that require maintenance as personnel identify them daily.

Table 7. Implementation Plan Schedule

Ref. No.	Project Title / Years	5-Year Plan					10-Year Plan					20-Year Plan									
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
SK-PM-01	Program Management and System Evaluation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Traffic Management																					
SK-TM-01	Metropolitan Area Wide Video Deployment	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
SK-TM-02	Incident Management Plan for West Salem Bridges			■	■	■	■														
SK-TM-03	Incident Response Program Enhancements	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
SK-TM-04	Detour Route Management			■	■				■	■				■	■						
SK-TM-05	Traffic Data Collection System	■	■				■	■				■	■			■	■			■	■
SK-TM-06	Arterial Congestion Map													■	■						
SK-TM-07	Advanced Rail Warning System						■	■				■	■					■	■		
SK-TM-08	Coordinated Emergency Management System						■	■	■												
SK-TM-09	Center to Center Integration - ODOT, Salem, Keizer, Marion County, Polk								■	■											
SK-TM-10	Salem Traffic Management Center Upgrade											■	■								
SK-TM-11	Downtown Salem Parking Management						■	■													
SK-TM-12	Central Signal System Upgrade								■	■	■										
SK-TM-13	Adaptive Signal Timing Project																		■	■	■
SK-TM-14	Flood Warning System						■					■					■				
SK-TM-15	Slide Monitoring System						■					■					■				
SK-TM-16	Advanced Vehicle System - Mayday to TOCS	■																			
SK-TM-17	Advanced Vehicle System - Vehicle Navigation System															■	■		■	■	
SK-TM-18	Isolated Intersection Safety Warning System													■	■			■	■		
SK-TM-19	Weigh-in-Motion Facility											■	■								
Traveler Information																					
SK-TI-01	En-route Traveler Information		■	■				■	■				■	■			■	■			
SK-TI-02	Cable TV Traveler Information Channel			■	■																
SK-TI-03	Broadcast Traveler Information											■	■								
SK-TI-04	Interactive Traveler Information																	■	■		
SK-TI-05	Wheatland and Buena Vista Ferry Traveler Information System											■	■								
Communications																					
SK-CO-01	Metropolitan Area Communications	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
SK-CO-02	Communications to Isolated Signalized Intersections	■	■				■					■									

■ Proposed Implementation

Table 7. Implementation Plan Schedule



Next Steps

This section outlines the steps to successfully implement the proposed ITS plan for the Salem-Keizer Metropolitan Area over the next 20 years.

Deploy "Early" Winner Projects

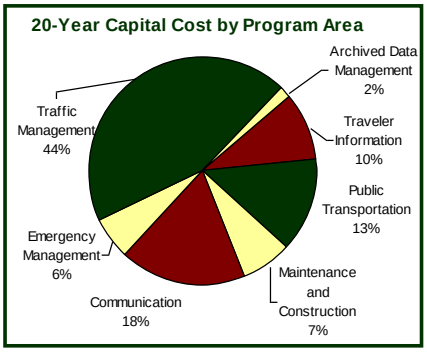
A key to success of ITS in the Salem-Keizer area will depend on the deployment of early winner projects. The Incident Management and Operations Plan for the West Salem Bridges is a potential early winner project because the successful management of incidents on these bridges is critical to the region. This project will require interagency coordination between transportation and emergency management agencies, as well as field device deployment. The cost for this project can be shared between agencies. Another benefit of implementing an early winner project is the ability to showcase the benefits to the public, as well as other agencies to gain continued support for future ITS projects. Another potential early winner project is the Metropolitan Area Wide Video Deployment, since much of the infrastructure (cameras) are already in place and the cost to implement this project would be relatively low.

Incorporate the ITS Plan into the RTSP and Local TSP/SDC

The ITS devices and communication infrastructure identified in this plan should be installed on corridors concurrently with traditional transportation construction and maintenance projects. This approach will minimize reconstruction, maximize the use of resources, and result in the modernization of the regional transportation system. Where applicable, relationships to currently planned regional projects have been identified in the Deployment Plan chapter of the Final Report. In addition, the data collection, analysis, operational techniques and information sharing developed through the projects in this plan can become key elements of other regional efforts. The ITS deployment plan and communication maps, as well as the deployment plan project list, should be adopted in the SKATS Regional Transportation System Plan (RTSP), as well as the Salem and Marion County TSPs. If adopted, ITS projects can become components of local capital improvement plans and possibly SDCs. In addition, the adopted plan maps can be used to require the installation of conduit with roadway projects to support future ITS implementation.

Define a Revenue Stream

Key stakeholders in the Salem-Keizer Metropolitan area will need to define a revenue stream for construction, operations and maintenance. This plan provides the basis for the funding needs and identifies opportunities for regional coordination and cost-sharing. The region must dedicate funding sources to implement each increment of the 20-year plan. Various possibilities exist for securing funding and to be successful the region should emphasize collaborative efforts that benefit a broad group of stakeholders. The total capital and annual operations/maintenance costs for the ITS plan are provided in Table 8. As illustrated, the capital costs are distributed between each program area, with the majority of cost falling in the traffic management category. In addition to these capital costs, this plan will need an on-going commitment to operations and maintenance of the equipment and software to maximize the benefits of the ITS program.



