

Chapter 1: Current & Future Transportation Conditions

1.1 INTRODUCTION

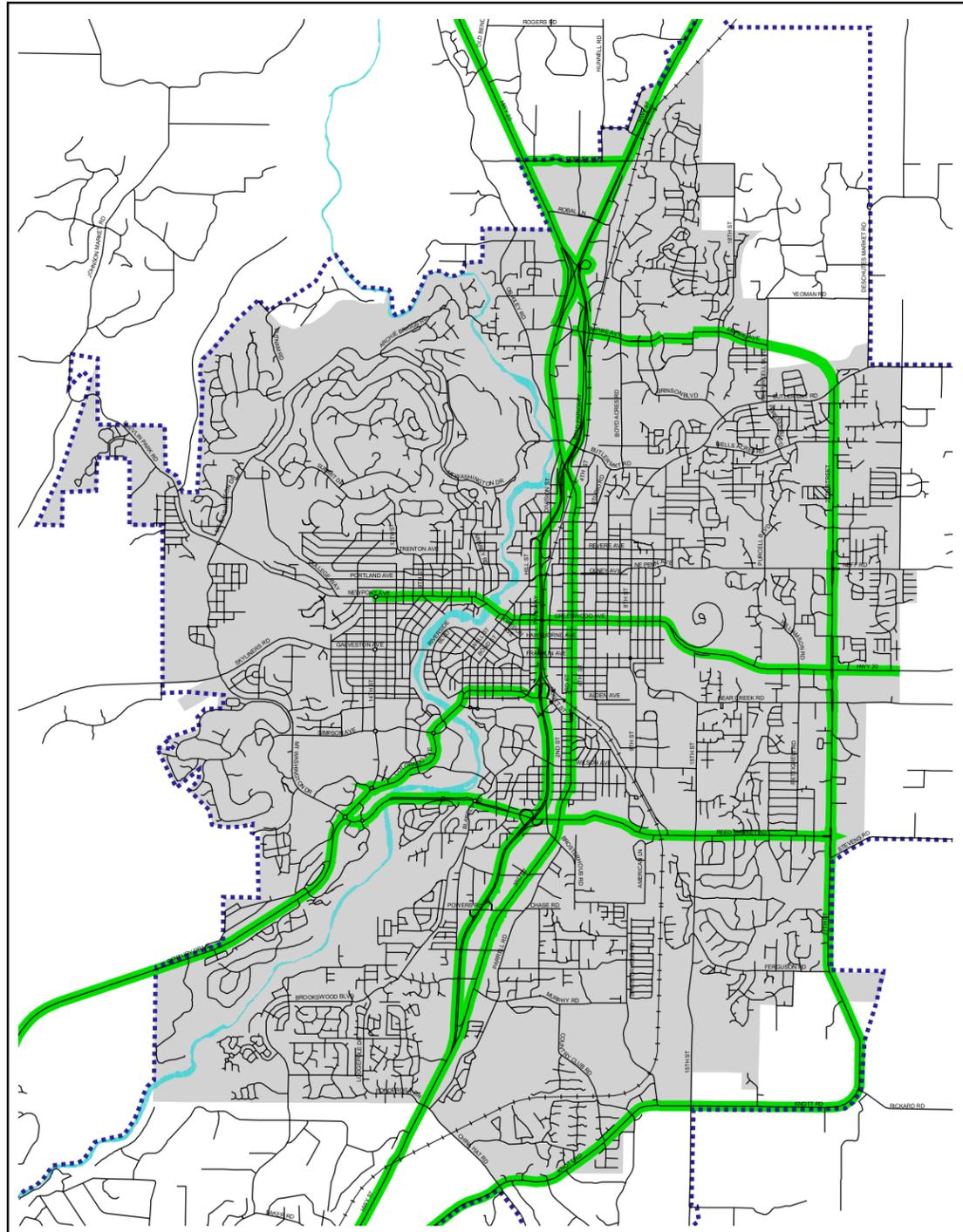
The purpose of this chapter is to provide an overview of the current and future transportation system conditions in Deschutes County and develop an inventory of the physical, operational, traffic safety, and travel characteristics of the transportation corridors in the study area. This inventory includes a summary of the following:

- ◆ Study area corridors
- ◆ Recurrent congestion locations
- ◆ High crash locations
- ◆ Transit operations
- ◆ Traffic signal control
- ◆ Intelligent transportation system (ITS) elements
- ◆ Communications network
- ◆ Emergency management
- ◆ Incident management
- ◆ Special events
- ◆ Freight movement
- ◆ Traveler information
- ◆ Relevant adopted documents

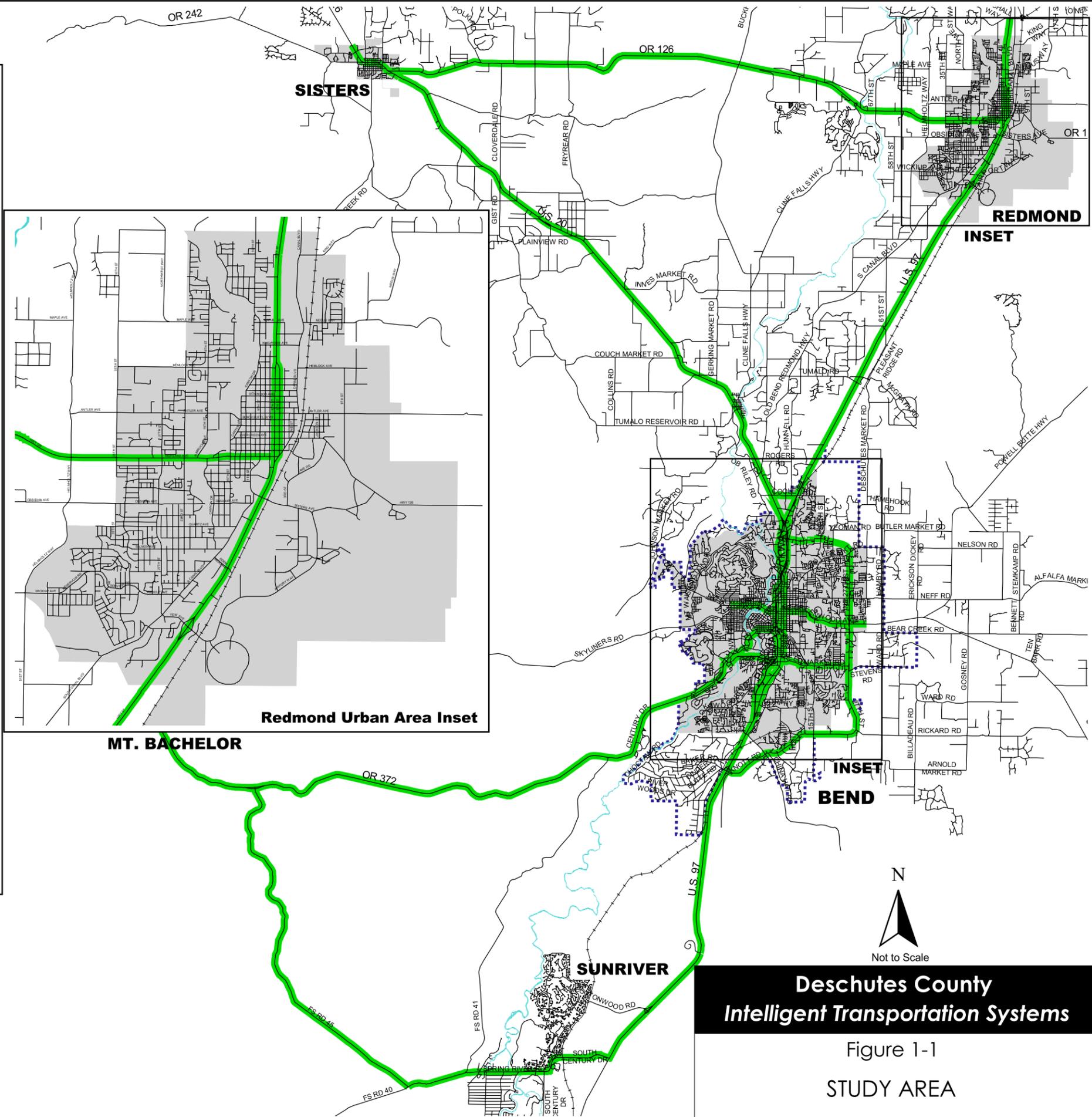
The main goal of the inventory is to establish the baseline conditions in the study area that will be used for building an intelligent transportation system based on regional transportation user needs.

1.2 STUDY AREA

Figure 1-1 illustrates the 10 study corridors in the study area, which encompasses the current boundaries of the Bend Metropolitan Planning Organization (BMPO) and stretches to Redmond, Sisters, Mt. Bachelor, and Sunriver. A detailed list of planned projects on each of the study corridors can be found in Section 1.13. The transportation operating conditions of the key study corridors are summarized in Table 1-1. Key regional facilities located within the study area are depicted in Figure 1-2. These facilities include City halls, public works departments (engineering offices and maintenance facilities), schools, and emergency management facilities (fire stations, police stations, 911 centers, shelters, hospitals, and emergency operations centers).



Bend Urban Area Inset



**REDMOND
INSET**

Redmond Urban Area Inset

MT. BACHELOR

**INSET
BEND**

SUNRIVER



Not to Scale

**Deschutes County
Intelligent Transportation Systems**
Figure 1-1
STUDY AREA

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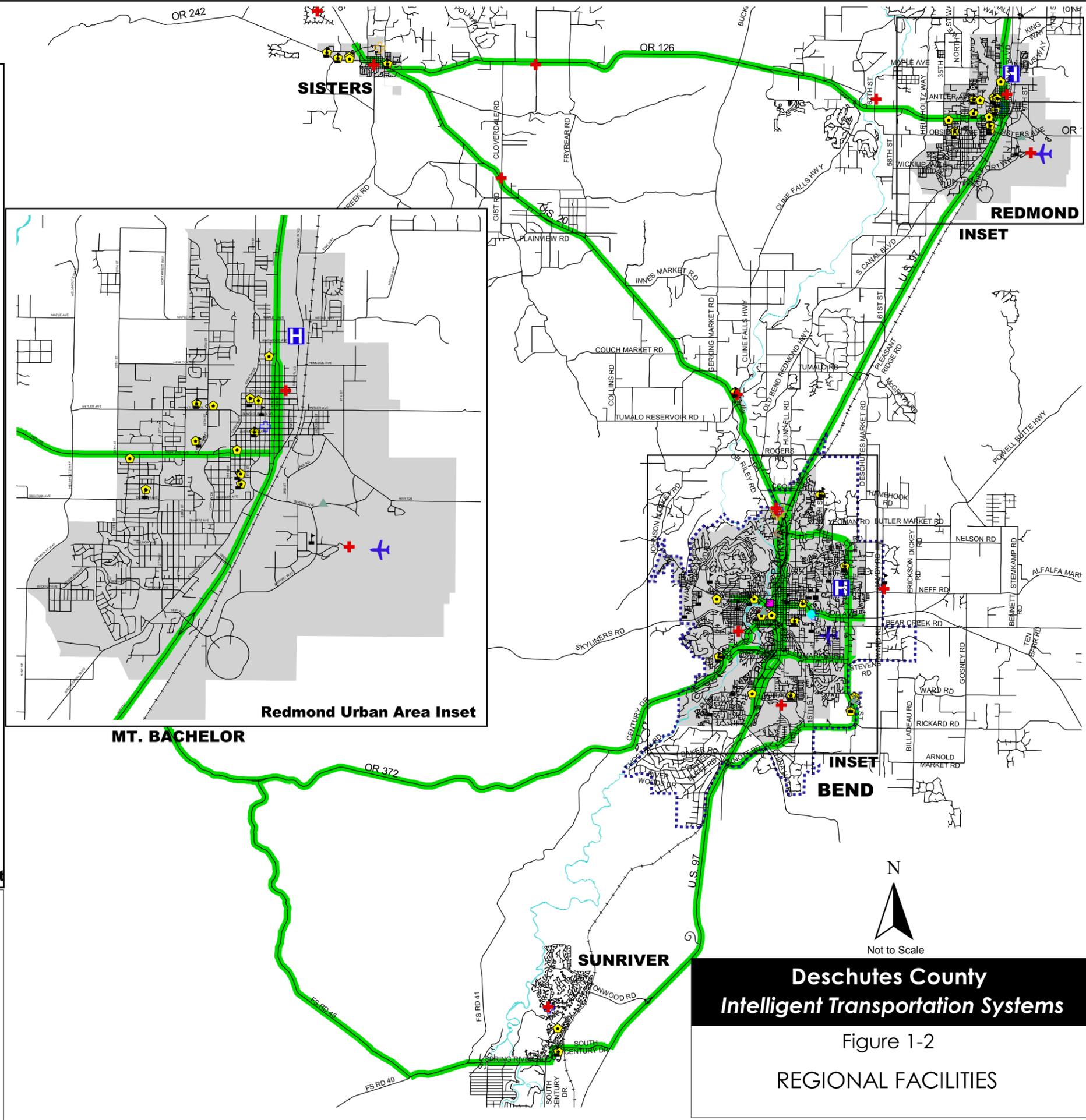
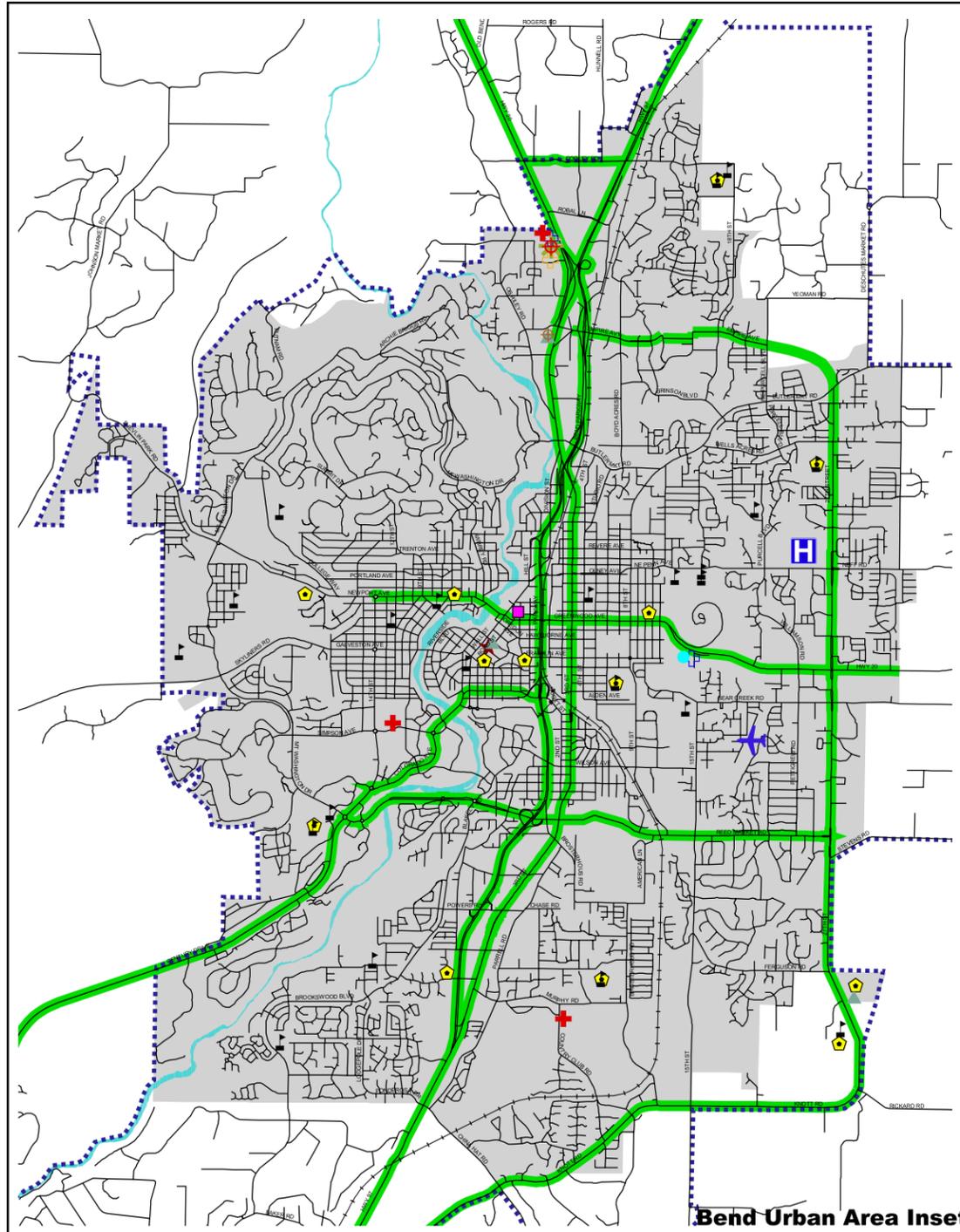
	ITS Corridors		Urban Growth Boundary
	Bend MPO Boundary		Railroads

Table 1-1. Study Area Corridors

#	Corridor	Limits	Maximum 2000 2-Way ADT*	Maximum 2023 2-Way ADT*
1	Highway 97	ONeil Highway (North of Redmond) to Sunriver (S. Century Drive)	36,700 (Empire ATR)	52,000 (N of Mt. View Mall)
2	Highway 97 Business	Entire length	41,700 (N of Empire Blvd)	65,500 (N of Empire Blvd.)
3	Newport/ Greenwood/ Highway 20	Between 14 th Avenue and the east Bend City limits	24,400 (W of 8 th Street)	30,800 (W of 8 th Street)
4	Highway 20	Between Highway 97 and Sisters	16,600 (NW of Hwy 97)	23,000 (NW of Hwy 97)
5	Colorado Avenue/ Century Drive	Between Highway 97 and Mt. Bachelor	5,900 (S of Inn at 7 th Mountain)	12,400 (S of Inn at 7 th Mountain)
6	Reed Market Road	Between Century Drive and E. 27 th Avenue	19,300 (at 9 th Street)	N/a
7	Empire/ 27 th Avenue/ Knott Road	Between 97N and 97S	21,700 (N of Forum)	N/a
8	Cooley Road	Between Highway 20 and Highway 97	N/a	N/a
9	Highway 126	Sisters to Redmond	11,200 (East Sisters City Limits)	18,000 (East Sisters City Limits)
10	Harper Bridge Road/ Upper Deschutes Road/ Edison Ice Cave Road	Sunriver to Century Drive	N/a	N/a

* ADT values are approximate values taken from ODOT's 2023 growth trend forecasts for state highways, or local Bend counts for City streets.

N/a – No data available



LEGEND

Schools	City Police	Emergency Operations Center
9-1-1 Dispatch Center	State Police	Hospital
ODOT Dispatch	County Sheriff	Airport
Dial-A-Ride Center	Emergency Shelter	ITS Corridors
Transportation Agency Office	City Hall	Bend MPO Boundary
Fire Station	Courthouse	Railroads

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Figure 1-2
REGIONAL FACILITIES

1.3 TRAFFIC CONDITIONS SUMMARY

Congested corridor sections/bottlenecks and high collision locations provide the greatest opportunities to implement ITS field elements that will produce a noticeable benefit. While Table 1-1 includes a brief summary of transportation operating conditions for each study area corridor, this section provides a summary of existing and future recurrent congestion locations and high collision locations.

1.3.1 Characteristics of Congestion

Congestion is typically categorized as either non-recurrent or recurrent. Non-recurrent congestion results from unexpected random events such as collisions or road debris in travel lanes. Recurrent congestion happens repeatedly at the same location, such as at key bottlenecks, merge points, or weaving sections, during peak periods. Volume-to-capacity (v/c) ratios help determine locations where traffic flows are near or at capacity on a consistent basis, indicating recurrent congestion. Travel demand forecast models provide v/c ratios by roadway link for current and future time periods. The congested levels that will be assigned for this analysis based on v/c ratios in Deschutes County models are listed in Table 1-2.

Table 1-2. Congestion Levels Based on Volume-to-Capacity Ratios

Congestion Level	Volume-to-Capacity Ratio
Moderate	0.80 – 0.89
High	0.90 – 0.99
Severe	≥ 1.00

1.3.2 Existing Congestion

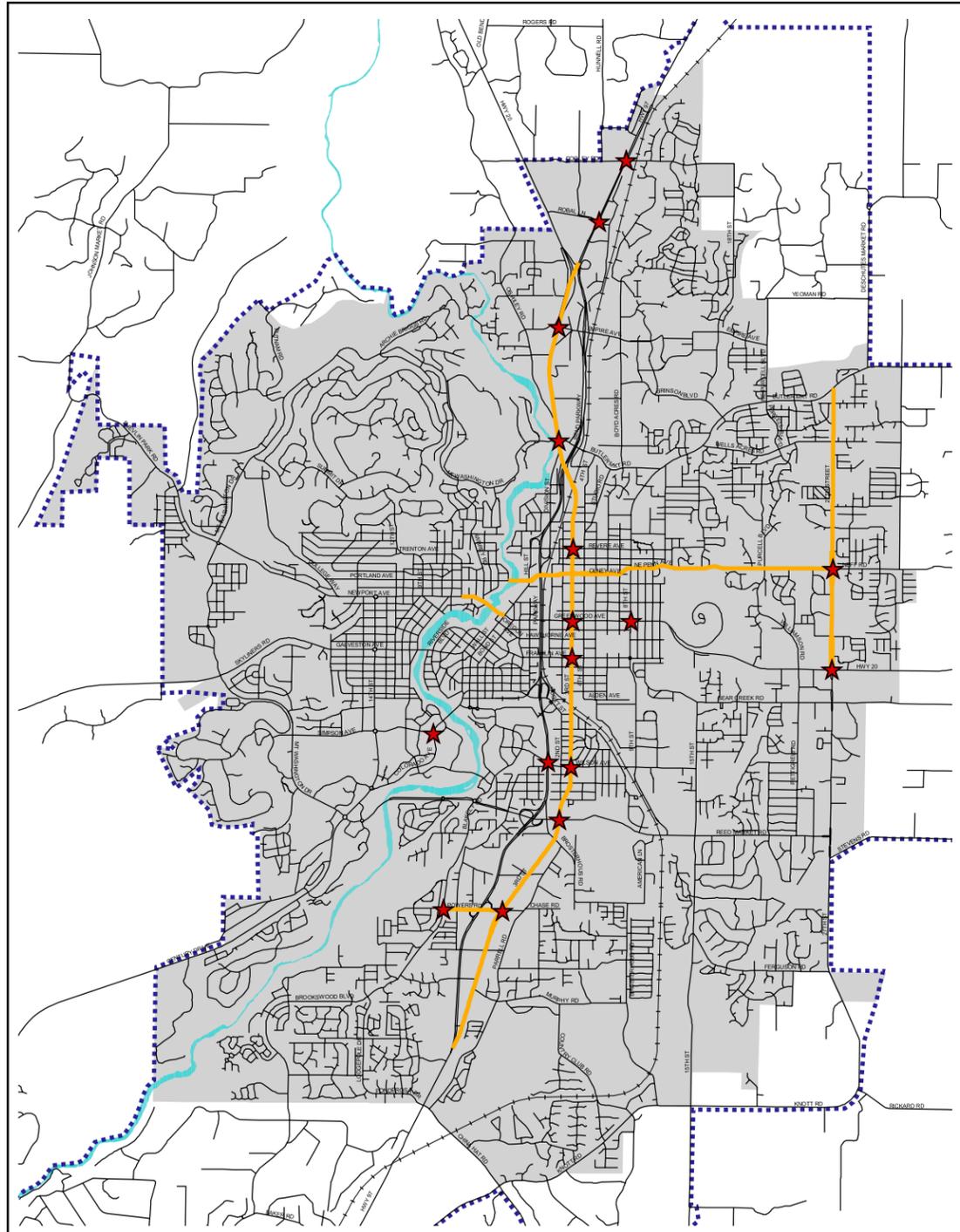
The Bend MPO Area does not have a current travel demand forecast model. ODOT is currently working on a model update, which should be available by November 2004¹. Local input provided for congested locations was used as a placeholder for model v/c ratio data. Redmond does have an existing forecast model, which was used to supplement local input. Outside of the Bend and Redmond City Limits, recurrent congestion is limited during peak periods to major highways. The two observed trouble spots are located on Highway 20 through Sisters and on Highway 97 in Redmond. Within Bend, there are approximately 15 congested intersections and 5 congested corridors, which are shown in Figure 1-3.

1.3.3 Future Congestion

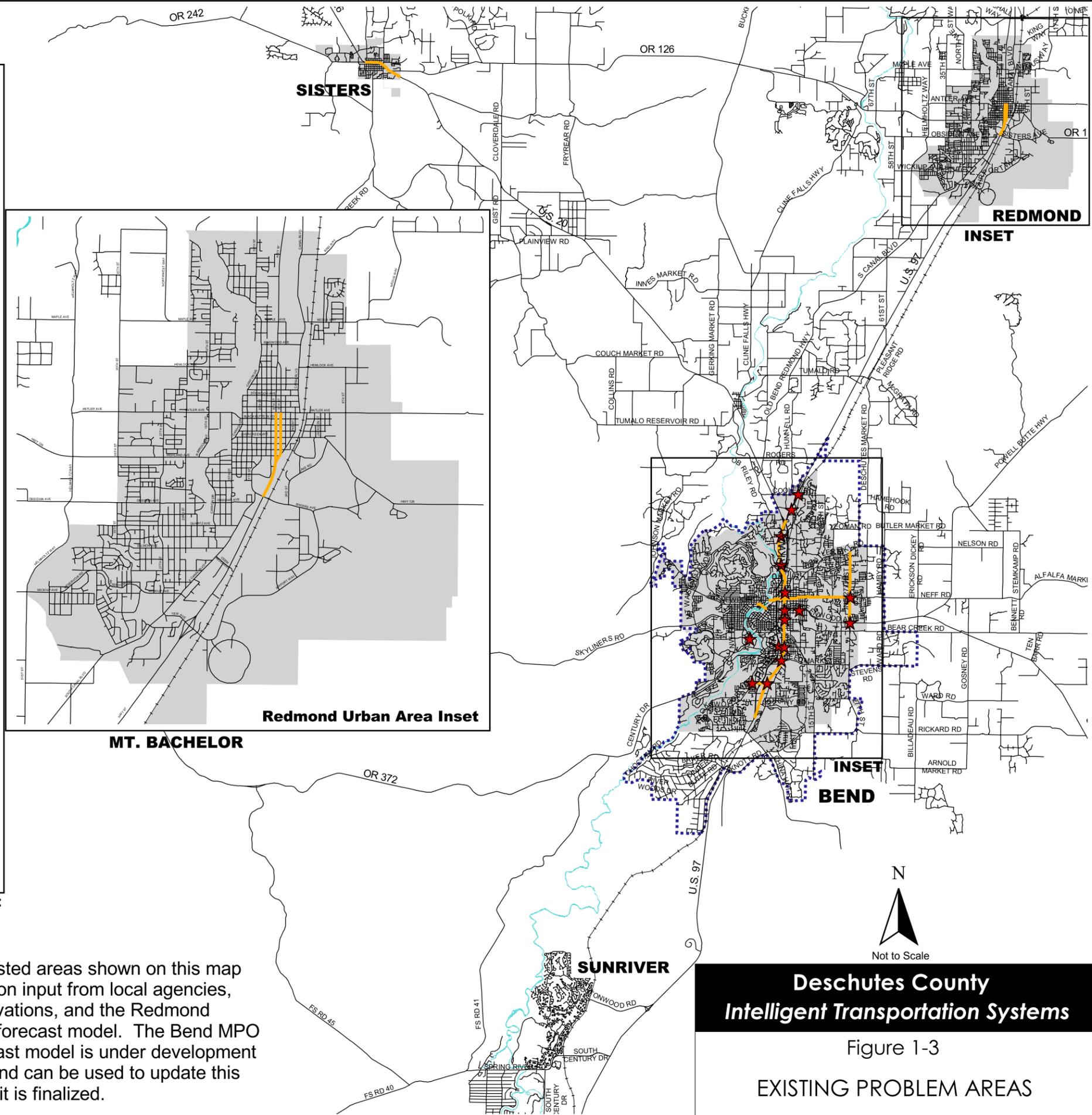
Figure 1-4 illustrates the magnitude of future congestion in Deschutes County based on the Redmond 2020 forecast model and the Bend TSP 2020 mitigated v/c plot². The Redmond model forecast does not reflect the planned ORE 126 couplet or the Hwy 97 bypass and therefore may represent a worst-case scenario. If the previously mentioned Bend forecast model update is completed before this ITS Plan is complete, it will be used to update Figure 1-4.