Next Steps

Table 8. Estimated Capital and Operations & Maintenance Costs for 20-Year Plan

Implementation Stage	Estimated Implementation Capital Costs	Estimated Annual Operations & Maintenance Costs*	Estimated Annual Staffing Costs
5-Year Plan: 0 – 5 Years	$6,997,000	$214,000	$240,000
10-Year Plan: 6 – 10 Years	$9,660,000	$266,000	$0
20-Year Plan: 11 – 20 Years	$13,067,000	$359,000	$60,000
TOTAL	**$29,724,000**	**$839,000**	**$300,000**

*Annual operation and maintenance costs are per year for the associated stage

Do Not Overlook Future Needs If They Fit With Current Opportunities

The region should pursue a flexible approach to implementing the plan. Although a schedule has been included as part of this regional plan, opportunities may arise in early years to implement elements of the plan identified for later deployment. New funding sources, coordination with current and planned roadway construction, or coordination with local agency/private initiatives represent new opportunities for implementing ITS projects ahead of schedule. Continued stakeholder participation and commitment to looking for these opportunities can contribute to the successful deployment of projects that will benefit the Salem-Keizer Metropolitan Area.

Lead Agency to Guide ITS Plan Implementation and Maintenance

One agency should be designated to lead and facilitate ongoing deployment, coordination, education and pursuit of funding. This task will be led by the Mid Willamette Valley COG, but will require coordination and participation from all of the key stakeholders. Successful implementation relies heavily on agency cooperation and committed leadership. Key responsibilities for the lead agency will include:

- Facilitate ongoing Steering Committee meetings
- Incorporate the ITS projects into regional project prioritization lists
- Coordinate funding applications for ITS projects
- Coordinate and track project implementation
- Maintain the regional architecture, including the Turbo Architecture file.
- Arrange public outreach sessions as needed.

Mid Willamette Valley Council of Governments

Regional Architecture Maintenance

One of the keys to successful ITS plan implementation is the maintenance of the plan and architecture as ITS projects are implemented, as regional ITS needs and services evolve, and as new technologies emerge. The architecture must be maintained per federal requirements and the FHWA recommends updating the regional architecture for the following primary reasons:

- Changes in regional needs
- Addition of new stakeholders
- Changes in scope of services considered
- Changes in statewide architecture or other architectures in adjoining regions
- Addition or deletion of projects
- Changes in project priority

Next Steps

The architecture maintenance will be led by ODOT, who will also update the Turbo Architecture file, and the Steering Committee will provide input to any changes. Significant changes to the architecture may be made at any time as deemed necessary by the lead agency and the Steering Committee; the changes will be tracked using a change log.

Project Implementation and Conformity

The implementation of ITS projects in the Salem-Keizer Metropolitan Area shall conform to the regional architecture per FHWA requirements. If the final design of an ITS project differs from the regional architecture, then the regional architecture shall be updated as described in this section. The FHWA requires a systems engineering analysis for all ITS projects on a scale commensurate to each project. The systems engineering analysis [2] shall include:

- Identification of portions of the region's ITS architecture being implemented
- Roles and responsibilities of participating agencies
- Definition of functional requirements
- Analysis of alternative system configurations and technology options to meet functional requirements
- Procurement options
- List of applicable ITS standards and testing procedures
- Operation and management procedures and resources

Steering Committee Roles

The Steering Committee, which consists of key stakeholders, helps foster interagency coordination and build consensus throughout the region. The continuing roles of the Steering Committee during the implementation of the ITS plan includes the following:

- Make decisions regarding project phasing. As opportunities arise (funding source, priority shift, or concurrent construction), adjust the project phasing as appropriate
- Help with or coordinate funding applications
- Help with or coordinate project implementation
- Develop memoranda of understanding (MOU's) or intergovernmental agreements (IGA's) as required
- Prepare plans and standards (incident management plans and standards for communication design, work zones, and data management)
- Review changes to the regional architecture

[2] Title 23, Code of Federal Regulations (CFR), Highways, Chapter 1: FHWA, Department of Transportation, Part 940: Intelligent Transportation Systems Architecture and Standards

Glossary of Acronyms

AD	Archived Data Management
AVL	Automated Vehicle Location
CAD	Computer Aided Dispatch
CCTV	Closed Circuit Television
CO	Communications
EM	Emergency Management
EOC	Emergency Operations Center
FHWA	Federal Highway Administration
GIS	Geographic Information System
GPS	Global Positioning System
HAR	Highway Advisory Radio
IGA	Inter-governmental Agreement
ITS	Intelligent Transportation System
MC	Maintenance & Construction Management
MDT	Mobile Data Terminal
MOU	Memorandum of Understanding
MWVCOG	Mid Willamette Valley Council of Governments
NWTOC	Northwest Transportation Operations Center
ODOT	Oregon Department of Transportation
OSP	Oregon State Police
PDA	Personal Digital Assistant
PT	Public Transportation Services
RTSP	Regional Transportation System Plan
SDC	System Development Charge
SKATS	Salem-Keizer Area Transportation Study
TOC	Transportation Operations Center
TI	Traveler Information
TM	Traffic Management
TSP	Transportation System Plan
VMS	Variable Message Sign
VMT	Vehicle Miles Traveled
WVCC	Willamette Valley Communication Center