¹ Based on phone conversation with Sam Ayash, ODOT's Transportation Planning Analysis Unit, July 26, 2004.

² Bend Urban Transportation System Plan – Figure 17, October 11, 2000.



Bend Urban Area Inset



Redmond Urban Area Inset

MT. BACHELOR

INSET BEND

SUNRIVER

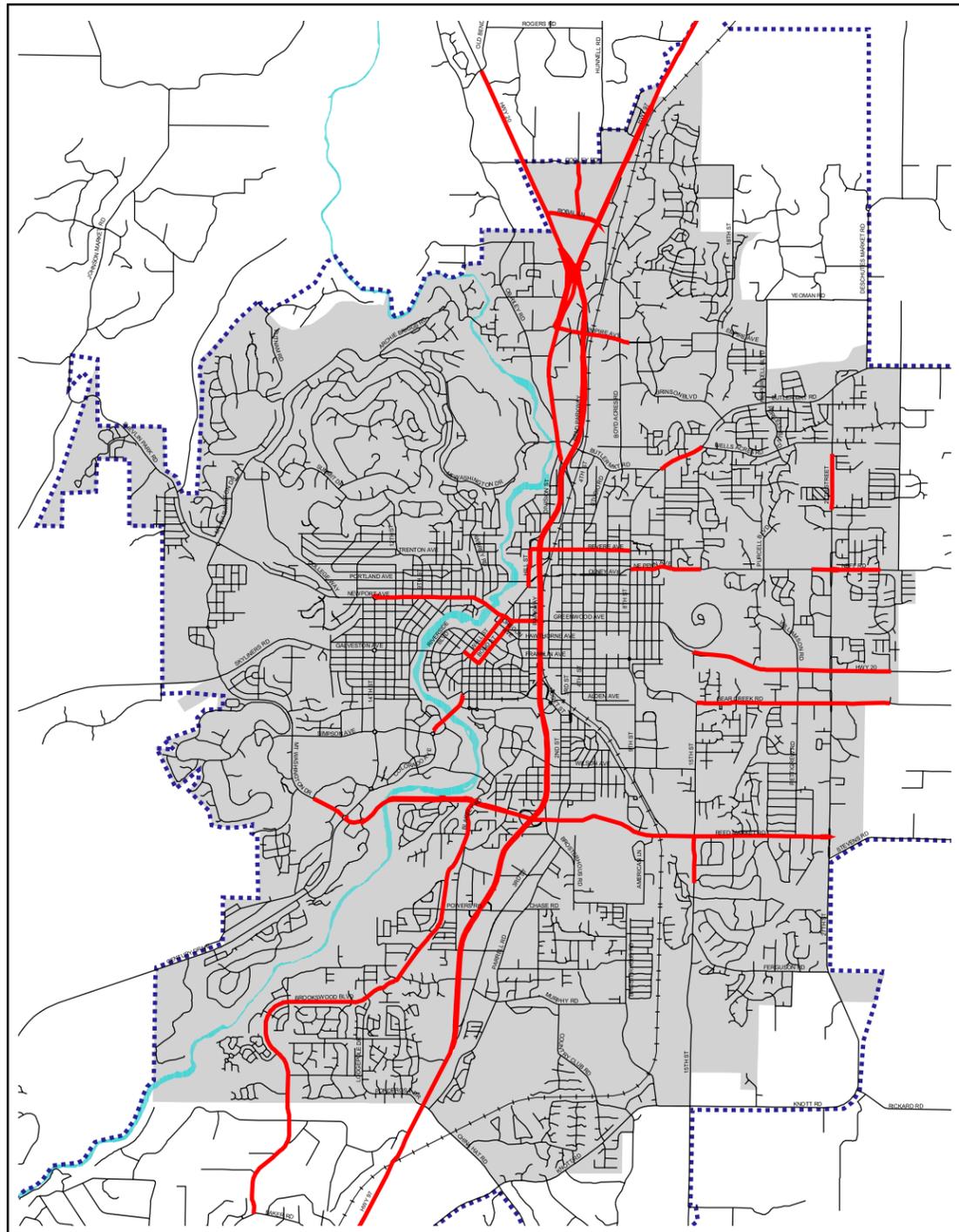
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	Congested Intersection		Bend MPO Boundary
	Congested Corridor		Urban Growth Boundary
	Railroads		

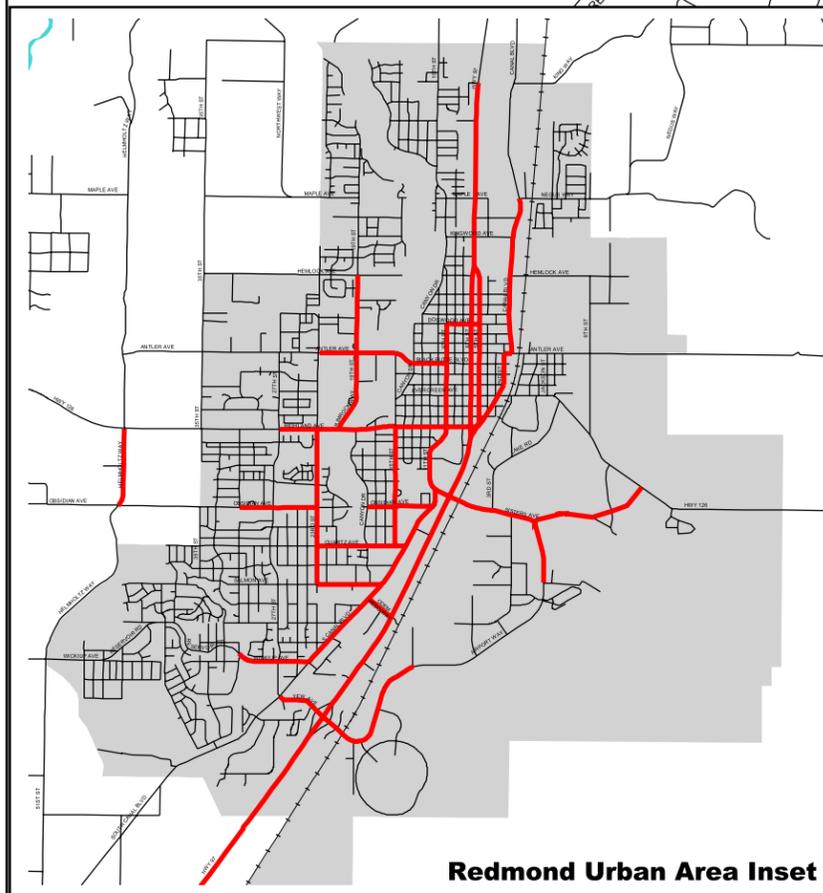
Note:
The congested areas shown on this map are based on input from local agencies, field observations, and the Redmond year 2000 forecast model. The Bend MPO Area forecast model is under development by TPAU and can be used to update this map when it is finalized.

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Figure 1-3
EXISTING PROBLEM AREAS

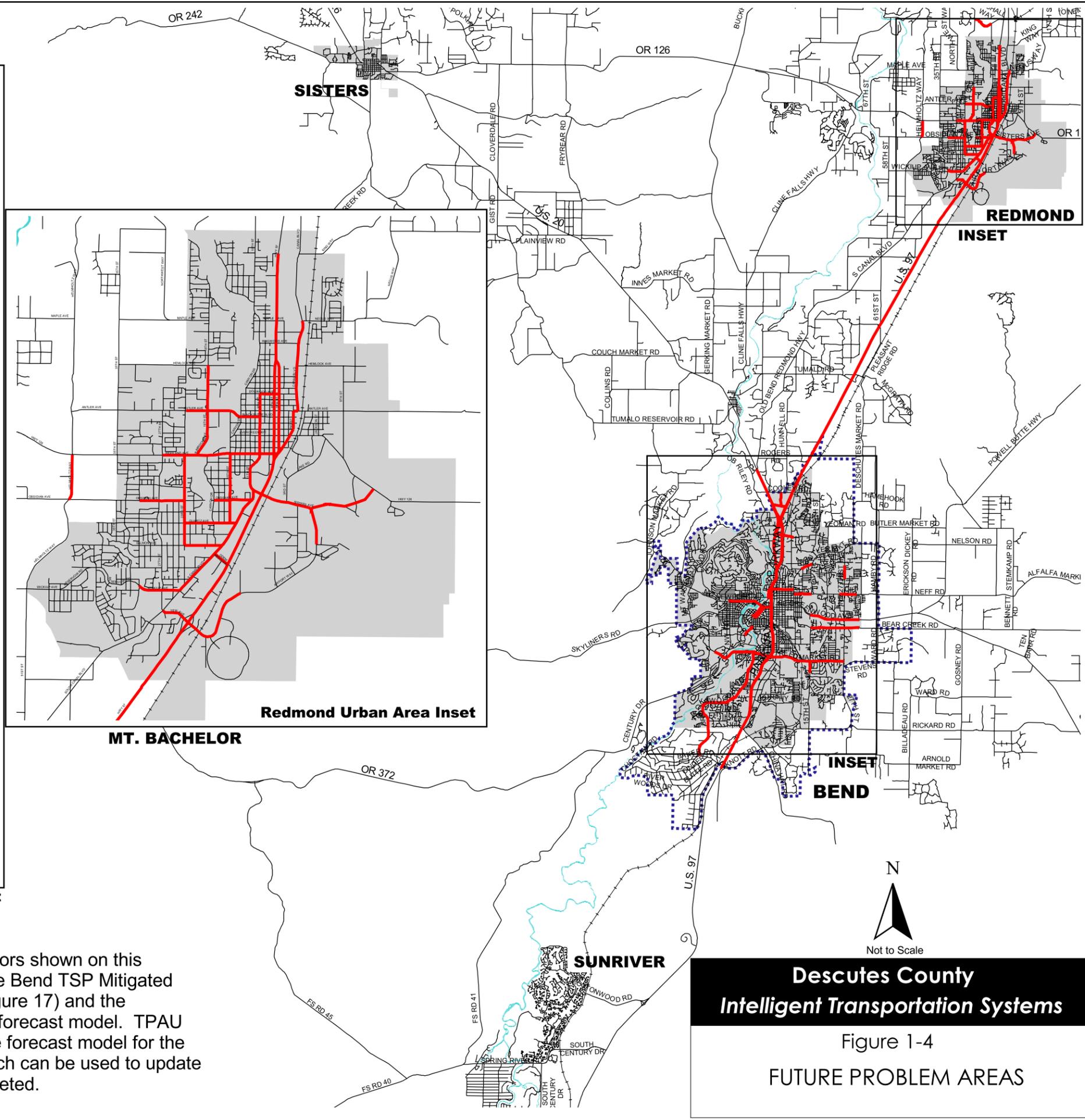


Bend Urban Area Inset



Redmond Urban Area Inset

MT. BACHELOR



REDMOND INSET

INSET BEND

SUNRIVER



Descutes County
Intelligent Transportation Systems
Figure 1-4
FUTURE PROBLEM AREAS

LEGEND

-  Congested Corridor
-  Bend MPO Boundary
-  Urban Growth Boundary
-  Railroads

Note:
The congested corridors shown on this map are based on the Bend TSP Mitigated Network V/C plot (Figure 17) and the Redmond year 2020 forecast model. TPAU is developing a future forecast model for the Bend MPO area, which can be used to update this map when completed.

1.3.4 Crash Summary

Additional problem locations are identified through an assessment of collision data. ODOT uses a ranking methodology to analyze specific locations based on a three-year crash history. Deschutes County also maintains a high collision location database for intersections within the study area.

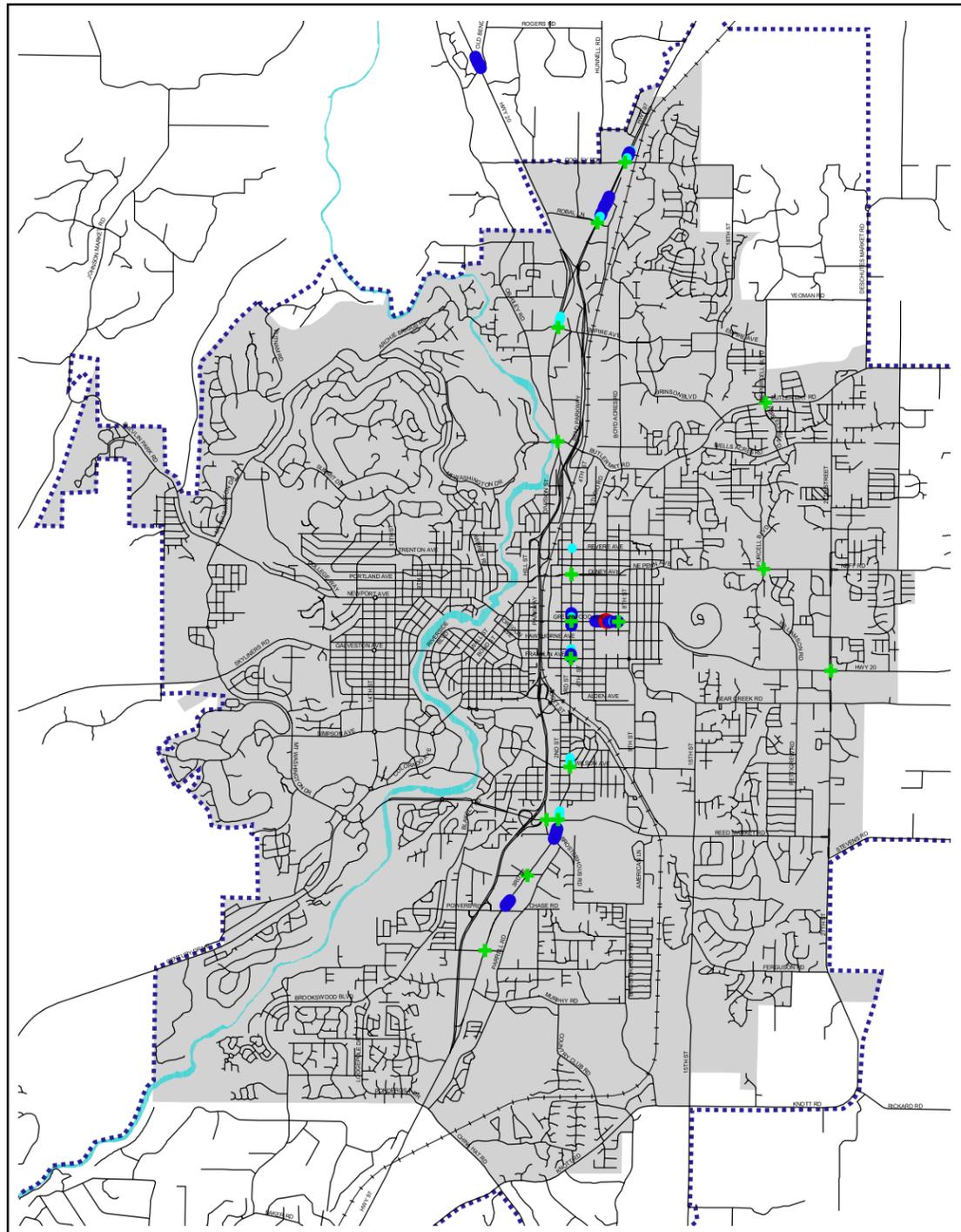


ODOT designates a “Safety Corridor” or a “Truck Safety Corridor” for any state or local highways that have a higher frequency of traffic collisions than the statewide average for a similar roadway type. In the past, there were several Safety Corridors in Deschutes County, including Highway 97, Highway 97 Business, Highway 20, and Century Drive. These corridors are no longer designated as Safety Corridors. ODOT strives to improve the safety on these designated corridors through increased law enforcement, engineering improvements, and education efforts.

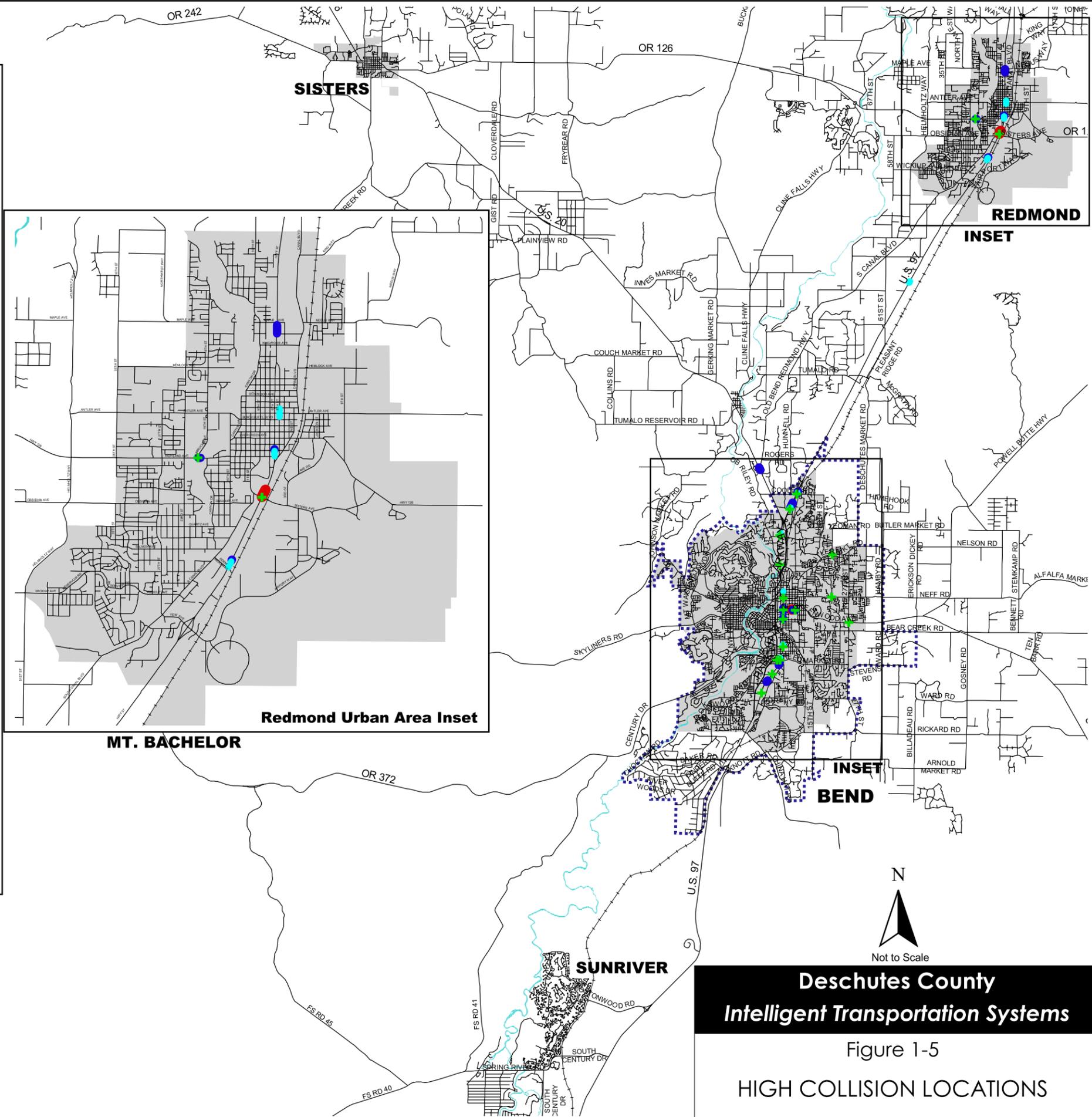
To identify locations with high collision rates, ODOT developed a Safety Priority Index System (SPIS). For every 0.10-mile section of roadway, a score is given based on three years of collision data with weighting for crash frequency, rate, and severity. Three or more collisions or one or more fatal collisions must have occurred at the same location over the previous three years for a location to be considered a SPIS site. ODOT identifies the top 10 percent SPIS sites every year and evaluates these locations for safety problems. Appendix C contains additional information about ODOT’s SPIS methodology.

Figure 1-5 highlights the high collision locations throughout the study area. This figure includes ODOT SPIS sites (2000 - 2002) for federal and state roadways and the highest collision intersections in Deschutes County (2000 - 2002). Collision data depicted in Figure 1-5 can be found in Appendix C.





Bend Urban Area Inset



Redmond Urban Area Inset

MT. BACHELOR

BEND

SUNRIVER



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Figure 1-5
HIGH COLLISION LOCATIONS

LEGEND

	Deschutes County High Crash Intersections		Railroads
	ODOT 2000-2002 SPIS Locations		Bend MPO Boundary
	85% - 89.99%		Urban Growth Boundary
	90% - 94.99%		
	95% - 100%		

1.4 TRANSIT

The City of Bend provides public transportation through a Dial-A-Ride program. Private long-distance bus service and several local shuttle connections are provided by private carriers. This section includes details about the City of Bend Dial-A-Ride and private transportation services.

1.4.1 City of Bend Dial-A-Ride

The City of Bend currently has a 10-vehicle Dial-A-Ride fleet, the largest fleet in the County, which is available to senior and disabled citizens. These vehicles are dispatched from the Public Works facility located on Highway 20 near Pilot Butte. The City of Bend recently procured a computer aided dispatch system to manage the scheduling and dispatch of the dial-a-ride vehicles³. This system is used primarily for demand response ride mapping and scheduling today, but has the capability to support automated vehicle location (AVL), interactive voice response (IVR), mobile data terminals (MDT), Internet trip scheduling, and real-time bus arrival information is available through add-on modules.



Bend Dial-A-Ride currently tracks their fleet maintenance history, replacement parts, and service scheduling in a maintenance management system. The service scheduling is monitored based on fuel consumption and is electronically tracked by the vehicle code. Each operator must enter the vehicle code prior to refueling.

The City of Bend Dial-A-Ride may become a separate transportation district within the next few months. There is a measure on the November 2004 ballot to create a Bend Area Transportation District. If this measure passes, the City of Bend has identified 7 fixed routes that would be served with regularly scheduled buses.

In addition to dispatching transit vehicles, Bend Dial-A-Ride is in the process of becoming the Medicaid call center for Eastern Oregon, and will perform scheduling services for small transit providers in the County.

³ Dispatch system is the Trapeze™ PASS system.

1.4.2 Private Transportation Providers

Deschutes County is also served by several private bus carriers that provide service to local destinations (Redmond, Mt. Bachelor, Prineville, etc.) and to the Willamette Valley (Portland, Salem, Eugene, etc) on a daily basis. These providers include:

- ◆ Greyhound
- ◆ Valley Retriever Bus Lines
- ◆ Porter Stage Lines
- ◆ The People Mover
- ◆ CAC Transportation
- ◆ Redmond Airport Shuttle
- ◆ Central Oregon Breeze
- ◆ Amtrak Thruway Bus Service
- ◆ Mt. Bachelor Super Shuttle and Employee Shuttle

1.5 TRAFFIC SIGNALS

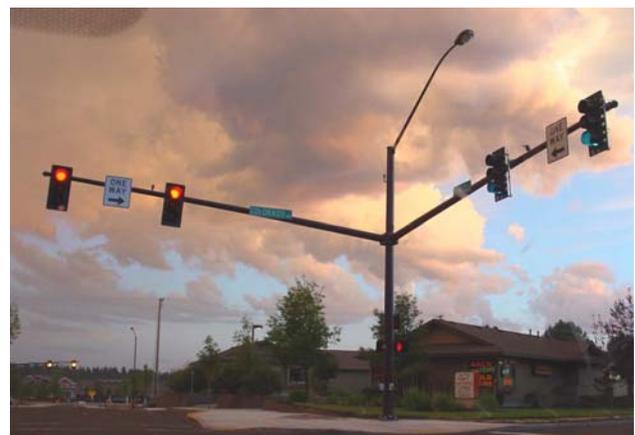
This section describes the traffic signal equipment used at the 65 signalized intersections in Deschutes County. Figure 1-6 depicts the existing and planned traffic signals in the study area. The signals are color-coded by the jurisdiction of ownership. Existing signal interconnect locations are depicted on Figure 1-8.



The following subsections include details pertaining to controller and controller cabinet type, video detection, existing central signal systems, and emergency vehicle preemption capabilities at traffic signals in the study area.

1.5.1 Traffic Signal Operations

ODOT operates and maintains all of the traffic signals in the Bend area through agreements with local agencies⁴. Each of the signals have Type 170 controllers and Wapiti W4IKS software. For remote access to the traffic signal controllers, ODOT uses the TransLink closed loop signal control software. Not all signal controllers are accessible remotely. Figure 1-8 identifies the traffic signal controllers that have remote access via landline or cellular phone.



Approximately 29 of the 65 existing traffic signals in Deschutes County are physically connected with copper twisted pair interconnect. The traffic signal interconnect is used, in combination with on-street masters and dial-up or cellular telephone lines, to provide remote

⁴ The ODOT Region 4 traffic signal operations contact is David Foster – (541)388-6472.

communications access to multiple traffic signal controllers within a “closed loop” and to provide coordinated signal timings. None of these signals are connected via wireline to a central transportation operating facility. The current system only allows the ODOT traffic engineers to monitor signal operations, check for faults, and upload preemption data and/or vehicle counts after dialing into the intersection. The current system does not provide the ability to automatically report signal faults, constantly monitor signal operations, or automate data uploads.

1.5.2 Video Detection

The majority of traffic signals in the Bend Metropolitan use inductive loops for vehicle detection. However, there are four different manufacturers of video detection equipment in use including Peek, Traficon, Autoscope, and Iteris. The intersection of 3rd Street/Butler Market Road uses Peek video detection. The City of Bend has installed Autoscope video detection at 27th Street/Forum Drive and 27th Street/Bear Creek Road. ODOT has installed Iteris video detection at the Parkway/Empire off-ramp intersection. ODOT has also installed Traficon video detection equipment at the intersections of 3rd Street/Highway 20, Highway 97/Cooley Road, and Highway 97/Robal Lane. The video used for vehicle detection is not transmitted to a central location for monitoring, but some can be accessed remotely over phone lines where the leased lines exist. Each of the video detection systems requires separate proprietary software to access the video and create detection zones.

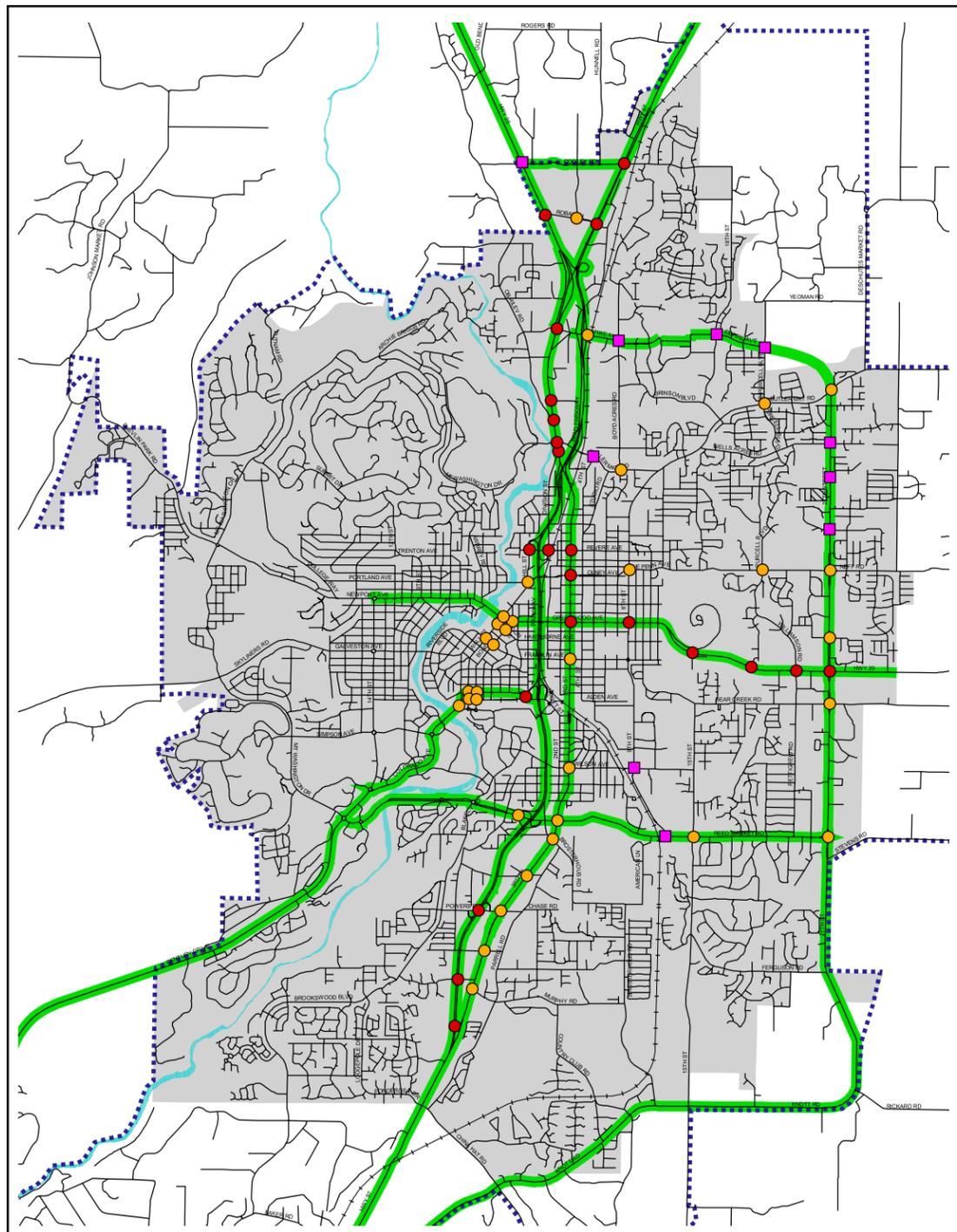


1.5.3 Emergency Vehicle Preemption

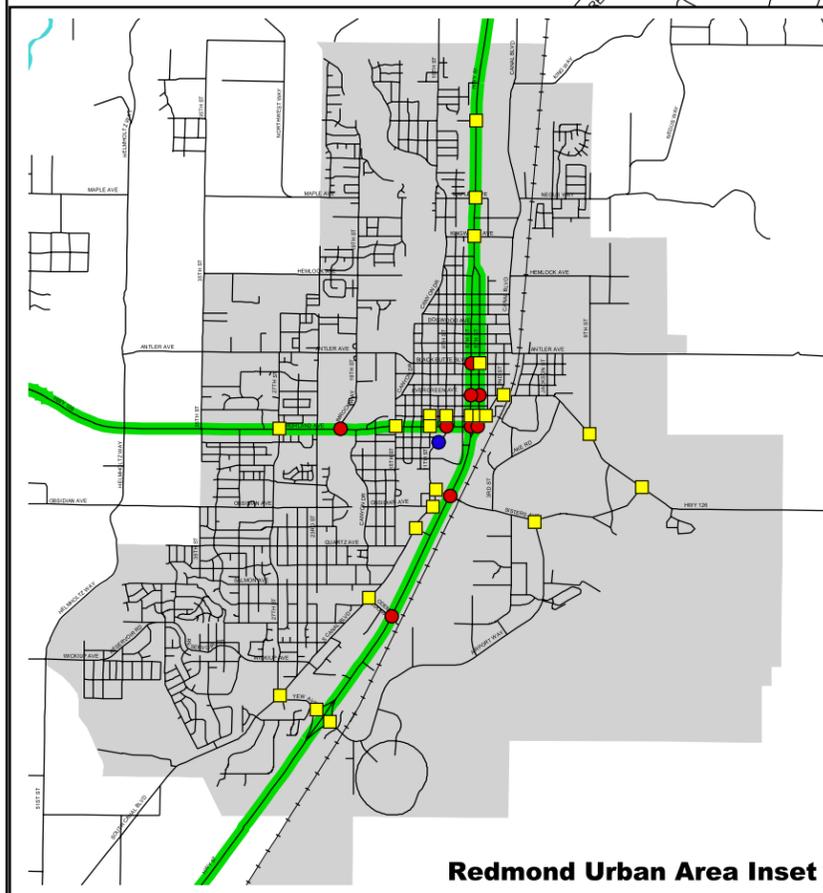


The majority of the traffic signals in Deschutes County have full emergency vehicle preemption capability using Opticom™ (with the exception of the six downtown Bend signals on Bond Street and Wall Street). Police vehicles do not have capability to preempt traffic signals. Most of the existing preemption equipment in the traffic signal cabinets (discriminators) do not have the ability to recognize vehicle identification codes, but the newer version discriminators can be programmed to only provide preemption to valid vehicle identification codes. The Opticom™ system has the capability to provide priority (early green/green extension) for transit vehicles.

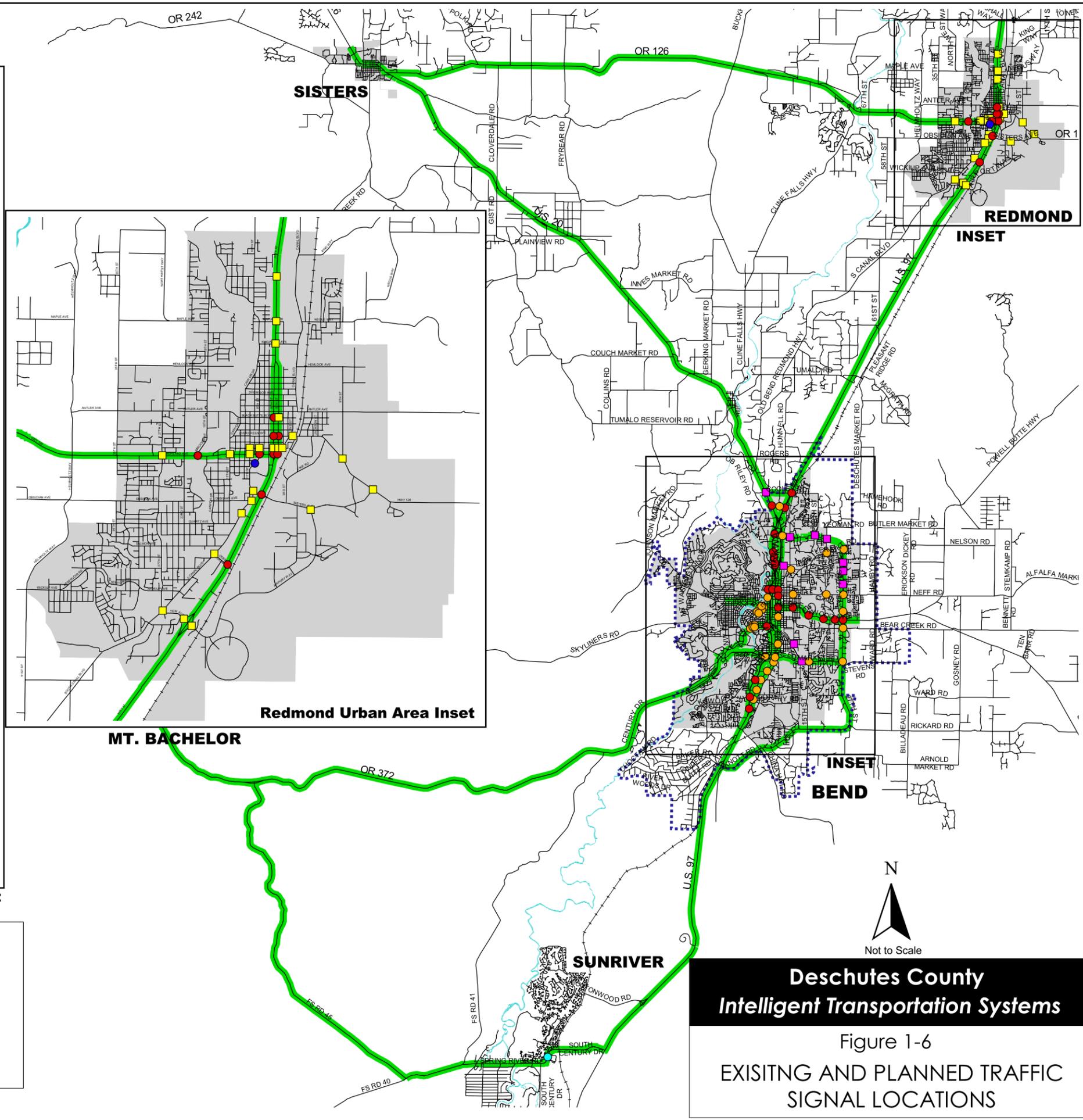
ODOT traffic engineers, using the 3M priority control software, have the ability to remotely upload the preemption logs to check for valid preempts.



Bend Urban Area Inset



Redmond Urban Area Inset



REDMOND INSET

INSET BEND

LEGEND			
Existing Traffic Signal Ownership	Planned Traffic Signals		ITS Corridors
CITY OF BEND	Bend Potential Location		Railroads
CITY OF REDMOND	Redmond CIP		Urban Growth Boundary
DESCHUTES COUNTY			Bend MPO Boundary
ODOT			



Not to Scale

**Deschutes County
Intelligent Transportation Systems**
Figure 1-6
EXISTING AND PLANNED TRAFFIC
SIGNAL LOCATIONS

1.6 ITS SYSTEMS AND EQUIPMENT

Deschutes County has numerous existing intelligent transportation systems and has several existing ITS devices. The following sections describe existing and planned ITS systems and equipment including the Traffic Operations Center (TOC), existing closed-circuit television (CCTV) cameras, dynamic message signs (DMS), traffic count stations (ATR), and weather stations (RWIS). Figure 1-7 shows the locations of the existing field devices.

1.6.1 ITS Systems

Deschutes County currently uses a variety of software systems to access and control field devices, and to dispatch vehicles. Table 1-3 provides a summary of the existing software systems and their primary function. Many of the software systems used today are redundant because they are proprietary to the specific vendor for the field device. Additional information about each system is provided under the field device or Center description in this Chapter.

1.6.2 Transportation Operations Center (TOC)

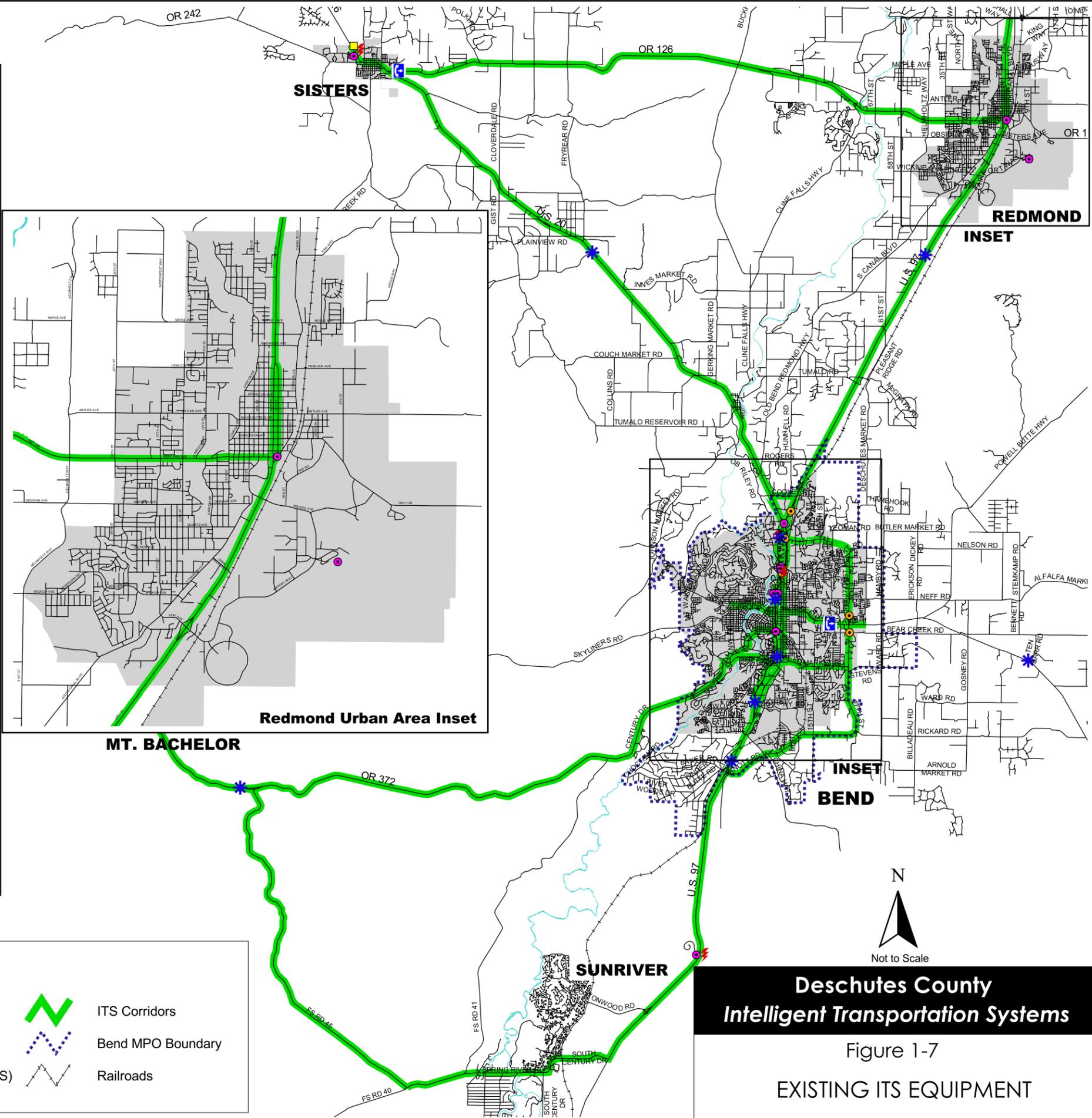
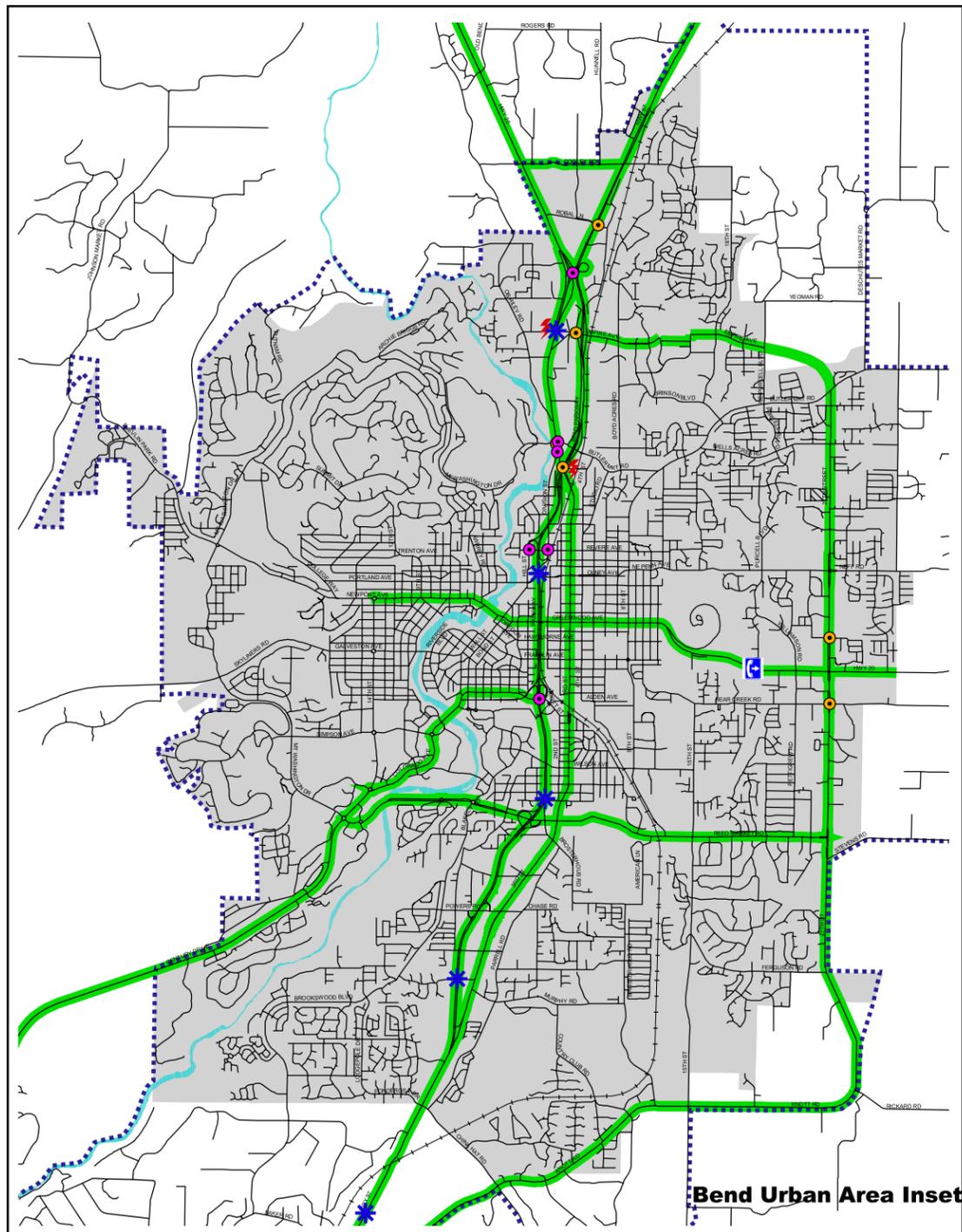
ODOT currently operates a Transportation Operations Center (TOC) in the Oregon State Department of Transportation building. The Transportation Operation Center in Bend serves many functions. A summary of the primary functions performed by the operators is provided below.



- ◆ Incident Management – Incident detection, response planning, resource tracking and coordination and output to the traveler information systems.
- ◆ Emergency Management – Includes incident management functions and the implementation of Emergency Operations Plans.
- ◆ Traffic Management – Control dynamic message signs, highway advisory radio, and dispatch incident responders.
- ◆ Traveler Information – Place and update incident alerts and road restriction messages on dynamic message signs and highway advisory radio and output to media and TripCheck.
- ◆ Winter Operations – Monitor the roadway conditions with CCTV and environmental sensors. Coordinate crew assignments and notifications. Place outputs to traveler information systems (HAR and DMS).
- ◆ Maintenance Operations – Assist maintenance manager with crew availability and location information and place call-outs.

More detailed information on the functions of the Operations Center is documented in the *Transportation Operations Center System Concept of Operations*⁵, by ODOT.

⁵ *Transportation Operation Center System – Concept of Operations*, Galen McGill, Patrick Hoke, Larry McKinley, ODOT, 2002.



LEGEND

	Automatic Traffic Recorders		Variable Message Signs		ITS Corridors
	Weather Stations (RWIS)		Video Detection Camera Location		Bend MPO Boundary
	CCTV Camera		Oversize Vehicle Closure Telephone System (OVCTS)		Railroads

Not to Scale

**Deschutes County
Intelligent Transportation Systems**

Figure 1-7
EXISTING ITS EQUIPMENT

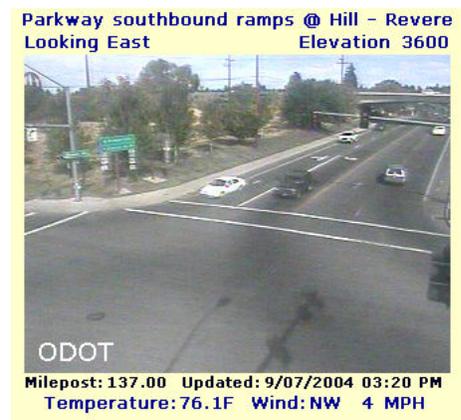
Table 1-3 Existing Systems in Deschutes County

#	System	Vendor/ Software	Operating Agency	Purpose	Notes
1	Signal System	TransLink	ODOT	Signal Control	TOC operators do not have access to this system.
2	Video Detection (3 Existing Systems)	AutoScope TrafiCon Iteris	ODOT	Intersection Detection	
3	Dynamic Message Signs (3 Existing Systems)	Skyline/ Daktronics	ODOT	Message Sign Control	Intent is to use the Skyline Software for access to all signs
4	Portable Variable Message Signs	Skyline Others DOS programs	ODOT	Message Sign Control	New PVMS are NTCIP. Intent is to use the Skyline software to control the PVMS signs.
5	Highway Advisory Radio	Highway Information Systems	ODOT	Radio Messaging	Bend controls Region 5 HAR. Server in Salem.
6	OSP Computer Aided Dispatch	Public Safety Systems Inc. (PSSI) CAD	OSP/ODOT	Manage Incidents	Provides link to OSP dispatch in Salem
7	Highway Traffic Conditions Reporting System	ODOT Visual Basic Application	ODOT	Feeds Info to TripCheck	
8	Road Weather Information System	SSI ScanWeb Software	ODOT	Weather Info	Server in Salem
9	Emergency Computer Aided Dispatch	HiTech Systems	Deschutes County 911	Computer Aided Dispatch	
10	Transit CAD	Trapeze Pass	Bend Dial-A-Ride	Transit Dispatch	
11	FRMS	Tiburon	Bend Fire	Fire Records Mgmt.	

Operators in the center currently must manage field devices using a variety of software packages. For variable message signs alone, the operators have three separate software packages to post messages because each manufacturer has a separate proprietary software package. However, ODOT has upgraded many of the fixed signs to be NTCIP compliant and is migrating to one software package for sign control. In addition, ODOT is currently conducting a Transportation Operations Center System (TOCS) project which intends to integrate the functions of the advanced transportation management systems (ATMS) and the computer aided dispatch (CAD) system. The ultimate intent is to provide an integrated system interface for the management of ODOT assets.

1.6.3 Closed-Circuit Television (CCTV) Cameras

Today, ODOT uses eight closed-circuit television (CCTV) cameras to monitor traffic in Sisters, Redmond, and Bend. One of the cameras has pan-tilt-zoom capability and can be controlled from the TOC. Six of the cameras are located on Highway 97 Business and the Parkway. The other two cameras include one in Sisters on Highway 20 and one in Redmond at the Redmond Airport. Seven additional cameras are planned on the Bend Parkway as part of 2004 - 2007 STIP. ODOT posts images from the existing cameras on the TripCheck website, which is described in Section 1.12.



1.6.4 Dynamic Message Signs (DMS)

Currently ODOT operates and maintains one fixed dynamic message sign on Highway 20 at the west edge of Sisters. This sign is NTCIP compliant. Additional signs are controlled from the Region 4 TOC, but our outside of this project study area. Adding DMS are planned on Highway 97 at the north and south end of Bend as part of the 2004 - 2007 STIP program.



1.6.5 Portable Variable Message Signs (PVMS)

ODOT Region 4 owns and operates several portable variable message signs. All new PVMS are being procured as NTCIP compliant, but several existing PVMS are not NTCIP compliant. Therefore, several software packages must be used to program the signs; but ODOT is migrating to one software package for PVMS sign control as the existing signs come to the end of their useful life.

1.6.6 Automatic Traffic Recorders

ODOT currently operates six automatic traffic recorders (ATR), independent of traffic signals, in the Bend area to collect volume, speed and occupancy data. Four ATRs are located on Highway 97, with one located between Redmond and Bend, two located on the Bend Parkway, and one located south of Bend. One ATR is located on Century Drive between Bend and Mt. Bachelor. The sixth ATR is located on Highway 20 east of Bend.

In addition, ODOT and the City of Bend collect vehicle volume information from system detectors at many traffic signals in the City of Bend. To upload the count information, ODOT uses the TransLink closed loop signal control software and must dial-in to the individual intersections to access the count data.

1.6.7 Road Weather Information Systems (RWIS)

ODOT currently operates and maintains four weather stations in the Bend area. These devices are located in Sisters on Highway 20, in Bend on Highway 97, and at Lava Butte (south of Bend) on Highway 97 and are connected with the RWIS server in Salem. Weather information from the sites is used to identify icy conditions and is posted on TripCheck for traveler information. Weather and road condition information collected from the site includes temperature, wind speed, wind direction, humidity, and road surface temperature.

1.6.8 Oversize Vehicle Closure Telephone System (OVCTS)

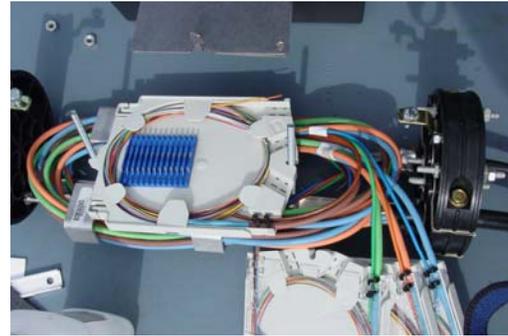
Oversized Vehicle Closure Telephones Systems are provided by ODOT on Highway 126 east of Sisters and on Highway 20 east of Pilot Butte in Bend. The system uses a Type 170 controller in a series of inductive loops to measure vehicle lengths. If all the loops are activated simultaneously, then it sends an alarm to the TOC.

1.7 COMMUNICATIONS EQUIPMENT

The communications system is one of the most critical components in the deployment of ITS infrastructure since local agencies must be able to monitor, control, and operate traffic management devices from remote locations and share information in real-time between operations centers to effectively manage the movement of passengers and goods and respond to incidents. The existing transportation related communications network in Deschutes County consists of a variety of media such as fiber optic cable, twisted-pair copper, radio, cellular telephone, and a public agency wireless network demonstration project. The existing agency-owned communications infrastructure is illustrated in Figure 1-8 where data is available. Additional communications infrastructure exists, either as part of the Bend Cable fiber optic network or wireless infrastructure on towers that have not been mapped to maintain security.

1.7.1 Fiber Optic Infrastructure

There is limited public agency installed fiber optic infrastructure in Deschutes County, but there is a significant center to center fiber optic network as a result of a franchise agreement with Bend Cable. As part of the franchise agreement, the public agencies received dark fibers where Bend Cable installed infrastructure. This agreement includes a maximum of 18 drop locations, 10 of which are currently in use. The existing drop locations include fire stations and public agency offices and a Gigabit Ethernet network has been established between these public agency facilities. The existing network includes the City of Bend, Deschutes County, and the City of Redmond. The current agreement will be re-negotiated in 2012⁶. The existing fiber optic network is configured in a “star” configuration with the Bend Cable facility as the head end.



Local telecommunications providers in the Bend area include Bend Cable, Qwest, and Quantum Telecommunications.

1.7.2 Copper Twisted-Pair Infrastructure

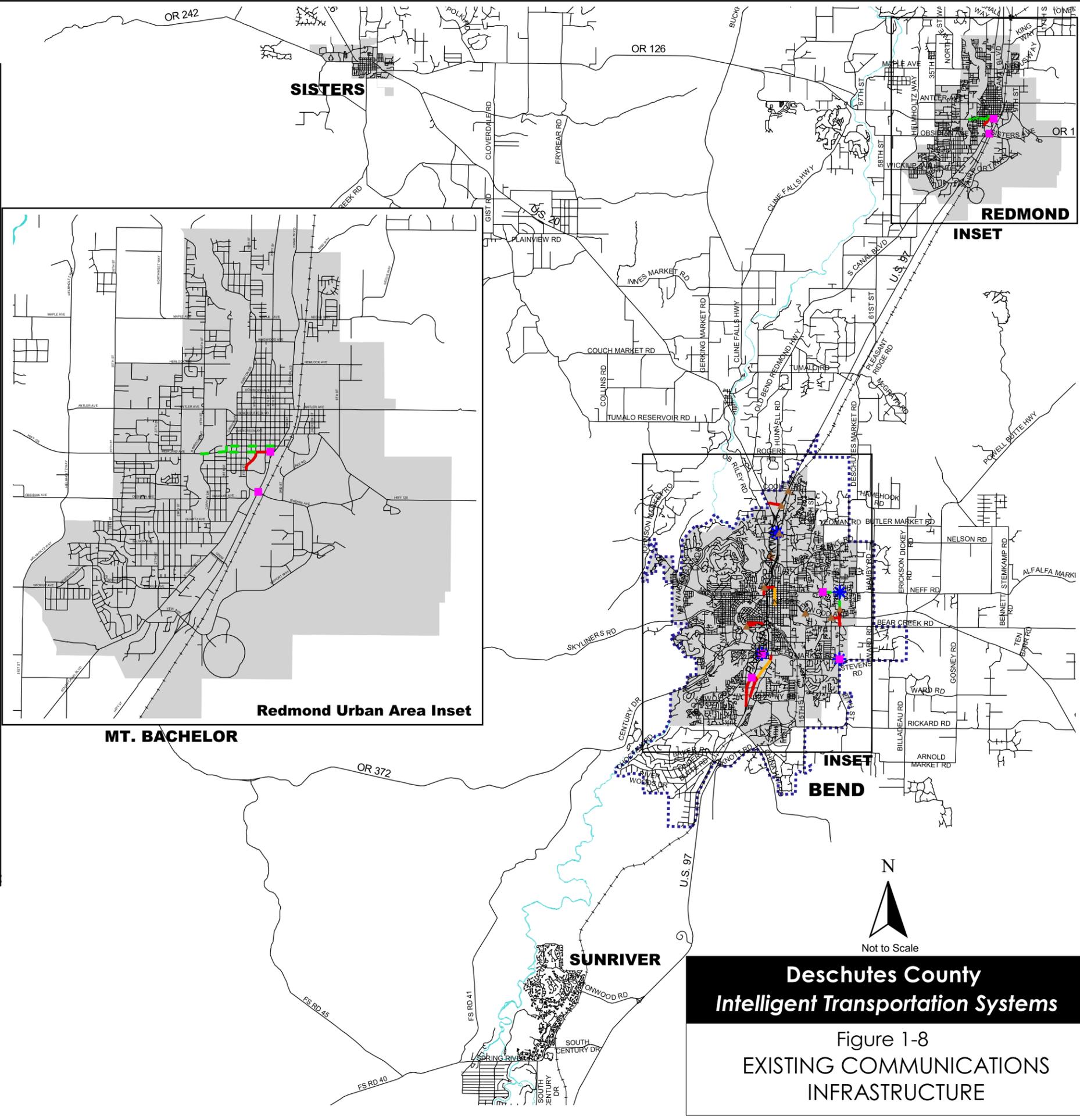
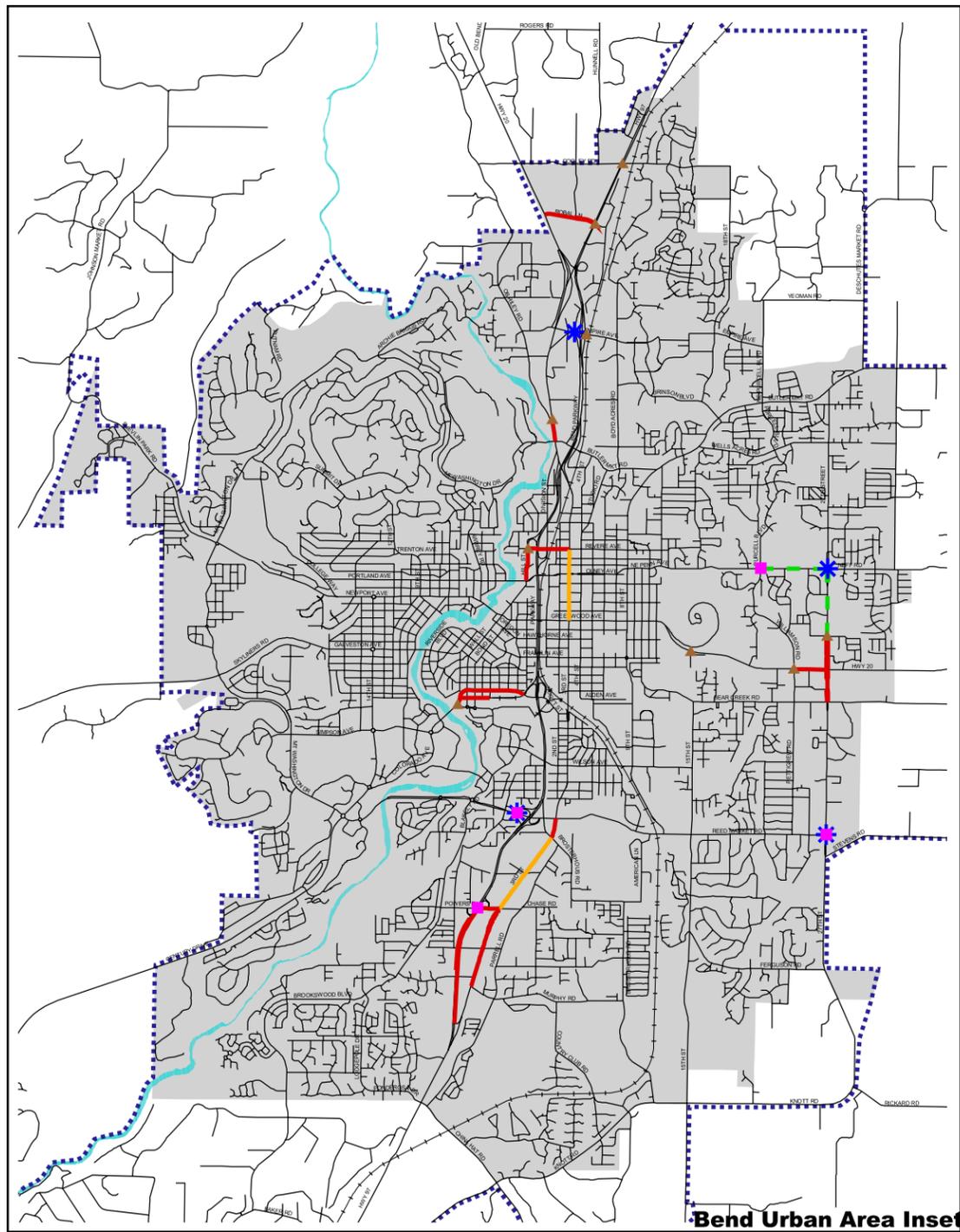
ODOT currently has copper twisted-pair infrastructure between approximately 29 traffic signals (shown in Figure 1-8). Today, the copper twisted-pair infrastructure is used for communications between traffic signals. ODOT accesses the signal communications via land or cellular phone drops.

1.7.3 Wireless Network

The City of Bend recently implemented a public agency wireless network with about 10 percent coverage in the City. The City is hopeful to have approximately 80 percent of the City covered with the wireless network in the future. While this system is not designed with the redundancy required for high priority services, it could be utilized for certain transportation operation and management applications, such as accessing traffic signal controller data from a transportation operations center. The current wireless network supports up to 11 Mbps and could provide a good opportunity to support the transfer of video and/or data from remote sites to a communications hub location.



⁶ Based on meeting with City of Bend IT Staff, August 20, 2004.



LEGEND

- Cell Phone Line Drop
- ▲ Land Line Drop
- Twisted Pair Copper Interconnect
- Existing Conduit
- Existing Overhead
- Planned Conduit
- ★ Signal with Conduit for Future Interconnect
- ⋯ Bend MPO Boundary
- Urban Growth Boundary
- Railroads

Deschutes County
Intelligent Transportation Systems

Figure 1-8
EXISTING COMMUNICATIONS
INFRASTRUCTURE

1.8 EMERGENCY MANAGEMENT

This section describes the emergency management agencies in Deschutes County as well as the strategies used for routine services typically handled by 911, police, fire, and medical agencies and strategies for major emergencies and disasters. Roles and responsibilities and interagency relationships (for emergency management and transportation management agencies) will be discussed in Chapter 4: Operational Concept.

1.8.1 911 Center

The Deschutes County 911 center serves all but one of the local agencies in Deschutes County for call-taking and dispatching. The Oregon State Police are dispatched from the Salem call center. Deschutes County 911 uses a computer-aided dispatch (CAD) system by HiTech, which is currently being updated to utilize the built-in mapping capabilities. The CAD system mapping upgrade will be used to move to proximity based dispatching.

Although Deschutes County 911 dispatches for most of the local agencies, they cannot communicate with several of the police and fire agencies with their CAD system. Deschutes County Fire and Sheriff use a system written by County staff. City of Bend Police and Fire use a new system. To breach this communication barrier, there has been discussion of moving to a regional interface that provided connections between each agency⁷.

1.8.2 Police, Fire, and Medical Agencies

Emergency management facilities and hospitals are illustrated in Figure 1-2. The police, fire, and medical agencies that serve these facilities are represented by the City of Bend, the City of Redmond, the City of Sisters, Deschutes County, and the Oregon State Police. While each of these agencies primarily serves their jurisdiction, the Oregon State Police patrols all of the region's federal and state highways.



The City of Bend police and the Deschutes County sheriff have mobile data terminals (MDTs) in all of their vehicles, but the Oregon State Police do not. Bend Fire is currently testing two MDTs and pursuing a grant to implement MDTs in all of their fire vehicles. Bend Police have additional plans to provide officers with remote access to the City services using personal digital assistants (PDAs).

⁷ Based on conversation with City of Bend staff, August 20, 2004.

1.8.3 Emergency Management Agency Communications

As noted in section 1.8.1, the various emergency management agencies throughout the Bend area currently utilize different radio equipment and frequencies. City of Bend Police recently implemented in 800 MHz radio network and other agencies including Deschutes County and ODOT maintain their VHF radio networks. Deschutes County recently procured a portable radio interconnect system, TRP-1000, that can be used to provide communications interoperability between VHF, UHF, 800MHz, 900MHz and trunking talk-groups.

1.8.4 Management of Major Emergencies & Disasters

There are no fixed emergency operations plans for the Bend area due to the varied nature of the regions most common disaster -- wild fires. The program that is in place establishes roles and responsibilities for agency personnel that pools resources and coordinates a rapid and flexible emergency response.

During a significant emergency, the Deschutes County Emergency Operations Center (EOC), located at the 911 dispatch building, is activated and local transportation personnel are responsible for coordinating with the EOC to maintain accessible transportation routes to shelters and to re-route traffic as necessary. The American Red Cross (ARC) is responsible for providing shelters, which typically include public schools, churches, or other locations. ARC determines which shelter locations to use based on each particular emergency situation. Portable variable message signs are not used during such area evacuations and time is crucial and safe routes can quickly change as fires spread.

1.9 INCIDENT MANAGEMENT

ODOT currently staffs an incident responder full time in Region 4. The ODOT incident responder coordinates closely with emergency management agencies during incidents and emergency situations and is responsible for maintaining accessible transportation routes and to re-route traffic during incidents. No formal incident response/management plan currently exists in the Bend area.

ODOT Region 4 and Deschutes County have discussed the need for fixed variable message signs located at key traveler decision points (e.g. the south end of Redmond and the north end of LaPine) to reroute or detour drivers during road closures or incidents that commonly occur during the winter. While agencies wait for this equipment to be installed as part of the STIP program, local agencies do have equipment on hand (i.e. portable variable message signs) that can be deployed in the event of an incident or major emergency to support local emergency management agency operations.



1.10 SPECIAL EVENTS

Deschutes County is a major recreational destination during both the summer and winter seasons. Seasonal traffic has a significant impact on the local transportation system, with significant peaks during key holidays (e.g. traffic to Mt. Bachelor on Presidents Day weekend). Seasonal traffic aside, there are few special event centers that generate traffic with significant regional impacts.

The Deschutes County Fairgrounds and Expo Center, located in Redmond next to the Airport, is the main special event center within the study area. The annual County Fair creates congestion within Redmond due to a lack of circulation options and the interchange capacity at Highway 97. In addition, the annual Motor Coach rally that creates significant congestion and parking issues within Redmond due to the volume of RVs and the size of the vehicles.



1.11 FREIGHT

Freight arrives, departs, or passes through the Bend via truck, train, and air. Most commercial vehicle traffic utilizes state highways, while train traffic travels along the Burlington Northern-Santa Fe Railroad tracks that generally parallel Highway 97 through the study area. Most of the roadway-rail intersections are at-grade through Bend and Redmond, with the exception of the Bend Parkway that is grade separated. The Redmond Roberts Field Airport is located in south Redmond east of Highway 97.

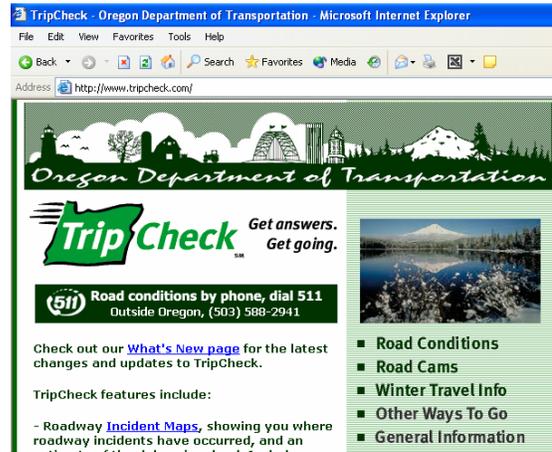


A large amount of commercial vehicle activity takes place on Highway 97 and Highway 20 in the Bend area, the major truck routes through Central Oregon. Traffic on these roadways, designated as Freight Routes in the *Oregon Highway Plan*, consists of 6 to 12 percent trucks⁸.

⁸ City of Bend Transportation System Plan, October 11, 2000.

1.12 TRAVELER INFORMATION

The Oregon Department of Transportation (ODOT) provides most of the traveler information for the Bend area. ODOT provides real-time traveler information through the TripCheck website, 511, and Cable Channel 48. ODOT's TripCheck website (www.tripcheck.com) includes six camera images, road conditions, weather information, incident maps, and construction activity for the Bend area. ODOT continues to add information to TripCheck as new equipment is deployed.



In late 2003, ODOT implemented 511, the new national traveler information number, throughout the state to provide various types of real-time traveler information. The 511 system is accessible to travelers over the phone through touch-tone dialing or voice activation.

Traveler information is also provided to the public on Cable Channel 48, which shows video footage from ODOT's CCTVs located through the Bend area. Temperature and wind updates are provided with the video footage.

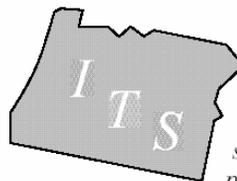


1.13 SUMMARY OF RELEVANT DOCUMENTS

A number of regional studies and plans have been compiled in Central Oregon that relate to ITS applications. A review of these documents was conducted to identify potential connections to other agencies and/or planned projects in Deschutes County. This section provides a summary of the key points from the documents reviewed.

1.13.1 Oregon ITS Strategic Plan: 1997 - 2017

To capitalize on the cost effective benefits of ITS projects, ODOT developed the *Oregon ITS Strategic Plan: 1997 - 2017* to set forth a vision and goals for ITS in Oregon. The plan includes a summary of existing ITS infrastructure, high priority user services, an ITS implementation strategy and timeframe, and associated costs (capital, operations, maintenance, staffing). Both regional and statewide



The vision of ITS in Oregon is to adopt systems, technologies and partnerships that enhance the mobility, transportation efficiency, safety, productivity and to promote economic prosperity and livability.

projects are included for implementation in the short (1997-2002), mid (2002-2007), and long (2007-2017) term. The following list includes projects identified for Region 4 as well as descriptions of what has been implemented to date:

- ◆ Incident Dispatch & Response (Short-Term Project): ODOT, OSP, and local agencies have dedicated staff for incident management that provide assistance to the public and other transportation and emergency management agencies along major corridors when incidents occur.
- ◆ Local Traveler Information Database (Short-Term Project): ODOT has incorporated traveler information from ODOT field equipment with the TripCheck website, but local agency data has yet to be integrated.
- ◆ Regional Traffic Management Center (TMC) (Mid-Term Project): ODOT has set up a regional TMC for the purposes of incident management and traffic signal control, but other local agencies have not yet been integrated with the TMC.
- ◆ Automatic Incident Detection System (Mid-Term Project): This project has not yet been implemented at the TMC, but will include the deployment of detection equipment to measure traffic flow parameters (e.g. speed, occupancy) that can be used to determine whether or not an incident has occurred.

The lengthy statewide project list encompasses many aspects of ITS such as transportation operations, traffic and incident management, traveler information, emergency response, and traveler safety.

1.13.2 1999 Oregon Highway Plan

The 1999 *Oregon Highway Plan (OHP)* developed by ODOT provides refined goals and policies of the *Oregon Transportation Plan* as well as a vision for the future of the state highway system and a system analysis of state highway needs and implementation strategies. Policy 2E: Intelligent Transportation Systems is included under Goal 2: System Management, which is one of the five goals included in the *OHP*. This policy states that a broad range of ITS services will be considered to cost-effectively improve safety and efficiency and will reflect the user service priorities developed in the *Oregon ITS Strategic Plan*. This policy highlights the following ITS services for consideration throughout Oregon:

- ◆ Incident Management
- ◆ En-Route Driver Information
- ◆ Traffic Control (Arterials and Freeways)
- ◆ Route Guidance
- ◆ Commercial Vehicle Electronic Clearance
- ◆ Pre-Trip Traveler Information
- ◆ Public Transportation Management
- ◆ Emergency Notification and Personal Security
- ◆ Emergency Vehicle Management
- ◆ Commercial Fleet Management

1.13.3 Planned Projects in Deschutes County

Table 1-4 summarizes planned projects (funded and un-funded) for the study area corridors and for transit in Deschutes County. These projects are detailed in the following plans or reports:

- ◆ *Statewide Transportation Improvement Program (STIP) 2004 – 2007*: ODOT’s four-year program with over \$1.3 billion in funding that comes from federal highway funds, federal transit funds, and state highway programs.
- ◆ *Oregon Transportation Investment Act (OTIA) I and II, 2001*: The Oregon Legislative Assembly approved this \$2.96 billion ODOT eight-year program to improve pavement conditions, capacity, and bridges throughout Oregon. Out of the four *OTIA I and II* projects in the study area, two projects on Highway 20 have already been constructed and the other two projects on Highway 126 have been incorporated into the current *STIP*.
- ◆ *Oregon Transportation Investment Act (OTIA) III, 2003*: The Oregon Legislative Assembly approved this \$1.3 billion ODOT bridge replacement and repair program for 2003 – 2005. The bridges included in *OTIA III* are based on the bridges included in the *Oregon Department of Transportation Economic and Bridge Options Report*, which is a 10-year plan ODOT put together to address the hundreds of bridges throughout the state that are nearing the end of their useful life. Two bridges in the study area were included in *OTIA III*, which is the first of five stages. No other study area bridges were included in the other four stages. However, one local bridge was selected for funding as part of *OTIA III* in addition to the bridges included in the *ODOT Economic and Bridge Options Report*.
- ◆ *City of Bend Transportation System Plan (TSP), 2000*: The proposed projects in this plan are recommended for incorporation in the City’s CIP.
- ◆ *City of Redmond Capital Improvement Plan (CIP), 2004*: The proposed projects in the City of Redmond over the next 15 years. Some of these projects are included in the *STIP*.
- ◆ *Deschutes County Transportation System Plan (TSP), 1996*: Provides a list of the transportation improvements needed through 2016.
- ◆ *City of Sisters Transportation System Plan (TSP), 2001*: The City of Sisters long-range plan, including CIP projects.

Table 1-4. Planned Projects on Study Area Corridors

Study Corridor	Project	Report/Plan
Highway 97 (The Dalles-California Highway)	<ul style="list-style-type: none"> ◆ Key 10637: Construct intersection improvements at S. Century Drive. ◆ Key 05157: Construct new highway alignment and realign and improve the connection at Highway 126; Phase 1 ◆ Key 13097: Grind out and inlay travel lanes from Wickiup Street to Bowery Lane ◆ Key 12568: Grind out, inlay, and overlay travel lanes from Village Way to Baker Road ◆ Key 11964: Replace the Riley Bridge (Bridge #01679) ◆ Key 13204 (OTIA III): Repair/replace Pilot Butte Canal Bridge (Bridge 01675B) and North Unit Canal-Swalley Canal Bridge (Bridge 08888); Construction is already underway 	2004 – 2007 STIP
	◆ Grade separation at S. Century Drive	<i>Deschutes County TSP</i>
	◆ Intersection improvements at Brosterhous Road	<i>Bend TSP</i>
	<ul style="list-style-type: none"> ◆ Traffic signal at Maple Avenue ◆ Reroute North in Redmond ◆ Traffic signal at Quartz Avenue Extension ◆ Traffic signal at Black Butte Boulevard/5th Street ◆ Traffic signal at Kingwood Avenue ◆ Sisters Avenue intersection improvements – east leg ◆ Traffic Signal at Yew Avenue NB and SB ramps 	<i>Redmond CIP</i>
	<ul style="list-style-type: none"> ◆ Mt. Washington Bridge/Hwy 97 ◆ Brousterhous Road Intersection Improvements 	<i>Bend CIP</i>
Highway 97 Business	◆ Bus. Hwy 97 Underpass	<i>Bend CIP</i>
Newport Avenue/ Greenwood Avenue/ Highway 20 (Central Oregon Highway)	◆ Key 12577: Consolidate private access and access at Torkelson Road to intersection at Erickson Road	2004 – 2007 STIP
	◆ Bridge 17B004: Replace the Deschutes River Bridge on Newport Avenue	<i>OTIA III</i>
	<ul style="list-style-type: none"> ◆ Greenwood/Hill Street intersection improvements ◆ Greenwood Avenue: Improvements from 3rd to Hill ◆ Greenwood/4th Street intersection improvements ◆ 9th & Newport Avenue: Right of Way Acquisition ◆ Newport/College Way Roundabout ◆ 8th Street/Greenwood Intersection ◆ Newport Bridge Replacement ◆ Greenwood Avenue, 3rd to Hill ◆ Newport Avenue, 12th to 13th ◆ Greenwood/4th Street Intersection ◆ Newport Avenue, 9th to Wall ◆ Newport Avenue, 10th to 13th ULTRA ◆ Newport Avenue, College Way to 15th Street ULTRA ◆ Empire Avenue, OB Riley to Hwy 20 	<i>Bend TSP</i> <i>Bend CIP</i>

Study Corridor	Project	Report/Plan
Highway 20 (McKenzie-Bend Highway)	<ul style="list-style-type: none"> ◆ Key 11872: Preserve pavement from the Deschutes River to Robal Road 	2004 – 2007 STIP
	<ul style="list-style-type: none"> ◆ Highway 20: Grade separation/realignment at Cook Avenue/ Bailey Road/ O.B. Riley Road 	Deschutes County TSP
	<ul style="list-style-type: none"> ◆ Realign the intersection of Highways 242/20 ◆ Realign the intersection of Highways 20/126 ◆ Realign Jefferson Ave. and Hwy 20/126 ◆ Highway 20 couplet 	Sisters TSP
Colorado Avenue/ Century Drive	No improvements identified	
Reed Market Road	<ul style="list-style-type: none"> ◆ Intersection Improvements at 9th Street 	Bend TSP
	<ul style="list-style-type: none"> ◆ Railroad Crossing ◆ American Lane Canal Crossing ◆ Parkway Signal to 3rd Street ◆ 15th Street to 27th Street ◆ Pettigrew Intersection ◆ 9th St. Intersection 	Bend CIP
Empire Avenue/ 27 th Avenue/ Knott Road	<ul style="list-style-type: none"> ◆ Empire Avenue Extension ◆ 27th Street: Widening from Bear Creek to Neff Road ◆ 27th Street: Improvements from Neff to Butler Market Road 	Bend TSP
	<ul style="list-style-type: none"> ◆ 27th Street Widening (Neff Rd to Forum) continued ◆ Empire Avenue/Boyd Acres Signal ◆ Butler Market/27th Street Intersection Improvements ◆ 27th Avenue, Neff to Butler Market ◆ 27th St/Micks Dr. Intersection Improvements ◆ 27th Street, Bear Creek to Reed Market ◆ 27th Street/Connors Intersection ◆ 27th Street/Medical Center Drive Intersection 	Bend CIP
Cooley Road	<ul style="list-style-type: none"> ◆ Cooley Road Interchange 	Bend TSP
	<ul style="list-style-type: none"> ◆ Hwy 97 to 18th Street, Interchange subject to funding 	Bend CIP
Highway 126	<ul style="list-style-type: none"> ◆ Key 13079 (OTIA I): Widen the highway and construct two one-way couplets on Glacier and Highland; Phase 1 ◆ Key 13564 (OTIA II): Widen the highway and construct two one-way couplets on Glacier and Highland; Phase 2 ◆ Key 09745: Install flashing beacon and left turn lane on highway at SW 43rd Street-SW Helmholtz Way ◆ Key 11869: Preserve pavement from Edgington Road to Squaw Creek Canal ◆ Key 12575: Grind out, inlay, and overlay travel lanes and upgrade guardrail and sidewalks from Latiwi Creek to Highway 97 	2004 – 2007 STIP

Study Corridor	Project	Report/Plan
	<ul style="list-style-type: none"> ◆ Traffic signal at 27th Street/Highland Avenue ◆ SW 9th/11th Street couplet conversion and traffic signal installations at Highland and Glacier ◆ Highland Avenue: Widen to 3 lanes between 15th and 27th Street ◆ Traffic signal at Sisters Avenue ◆ Traffic signal at East 9th Street 	<i>Redmond CIP</i>
Harper Bridge Road/ Upper Deschutes Road/Edison Ice Cave Road	<ul style="list-style-type: none"> ◆ Burgess Road: Reconstruction from Pringle Falls to South Century Drive ◆ South Century Drive: Widen and overlay from Vandever Rd. to General Patch Bridge ◆ FS Road #45: Reconstruction from Spring River Road to Century Drive 	<i>Deschutes County TSP</i>
Transit	<ul style="list-style-type: none"> ◆ Key 11970: Central Oregon Carpool/TDM Program in 2004 ◆ Key 11971: Central Oregon Carpool/TDM Program in 2005 ◆ Key 12559: Central Oregon Carpool/TDM Program in 2006 ◆ Key 12563: Central Oregon Carpool/TDM Program in 2007 ◆ Key 12125: Region 4 Transit Support in 2004 ◆ Key 12126: Region 4 Transit Support in 2005 ◆ Key 13019: Region 4 Transit Support in 2006 ◆ Key 13020: Region 4 Transit Support in 2007 ◆ Key 13370: Transit Operations in 2004 ◆ Key 13371: Transit Operations in 2005 ◆ Key 13372: Transit Operations in 2006 ◆ Key 13373: Transit Operations in 2007 ◆ Key 13374: Job Access Reverse Commute (JARC) Program 	<i>2004 – 2007 STIP</i>
ODOT Region 4 (Various Counties)	<ul style="list-style-type: none"> ◆ Keys 10732, 11892, 12557, and 12558: Implement a region-wide travel information system (remote cameras, message signs, and new technology) on various highways 	<i>2004 – 2007 STIP</i>
Statewide	<ul style="list-style-type: none"> ◆ Keys 11629 and 11633: Improve senior and disabled transit on the Oregon Transportation Network in 2004 ◆ Keys 11630 and 11635: Improve senior and disabled transit on the Oregon Transportation Network in 2005 ◆ Keys 12955 and 12597: Improve senior and disabled transit on the Oregon Transportation Network in 2006 ◆ Keys 12956 and 12958: Improve senior and disabled transit on the Oregon Transportation Network in 2007 ◆ Key 12266: Work zone safety program for 2005 – 2006 ◆ Key 13117: Work zone safety program for 2007 – 2008 ◆ Key 13547: Develop a Transportation Operations Center System 	<i>2004 – 2007 STIP</i>

1.13.4 City of Bend Transportation/Parking Strategic Plan

The *City of Bend Transportation/Parking Strategic Plan* identifies parking management strategies and facility recommendations for the downtown redevelopment. The plan proposed to adopt an 85% parking utilization strategy that manages parking supply to provide for priority users during peak periods. As part of implementing this strategy, the plan calls for implementing on-street directional signage to guide drivers to parking areas. This could be an opportunity to implement ITS devices to monitor parking demand and availability and utilize dynamic message on-street signs to guide drivers.

1.13.5 Regional Job Access Welfare-to-Work Transportation Plan

The *Regional Job Access Welfare-to-Work Transportation Plan* was developed for the Crook, Deschutes, and Jefferson counties to identify public transportation gaps and propose strategies for improvements. The strategies proposed for the Deschutes County area that could be incorporated within the Bend Area ITS Plan include:

- ◆ Complete an origin-destination study in Bend and submit a proposal for fixed routes.
- ◆ Hire a 1.0 FTE carpool/vanpool coordinator in Bend.
- ◆ Create subscription service pilot projects in Deschutes River Woods and Southeast Bend.
- ◆ Contract with the City of Redmond and COCOA Dial-a-Ride to extend existing service.
- ◆ Hire a 0.5 FTE carpool/vanpool coordinator in Redmond.
- ◆ Add a route on Highway 20 south of Sisters to Bend.

1.13.6 Bend Urban Area Transit Feasibility Study

The *Bend Urban Area Transit Feasibility Study* was developed for the City of Bend to identify the need for public transportation and the feasibility of providing fixed route service. Fixed transit routes and stops, as well as upgraded fleet vehicles, provide an opportunity to incorporate ITS technology into public transportation in Deschutes County. Key findings of the study include:

- ◆ A 5-bus fixed route system (providing 30-minute headways in key corridors) is the recommended action plan, which would achieve a 20 percent farebox recovery ratio and would require a property tax of 33 cents per \$1,000 value. The fixed routes for this scenario would include portions of Colorado Avenue, Newport Avenue, 3rd Street, Bend Parkway, Greenwood, Neff Road, Wilson Avenue, and Reed Market Road.
- ◆ Transfers between routes should be free.
- ◆ The land use patterns and limited connectivity in the Bend area will be a design impediment for maintaining headways.
- ◆ A new vehicle fleet of 30-foot buses is recommended.